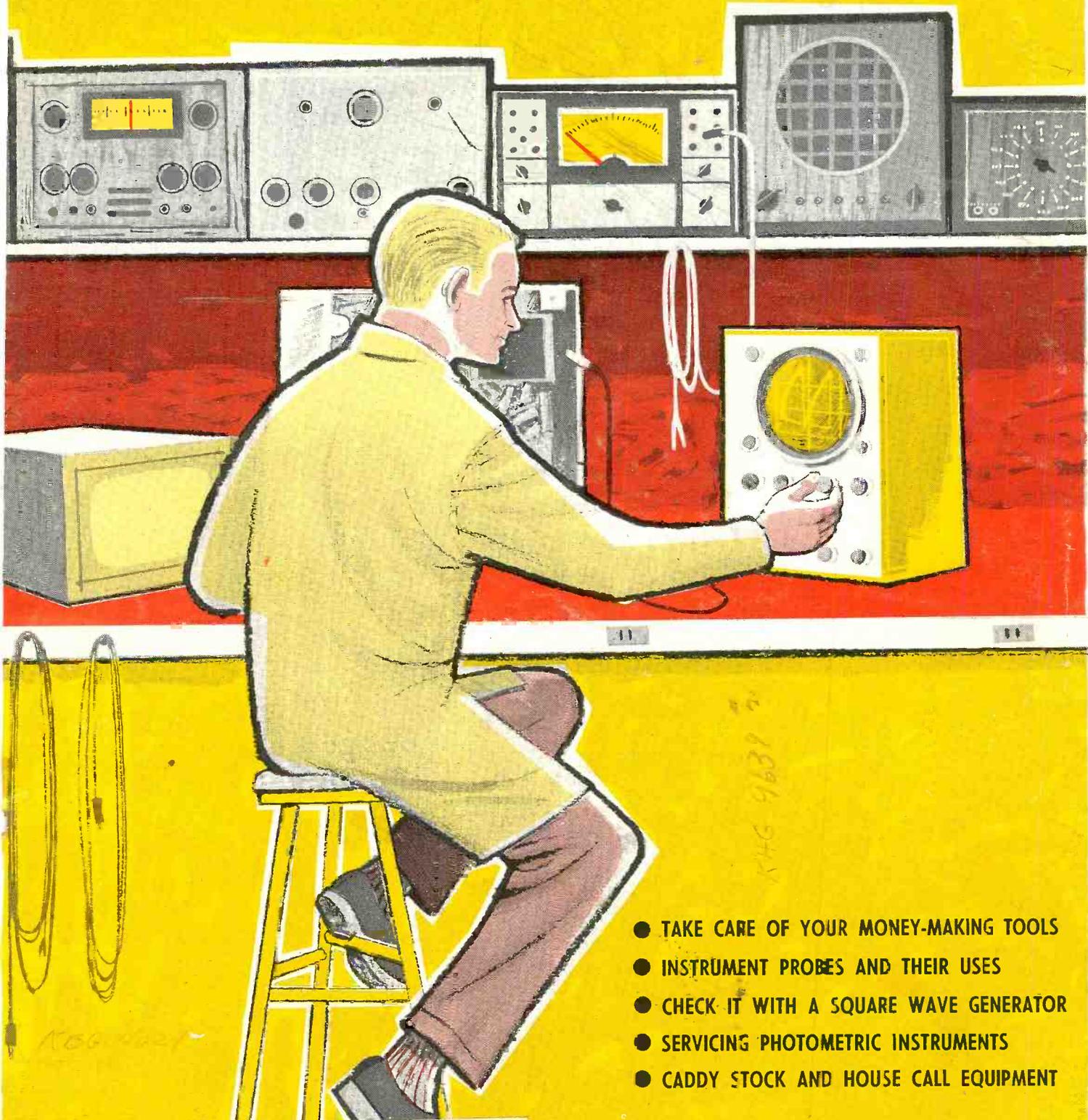


ELECTRONIC TECHNICIAN



- TAKE CARE OF YOUR MONEY-MAKING TOOLS
- INSTRUMENT PROBES AND THEIR USES
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- SERVICING PHOTOMETRIC INSTRUMENTS
- CADDY STOCK AND HOUSE CALL EQUIPMENT

NOVEMBER 1962



STEP ONE FOR COLOR TV SERVICING: THE NEW PRECISION E-450 COLOR BAR/WHITE DOT GENERATOR.

Simple to use, crystal controlled and voltage regulated, the PRECISION E-450 is a must for the busy serviceman. It combines the facilities to test and adjust the phasing, matrixing, linearity and convergence circuits in all color receivers. Three front panel controls and one simple antenna cable connection to the receiver under test afford a new high in ease of operation. The PRECISION E-450 is furnished complete with output cable and technical manual for only \$189.95 net. For complete details on this and other models, see your jobber or write today.

PRECISION APPARATUS CO., INC., GLENDALE 27, NEW YORK

Patterns: Color bars, White dots, Crosshatch, V bars, H bars. **RF Output and Sound Carrier:** Available on channel 3 or 4; field adjustable. RF output 50 mv max. Sound 10% of picture carrier. **Simple 300-Ohm Connection** to antenna input terminals of receiver. **No External Sync.** Signals required to lock in test patterns. **Master Voltage-Regulated, Crystal-Controlled Oscillator** operating on 189 kc assures stability of displayed patterns. **Easier Convergence Set-Ups:** Separate vertical and horizontal bar patterns. **Optimum Convergence Adjustments:** Extremely fine, well-defined dot pattern. **Color Bars:** A reference test signal, precisely controlled, produces 10 equally spaced color bars across face of TV receiver under test. Included are the color bars corresponding to R-Y, G-Y, B-Y, I and Q signals.

PRECISION 
All Precision Test Equipment is Guaranteed For One Full Year

... for more details circle 46 on page 50

The new RCA MARK VIII 27-Mc 2-WAY RADIO



More Features • Improved Performance • AT A LOWER PRICE

Here is THE outstanding bargain today in a 2-way Citizens' Band radio: THE NEW RCA MARK VIII. Compact, dependable, simple to operate, it outperforms and offers more features than even the famous RCA Mark VII.

Look what this remarkable new unit offers you:

- 9 crystal-controlled transmit and receive channels
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 - Exceptionally good voice reproduction—high intelligibility
 - Maximum allowable transmitter input of 5 watts*—nominal output of 3 watts or more
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 - Illuminated "working channel" feature
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- plus many more features to increase its usefulness and efficiency.

The new low Mark VIII price **\$149⁵⁰****
puts 2-way radio convenience within reach of everyone

GET THE FULL STORY; FILL OUT AND SEND IN THE COUPON BELOW

RCA Electron Tube Division, Commercial Engineering, Dept. K-46-R
415 South Fifth Street, Harrison, New Jersey

Please! Rush more information on the new RCA Mark VIII 2-way Citizens' Band Radio.

Name _____

Address _____

City _____ Zone _____ State _____

*Maximum plate input power to final radio-frequency amplifier stages as defined by FCC regulations

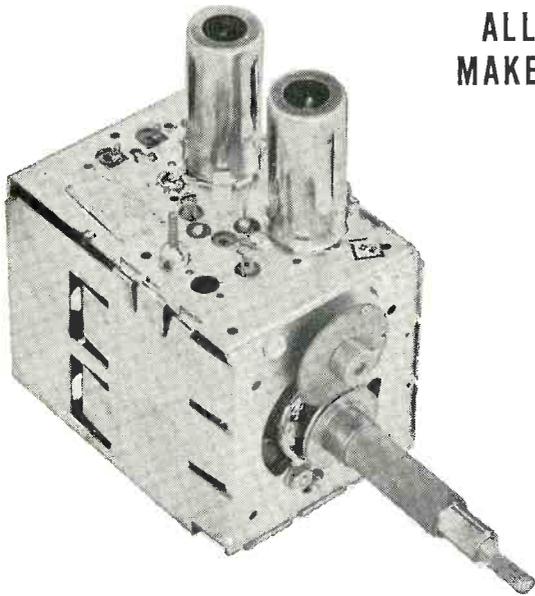
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Tarzian offers

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ALL
MAKES

It just makes sense that a manufacturer of tuners should be better-qualified, better-equipped to offer the most dependable tuner repair and overhaul service.

Sarkes Tarzian, Inc., pioneer in the tuner business, maintains a complete, well-equipped Factory Service Dept.—assisted by Engineering personnel—and staffed by specialized technicians who handle **ONLY** tuner repairs . . . on **ALL** makes and models.

Tarzian-made tuners received one day will be shipped out the next. There is a 12-month guarantee against defective workmanship and parts failure due to normal usage. And compare our cost of \$8.50 and \$15 for UV combinations. There is absolutely no additional, hidden charge for **ANY** parts except tubes. Replacements available at low cost on tuners beyond practical repair.

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ONLY

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INCLUDING

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Tuners Repaired on Approved, Open Accounts

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use this address for fast,
factory repair service

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CIRCULATION**

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November • 1962

Vol. 76 • No. 5

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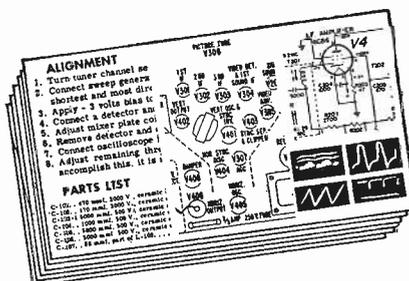
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CIRCUIT DIGESTS

PRECEDING BACK COVER



AIRLINE: TV Chassis, Models WG 1683A and WG 2683A

GENERAL ELECTRIC: TV Chassis, M 597 Series

PACKARD BELL: TV Chassis, Models 23DC16

RCA: TV Chassis, KC5136Y Series

SYMPHONIC: TV Chassis, TSL-001

WEECOR: Amplifier-Speaker System Model 4210



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■ You select exactly the number of channels, types of inputs and the power you require to fit each job! **You buy only what you need, use what you buy . . . never any waste!**

■ Expand or modify a system, anytime, with simple modules that install in minutes. Regardless of whether it's channels, inputs or power! **System never obsolesces!**

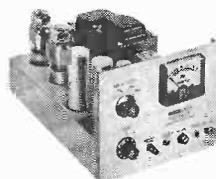
■ Apply compression or full limiting to any desired channel, on any kind of program source. Or, alternately, apply limiting action to the entire program mix. **Eliminate complaints about sound being too loud or too low; reduce the number of microphones and channels needed to achieve group coverage; prevents sound output exceeding point of feedback howl.**

■ Introduce beep, warble or continuous tones—all three if you wish—to signal time periods, fire, forced or unauthorized entry, occurrence of any disaster or emergency . . . even to signal rain, temperature, water level or other possibly significant conditions. And you can introduce these signals manually, or remotely and automati-

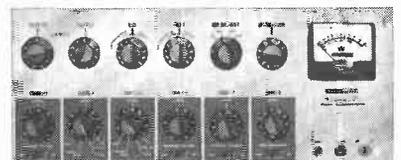
cally . . . even if the amplifier is turned off! **Now a sound system can more than earn its keep by doubling as an operational and safety aid.**

■ Employ "precedence" mode of operation, with local manual switch or remotely and automatically; complete cut-out of unwanted signal or any blend of the normal and precedence signals. **Now you can have all-call, emergency messages, tone signals, periodic sales messages, etc. . . . as an integral part of the regular sound system.**

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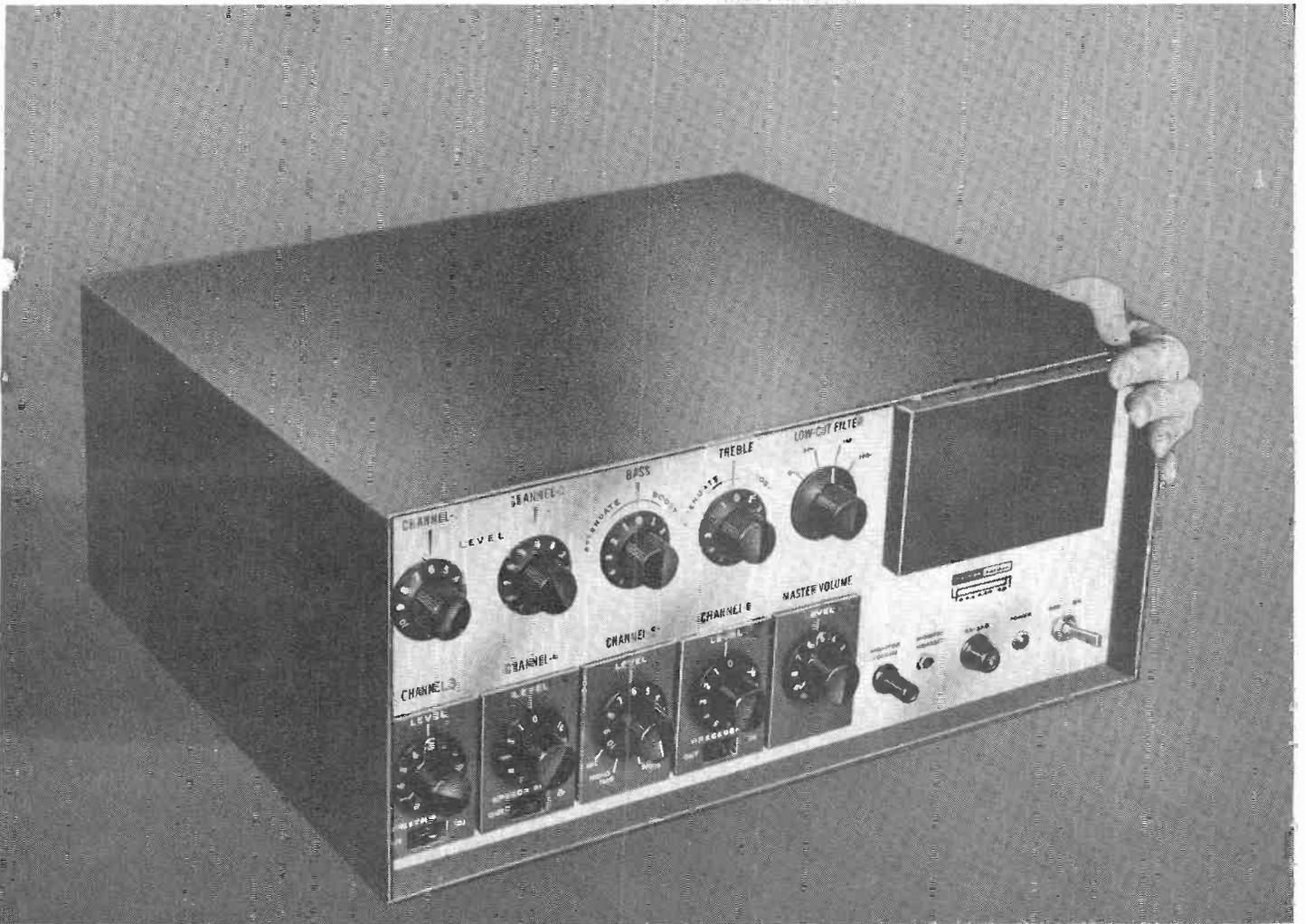


POWER BOOSTERS—available covering the range from 40 to 200 watts output.



PREAMPLIFIER-MIXER — accommodates up to 8 channels; includes VU Meter, line amplifier and power supply.

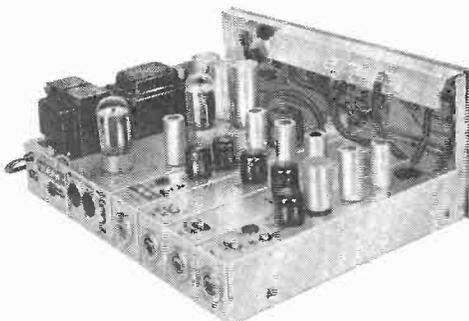
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more sound jobs — large or small — easier packaged public address amplifier!

■ Complete remote control facilities are provided... for control of program levels, putting the system on "stand-by" or turning the system on and off. **Place the equipment where it ought to be, control the system from where it's most convenient.**

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■ **Plus many other special operating and installation advantages, such as:** output to a tape recorder, independent of tone and master volume controls; four position Lo Cut Filter; bridging In-Out connections; on-chassis sockets for plug-in low impedance mike and line input transformers, phono and tape equalizers; both balanced and unbalanced 25V and 70V constant voltage outputs; choice of flush-panel, cage or rack-mounting facilities... and numerous other features.

AND DOLLARS-PER-WATT PRICES THAT DEFY COMPETITION!

No matter how small or how big the sound system you contemplate, you owe it to yourself to investigate the Harman-Kardon GALAXY Series before you buy. Use the coupon to get Free "Sound Headquarters" Decal that helps identify you as a source of quality sound equipment... plus all the facts on GALAXY!

harman kardon

HARMAN-KARDON INC. Commercial Sound Division
55 Ames Court, Plainview, L.I., N.Y. DESK G-11

Please send literature on the GALAXY Series immediately.

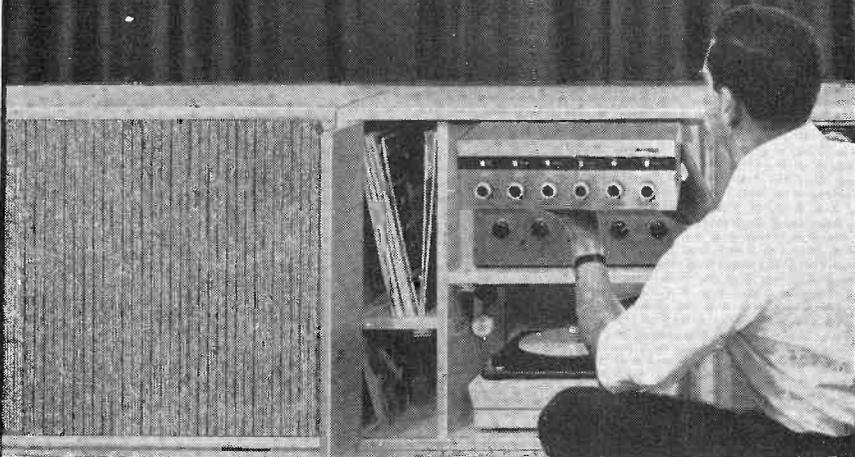
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... for more details circle 33 on page 50

For Big Profits Doing This...

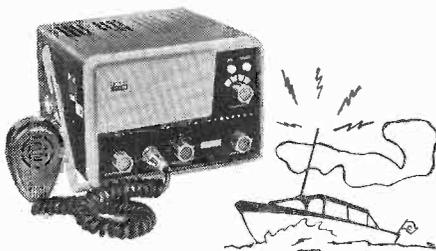


...Use These:

Whether it's hi-fi in the home, or CB in car, boat, truck, or taxi, custom installation jobs jump into the big-profit category when you deliver *high quality at low cost.*

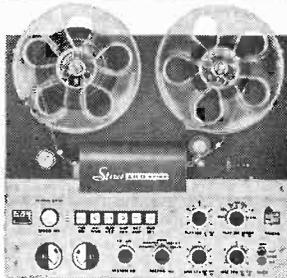
And especially with EICO kits, which average 40% less than our own, low, wired prices. Wire 'em up yourself and pocket the difference—with your customer's blessing, because if you build the components yourself, it's custom-made all the way through!

But kit or wired, EICO's all-out, no-compromise engineering, EICO's strikingly dramatic beauty, and EICO's fantastically low prices provide all the ingredients necessary for big profits on custom jobs. To put it simply: *You Profit from EICO Excellence.*



Deluxe Citizens Band Transceivers

	Kit	Wired
#770: 117 VAC only	\$79.95	\$109.95
#771: 117 VAC and 6 VDC	89.95	119.95
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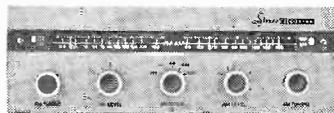


NEW TRANSISTORIZED STEREO/MONO 4-TRACK TAPE DECK RP100

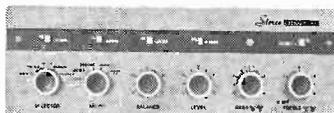
Semikit \$299.95 Wired \$399.95
Luggage-type Carrying Case \$29.95
Standard 19-inch Rack Mount \$9.95



STEREO FM MULTIPLEX TUNER ST97
Semi-Kit, \$99.95 Wired \$149.95
Includes metal cover and FET.



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AC VTVM & AMPLIFIER #250
Kit \$49.95
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Kit \$25.95
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IN-CIRCUIT CAPACITOR TESTER #955
Kit \$19.95
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ADD 5% IN THE WEST

For complete catalog of over 106 EICO kits and wired units—hi-fi, test equipment, citizens radio, ham gear—plus name of nearest distributor, write to dept ET-11
EICO ELECTRONIC INSTRUMENT CO., INC., 3300 Northern Blvd., L.I.C. 1, N.Y.
Export Dept., Roburn Agencies Inc., 431 Greenwich Street, New York 13, N.Y.

EDITORS' MEMO

Most magazine editors are human and like to receive mail bags filled with approving letters from readers. For us, letters may tell how an article, a hint or a "tough-dog" helped the reader in some practical way.

Another group of letters we receive offer constructive criticisms and suggestions to improve magazine content. Most readers take pride in helping to improve the magazine they read and find useful. And we particularly like to receive letters from technicians offering to contribute an outline for a technical article.

We receive our share of reader letters and appreciate them. They help us in our daily efforts to produce a more realistic "shirt-sleeve" type publication for professional TV-radio, Hi-Fi service-dealers and industrial electronic technicians.

Over the years we have received a few very special letters too—one here and another there. As a group, these letters assume special significance.

Every letter in this group accuses us of being something we shouldn't be, according to the writer. For instance, two or three letters claim that we are "anti-association."

And about the same number of letters take the opposite view and say that we are "obviously in favor of technicians' associations." We skim back over the past issues and can't find where or when we gave these impressions, one way or another. We always try to give equal space to the pros and cons of this subject.

One letter claims we are "in favor" of licensing technicians. Another states unequivocally that we are "against" licensing. Whatever you can imagine editors standing "for" or "against," we have stood, according to at least one reader.

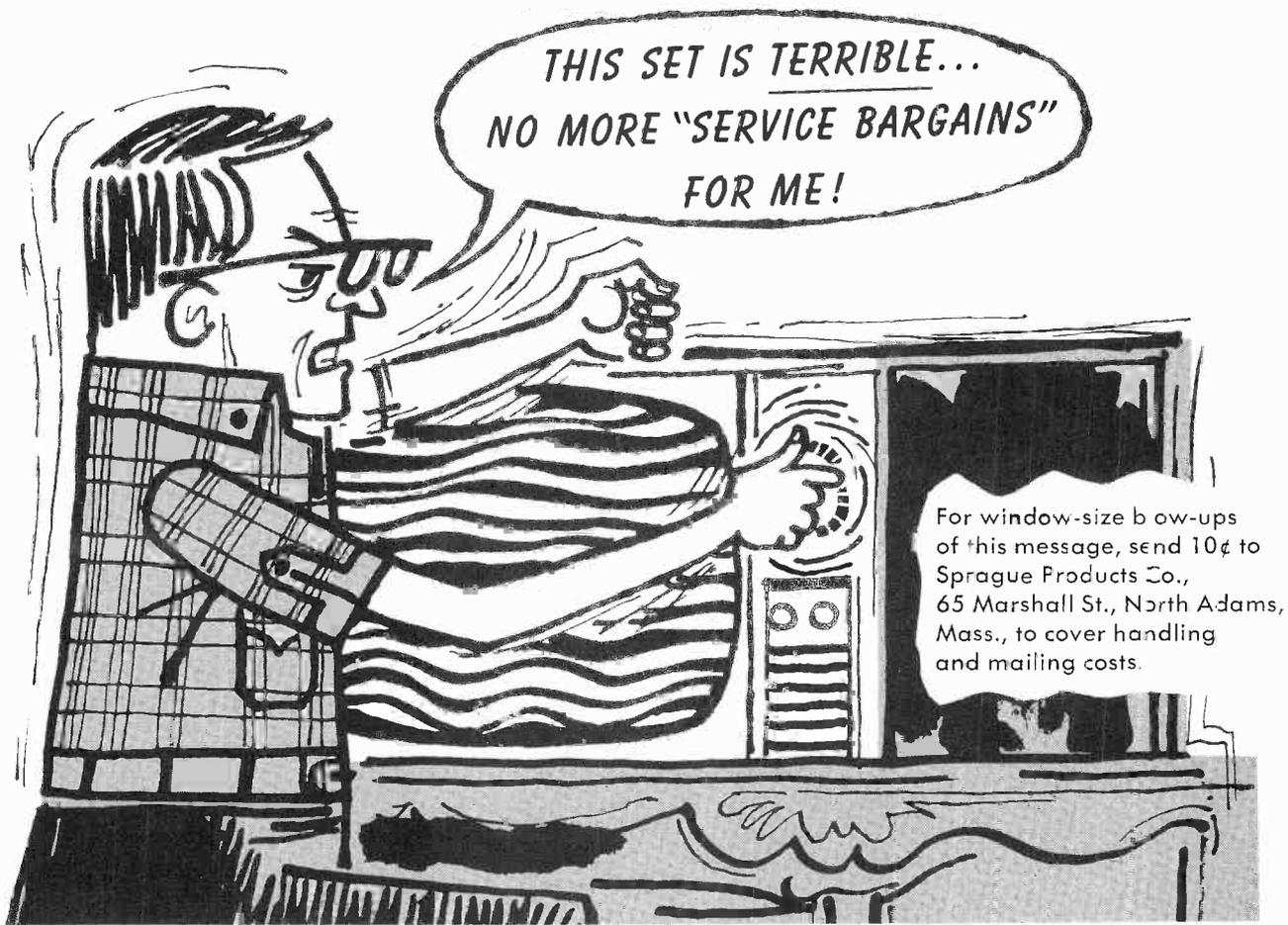
Some magazine editors toss these letters in a special basket. Others try to prove how wrong the writer is by dictating a long-winded letter in rebuttal.

Any editor worth his salt knows that letters in this category have special significance and are highly important to every one of his readers. He would have good reason to begin worrying if these letters suddenly stopped arriving altogether.

We hope this particular small group of letters, which yields an infinite variety of off-beat opinions, never subsides completely. Their periodic arrival guarantees the continuing existence of a democratic concept which is deep-rooted in the soil which feeds this Nation's special brand of scientific and social progress.

The Editors

... for more details circle 26 on page 50



HOW TO BE SURE OF GOOD TV SERVICE...

1. Beware the Service "Bargain." If you shop around for cut-rate prices or extra-liberal service contracts, you're *asking* for trouble. A "something-for-nothing" offer usually means cut-rate parts and substandard service methods. The *reputable service dealer* spends years in study and training—thousands of dollars on test equipment, tools, and service manuals—countless hours in keeping up-to-date on new developments and service techniques. Because of this heavy investment, he can't *afford* to offer "bargains."

2. Rely on a Fully Qualified Independent Service Dealer. Well known and highly regarded by your friends and neighbors, his professional training and experience have made him a real technical expert. He takes pride in his work. He wants to stay in business. And he stakes his reputation and his future on satisfying *you*. So he'll use only component parts of the highest quality and latest design—plus his thorough knowledge and keen skills—to do the job right. Depend on him; he can't *afford* to let you down!

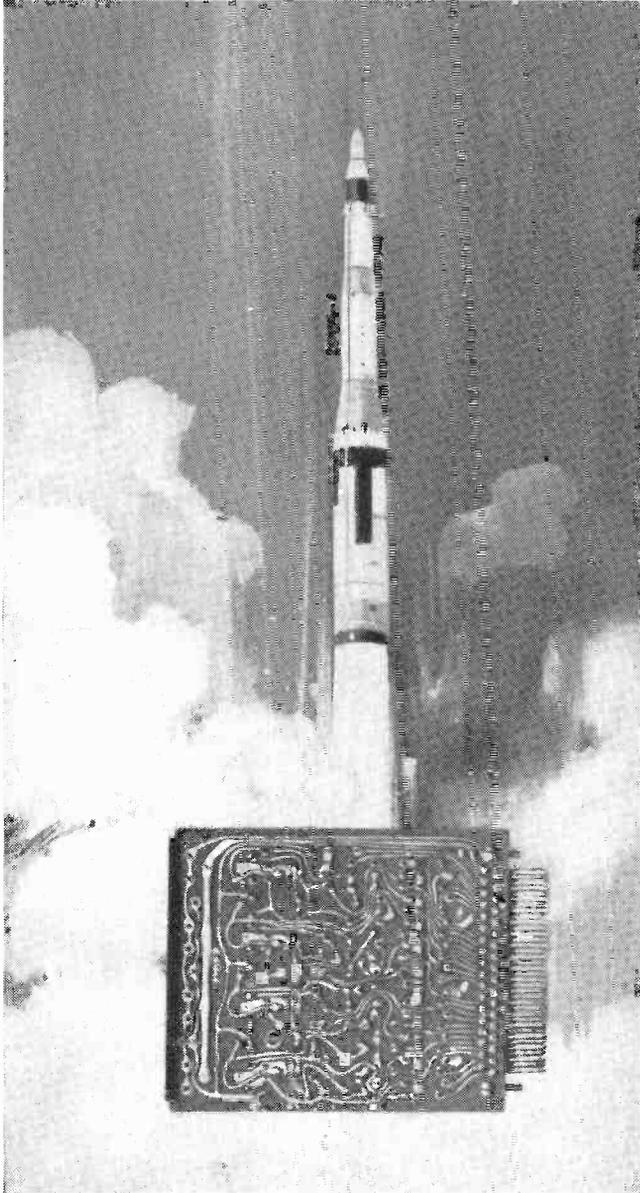
Your TV set provides you with a wealth of entertainment.
Keep it in the best repair . . . at lowest cost . . . by calling
your local TV-RADIO Service Dealer at the first sign of trouble!

THIS MESSAGE WAS PREPARED BY SPRAGUE PRODUCTS COMPANY,
DISTRIBUTORS' SUPPLY SUBSIDIARY OF SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASSACHUSETTS FOR . . .

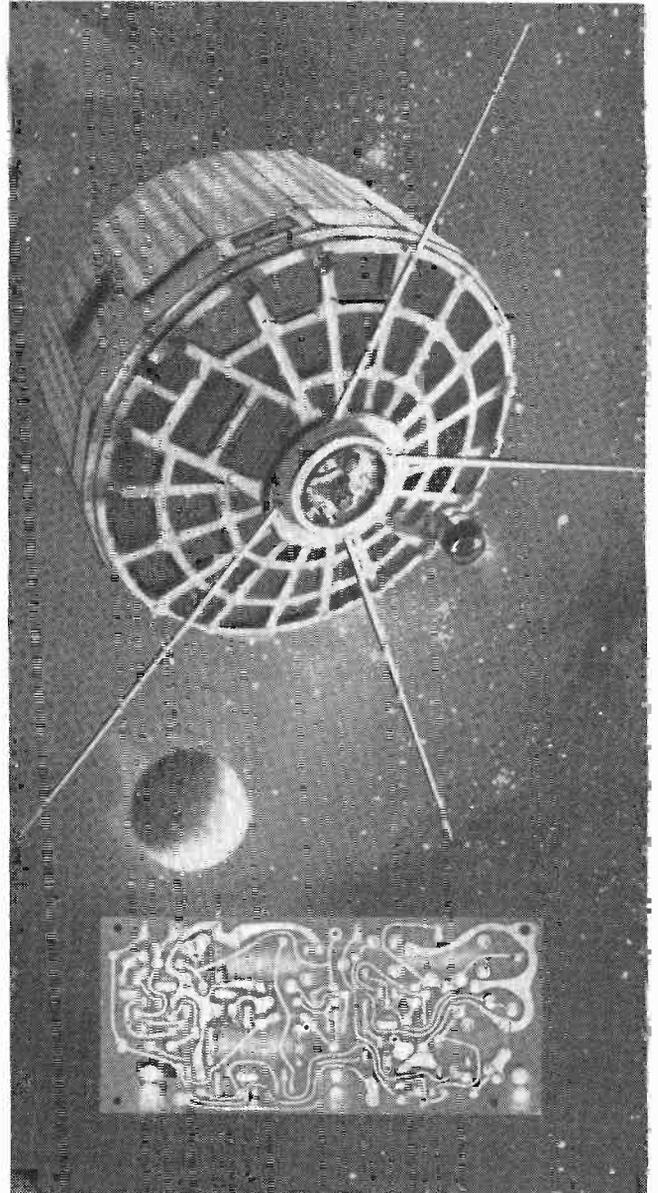
YOUR INDEPENDENT TV-RADIO SERVICE DEALER

. . . for more details circle 55 on page 50

This advertisement in the November Reader's Digest sealed circuits are the vital nerve systems for



RCA sealed circuit modules are used in the computer and communications of the U.S. Air Force Minuteman launching system, making possible high density of components, ease of maintenance, and rugged, reliable performance.



All five TIROS weather satellites, developed and built by RCA under the technical direction of Goddard Space Flight Center of NASA, have exceeded original goals; their lives enhanced by RCA-designed sealed circuitry.

How New Ideas in Sealed Circuitry

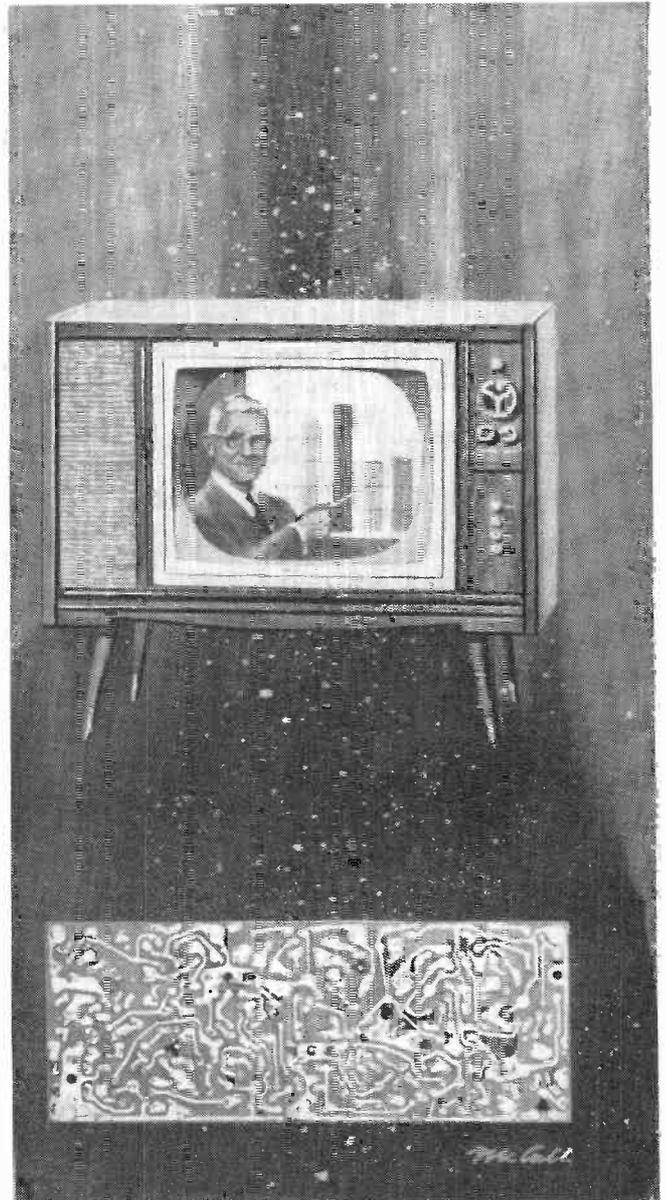
The circuit boards you see above are one of science's modern miracles used in satellites, space capsules, computers and TV sets. They differ in size—and design—and complexity—for their respective needs. But each one is the result of

science's search for the utmost in reliability and efficiency. Precision-crafted sealed circuit boards eliminate old-fashioned hand-wiring and hand-soldered connections that can come loose or short-circuit. These modern circuits are etched

shows millions of Americans why Precision-Crafted the marvels of the Space Age... and today's TV



Electronic Computers such as the RCA 301 calculate data at fantastic speed for American defense, and all phases of industry and communications. Their electronic hearts are sealed circuit boards



Color TV instructs, informs, as well as entertains millions. Here, the reliability of RCA Security Sealed Circuit Boards* has been proved for eight long years in homes like yours from coast to coast.

are Changing Our Daily Lives

in copper which is permanently bonded to boards, protecting them from heat and moisture.

**In the early days of television, RCA, like all other manufacturers, had to depend on all hand-wired circuitry. Today for greater pre-*

cision and reliability, two-thirds of RCA Victor TV circuitry is bonded on Security Sealed Circuit Boards.



The Most Trusted Name in Electronics
Tmk(s)®

50 new Lafayette Associate Stores now going strong

Are You Ready for Your Big Break?

For the independent serviceman who wants to be truly independent—a most unusual opportunity to own your own business.

If you have a basic knowledge of radio, television or electronics, and if you have ambitions for true independence and security, a Lafayette Radio Electronics Associate Store can be the beginning of a profitable and respected career.

■ Within the past year, Lafayette Radio Electronics began to explore the possibility of expanding on a nationwide basis. Fifty men such as you (some with established stores, some with little or no business experience) were granted associate store franchises. They have been given the benefit of Lafayette's many years of experience selling stereo kits, citizen band radios, recorders, science and electronics kits, tools, components, hobby supplies, television repair equipment and all the other things that make this the fastest-growing industry in the country. Today, every one of these men is the owner of a thriving business and is well on his way to a better way of life. (A list of these successful associates is available on request.) ■ As a result of this success, Lafayette has decided to expand the program. We are now looking for a limited number of men who are willing to invest from \$10,000 to \$20,000 to get the things they've always wanted out of life: travel, new home, new car, education for the children, security of their own business. ■ For more information on how you can own a profitable business, fill out and mail coupon below. Find out more about Lafayette's:

Protected Territory Yours will be the only franchised Lafayette Radio Electronics Associate Store in your marketing area. This means that when your customers want the advertised and branded merchandise supplied by Lafayette, they'll come to you. **Marketing Direction** With the knowledge gained from past successes, we will help you set up a complete program, from choosing the right location, to designing your store for maximum profits, to setting up your inventory.

Executive Guidance Our program will help you function effectively in the day to day operations of your store. We'll show you how to deal with customers, how to establish a large, loyal following, how to build public relations. In short, Lafayette will show you how to be the kind of responsible executive who is a success in business, a leader in the community. **Advertising Support** Millions of dollars have been spent to establish Lafayette Radio Electronics and its franchised dealers as the primary source for electronics radio and science equipment. The Lafayette sign in front of your store will indicate to everyone that you are associated with a multi-million dollar organization, one of the largest of its kind in the world. Furthermore, all-year 'round advertising, public relations and promotion campaigns will continue to send customers to your store. ■ Fill out and mail this coupon today. This can be the beginning of a new way of life.

Lafayette Radio Electronics Corporation

111 Jericho Turnpike, Dept. ET-112, Syosset, L. I., New York

Mr. Robert Laub: Please send me full information on how I can own my own profitable business. I understand there is no obligation.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

... for more details circle 38 on page 50

LETTERS TO THE EDITOR

Wants Cathode Beamer Info

Editor, ELECTRONIC TECHNICIAN:

I enjoy your magazine very much, especially the Circuit Digests, but like a lot of us I'm too lazy to tell you so until I get around to wanting something. I have recently purchased a Cathode Beamer. It was not in operating condition but my service department has got it working on the "sweeper circuit," but the weld section is dead. I do not know who manufactured this unit. The only thing it says on it is "Made in U.S.A." I need a schematic of this instrument. Perhaps some of your readers can tell me who manufactured it.

ORVILLE PATRICK

Woodbridge, Calif.

Too Many Goofs

Editor, ELECTRONIC TECHNICIAN:

You have a pretty good magazine, with much useful information, but it seems to me that you have too many errors in your articles. For example, the September '62 issue, in the last paragraph on page 22 about d-c restoration, says that a negative voltage is developed across R. I think that it would be more correct to say that a positive voltage is developed since the "whiter" signal, with the larger sync pulses, ought to provide a more positive voltage on the CRT grid in order to give more "white" on the screen. In the same issue, page 18, paragraph 4, it is stated that: "To convert p-p sine wave voltages to rms, the p-p voltage may be multiplied by 0.707." This is hardly true. The last paragraph in the same article, page 20, infers that an ordinary filament acts as a voltage regulator. This too I find hard to believe.

FINN POULSEN

Arlington Height, Ill.

• The clamp voltage must be negative to maintain the black blanking at a constant voltage. (The blanking will always be more positive than the clamping voltage.) In this manner, the video will remain proportionately light or dark. The circuit is not designed to develop new levels, but rather, to restore the original levels.

Paragraph 4, page 18, should have read "peak" instead of p-p. In the last paragraph, page 20, the author did not intend to infer that a filament transformer was a voltage regulator. He merely pointed out that a scope used by field engineers for measuring low p-p voltages would be more conveniently accurate if calibrated from a low voltage heater

Find it and Fix it in 1/2 the time!

EASILY SOLVES "TOUGH DOGS"... INTERMITTENTS... ANY TV TROUBLE



B&K MODEL 1076 TELEVISION ANALYST BLACK & WHITE AND COLOR

Just As Easy to Use As a VOM!

By Easy Point-to-Point Signal Injection, You see the Trouble on the TV Screen and Correct it—Twice as Fast and Easy!

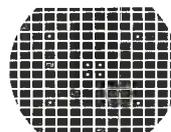
Simplified technique stops lost hours never recovered on "tough dogs", intermittents, and general TV troubleshooting. This one instrument, with its complete, accurate diagnosis, enables any serviceman to cut servicing time in half... service more TV sets in less time... satisfy more customers... and make more money.

With the Analyst, you inject your own TV signals at any time, at any point, while you watch the generated test pattern on the picture tube of the television set itself. This makes it quick and easy to isolate, pinpoint, and correct TV trouble in any stage throughout the video, audio, r.f., i.f., sync and sweep sections of black & white and color television sets—including intermittents. No external scope or waveform interpretation is needed. Checks any and all circuits—solves any performance problem. Gives you today's most valuable instrument in TV servicing—proved by thousands of professional servicemen everywhere.

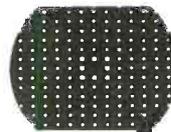
Available on Budget Terms. As low as \$30.00 down.

Net, \$29995

SIMPLIFIES COLOR TV SERVICING, TOO



Enables you to troubleshoot and signal trace color circuits in color TV sets, or facilitate installation.



Generates white dot, crosshatch and color bar patterns on the TV screen for color TV convergence adjustments.



Generates full color rainbow display and color bar pattern to test color sync circuits, check range of hue control, align color demodulators. Demonstrates to customers correct color values.

Time-Saving, Money-Making Instruments Used by Professional Servicemen Everywhere



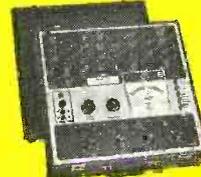
Model 960 Transistor Radio Analyst



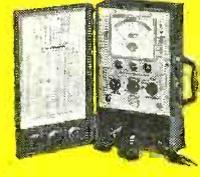
Model 360 V O Matic Automatic VOM



Model 375 Dynamatic Automatic VTVM



Model 700 Dyna-Quik Tube Tester



Model 440 CRT Rejuvenator Tester

See Your B&K Distributor or Write for Catalog AP 20-T



B & K MANUFACTURING CO.

Division of DYNASCAN CORPORATION

1801 W. BELLE PLAINE AVE. • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.

Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

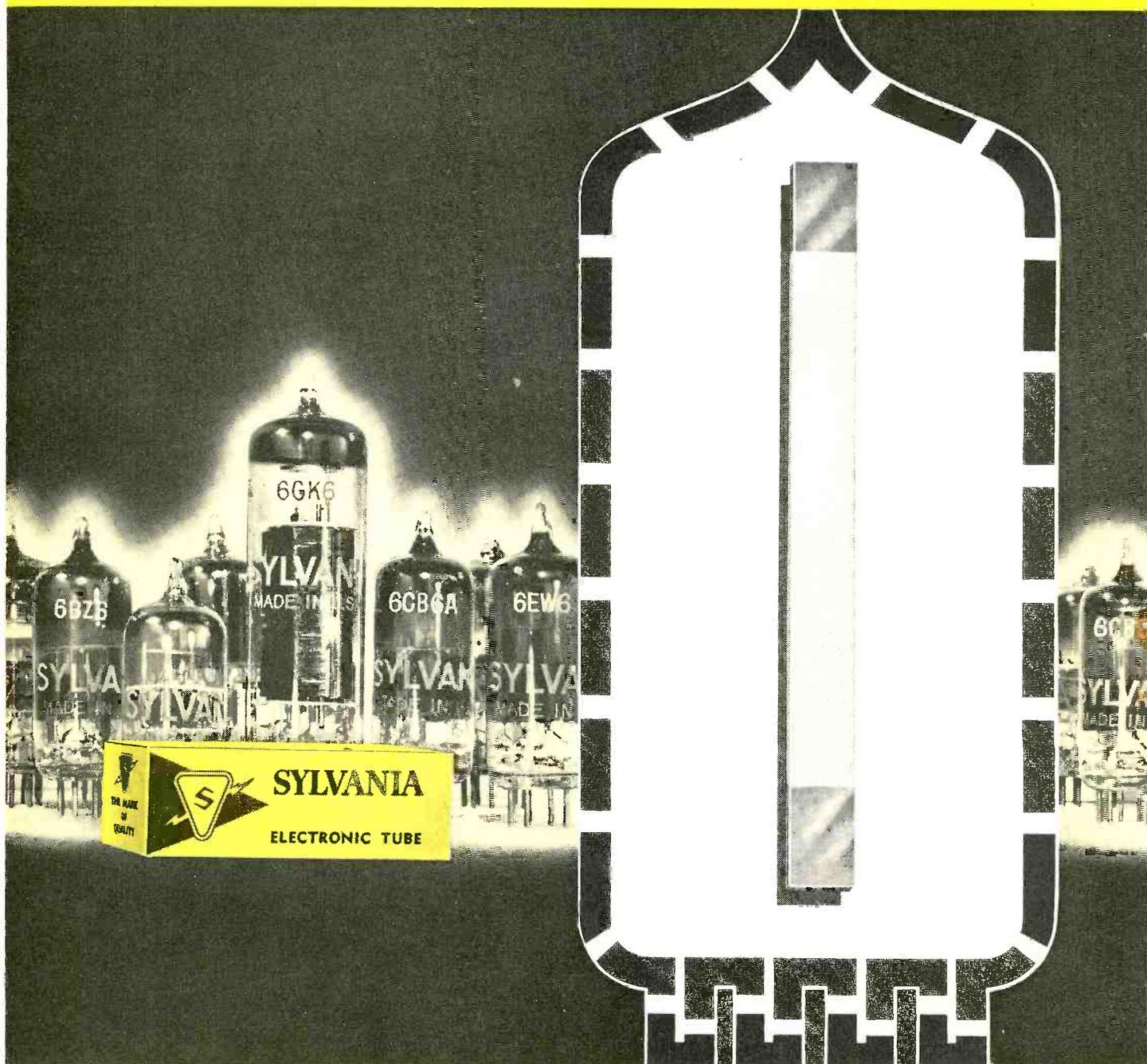
Sylvania—first with the Sarong and Bikini cathodes—now announces a new development that significantly increases the reliability of Sylvania tubes. "LIFE-Boost Cathode" is the name... the secret is an ultra-pure, uniform alloy made possible by Sylvania's leadership in powder metal technology.

Contrasted to conventional melted alloys, the LIFE-Boost powder-metal alloy is so pure and uniform, with performance so predictable, that it eliminates any need for the usual "melt approval." Alloy uniformity inhibits the formation of leakage paths, which extends tube life. It also means

better-controlled electron emission and regulated barium release throughout life—tube performance stays within specifications. Further, the new cathodes have 25% greater mechanical strength, which significantly reduces equipment failure in the field.

Precise control of alloy composition is the key. The basic pure nickel powder plus carefully controlled powdered reducing agents are thoroughly blended and immediately rolled into thin-gauge strip. Because no critical temperatures are involved, no impurities are introduced from crucibles and con-

New Sylvania LIFE-BOOST* Cathode dependability—fewer callbacks, more



tainers, forging hammers or hot-rolling equipment. And the powder process permits previously impossible or hard-to-attain combinations of wanted properties, such as electrical passivity and mechanical strength at high temperature.

A planned conversion of Sylvania tubes to the LIFE-Boost Cathode is under way. See your distributor for dependable Sylvania tubes—the only ones with this new development that means fewer callbacks, more profitable servicing.

means greater profitable servicing

MORE THAN 80 TYPES already
have the LIFE-BOOST Cathode.
Here's evidence of what it can do:

...In 6DZ4 UHF oscillator:

No failures, greatly improved stability

Test: 40 tubes operated at 130 VAC for 1500 hours in 40 TV sets (4 models, 3 manufacturers represented).

Failures: None resulting in set failure. (Statistical estimate: 1% per 1000 hours at 130 V, or about 0.3% per 1000 hours at 117 V.) Failure rate for same tube made with conventionally prepared cathode material: 13.1%.

Oscillator Grid Current: After 1500 hours at 130 V, 90% of LIFE-Boost Cathode tubes had grid current between 550 and 950 μ A. Only about 38% of the tubes with conventional cathodes remained within these limits after period of test.

...in 6GK6, used for critical vertical output:
TV set manufacturer reports improved stability

Test: More than 1000 hours at 135 VAC line.

Results: No leakage problems, no slump in characteristics; tube can be used in vertical socket as well as other sockets of customer's TV set line.

Sylvania tests show significantly reduced sublimation (formation of leakage paths), and improved plate current stability under accelerated life test and heater cycling conditions with over-voltages applied.

...in RF pentodes:

Reduced grid emission, no insulation breakdown

RF pentodes BZ6, CB6, EW6 and others, when subjected to life testing, showed reduced grid emission levels after conversion to the LIFE-Boost Cathode. Insulation levels during and at the completion of life showed little or no change—an indication of improved stability—and end-point failures due to breakdown were virtually nonexistent.

REMEMBER—many Sylvania Distributors give S&H Green Stamps when you purchase Sylvania Receiving Tubes. S&H Green Stamps are America's most valuable stamps and are exclusive with your participating Sylvania Distributor.

*Trademark



SYLVANIA

SUBSIDIARY OF

GENERAL TELEPHONE & ELECTRONICS



**"I've got
satisfied
customers
and
profits..."**



**by improving communications equipment reliability with
IERC Heat-dissipating Electron Tube Shields!"**

Extra profits in contract servicing are yours with TR type heat-dissipating tube shields—at installation, of course, and from the 2 to 12 time increase in tube life and reliability they provide. Electron tube failures, caused by heat, account for almost 70% of equipment failures. Service profits go out the window when valuable work, other service calls or "off hours" time must be given to meet service contract requirements **just to change a tube!** You can eliminate this problem by increasing the tube life and reliability of your customer's communications equipment with TR's—time-proved in vital military, aerospace and precision electronic equipment applications. A complete installation of TR's in almost any equipment takes only a few minutes—reliability and profits are immediate!

patented



SERVICE TECHNICIANS—
Write today for complete data on
IERC TR shields.

IERC
heat-dissipating

DIVISION
electron tube shields.

International Electronic Research Corporation
135 West Magnolia Boulevard, Burbank, California
heat-dissipating tube shields for miniature, subminiature, octal and power electron tubes

... for more details circle 35 on page 50

**LETTERS
TO THE EDITOR**

source. If calibrated from a 117 v line, a 10% fluctuation in the line, at the time of calibration, would represent an error of 11.5 v. The 6.3 v source would represent only a 0.63 v error. While the error percentage is the same in either case, more practical low voltage measurements would result with a scope calibration made from a low voltage filament transformer source.—Ed.

Needs Electronic Instruction Kits

Editor, ELECTRONIC TECHNICIAN:

This year we are offering, as part of our adult trade extension program, a 20-week course in basic industrial electronics. The course will consist of approximately six weeks of lectures on basic electronics and the remainder will be combined lectures and laboratory practice. Most of those attending the class have had little or no formal training in electronics but, by the nature of their work, they are not totally unfamiliar with the subject.

Your suggestions concerning texts and laboratory equipment for this course will be welcomed. Bernard Grob's *Basic Electronics*, published by McGraw-Hill is being used as a basic text but we need a slightly more advanced text dealing specifically with industrial electronics for the laboratory portion of the course.

If such is available, we would like to purchase a number of kits which would permit each student to construct and analyze basic industrial electronics controls and devices. Otherwise, we will have to design our own kits.

Specifically, we would like to have your suggestions as to texts and/or kits which would meet our needs as outlined above. If you are unable to make suggestions, we would appreciate it very much if you would pass this information on to publishers and suppliers who would send us descriptive materials and quantity price quotations. A text and kit will be purchased for each of the fifteen members of the class.

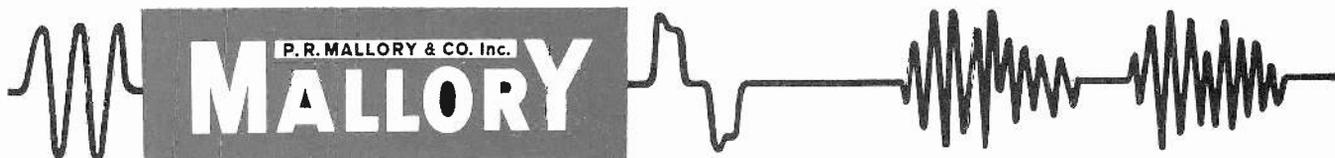
Your assistance and suggestions will be greatly appreciated.

MELVILLE G. PARKER, COORDINATOR
Albert G. Parrish High School

Selma, Alabama

Correction

The Hickok Model 660 Color Bar Generator featured in Test Instruments for Bench and Caddy (September ET) was incorrectly priced at \$170. The correct price is \$245.



P. R. MALLORY & CO. Inc.
MALLORY

Tips for Technicians

Mallory Distributor Products Company
P. O. Box 1558, Indianapolis 6, Indiana
a division of P. R. Mallory & Co. Inc.

Moisture and microfarads

Humidity can cause serious troubles in capacitors used in many of the electronic circuits used today. Take a look at the equivalent circuit of a capacitor, and you can appreciate the source of these troubles. The D-C leakage path of a capacitor can be considered as a parallel resistance across the terminals. In a radio circuit, a capacitor with insulation resistance of as little as 25 megohms would give reasonable operation. But not in television and other sophisticated circuits.

Most television circuits have high impedance. Coupling, bypass and timing capacitors should have insulation resistance many times the circuit impedance. In a multivibrator circuit, for instance, capacitor leakage resistance alters the time constant of the timing network. In a ringing oscillator, frequency depends not only on inductance and capacitance, but also on the resistance of the capacitor leakage path.

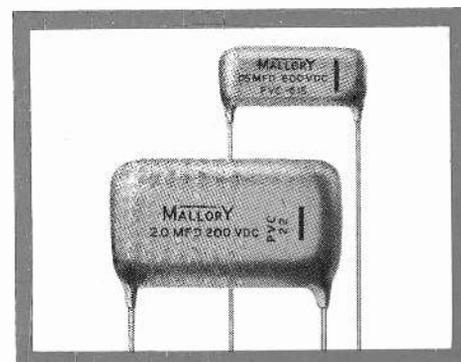
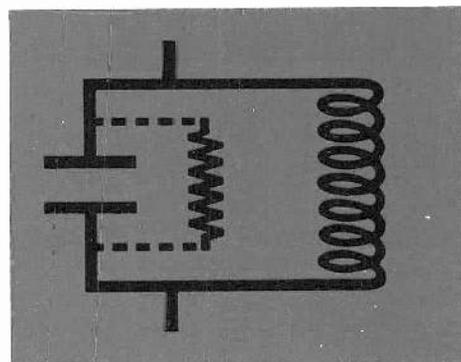
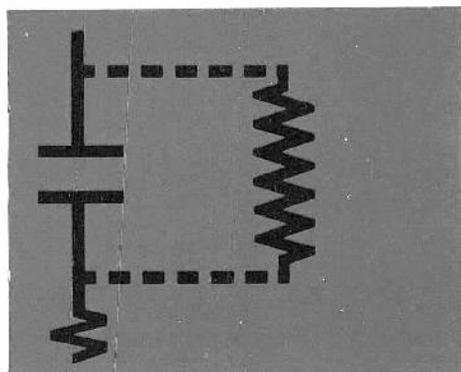
What happens when ordinary capacitors are exposed to humidity? Sometimes there's an all-out failure. But even without a catastrophic short-out, a capacitor can begin to lose insulation resistance to the point where, in a television circuit, for instance, it's impossible to get the picture to lock in, verticals will be wavy, and the picture will bend at the top.

Our tip for the month: be sure of stable operation no matter how wet the weather, by using Mallory PVC capacitors. PVC stands for *plus value capacitor*. They're made with 100% Du Pont Mylar* dielectric. They contain no paper, no combinations of Mylar and paper, no substitutes for this most moisture-impervious of dielectrics.

PVC also stands for polyvinyl chloride . . . the flexible case on these new, blue capacitors that won't crack when you bend the leads. PVC's are exceptionally small for their ratings. You can squeeze 'em readily into crowded circuits. And they're even better in reliability, ruggedness and stability today than when we introduced them months ago.

Get Mallory PVC capacitors from your nearby Mallory distributor. He's the man to see for the best in capacitors, resistors, semiconductors, batteries . . . for *all* your component requirements.

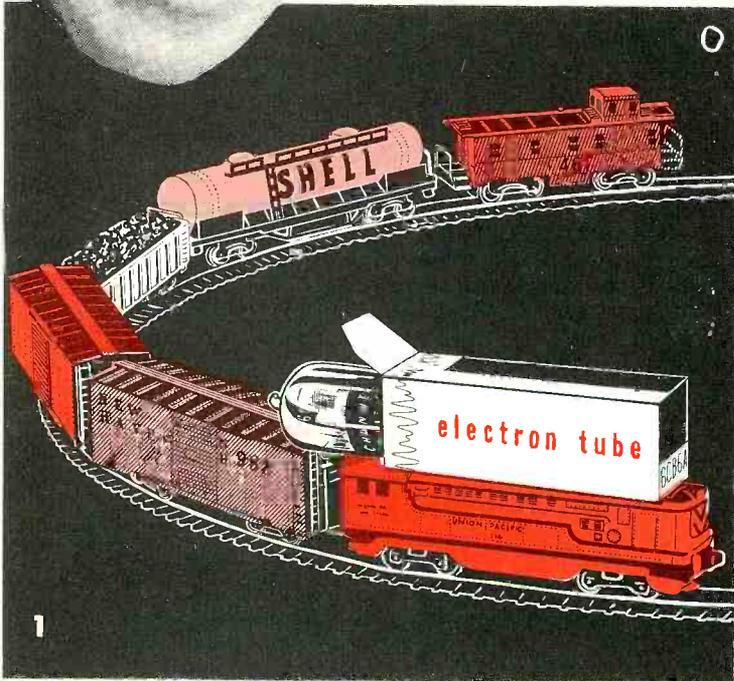
* Reg. Trademark—E. I. du Pont de Nemours





7 TIMES

...that's you, with these hot new ones



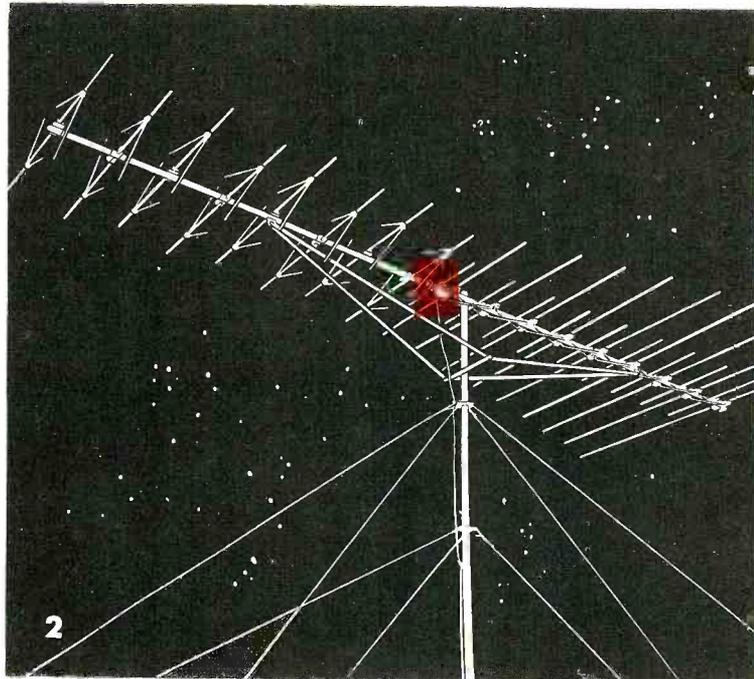
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"Rapido"—the world's Tiniest
Precision Railroad System.

...with purchase of *only 75*
**Channel Master Premium
Quality Electron Tubes!**

It's the big rage in Europe! And it's yours, in time for Christmas, at no cost. A complete set of unbelievably tiny 9mm gauge trains precision-engineered in accurate scale and authentic colorful detail—in a layout so small you can run it on your coffee table. Battery-operated. Lists for \$28.95

You Get: Baldwin Diesel Locomotive, 2 Boxcars, Gondola Coal Car, Shell Tank Car, Caboose...plus complete track layout (curved and straight sections), and Battery Case Control Box. **ALSO AVAILABLE FREE! 45-PIECE TRAIN ACCESSORY PACKAGE.**

CHOICE OF TUBES: GENERAL PACKAGE (23 fast-moving types) or UHF PACKAGE (25 fast-moving types). Top quality and top profit. Limited time, call your distributor.



All New Telstar Crossfire

World's most powerful electronic antenna combines unequalled performance of new Super-Crossfire TV/FM antenna with new built-in Telstar Booster! Gives up to 42% more gain (than 28-element Crossfire) before amplification.

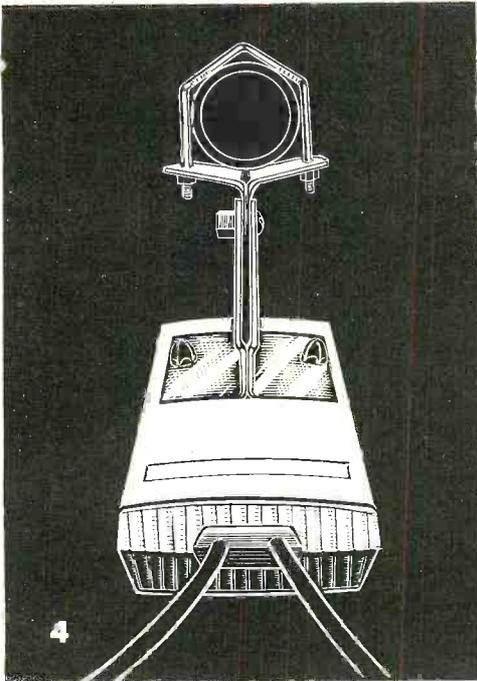
In the Telstar, an exclusive new TRI-BAND DIRECTOR SYSTEM which combines low band, high band, and FM Stereo on a single element, is now joined to Proportional Energy Absorption—the most effective principle yet for achieving top signal strength. On the high band, each director functions as 2 half-wave co-linear elements with in-phase current distribution. New 2-way boom bracing stops cross-arm bounce. Famous E·P·C "Golden Overcoat" corrosion protection.

3

NEW! SUPER-CROSSFIRE (Model 3607...available separately) Same as above—but **without** booster. Up to 42% more gain than 28-element Crossfire plus same high front-to-back ratios.

A WINNER!

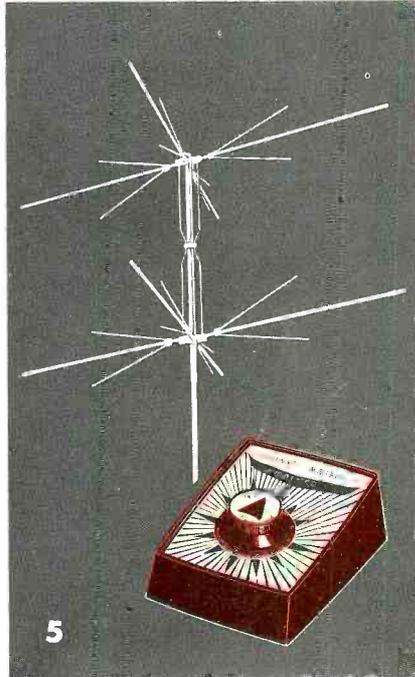
from **CHANNEL MASTER**



NEW Telstar BOOSTER-COUPLER features peak-power plus lightning-resistant circuit!

TV and FM Stereo get the biggest performance boost yet with a booster that is miles ahead of the "second best" booster. The Telstar Booster is especially engineered to pour more usable power than any other booster to 1, 2, 3, or 4 sets! The latest circuitry and advanced low-noise transistor result in highest gain and highest signal-to-noise ratios yet.

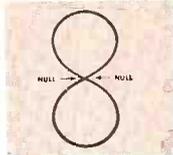
Lightning-resistant, too—because circuit utilizes the lightning rod principle to prevent transistor burnout caused by induced atmospheric lightning. Laboratory-tested by 250,000 lightning volts! Beautifully styled in blue-and-white. **Model 0023**



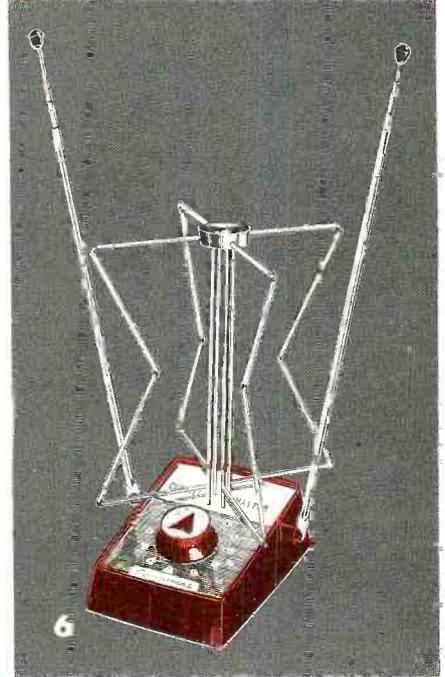
New OMNI-RAY TV/FM STEREO ANTENNA GHOST-KILLER EXTRAORDINARY!

A brand-new outdoor antenna with directivity electronically controlled by an indoor switch. (No rotator needed) • Stops ghosts and interference in metropolitan, suburban, and near-fringe areas. For Color TV, Black-and-White, and FM Stereo.

1. Perfect figure-8 reception pattern, electronically rotated in 22½ degree steps.
2. Deep side nulls 10:1 rejection ratio.
3. "Aim the beams" for top power; "aim the nulls" for top ghost and interference rejection.
4. Special "Duo-Twin" Transmission lead prevents mutual coupling.



Your choice of: • Supersembled stacked antenna only • Complete kit, single bay • Complete kit, stacked



Handsome New CANAVERAL FIRST INDOOR DIPOLE ANTENNA WITH TRUE ELECTRONIC CIRCUITRY.

Unique "Pix-Power" switch and impedance-compensating circuit give you these exclusive advantages:

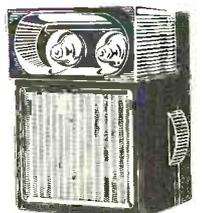
1. On low band—resonates on all channels (even 2 and 3) by electronically lengthening or shortening elements—without need for manual dipole adjustment.
2. On high band—Greatly increases gain by functioning as 2 co-linear half-wave dipoles—without manual adjustment.
3. Has balanced system with 300-ohm impedance-matched output to eliminate standing waves.

Has the longest elements anywhere (96" tip to tip) for greater pull-in power.

Smartly-styled, with tremendous merchandising possibilities. **Model 3720**

7 NEW! Rechargeable BRIGHT-MITE.

The revolutionary tiny miracle light that outshines big flashlights. Powered by the Permanent Energy Cells that power the Satellites. Ask about our terrific Display Pack deal.



See your Channel Master distributor for literature on all these products.

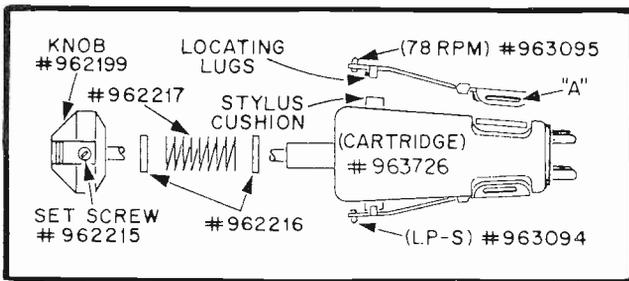
... for more details circle 20 on page 50

MANUFACTURERS TECHNICAL DIGEST

EMERSON

Model D-1900 B Record player — Cartridge Replacement

Cartridge number 963726 (Ronette #106-A1) is supplied complete with mounting bracket and all associated parts. If desired, some individual components



such as turnover knob, set screw, etc., may be ordered separately. Emerson part numbers for these items are noted directly on the illustration.

GENERAL ELECTRIC

Radio Models 875,930, C405 and T105 — Correcting Excessive Volume

A problem concerning excessive loudness when adjusting the volume level to minimum may occur on this series radios. The condition is caused by excessive capacity between terminal numbers 2 and 3 of couplate RCW-3207. This excessive capacity can be eliminated without replacing the couplate or removing the circuit board in the following manner:

1. Clip off couplate lead No. 3.
2. Solder a 220 pf capacitor across the two outside terminals of the volume control located on the component side of the chassis board.

ELECTROHOME

'62 19 and 23 in. TV Models — Horizontal Oscillator Adjustment

The horizontal oscillator in these sets should be adjusted as follows: Tune in a medium strength station and adjust all front panel controls for normal viewing. Short T.P. 3 to the ground and short out L-402 by placing a shorting clip from T.P. 4 to T.P. 5. Adjust the horizontal hold control (R-413) so that the picture floats slowly across the screen. Adequate adjustment should be left at either extreme of the hold control to produce a minimum of four diagonal bars. Remove the shorting clip from L-402. Adjust L-402 carefully for a

floating picture. Remove the shorting clip from T.P. 3. Picture should now lock. Changes in width control setting may affect the horizontal oscillator frequency slightly. If the width control is re-set after the horizontal oscillator adjustment, it should be checked again.

PACKARD BELL

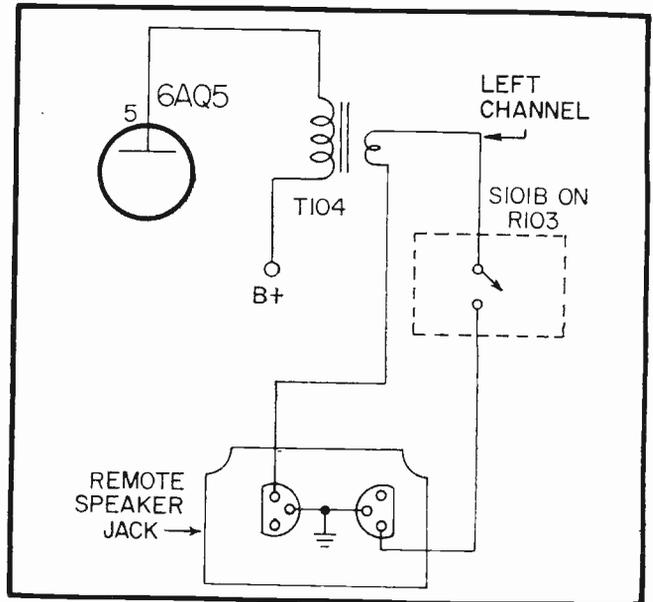
Color TV Chassis 98C6 — Loss of Video and Sync

In several sets capacitor C-313, 560 pf, has broken down and shorted out. This capacitor is in the plate circuit of the third picture i-f ($\frac{1}{2}$ 6AW8). Shorting resulted in loss of video and sync. The 470 ohm resistor R-317 burned out and in some cases resistor R-148, 5.6 k Ω , 5 w, also had to be replaced.

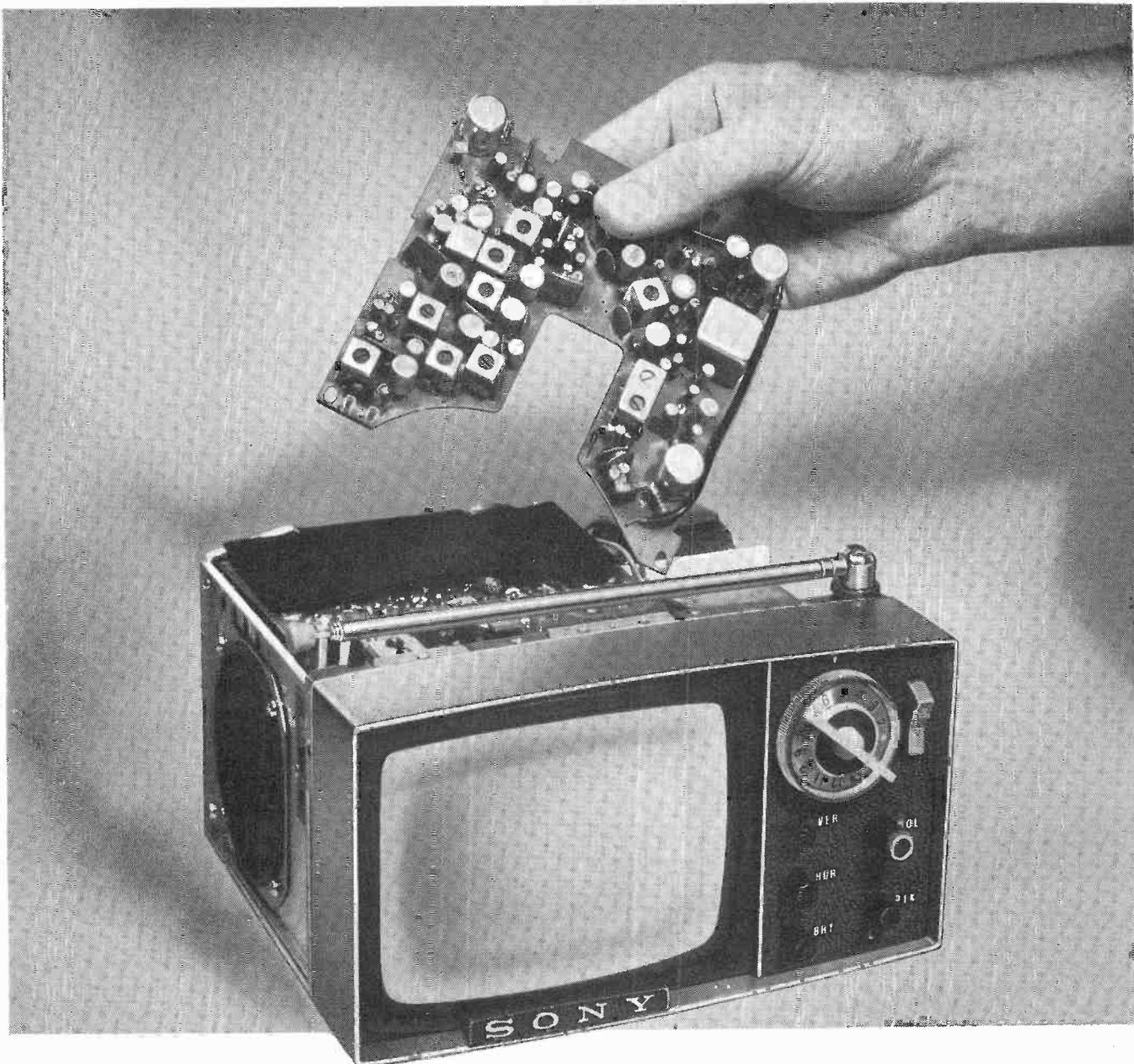
RCA

TV Chassis KCS 136YL — Production change

A production change on this series affects the audio output circuitry as follows: One of the audio output transformer secondary leads (T104) is connected to a



new DPDT switch (S101A & B) mounted with the volume control on the tuner mounting assembly. The return lead from the switch (S101B) is connected to the total sound speaker jack. The accompanying diagram indicates the changes.



Service is easy with the revolutionary New SONY MICRO-TV

Just about every component in the new SONY Micro-TV is mounted on two printed circuit boards, which makes it refreshingly simple to service. Unlike ordinary sets, there is no heavy chassis to "pull" and complicated wiring to follow. Instead, you quickly isolate the defective component and replace it yourself, or send the whole printed circuit board direct to SONY. In jig time it will be returned, with new component installed, ready

to be snapped back into the set. Interestingly enough, charges are moderate, with plenty of room for markup. Easy service, of course, is only one of the remarkable features of Micro-TV. Others? 8-lb. weight; operates on 2 power sources (117V AC and 12V DC); all-transistorized (24 transistors, 20 diodes); revolutionary picture tube. Size: 7 $\frac{5}{8}$ "W x 4 $\frac{1}{4}$ "H x 7 $\frac{1}{4}$ "D. Micro-TV 5-303W list \$229.95. Rechargeable battery pack optional.

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... for more details circle 54 on page 50

All-Transistorized Stereo Preamplifier

■ An all-transistor, stereophonic preamplifier is now being produced by Harman-Kardon, Inc.

The preamp has a frequency response of $\pm 0 - 0.25\text{db}$ from 1 cps to 1 Mc. Harmonic distortion specifications had to be calculated rather than measured, since the preamplifier distortion level is far below the residual level of test instrumentation.

Called Citation A, the new unit has two individual power switches, a six-position function selector, a five-position mode selector, blend control and separate turnover and roll-off equalization controls. Separate front-panel tape head controls adjust equalization for any tape head, regardless of age or tape speed.

Also included are step-type tone



Harman Kardon's stereo preamp contains 33 transistors mounted on 11 plug-in modules.

controls for each channel, a zero to infinity balance control, contour and channel reverse switches, low cut and high frequency filters and a switch that permits monitoring of tape while recording. There are four main preamplifier outputs, one center channel output and two tape outputs for recording.

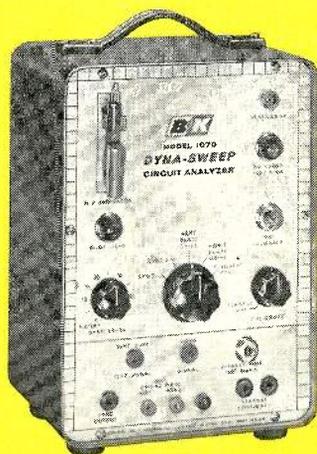
The rear section of the unit reveals a series of eleven modules containing 33 transistors. The circuit boards are plugged into a rack panel on the chassis. The boards are made of an epoxy glass. The modular type of construction is similar to that used in computer and missile design.

The unit has seven high gain, wideband stages which yield over 200 db of forward gain with feedback removed. Each stage utilizes a proprietary, temperature sensing system which stabilizes the individual circuits against temperature variations and assures low distortion over wide temperature ranges. The power supply is carefully regulated with low dynamic output impedance for stability in the one cycle region.

The unit measures 14 7/8 x 5 5/8 x 8 7/16 in., as compared with the company's tube-type preamplifier with similar functions, which measure 14 7/8 x 6 x 12 1/4 in.

The preamplifier is available from distributors either factory wired at \$350, or in kit form at \$250.

**Solve
Rough
Sweep
Output
Problems
IN MINUTES
INSTEAD OF HOURS**



B&K Model 1070
**DYNA-SWEEP
CIRCUIT ANALYZER**

1. Provides composite synchronizing signals (negative or positive) to inject directly in each sync stage for trouble-shooting sync circuits.
2. Provides vertical plate drive signal to check complete vertical output circuit, including V.O. transformer.
3. Provides vertical grid drive signal to check vertical output stage.
4. Provides vertical yoke test signal to determine if vertical yoke windings are defective.
5. Provides horizontal plate driving signal to directly drive TV horizontal output transformer circuit.
6. Provides B+ boost indicator.
7. Provides unique high-voltage indicator.
8. Provides sensitive tests for each of the horizontal output components, including H.O. transformer and yoke. Immediately reveals their true condition, good or bad, before any replacement.

Quickly solves tough output servicing problems that have always plagued the TV service technician. Provides horizontal and vertical sync and driving pulses that make it easy to check out every stage in the sync and sweep sections of a television receiver. Tracks down troubles in the horizontal and vertical output circuit, including defective output transformer and yoke. Checks for shorted turns, leakage, opens, short circuits, and continuity. Gives unique high-voltage indication. Eliminates trial and error replacements. Saves many hours of service work. Pays for itself over and over again.

Completely self-contained, with its own driving pulses, for convenient use any time. **Net, \$74⁹⁵**

See Your B & K Distributor or Write for Catalog AP20-T

B & K MANUFACTURING CO.

Division of DYNASCAN CORPORATION

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Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont. • Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.



... for details circle 68 on page 50



"As soon as we started running a larger Yellow Pages ad, business picked up!" says J. LeSage, owner, OK Television, Flint, Michigan. "Three years ago, we doubled the size of our Yellow Pages display ad, and our business improved immediately! The telephone and the Yellow Pages combine to do as good a job for us as any outside sales force could! The best source for anyone looking for any kind of repairs is the Yellow Pages!"



Display ad (shown reduced) runs under TELEVISION DEALERS. Call the Yellow Pages man at your Bell Telephone Business Office to plan your program.

Why Fuss — Call Us

OK TV OK

FOR BETTER QUALITY

MOTROLA
MOST RELIABLE TELEVISION

OK TV OK

FOR NEWER MODELS

ZENITH
THE QUALITY OF TELEVISION

COLOR TV SPECIALISTS
QUALIFIED TO REPAIR ALL MAKES

FLINT'S FACTORY AUTHORIZED ZENITH SALES AND SERVICE

REPAIRS ON ALL MAKES



MEMBER OF T.E.S.A.

CE 3-8796

8410 DETROIT ST. AT WOOD IF BUSY CALL CE 9-2231

OK TV OK

FOR LOWER PRICES

OK TV OK

RADIO — "STEREOPHONIC" — Repair on all makes

OK TV OK

FOR FAST ACTION

OK TV OK

OWNER JOHN LESAGE

NORGE AND AMANA APPLIANCES
WASHERS DRYERS REFRIGERATORS FREEZERS RANGES

**FINEST
MONEY-MAKER
FOR
Professional
Servicemen**

Multiple-Socket Speed with Gm Accuracy

PLUS OBSOLESCENCE PROTECTION

TESTS
All TV and Radio Tubes
—Old and New

TESTS
Nuvistors and Novars

TESTS
European Hi-Fi Tubes,
Voltage Regulators, and
Most Industrial Types

TESTS
the New 10-Pin Tubes

TESTS
for True Dynamic
Mutual Conductance (Gm)

TESTS
New 12-Pin
Compactrons



TESTS BOTH OLD AND NEW TUBE TYPES—SELLS MORE TUBES PER CALL

All over the nation, thousands of professional servicemen rely on the "700". Once you use it, you'll be as enthusiastic as they are. *Everyday use has proved its speed . . . its accuracy . . . its efficiency.* This up-to-date, obsolescence-proof tube tester is designed for maximum use *today and tomorrow.* Provides multiple-socket section to quick-check most of the TV and radio tube types the *true dynamic mutual conductance way—plus* simplified switch section to check new tube types in Dyna-Quik emission circuit. Also includes provision for future new sockets.

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ELECTRONIC TECHNICIAN

Charge for Your Skills

The ears of technicians who attended the Texas Electronic Association's annual meeting were all but blistered from an address given by Fred H. O'Kelley. O'Kelley is the manager of Product Sales for the Electron Tube Division of Westinghouse. We believe some interesting points of his speech should be repeated here.

At the high point of his address, O'Kelley blamed technicians for parts distributors' high average operating costs and low gross margins. He said:

"Part of this high cost in some cases may be the results of poor management and poor controls on the part of the distributor. On the other hand, you in the service trade seem to want to be molly-coddled by the distributor—and this is costly to him. You want instant service, credit, free delivery, premium merchandise, more credit, technical assistance, still more credit, larger discounts, better prices, frequent salesmen's calls, a lot of attention, and still more credit . . . and if you finally run out of credit, you just might sneak your orders in the mail to a mail order house—with cash. You impose on your distributor many, many small tedious orders which are very costly to handle instead of ordering on a systematic and methodical basis. A recent study showed that the average sale for a parts distributor amounts to \$3.20. This compares most unfavorably with large retail department stores that average \$8.50 per sale.

"Today, gentlemen, the electronic parts distributor is in trouble. He must either get his costs down—or he has no choice but to support his gross margins with over-the-counter sales to the retail trade. You'd obviously howl about this, but really, what have you done individually or as a group to allow your distributor to get his costs down . . ."

"The electronic service technician or dealer who recognizes his place in the distribution structure, and who continues to earn the right to be in business, will

not only survive—he will survive with notable profits. But he must be a business man and a merchant. He sells both service and product. The competition he recognizes springing up around him rarely, if ever, provides both product and service. What, then, is his most important economic contribution? The very service he renders.

"Not long ago, I took my old Buick in for a check-up on some trouble in the rear-end. I learned that I needed a pin replaced somewhere, and that the cost of the pin was 65c . . . fine, I said, go ahead. I'll be reckless and spend 65c. 'But, Mr. O'Kelley,' the serious minded service manager said, 'we have to pull the rear axle plus the drive shaft . . . quite a job . . . and the service on the job will cost you \$125.00 . . .' This pin probably cost the factory less than a nickel to make. The distributor probably paid a dime for it, and the service dealer probably paid 15 cents for it. Now, I come along and the price has been marked up 400% and the price to me is 65c.

"If the Buick service dealer acted like some of our electronic service dealer friends, he would have charged me \$1.50 for the pin—or a 1000 percent markup—and thrown the service in for nothing—just look at the profit on the product sale!!!

Obviously I'm not against product sales . . . just look at the margin you make, for instance, on the sale of a prime manufactured picture tube. Product sales help, to be sure, but your ability to render a service is your most important economic asset. You should be paid accordingly . . ."

And this was the point Mr. O'Kelley was making: Why must we break our necks giving service to customers and then charge them ridiculous prices for parts—the same parts that they can buy at the corner drug store or from one of the mail order houses—for a lot less. Technical skill is our prime asset. We should receive just payment for it.

Onward and Upward

For some time now, it has been the policy of ET to refer to qualified TV service people as technicians. As a matter of fact, ET pioneered in the effort to upgrade the technicians image through use of a proper title. We feel the experience and training necessary to qualify the technician certainly gives him the right to a title having more prestige than repairman, serviceman, or TV mechanic.

At a recent meeting of the Tri-State Council of TV Service Associations in Atlantic City, the membership voted to end references to TV Servicemen and replace it with "technician." Whether we like to admit it or not, a job title goes a long way toward boosting our morale and giving us self confidence. We're with you fellows; may your crusade be short lived and successful.

Have your instruments checked by
an expert technician once each year

TAKE CARE OF YOUR MONEY-

by David A. King

■ Most of us are inclined to take our tools and test-equipment for granted. Of course, the soldering iron gets a new tip when the old one becomes so pitted it's impossible to tin it and other tools are usually replaced when they have become so worn they are a nuisance to use.

Most of us will go on using a test instrument year after year with no thought of its measurement accuracy. Think for a moment how much those measurements mean in terms of ease of service and freedom from call-backs on service jobs!

There was a time when plus or minus 10 percent accuracy was entirely adequate. Most of the radio receivers of that era weren't any more accurate, except in the resonant circuits, and they could be set "by ear"—using the signal from a broadcasting station if need be.

Transistorized radio receivers, as well as practically all television receivers, however, demand precision voltage and frequency measurements at some point in a complete alignment. This in turn demands that service technicians have equipment to make these measurements; that he know how to use this equipment; and that the equipment's accuracy is known.

Not many TV or radio technicians will want to invest in the precision standards needed for calibra-

tion of their own instruments. Investment in this equipment would be completely unjustified for a number of reasons.

Accurate calibration of multimeters, electronic VOMs and similar instruments require precision voltage and current standards. In addition, only a skilled watchmaker is capable of servicing these instrument movements. In fact, many practical instrument mechanics are watch-makers as well. The pivots and jewels in good-quality instruments are fully as delicate as the balance wheel assembly in a fine watch.

For this reason, it is an excellent idea to entrust multimeters and similar instruments to a skilled instrument technician at least once a year. Let him give the instrument a thorough calibration check and at the same time perform any needed maintenance work. For example, replacement of cracked jewels and re-surfacing or repairing damaged pivots.

Remember, a voltmeter's or ammeter's indication depends on several things: the current through the instrument's moving coil, the strength of the magnetic field, the stiffness of the hairsprings, even the amount of friction in the pivot bearings. Of these items, the current through the moving coil is the

only thing the operator is interested in. He bets on the other factors remaining constant and repeatable—if he thinks about them at all! It is precisely these "other" items the instrument technician takes care of during his maintenance.

We must remember one thing—no technician can make an instrument exceed specifications established by a manufacturer. If the instrument's guaranteed accuracy is 5 percent when the technician gets it, the accuracy it will be calibrated to is 5 percent. When it is performing that well, it will be certified accordingly.

Common-Sense Precautions

Let's look at a multimeter and see what can happen to it. The multimeter uses a permanent magnet of some kind as an operating field. Magnets often lose strength with age. Knowing this, instrument manufacturers age their field magnets before the instruments are calibrated in the factory; even so there is a continued slow loss of field strength which will cause a slow loss of deflection.

The metals used in hairsprings all change somewhat with age. These changes quite often tend to make a spring somewhat weaker. The whole moving coil and pointer assembly is suspended on two needle-

MAKING TOOLS

like steel points. A severe jar can drive these points into the bearings which are commonly synthetic sapphires or rubies. This either blunts the pivot or chips the jewel—or both. Powerful magnetic fields—especially alternating current—can de-magnetize a magnet in very short order.

In normal service a multimeter may be exposed to any or all of these conditions without the technician being aware of what has happened. The instrument may look unharmed; it may even *seem* to work normally, but its indications may be off a long way.

The smart thing is to take them to a competent technician and have them checked at least once a year. If an instrument is dropped, overheated or exposed to a powerful magnetic field (a tape demagnetizer for instance) play it safe, take the instrument in and have it checked. Remember, you are staking your reputation on that instrument. A gross error in indication can mean a costly call-back and a loss of

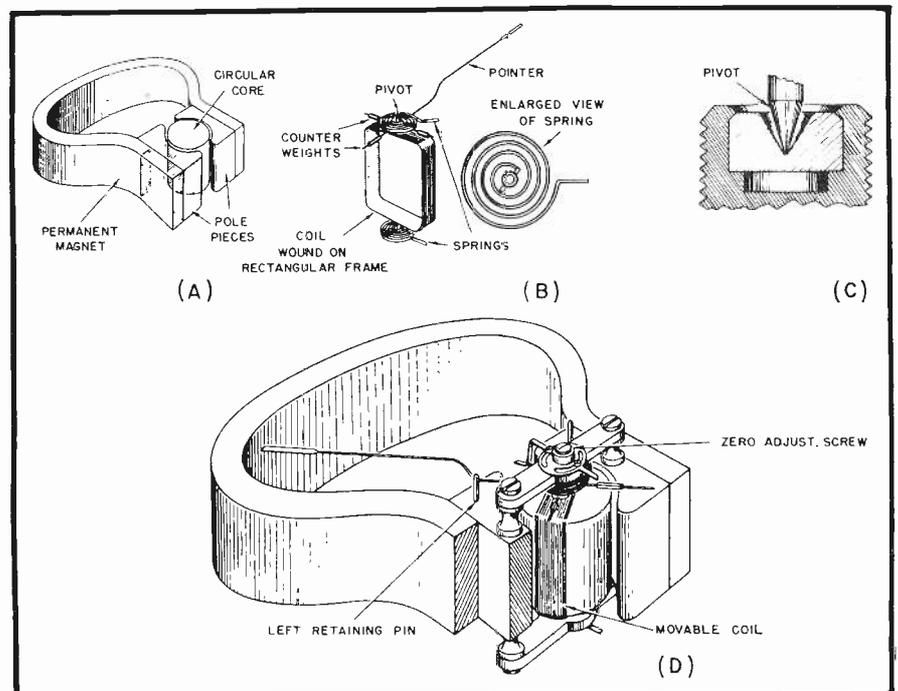
reputation with a good customer or wasted time in troubleshooting.

Your oscilloscope is probably one of the most abused instruments in many shops. Basically, they are no more delicate than a TV receiver; and the exercise of some common-sense precautions will give you years of service from a scope. One of the commonest

sources of trouble is just plain carelessness in adjusting the intensity control. Experienced technicians (who presumably should know better) often set the intensity on a fairly bright setting then go off and leave a scope running hour after hour with a fixed pattern or worse, a line or even a dot on the screen. Any of these will burn a screen. After it is burned, the screen just doesn't glow any more and the result is annoying gaps in the pattern—gaps that shout about the neglect the instrument has been subjected to!

A good idea is to make a habit of turning the intensity down so the beam is extinguished whenever the scope is not going to be used for a few minutes. Some oscilloscopes have a switch which will do this for you—or an instrument technician can wire a switch into the cathode bias circuit of almost any oscilloscope if desired. This switch can easily be made to apply some added positive voltage to the cathode thus blanking out the beam. Don't try this without adequate service schematics. Some instruments work the cathode "hot" with the screen and final accelerator anode at ground. Be sure of where you are going before you "jump!" The in-

Construction details of the Weston-type moving coil (A)—Magnet relationship to the coil assembly. (B)—Relationship of the coil, springs and pointer. (C)—The pivot. (D)—The entire assembly.



Money Making Tools *Continued*

tensity control is always there—use it.

The oscilloscope is not difficult to calibrate if you have access to an accurate oscillator. Remember the time per cycle is the reciprocal of the frequency. In other words, if the frequency is 400 cycles, each full cycle takes 1/400 sec or 0.0025 sec. Using each full cycle as 0.0025 sec, the total sweep time for some ranges of the oscilloscope could be calculated with pretty good accuracy. Naturally, higher and lower frequencies could be used the same way to calibrate faster and slower sweeps.

The ideal method of calibrating an oscilloscope is to use a time-mark generator. These instruments offer good sharp "spikes" at accurately-known intervals which allow accurate calibration on all ranges. If you're fortunate enough to have an expensive scope it might be worth your while to take it to a lab where a time-mark generator is

available and have it calibrated every few months. The better scopes will hold calibration for a surprisingly long time so this is very much worth while. It would not be profitable for most service laboratories to have the time-mark generator, however. This would be profitable only if the laboratory were large enough to have at least fifteen or more scopes to calibrate.

Voltage calibration can be undertaken with the same oscillator used for sweep timing (provided the oscillator yields a clean sine wave.) Using a good-quality a-c voltmeter "good" at the frequency you care to use for calibration, read the voltage being applied to the vertical plates of the scope. Multiply the voltage indicated by the voltmeter by 2, then by 1.414. This will convert the rms indication of the meter to a peak-to-peak indication which is the pattern on your scope screen.

Remember, the a-c must be a sine wave; the meter you are using is

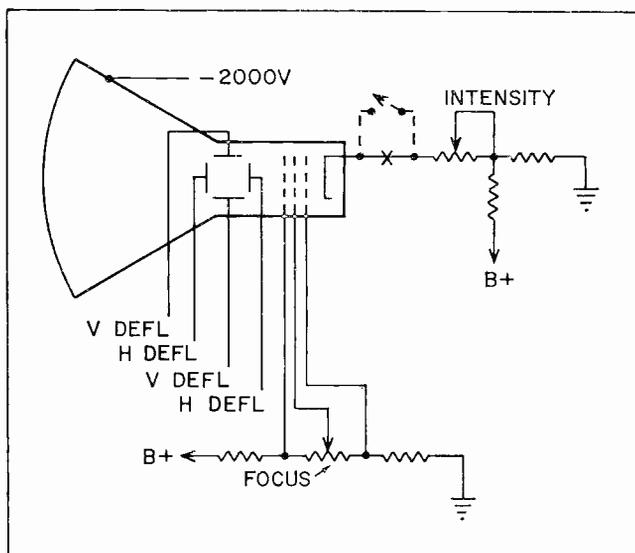
calibrated in terms of sine wave rms. While the meter will read voltages of other configurations; its indications will not be accurate.

Other Instruments

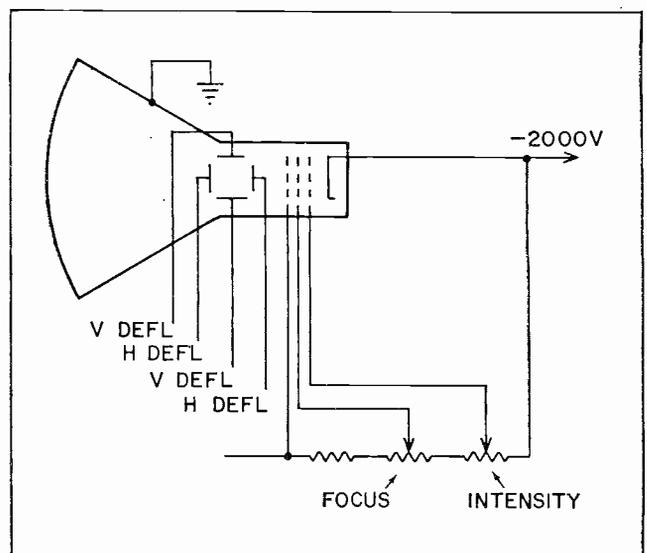
Frequency meters and signal generators take about the same care as a good radio receiver. Keep their interior free from dust and make an occasional check of the voltages delivered by the power supply; follow service literature furnished by the manufacturer.

Many of these instruments are fairly simple to calibrate for frequency. Using a receiver capable of receiving one or more of WWV's carriers (5, 10, 15, 20 or 25 Mc) zero-beat a harmonic of the frequency-meter's oscillator (or that of the signal generator) against WWV's carrier. When adjusted to a good zero-beat, the frequency of the signal generator will be known to perhaps five or six parts per million depending on how you observe the zero-beat condition, how good the signal from WWV may be at the time the adjustment is made—and of course your own patience in making the adjustment.

Your test equipment is the key to your livelihood in just as true a sense as your soldering iron or that shiny kit of nut-drivers the salesman sold you on his last call. Give it intelligent care, and it will serve you for years to come! ■



CRT circuitry with high voltage supplied to the anode. Dotted lines show switch connection to cathode for killing brightness when scope is not in use.



When the CRT's high voltage is supplied to the cathode, with the anode at ground or B, the intensity-defeat switch must be installed elsewhere.

Instrument Probes and Their Uses

Attenuator, r-f, and special probe types
can solve many of your service problems

by E. M. Frickert

■ When to use a probe and what probe to use can be perplexing problems for electronic technicians. Not only does the technician need special probes for optimizing scope performance, but special probes are also valuable for VTVM and VOM use.

Some probes can be adapted for several instruments, but others serve only one function for a single instrument. Some are merely "cover" accessories for the original equipment's shortcomings. In some cases, the probe's attenuation factor creates a need for a special pre-amplifier.

The r-f Probe

Without the r-f (demodulator) probe, troubleshooting in r-f or i-f sections of TV and radio sets would be seriously handicapped—in most instances limited to checking operation through supply and bias voltages. Voltage measurements of r-f signals would, likewise, not be possible. Just as the meter's movement is immune to r-f frequencies, so are most scope amplifiers.

Even in scopes that have a very high frequency response the viewability of the wave form is limited by horizontal sweep frequencies

and CRT phosphor characteristics.

Since the purpose of r-f is to carry the modulation, a look at the modulation will tell us all that is necessary. To do this, only a simple demodulating probe is necessary. Some typical demodulating probe schematics are shown in Fig. 1.

The r-f probe functions in exactly the same way as the detector in any radio or TV set. The process is almost identical to the rectifier and filter circuit in a power supply. Since the r-f signal is both negative and positive, the resultant useful output is zero.

A diode, however, limits the output to either a positive or negative signal. A small filter at the output of the diode smooths the r-f to fluctuating d-c. Fluctuations take place at the audio, video or modulating rate. If a large filter is used, the output would be smoothed to a point which would cancel any high frequency component on the carrier.

Action of the diode detector is shown in Fig. 2. Although there are many other types of detectors, the diode detector is employed in probes because of its simplicity and size.

Low Capacity Probes

Low capacity probes are often called attenuator probes. The name applied to the probe is usually taken from the primary function of the probe. That is, a probe being used as a signal attenuator is an attenuator probe. One which is being used in sensitive circuits, a low capacity probe.

Low capacity probes are made by simply adding a series capacitance to the input of the scope. The capacitor is frequently adjustable and paralleled with a large resistance. A typical low capacity probe circuit is shown in Fig. 3.

The attenuation factor of most probes is 10. In other words, the actual amplitude of any measured signal will be ten times that shown on the scope. Calibration can be checked by viewing a wave form in some nonsensitive circuit, and then with the coarse vertical amplitude control turned down by a factor of 10 without the probe. The wave forms should be exactly the same amplitude.

The effect of the series capacitor can be easily understood if you remember that the total capacity of series capacitors is less than any

Instrument Probes

Continued

individual capacitor in the circuit. The series capacitor is always added to the free end of the scope lead so that cable capacity is also effectively in series with the probe capacitance.

If a pair of open wires can be used, the total input capacity will be greatly lessened. Shielded wire is usually necessary, however, to prevent interference pickup in circuits requiring use of a low capacity probe.

Results of using a direct and low capacity probe in high frequency circuits are graphically shown in Fig. 4. High frequency components, similar to those found in square waves are virtually lost when using a direct probe. The direct probe is, of course, no more than a wire.

High Voltage Probes

The high voltage probe finds wide application in adapting VOMs

and VTVMs to voltage measurements beyond the normal range of the instrument. Most instruments are able to make measurements up to about 5000 v. Employing a high voltage probe extends this range to as high as 50 kv.

The high voltage probe is actually a precision resistor or string of resistors with several megohms resistance. The resistor is matched to drop the proper voltage and extend one meter scale by a factor of 1000 or 10,000 times. Most "universal" probes available are made for 20,000 ohms/v meter movements. VTVM high voltage probes are made specially for each VTVM model by the manufacturer.

When using the high voltage probe, care should be taken to ground the probe with the clip provided. Failure to do this may result in a painful shock, damage to the instrument, or at the very least, an inaccurate measurement.

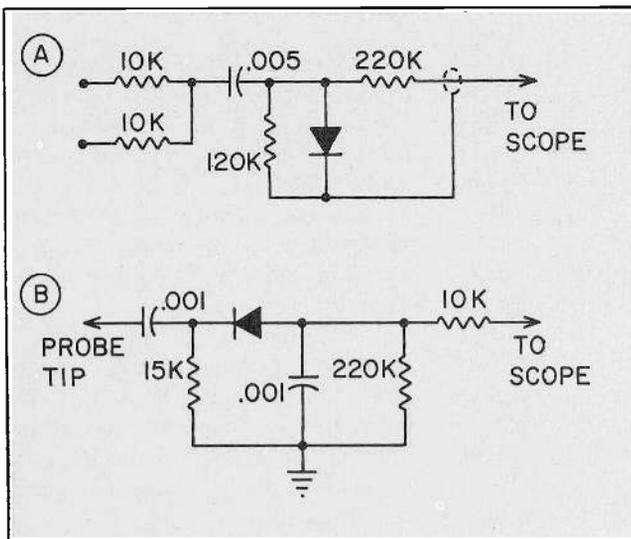


Fig. 1 (A)—Two-input shunt type demodulator probes are used to mix signals for single display. (B)—Conventional series type demodulator probe. Wide variations in probe configuration is needed for different loading required for many applications.

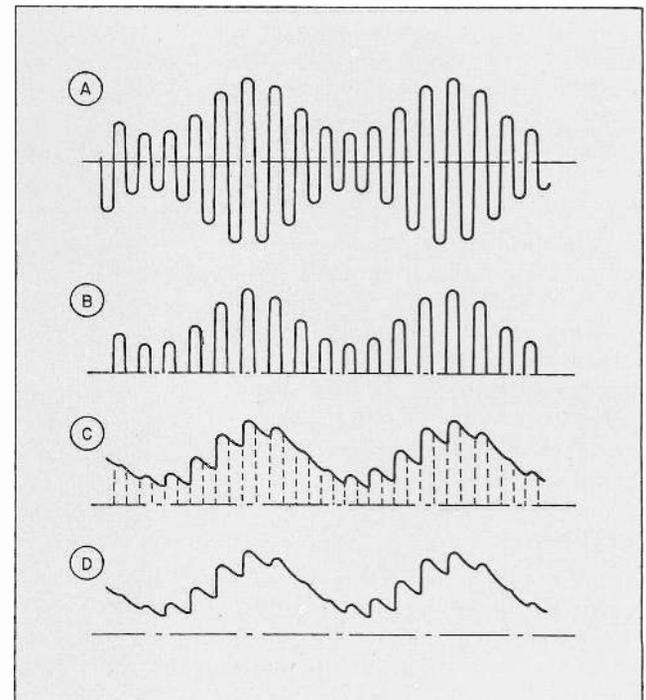
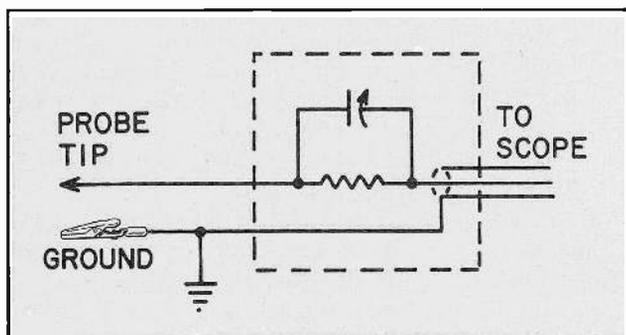


Fig. 2 (A)—An amplitude modulated r-f wave similar to one that may be found in a video amplifier. (B)—After being applied to a demodulator probe the signal is rectified. (C)—Filtering by a shunt capacitor smooths the r-f; dotted lines show removed r-f. (D)—output of the detector probe appears on the scope as video only.

Fig. 3—The attenuator probe is a simple RC combination. Component values depend on the scope input capacity and resistance.

Special Purpose Probes

Besides the three common probes already mentioned, there is a large number of special probes which the technician can use to advantage.

A new probe type is the speed probe illustrated in Fig. 6. With this probe, the technician's hands are free from the meter. All of the meter's normal ranges are available by pushbutton selection on the probe.

One of the more common probes used to great advantages is the amplifier probe. This probe frequently has a demodulator built in so signals from low level stages can be examined. This eliminates the need for special preamplifiers to build up low level signals so they can be viewed on the scope or measured with a VTVM. Early amplifier probes employed subminiature vacuum tubes built directly into the probe and were powered from the

line. Later models use battery powered tube and transistor circuits built into the probe.

All the probes in the world won't do the technician any good if they are not properly applied, however. Generally speaking, the low capacity probe can be used anywhere a direct probe can be used. The exception is where the signal in a non-sensitive circuit is small and greater amplitude is required. Anytime high frequencies are being measured the low capacity probe should be employed.

The r-f probe should be used when the modulation of an r-f carrier is viewed or measured. This probe also attenuates and may require a special preamplifier in some low level circuits.

If you find it necessary to use a preamplifier with your scope, be sure it has sufficient frequency response. Narrow-response amplifiers can sometimes be used to check

a single i-f or tuner stage but cannot be successfully used with stages which cover the entire video bandwidth.

An exceptionally wide gain amplifier which cannot be employed for normal TV service work is the chrominance amplifier. This amplifier has a relatively flat response from 8 kc to 4 or 5 Mc. Chrominance amplifiers find great use in troubleshooting color circuitry.

TV manufacturers often provide schematics for probe design in service data. The reason for this is to assure proper loading of the stage where the detector is connected to the circuit. Knowing which probe type you are using, and a glance at the circuit configuration, should allow you to judge whether or not the load variation is sufficient to merit building a special probe for the job. Ten or 15 percent variations should be well within the tolerance for most circuits. ■

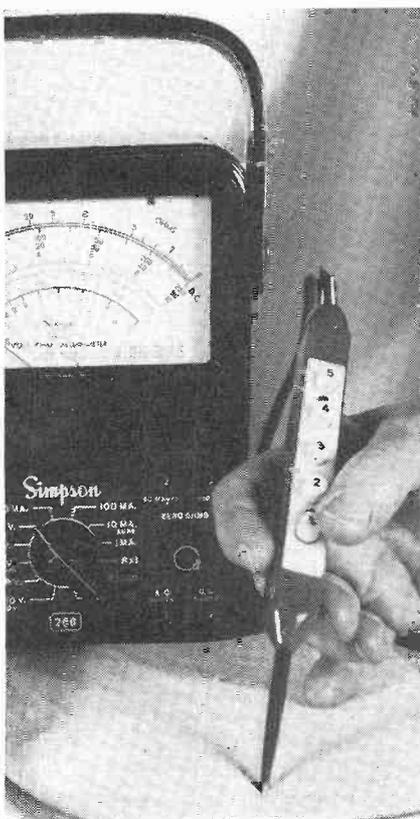


Fig. 5—Speedprobe allows selection of voltage ranges on the probe. A wide range of special probes are available.

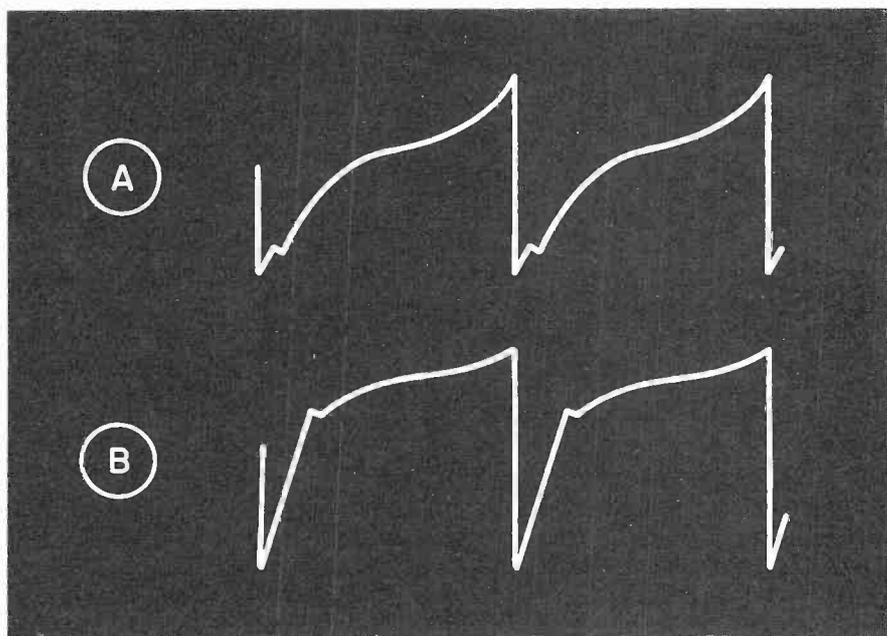
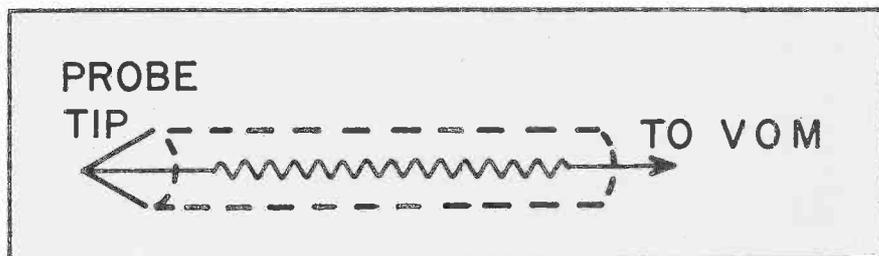


Fig. 4 (A)—A signal viewed without a low capacity probe loses the high frequency component. (B)—The same signal as it would appear with a low capacity probe.



The high voltage probe is a simple series resistor.

Simple audio and video amplifiers test set-up reveals phase shift and poor frequency response

Check It with a Square



by Ben Allen

■ Most technicians have seen specifications of audio or perhaps video amplifiers showing square wave response. Some of you may have wondered how this might be used in troubleshooting. But few shops own a square wave generator, and seemingly for no good reason. The square wave generator, in conjunction with the scope, can be one of your most valuable instruments for checking audio and video amplifier quality and even pinpointing faulty or misaligned components.

Interpretation of scope waveforms for amplifier analysis is not difficult—in fact, it is not really necessary to understand the logic associated with the interpretation, but only to compare the resultant waveform with a normal one.

The Test Set-Up

When testing the square wave response of any amplifier, the set-up will always take the same form: A low amplitude square wave is fed into the amplifier input and the amplifier's output is observed on the scope. Failure to use a low amplitude input signal will result in saturation and will fail to give a true indication of response. Waveform deviations or distortions resulting from the insertion of the

amplifier in the generator-scope link can be classified. These classifications will vary between audio and video amplifiers: Poor low or high frequency response; phase shift; poor mid-frequency response and others.

Proper impedance matching and grounding can be just as important in square wave test set-ups as r-f alignments—depending on the type of amplifier and generator being used. Most generators use an output system which remains linear but decreases in output as the load resistance is decreased. Other types must be matched to prevent distortion. Generally speaking, output capacity should be kept to a minimum to assure good rise time at high frequencies.

A certain amount of distortion can be tolerated. This is fortunate, since most shops can't afford to plunk down the cost of a laboratory-type generator. The only requirements that must be met are fairly good rise time (about 0.5 μ sec) and a frequency response variable between 60 cps and 25 kc. Generators in this category are available in kit form or prewired from several leading manufacturers. Most generators cover the entire "audio" range (20 cps to 100 or 200 kc)

and have variable sine wave outputs as well. The unit therefore makes a dual purpose audio test instrument and also serves as a modulation source.

To check the "residual" distortion in your test set-up, the square wave generator should be fed directly into the oscilloscope. Any rounding on waveshape corners, gradual rises or decays at the top or bottom or slow rise or decays of the vertical portion should be noted. When the signal is fed through a properly loaded amplifier, any deviations from the waveform as noted in the previous test can be chalked up to distortion. For a qualitative analysis of the amplifier's response, the deviation of the waveform should be calculated in percent of the over-all waveform. The amplifier's distortion can be measured in the same manner. When the difference is computed, the amplifier's rise time or decay time is obtained. This is exaggerated for clarity in Fig. 1. The two basic setups (equipment test and amplifier test) are shown in Fig. 2.

Interpretation and Faults

Waveforms obtained using a square wave generator are generally easy to interpret. Four items must

Wave Generator



be kept in mind: Rise time, decay time, steady-state rise or fall and general distortion. Changes in the normal square wave are shown graphically in Fig. 3. These deviations can easily be memorized. Once they are memorized (by understanding them) troubleshooting becomes largely a matter of how

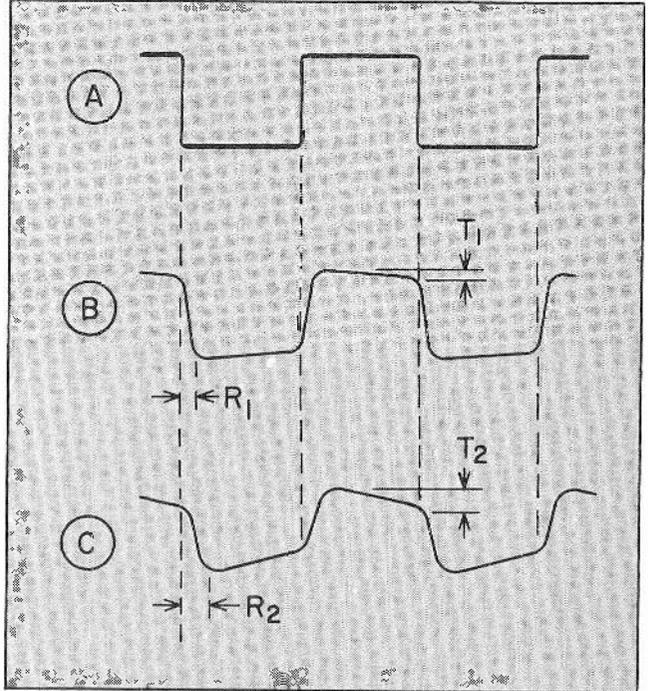


Fig. 1 A)—The ideal square wave rises in a perpendicular line and has a constant steady-state condition. (B)—Delayed rise time and sloping steady-state conditions will be present to some extent in a direct generator-to-scope hook-up. (C)—When the signal is fed through an amplifier, the condition will be more or less pronounced. The difference in rise times (R_1 - R_2) and the difference in slope angle T_1 - T_2 show the amplifier's actual response.

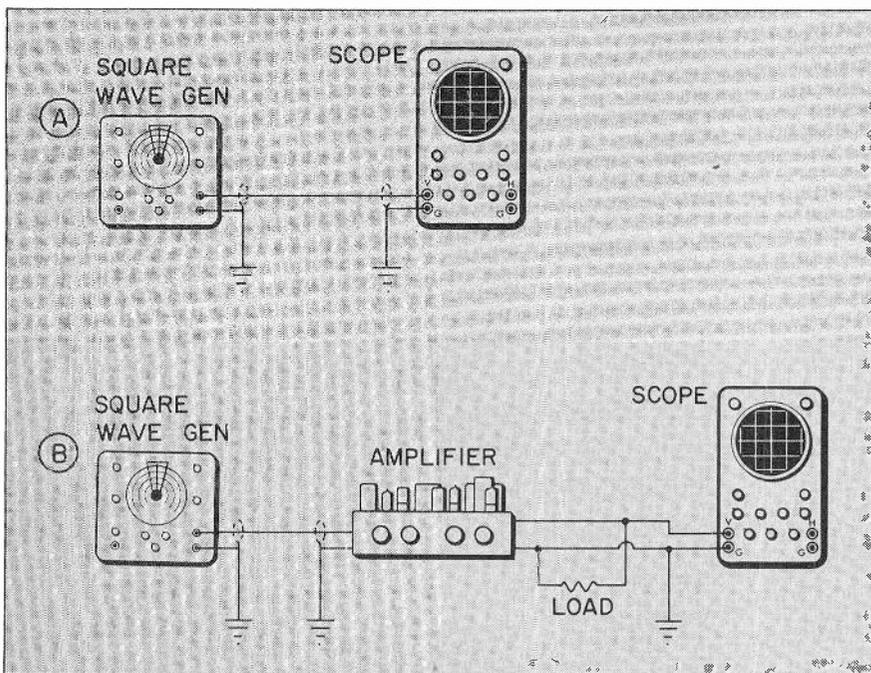


Fig. 2 (A)—Test set-up to check deficiencies in the test equipment is a simple generator-scope connection (B)—Amplifiers are checked by connecting them between the test setup shown in (A). The amplifier under test should always be properly loaded.

Square

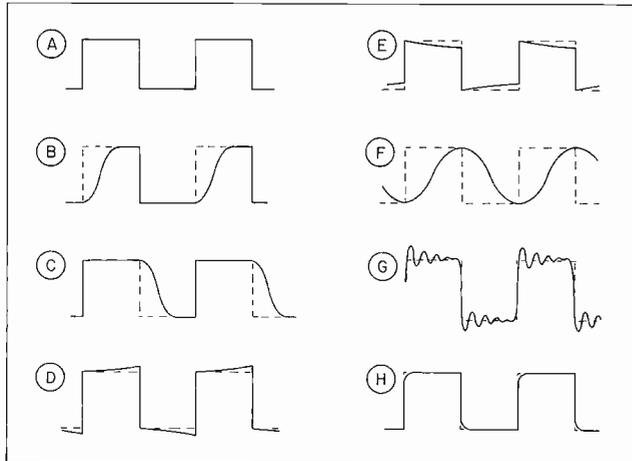


Fig. 3 — Exaggerated amplifier response patterns: (A) — The ideal square wave. (B) — Poor rise time. (C) — Slow decay. (D) — Low frequency boost. (E) — Low frequency loss. (F) — Poor low and high frequency response. (G) — Oscillations and (H) — Phase shift, equal over entire frequency range.

well you know your audio or video amplifier theory.

Let's see why the square wave becomes changed when certain faults are present in the amplifier. To accomplish this, an understanding of the composition of the square wave will be necessary. A square wave, of course, need not be square to deserve the name. Simply increasing or decreasing the amplitude of a square wave could classify it as a "rectangular" wave.

The square wave is actually composed of a fundamental sine wave (the same frequency as the square wave) and all of its harmonics—including the highest. This is shown with a sine wave and a few harmonics in Fig. 4. An infinite number of harmonics would produce a perfectly square-cornered wave shape. A glance should indicate that if high frequencies are lost, the corners of a square wave become rounded and some tilt (slow rise) becomes evident in the waveform. If low frequencies are increased or attenuated the steady-state condition becomes tilted up or down respectively.

Shock oscillation sometimes takes place when a transient is applied to the amplifier. These oscillations may be of short duration at the beginning or end of each steady-state condition of the square wave and may increase or decrease in amplitude. Oscillations can also be continuous throughout the steady-states.

In addition, phase shift is always present to some extent in any amplifier. Using sine waves to detect phase shift involves interpreting Lissajous patterns. With the square wave, phase shift is evidenced by rounding of diagonally opposite corners of the wave (see Fig. 3).

Phase shift is actually a delay in

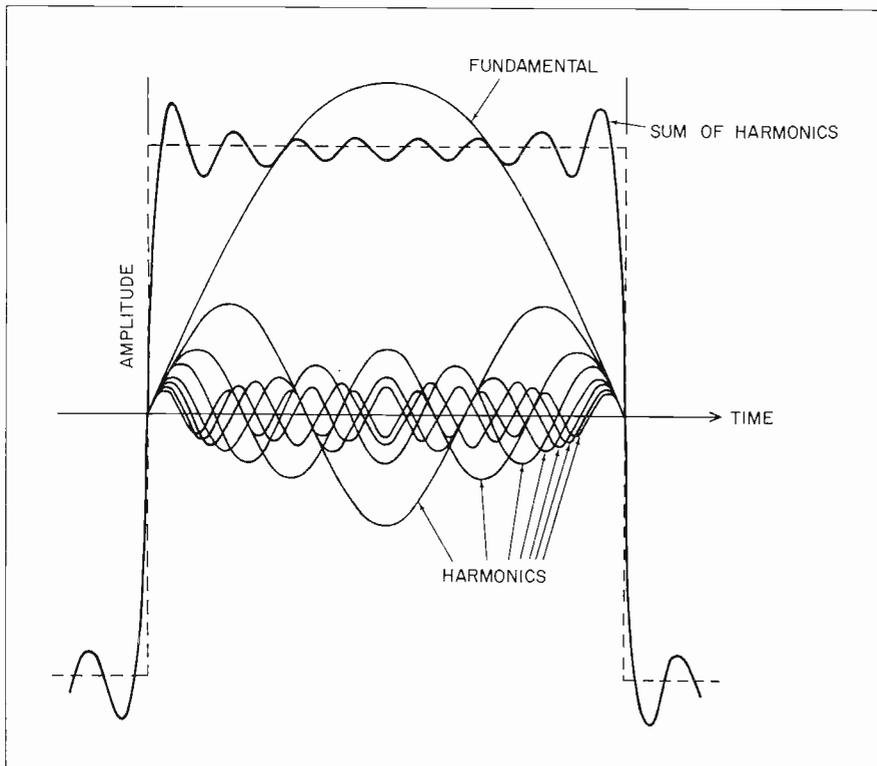


Fig. 4—A square wave is the sum of a sine wave and all of its harmonics. Frequency of the square wave is the same as the sine wave fundamental.

Wave Generator

the amplifier's response. As an amplifier's high frequency response is indicated by its ability to rise to a given value rapidly, a delay is indicated by rounded corners after the rise. This delay is called damping.

An example of over-damped square wave response is shown in Fig. 5. The effects of oscillation and delay will become more pronounced as the high frequency limitation is approached.

A different method of interpretation is necessary when the square wave response is lowered into the region of poor low frequency response. High frequency deficiencies must be neglected. Only the slope of the steady-state should be considered at the low end.

Of course, a large number of combination faults are possible. An example is shown with oscillations and poor frequency response in Fig. 6.

Procedures

As with most amplifier tests, the output impedances of both the generator and the amplifier must be within the instrument's tolerance. The input cable to the amplifier should be as short as possible to keep capacity to a minimum. Shunt

capacitance effects cause attenuation of high frequencies which can be seen by rounded waveform corners.

Two frequencies are usually picked to diagnose either a video or audio amplifier. The frequencies chosen should be within the normal range of one amplifier's response. For audio amplifiers, this may be 100 cps and 5 kc and for video amplifiers, 60 cps and 25 kc. Although the upper range in either of these does not approach the amplifier's top frequency response, keep in mind that poor response of much higher frequencies will be shown by the harmonics contained in square waves.

A precaution which need not be observed in audio amplifiers becomes all important in video amplifiers; that is, amplifier loading. Since most video amplifiers have high impedance outputs feeding the CRT grid—any lesser impedance will load the amplifier. A low capacity probe should be used to prevent this. On video amplifiers using cathode follower outputs, this precaution is not necessary.

When testing audio amplifiers the bass, treble and loudness compensation controls should be set for flat response. If any of these con-

trols are not flat, then the evaluation of the amplifier's response will, of course, be distorted with boosts or attenuations of low or high frequencies. Minor oscillations may also take place at certain square wave frequencies.

Video amplifiers present some problems which will not be encountered in audio equipment. Fortunately they will all be visible on the CRT.

A gradual change of low frequencies will be indicated by shading from the top to bottom of the picture. Coupling capacitors and compensation circuits should be suspected. Poor high frequency response is indicated by fuzzy pictures or pictures which lack detail. Peaking coils, lead dress and coupling networks should be investigated.

Black and white vertical striations are caused by excessive high frequency response. This will be seen in the square wave test as overshoot. White borders following a black-to-white transition or a black border following a white-to-black transition can be caused from too much or insufficient midrange frequency response. Peaking coils, lead dress and couplings should also be investigated here.

All of these problems can be encountered in audio equipment as well. Describing them is difficult, however, since the technician must rely on sound descriptions. It is felt that the average audiophile is capable of detecting and describing these faults in terms of distortion, too much bass, treble, etc. as the TV viewer is in terms of poor picture quality. ■

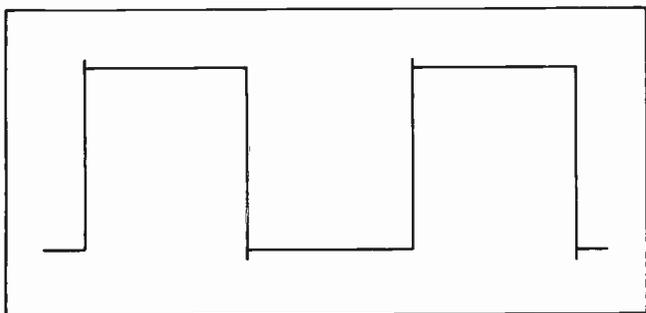


Fig. 5—The over-damped square wave has over-shoot at each rise. This is caused by excessive high frequency response.

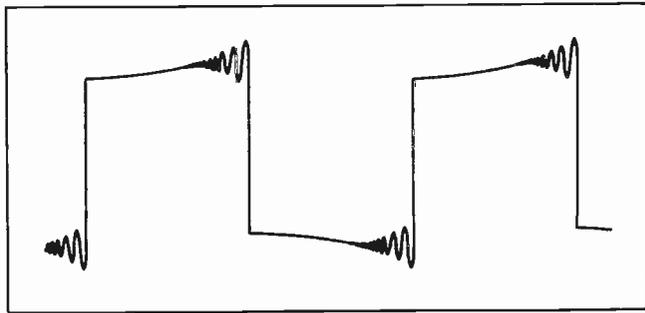


Fig. 6—Amplifier response showing low frequency boost and oscillations. Combination faults often show up in square wave tests.

Fig. 1 — The flame photometer analyzes the light quantity of a specific wavelength emitted from a substance when it is burned.

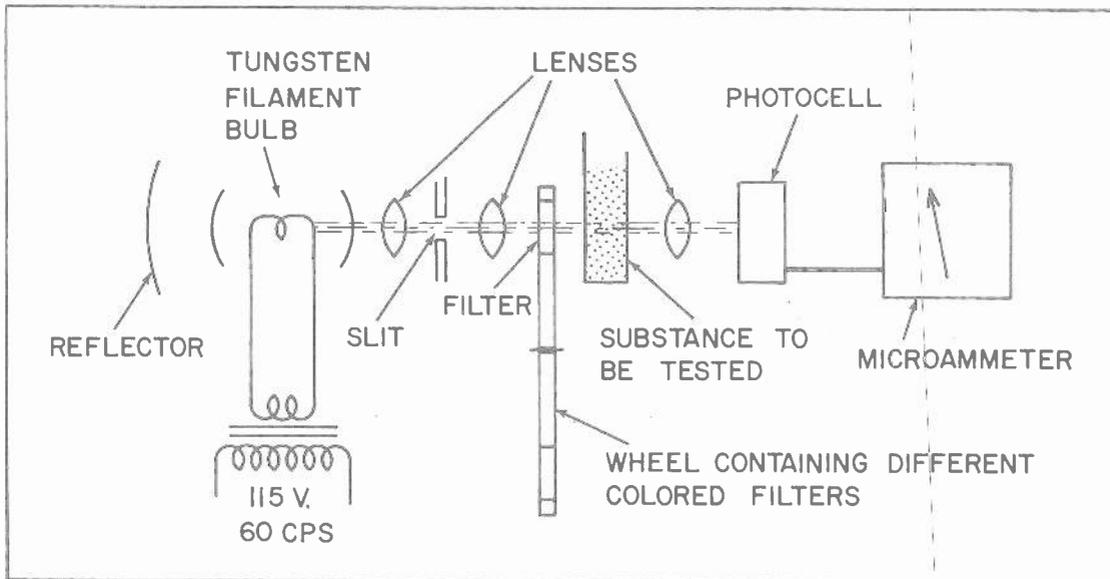
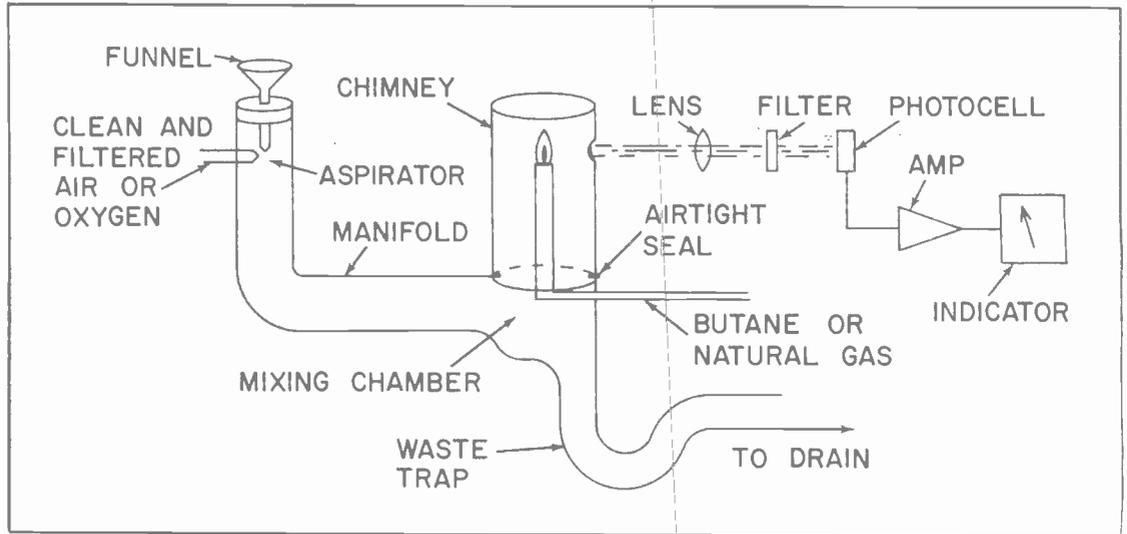
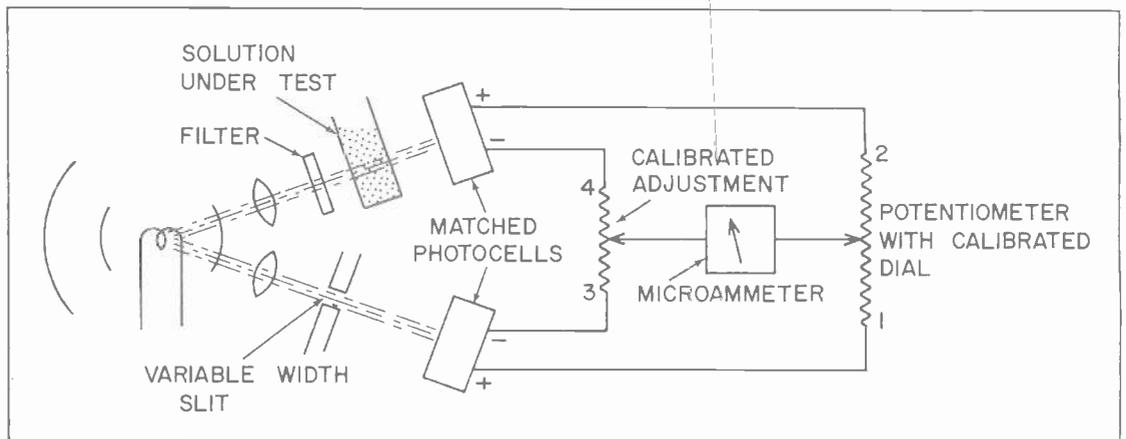


Fig. 2—Some chemicals are checked in a diluted solution by passing light through the solution and analyzing the light. Here, the absorbed light is associated with the chemical being analyzed.

Fig. 3—Concentration of chemicals are checked in the double cell calorimeter. The meter is kept at zero while the slide potentiometer reads the percentage of concentration.



■ Of all instruments that can be used for a quick, accurate chemical analysis, photometric instruments are outstanding. These instruments are essentially modified versions of the simple light meter used by photographers. In fact, in many cases the circuitry is exactly the same.

Photoelectric instruments include photometers, photrometers, spectrophotometers, calorimeters, flame photometers, and many others. Differences in application and cost are primarily in the light sources and the method of control for the light system. Three different types of light sensitive photocells are used as detectors. First the "barrier

The electronics portion of the system is primarily in the detector unit where photocells are used. In order to troubleshoot these systems, however, the technician must understand the various transmission systems.

Flame Photometers

Let us begin with the system which requires burning the chemical and analyzing the emitted light. Sodium, Potassium, Calcium, Lithium, and many other elements can be simply sprayed in a flame, and light is given off which is characteristic of the particular chemical element mentioned. Sodium gives off a yellow light of 5890 A wave-

cially pure gas, similar to butane, is burned in an "air containing the chemical to be analyzed. The gas is mixed with oxygen which has been mixed with the chemical to be burned by an aspirator. The light is passed through a colored glass filter to the photocell. Output of the photocell deflects a sensitive galvanometer, or microammeter. Operation of the flame photometer is shown in Fig. 1.

Calibration of the instrument is achieved by placing a solution containing a known amount of the chemical in the aspirator, then adjusting the sensitivity of the instrument to the proper reading on the galvanometer. With a solution having a different concentration, the galvanometer reading is again noted. An unknown can now be placed in the aspirator, and its concentration calculated from the difference between its reading on the galvanometer and the readings of the two known solutions.

To prevent flame variations because of changes in pressure of the gas or air, a constant is injected into the mixture undergoing analysis. This mixture is mixed with a "stock solution" containing a chemical which is not found in the substance being analyzed. Lithium can be used.

The "lithium plus unknown" mixture is sprayed into the flame by the aspirator; the resultant light is passed through two separate filters and detected by a pair of matched photocells. The difference in the electrical output is measured with a zero center galvanometer used as a null indicator. A modified type of potentiometer, usually a ten-turn Helipot, is employed to null the readings. The scale of the potentiometer is calibrated against standards for the specific chemical to be measured. The electrical circuits are very simple, the most serious trouble with these instruments, other than chemical cleanliness, is in the photocells themselves which frequently need replacement.

Calorimeters

Absorption cell photometers or calorimeters usually use tungsten filament bulbs as a light source. The light is first passed through a filter,

SERVICING PHOTOMETRIC INSTRUMENTS

Flame photometers, calorimeters and spectrophotometers use common principle for chemical analysis

by Charles R. Maduel, Jr.

type" or selenium cell; second, the vacuum photocell, sometimes called the cesium cell; and third, the more complicated electron multiplier tube.

The instruments have several variations, which depend on the chemical analysis to be performed. The light "transmitter" may be emission, as the flame photometer, where the emitted light is analyzed. Or the emission of light may be constant with the chemical analysis accomplished by absorption of certain wavelengths when light is passed through a cell containing a dilution of the substance to be analyzed.

length, potassium a pink at 7680 A, lithium red, of 6710 A, and so forth.

It is only necessary to pass light from the flame through a suitable filter, one which passes only the light of the chemical being measured, and none other. This light is then allowed to strike a photocell. The number of electrons given off by the photocell is a direct function of the strength of the impinging light which is directly proportional to the amount of the substance of the chemical.

The essential part of flame photometers is a burner in which chem-

which absorbs all except a narrow band of color. This "colored light" is then passed through the unknown chemical to the photocell. This category of instruments called calorimeters may be photocalorimeters or photometers. They work on the principle, however, that light of certain wavelength (color) is absorbed by certain chemicals. And that the amount of light transmitted through is proportional to the amount of the chemical present. This system is shown in Fig. 2.

Calibration for calorimeters is achieved by placing a solution containing a known amount of the chemical to be tested in the testing chamber. The photocell circuit is then set to read a predetermined value on the indicator. Several different types of circuits are used in these devices. First, the simple photocell directly connected to the meter, with zero on the meter scale adjusted to "darkness," and full scale adjusted by tilting the photocell in a way that only part of the light strikes it.

Another method uses the meter only as a null indicator. Two matched photocells and a calibrated potentiometer are employed in this system (Fig. 3). One of the photocells is used in the absorbing system, the other having a simple light slit to regulate the amount of light reaching the cell and therefore the cell's electrical output. All "two

cell" instruments require matched pairs of photocells.

Troubles encountered with these instruments are similar to those previously mentioned: Defective or weak cells. One additional trouble comes into play, however. The light source must be constant. A tungsten projection type bulb powered from a-c lines is generally used. A constant voltage transformer is often used to assure constant current through the bulb filament. Most light source troubles develop in the bulb socket so that good contact is impossible. One satisfactory answer to this is to solder the wire from the transformer to the bulb on the bulb's terminals. The socket is then utilized only to hold the bulb in place.

Photocell Testing

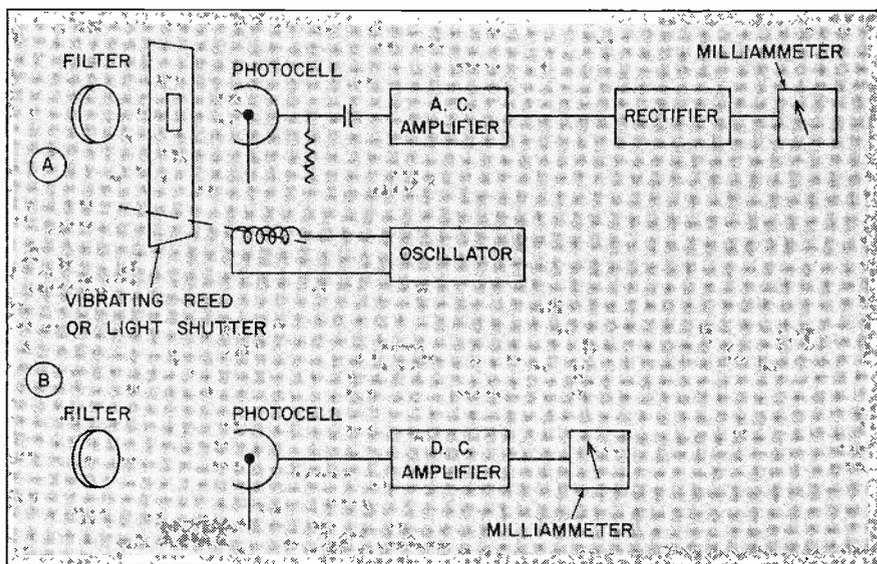
Several tests are necessary for photocells. These tests involve three separate quantities. Dark current, maximum output at the light wavelength to be measured, and linearity. The first test insures dark current stability. The current is never zero, but must not drift. The two photocell circuit insures more stable zero point since both cells change by the same amount from environmental phenomena, such as heat. The second test insures maximum output of the cells at the light wavelength to be measured. Photocells will not change light to

electrical energy with the same efficiency at all wavelengths. Hence, in many instruments two or more different types of photocells are used for the range of wavelengths between ultra-violet and infra-red. A cell having adequate electrical output for a particular wavelength may with age become deficient in this respect and should be replaced.

The third test for photocells is for linearity. Photometric instruments usually use photocells in their linear range. Meters employed with the cells are calibrated in a linear scale or in a logarithmic "optical density" scale. The light output, as a measure of chemical quantity, is a function of optical density. Photometric instruments with linear scales must be correlated with the optical transmission of the measured chemical. This is usually done by graphs, supplied with the instrument by the manufacturer.

The initial or "100 percent" intensity is measured by using a cell containing distilled water, or a cell of known concentration. The transmitted intensity of the unknown is then measured. A simple set of test solutions may be made by using a very small amount of copper sulphate (the electroplater's "Blue-stone") or Potassium permanganate and dropping a few small crystals in water. These chemicals may be obtained in small quantities from a children's chemical set, or drug-store.

Drop a measured quantity, of a "stock solution" in a tube containing a measured amount of water, for solution 1, and two drops in the same amount of water for solution 2. Your druggist can help you by making stock solutions of 0.01 percent. These two solutions should transmit the light from the photometer so the optical density of No. 2 is twice that of No. 1. On linear scales, the reading of solution 1, (weakest) is adjusted to 100, solution 2 (double concentration) should read 69. The solution should be used with the filter that transmits the particular wavelength of the solution. (A blue filter for copper sulphate, a violet filter for potassium permanganate). This will insure linearity of the photocell detectors.



(A)—The sensitive micrometer is replaced by a less sensitive meter by chopping the light and employing an a-c amplifier or (B)—Using a d-c amplifier.

Galvanometers are usually very expensive, and chemical analysis of minute quantities usually require several refinements to simple circuit described. Amplifiers are used to increase the small voltage output of vacuum photocells to a sufficient strength to operate less sensitive meter movements. These amplifiers usually are of one of two forms: The d-c amplifier or a-c amplifier. In the latter, the light is passed through a vibrating reed placed between the photocell and the light filter. The reed interrupts the light changing the d-c output of the photocell a-c after a-c amplification, the signal is rectified and fed to an indicator.

These electronic systems are not complicated, but as all electronic systems they are subject to failures: burned out tubes, defective transistors, resistors, capacitors, and dirty or burned switch contacts to name a few. Amplifiers used for photocell amplification is as varied and numerous as the manufacturers of these instruments.

Spectrophotometers

The ultimate instrument for absorption or emission analysis of light is the spectrophotometer. In the spectrophotometer, either absorption, or emission can be measured; the filter is replaced by a system for more accurately determining (and sometimes measuring) wavelength. The detector in the spectrophotometer is useful over the entire range of wavelengths used. The light source may be either

a flame, tungsten bulb or a more sophisticated system: hydrogen or mercury vapor lamp. The purchaser chooses the system that suits his purpose, but since light sources are interchangeable, the instrument remains a multipurpose one.

The detection system also is variable, and may take the form of a simple photocell and amplifier circuit or a photomultiplier tube. A diagram of the photomultiplier is shown in Fig. 4. Spectrophotometers invariably use the null method of measurement on a microammeter and an accurate scale on the potentiometers.

The photocell voltage output is amplified by electron tubes to a value that will operate a milliammeter so that an accurate d-c null can be obtained. Batteries are often used to operate the amplifier because of their stability.

Spectrophotometers have an elaborate system for accurately separating the light from the light source to its wavelength. A prism or diffraction grating is turned on an axis allowing the various separated wavelengths to reach the photocell. The amount of light striking the photocell is controlled by a calibrated slit. This system is shown in Fig. 5.

Trouble seldom develops in the prism or diffraction section of the

instrument since this section is an accurately machined instrument. Light sources have the same defects as the more basic instruments discussed earlier.

Tubes used in spectrophotometers are usually specially selected to be non-microphonic and to have specific gain characteristics. Potentiometers often get dirty resulting in erratic operation. They should be cleaned with alcohol, (highly concentrated 190 proof ethyl-alcohol is most satisfactory). Do not use carbon tetrachloride since it leaves a residue on the control. Ether may be used with extreme caution, as it is highly flammable. A very light coating of pure white petroleum will assure quiet operation. Silicone oils are also available and are satisfactory.

The most serious problem on these instruments are the batteries. This is especially true in the photomultiplier circuit. The high voltage consisting of 10 or more 100v batteries in series will upset the entire operation if one or more cells delivering proper potential to some of the dynodes is even slightly off. All batteries should be tested in the circuit with the circuit turned on, of course, so that any difference in voltage caused by drain can be detected. Batteries more than 5% off in voltage should be replaced. ■

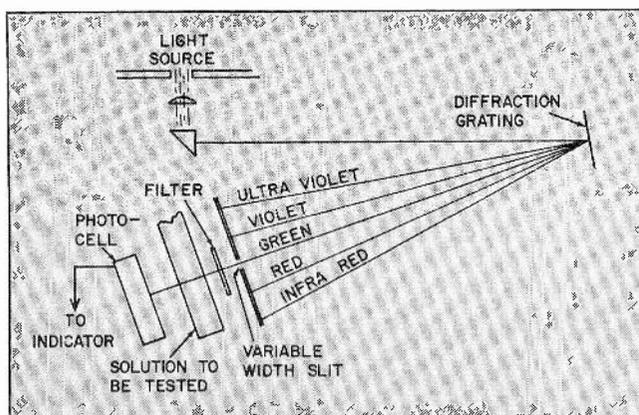
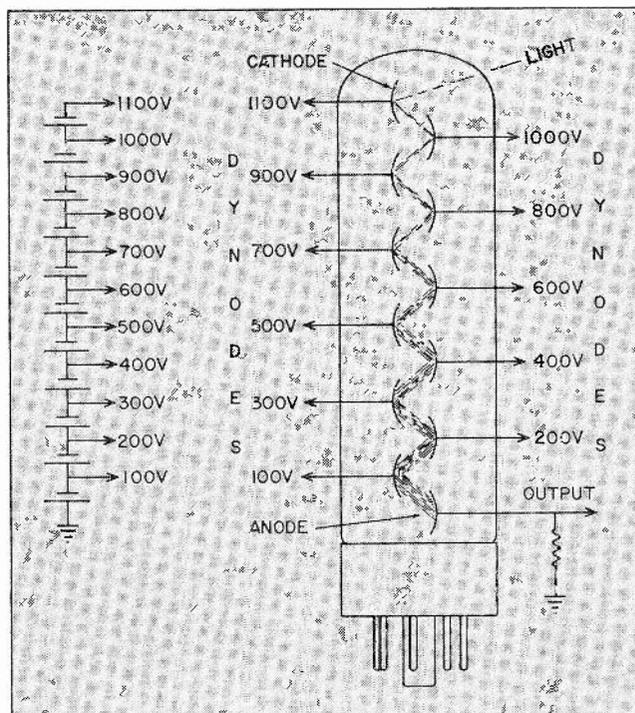


Fig. 4—The spectrophotometer employs a prism to split the light source into different wavelengths. The diffraction grating is tilted to allow different wave lengths to pass through a variable slit. The solution to be analyzed is placed behind the slit and a filter, and the light passes through the solution to a photocell.

Photomultipliers' sensitivity is achieved by dynode multiplication; light strikes the cathode and electrons are emitted.



Multipurpose instruments and up-dated component stocks reduce return calls and save money

Caddy Stock and House

by Aaron Shaw

■ How many times on a house call have you muttered the words "I forgot that . . ." or "If I only had a . . .?" The chances are that you've found yourself in that situation several times—depending on just what type of service work you do in the home.

One school-of-thought maintains that the more work you can accomplish in the home, the bigger your profits. This is probably true in small organizations where the bench man may be the house call expert too. If this is your problem, then it may be a good idea to take stock of the dead merchandise and useless testers you're carrying around and see what you can add to your caddy to ease the job.

Standard Equipment

There's probably not a TV technician in the business that doesn't carry a 1/4 in. nut driver, a screwdriver and a cheater cord on every call. In many cases, these tools and the proper tube is all that's necessary. The important concern, however, is the out-of-the ordinary cases; and increased speed needed even on common problems.

Suppose you have a call on a series string set which is almost new, and none of the filaments light. Do you systematically check all the tubes in a regular tube tester? If you do, you're wasting time. Special inexpensive testers are built to check tube filaments by simply

plugging them into a socket. If the "pilot" light stays on, the tube's filament is open. No waiting for warm-up or fiddling with charts. All the tubes' filaments, including the CRT, can be checked in two or three minutes. A schematic diagram of a filament tester is shown in Fig. 1. This particular circuit will not check some rectifiers or tubes having odd filament connections.

Here's a caddy item that is often overlooked: a small speaker. Mid-gest speakers with 3.2 ohm coils can be enclosed in a plastic box and tucked away into a corner of your caddy. Why take the extra 10 minutes to pull a console-unit's speaker—"just to make sure" and

HOUSE CALL CHECK LIST

HAND TOOLS

- Alignment tools, (long, common tip, assorted hex tips, short common tip.)
- Allen wrench set (small)
- Cutters, diagonal
- Magnetic pickup
- Mirror, purse type and dental type
- Nut driver, 1/4 in.
- Nut drivers or socket wrenches, 3/16, 5/16, 3/8, 7/16, 1/2 and 9/16 in.
- Pliers, slip-joint and needle-nose
- Screwdrivers, 3 common, (small, medium and large)
- Screwdriver, 1 phillips (medium)
- Slug retriever
- Soldering iron or gun
- Tube tapper
- Wrench, adjustable

PARTS AND MISC.

- Business forms (prices, invoice pad, business cards, back-of-set stickers, etc.)
- Capacitors (assortment of 600 v types)
- Capacitors (electrolytic for series doubler sets)
- Cheater Cord, (common and zenith)
- Contact cleaner (with spray and injector attachments)
- Corona Dope
- Diodes, universal phase det. types
- Fuse kit
- Fusistor kit
- Glass cleaner
- Globars (assortment of universal types)
- Hardware (assortment of metal screws, nuts and bolts)
- High voltage wire

Call Equipment

take the chance of damaging it? The test speaker can be equipped with alligator clip leads and can be used to check every sound problem before pulling the chassis.

If you don't have a raster, there's a simple and safe way to find the section at fault. Simply cement the leads of a Ne-2 neon lamp in the end of an old test probe. By positioning the bulb near the CRT anode lead, the high voltage rectifier plate, or the plate cap of the horizontal output, you'll be able to pin-point the area of high voltage loss. This can often be accomplished without removing the cover from the high voltage compartment. Where high voltage is low, this test may be misleading.



In addition to a 1/4 in. nut driver, it's a good idea to pack a set of small nut drivers (or sockets) and a small adjustable wrench for removal of odd-size chassis bolts. In addition, three or four different sized common screwdrivers and one phillips type should be included in the caddy.

Some technicians don't carry

alignment tools, feeling that any alignment problems should be handled in the shop. This is not exactly wise. Oscillator slugs in the tuner can almost always be adjusted in the home. Many times the sound detector coils can be carefully touched up to reduce or eliminate noise interference. Most tuner adjustments can be accomplished with

- Hookup wire
- Parallel CRT brightener (or combination series-parallel)
- Pen, pencil and paper
- Pilot bulbs (47)
- Polishing cloth
- Resistors (package of two universal 10w types)
- Resistors (assortment of 1/2 w)
- Series CRT brightener (or combination series-parallel)
- Snap-on fuse adapters
- Solder (wrap around iron)
- Spring inserts for knobs
- Tape
- Tubes, (common types — rare tubes in 2nd caddy for truck)
- Rectifiers (silicon)
- TV, Hi-Fi, radio and phonograph, new literature

SALES ITEMS (CADDY)

- "Clothes pin" antenna clips
- Extra cheater cords
- Lightning arrestors (for outside antenna systems)
- Phono needle kit
- Record cleaner cloths
- "Tube-saver" (delay relay)

SALES ITEMS AND EQUIPMENT (TRUCK)

- High pass filters (in troubled areas)
- H-pads (in areas where necessary)
- Ladders
- Oscilloscope ("portable")
- Rabbit ears (not applicable to fringe areas)
- Radio batteries

- Stand-offs for twin-lead (not applicable to strong signal areas)
- Truck, for set moving
- Twin lead (hank or roll)

TEST EQUIPMENT

- High voltage and yoke extension wire
- High voltage indicator
- Speaker, 1 1/2" or 2" 3.2 ohms with alligator clips
- Tube filament tester
- Tube tester
- VOM

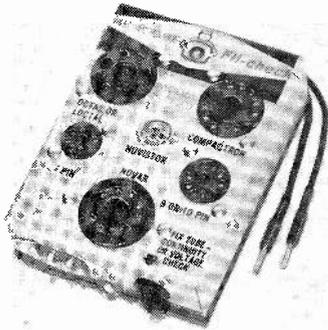
OPTIONAL EQUIPMENT

- Bar Generator (CRT Socket type)
- Signal Injector, miniature
- Signal Tracer, miniature

a single long plastic tool 1/8 to 3/16 in. in diameter with a common screwdriver type tip. The tool should be at least a foot long to allow access in sets where the tuner is recessed several inches behind the panel.

A similar tool—about 4 in. long—and an assortment of hex type tips should let you touch up almost any sound detector. With the exception of a long alignment tool, all the alignment tools should be flexible. This allows freedom in tight spots which might otherwise necessitate pulling the chassis.

If you plan to adjust oscillator slugs in TV tuners, you'd better obtain a "slug retriever" too. It never fails: If you don't have one, the slug slips off the spring clip and slides back out of reach. The slug retriever enables you to grasp the slug and pull it forward and back under the clip.



Sencore's filament tester automatically checks cheater cord and has two leads for numerous continuity checks.

Probably not one in 10 caddys have a "tube tapper." This can be a very valuable tool—it reaches much further than a pen or pencil and reduces the possibility of shock or component shorts in some of the new "inside-out" chassis. Not only that, but some tappers have (in addition to the plastic hammer head) a tip which is ideal for touching up the oscillator slugs in tuners. By carrying combination tools of this type you actually reduce the number of tools in your caddy while increasing the number of jobs you can do with them.

Test Equipment

Not many technicians carry a meter. This is a mistake. Several very good meters are available which are small enough to be carried in your shirt pocket. Tucked away in your caddy, they hardly take up more room than a tube. If you want to carry more tubes, take a separate caddy loaded with all of the rare tubes that you might need "someday," and leave it in the car or truck. You'll have more room for more test gear.

Several testers are now on the market which are designed to perform several general functions. One type includes the functions of d-c and a-c voltmeter, allows resistance and capacitance substitutions, acts as continuity checker and signal generator. This instrument is small enough to fit in the caddy with room to spare in place of equipment it can replace.

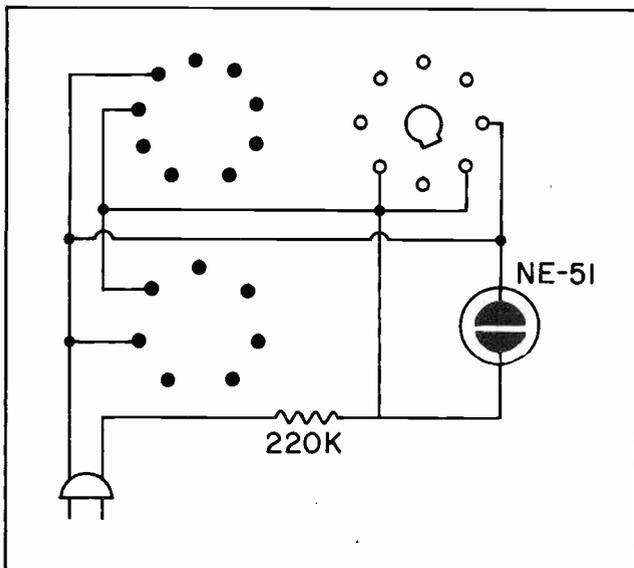
Those who are seriously considering increasing in-home servicing should investigate some of the new miniature signal tracers and signal injectors now on the market. Both sound and video problems can often be pinpointed as quickly in the home as in the shop. Also, if you are considering buying a signal tracer or signal injector for the shop you should check the miniature models. These units are entirely transistorized and serve in the home as well as their larger vacuum tube counter-parts.

There are no emission or mutual conductance tube testers presently available which are practical to put in the caddy. Most technicians find it helpful to carry a tube tester, however, if the customer desires proof or wants the tubes checked. There are several small, light-weight testers available which are ideal for house calls. If you're properly stocked, the only two items you should have to carry into the house for a B/W set are the caddy and tube tester. Trips back to the truck for more equipment should be rare.

Selling on House Calls

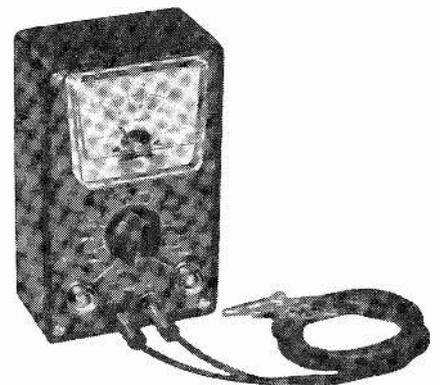
Unless you're sales minded, you're probably missing a lot of sales every day. Antennas, batteries, and phono needles to name just a few. A phono needle kit can be kept in your caddy; antennas, batteries and other sales items can be kept in the truck. If the customer needs a new antenna, you should

Continued on page 86



Simplified schematic of a filament continuity tester.

Heath's model IM-20 performs most VOM functions and serves as capacitor and resistance substitution box.



Upper New York technicians build goodwill during Yuletide season

What About CHRISTMAS?

by William Dufer, Jr.



■ Christmas offers radio-TV service-dealers many opportunities to build business, and bolster goodwill. Now is the time to prepare.

For example, three technicians in upper New York State employ a number of methods for making the Christmas season pleasurable for their customers and profit by it too.

One sends individually autographed greeting cards to all customers who have used his services during the past several years. These cards carry a photograph of the technician and his associates. Each card is signed by the technician and his associates.

Tucked inside each greeting card is a credit slip worth \$0.50 on service bills of \$5 or more arising during any month of the coming New Year. These cards are mailed first class.

The technician also offers a free Christmas tree with service charges of more than \$15 paid during the period between December 1st and 20th. He uses local newspaper advertisements to suggest having TVs checked and placed in top condition for the many fine holiday offerings. In addition, he suggests that all radios in the home be examined at the same time. In this way the service transaction will justify the "tree for free." Vouchers are given, redeemable at a local tree dispensing lot, for a substantial Christmas tree.

Pushes Used Sets

The same technician employs newspaper ads, window posters, and an occasional local radio spot to offer "Used But Not Abused" radios and TV sets, ideal for children's rooms. These sets are carefully reconditioned so that any child will consider them highly acceptable Yuletide gifts. A special shop display from the first week in December on through Christmas shows samples of these sets. During the last week before Christmas a different "Special" is offered each day. A used TV or radio is displayed at an attractive price.

Gift Certificates

Another service-dealer offers gift certificates in amounts of \$10 to \$100 for use as cash by recipients to pay for services: TV picture tubes, accessories, or as payment on a used radio or TV set. Each certificate is worth \$0.50 more than it costs, up to \$25; \$1 more from \$25 to \$50, and \$2 more on certificates issued in amounts from \$50 to \$100.

These attractive certificates are enclosed in gift envelopes to match. Certificates are suggested for relatives, friends, and others who own radio or TV sets. This alert technician emphasizes the "senior citizen," the old man or woman, who frequently relies on TV and

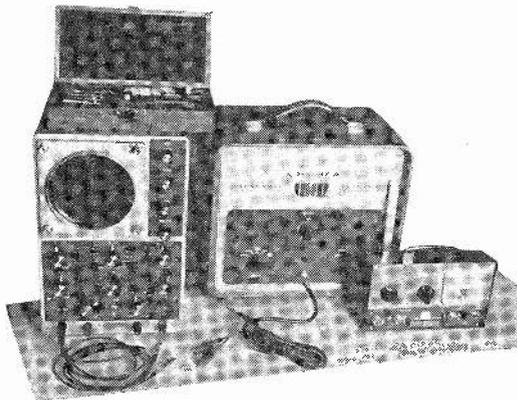
radio for companionship during many leisure hours.

Newspaper advertisements inquire: "Have you a senior citizen in your home, or do you know one you would like to give a Christmas present?" A portion of the advertisement is employed to suggest a used TV or radio for the senior person's room.

A third service dealer has a free gift which his service technicians leave on all house calls where there is one or more children in the family. This is a Disney comic book valued by children and parents alike. A bag of crunchy peppermint candy is also left for children in the home, with the mother's permission of course. All who bring sets in for repair receive similar gifts for their children.

Yes, Christmas is indeed the time for goodwill. ■

TEST INSTRUMENT



The instruments checked this month by ET editors would be a credit to most shops. Shown here is Unified's mini-tracer, Heath's scope, Precision's color generator and GC's CB tester.

MINI-TRACER

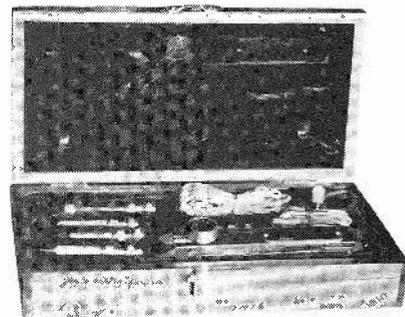
Unified Development Corporation, Mini-tracer, Laboratory and Industrial Model, \$139.95, General Service Model, \$99.95—Here's a signal tracer which you should find more uses for than we can list here. We checked the laboratory model, since it contains all the attachments used in the general service model for TV, radio and Hi-Fi work.

The unit is well-built, rugged and can be adapted to any of several probes in seconds. Two are employed in the General Service model: direct and demodulator. The laboratory model includes these probes as well as microphone, inductive and vibration transducer probes.

A volume control on the tracer

can be operated with the same hand holding the instrument. The output signal is normally connected to a small ear piece, but can also be fed into a power amplifier if desired.

The demodulator and direct probes are self-explanatory; the inductive probe may be used to trace concealed a-c wiring and for monitoring intercom and phone lines without contact. The vibration transducer detects mechanical noise in turntables, tape recorders and a variety of other applications on motor and servos. The most obvious use for the microphone probe is as a "bug." However, it will probably find wider application in mechanical sound-probing in otherwise inaccessible areas.

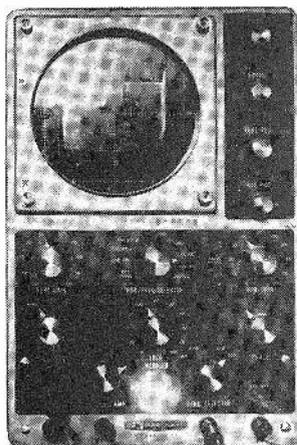


Mini-tracer is versatile hand hold laboratory test instrument. The laboratory model measures only $9\frac{1}{4} \times 4\frac{1}{2} \times 2\frac{1}{4}$ in. The general service model is $3\frac{1}{2}$ in. deep.

We found another use for it in our lab: By using the detector probe, we were able to build up a transistor r-f stage without having to breadboard a complete receiver and *then* find the flaws.

Complete with a mounted probe, the unit weighs less than 5 oz. A small mercury battery powers the unit and should give long life.

OSCILLOSCOPE



The versatility of the 10-12 scope is demonstrated here with a TV picture displayed on the CRT screen. The bright area in the screen's upper left corner is a reflection; the picture is upside down because the sweep was tapped off the linearity control so the TV would not have to be "torn up." Horizontal sync was taken from a yoke lead and the "Z" axis was fed from the picture tube drive.

Health Company, Oscilloscope, Model 10-12, \$76.95, Kit—Many technicians who are starting in TV, radio or audio work, and old timers who are looking for a new scope, are price conscious. If you're looking, and price is a factor, the 10-12 kit may be the answer.

We put the kit together in about 10 hours—the assembly was remarkably easy, most of the job being done on PC boards. A pre-assembled cable for panel connections and CRT high voltage also eases construction problems. The only difficulty encountered

for Bench and Caddy

COLOR BAR GENERATOR

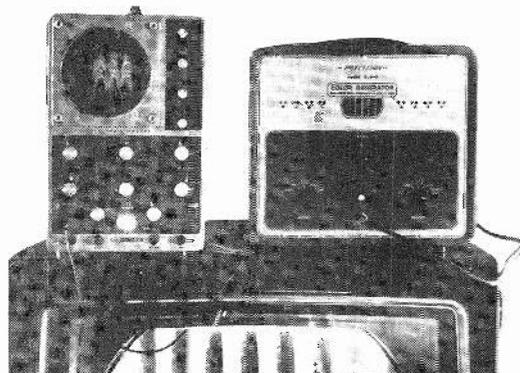
Precision, Color Bar Generator, Model E450, at \$189.50—The Model E450 generator is the easiest-to-operate generator we have tested. All the tester's functions are controlled by only three knobs. A single r-f output is coupled to the set's antenna terminals for reception on either channel three or four. The channel selection is made by a recessed adjustment located on the rear of the unit.

The unit we checked was preset for channel three; in this locality channel three is strong, so the slug was re-adjusted for channel four, an unused channel. The total time for this adjustment takes only a minute. Although the generator produced horizontal bars, vertical bars and a dot pattern, at first we had some difficulty obtaining color bars.

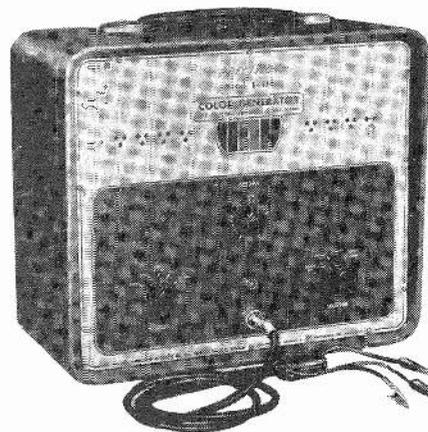
This seemed to be caused by

misalignment of a count-down oscillator which was easily adjusted. Adjusting these oscillators is accomplished with only the aid of a scope. The procedure is fully and clearly outlined in the manual supplied with the instrument. We feel that the misalignment was probably a rare instance which should not concern the prospective buyer. It did give us a chance to "play" with the adjustments, however, which are all located on the rear panel. The adjustments are all wide-ranged and easily made.

The dot pattern produced is especially interesting. The TV set's controls can be adjusted to produce a light cross-hatch pattern superimposed on the dots which would be most helpful in orienting the dots on a badly misconverged set. Ten color bars are produced—including



When connected to a TV, Precision's color generator delivers sharp stable color bars. Scope displays stray pickup.



Simplicity is the outstanding characteristic of Precision's color generator. Only three main controls and one set of cables are used for tests.

those corresponding to R-Y, B-Y, G-Y, I and Q signals which can be readily identified.

was a blown fuse when the EZ81 rectifier flashed momentarily. This is quite common in these rectifiers, when new, and is really of no concern.

The scope's sync is exceptionally stable and can be locked in easily on small signals. All controls are grouped so that chance of errors are reduced and operation is simplified. Voltage calibration is obtained by a simple circuit which delivers 1 v p-p to the front panel where it can be used for vertical or horizontal calibration. A special feature which would come in handy on the TV bench is two preset sweep fre-

quencies. The frequencies are adjustable from the front panel between 10 to 100 cps and 1000 to 10 kc ranges. Internal modifications can extend these ranges to any frequency within the normal range of the scope.

By setting the preset controls at half horizontal and vertical TV sweep frequencies, the technician can have the proper setting for checking these circuits quickly.

They can also be used as rough frequency checks in oscillator circuits.

Continued on page 87



Difficult Service Jobs Described by Readers

Video Output Kills AGC

An RCA KCS68C was brought into the shop for age overload. The pictures were "negative" and the age control had no effect. An external age voltage was applied to the i-f strip and I was able to bring in good pictures from all available stations. This indicated to me that everything was up to snuff, from antenna input to CRT cathode, so I concentrated on the age amplifier tube and its associated circuitry.

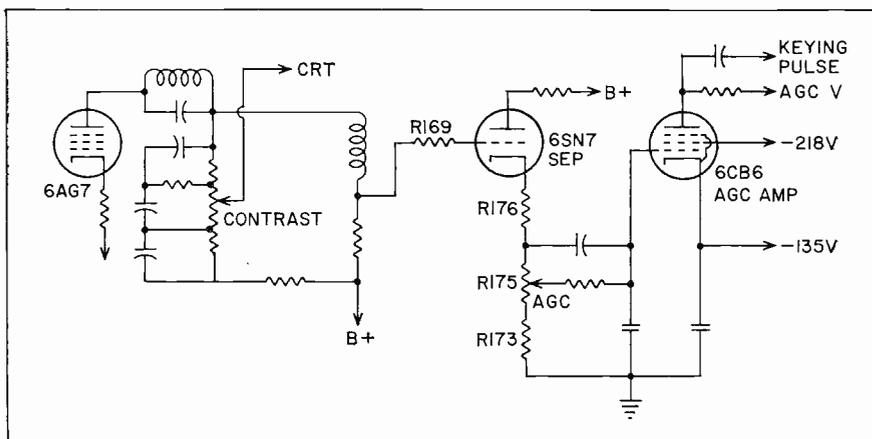
Voltages in and around the amplifier were pretty close to normal. The age control was performing its function, varying the voltage on the age control grid from a high value to a low value. The keying pulses on the amplifier plate were also normal.

After checking out all the components in the circuit I re-examined the biasing voltages on the age amplifier tube. With the age control set at maximum counter clockwise the tube was biased at 25 v negative. As the control was advanced clockwise the grid voltage became less positive. Perhaps, I thought, even the minimum value of 25 v was enough to block the tube from conducting.

By studying the schematic I tried to determine just what set up the biasing level of the age amplifier tube. Current flowing through R-173, R-175, R-176 and, finally, through the sync separator tube gives a high positive voltage on the separate cathode. The age control, being a part of this network, gives a variable voltage to be applied to the age amplifier grid. The sync separator grid, in turn, is dependent upon the plate voltage of the 6AG7 video amplifier because of the direct coupling through R-169. With this realization I took voltage measurements again.

This time I felt that the age amplifier grid was reading low. The separator grid was also low as was the video amplifier plate. I tried a new 6AG7 tube and the plate voltage immediately rose; the separator tube pulled more current, the cathode voltage went up and the age tube started conducting.

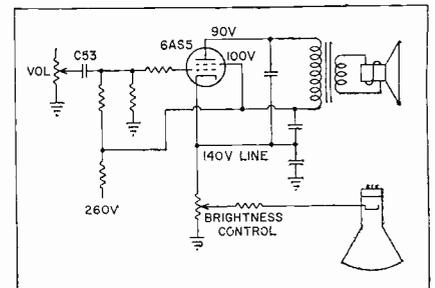
What made the repair so tricky was the fact that with the external age bias hooked in, the picture quality was perfect, so I never once suspected a defective video amp.—*Frank A. Salerno, Long Island City, New York.*



A defective video output tube reduced conduction of the sync separator and biased off the age tube.

Volume Controls Brightness

An Admiral 18 x 4 GZ Chassis was brought into the shop with a complaint that when the volume was

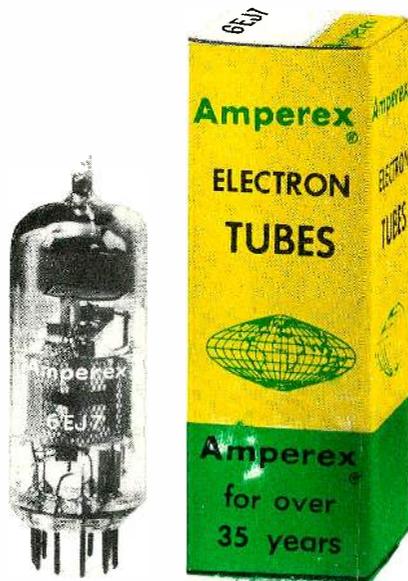


A defective capacitor in the audio circuit caused the volume setting to change the CRT brightness.

turned up the picture got dim. The first thing we checked was the brightness control and associated resistors and found them to be within tolerance. The next logical step was to look for something in the audio stage. In checking voltages we found them to be acceptable. Next we checked the filters on the 140 v line and found them OK. In checking the voltage on the 140 v line, however, we found a variation when the volume control was adjusted for maximum. This decreased the +140 line voltage which in turn supplies bias for the cathode of the CRT. We checked the coupling capacitor C-53 and found it to be leaky, causing the 6AS5 tube to load the 140 v line. Changing the capacitor brought the set back to normal.—*Vernon I. Bringol, Alexandria, La.*

TOUGH DOGS WANTED

\$10.00 paid for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photographs are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minnesota.



are you replacing top quality tubes with identical top quality tubes?

You can, now! You can carry the identical tubes that you find in most of the quality TV sets you're servicing. Chances are, you were not aware that these sets were designed around special Frame Grid tubes originated by Amperex.

For some time now designers have been using many Amperex Frame Grid tubes in their quality TV receivers and we can tell you now that even more Amperex tubes are being designed into the sets you'll be handling in the future.

Compare, if you will, the performance of Amperex Frame Grid tubes with conventional IF tubes: they provide 55% higher gain-bandwidth, increase TV set reliability by simplifying circuits and they make your servicing easier, faster and more profitable because their extraordinary uniformity virtually eliminates time-consuming realignment when you replace tubes. Technicians are finding Amperex THE line to carry.

Tubes introduced by Amperex and currently being used by major TV set makers include:

<i>Frame Grid</i>				<i>Others</i>	
2GK5	4GK5	6GK5	6EH7	6AL3	9A8
2ER5	4EH7	6ES8	6EJ7	6BL8	15CW5
3GK5	4EJ7	6ER5	6HG8	6BQ5	16AQ3
3EH7	4ES8	6FY5	7HG8	12AX7	27GB5

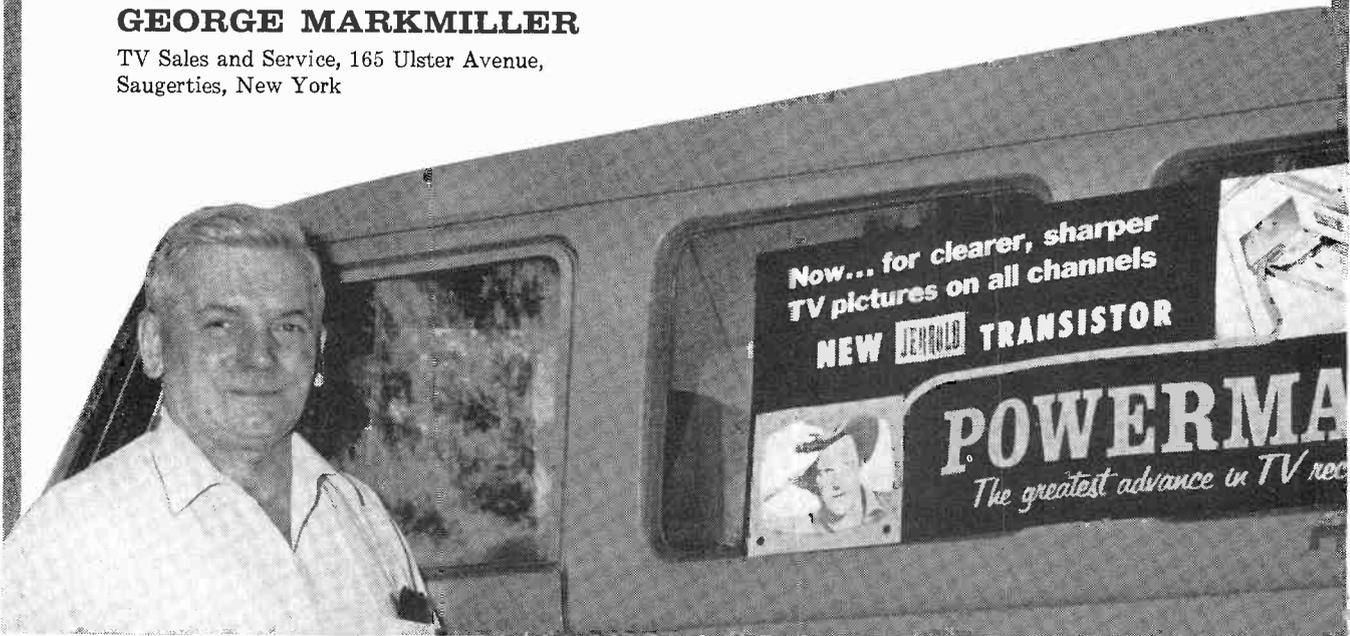
For optimum customer satisfaction and maximum profit operation for yourself, make room in your caddy right now for the identical, matchless-quality tubes designed into the original sets. Next time you visit your distributor look for the green-and-yellow box and ask about Frame Grid tubes for TV and other entertainment replacement applications. Amperex Electronic Corporation, 230 Duffy Ave., Hicksville, L. I., N. Y. In Canada: Philips Electron Devices Ltd., 116 Vanderhoof Ave., Toronto 17.

... for more details circle 12 on page 50

**"OVER \$12,000 WORTH OF
POWERMATES SOLD...AND
IT'S JUST THE BEGINNING!"**

GEORGE MARKMILLER

TV Sales and Service, 165 Ulster Avenue,
Saugerties, New York



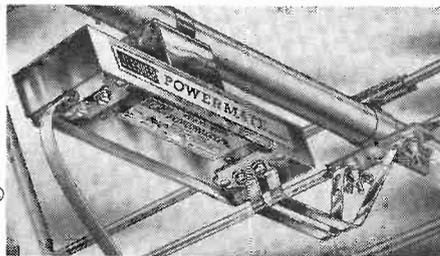
POWERMATE sells itself through its performance

George Markmiller's customers "were from Missouri" where TV reception was concerned. The products they had tried, in spite of high claims, had not produced snow-free TV from the distant New York stations. With the help of his Jerrold distributor, George used the potent promotional kit to tell his customers the POWERMATE performance story. Newspaper ads, truck banners, stuffers and store displays presold

POWERMATE because the promotion was *custom-designed* for his area.

The real clincher came after the demonstration when one customer began to tell the other about POWERMATE's amazing reception. The Saugerties area had never seen such clarity in black and white *and in color*. As George says, "The performance of this unit has been the best advertising that has helped to sell it."

Jerrold's ready to set up a POWERMATE promotion designed for *your local area*. You can repeat George Markmiller's success story as hundreds are doing—all over the country. Write for the name of your nearest Jerrold distributor.



TRANSISTOR

POWERMATE

ANTENNA AMPLIFIER

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LIST

JERROLD ELECTRONICS CORPORATION
A subsidiary of THE JERROLD CORPORATION
Philadelphia 32, Pa.

Jerrold Electronics Corporation
Distributor Sales Division, Dept. IDS-279
Philadelphia 32, Pa.

I want Jerrold to promote the POWERMATE in my LOCAL area. Send me the name of my nearest distributor.

Name _____

Address _____

City _____ Zone _____ State _____

... for more details circle 37 on page 50

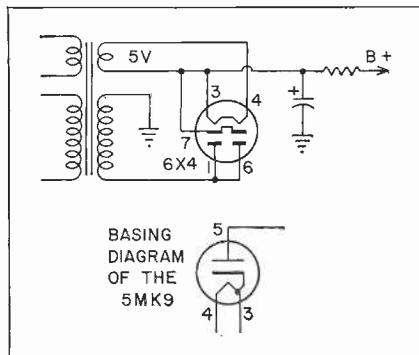
ELECTRONIC TECHNICIAN

SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

5MK9 Substitute

The 6x4 rectifier can be substituted for the 5MK9 imported rectifier by rewiring the socket connec-



The 6X4 can be substituted for the 5MK9 by rewiring the socket.

tions. The cathode is connected to the heater circuit and plate pins 1 and 6 are tied externally. The lower heater voltage will not adversely affect the operation of the receiver. The warm-up period will be extended a few seconds, however. The 5MK9 is used principally in receivers and recorders manufactured in Japan. There is no standard replacement. — *E. L. Deschambault, St. Romuald, Levis, P. Q. Canada.*

Phono Patch Cords

When taking the phonograph changer assembly from the radio phonograph cabinet a connector to hook up the motor is sometimes a problem. The phono motor is usually operated from 117 volt ac. By simply plugging a TV cheater cord into the male plug on the motor, it will operate the turntable. To check crystal cartridges, a female phono jack may be soldered to one end of a flexible shielded cable and a male phono plug attached to the other end. The cable can then be plugged into the radio-phonograph chassis from which it came or into a phono plug on a small table radio. Another female phono plug and alligator clips can be made to clip into the audio cir-

cuit of a radio to test the cartridge output. — *Homer L. Davidson, Ft. Dodge, Iowa.*

Correcting Changer Set-down

A recurrent complaint on RCA RP216-1A changers is that the arm won't set down on the edge of 33 $\frac{1}{3}$ and 45 rpm records. The arm starts to set down and just before it contacts the record it moves away from the turntable and falls near the rest post. I have corrected the above fault by placing a washer approximately .020 inch thick between the actuating lever (No. 78724) and the pickup arm pivot lever, (No. 108570) to take up play in the mounting. — *Ken Miller, Adrian, Michigan.*

Cheater Saver

When you add one or two fused a-c receptacles on your tube checker you have very convenient outlets nearby when servicing TV sets in the home. Plug your cheater cord or soldering gun into these outlets and you'll never run the risk of leaving them behind. The receptacles can usually be installed in blank tube socket holders. Also, I found by making the line cord on the checker about twice as long, I'm able to place it where I want it near the TV set. — *Frank H. McComb, Victoria, B.C., Canada.*

Cash Builder

On home service calls the customer will often say, "I'll be down to the shop tomorrow, (or Pay Day) and settle up with you" or "Send me a bill the first of the month," or "I'll try this a few days and then pay you," whereupon a lengthy explanation that all work is cash, and that parts and labor are guaranteed, becomes necessary. By printing a sign "All Repair Work strictly Cash" on one of the tube compartment lids of the tube caddy, I would estimate that 80% of the

house call "charge it" business has disappeared, to say nothing of the countless hours saved in explanations. — *Wm. Schlickbernd, Jr., Chadron, Nebraska.*

Tube Puller

If you find yourself stuck without a tube puller, a good temporary one can be found in a vibrator. Simply disassemble the vibrator and use the rubber pad found over the contacts. — *James L. Lacey, Recor, Arkansas.*

Renew Safety Glass

When plastic safety glass used on portable TV sets becomes dull and fuzzy, it can be "cleaned" with paste wax. Most any auto polish paste wax will work. Rub the wax on the safety plate for a few minutes and shine with a soft cloth. On badly scratched "glass" several applications may be necessary. — *Leo Kramer, Linton, N.D.*

Wax Eraser

When removing wax or oxide from subminiature components, leads can easily be damaged. Safe removal can be effected by utilizing a simple "course-fine" rectangular eraser with a deep V notch cut in each end. The leads can then be inserted in the notch and pulled through the eraser while squeezing it together. The degree of "scraping" can be controlled by selecting the course or fine end of the eraser. — *Larry Mings, Savannah, Ga.*

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 if accompanied by a stamped envelope. Send your entries to Shop Hints Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minnesota.

FREE LITERATURE

To receive the literature below without charge, simply circle the number on the coupon

CABLING

"A revolutionary new method of cabling," is the way this firm describes its "STA-STRAP" tool, ties and clamps. It is claimed that harnessing time can be reduced by as much as 50% over ordinary lacing and alternate strapping methods. Panduit Corp.

- - - for more details, circle 300 below

CAPACITORS

Technical data on duct type feed-through capacitors, sub-miniature size units applicable for military, aircraft, automotive, industrial electric and electronic applications is provided in Bulletin 181B2.1. Capacitors listed are rated for circuits up to 10 amp continuous duty. Voltage ratings available are 100 through 600 vdc and 125 and 250 vac operation at frequencies up to 400 cps. Aerovox Corp.

- - - for more details, circle 301 below

DEGAUSSERS

Complete information is provided on three models of tape and film degaussers, each of which is capable of erasing a recorded signal to more than 50 db below saturation. The Type 9205 A is designed to be a stationary unit, the type 64221 is designed for home and industrial use and the Type 8905

Degausser is an erasing pencil. Hi-Q Div., Aerovox Corp.

- - - for more details, circle 302 below

KITS

Catalog 81/22 is the latest in this manufacturer's line of kit catalogs. A total of 100 pages is devoted to stereo, Hi-Fi, amateur, test equipment, educational and marine equipment kits. Heath Co.

- - - for more details, circle 303 below

SOLDERING IRONS

These technical bulletins, describe a line of soldering equipment. The four bulletins, LM-62, SG-62, SM-62 and TM-62, give full specifications, including Thermo/Gram values, on the following lines: Line Master soldering pencils and iron, Shop Master soldering irons, TechniMaster soldering pencil and Trig-R-Heat soldering guns. Wall Mfg. Co.

- - - for more details, circle 304 below

HI-FI CATALOG

This catalog is devoted exclusively to high fidelity products. Described, in the eight-page booklet, is the firm's complete line of monophonic and stereo phonograph cartridges, including the new M33 and M77 models. The catalog also describes tone arms and the company's line

of stereo preamplifiers. The catalog lists specifications and prices. Shure Brothers, Inc.

- - - for more details, circle 305 below

CB CATALOG

This 16-page brochure presents the company's approach to the manufacture of CB equipment. A resume of its history with particular emphasis on the company's entrance into the CB field, is documented. Browning Labs, Inc.

- - - for more details, circle 306 below

TEST EQUIPMENT

This 20 page equipment catalog, done in two colors, measures 7 x 10 in. It is said to contain all of the necessary features, specifications and prices of the company's complete line of test equipment. Precision Appartus Co., Inc.

- - - for more details, circle 307 below

DISTRIBUTOR CATALOG

This firm's new 284-page shopping guide features over 10,000 individual items, including an array of special closeout purchases of nationally advertised hi-fi components plus a comprehensive presentation of latest products and new lines.

- - - for more details circle 308 below

CUT HERE

Cut out and mail to **ELECTRONIC TECHNICIAN, Ojibway Building, Duluth 2, Minn.**

Use this coupon, or your letterhead, before **January 10, 1963**

Please send me literature of companies whose code numbers I have circled below (includes editorial and advertised items):

ADVERTISED PRODUCTS

10	22	34	46	58
11	23	35	47	59
12	24	36	48	60
13	25	37	49	61
14	26	38	50	62
15	27	39	51	63
16	28	40	52	64
17	29	41	53	65
18	30	42	54	66
19	31	43	55	67
20	32	44	56	68
21	33	45	57	

NEW PRODUCTS

200	207	214	221	228
201	208	215	222	229
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203	210	217	224	
204	211	218	225	
205	212	219	226	
206	213	220	227	

FREE LITERATURE, CATALOGS, BULLETINS

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Name..... Position.....

Firm..... Address.....

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

Note: If you have given your residence address, please enter your company name and address on this line:.....

New Heavy Duty RFI Suppression Kit For Mobile Radio



RADIO HAMs, fleet owners, and CB operators can now enjoy clearer, more readable, less tiring mobile communications at longer effective ranges.

Sprague's new Type SK-1 SUPPRESSKIT provides effective R-F Interference suppression—at moderate cost—up through 400 megacycles. Designed for easy installation on automobile, truck, or boat engines with either 6-volt or 12-volt generators, the Suppressikit makes possible high frequency interference control by means of Sprague's new, extended range, Thru-pass® capacitors.

The components in the SK-1 Suppressikit are neatly marked and packaged, complete with easy-to-follow installation instructions. All capacitors are especially designed for quick, simple installation.

The generator capacitor is a heavy-duty unit rated at 60 amperes, and will operate at temperatures to 125°C (257°F). This means you'll have no trouble with an SK-1 installation in the terrific temperatures found "under the hood" on a hot summer's day. There's no chance of generator failures from capacitor "short outs," as with general purpose capacitors. The Thru-pass capacitors for use on voltage regulators are also rated at a full 60 amperes.

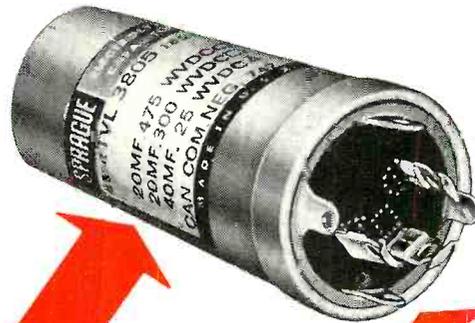
The Deluxe Suppressikit is furnished complete with an 8-foot shielded lead on the generator capacitor which can be trimmed to necessary length for any car or small truck, preventing R-F radiation from armature and field leads.

Containing only 5 easy-to-install capacitors, the Deluxe Suppressikit is a well-engineered kit. The net price is a little higher than that of many thrown-together kits, but it saves you so much time and aggravation it's well worth the slight extra cost.

For additional information on the Type SK-1 Suppressikit, see your Sprague Electronic Parts Distributor.

GS-341 R2

Sprague TWIST-LOK® Capacitors give you 2 tremendous advantages over all other twist-prong electrolytics



1

The right size, the right rating, for EVERY replacement job

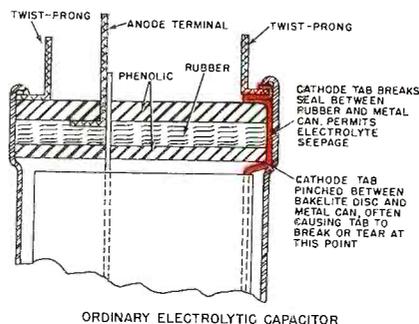
No need to compromise or improvise...the TWIST-LOK Line includes over 1690 different capacitors . . . It's the industry's most complete selection of twist-prong type capacitors, bar none!

2

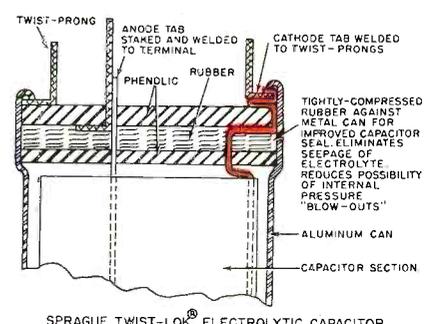
Exclusive, improved cover design for greater dependability

Type TVL Twist-Lok Capacitors are now more dependable than ever! Sprague's new cover design provides a truly leak-proof seal and permits capacitors to withstand higher ripple currents.

Compare internal construction of TWIST-LOK to ordinary 'Lyctic



ORDINARY ELECTROLYTIC CAPACITOR



SPRAGUE TWIST-LOK® ELECTROLYTIC CAPACITOR

Complete listings are shown in handy Wall Catalog C-457. Get your copy from any Sprague Distributor, or write to Sprague Products Company, 65 Marshall St., North Adams, Mass.

WORLD'S LARGEST

MANUFACTURER OF CAPACITORS



... for more details circle 56 on page 50

NEW PRODUCTS

FOR MORE INFORMATION CIRCLE PRODUCT NUMBERS ON PAGE 50

ELECTROLYTIC CAPACITOR 200

An electrolytic capacitor cover seal reportedly eliminates the shortcomings of conventional retaining rings. Specifically,



the construction is said to eliminate any possibility of shorts between the formerly used metal ring and the terminals that have been a problem in particular on smaller size capacitors and capacitors with special mountings. The product is claimed to exceed all U. L. specifications for an air gap (electrical creepage) clearance from live parts to ground. Aerovox Corp.

MULTIPLEX GENERATOR 201

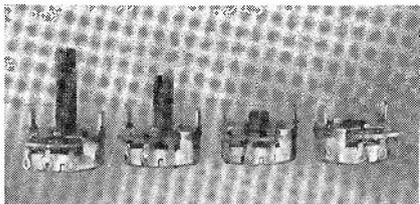
An f-m multiplex stereo signal generator, designated Model MX-1G is said to generate the FCC specified stereo signal



for use in design, production testing and alignment of f-m stereo adapters and receivers. Features include a patent-pending stereo modulator design, crystal-controlled pilot and carrier signal, and integral audio frequency oscillator. Versatile switching provisions permit rapid testing of sync stability, channel separation, channel balance and distortion. Price: \$250 cabinet mounted, \$255 rack mounted. Karg Labs., Inc.

POTENTIOMETERS 202

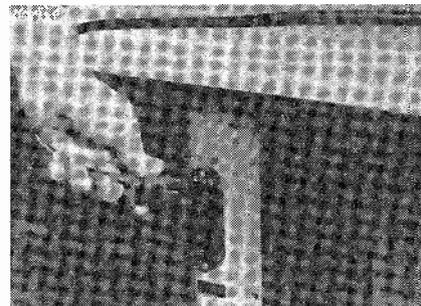
Molded nylon shaft assemblies are offered in many shapes of non-conductive shafts for the Series 47 composition element potentiometer. The use of non-



conductive shafts is especially applicable to installations requiring a high above-ground operation of the potentiometer, with fingertip or screwdriver settings. The shaft assemblies are available in black or white material. A unique design reportedly enables the user to specify virtually any length of shaft, and the shaft may be run out the front or rear of the control. Flush shafts, adjusted with a hex tool, are also available for set-and-forget trimming adjustments. The Series 47 potentiometer is rated at 0.5 at 40°C. Clarostat Mfg. Co., Inc.

WORK BENCHES 203

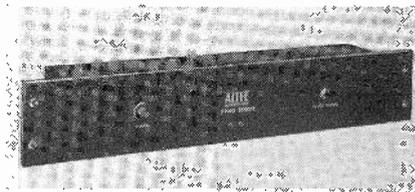
This line of industrial benches incorporates an arrangement for electric outlets and wiring within the bench struc-



ture. Each steel leg assembly is pierced to receive an industrial type outlet on the vertical column and other parts are arranged to receive armored cable or conduit and junction boxes. This gives the most convenient location possible for the outlet and allows the complete installation to be made without drilling. Benches themselves are available in 4, 5, 6, and 8 ft. lengths with choice of steel, composition, or laminated maple tops. Various sizes of drawers are also available. Bay Products.

PA MONITOR 204

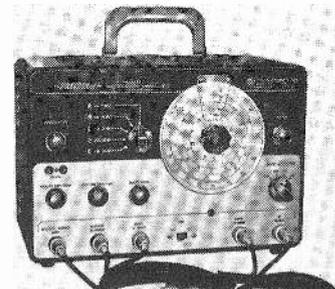
"Sequor," a unique circuit innovation is claimed to assure fail-safe sound system operation. By operating power amplifiers in pairs through the "Sequor" panel a safe and reliable method for effectively paralleling the amplifiers into a common load is provided, according to the manufacturer. Failure of one amplifier by any cause, even one which places a short circuit across its output terminals, will have no effect on the output of the surviving amplifier. To make up for volume losses caused by amplifier failure, the input level is increased automatically and no change in volume of projected sound is noted in most cases, although some clipping might be heard. To insure that the defect becomes known, and maintenance provided,



the circuit automatically activates a signal light. Terminals are provided to connect additional remote warning devices, including buzzers and bells. Altec Lansing Corp.

SWEEP GENERATOR 205

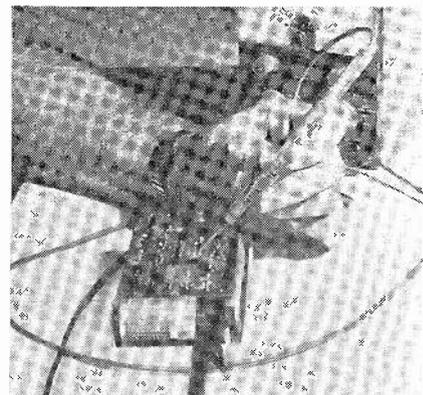
Known as the Model E-410, this unit is claimed to offer truly efficient f-m and TV visual alignment and ease of operation. It provides for sweep frequency coverage in 5 fundamental output ranges—from 3-to 213 Mc. Sweep width is continuously variable up to 30 Mc. A built-in crystal oscillator supplies accurate fixed frequency markers (a 4.5 Mc crystal is included); built-in agc circuitry regulates the output voltage amplitude to required spec. A phasing control corrects any phase shift between the r-f output and the scope horizontal output.



A dual attenuator provides wide control of the r-f output. Price: \$159.95. Precision Apparatus Co., Inc.

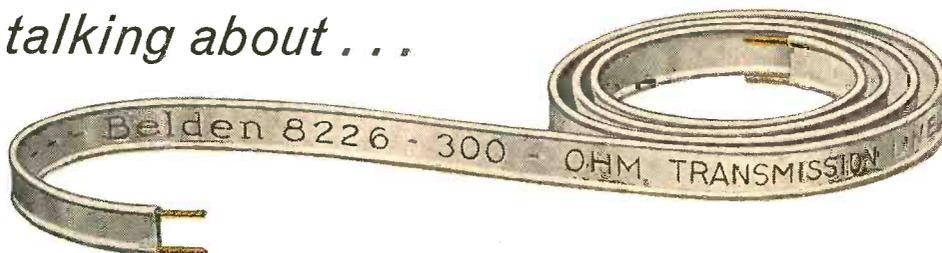
TEST PROBE 206

Hailed as the first new development in test leads since World War II, the



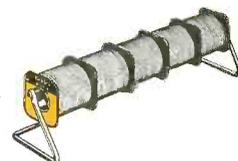


Here's the Decorator 300 ohm TV lead-in cable they're talking about . . .



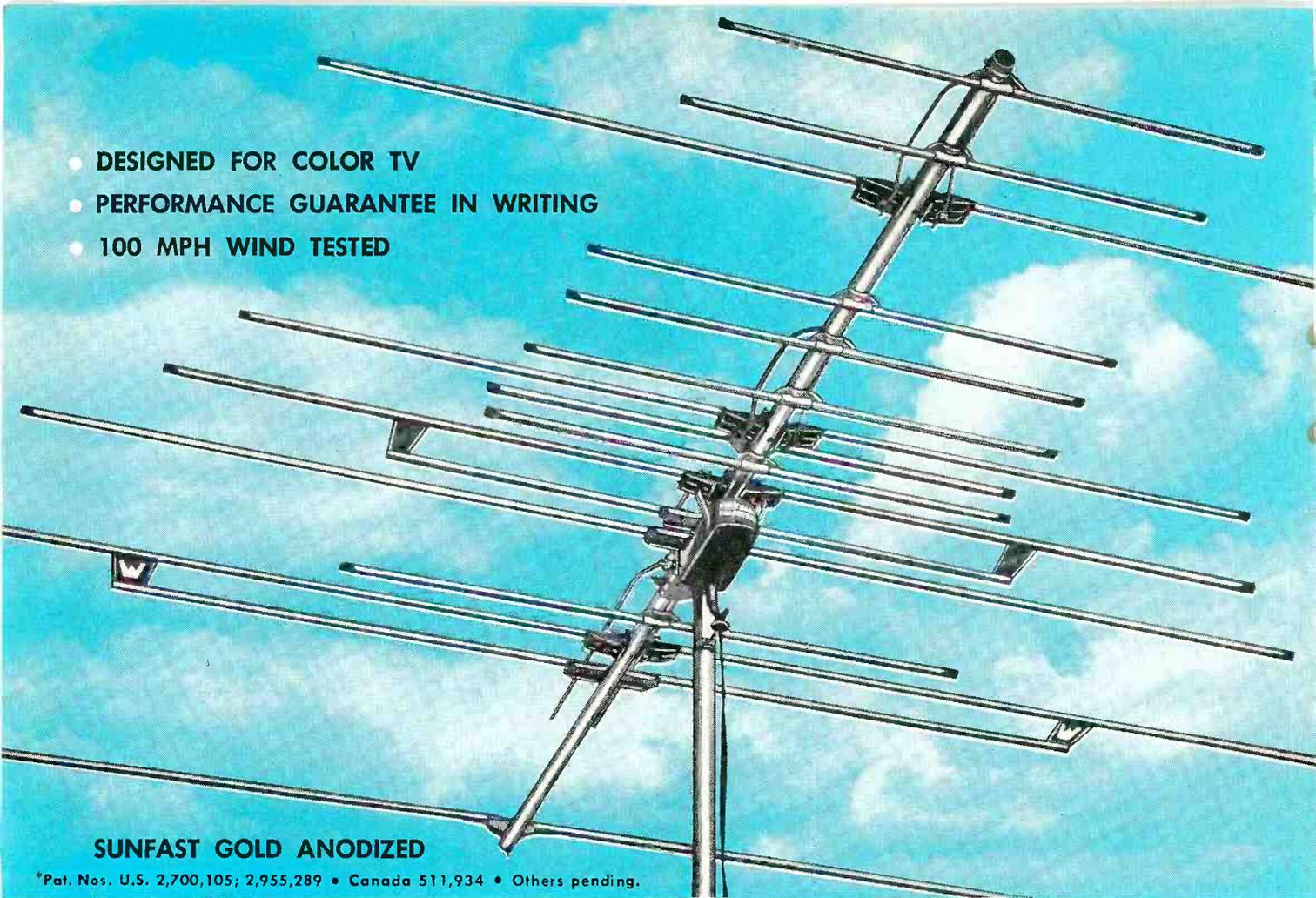
Its neutral color blends into any interior decorating arrangement. This popular cable comes in 25, 50, 75 and 100 foot lengths—put-ups in pancake coils for easy handling and display (8226).

This is the work-bench hook-up wire dispenser. No fumbling around for the right spool. It's always in the same place—right in front of you.



Your Belden jobber carries a complete line of TV lead-in cable . . . also microphone and shielded power supply cables; hi-fi, stereo and phonograph cables; power supply cords; rubber-vinyl, multi-conductor portable cordage; antenna rotor cables; hook-up wire; TV and cheater cords; aluminum ground wire . . . and related items. It's all in his stock.

- DESIGNED FOR COLOR TV
- PERFORMANCE GUARANTEE IN WRITING
- 100 MPH WIND TESTED



SUNFAST GOLD ANODIZED

*Pat. Nos. U.S. 2,700,105; 2,955,289 • Canada 511,934 • Others pending.

NEW FOR COLOR Winegard COLORTRON

EVOLUTIONARY — The finest TV antenna design ever engineered is the time-proven Electro-Lens all channel Yagi. This patented basic design, with its cross-phased driven elements and intermixed director system, was introduced by Winegard to the industry in 1954 and has never been surpassed. Now, through continuous research and product development, a new, improved Electro-Lens Yagi has evolved—the NEW WINEGARD COLORTRON—bringing this acknowledged design to a new peak of perfection.

4 COLORTRON MODELS \$24.95 to \$64.95
There are 4 new COLORTRON yagis to cover every reception need, from suburbs to distant fringe areas . . . setting new industry standards for reception results and mechanical construction. They are

the only outside antennas that carry a *written factory guarantee of performance* with full factory back-up of consumer satisfaction.

PERFECT COLOR ANTENNA — COLORTRONS have an almost flat frequency response (plus or minus 1/2 DB across any 6 MC channel), no “suck-outs” or “roll-off” on end of bands . . . accurate 300 ohm impedance match, (VSWR 1.5 to 1 or better) . . . unilobe directivity for maximum ghost and interference rejection. They deliver today’s finest TV reception—COLOR or BLACK AND WHITE.

RUGGED CONSTRUCTION — **SUNFAST GOLD ANODIZED**—COLORTRONS are *built to last* . . . made of high tensile aluminum

tubing for rigidity and stability. New locking devices keep the elements aligned—straight as a die. This quality of construction will satisfy a perfectionist! Insulators have a triple moisture barrier to insure top performance, rain or shine. Every COLORTRON is GOLD ANODIZED the WINEGARD way for the best looking, most corrosion-proof and permanent Gold finish known for aluminum.

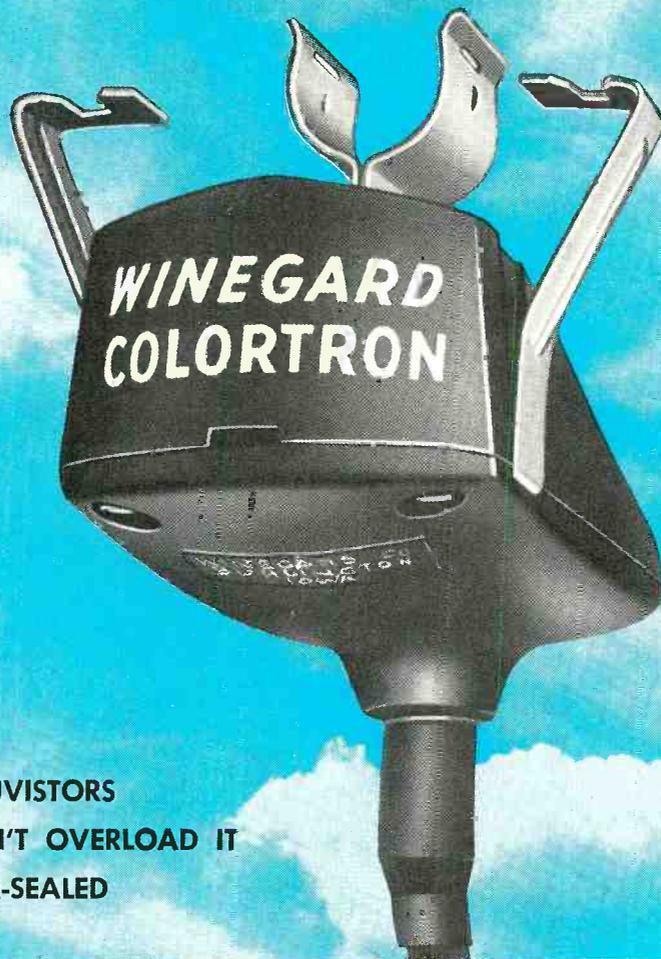
POWERFUL ELECTRONIC ANTENNA — Because the COLORTRON and the NUVISTOR amplifier were designed to match each other perfectly, electronically and mechanically, together they make the most efficient electronic TV antenna yet devised .

MODEL C-44
GOLD ANODIZED \$64.95

MODEL C-43
GOLD ANODIZED \$51.90

MODEL C-42
GOLD ANODIZED \$34.95

MODEL C-41
GOLD ANODIZED \$24.95



- USES 2 LONG LIFE NUVISTORS
- STRONG SIGNALS CAN'T OVERLOAD IT
- COMPLETELY WEATHER-SEALED

ANTENNA and COLORTRON AMPLIFIER

REVOLUTIONARY—Now a revolutionary new circuit, using two NUVISTORS enables the WINEGARD COLORTRON amplifier to overcome the limitations of other antenna amplifiers. For instance, oscillations, strong signal overloading and cross modulation picture interference are not problems with a COLORTRON AMPLIFIER because it will take up to 400,000 microvolts of signal input, 20 times more signal than other antenna amplifiers. *You can use it to amplify weak signals from far-away stations even though you have strong local signals from TV and FM stations. The COLORTRON NUVISTOR Amplifier is the only antenna amplifier that can do this!*

"LIFESAVER" CIRCUIT GIVES NUVISTORS 4 TIMES THE LIFE OF ORDINARY TUBES—A special "LIFESAVER" circuit has been designed to give the rugged LONG LIFE NUVISTORS an operating life many times

that of tubes, and superior to transistors in similar use. The COLORTRON NUVISTORS will operate perfectly for years.

PERFECT COLOR TV AMPLIFIER—The COLORTRON amplifier *has what it takes* to give CLEAN, CLEAR COLOR PICTURES, sharp and bright without smear. On weak signals, it will effectively reduce snow and interference, often making the difference between a very good picture and a poor one. It has an ultra low noise circuit... high amplification... flat frequency response... accurate impedance match (VSWR 1.5 to 1 or better, input and output)... and no phase distortion. You can be confident it will improve color and black and white TV reception in any location. This amplifier is so powerful, it can easily drive 6 sets at once with gain to spare!

WEATHER-SEALED POLYSTYRENE CASE ... CORROSION-PROOF—The COLORTRON

NUVISTOR amplifier is completely weather-sealed! Nothing is exposed to corrode and cause trouble—even the terminals are protected. A rubber boot over the twin-lead keeps moisture out. A built-in heat sink controls temperature of NUVISTORS. Everything possible has been done to eliminate maintenance problems. It comes complete with an all AC power supply with built-in 2 set coupler. (Mod. No. AN-220, \$39.95). The COLORTRON amplifier will give trouble-free performance for years. Install it and forget it!

OTHER ANTENNA AMPLIFIERS

FOR TV—2 Transistor (Mod. No. AT-220, \$39.95) also available. Will take up to 80,000 microvolts of signal input without overload. This is 3 times the input of other transistor antenna amplifiers.

FOR FM—Super sensitive 2 Nuvistor, 200,000 Microvolts Input—\$39.95.

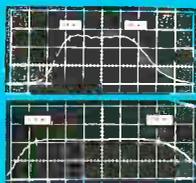
Write for information.



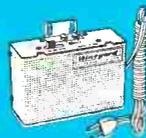
AMPLIFIER WORKS ON ANY ANTENNA.



SPECIALLY DESIGNED AMPLIFIER CLAMP SNAPS ON COLORTRON ANTENNA IN SECONDS.



UNRETOUCHED PHOTO OF AMPLIFIER GAIN CURVE—FLAT RESPONSE ALL CHANNELS.



COLORTRON POWER UNIT WITH BUILT-IN 2 SET COUPLER.



Write for technical bulletins

Winegard

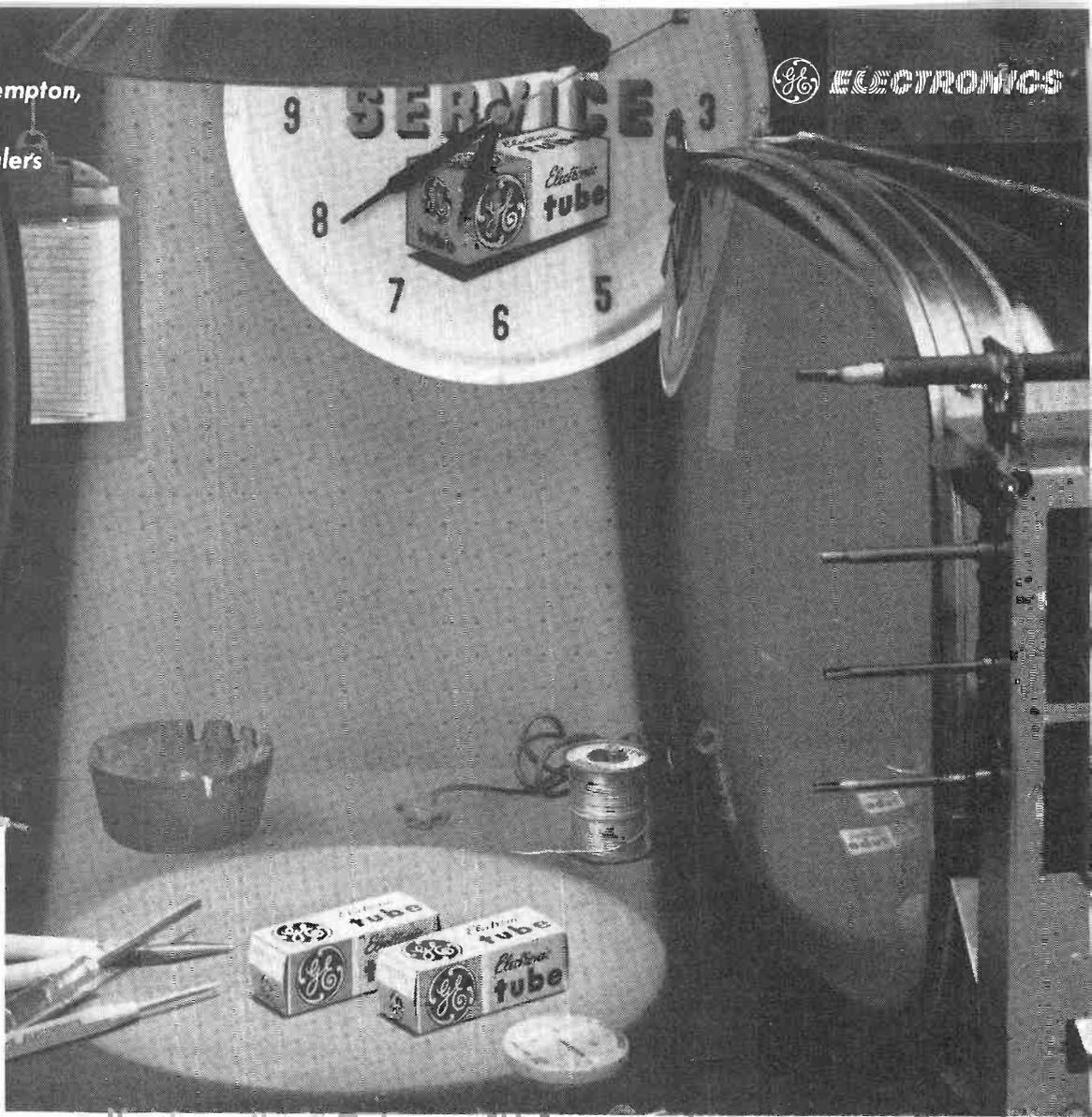
ANTENNA SYSTEMS

3019-11 KIRKWOOD • BURLINGTON, IOWA

... for more details circle 66 on page 50

G-E reporter, Roland Kempton,
makes the rounds with
independent service dealers

 **ELECTRONICS**



No callbacks tonight for Jim Liston, thanks
to his in-warranty failure of less than 1%
with G-E *SERVICE-DESIGNED* receiving tubes

"In this business, a reliable replacement tube can make you look like a hero... a callback due to in-warranty failure gives you a black eye, and wastes time and money. So, it's real simple, why I use G-E SERVICE-DESIGNED tubes in almost everything that comes into the shop. I can't afford callbacks."

Jim Liston is the owner of SOUTH CITY TV, South San Francisco, Calif. G-E SERVICE-DESIGNED "universal" replacement tubes help protect his profits—and his reputation. Here are just a few of their typical high-reliability features: (1) **Rhenium-tungsten heaters** increase tube reli-

ability up to 4½ times. (2) **Three- and five-ply plate material** provides uniform heat conduction and radiation. (3) **Straight-sided bulbs** give more uniform heat dissipation. (4) **Tapered pins** prevent socket damage; save time. (5) **Tubes are interchangeable in all sets.** General Electric Company, Distributor Sales, Electronic Components Division, Room 1743, Owensboro, Kentucky.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

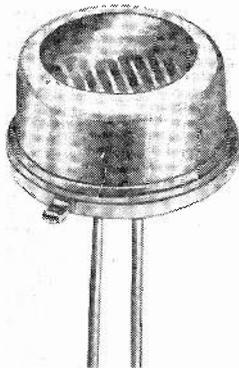
... for more details circle 30 on page 50

NEW PRODUCTS

"Gator-Probe" reportedly replaces three or more sets of conventional leads. Among unusual features of unit is an adjustable length probe than can be locked in or out. Swivel jawed clips are used to clamp to round, square or flat surfaces. Price: \$4.95 per pair. Gator-Probe Corp.

PHOTOCONDUCTIVE CELLS 207

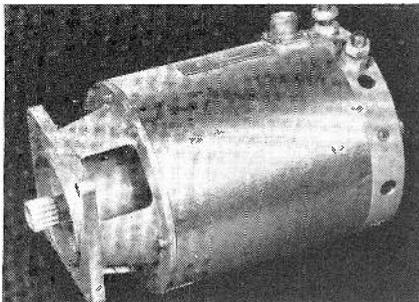
A range of cadmium sulphide and cadmium selenide photoconductive cells is hermetically sealed in gold-plated T0-5



cans. Through unique manufacturing and fabrication techniques, these new devices exhibit remarkable performance to dark ratio, according to the manufacturer. The cells are available in a variety of spectral responses with light resistance ranging from 1.5K ohms to 670K ohms. Voltage ratings are 80 and 300 v with power output of 100 mw. Photocell Corp.

GENERATOR 208

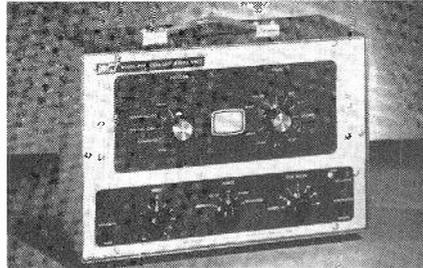
A brushless direct-current generator is capable of supplying 100 amp at 30 v. Although it was designed specifically for use on small aircraft, it is said to be readily adaptable for use on marine or ground vehicles. Rotating silicon diodes perform the functions normally performed by the commutator, slip rings and brushes. The output voltage of the generator is rectified by stationary diodes which are mounted in the air-intake end of the generator frame. Most wearing components of the generator have been eliminated so maintenance should be negligible, according to the manufacturer. Overhaul consists only of bearing replacement at 1500 hour intervals. It operates at rated output over a speed



range of 3000 to 8000 rpm. At engine idle with a generator speed of 1400 rpm, it will deliver 25 amp. A small transistor voltage regulator which weighs only one and one-quarter lb is available for use with the generator. Westinghouse Electric Corp.

COLOR ANALYST 209

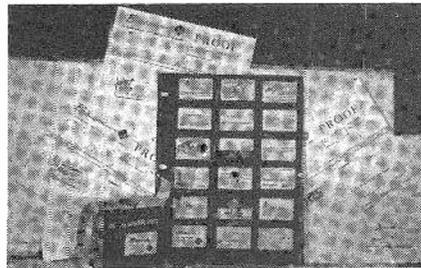
The Model 850 color analyst reportedly provides dot patterns, crosshatch, vertical and horizontal lines, burst signal and



individual colors one at a time on the instrument panel and the color TV set for fast, easy checking. The difficult probing into the color set is eliminated. A unique window-viewer on the front panel enables the serviceman to see each pattern and color as it should be. This provides a display standard to use as a guide for visual comparison and correct set-up of the color set. The 850 produces the colors R-Y, B-Y, I, Q, bursts, yellow, red, magenta, blue, cyan and green. Video output jack and video level control provide both positive and negative information. A crystal-controlled 4.5 Mc sound signal is provided for ease of receiver tuning and sound trap adjustments. Switch-selected r-f signals, factory-tuned for channels 3, 4 and 5 are provided. B & K Div. Dynascan Corp.

LABEL TAPE 210

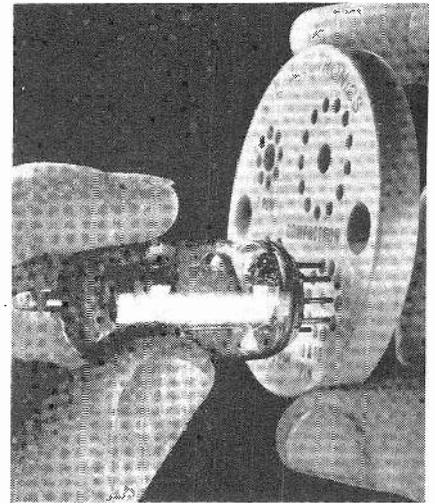
This dispenser, called "Identi-fi" reportedly makes it possible for anyone to produce, with a pull on the tab, a self-



adhesive reproduction of his business card, service reminder or institutional advertisement. The labels are packaged in standard size of 2 x 1 1/8 in., 500 to the "A Pak." The copy used is an existing business card or advertisement suitable for camera or art work furnished by the customer. Prices; from \$4.50 to \$7.50 per box of 500. Benson Products, Inc..

CHANNEL TRAPS 211

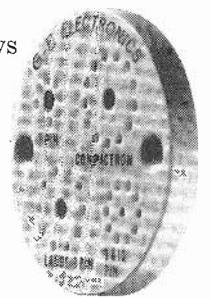
These wave traps will give approximately 35 db attenuation on any interfering TV or f-m station, thus permitting the use of all VHF channel amplifiers.



GE ELECTRONICS

New G-E Service Aid Provides Fast, New Way to Straighten Tube Pins

This original G-E Service Aid helps eliminate tube damage caused by bent pins; straightens pins on all 7-, 9- and 10-pin miniature tubes, large 9-pin and compactrons. Just insert tube pin base into pre-drilled bevelled holes and remove. Simple, fast, safe. This handy tool is small enough to carry in your pocket (2 1/2" diameter), or mount it in your service case or on the bench with screws provided. Get it from your G-E tube distributor or mail coupon to Chicago warehouse address shown.



Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric Company, Dept. 1743
3800 N. Milwaukee Ave., Chicago 4, Ill.

Please ship prepaid:

_____ ETR-3200 Multiple-Tube Pin Straightener,
60¢ each.

My check or money order is enclosed for the required amount plus any sales or use tax applicable in my area.

Name _____

Address _____

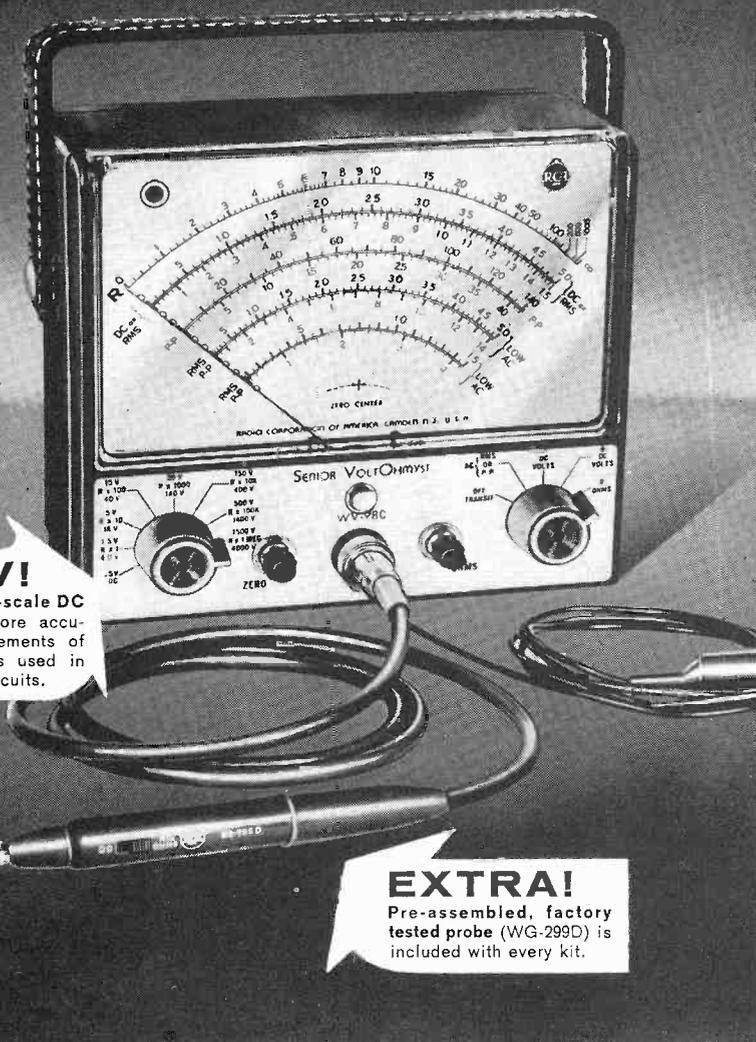
City _____

Zone _____ State _____

... for more details circle 31 on page 50

NEWEST RCA SENIOR VOLTOHMYST®

NOW AVAILABLE AS A KIT FOR ONLY \$57.95*



NEW!

0.5-volt full-scale DC range for more accurate measurements of low voltages used in transistor circuits.

EXTRA!

Pre-assembled, factory tested probe (WG-299D) is included with every kit.

SAVE MONEY with this kit version of the RCA WV-98C, the newest improved model of the popular RCA SENIOR VOLTOHMYST. Even with its added features for extra versatility, this new kit still costs less than prior models.

This rugged precision instrument measures **AC voltages** (0.2 to 4200 volts peak-to-peak and 0.1 to 1500 volts rms); **DC voltages** (0.005 to 1500

volts DC); and **resistances** (0.2 ohms to 1000 megohms). Accurate to $\pm 3\%$ full-scale on both AC and DC ($\pm 5\%$ on the 1.5 and 5-volt AC ranges). Less than 1% tracking error.

Scales are separately color-coded to differentiate peak-to-peak and rms voltage readings. Its big meter, 6½ inches wide—electronically protected against burnout—is one of the most readable ever designed into a VTVM.

RCA WV-98C

\$57.95*
KIT

\$79.50*
WIRED

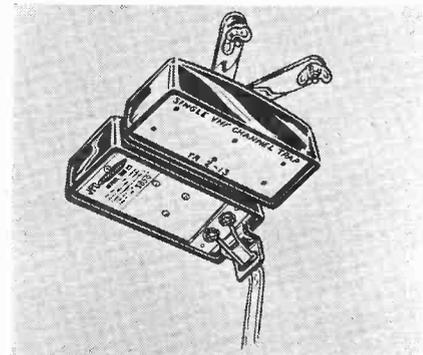
For more information, ask your Authorized RCA Test Equipment Distributor.

*User Price (Optional)

RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



THE MOST TRUSTED NAME IN ELECTRONICS

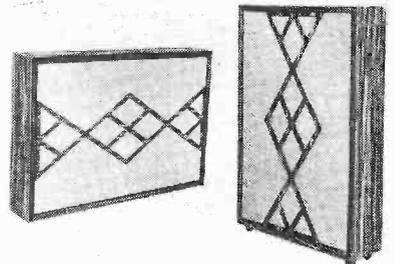


according to the manufacturer. The wave trap is piggy-back mounted on the firm's amplifier and then attached directly to the antenna terminals by solid aluminum busbars. At this location, the antenna output feeds directly into the trap where the troublesome signal is attenuated before it is boosted by the amplifier. JFD Electronics Corp.

SLIM SPEAKER

212

The "decor-ette" is only 4-¾ in. in width and can be placed on a bookshelf, mounted on the floor, used as a room

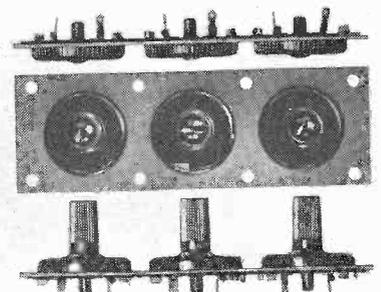


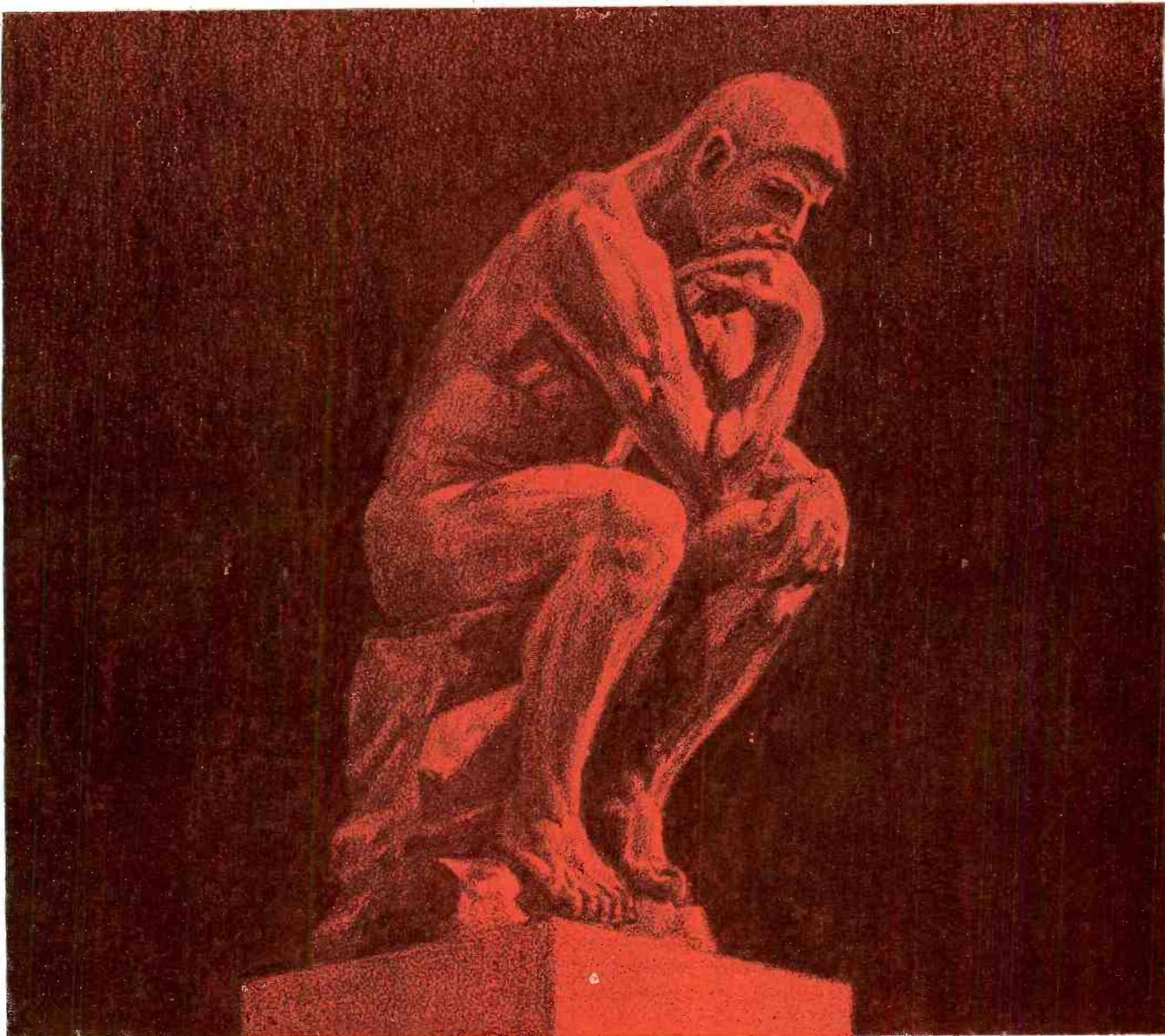
divider or hung on the wall. It is designed for either horizontal or vertical placement. The "decor-ette" is a 5-speaker 3-way system containing two 8 in. woofers, a specially designed 6 in. open back mid-range driver, a 3-½ in. cone-type tweeter and a dome lens type compression tweeter. Over-all frequency response is 40 to 20,000 cps. Power handling capacity is 30 w continuous, 60 w peak. Impedance is 8 ohms. Size: 25 x 17 x 4-¾ in. Price \$59.95. Lafayette Radio Electronics Corp.

POTENTIOMETER

213

A potentiometer design incorporates the resistance element inside the con-





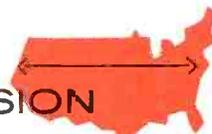
WHY PONDER?

*it's a fact...
Clarostat's
best!*

Anyway you look at it, you're always ahead with Clarostat. Clarostat offers the most complete line of popular replacement potentiometers and resistors, and every one is designed and constructed to the same high standards that has made Clarostat the No. 1 Name in the Field.

Time is money, so don't ponder, send for the complete Clarostat catalog today . . .

DISTRIBUTOR SALES DIVISION



CLAROSTAT

CLAROSTAT MFG. CO., INC. DOVER, NEW HAMPSHIRE

. . . for more details circle 21 on page 50



SAVE VALUABLE MONEY-MAKING TIME with **Mercury** TEST INSTRUMENTS...

Model 500 COMPONENT SUBSTITUTOR

Now you can have all the substitutes for electronic components you want and need in your every day work in one compact unit. You'll find the 500 more convenient to take on calls... so much easier and faster to work with in the shop.

Handsome hammertone steel case



A complete range of components at your fingertips for fast substitution

SAVE MONEY! No need to buy many individual component substitutes... The Model 500 does all the jobs.

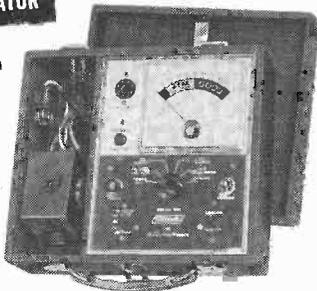
Substitutes for more components than any other instrument of its type!

\$3495 Net Size: 5 1/4 x 7 1/4 x 3 1/2"

- Substitutes for 20 values of resistors from 33 ohms to 10 megohms
- Substitutes for 10 values of condensers from .001 mfd. to .5 mfd.
- Substitutes for 10 values of electrolytics from 4 mfd. to 330 mfd.
- Substitutes for diodes • Substitutes for power rectifiers up to 500 ma.
- Substitutes for power resistors • Substitutes for bias voltages

Model 800 CRT TESTER-REACTIVATOR

- ✓ Also accommodates the new 8-pin, 7-pin and 14-pin base picture tubes
- ✓ Also provides the newer 2.35 and 8.4 filament voltages
- ✓ Tests and repairs the red, green and blue sections of color tubes separately



\$4995 Net

Sturdy case—leatherette finish

The Model 800 takes the guesswork out of the check, repair and reactivation of any black and white or color picture tube in the set or in the carton. It is a terrific money-maker... makes picture tube sales easier... builds customer confidence and goodwill.

... for ALL BLACK and WHITE and ALL COLOR picture tubes

CHECKS

- Emission • Inter-element leakage • Shorts • Opens • Life expectancy test estimates the remaining life of picture tube

REPAIRS

- Inter-element shorts • Open elements

REACTIVATES

- Low emission tubes to restore brightness • Meter indicates reactivation for proper control

Size: 11 1/4 x 9 1/2 x 4 1/2"

Model 300-A COMBINATION TESTER



Sturdy case—leatherette finish

\$10975 Net

The Model 300-A represents a new high in convenience for you... three instruments essential in your everyday work, combined into one compact, professional unit—available at an unbelievably low price.

Size: 17 1/2 x 13 1/8 x 4 1/2"

3 INSTRUMENTS IN 1

- 1 Tube Tester
- 2 CRT Tester-Reactuator
- 3 20,000 ohms per volt VOM

A complete portable service shop at your side wherever you go

AS A TUBE TESTER... will check emission, inter-element leakage and gas content of all tubes including Novars, Nuvisitors, Compactrons and the new 10-pin types.

AS A CRT TESTER-REACTIVATOR... will test, repair and reactivate all black and white and all color picture tubes.

AS A VOM... (20,000 ohms/volt)
DC VOLTAGE RANGES: 0 to 7500 volts
AC VOLTAGE RANGES: 0 to 1500 volts
OHMS RANGES: 0 to 10 megohms
DC CURRENT RANGES: 0 to 15 amps.
CAPACITY RANGES: .001 mfd. to 180 mfd.

See your electronics parts distributor or write for complete Mercury catalog



ELECTRONICS CORPORATION

manufacturers of quality electronic products

111 Roosevelt Avenue, Mineola, New York

EXPORT: EMEC Inc., 127 Grace St., Plainview, N. Y.

... for more details circle 41 on page 50

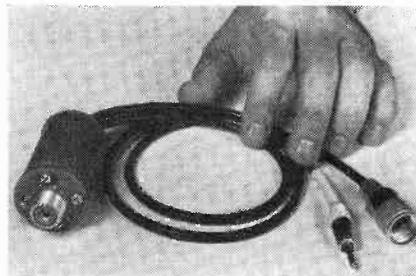
NEW PRODUCTS

trol knob. The Series 81 is an inexpensive composition-element potentiometer that permits entirely new concepts in mounting and control panel design, according to the manufacturer. The unit is mounted on a strip, either singularly or in multiples. Without the turning knob, the unit is smaller than a poker chip, and slightly thicker. In this configuration it may be mounted so that the serrated edge protrudes beyond the mounting surface for "thumb" control. Resistance range of the Series 81 is 1000 ohms to 5 Mohms, linear or tapered. Standard resistance tolerance is plus-minus 20%. Power rating is 0.5 w at 40°C for linear units, and 0.25 w at 40°C for tapered units. Clarostat Mfg. Co., Inc.

COUPLER

214

A broadcast coupler permits a citizens band antenna to be used simultaneously with a citizens band transceiver and with

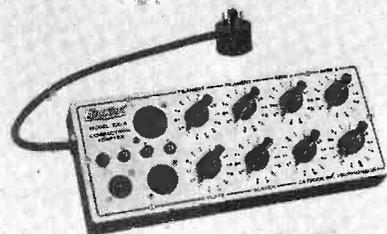


a standard a-m automobile radio. Designated the CBC-1, the coupler reportedly has extremely low insertion loss. Tests have shown maximum loss to be less than 0.3 db between transceiver and antenna. The antenna cable is connected to a SO-239 input plug that is completely potted for long life. A lead with a PL-259 plug is connected to the CB transceiver. A conventional am radio jack-plug connects the other lead to the standard broadcast receiver. Price: \$7.20 each. B & K Div., Dynascan Corp.

TUBE ADAPTER

215

The new CA-4 Universal Adapter is designed for modernizing your present tube tester. The CA-4 enables you to test 5 and 7 pin Nuvisitors, Novars, Compactrons and the new 10-pin types, types being used in many 1962 circuits for TV, stereo and other equipment. Each one of up to 14 possible pin locations is controlled by each of 8 individual selector switches. Thus, if tubes



Announcing a Great Opportunity in

2-WAY MOBILE

Sales & Service Dealerships

THE OPPORTUNITY

To augment its long established dealer organization, Aircraft Radio Corporation (ARC), leading manufacturer of aircraft navigation and communication equipment, makes available a limited number of sales-service dealerships for its new, complete line of 2-way mobile equipment. Initial investment is limited to the test and service equipment necessary to service the new line. Financing can be coordinated by ARC.

THE COMPANY

 Aircraft Radio Corporation, Boonton, New Jersey, has established a reputation as producer of the finest airborne electronic equipment since 1928. The name is a standard of excellence among commercial and private pilots and aircraft owners. The new mobile radio line will continue to feature the same high performance, high reliability and high audio quality.

NEW LINE, ALREADY ACCEPTED

 The new line of 2-Way Mobile Radios is presently manufactured exclusively for ARC in the U. S. by Pye Telecommunications Ltd. of Cambridge, England. Pye is presently the world's third largest producer of mobile radios. ARC will soon perform all assembly of Pye components, and finally ARC will establish complete manufacturing facilities here in the U.S.A.

EXTENSIVE PRODUCT LINE

The FCC approved ARC line offers the dealer complete coverage of any and all 2-way mobile needs. High and low power equipment, AM and FM, AC and DC, single and double channel simplex, base stations with remote control gear, four different lines of dash-mounted and trunk-mounted equipment with all accessories, electronic megaphones, portable radiotelephones, separate amplifiers. A broad price range permits the dealer to satisfy any budget.

BIG DISCOUNTS, STRONG WARRANTY

The ARC Dealer Program provides for a big 25% discount on *all* equipment and a workmanship and material warranty of ninety days from date of installation.

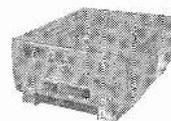
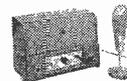
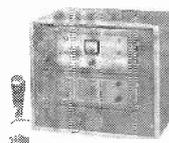
ARC DEALER SUPPORT

In keeping with its successful policies in airborne radios, ARC provides complete ready-to-ship parts stocks in Boonton, New Jersey; Wichita, Kansas; and Los Angeles, California. A fully equipped demo and service van is made available on special ARC-financed lease-purchase arrangement. Technical service personnel will be on call for special assistance — spec-writing, demonstration help (always leaving the final sale and commissions to the dealer, even in the case of local government and utilities).

ARC's long experience with the FCC and active Washington representation enable the company to be of service to dealers in their procurement of FCC licenses and frequency assignments for customers. A program of powerful dealer advertising assistance and national advertising has been planned, and a full complement of technical manuals, sales literature is provided.

WRITE TODAY

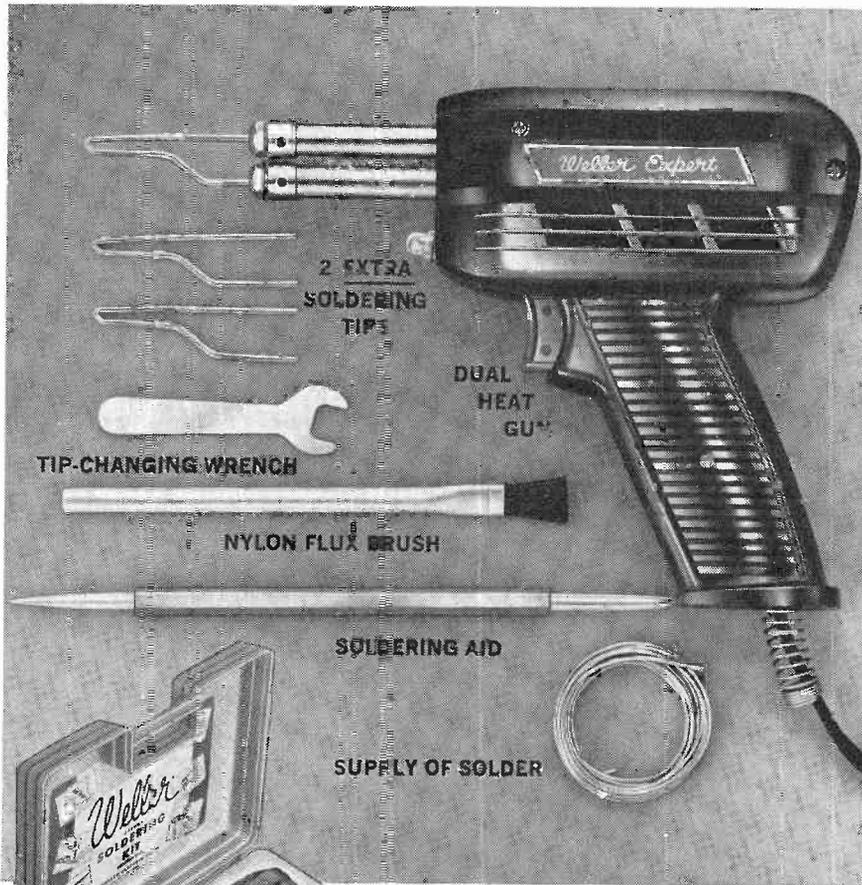
If you are interested, write today to the Commercial Sales Manager, with full details on your organization.



Aircraft Radio Corporation
BOONTON, NEW JERSEY

Dependable Electronic Communications Equipment Since 1928
... for more details circle 10 on page 50

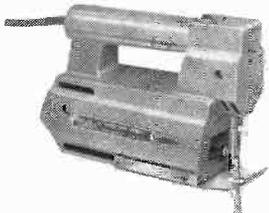
COMPLETE SOLDERING OUTFIT IN PLASTIC CARRYING CASE



Weller® Expert Soldering Kit

All your soldering needs in a break-proof plastic utility case. Gun features dual heat. 2 trigger positions permit instant switching to low 100-watt or high 140-watt heat. Low heat prevents damage to heat sensitive components. By using high heat only when necessary, you prolong tip life and save current.

Plastic case can be used for carrying or storing tools, parts and equipment—also as a lunch or fishing tackle box. Model 8200PK.



Weller® Hi-Speed Sabre Saw

For smooth, fast cutting of all kinds on speaker and record player mounting boards, cabinets, walls, etc. Makes its own starting hole for inside cuts. Never splinters or tears wood. 4.8 ampere, heavy-duty reciprocating motor. Model 88.

On sale at your Electronic Parts Distributor

WELLER ELECTRIC CORP., EASTON, PA.

... for more details circle 65 on page 50

NEW PRODUCTS

with the same basing but different circuits are developed, the CA-4 can still provide the quick, reliable, handbook-type tests. Hickok Electrical Instrument Co.

INTERCOMS

216

A new intercommunication system that features compact, executive design is being marketed. This intercom is de-

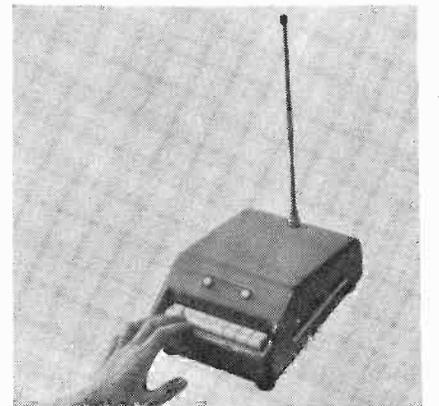


signed and engineered to provide highly flexible communication at a reasonable cost, according to the manufacturer. The BIE systems use the principle of a single central unit which eliminates the need for separate, space consuming amplifiers at each master station. Special features or modifications are accomplished using relays. The 1800 Series, for example, consists of relay connector selector modules located in the central unit capable of 324 switching combinations. Bie Div., Ballantyne Instruments and Electronics, Inc.

POCKET PAGING

217

The "Executive Model" radio paging transmitter is specifically designed to solve the staff locating problems of



small offices, plants, stores, hotels, clubs and other businesses. This latest addition to the firm's line of "Personal Call Pocket Paging Systems" provides, for the first time, a desk model radio transmitter, operating on the citizen's band and equipped with a built-in selective paging facility and integral antenna. By incorporating the encoder, transmitter and antenna in a single unit about the size of a telephone, the Executive reportedly becomes the first pager of its kind to operate anywhere without installation or wiring. An external an-

SENCORE

SIMPLIFIES SWEEP CIRCUIT TROUBLE SHOOTING

SS117 SWEEP CIRCUIT ANALYZER

For Color and Monochrome Testing

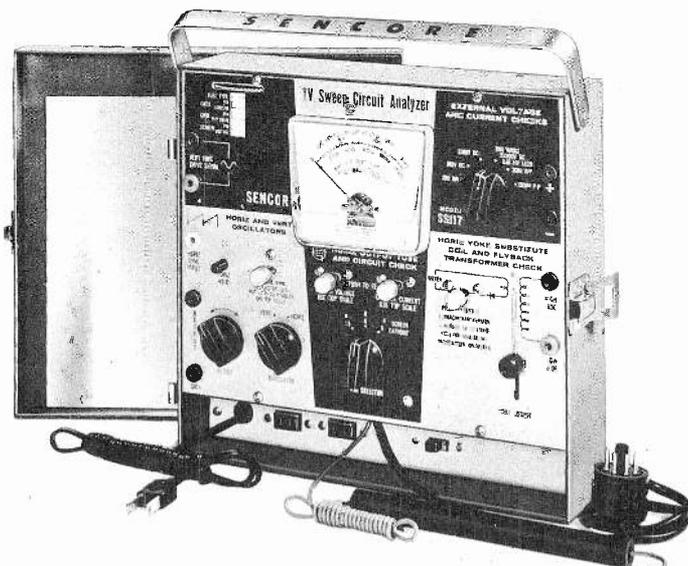
A professional trouble shooter that helps you methodically walk the trouble out of "tough-dog" sweep circuits in monochrome and color receivers. The SS117 provides a positive but simple push button test on all circuits indicated in the block diagrams. These time-consuming circuits are checked step-by-step with tried and proven signal injection and substitution methods. All checks can be made from the top of the chassis or from under the chassis when it is removed from the cabinet.

TV horizontal oscillator check is made by substituting a universal oscillator known to be good. Horizontal output check consists of a cathode current and screen voltage test. The TV horizontal yoke is checked by substituting a universal yoke from the SS117 and viewing brightness or restoration of 2nd anode voltage. Horizontal flyback is checked dynamically in circuit by measuring the power transfer to the yoke when TV is turned on. TV horizontal sync can be used to control the SS117 horizontal oscillator, providing a positive check on sync from the video amplifier to the TV oscillator. Vertical circuits are tested by simple signal injection from vertical yoke to oscillator for full height on CRT. The SS117 with the CA122 Color Analyzer provides a complete TV analyzer for virtually every stage in monochrome or color receivers.

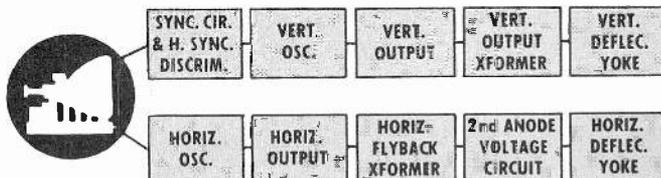
External checks for AC, DC, peak to peak voltage readings and DC current in the upper right hand corner save using a separate VTVM. Accurate 2nd anode measurements up to 30,000 volts are made with a sensitive 300 microamp meter and the attached high voltage probe. AC outlets, all steel construction and mirror in the cover makes every servicing job easier.

Size: 10 1/4" x 9 1/4" x 3 1/2". Wt. 10 lbs.

Dealer Net. 89.50



The SS117 checks them all



FREE—A 33 RPM half hour permanent record packed with every unit explains each test.

FOR FASTER MORE ACCURATE TUBE TESTING TC114 MIGHTY MITE TUBE CHECKER

This is the famous Mighty Mite, acclaimed by over 25,000 servicemen, maintenance men and engineers as "the best they've ever used." A complete tube tester that is smaller than a portable typewriter yet finds tubes that testers costing hundreds of dollars miss, thus selling more tubes and reducing call backs. A real money maker for the serviceman and a trusty companion for engineers, maintenance men and experimenters. The Mighty Mite has been acclaimed from coast to coast as the real answer for the man on the go. Even though the Mighty Mite weighs less than 8 pounds, new circuitry by Sencore enables you to use a meter to check grid leakage as high as 100 megohms and gas conditions that cause as little as one half microamp of grid current to flow. Thus, too, it checks for cathode current at operating levels and shorts or leakage up to 120,000 ohms between all elements. And it does all this by merely setting four controls labeled A, B, C, & D with new type easy grip knobs. Check these plus Sencore features... Meter glows in dark for easy reading behind TV set... The new Mighty Mite has large size Speedy-Setup Tube Chart inside of cover—cuts setup time for even faster servicing. New stick proof D' Arsonval meter will not burn out even with shorted tube... Rugged, all steel carrying case and easy grip handle.

The improved Mighty Mite will test virtually every radio and TV tube that you encounter, nearly 2000 in all, including foreign, five star, auto radio tubes plus the new Compactrons, Novars, Nuvistors and 10 pin tubes. Has larger, easy-to-read type set-up booklet for faster testing.

Size: 10 1/4" x 9 1/4" x 3 1/2". Weight: 8 lbs.

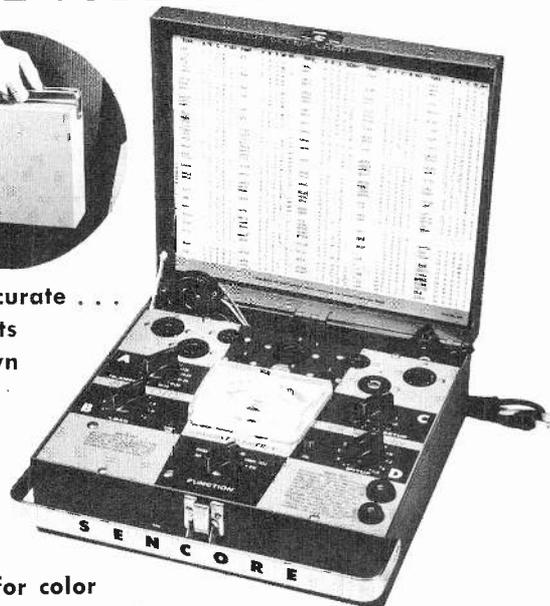
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TM116 TUBE TESTER MODERNIZING PANEL

New tube adapter for testing Compactrons, Novars, Nuvistors and 10 pin tubes in any tube tester except cardomatic types. Plugs into octal socket of your tube tester enabling you to test these new tubes in the same manner



Fast, Accurate . . . never lets you down



A must for color



that your tester checks conventional tubes. Tube set-up chart included with each adapter.
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SENCORE, ADDISON, ILLINOIS

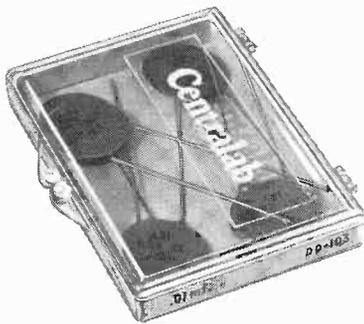
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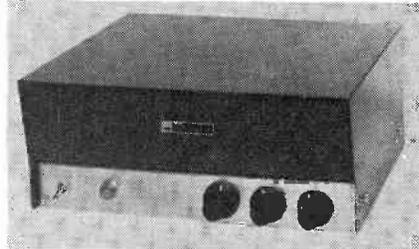
... for more details circle 19 on page 50

NEW PRODUCTS

tenna may be used for optimum coverage. Multitone Electronics Ltd.

AUDIO AMPLIFIERS 218

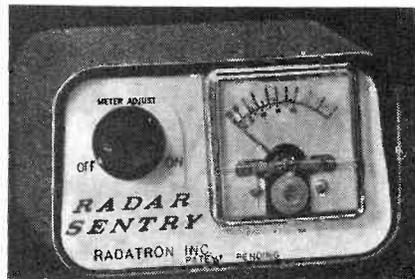
Designated as Model NLAA-25, this amplifier contains completely transistorized circuitry and has a bandwidth of



20 to 15,000 cps, with 25 w continuous output. Three separate audio channels can be mixed as desired and fully controlled from the front of the amplifier. Channel No. 1 is a switchable low or high impedance microphone channel. Channel No. 2 is a switchable high impedance, 1600 ohm, or balanced-to-ground 600 ohm input and channel No. 3 is the second microphone channel included as optional equipment and is similar to Channel No. 1. The amplifier is available as a separate unit or in a portable sound system package which includes: 24 vdc power pack, low impedance microphone with 50 ft of shielded cable, 25 w weatherproof and tropicalized trumpet and driver, stand for trumpet and driver, 50 ft cable for trumpet and driver and a carrying case for amplifier with microphone and cable compartment. Price: Basic amplifier, \$175 and portable system, \$332. Nassau Laboratories.

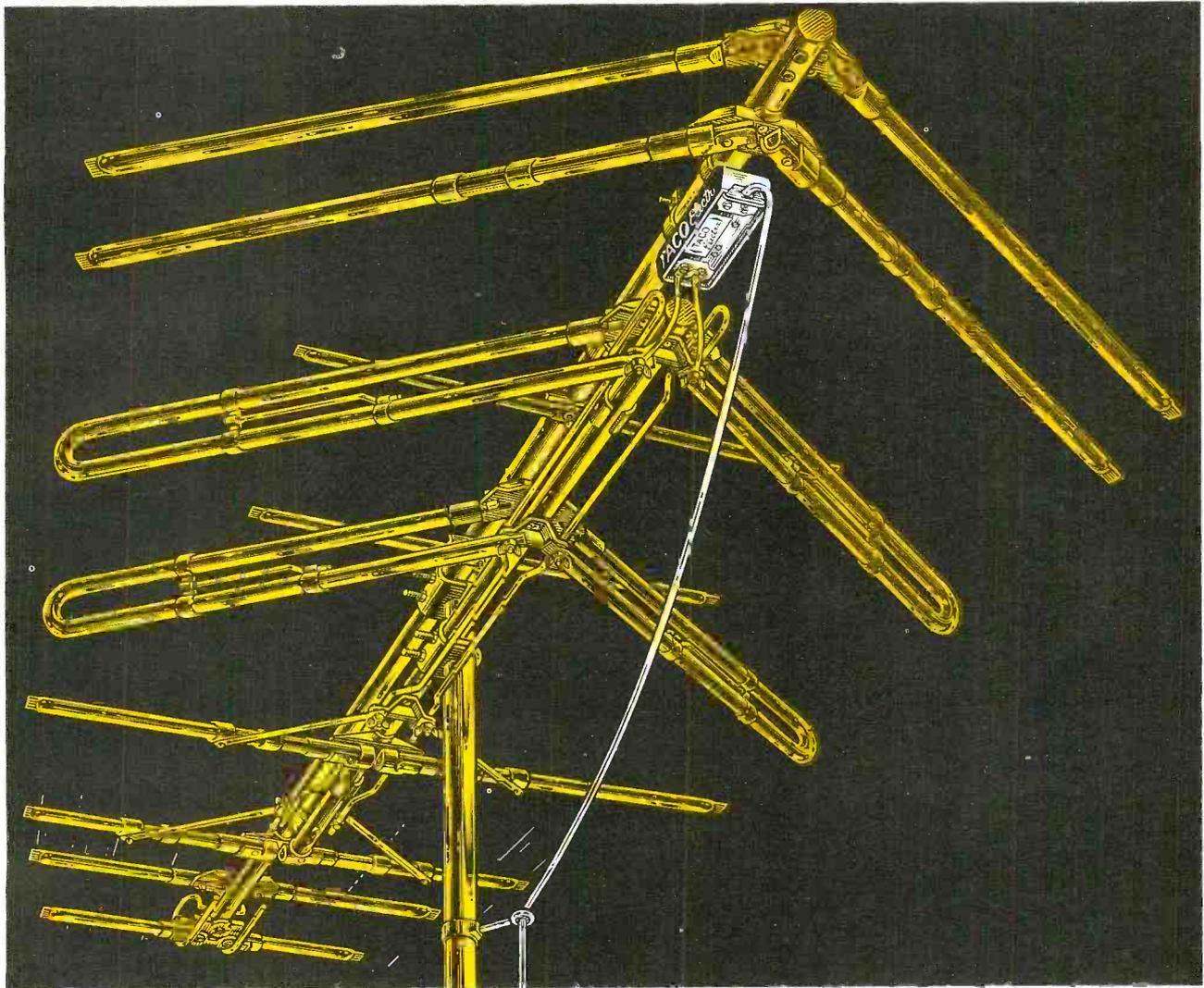
FIELD STRENGTH METER 219

The "Radar Sentry" weighs only 13 oz and measures approximately 3 5/8 x 2 1/4 x 3/4 in. Its components include 8



transistors and 2 diodes mounted on print circuitry and housed in a durable, interference-free magnesium case. Completely portable, it operates on two 1,000 hour, self-testing mercury batteries. The instrument is capable of receiving cw signals and all other types of modulation over a frequency range from 1000 Mc, in the "L" band, up through 11,000 Mc, in the "X" band. It is sensitive to signal levels as low as -65 dbm. Detection of radiation is indicated by an audible

TACO **T-BIRD** ELECTRA



HOTTEST- and TOUGHEST

Compare and you'll see why! →

Besides being the most durable, note the almost flat response curve of the T-BIRD ELECTRA throughout the VHF band—no hills and valleys that cause smear and distortion in black-and-white, and disrupt optimum reproduction of color. T-BIRD ELECTRA delivers a strong, clean signal, free of element "junction noise" and gain flutter—a boon to black-and-white reception, a must for color!

Write for name of nearest distributor

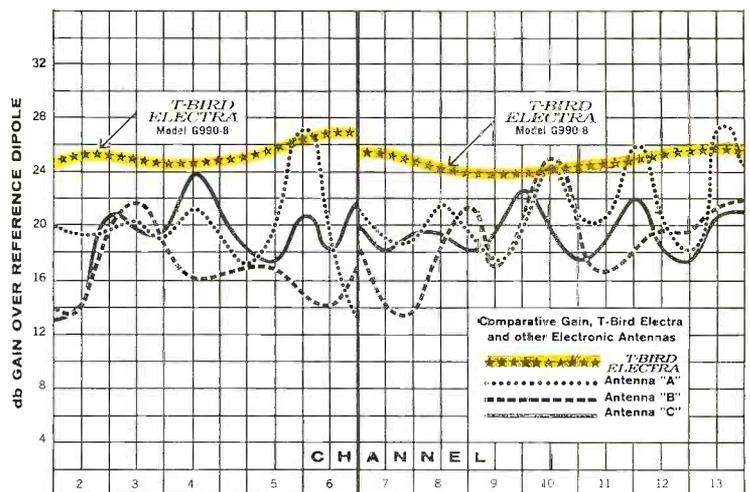
TECHNICAL APPLIANCE CORPORATION

Dept. JTD-65, Consumer Products Division

Sherburne, New York

A Subsidiary of

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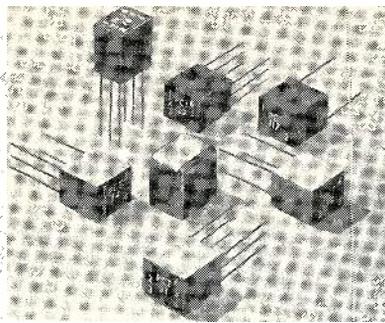
... for more details circle 58 on page 50

NEW PRODUCTS

800 cps tone. The Radar Sentry can also be made available with a calibrated meter. Radatron, Inc.

TRANSFORMERS 220

These transformers are called "Polychromatrans" because of the unique color coding technique used to differentiate their function. There are 22 different models in the line, covering most of the frequently used transistor applications. Each type of transformer has



a different color encapsulation, according to function. All units are the same size, measuring 0.410 x 0.310 x 0.465 in. The series consists of three input transformers with brown encapsulation, three a different color encapsulation, according

three orange drive transformers, seven outputs (yellow), two isolation (green), and four chokes (blue). In addition to the individual units, the line also includes a Mu-Metal shield which can be used where additional shielding is required. Stancor Electronics, Inc.

MICROPHONE 221

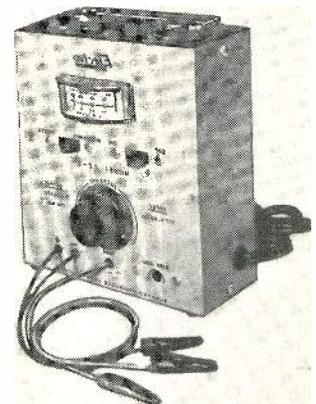
Called the Model 488 "SONO-BAR," this microphone reportedly provides highly intelligible speech communication while cancelling out unwanted background noise. According to the manufacturer, the 488 incorporates the firm's patented controlled reluctance cartridge



for high speech intelligibility and superior noise discrimination. Three versions are available: 488A-high impedance; 488B-low impedance and 488T-transistorized for direct replacement of carbon microphones. The Model 488T is FAA certified for aircraft applications and is treated with ultraviolet paint for easy "in-the-dark" locating. Price: 488A and B, \$57.50; 488T, \$72.50. Shure Brothers, Inc.

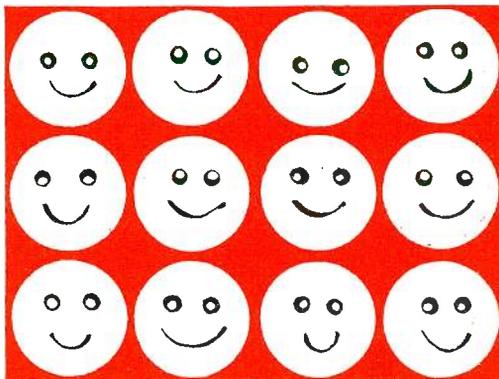
POWER SUPPLY 222

The Electro Model EC-3 is said to be capable of servicing any transistor portable radio on the market. According



to the manufacturer, it features a bias tap control fully adjustable from 0 to 6 v, and provides complete filtering. Rated at 0-20 v, the continuously adjustable unit delivers a full 150 ma at this output. At 100 ma, it can deliver voltages as high as 24 v. An edge-reading meter with red pointer reads either output voltage (0-24 v) or output current (0-100 ma). Price: \$19.95. Electro Products Labs., Inc.

look what happens when you
buy a
dozen
vu-brites...



You get the desk pen set free . . .

long-life easy-writing desk pen in a handsome satin-finished base for home or office use. Yours free with the purchase of 12 Vu-Brites.

You get twelve happy customers . . .

because 12 CRT's will be given an extra lease on life, 12 households will enjoy TV more, thanks to the brighter picture you (and Perma-Power's Vu-Brite) have provided.

what a deal!

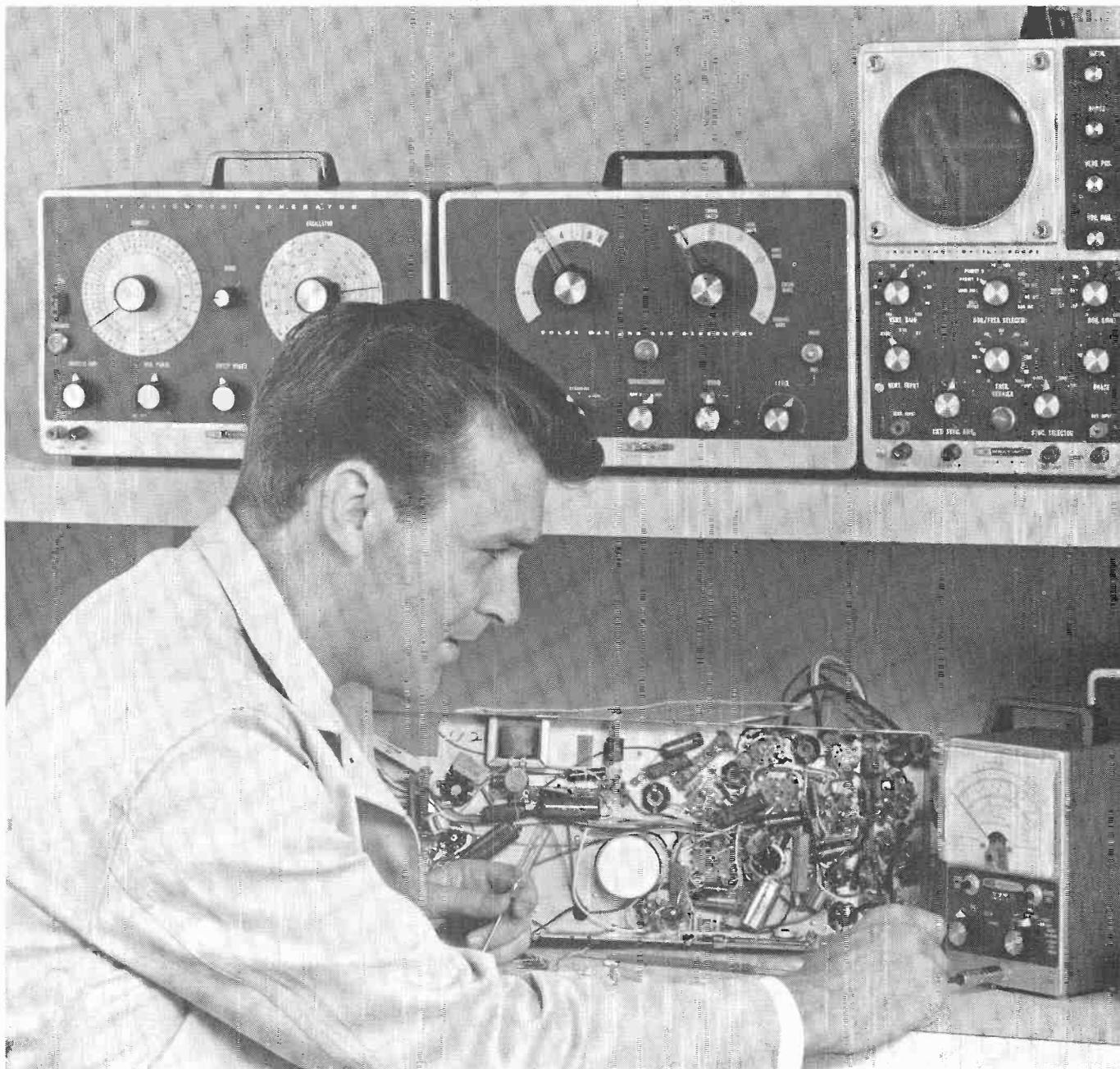
For a limited time, Perma-Power is offering you this wonderful gift absolutely free with the purchase of 12 Vu-Brites at the regular price. Vu-Brites are the Briteners that really do a job—on parallel or series sets (Model C401 for parallel; Model C402 for series). They come colorfully packaged in individual boxes . . . and are priced at \$9.95 the dozen, net.

Perma-Power
COMPANY

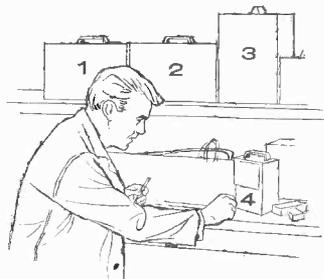
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 Call your distributor today.*

. . . for more details circle 45 on page 50



This Heathkit TV service group can be yours for only \$22 per mo.



Only Heath, world's largest manufacturer of easy-to-build electronic kits, can offer test instruments with outstanding quality and performance, new professional styling and tremendous dollar savings! None other can match their great value. Equip your TV service bench with Heathkit Test Instruments as have so many other successful service technicians . . . enjoy far greater quality . . . at far less cost . . . by doing the easy assembly yourself!

Complete TV servicing facilities are yours with these new Heathkits: 1. Model IG-52 TV Sweep Alignment Generator, \$54.95; 2. Model IG-62 Color Bar & Dot Generator, \$64.95; 3. Model IO-12 Laboratory Oscilloscope, \$76.95; and 4. Model IM-11 Vacuum Tube Voltmeter, \$29.95. Use Heath's convenient time pay plan . . . pay only \$22 mo. while you enjoy the equipment you need now! See the complete new line of professional Heathkit test instruments in the 1963 Heathkit catalog or at your nearest Heathkit distributor.



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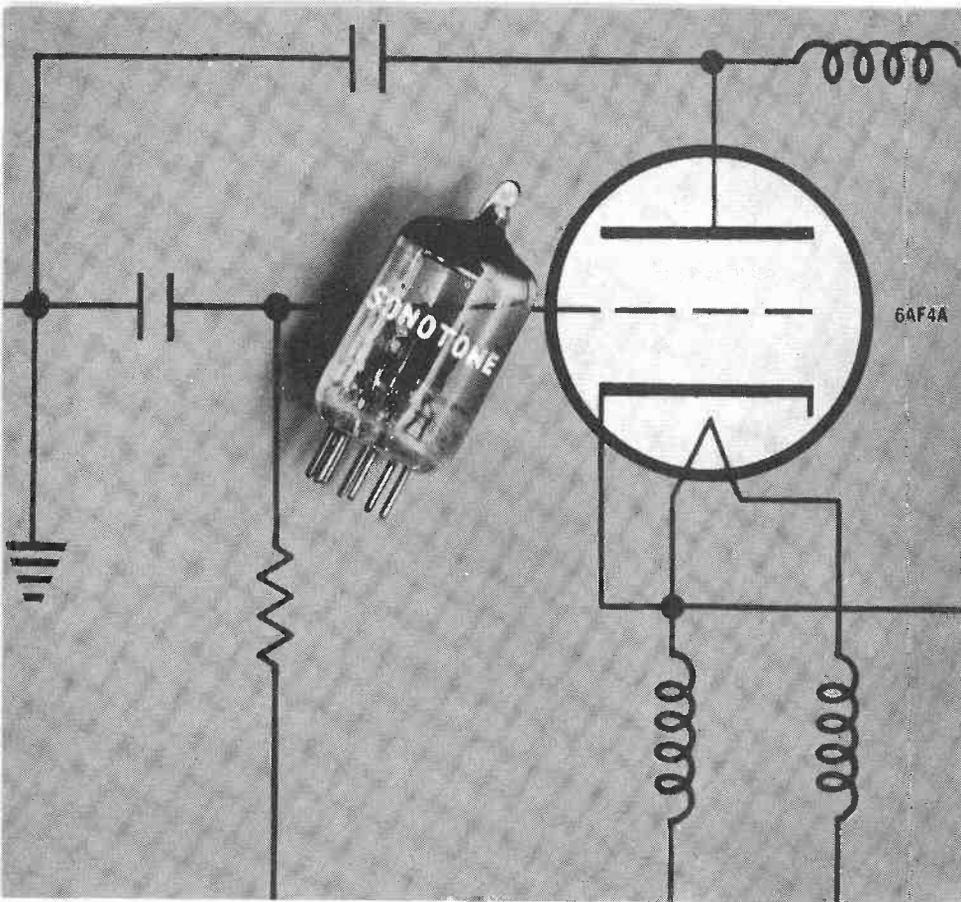
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WON'T JUST ANY 6AF4A DO?

All 6AF4A tubes are designed for UHF applications — the Sonotone 6AF4A even more so! And when you're up around 800 megacycles, the extra stability you get with the Sonotone 6AF4A can make a world of difference in the performance of the unit.

There are any number of problems which the tube can introduce in a UHF oscillator circuit — drift, spurious oscillation, general instability and just plain malfunction. Whether or not they arise depends upon the tube you use. The Sonotone 6AF4A performs as it does because the manufacturer has taken unusual pains to maintain certain standards.

Every Sonotone 6AF4A is individually evacuated. A mechanically defective tube cannot contaminate the others. And any defective tube will be automatically rejected in the tests to which each tube is subjected.

More manufacturers of UHF tuners and converters specify the Sonotone 6AF4A than any other single make. Their engineers have learned that they can rely on the extra quality and performance which Sonotone engineers into its tubes. Next time you have to replace a 6AF4A, it makes sense to use a tube that will protect you from callbacks.

Just as in the 6AF4A — there's something extra engineered into all Sonotone tubes. It stands to reason that, as the first electron tube manufacturer to qualify for complete RIQAP (Reduced Inspection Quality Assurance Program) participation by the U. S. Army Signal Corps, Sonotone engineers a top quality tube. Sonotone offers more than 200 tube types; including many hard-to-get European types — home entertainment and industrial. All conform to the same high standards and are your key to replacement profits. Replace with Sonotone.

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ELECTRONIC APPLICATIONS DIVISION • ELMSFORD, NEW YORK
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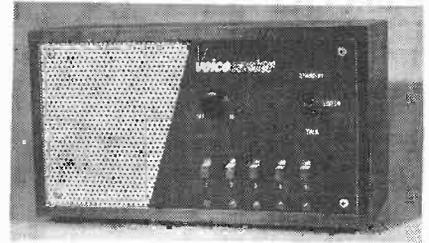
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NEW PRODUCTS

INTERCOMS

223

A line of intercom systems is fully transistorized and available in either a-c or battery operated models. The "all

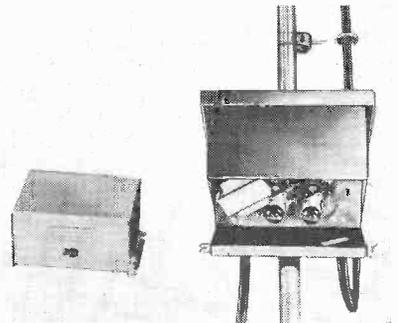


purpose" 5-call and 10-call master stations (VC500-VC1000), on which all incoming calls are annunciated by light and buzzer, come in walnut finished cabinets and are said to be "exclusives" in the intercom field. A "privacy" switch prevents any other caller from cutting in and hearing the conversation. In addition, the number of conversations that may be carried on are limited only by the number of "all purpose" masters used in the system. Price: from \$27.50 to \$67.50. Voicecaster Div, Lee Communications, Inc.

UHF BOOSTER

224

The UB series amplifies signal voltage in weak areas, providing "snow"-free reception on UHF channels, according

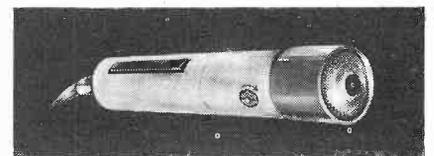


to the manufacturer. The product consists of two units: a broadband amplifier; and a remote power supply to send a-c power to the mounted amplifier. Excellent signal-to-noise ratio is cited as one of the major features of the booster. It reportedly yields a high gain of at least 14 db on all UHF channels. Blonder-Tongue Labs, Inc.

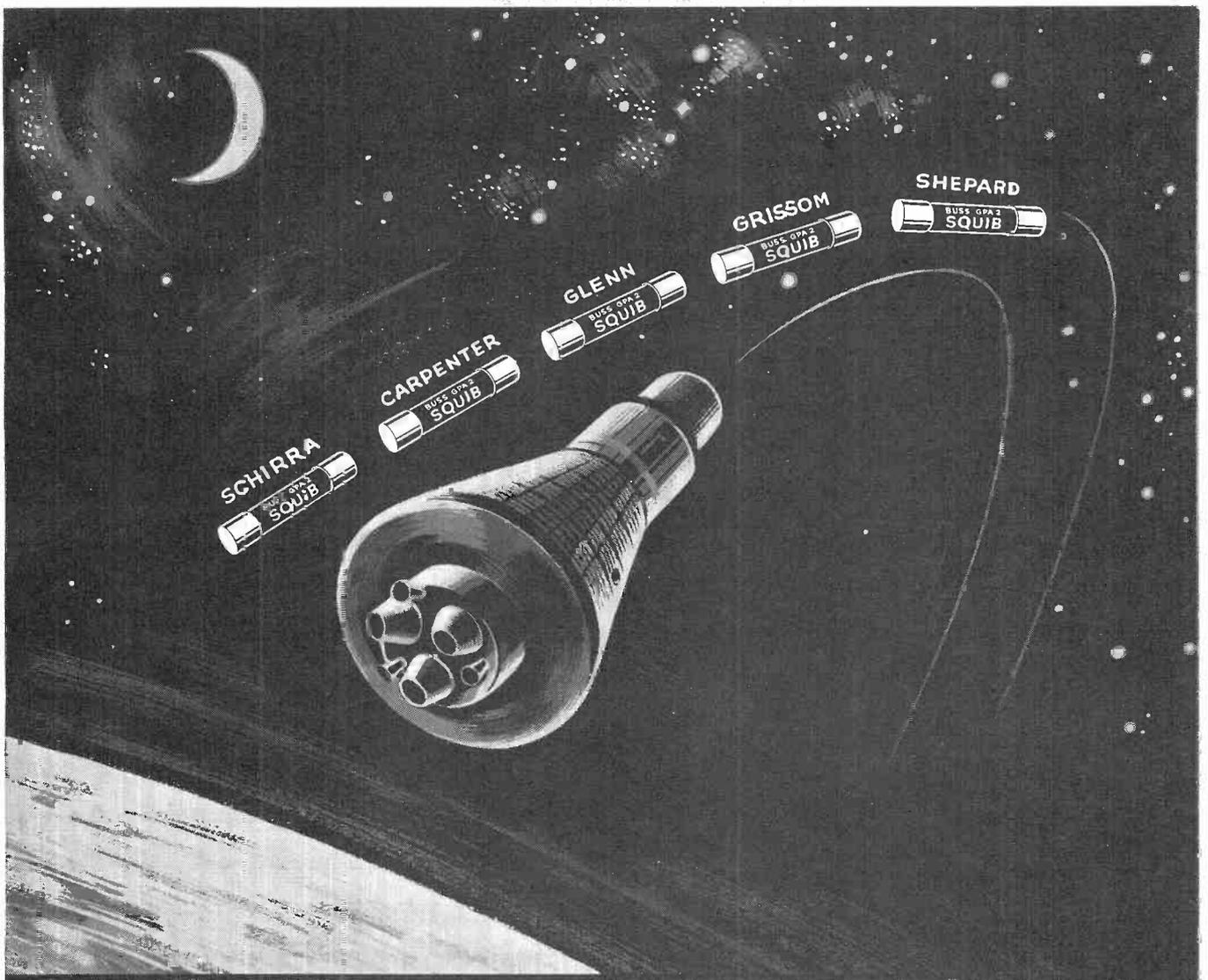
VARIABLE MICROPHONE

225

"Big Mike," a high output, transistorized, variable microphone is designed for mobile or base citizens band and amateur radio transceivers. Construction is of anodized aluminum, with output and tone controls, and "squeeze-to-



ELECTRONIC TECHNICIAN



**BUSS FUSES FLEW INTO SPACE WITH
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*and by proper functioning helped bring them back safely!***

When a man's life and scientific data relies on the accuracy and dependability of every component in a spacecraft,—chances with unknown or improperly engineered components cannot be tolerated.

That's why the Space Age engineers turned to BUSS for the fuses used to protect the electrical circuits in the spacecrafts.

This is not surprising when you consider that BUSS maintains the largest staff of fuse engineers and the largest fuse testing laboratory in the world.

Possibly, your fuse application is not as dramatic as America's manned space shots but you, too, can be sure of the finest, most dependable protection by standardizing on BUSS fuses.

To make sure BUSS fuses will operate as intended under all service conditions,—every BUSS fuse is individually tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

BUSS

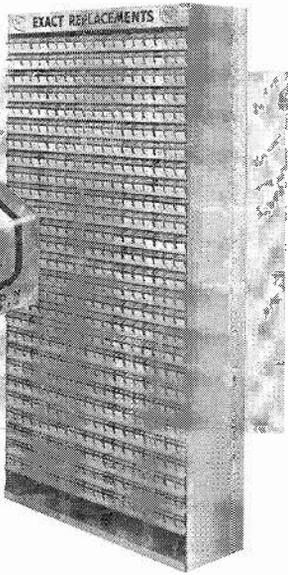
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AFH... twist-prong 'lytics feature 85°C operation, improved sealing, high-purity aluminum foil construction throughout, ruggedized prongs and mounting terminals. Tops for filter use in TV-radio and amplifiers.

In addition to your technical skill and business integrity, your reputation and your profits depend on the performance of the replacement parts you use. When it comes to capacitors, you can depend on Aerovox because our continuous program of advanced product research and development has produced the most dependable and complete line of exact replacement 'lytics in the electronics industry, year after year! You see, we guard our reputation as zealously as you guard yours. Your local Aerovox Distributor stocks every rating you need, including the popular types featured here.



PR... wax-filled tubulars manufactured to same high standards as more expensive metal-cased units. Made for exact replacement in TV receivers. Available in singles, duals, triples, quads, and quints for 0-65° operation.



PTT-PWE... Miniaturized tubular 'lytics for repair of personal transistor radios, portable TV sets, and all space-tight requirements. Feature Polycap® plastic cases with exceptional humidity resistance.



PRS... compact "Dandee" units for trouble-free repair of series-string TV and AC-DC table radios. Aluminum cans with cardboard insulating sleeves. Made in singles, duals, and triples, as well as AC rated and non-polarized units.



XA... tubular 'lytics made especially for antenna rotors. Specify XA-4283 or XA-4098A* for 70 MMF capacity, 50 VAC and XA-10001 for 100 MMF, 50 VAC applications (*5" leads, no bracket).



SRE... "Bantam" metal tubular 'lytics hermetically-sealed in aluminum cans with cardboard insulating sleeves. Smaller than the PRS but capable of handling full size loads to 85°C.

NEW—TV Electrolytic Capacitor Replacement Guide AFG-462. Available direct from Aerovox for 50 cents or free from your Aerovox Distributor.



REMEMBER—it pays to use Aerovox!

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NEW BEDFORD, MASS.

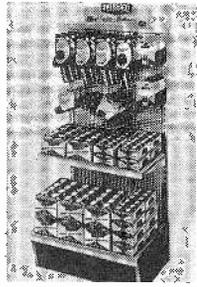
Technical Leadership — Manufacturing Excellence

NEW PRODUCTS

talk" bar in convenient positions. Output and tone controls are countersunk. The large "squeeze-to-talk" bar is positive in action. A miniature, mercury cell, battery pack, located inside the microphone, is good for many months of normal operation. Size of complete microphone is less than 4½ x 1½ in. Price: \$29.95. Communication, Inc.

SELF-SERVICER

226

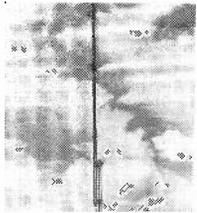


A Floor Displayer made of steel, is designed to build impulse sales in high traffic locations. The Self-Servicer No. 11 is featured in the new nationwide merchandising program now being announced

for 1962-63. It contains a "fast selling" assortment of Flashlights and "Two Packs" of Batteries (D, C and AA sizes). Union Carbide Consumer Products, Co.

BASE STATION ANTENNA

227

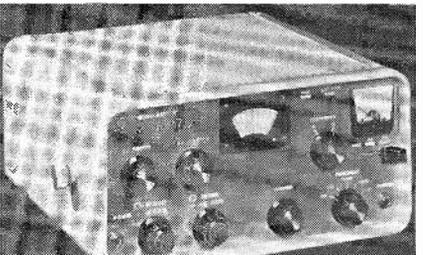


A line of low-priced omnidirectional base station antennas is designed for two-way communications in the 150 and 450 Mc ranges. Known as the Mark "Beacon" line, the antennas are designed for taxi operators, police and fire departments, and commercial car fleets. High strength-to-weight ratios are claimed to permit the antennas to withstand 100 mph winds with a ½-in. radial ice load. Grounded structure minimizes lightning load, while a protective cap eliminates corona. The beacon line consists of half-wave dipole radiators fed in phase with RG-8A/U cabling harness. The gain rating of the antenna determines the number of fed elements and the spacing between centers of the stacked elements. Price: from \$75 to \$150. Mark Products Co., div., Dynascan Corp.

SSB TRANSCEIVER

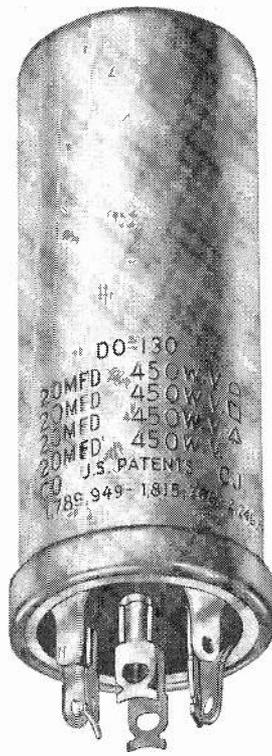
228

Called the "Mono-Bander," this one





Blue Beaver™
Types BBR/BR



Twist Prong
Types A, B, C & D



Electromite™
Type NLW

so you think you know electrolytics!

(TAKE THIS QUIZ...RATE YOURSELF)

1. (True or False) In normal servicing, all 3 usually mount under the chassis.

Ans: FALSE. Twist Prongs, almost by definition, mount through the chassis. And the NLW is often mounted on printed circuit boards.

2. (True or False) The range of ratings of the 3 basic electrolytic types are clearly separate and distinct.

Ans: FALSE. Blue Beaver ratings are 3 to 300 V, 1 to 2000 mfd. NLW ratings overlap Blue Beaver ratings in many of the lower values. And Twist Prongs, as you know, are available in practically every rating imaginable.

3. (True or False) Although all 3 types are listed in the CDE Service Selector, the NLW is really a "special".

Ans: FALSE. All 3 are standard, stocked in depth by CDE distributors. In fact, the NLW has become such a favorite with technicians over the years Distributors tell us it's one of their fastest movers!

4. (True or False) Twist Prongs and Blue Beavers are designed for entertainment electronic replacements. The NLW, on the other hand, is so expensive that it should only be used in missiles.

Ans: FALSE. The NLW is designed for entertainment as well as in-

dustrial replacements. Use it where space is important (it gives your fingers "wobble room") and whenever an extra margin of reliability is important. The price difference between the Blue Beaver and the NLW is actually only a few pennies.

5. (True or False) If you had the right answer to all these questions, you are, without doubt, an outstanding person with intelligence and wit far beyond your station. You are a credit to yourself, your family and your country. You are also a successful technician in your community.

Ans: TRUE.

CORNELL-DUBILIER ELECTRONICS, DIV. OF FEDERAL PACIFIC ELECTRIC CO., 50 PARIS ST., NEWARK 1, N. J.

CDE **CORNELL-DUBILIER**
the line that collects dollars, not dust!

... for more details circle 23 on page 50

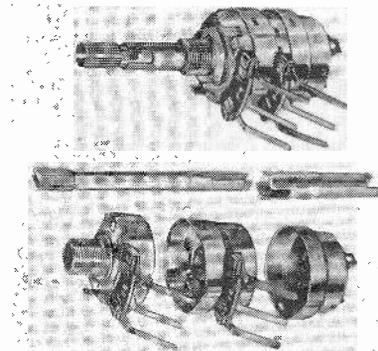
NEW PRODUCTS

band SSB transceiver uses a 2.1 kc mechanical filter and the driver stages employ electronic tuning. Some of its other features include; automatic modulation, vox/anti-vox/push-to-talk, upper/lower sideband, and heavy gauge iridized aluminum construction. Models are available for 10, 15, 20, 40, or 80 meter bands with commercial frequencies available within this range. Specifications include 180 w pep, 160 w cw and 50 db unwanted sideband suppression. Receiver

has 1 μ v sensitivity for a 10 db s/n ration. Weight is 10 lbs. and the "Mono-Bander" measures 5 $\frac{1}{4}$ in. x 11 $\frac{3}{4}$ in. wide x 11 $\frac{3}{4}$ in. deep. Voltage input is 12 vdc, 23 amp transmit, 6 amp receive. Price: \$395 with one crystal — Sonar Radio Corp.

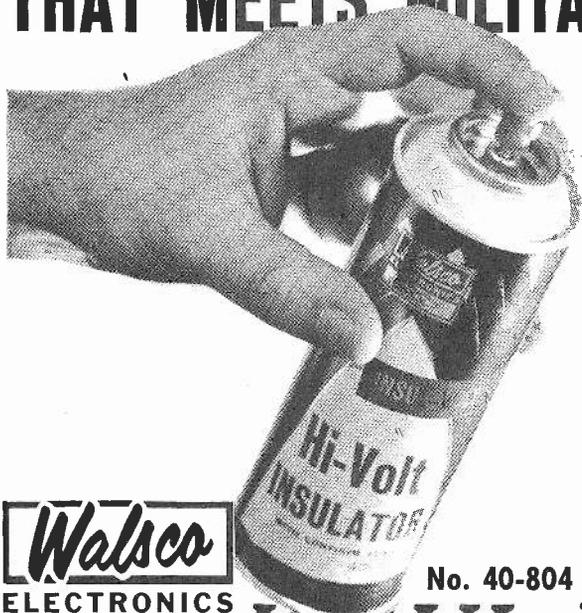
CONTROLS 229

This replacement control system reportedly provides exact replacements for 15/16 in. controls. The system covers all dual concentric types, as well as single and dual controls. With the new system, known "Fastatch II," any control can be assembled in seconds and the resulting product is indistinguishable from a factory assembled unit. The components are



designed to plug-in and snap-together, and a permanent locking construction reportedly guarantees that the shaft won't loosen or pull out. Exact replacement shafts are available for every application, regardless of the length or termination. The units have universal terminals which replace wire-wrap, hole type and all three types of printed circuit terminals.—Centralab, The Electronics Div. of Globe-Union Inc.

ONE HIGH VOLTAGE INSULATION THAT MEETS MILITARY SPECS!



This high voltage insulator really does the job . . . In fact it meets mil specs MIL-V-1137-A, Grade BA. Walsco INSUL-VOLT formulated and recommended for transformers, electric motors, generators, etc. . . flexible, heat and acid resistant, impervious to oil, grease or moisture. Properly applied, INSUL-VOLT provides protection over

**STOPS
HIGH VOLTAGE
LEAKS—
ARCING and
CORONA SHORTS**

No. 40-804

INSUL-VOLT

20,000 volts. Look for it at your distributors in the handsome foil labeled spray can. Enjoy superior insulation with the convenience of spray cans. Incidentally, these new walsco sprays feature a confined spray . . . exact as Chemtronics.

No. 40-804 WALSOCO INSUL-VOLT Dir. Net 2.79 (8 ounce can)

THERE'S A WALSCO Complete Line of Spray Chemicals

Tuner Cleaner . . . Contact Cleaner . . . Freeze Mist Circuit Cooler . . . Penetrating Oil and Frozen Yoke Remover . . . Control Cleaner . . . Glass and Picture Tube Cleaner . . . even hand cleaner with lanolin . . . all conveniently packaged in convenient, tidy, easy to use spray cans, some in caddy sizes . . . See your distributor soon . . .

WALSOCO ELECTRONICS, CO.
DIVISION OF TEXTRON ELECTRONICS, INC.
400 SO. WYMAN ST., ROCKFORD, ILLINOIS U.S.A.

Free Catalog of Walsco spray chemicals as well as tools, service aids, hardware and the rest of the Walsco line. Send to WALSOCO Dept. 25, 400 So. Wyman St., Rockford, Illinois, USA

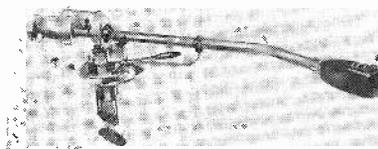


NAME _____
ADDRESS _____
CITY, STATE _____

. . . for more details circle 29 on page 50

TONE ARM 230

The SME tone arm pivot friction is less than 20 mg, horizontal and vertical, said to be made possible by mounting the arm on virtually frictionless knife edge



bearings. The SME's weight system enables the arm to be balanced longitudinally and laterally. Stylus tracking force is adjusted from $\frac{1}{4}$ to 5 g by a moving rider weight. As this always starts from a balanced position, precise force is applied to the stylus of any cartridge obviating the use of a stylus force gauge. To fulfill optimum requirements for length, offset, overhang and flexibility to eliminate tracking error, the unit features a sliding base offering a length adjustment of 1 in. and a sliding pillar height adjustment of $\frac{3}{4}$ in. A hydraulic, lever-operated control permitting feather-light lowering and raising of the arm anywhere on the record also is provided. Prices: Model 3009, for 12 in. records, \$89.50 audiophile net Model 3012, for 16 in. records \$99.50 audiophile net.—Shure Brothers, Inc.

MOVING?

Be sure to let us know your new address at least 30 days in advance. And please enclose a complete address label from one of your recent issues.

ELECTRONIC TECHNICIAN

OJIBWAY BLDG. DULUTH, MINN.

FASTER THAN A SHORT CIRCUIT



SUB-MINIATURE MICROFUSES

and microfuse holders
for internal connection
and panel mounting.

1/500 AMP. thru 5 AMPS.
@ 125 volts. Will
interrupt 10,000 AMPS.
DC short circuit.



8AG INSTRUMENT FUSES

1/500 AMP. thru 5 AMPS.

For instrument and meter protection, Littelfuse
pioneered the design and
development of reliable fast-acting fuses.

LITTELFUSE

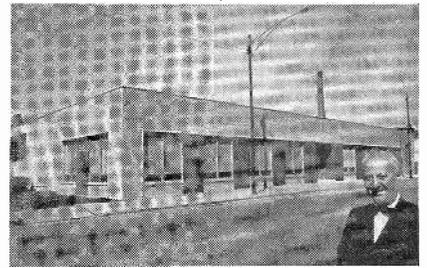
Des Plaines, Illinois

... for more details circle 39 on page 50

Jerrold Corp., announces the resignations of **Zalmon H. Garfield**, an authority in the fields of community antenna television and pay television. Mr. Garfield, who has been assistant to the president, resigned to become an independent business management consultant, with emphasis in the community antenna and pay television fields.

Cleveland Institute of Electronics, a home study school with over 14,500 students, has been reaccredited by the **Accrediting Commission** of the **National Home Council** for a period of five years, according to **Gerald O. Allen**, Institute president. The commission is the nationally-recognized professional accrediting agency for private home study schools. It is a non-profit organization.

Wen Products Inc., has increased its production facilities with the



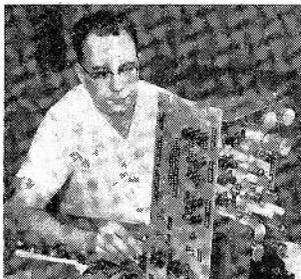
Wen Products, Inc.

building of a new 20,000 sq ft single story brick building located at 6166 Northwest Highway, Chicago. According to **Nick Anton**, president of the firm, with the present 30,000 sq ft plant, Wen now has a total of 50,000 sq ft of production space. The expansion is attributed to an increase in sales and new product lines.

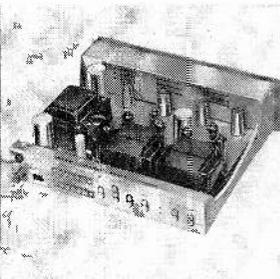
Sylvania Home Electronic Corp. establishes direct-to-dealer sales organization for New York City and northern New Jersey. **Leon M. Schachere** is selected sales manager with responsibility for the sale of Sylvania television receivers, radios, and stereophonic high fidelity phonographs in the territory. His headquarters and a dealer display room are located at Sylvania's corporate offices at 730 Third Ave. in New York.

Confused About Brands?

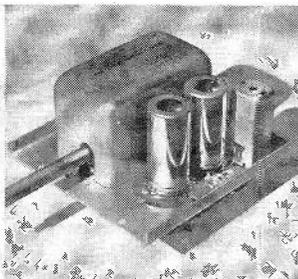
Here's Why the Experts Recommend Scott® Tuners • Amplifiers • Speakers



Advanced Engineering. Scott quality begins in the laboratory where the Advanced Development Team pioneered Wide-Band Design and "Time-Switching" multiplex circuitry. Chief Engineer Daniel Von Recklinghausen is shown here with the original model of the world's first commercial FM Stereo signal generator, which is used by manufacturers throughout the world.



Design Leadership. All Scott amplifiers use massive output transformers to assure full bass response to below 20 cps. Important engineering extras such as solid aluminum chassis and DC heated preamplifier tubes assure performance that is totally free from hum and noise.



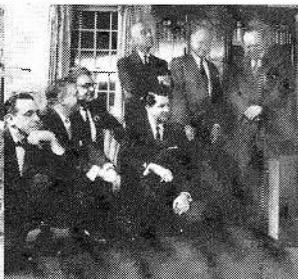
Uncompromising Quality Standards. The heavily silver-plated RF section and the Wide-Band circuitry common to all Scott tuners is shown here. These exclusive design features result in high sensitivity without distortion, complete freedom from drift, and outstanding reception even from weak multiplex stations.



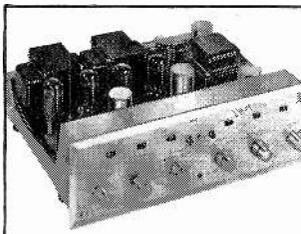
Conservative Claims. Every Scott component is guaranteed to meet or exceed claimed specifications. Each component undergoes more than fifty separate tests. Scott uses IHFM test procedures to guarantee that you receive meaningful specifications. Shown here is the elaborate "screen room" used for precision alignment of tuners.



Technical Recognition. WCRB, Boston's leading good music station, uses Scott multiplex equipment for monitoring and for long-distance relay of their FM stereo broadcasts. The reliability, high sensitivity, and rugged construction of Scott tuners and amplifiers make them the choice of more than 100 leading FM stations.



Musical Recognition. Professional musicians, like these members of Boston's leading symphony orchestra, choose Scott components for their own music systems. The expert editors of America's most respected high fidelity magazines consistently give Scott components top ratings, and highly recommend them to their readers.



Scott components, like the 80-Watt 299C shown here, are designed with useful, years-ahead features including separate bass and treble controls; derived center channel output with front panel control; complete tape monitoring facilities and Scott's exclusive stereo-balancing circuitry. Your franchised Scott dealer will be proud to demonstrate Scott tuners, amplifiers and speakers for you without obligation.



FREE! New Stereo Record "The Sounds of FM Stereo"

Scott has just produced a new 7" stereo record demonstrating FM Stereo and explaining the meaning of the technical specifications used to describe this wonderful new kind of broadcasting. For a free copy, and Scott's new 20 page "Guide to Custom Stereo" mail this coupon today.



Please send me, without obligation, your free demonstration record of FM multiplex stereo and your 20 page Guide to Custom Stereo.

Name

Address

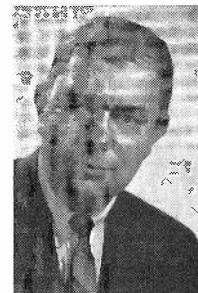
City Zone State

If you would like Scott literature sent to any of your friends, include their names and addresses.

Export: Morhan Exporting Corp., 458 Broadway, NYC. • Canada: Atlas Radio Corp., 50 Wingold Ave., Toronto

Dept. 140-10

... for more details circle 50 on page 50



Schachere



Burke

Standard Kollsman Industries, Inc., reports that its board of directors has elected **J. W. Burke** to the office of assistant to the president. Mr. Burke, the son of **James O. Burke**, president of the company, will devote himself to Standard Kollsman's Tuner Div.

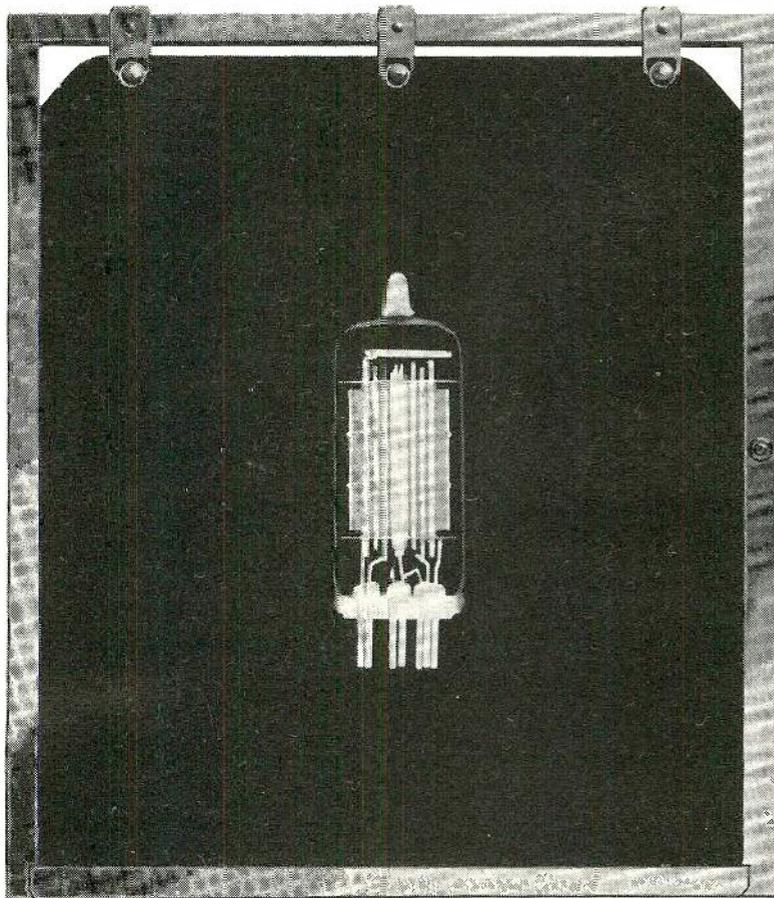
Webster Electric Co. disclosed the formation of a wholly owned subsidiary at Kitchener, Ontario to direct the manufacture, distribution and sales of electronic and inter-communication equipment in Canada. The new firm will be known as **Webster Electric (Canada) Ltd.** The move reportedly was motivated by strong growth trends

NEW AUDIO AMPLIFIER TUBE SUPPLIES FULL-RANGE TONE FIDELITY IN RECEIVERS

NEWEST addition to Tung-Sol's family of fine audio amplifier tubes is the type 4GZ5 pentode. Thorough exposure to realistic combinations of operating and environmental hazards during development shows this tube will lead its class in television, radio and high-fidelity service. Even after accelerated life testing, the subject remains full of pep, providing large power output with remarkably low distortion over the full audio range from

loud cry to subdued chortle.

Tung-Sol takes lavish parental care of this baby during its formative stages. Internal elements are welded and brazed on hospital-clean production lines after sterilization in bakeout ovens to prevent gas, leakage and spurious emission. Rigidized construction cures low-frequency rattles and other forms of tube distress. Alclad plates spread body heat evenly for efficient cooling.



FORMULA FOR GOODWILL

Customers will love the way this model tube makes stereo, radio and tv audio come alive. Foster good customer relations by adopting the 4GZ5 as your first choice in replacement tubes. Others in Tung-Sol's family of audio amplifiers are: 6CU5, 6BQ5, 12CU5, 6AQ5A, 6GK6.

 **TUNG-SOL[®]**
AUDIO AMPLIFIER TUBES

TUNG-SOL ELECTRIC INC., NEWARK 4, N. J.

in the Canadian market and to meet increasing competition from European manufacturers.

Travler Radio Corp. is changing its name to **Travler Industries, Inc.** **Joe Friedman**, president, told the stockholders that the new name more nearly reflects the widely

diversified business of the corporation as television, tape recorders, record players and stereophonic Hi-Fi play a more important part in the company's sales than radios.

Cornell-Dubilier appoints **Ray Hurd** product sales manager, ac-dc oil capacitors, for the division of **Federal Pacific Electric Co.** Mr. Hurd is responsible for national marketing activities of ac-dc oil capacitors. He reports to **F. W. Reynolds**, general products marketing manager.

Wen Products, Inc., is awarded President Kennedy's "E for Export" flag by Secretary of Commerce **Luther B. Hodges**. The electric portable tool manufacturing firm was one of nine so to be honored in official ceremony at Chicago's International Fair. This is the second export citation received by Wen from the Commerce department in the last four months for its active export role. **Nicholas Anton**, president of Wen Products, received the "E" flag citation from the Secretary, who was accompanied by President **Carlos Julio Arosemana** of Ecuador, honored guest and keynote speaker at the Fair. The "E" flag awards are made for progress and success in helping to promote United States trade with the rest of the world.

Shure Brothers, Inc., received Patent 3,055,988 covering the moving-magnet Dynetic phonograph cartridge. The patent also covers the important stylus suspension system of some of the popular Stereo-Dynetic cartridges. Application for the patent was filed on April 8, 1957, upon introduction of the company's original M1 Dynetic cartridge.

COMING EVENTS

- November 12-14: Radio Fall Meeting, King Edward Hotel, Toronto, Ont., Canada.
- November 13-15: NEREM (Northeast Res. & Engineering Meeting), Boston, Mass.
- November 28- December 2: First International Communications Fair, New York Coliseum, N. Y.
- December 6-7: PGVC (PG on Vehicular Communications) Conference, Mayfair Hotel, Los Angeles, California.



"Did you call about your TV set being out of alignment, M'am?"

Special!

ONLY \$4.99

NOW... SAVE \$1.77

IMPERIAL Ungar

#6060 SOLDERING IRON

SAVE when you buy the **IMPERIAL**... SAVE every time you use it on the bench or for on-the-spot servicing. The #6060 **IMPERIAL**... designed especially for printed circuitry and miniature soldering applications... reduces costly customer callbacks, damage to circuits, time spent on servicing.

The **IMPERIAL** features complete interchangeability of parts, comes with two of the most-used tips (44 are available), and a 40 Watt high heat, long-life heat cartridge. See for yourself why the new **IMPERIAL** is the most preferred iron in the electronics field today!



115v AC-DC



ASK FOR THIS SPECIAL OFFER AT YOUR UNGAR DISTRIBUTOR TODAY!

Iron-clad, 24K gold plated interchangeable tip

40 Watt (750-950° F)

PATENTED

... for more details circle 62 on page 50



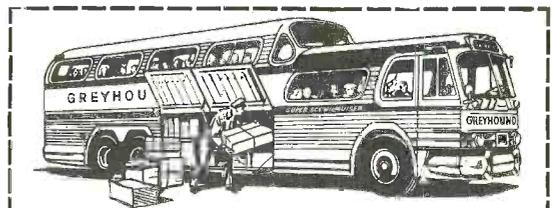
IT'S THERE IN HOURS
AND COSTS YOU LESS

TUPES

SHIPMENTS LEAVE SOONER, GET THERE FASTER, COST LESS, TOO!

	Buses Daily	Running Time	15 Lbs.	25 Lbs.	35 Lbs.
BOSTON NEW YORK	18	5 hrs. — min.	\$1.80	\$2.10	\$2.35
PITTSBURGH CLEVELAND	14	2 hrs., 55 min.	\$1.60	\$1.85	\$2.15
CHICAGO ST. LOUIS	8	6 hrs., 10 min.	\$1.90	\$2.15	\$2.45
LOS ANGELES SAN DIEGO	38	2 hrs., 30 min.	\$1.25	\$1.45	\$1.70
CINCINNATI LOUISVILLE	15	2 hrs., 40 min.	\$1.50	\$1.70	\$1.95

Greyhound Package Express not only saves you time and money, it could be the answer to your inventory control problems, too. Packages very often arrive the same day shipped. They travel in spacious compartments on regular Greyhound buses. That means you can ship any time...twenty-four hours a day, seven days a week, weekends and holidays. Ship C.O.D., Collect, Prepaid, or open a charge account. Be sure to specify Greyhound Package Express. **It's there in hours...and costs you less!**



CALL YOUR LOCAL GREYHOUND BUS TERMINAL TODAY...OR MAIL THIS CONVENIENT COUPON TO:

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140 S. Dearborn St., Chicago 3, Illinois

Gentlemen: Please send us complete information on Greyhound Package Express service...including rates and routes. We understand that our company assumes no cost or obligation.

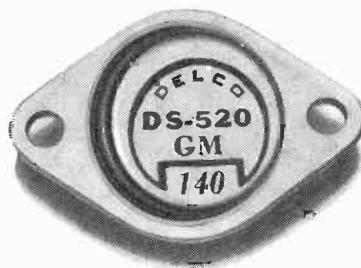
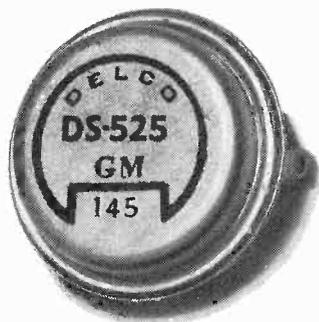
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ PHONE _____

... for more details circle 32 on page 50



HOW TO CUT THE COST OF POWER TRANSISTORS—WITHOUT CUTTING CORNERS:

simply say Delco

Now you can offer your customers inexpensive replacements for their Delco audio output transistor needs. The DS 520 and our new DS 525 can be used in place of the Delco DS 503 and DS 501 where low cost is a factor. Each of these low-priced transistors can produce 4 watts of output with top Delco reliability. They're ideal for the servicing of older car radios or for the experimenter or ham operator. The DS 520 and the new DS 525 will be a profitable addition to your basic line of Delco transistors: the DS 501 and DS 503—to restore full power audio output in all Delco

Radios; the DS 25 and DS 26 to cover small signal needs in Delco and just about every other auto radio or small portable on the market. How's that for a complete line of transistors? Oh, you need application and cross reference charts too? Look in the package. They come with all Delco transistors. All are available now through your United Delco electronics parts distributor.

Delco Radio automotive radio service parts and electro-mechanical devices are distributed nationally through **United Delco**.

DELCO RADIO, Division of General Motors, Kokomo, Indiana



CALIFORNIA

CESA, Los Angeles, requests that members and non-members alike report TV technicians' irregularities to their office. The organization is primarily concerned with the listings of some dealers in phone book yellow pages. Since most irregularities have developed from firms who have given no address for a place of business, Pacific Telephone has agreed not to accept listings from them.

FLORIDA

TESA, Miami, members have announced their plans to operate a technical laboratory to handle members' "tough dogs." The lab is being built and equipped by donations of time and money from the participating men. Only Saturdays and Sundays are being spent on the project. In addition to collaring dogs, other "technical ventures" will be undertaken.

MINNESOTA

TVRSA, Duluth, reports that greater effort is being put into their bid for city licensing. Although the group has been actively working on a bill for about three years, it is now being reworked to include more safety features for the set owner. In an effort to obtain the best bill possible, the association is asking for suggestions from other groups who have undertaken city licensing. Organizations who wish to suggest or exchange ideas should contact Neil's TV, 412 No. 5th Ave. E., Duluth, Minn.

NEW YORK

PETEC, Kenmore, reports that they have adopted a constitution, bylaws and a code of ethics. The organization is relatively new and boasts all of the advantages of other TV associations but restricts membership to technicians meeting their qualifications. PETEC is short for Professional Electronic Technicians and Engineers Co-operative.

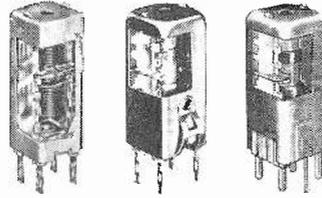
WASHINGTON

TSA, Seattle, reports that the Better Radio and TV Service Vs. Better TV Shops hearing has been settled without trial. A cease and desist order was issued to Better TV Shops by Better Radio and TV Service attorneys when the former adopted its name. Attorneys for the plaintiff and defendant got together at the hearing and agreed that no further advertising would be used under that name and that all phones listed under that name would be disconnected.

News from your Association should be sent to Association News Editor, **ELECTRONIC TECHNICIAN**, Ojibway Building, Duluth 2, Minnesota.

Exact Replacements

**for Original
Auto Radio Equipment**



In addition to our regular replacement line of I.F. transformers we are now offering the following special replacement items, as well as the exact replacement I.F. transformers for those parts which were supplied by the original manufacturer.



EXPORT REPRESENTATIVE:
Roburn Agencies, Inc., N.Y. 13, N.Y.

CANADIAN REPRESENTATIVE:
Atlas Radio Corp., Ltd., Toronto 10, Ont.

Cat. No.	Use	O.E.M. Part No.
Bendix		
6501	262 kc I.F.	2090237-1
6502	262 kc I.F.	2090237-2
6503	262 kc I.F.	2090237-3
6504	262 kc I.F.	2090237-4
6505	262 kc I.F.	2090237-5
6506	262 kc I.F.	2090239-1
6507	262 kc I.F.	2090239-2
6508	262 kc I.F.	2090239-3
6509	262 kc I.F.	2090907-2
6510	262 kc I.F.	2090908-3
6511	262 kc I.F.	2090907-3
6513	262 kc I.F.	2090908-4
6514	262 kc I.F.	2090907-5
6515	262 kc I.F.	2090908-5
Delco		
6540	262 kc I.F.	1221253
6541	262 kc I.F.	1221255
Motorola		
6550	455 kc I.F.	24C485553
6551	455 kc I.F.	24C485554
6552	455 kc I.F.	24C485555
6553	262 kc I.F.	24D563300 (Mopar)
General Replacement		
6581	455 kc I.F. Output with Diode Filter	
6582	455 kc I.F. Input	
6583	455 kc I.F. Output	
6584	262 kc I.F. Input	
6585	262 kc I.F. Output with Diode Filter	

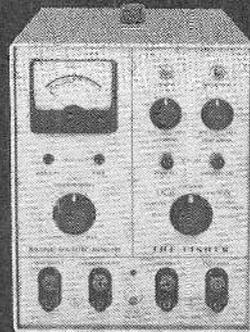
Available through your local distributor

J. W. MILLER COMPANY

5917 S. Main St., Los Angeles 3, Calif.

... for more details circle 42 on page 50

**Who says Multiplex servicing is complex?
All you need besides your 'scope
is this!**



The Fisher Model 300 all-in-one Multiplex Generator with built-in FM Signal Generator.

Only Fisher could have designed this unique instrument—because only Fisher has the engineering depth in FM Stereo Multiplex tuners and receivers to create the ideal test equipment for servicing them. The future of high-fidelity radio unquestionably belongs to FM Stereo and the Model 300 is the instrument for the service technician in search of new business. It is compact, fully portable and completely self-contained. It has its own built-in FM signal generator. In addition to a composite MPX signal, it also generates low-distortion, stable audio signals. Thus it requires no companion instrument other than an oscilloscope for professional alignment of Multiplex equipment. Best of all, **THE FISHER** costs only \$495.

USE THIS COUPON FOR DETAILED INFORMATION

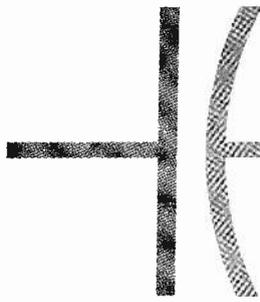
FISHER RADIO CORPORATION 091117
21-24 44th Drive, Long Island City 1, N. Y.

Please send me complete data and technical specifications on the Fisher Model 300.

Name _____
Address _____
City _____ Zone _____ State _____

09917

... for more details circle 28 on page 50

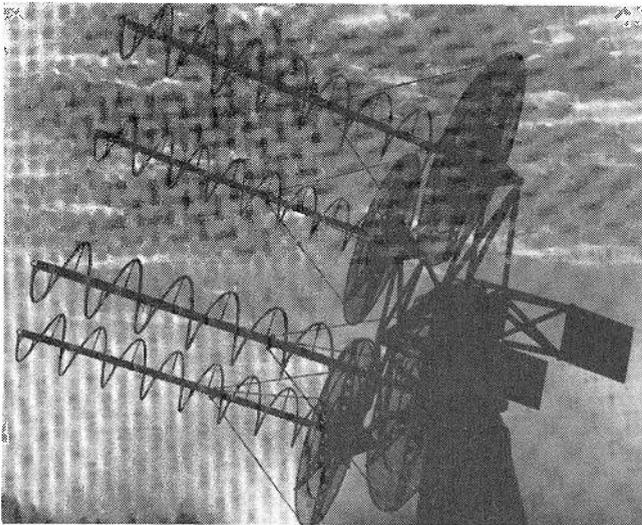


TUNING IN

RADIO RECEIVERS in more than 49 million homes receive 4000 U.S. and foreign broadcast stations on one or more radios, according to the eighth annual edition of "Radio '62," a report published by the media research division of A. C. Nielsen Company. In-home listening last winter averaged 1 $\frac{2}{3}$ hours per home per day, reaching its peak between 8-9 a.m. Home radio listening is somewhat greater in winter than in summer. Some use was made of 79.8 percent of all home radios during weekday morning hours. On an average, these families devoted three quarters of their in-home listening to daytime programs and the remaining quarter to nighttime programs.

TWELVE NICKEL-CADMIUM STORAGE BATTERIES, each weighing 130 pounds, are original equipment on the U. S. Army's gigantic Overland Train "trackless train" which runs on huge tires over roadless terrain anywhere on the globe. The batteries aboard not only provide starting power for the four gas turbine engines of the "trackless train" but also supply current for lighting, radio communications, heating and ventilation. The temperature-resistant characteristics of the batteries are vital in this vehicle,

ASSISTED ASSIST



A 'telstar' automatic tracking antenna transmits coded commands and receives telemetry data. The tracking antenna's movement helps point another antenna, a precision beacon tracker. The precision tracker in turn provides information for pointing a huge horn-shaped antenna, which must be aimed precisely at the satellite to establish and maintain long distance radio communication. The command tracker is one of two systems at Andover, Me., and Cape Canaveral, Fla.



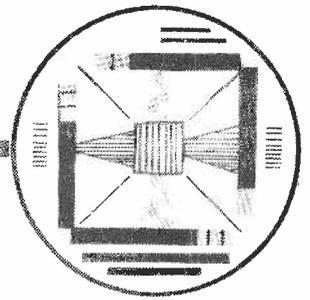
"It's time you started troubleshooting a little more scientifically, Ferbisher."

since it is designed to provide transportation in roadless areas ranging from hot deserts to frigid Arctic regions.

AN AUTOMATIC RADIO TRANSMITTER system for automatically actuating such survival devices as life preservers, parachutes, life rafts, and similar emergency life saving equipment has been granted to Dr. D. Lawrence Jaffee of Great Neck, New York. The weekend boating enthusiast-inventor, considered the safety of his family and the everpresent possibility of danger while boating and devised a unique automatic triggering system to relieve his children of the responsibility of remembering to pull their life jacket cords to actuate carbon dioxide cylinders which in turn inflate the preservers. The automatic Actuator works on the radio receiver-transmitter principle, with the boat or aircraft containing the transmitter and the battery-operated receiver attached to the survival device. In shipboard use, the receiver is attached to an inflatable life jacket.

ONE HUNDRED DISABLED MEN AND WOMEN who want to learn a skill which can make them independent for the rest of their working life are being recruited in a Federation of the Handicapped campaign. They are being offered an opportunity to get paid on-the-job training in four Industrial Divi-

THE PICTURE



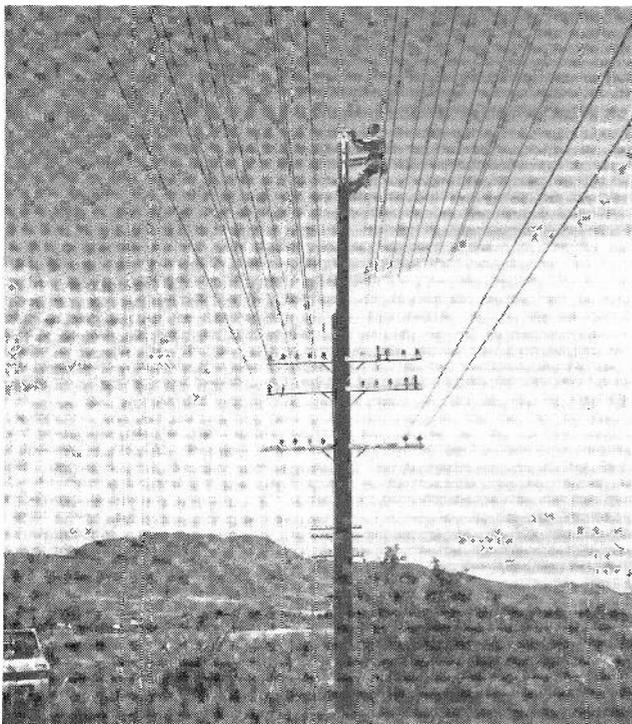
sions maintained by the Federation. Any disabled man or woman who has good eyesight, can use both hands, and get to and from work on a regular five-day-a-week basis, is eligible to apply for the new training jobs in industrial packaging and electronics. Applicants are being accepted whether they have worked previously or not. They may have either visible or invisible handicaps.

AN ELECTRON BEAM MACHINE that can both cut and weld has been developed as a production tool for the electronics industry by Hamilton Standard. The manufacturer of electron beam machinery said the combination cutter-welder was designed primarily for fabricating and assembling microminiature electronic devices. It works all metallic materials and many non-metals like ceramics and glass. Electrons from its

electron gun pack 10-billion watts of power per square inch. The beam, however, is focused to a spot less than five 10-thousandths of an inch (.005 in.). When it is pulsed, the electron beam cuts, drills, and scribes. Programmed by the deflection system, the beam can form a variety of geometric patterns for cutting circuits on thin metallic films of electronic resistors, capacitors and inductors. This system is said to be one of the best now available for assembling micro circuits.

A SUSPENSION SYSTEM for electrical indicating instruments which is claimed to be more accurate and more durable than pivots and jewel bearings, and to give greater resistance to shock, has been developed by a British firm. The movement is suspended by ribbons of heat-treated beryllium copper held taut by tension springs mounted on bushings which are fitted to supporting brackets on the movement frame. Tension on the ribbons is adjusted so that the instrument can be mounted in any position without significant loss of accuracy. During tests, the instruments fitted with the new movement were subjected to more than 10,000,000 deflections of the pointer from zero to full scale without any sign of fatigue or diminished accuracy.

TRIGGER RIGGER



Rigger installs one unit of a bomb alarm system that provides almost instant notice to civilian and military authorities that a nuclear blast has occurred in or near any one of 99 critical target areas in the United States. The sensor units can be triggered only by light waves peculiar to nuclear blasts. Even though destroyed itself by the explosion, the Western Union system will transmit a warning signal to all Combat Command Centers.

A MINIATURE BEHIND-THE-EAR HEARING AID which automatically adjusts itself to protect the wearer against sudden loud noises, is being marketed by Acousticon International. Weighing less than half an ounce, the new four-transistor instrument can also pick up telephone voices through electro-magnetic induction, eliminating competing background noises. The hearing aid features a selector switch which allows the user to put the instrument on automatic gain control. For average sounds the control's action is hardly noticeable, but loud noises cause the automatic gain circuit to reduce the sound to a comfortable level.

A PORTABLE AUTOMATIC HAND is produced by United Fleximation Corporation. The manipulator can be programmed to perform up to 16 different operations at any combination of 8 locations in a wide work range; it handles objects weighing up to 25 pounds. According to UF's President, "FLEXIMAN" can be programmed to assemble parts, feed conveyors, insert products into cartons or feed and operate such production machines as drill presses, punch presses and welders.

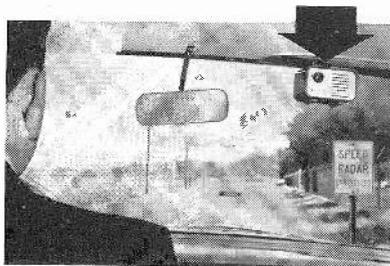
85,000,000
licensed
drivers
need

**RADAR
SENTRY***



Ingenious, miniature electronic detector gives audible warning of approach to radar-timed speed zones and dangerous areas protected by radar-operated signal lights.

Every new or used car buyer, every service customer is a qualified prospect. Banners, window and wall signs announce you have it. Intriguing, self-demonstrating display sells Radar Sentry on sight . . . give you quick, extra profits without extra work (no special installation required).



Precision constructed. Factory guaranteed.
NATIONALLY ADVERTISED
Immediate delivery.

Retails at **\$39.95** Generous discounts.
See your jobber or write for details.

*Patent Pending

RADATRON, INC., 2417 Zimmerman St.,
N. Tonawanda, N. Y.
... for more details circle 48 on page 50

**REPS AND
DISTRIBUTORS**

ITT Distributor Products Div. of International Telephone and Telegraph selects H. L. Dalis to handle its line of receiving tubes. Dalis is said to be the first distributor for the New York Metropolitan area to be franchised for tubes under the Division's new "Partnership in Prestige and Progress" Program.



Rego

Aerovox Corp. appoints **Gerald Rego** as advertising manager of the **Distributor Div.** Mr. Rego attended the New Bedford Institute of Technology and has been active in commercial

photography, advertising and printing production for the past seven years.

Universal Electronics Lab appoints **F. M. Houghton, Jr.**, of Donelson, Tenn. as a dealer. Universal Electronics produces Electronic Teaching Machines and Equipment.

Olympic Radio and Television Div. announces the appointment of **Modern Wholesale Distributors, Inc.**, of Nashville as Olympic distributor in central Tennessee for the **Lear Siegler Div.** Modern Wholesale will handle Olympic's complete line of television, Hi-Fi stereo and radio products including Olympic's All-at-Once radio-television-phonograph combinations.

The **Electronic Industry Show Corp's** board of directors elects **Henry Russell** president for 1962-63. Mr. Russell is vice-president of **United Transformer Corp.** and represents **PACE** (Producers of Associated Components for Electronics) on the Show's board of directors. As show corporation president he will head the operation of the 1963 Electronic Parts Distributors Show, May 20-22 in Chicago, Ill. **Warren Stuart**, sales manager of **Beldem Mfg. Co.**, was last year's president.

**PRODUCTS
FOR
MODERN
LIVING**

**ATR PLUG-IN TYPE
PORTABLE
INVERTERS***

A.C. Household Electricity
Anywhere . . . in your
own car, boat or plane
Operates Standard A.C.
● Record Players
● Dictating Machines
● Small Radios
● Electric Shavers
● Heating Pads, etc.

MODELS
6-RMF (6 volts) 60 to 80
watts. Shipping weight 12
lbs. **DEALER NET
PRICE \$33.00**
12T-RME (12 volts) 90 to
125 watts. Shipping weight
12 lbs. **DEALER NET
PRICE \$33.00**
*Additional Models Available

**ATR "A" Battery
ELIMINATOR**

For Demonstrating and
Testing Auto Radios—
TRANSISTOR or VIBRATOR
OPERATED!

Designed for testing D.C.
Electrical Apparatus on Regu-
lar A.C. Lines—Equipped
with Full-Wave Dry Disc-
Type Rectifier, assuring
noiseless, interference-free
operation and extreme long
life and reliability.

MAY ALSO BE USED AS A BATTERY CHARGER
**MODEL 610C-ELIF . . . 6 volts at 10 amps, or 12 volts
at 6 amps. Shipping weight 22 lbs.**
DEALER NET PRICE \$49.95
**MODEL 620C-ELIT . . . 6 volts at 20 amps, or 12 volts at
10 amps. Shipping weight 33 lbs.**
DEALER NET PRICE \$66.95

**AUTO-RADIO
VIBRATORS**

By every test ATR Auto-
Radio Vibrators are best!
and feature Ceramic
Stack Spacers, Instant Start-
ing, Large Oversized Tungsten
Contacts, Perforated Reed,
plus Highest Precision Con-
struction and Workmanship and
Quiet Operation!

There is an ATR VIBRATOR for
every make of car!
Ask your distributor for ATR's Low Priced type 1400,
6 volt 4-prong Vibrator; and 1843, 12 volt 3-prong; or
1840, 12 volt 4-prong Vibrator. **THE WORLD'S FINEST!**

**ATR UNIVERSAL
KARADIO**
MODEL 600 SERIES

Easily installed in-dash or
under-dash. Amplifier pow-
er-supply chassis may be
separated from tuner chassis
for installation flexibility and easy servicing. Utilizes 6-
tube super heterodyne circuit (2 dual-purpose tubes) with
8-tube performance . . . pulls in those distant stations
with good tone and volume. Supplied with separate 5"
x 7" speaker which is installed in original automobile
speaker compartment for high fidelity performance. Neu-
tral gray-tan baked enamel finish. Overall size 4 1/2" deep
x 6 1/2" wide x 2" high. Tuner Chassis; with Amplifier
Chassis, 2 3/8" deep x 6 1/2" wide x 3 7/8" high. Shipping
weight 7 lbs. **WILL OUTPERFORM MOST SETS!**
Model 612 12 volt Dealer Net Price \$31.96
Model 606—6 volt Dealer Net Price \$31.96

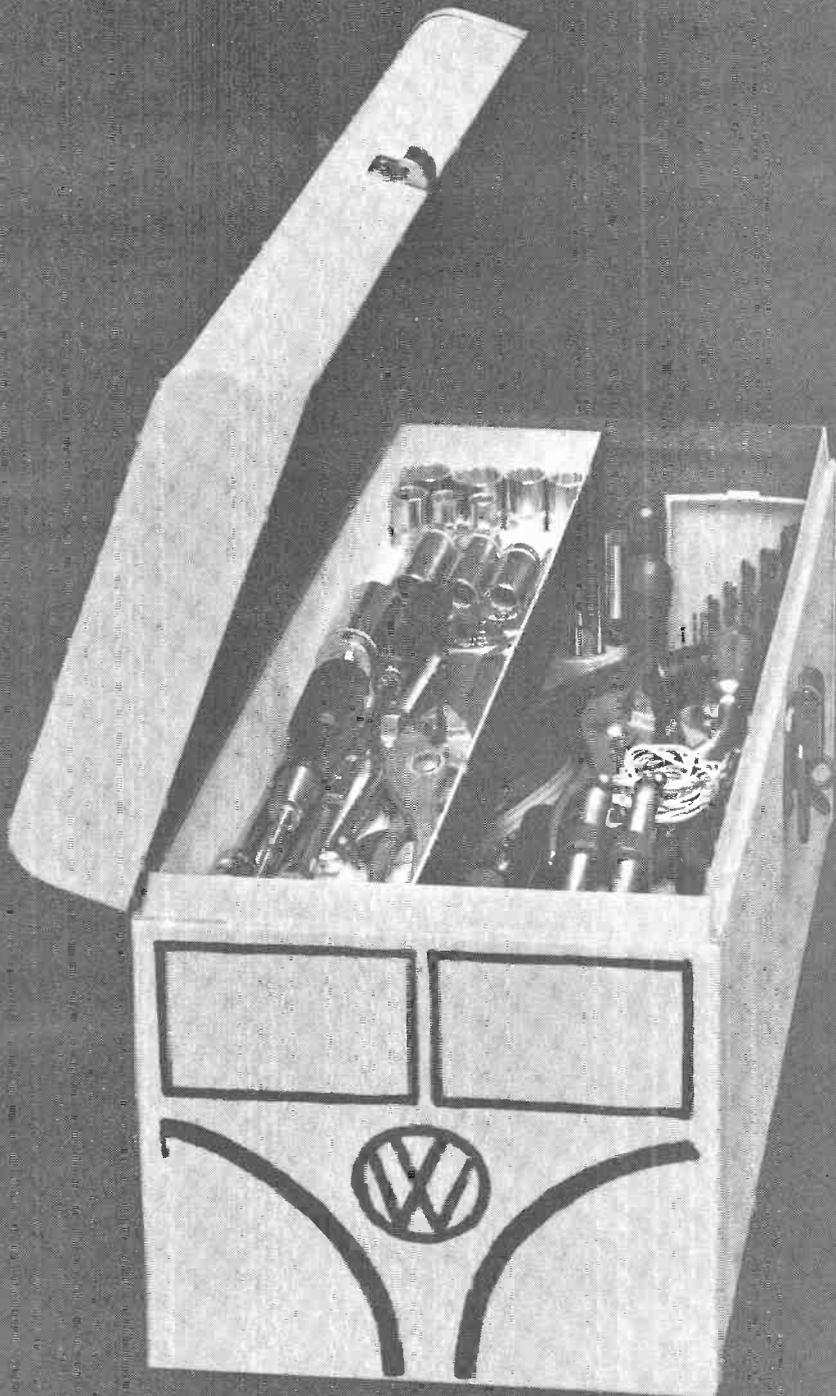
**ATR TRUCK
KARADIO**

Excellent Tone,
Volume, and Sensitivity!
Compact, yet powerful. Fits
all trucks, station wagons,
most cars and boats. Just drill a 3/8 inch hole in roof and
suspend the one-piece unit (with 10" over-all size 4" deep
x 6 1/2" wide x 2" high). Watertight mounting assembly holds antenna
upright. Yoke-type bracket lets you tilt radio to
any angle.

Extra-sensitive radio has 6 tubes (2 double-purpose),
over-size Alnico 5 PM speaker for full, rich tone. Big,
easy-to-read illuminated dial. Fingertip tuning control.
Volume and tone controls. 33-in. stainless steel antenna.
Neutral gray-tan enameled metal cabinet, 7 x 6 1/2 x 4 in.
high over-all. Shipping weight 10 1/2 lbs.
Model TR-1279—12 VA for 12V Dealer Net Price **\$41.96**
Model TR-1275—6A for 6V Dealer Net Price **\$41.96**

NO PRINTED
CIRCUITRY

SEE YOUR ELECTRONIC PARTS DISTRIBUTOR
WRITE FACTORY FOR FREE LITERATURE . . .
ATR ELECTRONICS, INC.
Formerly, American Television & Radio Co.
Quality Products Since 1931
ST. PAUL 1, MINNESOTA—U.S.A.
... for more details circle 14 on page 50



©1962 VOLKSWAGEN OF AMERICA, I.N.C. *SUGGESTED RETAIL PRICE.

Our truck is a big tool box.

You can load up a VW Truck with 1,000 lbs. of tools or parts or equipment. And still have room for 800 lbs. more.

Our truck will actually tote 1,830 pounds; 800 more than a half ton.

Yet, the VW is 3 feet shorter and weighs only half as much as a half ton.

It's our boxy shape that does it.

Outside, the VW doesn't have a long front hood. Because our engine's in the rear. For extra traction.

Inside, there's 170 cubic feet of usable space. With a 4-foot-wide side doorway. And double side doors. And a rear door. (And, if you want it, another side door in the far side for 80 bucks* more.)

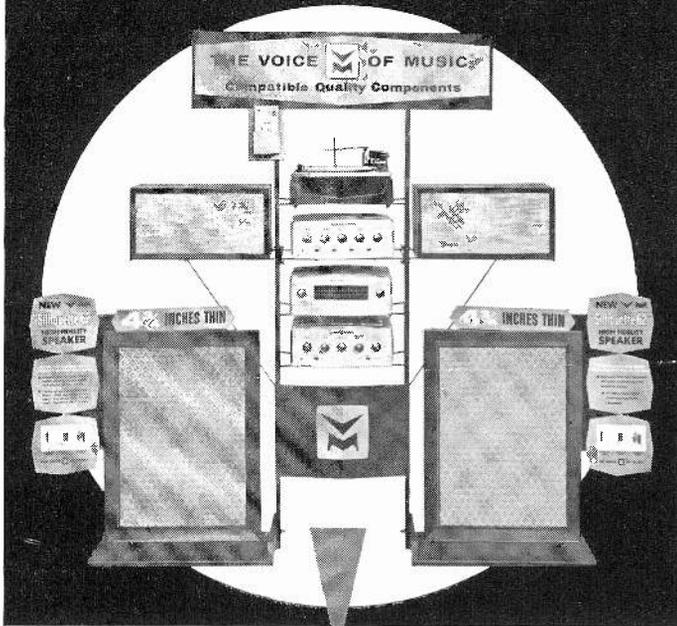
Anderson & George Murray of Orleans, Mass., carry a big table saw over the engine in back of their VW.

They also carry so many tools and stuff that people have said: "It looks like you have the shop right in the truck."

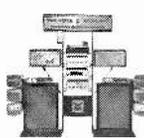
They do.

... for more details circle 64 on page 50

ADD NEW PROFIT TO YOUR HI-FI COMPONENTS BUSINESS THE EASY V·M WAY!



- Priced to attract *new* customers, this complete line of quality components is effectively displayed and demonstrated in only 5 square feet.
- Convenient one-source buying . . . backed by V·M's national network of Service Centers.



The store display fixture is complete with literature dispenser and the "Silhouette 62" speaker feature posters. It actually displays nine V·M component products!



'Stere-O-Matic'® 4-Speed Automatic Record Changer Model 1571 11" turntable.

Automatic Manual-Play, Extra-long, dynamically balanced, non-resonant Tone Arm, Diamond Needle, Shadowlite stylus pressure.



Changer Base Model 1438. For 'Stere-O-Matic'® Changers. Pre-wired receptacles.



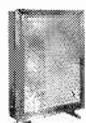
Stereophonic High-Fidelity Component Amplifier Model 1428. 60 watts (peak); 30 watts per channel. Frequency response, 20-30,000 cps.



High-Fidelity FM Stereo, FM, AM Component Radio Tuner Model 1465.



Precision-Built AC Stereo Amplifier Model 1448. 40 watts (peak); 20 watts per channel. Frequency response, 40-25,000 cps.



"Silhouette 62" High-Fidelity Component Speaker System. Three speakers: 10" woofer, 6" mid-range, 3.5" tweeter. Frequency response, 30-16,000 cps.



High-Fidelity Component Speaker Model 32. Three speakers: Two 6" and one 3". Frequency response 60-12,000 cps.

YOUR V·M DISTRIBUTOR IS READY NOW TO GIVE YOU ALL THE DETAILS AND POINT OUT THE MANY ADVANTAGES OF THIS NEW V·M COMPONENTS LINE. CALL HIM TODAY!



V·M CORPORATION • BENTON HARBOR, MICHIGAN

KNOWN FOR THE FINEST IN RECORD CHANGERS, PHONOGRAPHS AND TAPE RECORDERS . . . for more details, circle 63 on page 50

AUDIO NEWS LETTER

American Geloso Electronics, Inc., announces its complete 1962-63 line of tape recorders and "StenOtapes." Included are the No. 258/A 10-hour play recorder priced at \$199.95; the No. 257-2-hour play recorder at \$139.95; the No. 61 Unicorder combination battery and a-c operated tape recorder, \$179.95; the No. 256/60 StenOtape combination dictation-transcription machine and tape recorder, ac operation 1 7/8 ips, listing at \$179.95, and the No. 711 StenOtape combination battery model at \$199.95.

Jensen Industries is moving from Forest Park to a new plant at 319 Interstate Road in suburban Addison in an expansion that will double its production capacity. Jensen Industries will become the newest manufacturing firm in the industrial area near O'Hare International Airport.

Robins Industries Corp., introduces a new product called "Disk-Whisk" Kit, which cleans records while they play and prevents dust from re-settling on them. The "Disk-Whisk," priced at \$4, clips easily to the tonearm of any record changer or turntable. It consists of a cylindrical pad ("disc") and brush ("whisk"). The device's brush sweeps the grooves clean as the record plays, which leaves a clean surface for the cylinder pad to deposit a coating of anti-static fluid (included in the kit) on the grooves to prevent further dust formation. A specially designed stylus brush is included in the kit. The roller and anti-static fluid are also available as a replacement kit (Model ESK-8), at a list price of \$2.00.

Lafayette Radio Electronics Corp., introduces the new RK-155WX 2-speed, 4-track stereo tape recorder to sell for \$169.95 audiophile net. Specially designed to record fm multiplex broadcasts, the RK-155WX records 4-track stereo or 4-track mono and plays back 2-track stereo, 4-track stereo or 4-track mono. Also records on one channel at a time (sound-on-sound).

H. H. Scott releases a new edition of their complete "Guide to Kit Building." This full color brochure shows the line of Scott Kits and tells how to select the right kit for your needs.

3-M Co., is introducing an extra long-play magnetic tape for maximum recording time on miniaturized recorders. The tape, designated "Scotch" brand No. 290, is available in 600 ft. lengths on 3 1/4 in. reels which can be accommodated by most transistorized recorders. It will provide a full hour of recording time on two tracks at 3 3/4 ips.

Altec Lansing Corp., announces changes in the 3000B high frequency speaker. The aluminum diaphragm has been replaced with "Mylar" diaphragm. "Mylar" reportedly provides a substantially smoother high end response resulting in a more realistic sound reproduction, and completely eliminates the problem of crushed diaphragms. The 3000B's frequency response is given 3,000 to 22,000 cps.

American Microphone Co., is now in full operation in its new home at First and George Streets, in Galien, Michigan. The company occupies a one-story building, which has been especially remodeled for efficient traffic flow from department to department. The building covers an area of over 12,000 sq ft with additional space available for future expansion.

United Audio Products announces a price increase of \$10 on the "Dual 1006 Custom Automatic Turntable/Changer." The new price is \$89.95. According to Burt Brooks, national sales manager, the increase became necessary because of continually rising production costs which the company was unable to continue absorbing.

NEW BOOKS

REPRODUCTION OF SOUND *By Edgar Villchur. Published by Acoustic Re-*



The Serviceman's
Always
Right ...
When He Uses
QUIETROLE

The happiest customers are serviced by repairmen who use Quietrole . . . the amazing lubricant that so effectively silences pesky, noisy controls and switches on radios, TV sets and electronic instruments. If you want to leave your customers smiling, you'll do what good servicemen do everywhere . . . **USE QUIETROLE!**



Now, with **FREE EXTENDER TUBE** for aerosol can to easily reach the most remote places. The best distributors everywhere are pleased to sell **QUIETROLE!** IN SPRAY CANS or 2, 4, 8 oz. BOTTLES

manufactured by



QUIETROLE

COMPANY

Spartanburg, South Carolina
In Canada: CROSS CANADA ELECTRONICS
12 Laurel Street, Waterloo, Ontario

... for more details circle 47 on page 50

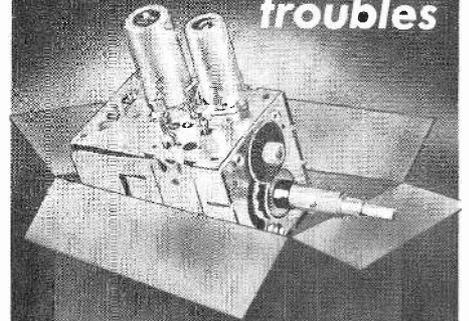
search Inc. 90 pages, soft cover. \$2.00

Although this text is basic, the average TV technician could probably benefit by reading it. The volume is a complete text on all aspects of Hi-Fi reproduction. Chapters include Sound, Standards of High Fidelity, The Reproducing System, Disc Recording, Pickups and Needles, and seven other chapters dealing with arms, amplifiers, preamplifiers, control units, feedback, enclosures and room environment. The text is entirely devoid of math and easy to understand. Drawings and photos are used profusely throughout the volume. The material is up-dated from a series of 12 articles the author wrote for Saturday Magazine, one chapter from Saturday Review and new material on stereo not printed before.

IT'S EASY TO USE ELECTRONIC TEST EQUIPMENT *By Larry Klien and Ken Gilmore. Published by John F. Rider Publisher, Inc. 173 pages, soft cover, \$4.00.*

This book is aimed at the service technician, laboratory technician and radio amateur. All of the basic electronic test equipment is described in concise, clear terminology. The book assumes a basic knowledge of electronics, though math and complex problems are avoided. More than 100 illustrations are included showing test equipment hookups and test equipment circuits. Some of the typical chapters in the book are: Using the VOM; The VTVM at Work; Oscilloscope controls; The Voltage Calibrators. Electronic Switches and Probes; The R-F Sweep Generator; The Harmonic Distortion Analyzer and many others. All common test equipment is included. If you have any questions, this book probably has the answers.

Pack up your troubles



and send them to CASTLE

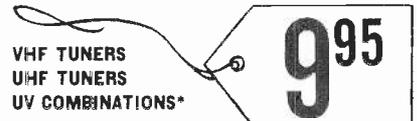
Ask yourself

... do you have the time to fool around drilling, sawing, filing . . . trying to make a "Universal" replacement tuner fit in place of the original? Do you have all the expensive instruments and equipment to complete the alignment so essential after each tuner repair or replacement? Can you spare the time repairing and adjusting your own TV tuners and can you charge enough to justify the time spent?

A Castle Overhaul eliminates every one of these problems.

Castle replaces all defective parts (tubes and major parts are extra at net prices) and then aligns your tuner to the exact, original specifications. Simply send us your defective tuner complete; include tubes, shield cover and any damaged parts with model number and complaint.

ALL MAKES ONE PRICE



VHF TUNERS
UHF TUNERS
UV COMBINATIONS*

*UV combination tuner must be of one piece construction. Separate UHF and VHF tuner with cord or gear drives must be dismantled and the defective unit sent in. 90 Day Warranty.

Send for **FREE** Mailing Kit and complete details

CASTLE

TV TUNER SERVICE, INC.

Check Map for the
Castle Center Serving You.



5713 N. WESTERN AVE., CHICAGO 45, ILLINOIS
653 PALISADE NORTH, CLIFFSIDE PARK, N. J.
CANADA: 36 MAIN ST., TORONTO 13, ONT.

Pioneers in



TV Tuner Overhauling

... for more details circle 18 on page 50

Now... Tomorrow and for years to come!

Sonar CITIZENS BAND RADIO

- 8 Channels, crystal controlled transmitter and receiver
- Tunable receiver for 22 channels
- Transmitter 100% Class B modulated
- Adjustable squelch
- Automatic noise limiter
- R. F. Power indicator
- 1 Year guarantee
- Easy to install. Ideal for home, boat, car or business. Weighs only 9 lbs. . . 4 $\frac{3}{4}$ x 9 $\frac{1}{2}$ x 11 $\frac{1}{4}$
- FCC Type accepted*

*in preference to only certification

with 1 pair of crystals, microphone and power cables

\$179.50



Sonar RADIO CORPORATION
73 Wortman Avenue • Brooklyn 7, N. Y.
Please send me complete information on Model "E" CB Radio.
Dept. #205

NAME _____
ADDRESS _____
CITY _____
STATE _____

... for more details circle 52 on page 50

how often
could you
have used...

**an
Xcelite
"Seizer"?**

Handy as an extra hand or helper. Clamps lightly or tightly... for moments or minutes.

two-position snap-lock

slim, serrated jaws

Outreaches, out-holds needle-nose pliers. Hardly a spot too small for it. Approx. 6" long. Dozens of uses: Holds and positions wires for soldering... retrieves small parts from inaccessible places... it's a heat sink. Two-position snap-lock won't slip, yet releases with a twist of the fingers. All stainless steel—precision machined and tempered for smooth action and years of service.

2 Models: No. 43H curved nose and No. 42H straight — Ask your distributor to show you Xcelite Seizers today.

XCELITE

XCELITE, INC. • ORCHARD PARK, N. Y.
Canada: Charles W. Pointon, Ltd., Toronto, Ont.

... for more details circle 67 on page 50

...CADDY STOCK

Continued from page 42

suggest it. Since you can't be aware of every customer that has a battery operated radio, have a small card made up to fit over one of the tube compartments in your caddy; "Radio Batteries Available." Since the customer is almost always present when you're on a house call, he'll see the sign when you open the caddy.

Almost daily the house call man runs into someone who doesn't want to put much money into their set—"Just put in what you have to." Many of these people are in the market for a new set. This is your opportunity to leave some new set literature with them and invite them into your showroom or to a home trial.

Questions about stereo and Hi-Fi also offer an opportunity to give them the sales pitch. Carry literature on all the equipment you sell; one folder of each in your caddy, backed up by a supply in the truck.



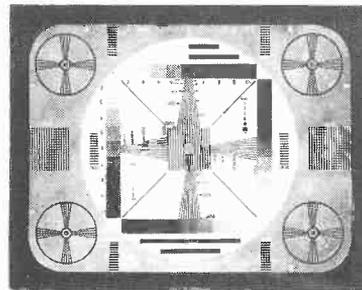
The Customer Reminder Plan is yours—**FREE!** Write

Jensen[®]
INDUSTRIES, INC.
301 Interstate Rd., Addison, Ill.

... for more details circle 36 on page 50

**TV TIPS
FROM TRIAD**

NO. 18 IN A SERIES



Joe stood frowning at the parade of Mr. 5 x 5 characters waddling across the screen. The raster was filled vertically, but the figures looked like they had been run over by a steam roller and only partially restored. "No width control on this one," he muttered.

Bill, the Senior PTM, glanced up from a rush job, "Hmm, looks like a new picture tube and yoke have been installed!"

"Correct," confirmed Joe. "Customer installed it himself. Said something about removing all the 'packing' and wants the set adjusted!"

Bill squinted along the picture tube neck, then went over to the junk box. He pulled out a piece of impregnated paper and a small sheet of brass shim stock which he deftly wrapped around the neck and inserted into the yoke. The picture returned to normal. "Missing metal collar," he said. "The metallic sleeve absorbs some energy from the yoke, and width control results in proportion to insertion!"

"How come height is not affected?" queried Joe.

Bill explained, "The horizontal coils are always nearest the picture tube neck, so the metal collar absorbs more energy from the nearest coils. However, a word of caution. There's as much as 3500 peak-to-peak volts in the horizontal coils with only the varnish coating insulating it from the width collar. To reduce shock hazard, install an insulator between the yoke and the collar!"

MORAL: Triad includes a special treated sleeve—the *Saf-T-Liner*—in yokes using this type of width control. Next time you go to your favorite Triad distributor, note the red and white boxes on his shelf. They contain highest-quality components engineered for the professional serviceman. For our helpful new catalog TV-62 and other literature, write Triad Distributor Division, 305 No. Briant St., Huntington, Indiana.

A DIVISION OF LITTON INDUSTRIES

... for more details circle 59 on page 50

ELECTRONIC TECHNICIAN

...TEST INSTRUMENTS

Continued from page 45

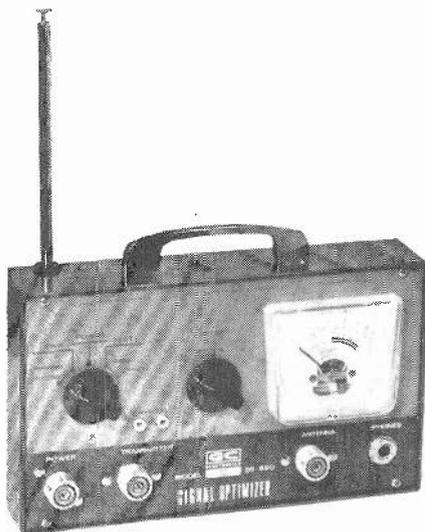
The scope performs well to 5 Mc to handle color service work and includes features such as Z axis input for lab work. The vertical input is compensated in all ranges for optimum frequency response by two attenuator-trimmers. The adjustments are made by feeding an internal sweep frequency into the vertical input and adjusting the trimmers for a straight line.

SIGNAL OPTIMIZER

GC Electronics, *Signal Optimizer, Model 36-590*, at \$47.50—This is a CB and amateur transmitter signal tester which performs several functions frequently performed by a number of instruments. The unit is capable of testing transmitter power output up to 1000 w; measures percent of modulation; detects harmonics, SWR, and acts as a relative field strength meter.

The tester can also measure receiver or transmitter frequencies accurately. When a crystal is inserted in the Optimizer it becomes an oscillator. The signal is then radiated from the telescoping antenna at the crystal frequency and can be picked up by a receiver. Signals can also be monitored through a phone jack provided on the panel.

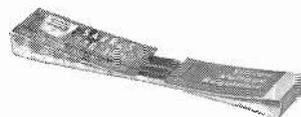
The antenna is entirely removable from the instrument by simply



GC's Signal Optimizer combines the functions of several testers into one easy-to-use unit.

SARKES TARZIAN Silicon Rectifiers

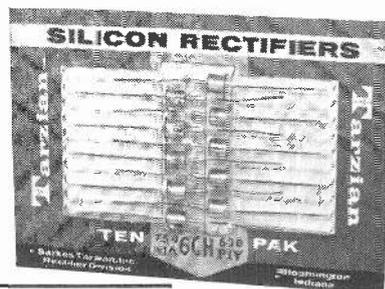
are first choice among service technicians (according to nation-wide polls) for good and simple reasons:



Tarzian 400V and 600V "F" Series units in handy Ten-Paks, Doubler Replacement Kits, and in bulk



Tarzian 400V and 600V "H" Series units in handy Ten-Paks, Doubler Replacement Kits, and in bulk



- ★ They are immediately available from distributors throughout the nation
- ★ They are "handy-packed" in the quantities and sizes you need most
- ★ Their proven quality and dependability eliminates callbacks that waste your time and profits

A free Tarzian "Replacement Line" catalog is yours for the asking. It's your guide to replacement rectifiers with competitive prices, unsurpassed performance.

Write or call your nearest Tarzian distributor, or:

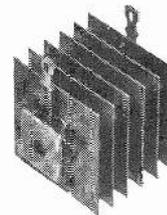


Tarzian's nine standard tube replacement rectifiers replace over 95% of all vacuum tube rectifiers



Tarzian M-500 and M-150 units in Conversion Kits and in bulk

Tarzian's four "condensed stack" selenium rectifiers fit small-size, high-efficiency applications



SARKES TARZIAN, Inc.

World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices
SEMICONDUCTOR DIVISION • BLOOMINGTON, INDIANA
Canadian Licensee: Marsland Engineering Limited • 350 Weber Street North, Waterloo, Ontario

... for more details circle 49 on page 50

**THE INDUSTRY'S
ONLY COMPLETE
"LOOK-ALIKE" LINE**

**Exact Replacement
Needles/Cartridges**



Highest quality guaranteed! At your E-V distributor's or write for FREE replacement guide, today! Electro-Voice, Inc., Buchanan, Michigan, Dept. 11277

Electro-Voice®

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unscrewing it. The unit is completely transistorized and operates from a small 9 v battery. In the unit we checked, the battery was loose in the cabinet—probably dislodged in shipping.

The unit is portable, weighing only two lb and measures 8½ x 5 x 2 in. The tester is worthy of investigation by technicians planning to work with citizens band or other two-way equipment.

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1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Howard A. Reed, 480 Lexington Ave., New York 17, N. Y.; Managing Editor, Jack Hobbs, Ojibway Building, Duluth 2, Minn.; Technical Editor, Victor Bell, Ojibway Building, Duluth 2, Minn.; Business Manager, E. A. Kuefner, Ojibway Building, Duluth 2, Minn.

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(Signature) Marshall Reinig
President

Sworn to and subscribed before me this 26th day of September, 1962.

(SEAL) (Signature) Empi S. Fisher
Notary Public
St. Louis County
Minn.

(My commission expires Jan. 31, 1963.)



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1NSGT	5A05	6DQ6/A/B	12A27
1R5	5A78	6DT6	12B4
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	5U4G	6H6	12C06
	5U4G/A/B	6J5	12D4/A
	5U8	6J6A	12DB5
	5V4G	6K6GT	12D06/A/B
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	5Y3GT	6L6GA/B/C	12L6GT
	6A8GT	6M7	12Q7GT
	6A84	6A7	12S6GT
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	6AF4/A	6SH7	12F7
	6AG5	6SF7	12SK7
	6A4GT	6A7	12S7GT
	6AH6	6SL7GT	12V6GT
	6AK5	6SN7GT/A/B	12W6GT
	6AL5	6S7	12X6GT
	6AM8/A	6T4	13DR7
	6AN8/A	6T8/A	14A7
	6AQ5/A	6U8/A	14B6
	6AS5	6V3A	14F7
	6AT6	6V6GT	17AV5GA
	6AT8/A	6W6GT/A	17AX4GT
	6AU4GT/A	6W6GT	19AU6GT
	6AU5GT	6X4	19B6GT/A
	6AU6/A	6X5GT	19T8
	6AU8	6Y4	21A4GT
	6AV5GA	6Y6G/A	25BQ6
	6AV6	7A5	25C5
	6AW8/A	7A7	25D6GA/B
	6AX4GT/A/B	7A8	25C06
	6AX5GT	7AG7	25D06
	6B5	7A7	25D06
	6B05	7B4	25L6GT
	6B8	7B7	25W4GT
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	6BH6	7F8	35B5
	6B8	7H7	35C5
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	6B7GT/A	8B05	35Z3
	6BN6	8C7	35Z5GT
	6BQ6	8C7	50A5
	6BQ6GT/A/B	8C7	50B5
	6B07/A	8C8	50C5
	6BU5	8SN7GTB	50E5
	6BY5GA	9A7	50F5GT
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	6CG7	12A05	117Z3
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1U4	4AU6	5V4	6AV5	6BR8	6CU5	6J5	8CG7	12BL6	12BL6	19BG6
1U5	4BC8	5X8	6AV6	6BS8	6CU8	6J6	8CX8	12BQ6	12BQ6	25AX4
1V2	4BQ7	5Y3	6AW8	6BU8	6CX8	6K6	9AU7	12BR7	12BR7	25CD6
1X2	4BS8	6AB4	6AX4	6BX7	6CY5	6L6	10DE7	12BY7	12BY7	25DN6
2BN4	4BZ6	6AC7	6AX5	6BY5	6CY7	6S4	10DR7	12BZ7	12BZ7	25L6
2CY5	4BZ7	6AF4	6BA6	6BY6	6C25	6SA7GT	11CY7	12CA5	12CA5	25W4
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3AL5	4CS6	6AH4	6BC5	6BZ7	6DE4	6SH7	12AF6	12CX6	12CX6	35A5
3AU6	4EW6	6AH6	6BC8	6BZ8	6DE6	6SK7GT	12AQ5	12D4	12D4	35B5
3AV6	5AM8	6AK5	6BD6	6C4	6DG6	6SL7	12AT6	12DQ6	12DQ6	35C5
3BC5	5AN8	6AL5	6BE6	6C6	6DK6	6SN7	12AT7	12K5	12K5	35L6
3BE6	5AQ5	6AM8	6BG6	6C86	6DN6	6SQ7	12AU6	12L6	12L6	35W4
3BN4	5AS4	6AN8	6BH6	6CE5	6DQ6	6T8	12AU7	12SA7	12SA7	35Z5
3BU8	5AV8	6AQ5	6BH8	6CF6	6DR7	6U4	12AV5	12SK7	12SK7	50B5
3BY6	5BK7	6AQ7	6BJ6	6CG7	6DT6	6U8	12AV6	12SN7	12SN7	50C5
3BZ6	5BQ7	6AR5	6BK5	6CG8	6E8	6V8	12AV7	12SQ7	12SQ7	50L6
3CB6	5BR8	6AS5	6BK7	6CH8	6EB8	6W4	12AX4	12V6	12V6	117Z3
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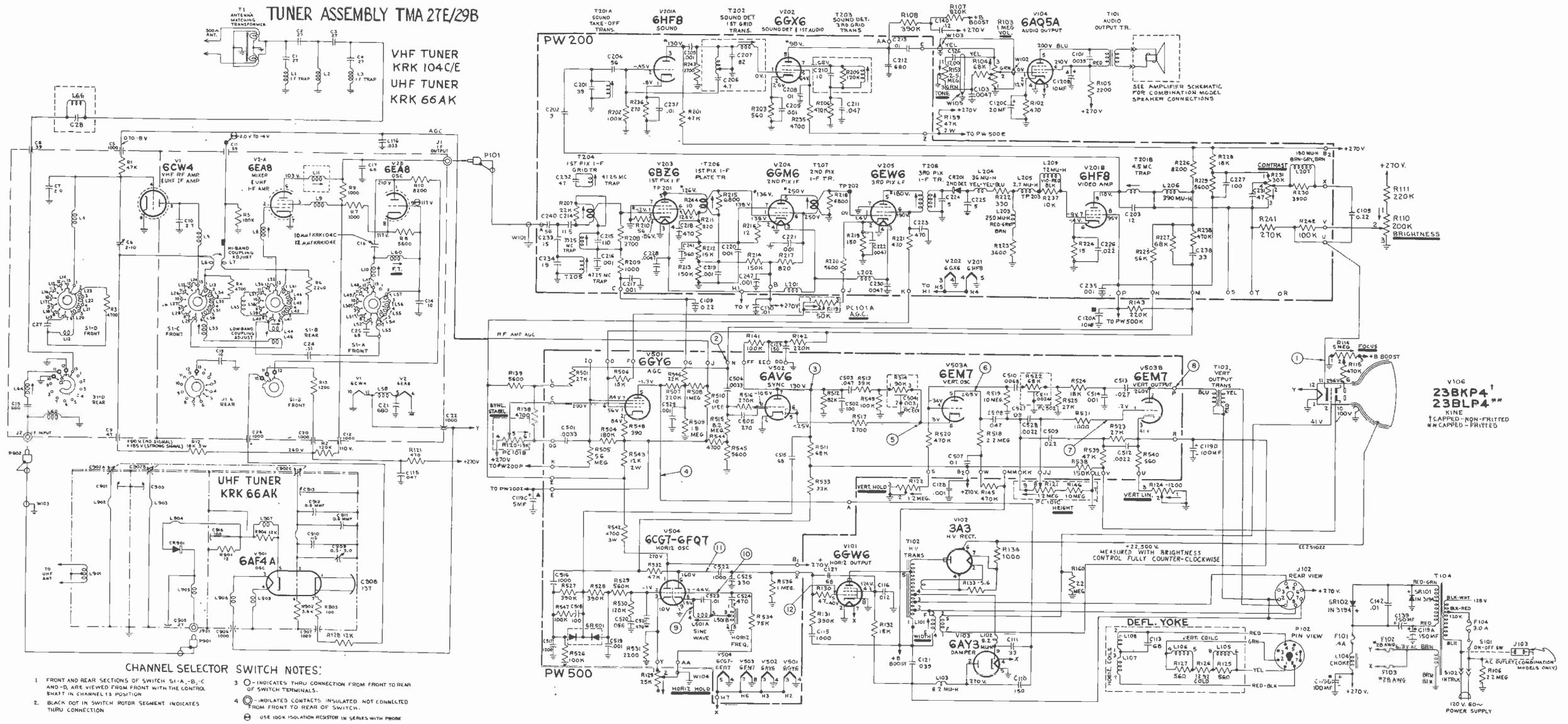
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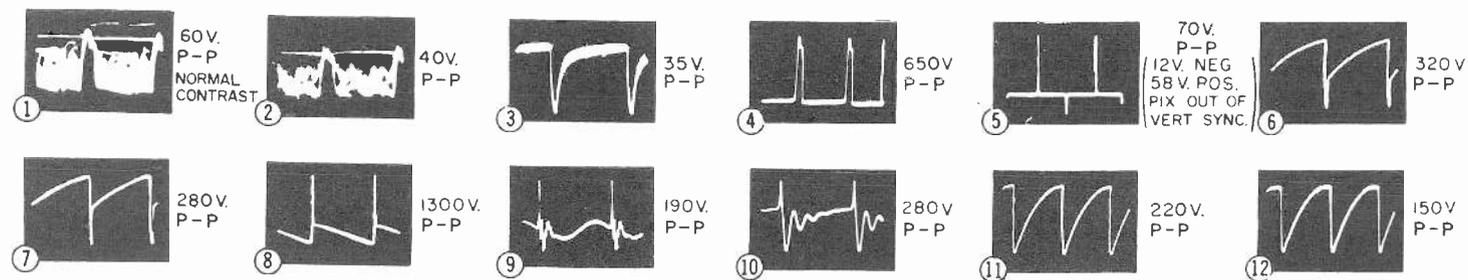
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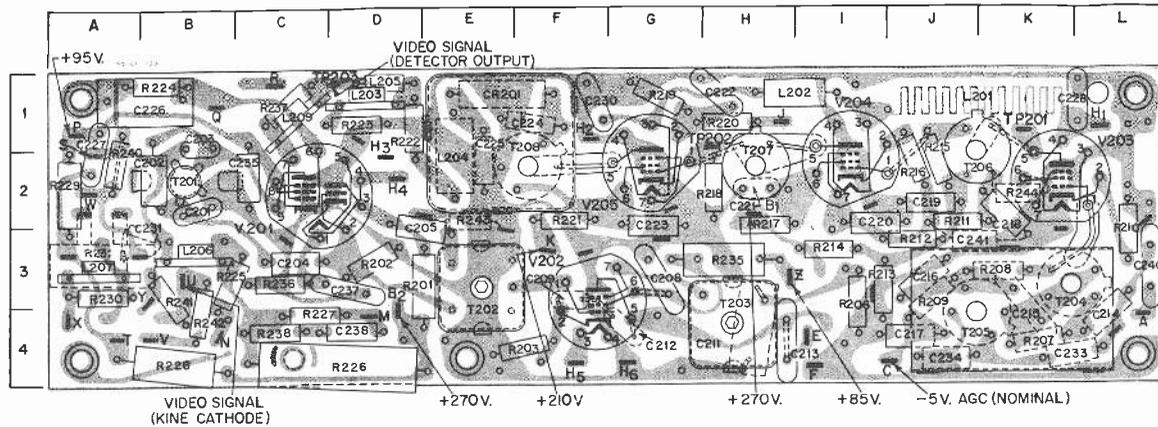


More Data on Reverse Side

Balloons ①, ②, etc., shown on schematic indicate points of observation of the waveforms shown below the schematic. Use low-capacity probe when observing waveforms ①, ②, ③, and ④.



PW200 SECURITY SEALED CIRCUIT ASSEMBLY

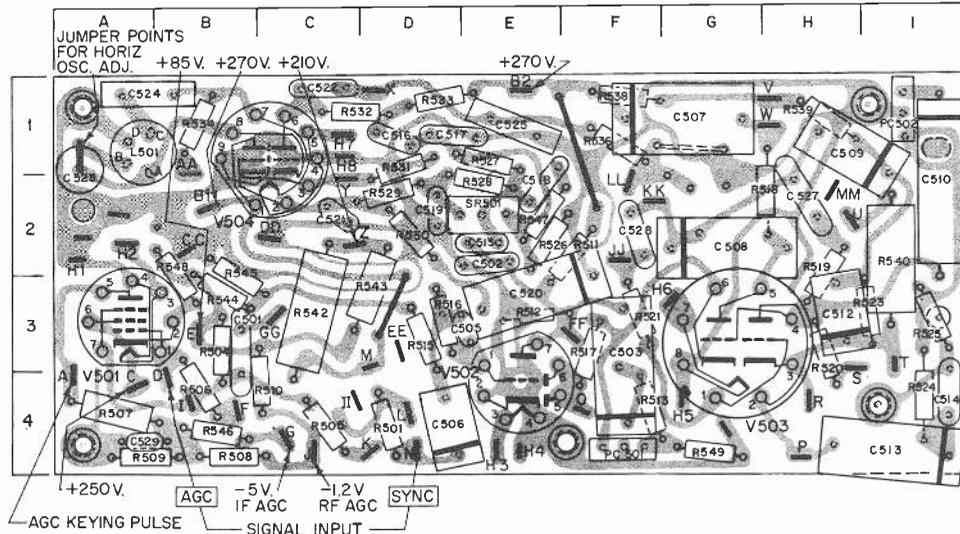


PW200 COMPONENT LOCATION GUIDE

C201 B2	C216 J3	C228 L1	L201 J1	R207 K4	R218 H2	R230 A3	T201 B2
C202 B2	C217 J4	C230 F1	L202 I1	R208 K3	R219 G1	R231 A3	T202 E3
C203 B1	C218 K2	C231 B3	L203 D1	R209 J3	R220 H1	R235 H3	T203 H4
C204 C3	C219 J2	C233 L4	L204 E2	R210 L3	R221 F2	R236 C3	T204 K3
C205 D2	C220 I2	C234 J4	L205 D1	R211 J2	R222 D1	R237 C1	T205 K4
C208 G3	C221 H2	C235 C2	L206 B3	R212 J3	R223 D1	R238 C4	T206 K2
C209 F3	C222 H1	C237 D3	L207 A3	R213 I3	R224 B1	R240 A2	T207 H2
C211 H4	C223 G2	C238 D4	L209 C1	R225 B3	R241 B3	R242 B4	T208 F2
C212 G4	C224 F1	C240 L3	R201 E3	R214 I3	R226 D4	R243 E2	
C213 H4	C225 E2	C241 J3	R202 D3	R215 J2	R227 C4	R244 K2	
C214 L4	C226 B1	R203 F4	R203 F4	R216 J2	R228 B4		
C215 K4	C227 A1	CR201 E1	R206 I3	R217 H3	R229 A2		

†In chassis with auto-brightness; omitted in chassis without auto-brightness.

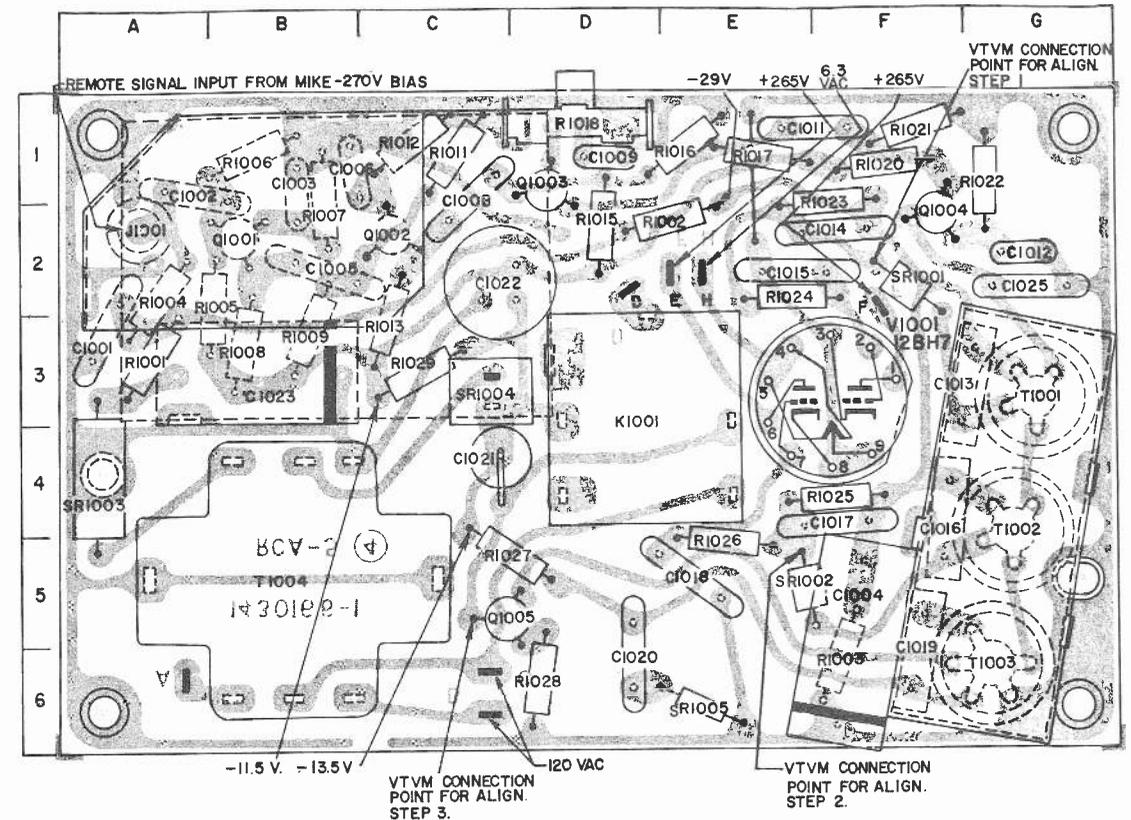
PW500 SECURITY SEALED CIRCUIT ASSEMBLY



PW500 COMPONENT LOCATION GUIDE

C501 B3	C513 I4	C523 A1	PC502 I1	R511 F2	R523 I3	R533 D1	R546 B4
C502 E2	C514 I4	C524 A1		R512 E3	R524 I4	R534 B1	R547 E2
C503 F3	C515 E2	C525 E1	R501 D4	R513 F4	R525 I3	R535 F1	R548 B2
C505 D3	C516 D1	C527 H2	R504 B3	R515 D3	R526 E2	R538 F1	R549 G4
C506 D4	C517 D1	C528 F2	R505 C4	R516 D3	R527 E1	R539 H1	
C507 G1	C518 E2	C529 A4	R506 B4	R517 F3	R528 E2	R540 I2	SR501 E2
C508 G2	C519 D2		R507 A4	R518 H2	R529 D2	R542 C3	
C509 H1	C520 E3		R508 B4	R519 H2	R530 D2	R543 D3	
C510 I2	C521 C2	L501 A1	R509 A4	R520 H3	R531 D1	R544 B3	
C512 H3	C522 C1	PC501 F4	R510 C4	R521 F3	R532 C1	R545 B2	

†In chassis without auto-brightness; omitted in chassis with auto-brightness.



PW900 COMPONENT LOCATION GUIDE

C1001 A3	C1013 F3	C1023 B3	Q1004 F2	R1008 B3	R1021 F1	SR1001 F2
C1002 A2	C1014 F2	C1025 G2	Q1005 C5	R1009 B3	R1022 G1	SR1002 E5
C1003 B1	C1015 E2			R1010 B3	R1023 F1	SR1003 A4
C1004 F5	C1016 F4	J1001 A2	R1001 A3	R1011 C1	R1024 E2	SR1004 C3
C1005 B2	C1017 F5		R1002 D2	R1012 C3	R1025 F4	SR1005 E6
C1006 B1	C1018 D5	K1001 D4	R1003 F5	R1013 C3	R1026 E4	
C1008 C1	C1019 F5		R1004 A2	R1014 D2	R1027 C5	T1001 G3
C1009 D1	C1020 D6	Q1001 B2	R1005 A2	R1015 D2	R1028 D6	T1002 G4
C1011 E1	C1021 C4	Q1002 C2	R1006 B1	R1016 E1	R1029 C3	T1003 G6
C1012 G2	C1022 C2	Q1003 D1	R1007 B1	R1017 E1		T1004 B5
				R1018 D1		
				R1019 D1		
				R1020 F1		

KRS26A REMOTE CONTROL AMPLIFIER ALIGNMENT

- SIGNAL SOURCE** A CRK1A transmitter, checked for accuracy and proper operation, is recommended as a signal standard to be used in aligning the amplifier. (Transmitters used as standards should be checked frequently against a crystal standard or several amplifiers known to be operating properly.)
- TRANSMITTER** The transmitter standard should be operated at a distance of approximately four feet from the amplifier to prevent excessive pick-up when the amplifier is finally peaked.
- VACUUM TUBE VOLTMETER** Connect meter to junction of SR1001 and R1023.
- MISCELLANEOUS** When depressing the function button on the transmitter, depress the button fully and hold depressed as amplifier adjustment is made. Refer to Fig. 15 below for adjustment locations.

STEP	TRANSMITTER FREQUENCY	TRANSMITTER FUNCTION	ADJUST
1	Adjust 43.25 kc. coil	43.25 kc.	Depress "OFF" button
			T1001 for maximum dip on meter.
Move meter to junction of SR1002 and R1025.			
2	Adjust 39.50 kc. coil	39.50 kc.	Depress left side "Volume" button
			T1002 for maximum dip on meter.
Move meter to junction of C1021 and Q1005 collector (black dot)			
3	Adjust 35.75 kc. coil	35.75 kc.	Depress left side "tint" button
			T1003 for maximum dip on meter.

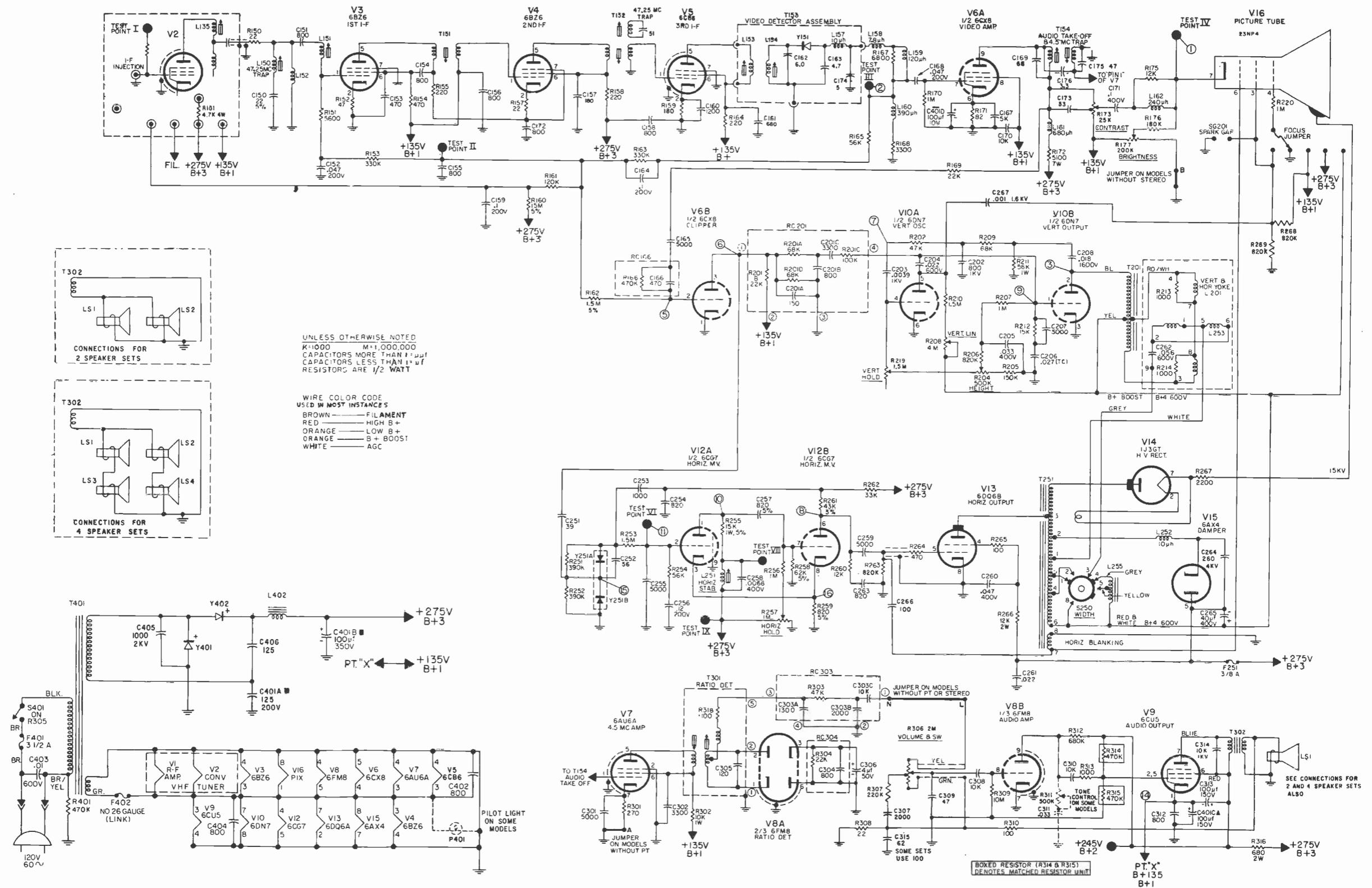
Note: Sensitivity control R1018 is preset at the factory and should not be adjusted unless one of the transistor amplifiers (Q1001 through Q1005) is replaced. To perform this adjustment, when necessary, inject a weak signal from the transmitter (approximately 10 uv.) and adjust R1018 for 20 ma. plate current in the weakest section of the 12BH7A tube, V1001.

ELECTRONIC TECHNICIAN 745

CIRCUIT DIGEST

GENERAL ELECTRIC
TV Chassis
M 597 Series

November • 1962



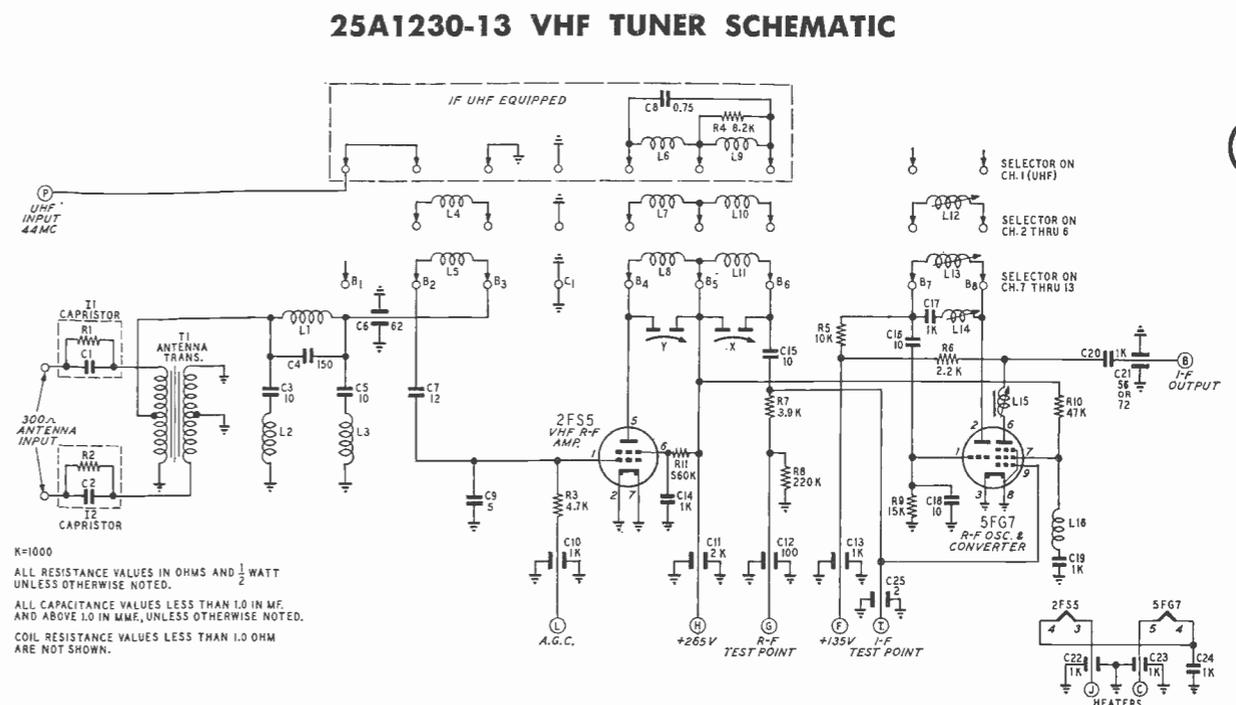
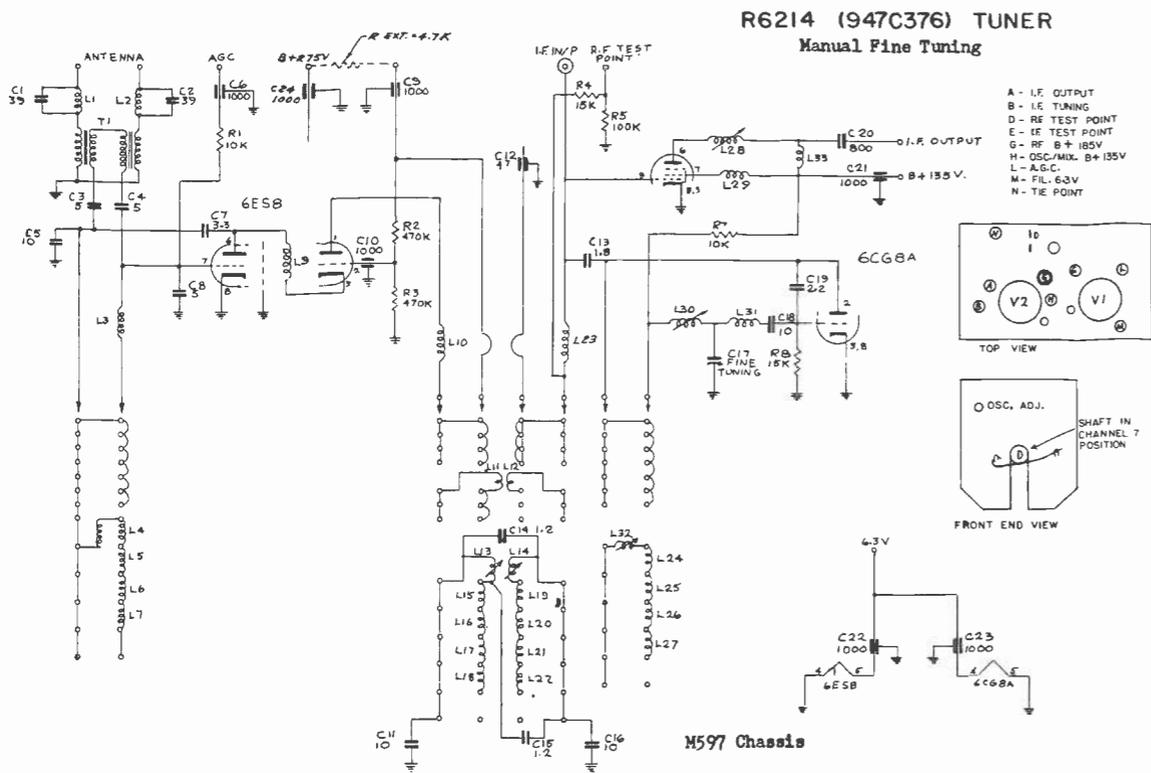
UNLESS OTHERWISE NOTED
K=1,000 M=1,000,000
CAPACITORS MORE THAN 1 μF
CAPACITORS LESS THAN 1 μF
RESISTORS ARE 1/2 WATT

WIRE COLOR CODE
USED IN MOST INSTANCES
BROWN — FILAMENT
RED — HIGH B+
ORANGE — LOW B+
ORANGE — B+ BOOST
WHITE — AGC

BOXED RESISTOR (R314 & R315)
DENOTES MATCHED RESISTOR UNIT

Electronic Technician
CIRCUIT 745
DIGEST

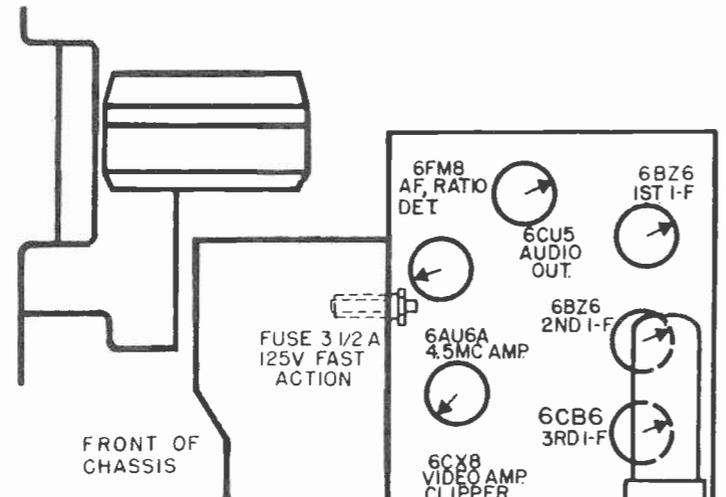
More Data on Reverse Side



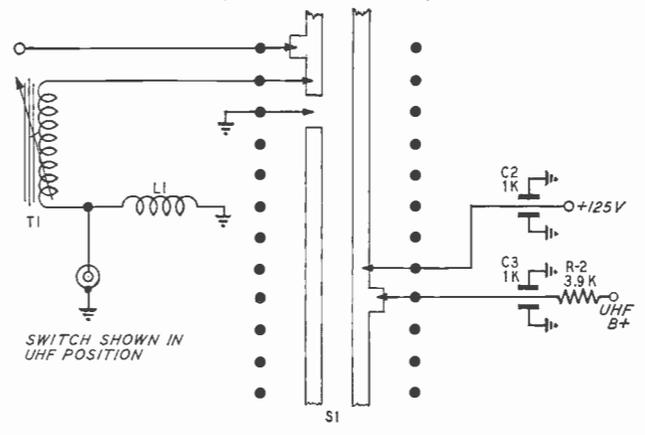
GENERAL ELECTRIC
 TV Chassis
 M 597 Series

Electronic Technician
CIRCUIT DIGEST

745



2A553 UHF IF INPUT SWITCH (IF UHF EQUIPPED)

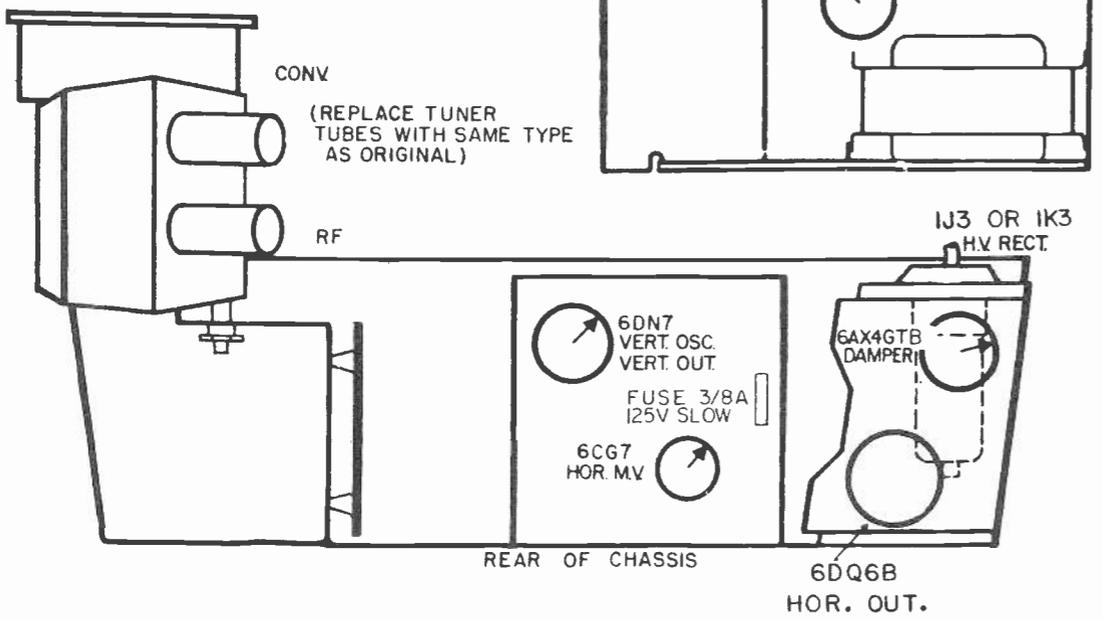


AIRLINE
 TV Chassis
 Models WG 1683A
 and WG2683A

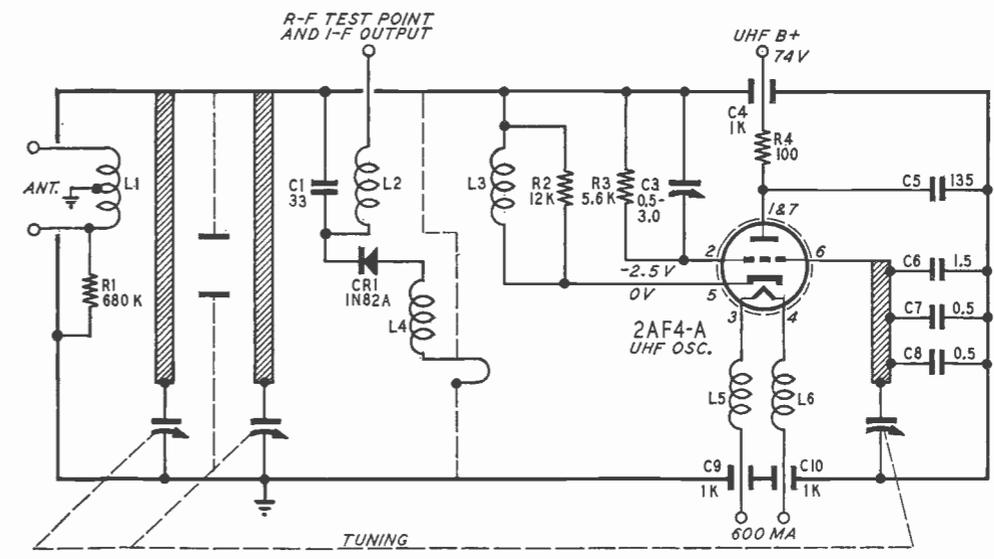
Electronic Technician
CIRCUIT DIGEST

746

More Data on Reverse Side



25A1193-5 UHF TUNER SCHEMATIC (IF UHF EQUIPPED)



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OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide band television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak to peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corners of the pulses will tend to be more rounded than those shown on the schematic diagram and the amplitude of any high frequency pulse will tend to be less.

DC SOCKET VOLTAGES

All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.

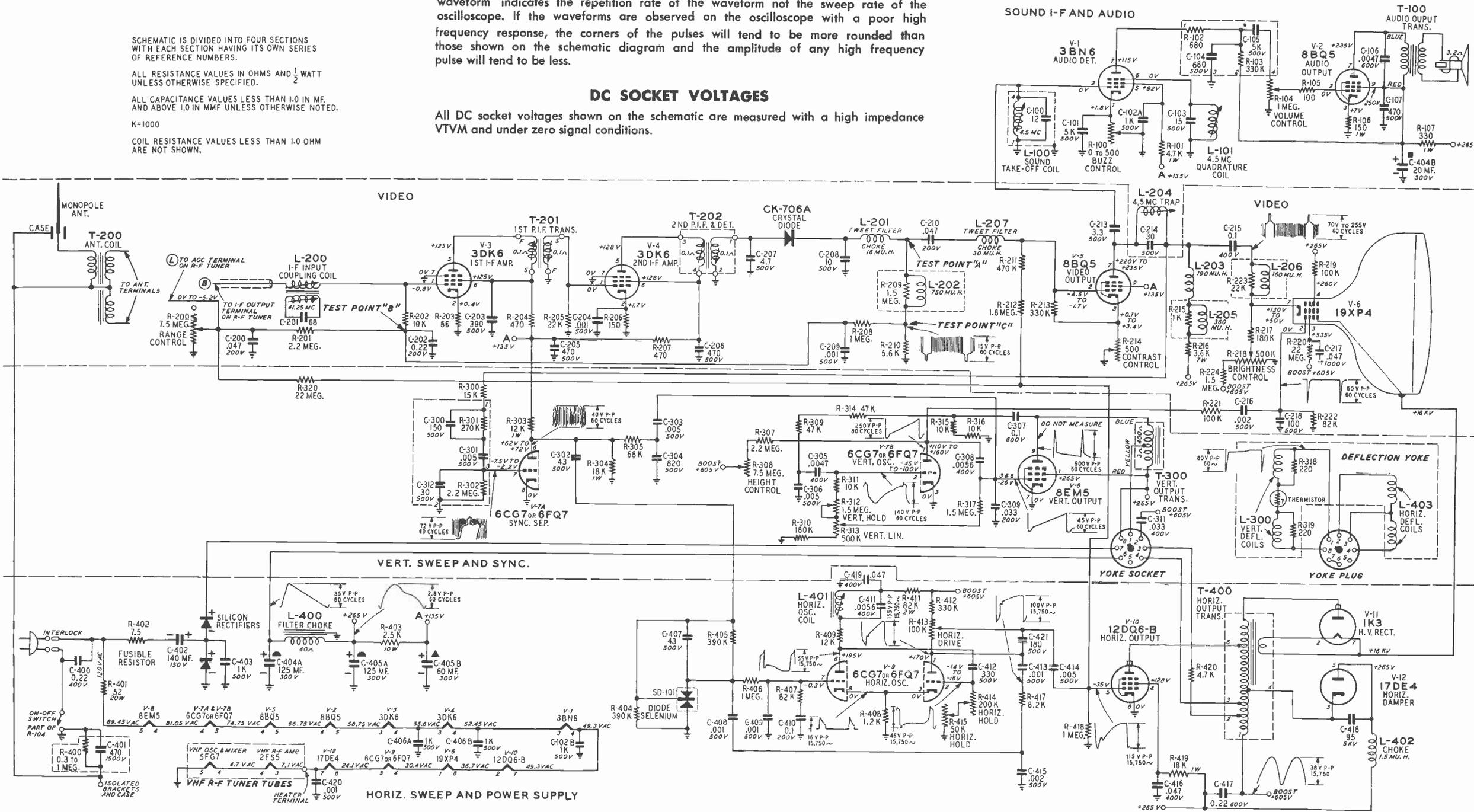
SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS.

ALL RESISTANCE VALUES IN OHMS AND $\frac{1}{2}$ WATT UNLESS OTHERWISE SPECIFIED.

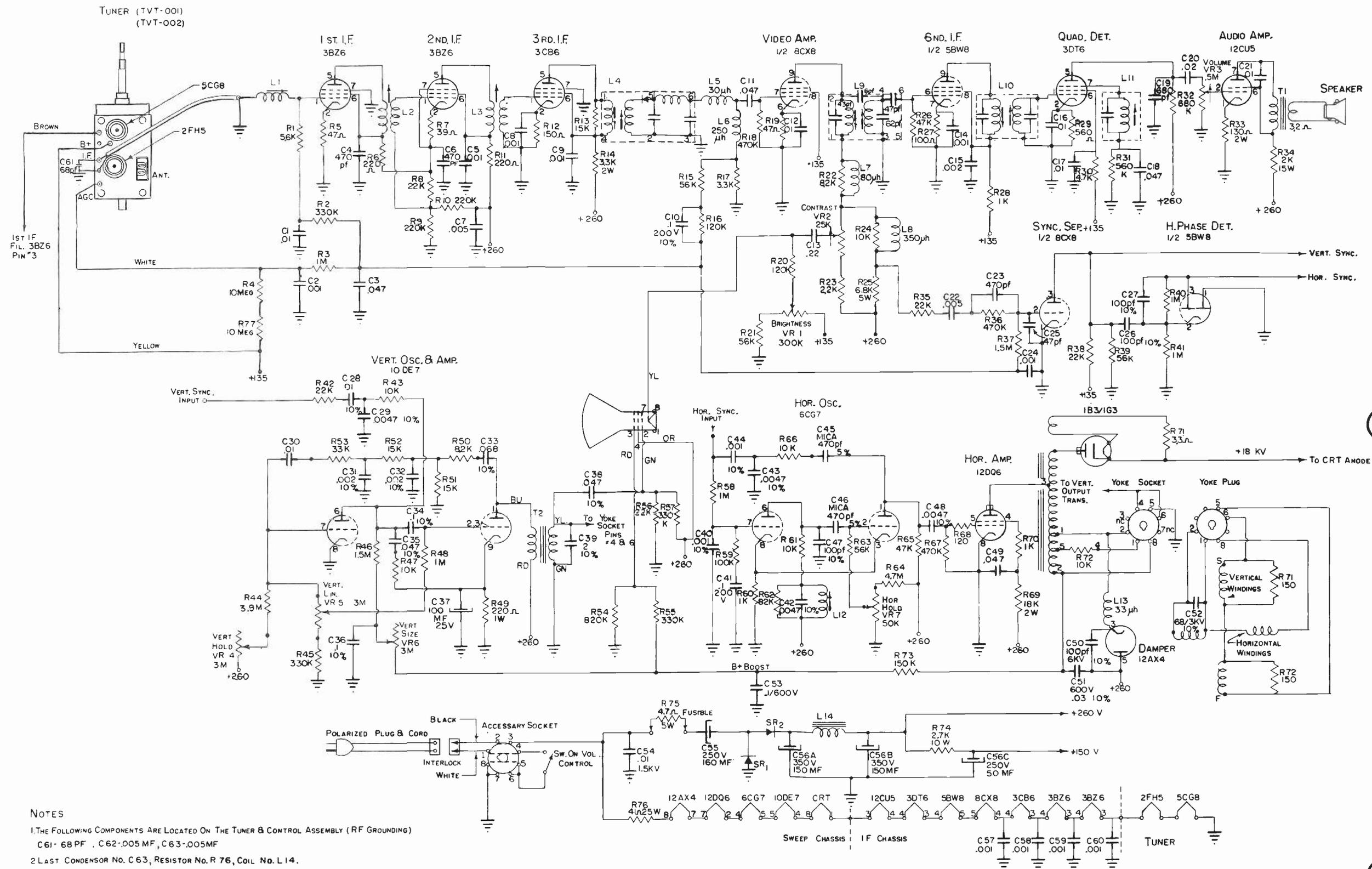
ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF UNLESS OTHERWISE NOTED.

K=1000

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.



NOTE—In UHF receivers the filament voltages in the tuner and above the tuner in the heater string will be slightly greater because of the filament voltages of the tuner tubes.



NOTES
 1. THE FOLLOWING COMPONENTS ARE LOCATED ON THE TUNER & CONTROL ASSEMBLY (RF GROUNDING)
 C61- 68PF, C62-.005MF, C63-.005MF
 2. LAST CONDENSOR NO. C63, RESISTOR NO. R76, COIL NO. L14.

ELECTRONIC TECHNICIAN

CIRCUIT DIGESTS

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In This Issue (No. 123)

Circuit Digest Schematic No.

AIRLINE 746
TV Chassis
Models WG 1683A and WG 2683A

GENERAL ELECTRIC 745
TV Chassis
M 597 series

PACKARD BELL 748
TV Chassis
Models 23DC16

RCA 744
TV Chassis
KCS 136Y Series

SYMPHONIC 747
TV Chassis
TSL-001

WEBCOR 749
Amplifier-Speaker system
Model 4210

GROUP
123

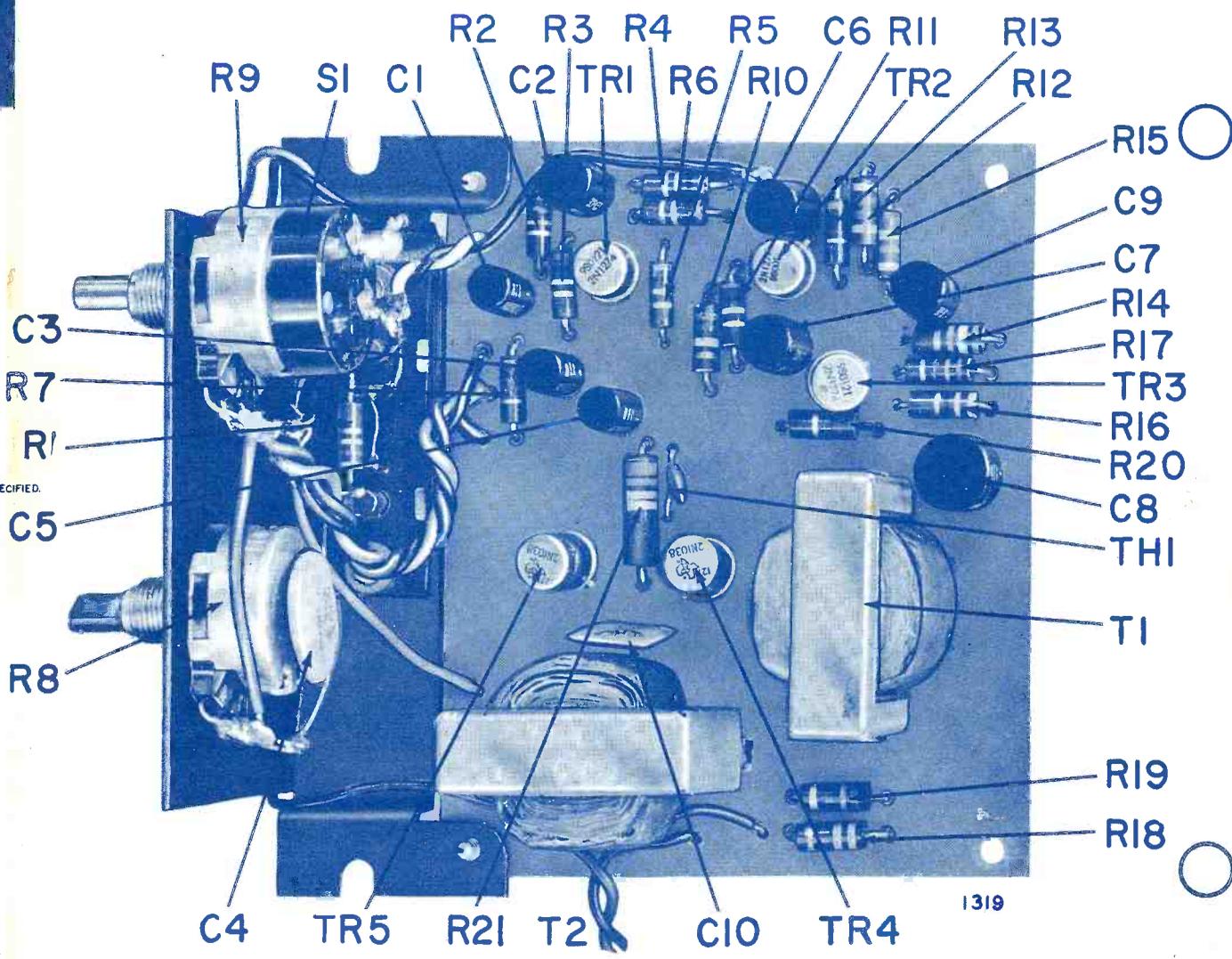
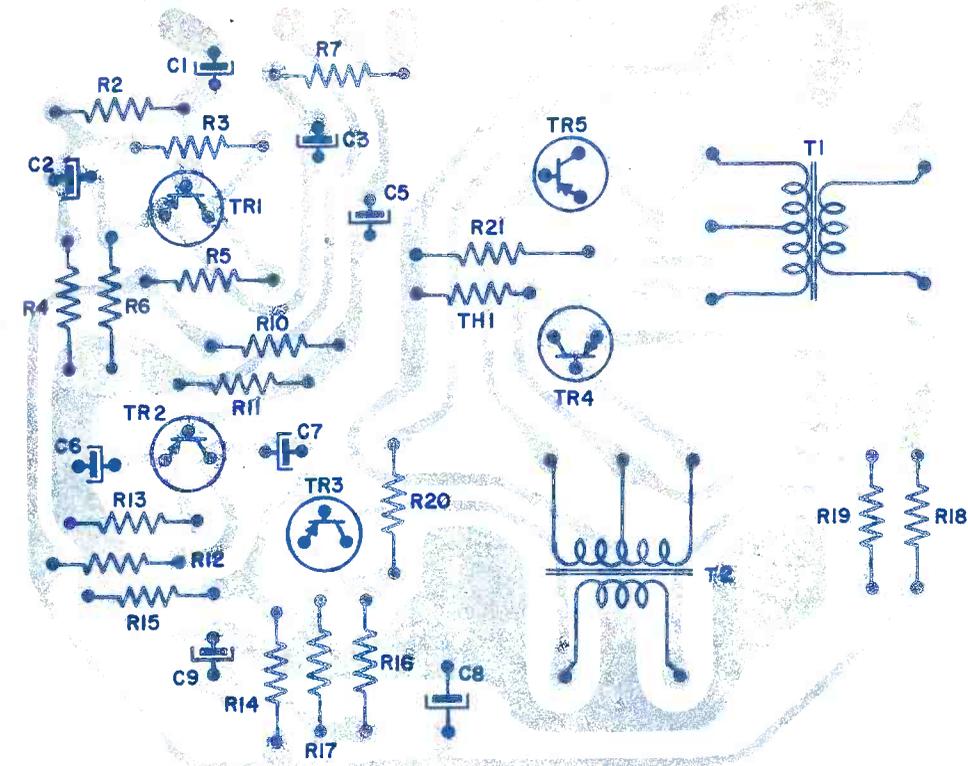
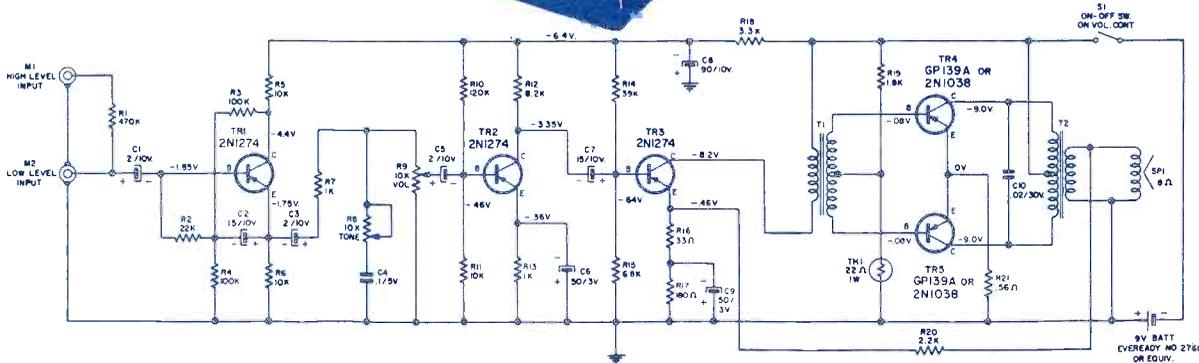
ELECTRONIC TECHNICIAN 749



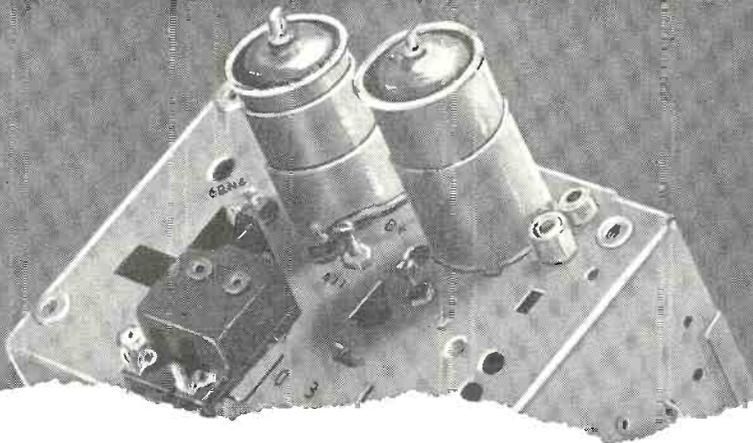
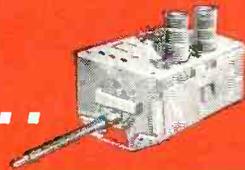
WEBCOR
Amplifier-Speaker System
Model 4210

November • 1962

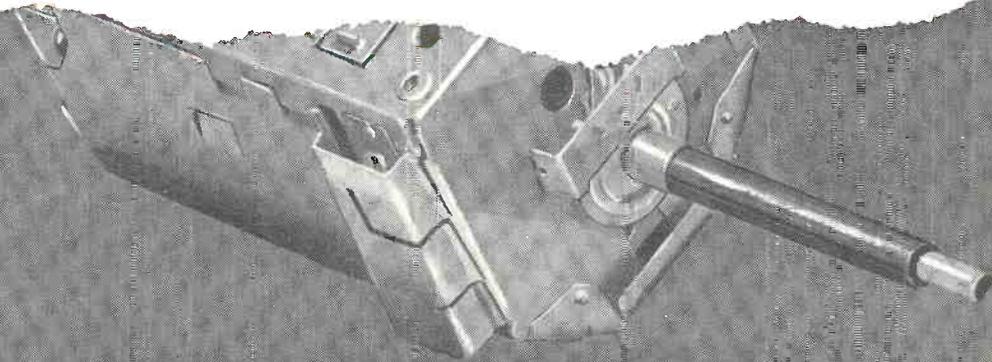
- NOTES
1. ALL RESISTORS RATED 1/2 WATT ±10% UNLESS OTHERWISE SPECIFIED.
 2. ALL CAPACITOR VALUES ARE IN MFD.
 3. ALL D.C. VOLTAGES MEASURED WITH A V.T.V.M. OF 11 MEGOHM INPUT RESISTANCE OR BETTER AND A SUPPLY VOLTAGE OF 9.0 V.D.C. WITH NO SIGNAL APPLIED.
 4. MEASURED VOLTAGES SHOULD BE WITHIN ±10% OF INDICATED VOLTAGES.



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standard kollman INDUSTRIES INC.

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... for more details circle 57 on page 50

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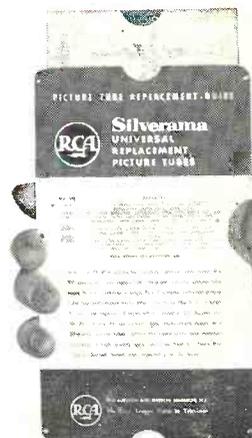
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