

16 pages

CIRCUIT DIGESTS

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TECHNICIAN



STARTING A SOUND SYSTEM BUSINESS

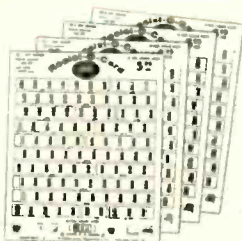
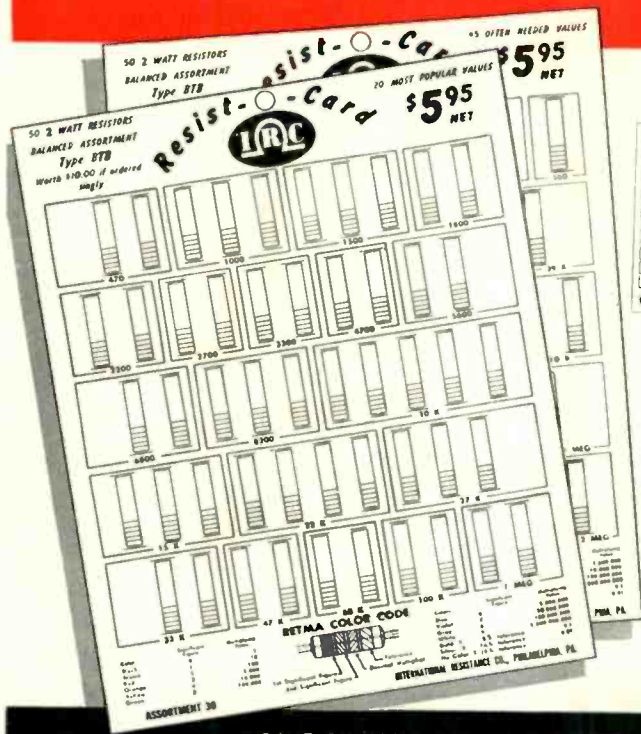
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October • 1956

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NEW Resist-O-Cards now offer IRC Type BTB resistors in two balanced assortments meeting 2-watt replacement needs. See your IRC distributor ... save time and money!

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TECHNICIAN & Circuit Digests

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OCTOBER, 1956

FRONT COVER

The world of home and commercial sound is a world of opportunities for electronic technicians. Public address systems, phonographs, tape recorders, intercoms, hi-fi sets and other audio devices are a natural for technician sales and service. For details on how to start a sound system business, see article starting on page 38.

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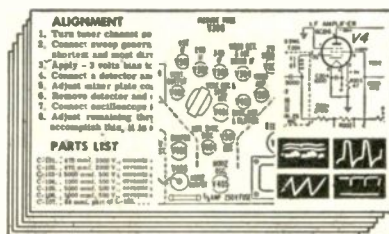
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NEW 16-PAGE G-E 108 PROMOTION



Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

CATALOG OFFERS AND TV-SERVICE AIDS!

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Included are a dozen signs, decals, and streamers for your store identification alone—among them a brand-new Sign-a-rama that flashes different colors three times every two seconds. There are 18 attractive mailers and postcards to

pull business . . . 19 copy-tested ads in mat form . . . many doorknob hangers, "out" cards, and other sales-builders. The catalog also lists service helps galore, from job tickets to 10 ingenious mechanical aids to faster, more economical service work.

Pick up your copy of the catalog from your G-E tube distributor . . . or, if your location makes this inconvenient, write direct to General Electric. Just clip, fill out, and mail the handy coupon below! *Electronic Components Division, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC'S 108 BUSINESS AIDS INCLUDE—

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Window valances & streamers

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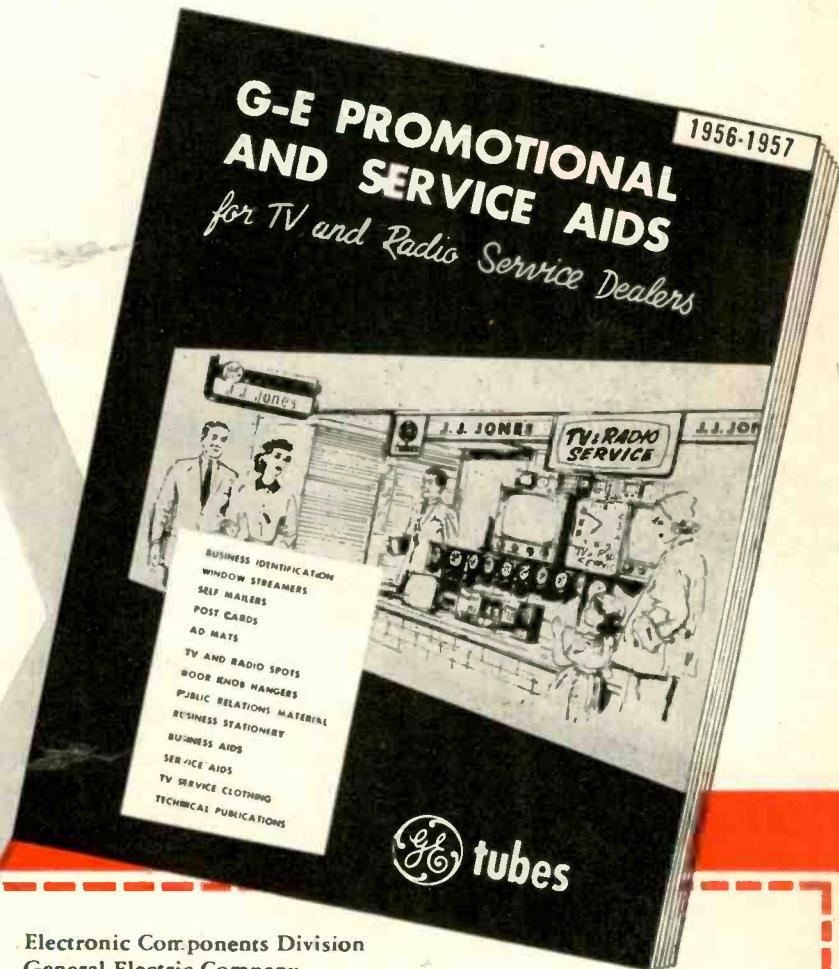
- Postcards
- Ad mats
- TV and radio spots

Public-relations helps:

- Doorknob hangers
- Children's Color Book
- Customer TV service reports
- Giveaway booklets

Business stationery

- Business aids
- Service aids
- TV service clothing
- Technical publications



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WONDERFUL!

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This finish is *not* a surface paint, but an exclusive method developed only by Ward.

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A MUST for Accurate TV Service at a Profit



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...without removal from cabinet

At last, a multi-purpose instrument that simplifies service and saves you time and money. Completely eliminates the task of removing chassis or picture tube from the cabinet for trouble shooting. Tells whether trouble is in the chassis or picture tube. Permits checking new CR tubes without removal from original cartons. The Philco "Service King" is available now at your Philco distributor.

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Write for FREE brochure on the complete line of Philco test equipment today.

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ads building new
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model no.	description
350F	Mahogany & Gold
350	Blond & Gold
350E	Ebony & Silver



Tremendous consumer response emphasizes desire for better TV antennas . . .

and there are no antennas on the market today that compare with these fabulous new Channel Master models.

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model no.	description
350	7-element
350-2	7-element stacked
351	5-element
351-2	5-element stacked
352	3-element
352-2	3-element stacked



CHANNEL MASTER CORP.

ELIZAVILLE, N. Y.

WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES

LETTERS

To the Editor

Tall Tube Tale

Editor, TECHNICIAN:

I got a bang out of the story in your July "Editor's Memo." Your idea of not taking things for granted too readily brought to mind an incident that occurred back in the early thirties when the micro-synchronous and super-sonics were starting to be pushed aside by the super-heterodyne. I was handling Sparton which had been reluctant to switch over to the new idea, or for that matter screen grid tubes. A friend wanted to buy a radio, so I put a small Sparton set in on demonstration. When I called at his home I found the opposition had stuck in an RCA and the wife was practically sold on it. After a lot of alibis, the husband came up with "anyway this set has those new super-hydrogen tubes which your set hasn't got."

This floored me momentarily, but realizing my sale was a gone goose, I decided not to be outdone. "No," I said, "Sparton always considers they have too high a reputation to fool around with these new fangled ideas until they have been proven. After a short time this hydrogen evaporates and has to be replaced. It's an expensive item." I could see he was skeptical so I added, "See for yourself." I took him behind the RCA and showed him how the grid caps were just cemented on. They could be taken off to replenish the hydrogen. This convinced him, and since the wife was determined to have the RCA, I now had the family row well in progress. I got out quickly. A few days later I met this man and we both had a good laugh.

O. H. CLEARWATER

Muenster, Sask., Canada

Scope for Sync

Editor, TECHNICIAN:

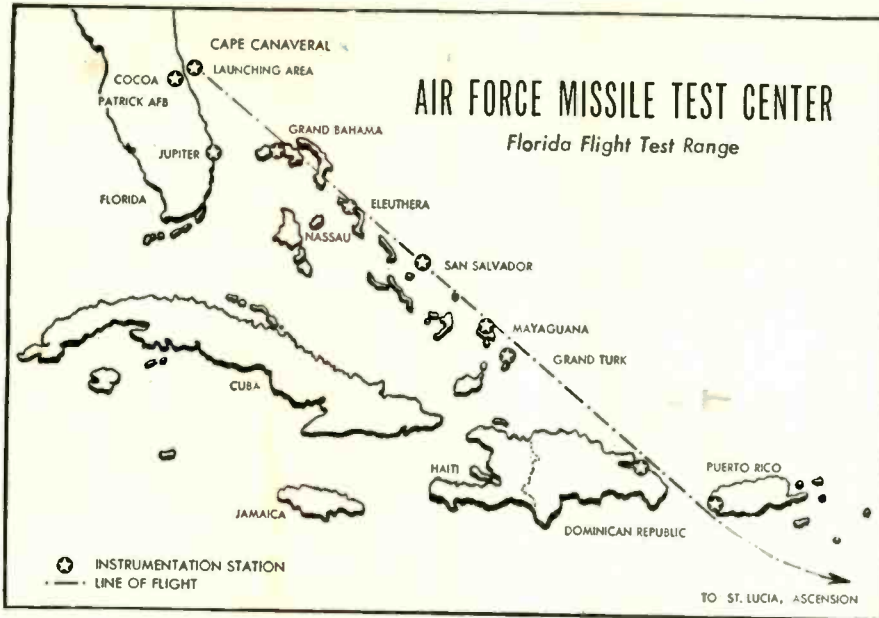
I learned much from the article in August TECHNICIAN written by H. P. Manly on "Troubleshooting in the Horizontal Sweep Section." I have a question that I would like to have answered by Mr. Manly. Recently I worked on a set that would drift out of horizontal sync to a point that the H. hold would become ineffective when the set warmed up. I wonder if the scope could have been utilized to locate the exact circuit where the trouble existed? Would the horizontal waveform show normal up to the stage where the defect existed? Could the scope have been used as a signal tracer to the defective stage?

W. T. WILLIAMS

Port Arthur, Texas

• See article "Scope Traces Horizontal Sync Failure" by H. P. Manly coming up in next month's issue. Ed.

(Continued on page 12)



RCA

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In Guided Missile Test Instrumentation For Electronic Technicians

At the following locations

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Engineering development technicians	Radar	Timing
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These positions are located on the Islands shown on the map above. Salary, 30% differential, meals and lodging furnished. Return to U.S. every 3 months.



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Mr. H. C. Laur
Technical Employment, Dept. N-32K
Missile Test Project
RCA Service Co., Inc.
P.O. Box 1226, Melbourne, Florida



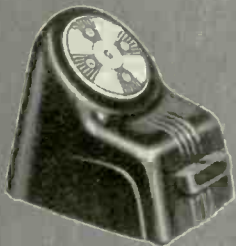
RADIO CORPORATION of AMERICA



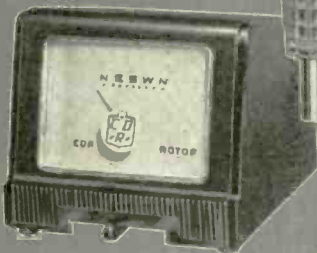
AR 1 and 2



AR-22



TR-2



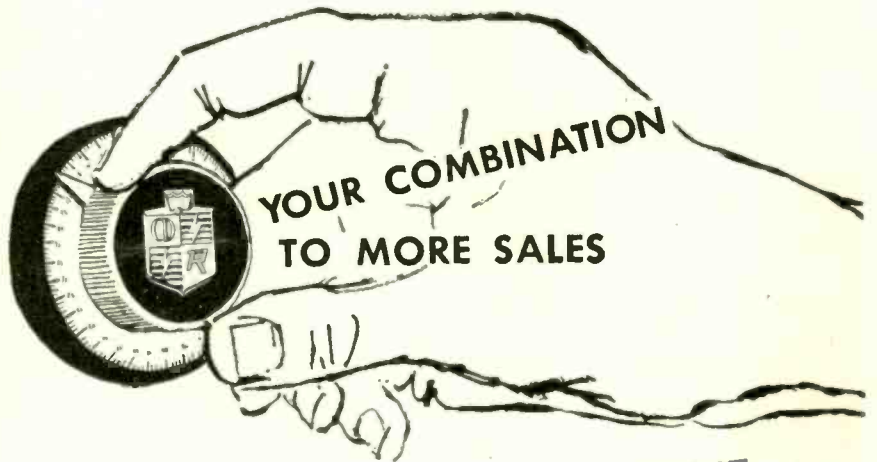
TR-4



TR 11 and 12

Everything You Need for Profitable Rotor Sales

CDR ROTORS have EVERYTHING



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... a model for every need... whatever the application there is a CDR Rotor that meets the situation best!

PRE-SOLD FOR YOU!

The greatest coverage and concentration of full minute spot announcements on leading TV stations in every major rotor market is working for YOU...pre-selling your customers!

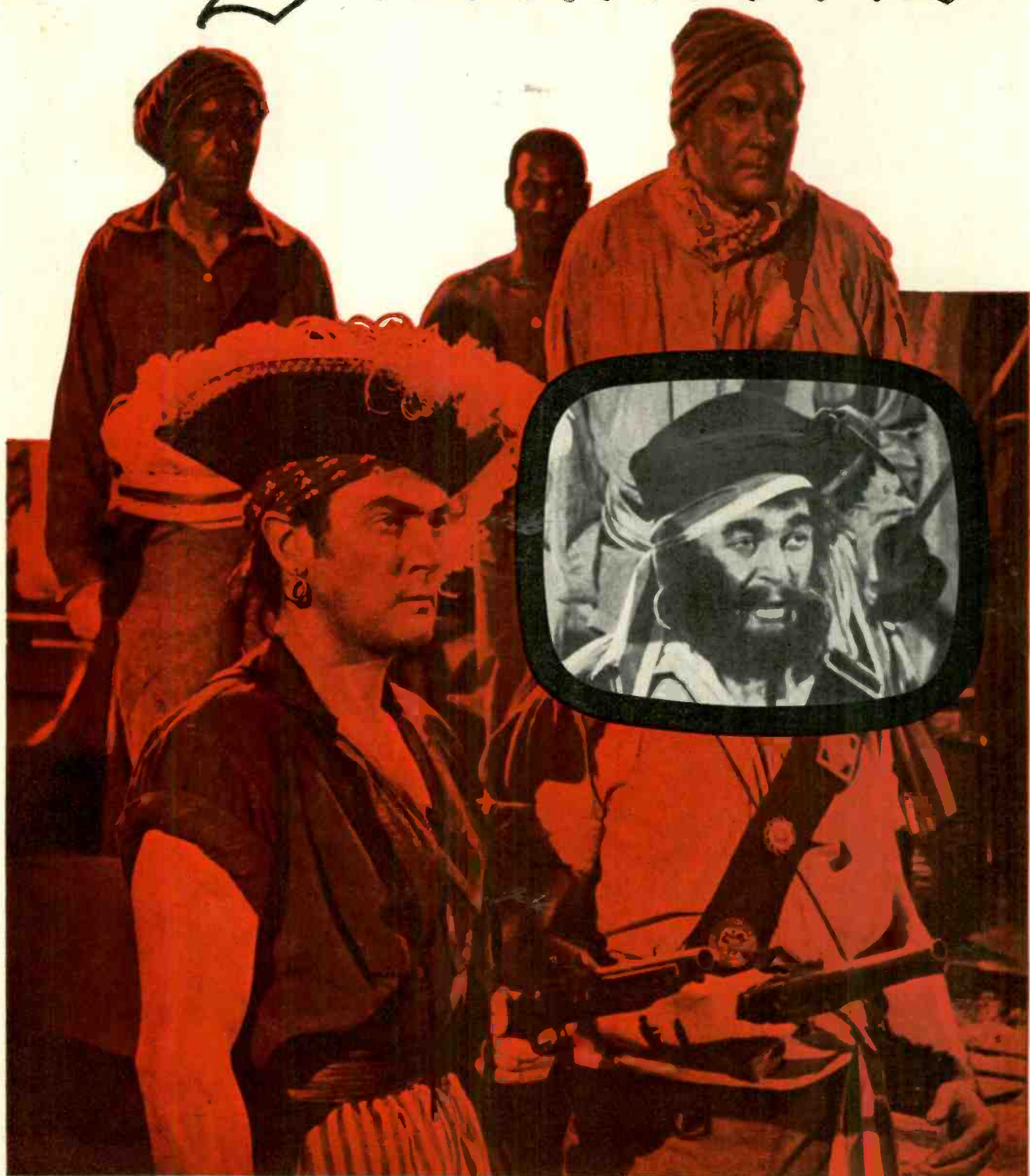


CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.



THE RADIART CORP.
CLEVELAND 13, OHIO

The "Buccaneers"



Sylvania's new TV show will be televised nationally over CBS stations every Saturday night. Check your local listings for time and station.

new Sylvania TV SHOW

launches a dramatic new advertising program for TV Service Dealers



Biggest TV news this fall for you as a service dealer is Sylvania's new adventure thriller "The Buccaneers." Packed with exciting pirate lore, Sylvania's new TV show offers entertainment for the entire family.

And it offers you a brand-new opportunity to build your service business through a dramatic new consumer advertising campaign, "TV SMOG."

Millions of TV set owners will be reminded that TV Smog comes from old worn out picture tubes and receiving tubes. And they'll be reminded to see the service dealer who displays the Sylvania Radio & TV service sign for a TV Smog check-up.

To supplement this powerful TV advertising, a complete campaign in *TV Guide* magazine will also steer the TV set owner to you for a TV Smog check-up.

Get behind this TV Smog promotion: identify yourself as the dealer in your neighborhood who features "Silver Screen 85" picture tubes and Sylvania's quality brand receiving tubes.

And keep in touch with your Sylvania distributor for new Buccaneer promotion pieces and premiums.

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

LIGHTING • RADIO • ELECTRONICS
TELEVISION • ATOMIC ENERGY



SYLVANIA



... get a "TV SMOG" rating on your set



... the serviceman who displays this sign



... will install a genuine "Silver Screen 85"



... and replace worn-out receiving tubes with Sylvania's quality brand

... another
MALLORY
service-engineered
product



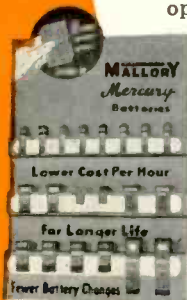
MALLORY *Mercury* BATTERIES...

leading line for transistor portables

Cash in on the growing battery replacement market for transistorized portables—with the line that offers you an unequalled combination of prestige and profit.

Mallory pioneering of mercury batteries helped make these new miniature radios possible. Leading set makers supply Mallory Mercury batteries in original equipment... recommend them to set owners, too!

Mallory performance builds business, assures repeat sales and profit to you. They're the value leader, because they cost less per hour of operation.



SPECIAL INTRODUCTORY BATTERY MERCHANDISER

Because of the remarkable shelf life of Mallory Mercury Batteries, now for the first time you can stock batteries without fear of inventory loss. This introductory assortment covers all popular transistor portables. No extra charge for the display unit! Order yours today!

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MALLORY

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- Controls
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- Switches
- Resistors
- Rectifiers
- Power Supplies
- Filters
- Mercury Batteries

LETTERS

To the Editor

(Continued from page 8)

Multivibrator Frequency

Editor, TECHNICIAN:

We are very interested in Bob Eldridge's article on horizontal instability in the July issue. We have some questions. He says that the natural frequency of the multivibrator should be higher than 15,750 with the ringing coil shorted. The question is, how can you determine that this frequency is higher than the natural frequency? It is true that with the pix out of sync, the lines slant one way when the frequency is high and slant the other way when it is low. Or at least we think this to be the case.

He says that control voltage on grid of first section of oscillator should be zero or minus (contact voltage) with AFC removed. Aren't there some sets with a bias on this grid instead of it running at zero? If this were not the case, then in all cases grounding this grid would eliminate all difficulties ahead of the oscillator.

V. I. STEEN

Vic's TV Service
Canon City, Colo.

• Author Eldridge replies: "1. The natural frequency of the multivibrator is determined by the R-C constant, R being the grid leak and usually including the hold control. To make the oscillator run high we therefore first adjust the hold to correct sync, then turn the control in such a direction that the grid resistance is reduced. It follows that if there are slanting lines on the screen, the frequency is higher than 15,750 if the number of lines increases as the resistance of the control is reduced.

"2. Except for the Stromberg-Carlson 521 series (TECHNICIAN Circuit Digest 151), which has a rather unusual circuit using variable bias on the first section of the oscillator/control tube, I do not know of a set using a multivibrator which has a bias applied deliberately to this grid. If there are some sets using bias, it will be easily apparent from the schematic that this is the case."—Ed.

Civil Defense Labels

Editor, TECHNICIAN:

TV-radio technicians can perform a public service and earn business good will in the process, by affixing Civil Defense radio dial labels to the two CD frequencies, 640 and 1240 kc, on sets which come in for repair. I have ordered a supply of these labels from our state CD agency, which supplies them free.

JOHN L. MANCINI

John's Radio & TV Service
Winthrop, Mass.

Article Reprint

Editor, **TECHNICIAN**:

The Board of Directors of MARTS (Milwaukee Association of Radio & Television Servicemen) was very favorably impressed with an article "You and the Law" which appeared in your July 1956 issue of **TECHNICIAN**. They feel it is something that all its members should read and would like permission to reprint it in its house organ MARTS NEWS.

HELEN BESSERT
Editor, MARTS NEWS

Milwaukee, Wis.

• We are pleased to extend reprint permission. Any group wishing to reprint articles from **TECHNICIAN** should make written requests.—Ed.

"Crawler" Makes Hair Crawl

Editor, **TECHNICIAN**:

The hair crawls right up the back of my neck when I see the term "night crawler" used so freely in your articles to apply to part time servicemen like myself. A lot of us would like to have enough capital to open a fancy full time shop. Your publication should have a better word for techs who are trying to do good work with limited capital and must do this work part time for the present. We should be judged by the quality of our job, the honesty of our effort and the fairness of our price. I think you have a great publication.

CHARLES R. HARBAUGH

Whiteland, Ind.

Advantages of UHF

Editor, **TECHNICIAN**:

There is no longer any reason why UHF could not completely replace VHF for TV broadcasting, as the FCC has proposed. The argument in favor of VHF is the ability of a VHF station to serve a greater area than a UHF outlet. However, this is overcome by the fact that say two UHF stations could be assigned to cover the same area. This would appeal to retail advertisers who have no need to advertise in the second area ordinarily covered by the one VHF station. By moving all TV to UHF, there is a potential of 2500 stations in the same area that could be served by only 250 VHF stations without adjacent channel or co-channel interference. And UHF stations are less expensive, producing more ghost-free pictures. Furthermore, some of the VHF frequencies thus made available could be assigned to the mobile services (police, taxi, aircraft, etc.) to relieve the overcrowded conditions in these services, which can not use UHF to the same advantage TV can. We have 5000 kw UHF transmitters that can cover a 50-mile radius. The U.S. economy was built on competition, so let's have UHF instead of VHF.

CHARLES R. MADUELL, JR.

Delta Electronics
New Orleans, La.

... another
MALLORY
service-engineered
product



for value in
"wire-wounds"
make it
MALLORY

Take your choice of these Mallory wire-wound resistors, and you're sure of long service and stability on any replacement job.

Mallory vitreous enamel resistors are protected against moisture and corrosion by a special non-porous, non-alkaline vitrified coating... are wound on a high-stability steatite core. In both fixed and adjustable types, 5 to 200 watts.

Mallory axial lead resistors, famous for cool operating and easy mounting, are coated with a dense, non-corrosive cement that keeps moisture out, and assures good heat dissipation. Leads can't pull away from the winding. 4-watt and 7-watt ratings, in a full range of resistance values.

Order now—from your nearby Mallory distributor!

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MALLORY

- Capacitors
- Controls
- Vibrators
- Switches
- Resistors
- Rectifiers
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- Mercury Batteries

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

NEW EDITION!

Editor's Memo

As soon as I walked into my friend's service shop, I could see I was in for something.

"Al, you're a man of the world," he said, buttering me up for the kill. "I'd like to give you a sex quiz."

And with that he proceeded to ask me to define the words sexagesimal, sextan and sextile. As you might have guessed, this "sex" has nothing to do with the Marilyn Monroe (or Clara Bow, if you have a long memory) variety. It relates to the numbers 6 and 60. Sexagesimal means based on the number 60; sextan is a fever characterized by paroxysms every 6th day; and sextile pertains to heavenly bodies 60° distant from each other.

Well, I got one out of three right, and 33% flunks the test. But it got me thinking that there must be plenty of tricky words to help fight my pal's fire with fire. So that night I burned the midnight oil (110 volts ac, that is), and came up with a few words which evened the score. Here are three of them. If you can get all of them right, "you're a better man than I am Gunga Din."

What is a demivolt?

What is the function of a circuit rider?

What is the meaning of O.H.M.S.?

The definitions are presented below . . . just turn the page upside down.

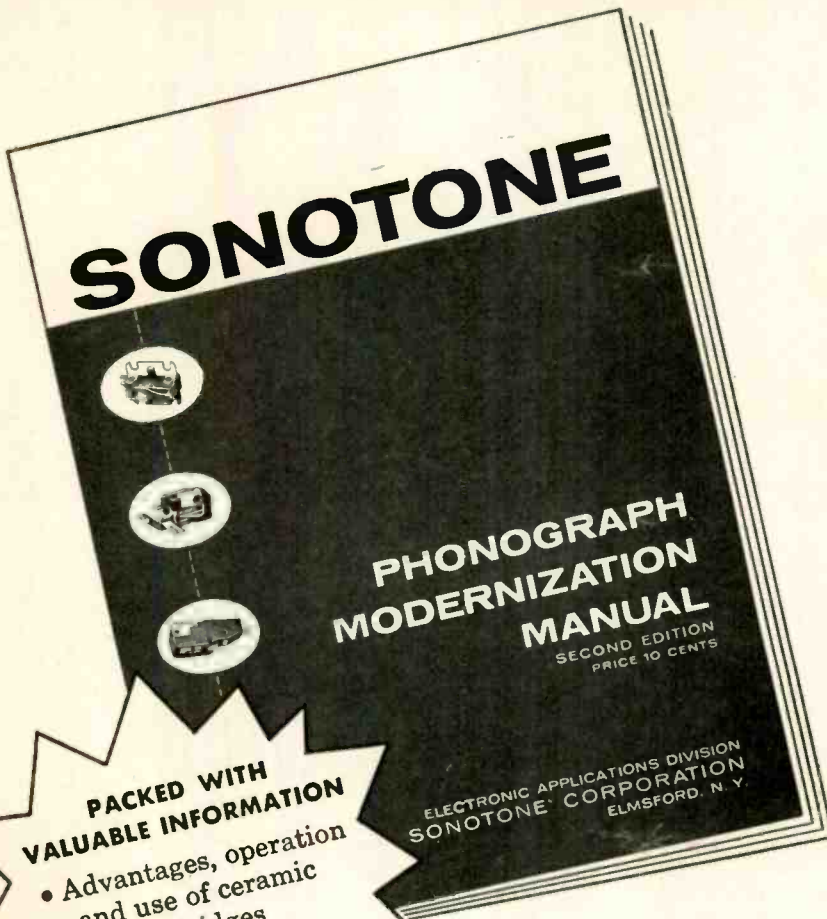
But before you do, while on the subject of words, I'd like to note that the tech who understands what people *mean*, instead of what they *say*, has the best chance for business success. Folks use a facade of words which give them an "out," making it easier to express what they mean.

Example: Customer saying "I think it's just one little part or tube causing the trouble" probably means "I hope you won't charge much."

Of such subtleties are human relations and gray hairs made.

As you might have guessed from the sexless meanings of the three words starting with s-e-x, the three word teasers I came up with are not at all electronic.
Demivolt is not half of an electrical volt. It's actually one of seven artificial movements of a horse, consisting of a half-turn with the fore leg raised. It could also be a half-turn in fencing.
Circuit rider does absolutely nothing on an electronic circuit. The word describes a minister who rides from place to place to preach.
O.H.M.S. does not refer to electrical resistance, or ohms. It's simply an abbreviation of Oh His (or Her) Majesty's Service.

Al Forman



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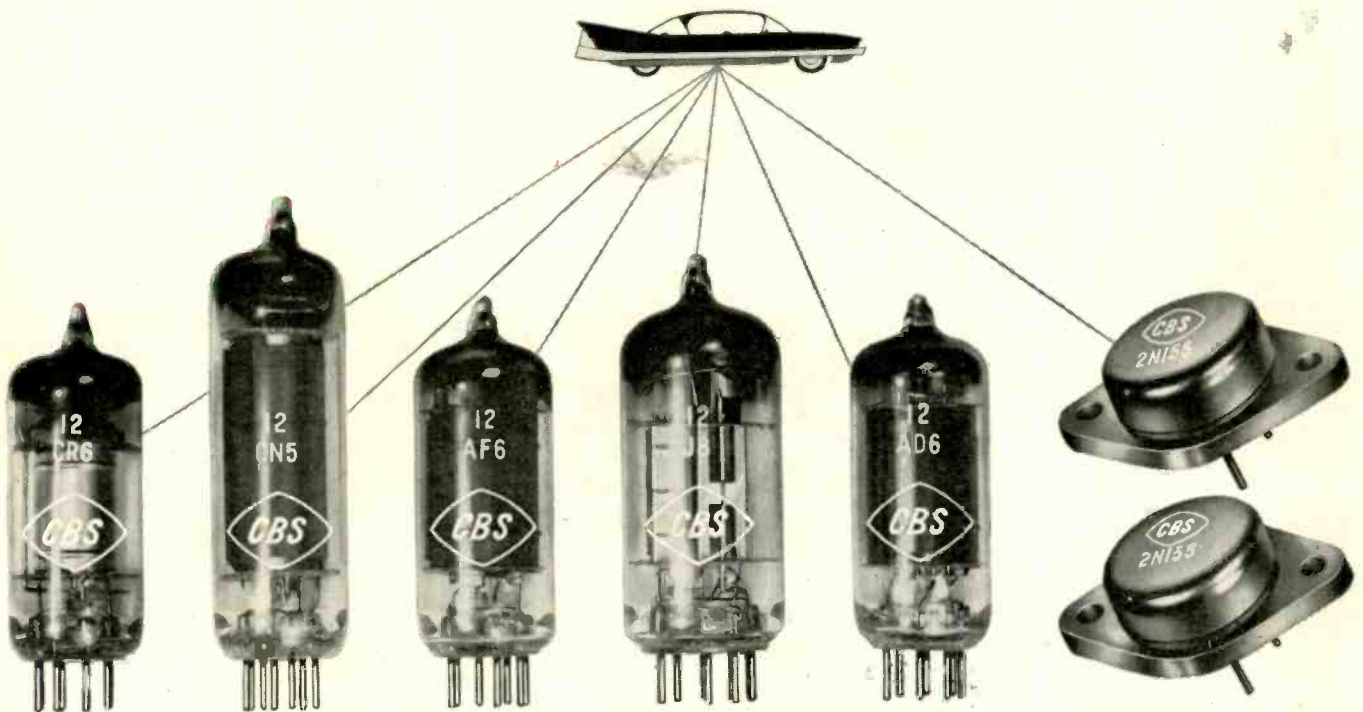
CITY _____ ZONE _____ STATE _____

**a look at
the latest in
.....
AUTO RADIO**

Here are some typical CBS tubes and transistors you will be discovering in 1957 "hybrid" auto radios. They combine the advantages of new CBS power output transistors and modern CBS low-voltage mobile radio tubes. All power for them is drawn directly from the 12-volt battery; the vibrator power pack is eliminated. Both the tubes and transistors are especially designed for hybrid auto radio.

As the 1957 automobiles come into use this fall, you will find CBS ready to supply you with these new tubes and transistors. That's only natural. CBS pioneered the first auto radio tube kit. CBS has specialized for years in supplying auto radio tubes to leading set manufacturers. And now CBS advanced-engineering pioneers again with new hybrid auto radio components.

Whether it's tubes or transistors — whatever you need for auto radio — old, modern, or ultramodern . . . make it CBS. Replace with the same tubes and transistors the original equipment designer specifies . . . CBS.



tubes • semiconductors

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through Advanced-Engineering*

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BEST FOR COLOR TEST!

There's just one way to test the new color TV sets... WITH NTSC COLOR PATTERN. That's what Hycon's Model 616 Color Bar/Dot Generator offers... all standard colors, sequences and patterns easily selected and graphically shown in actual color right on the control panel. For color TV, get ready... GET HYCON!

Another Hycon test help...



MODEL 622 5" SCOPE
with automatic triggered sweep, first really new scope development in years. Fewer adjustments, no sync problems.

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616 and 622

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P.O. Bin D Pasadena, California
Please send me the new model 616 and 622 catalogs.

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City _____ State _____

Audio education has come to the public once credited with having "a glass eye and a tin ear." You don't believe it? Then listen to this slice-of-life overheard at a hi-fi showroom: "How many cycles does it have? Does it have modulation?" asked the sprightly young lady.

There are some folks, of course, who become de-educated. No better example than the owner of a small manufacturing plant who wanted to install a loud paging system with high distortion. His reasoning, or whatever you want to call it, was that the distortion would be sufficiently irritating to his workers' ears that they would be sure to hear the message. Takes all kinds to make a world.

Chapel bell sounds will ring out at 43 Air Force bases around the world soon, but the sonorous notes will come from Stromberg-Carlson electronic carillons (few hundred pounds) instead of cast bells (few tons). The equivalent sounds are produced by amplifying the result of plastic hammers striking small metal tone bars.

"A noble experiment which did not work" is the way Jensen Mfg. VP Ralph Glover describes the firm's two-step wholesaler-to-dealer distribution plan. After a two-year trial, attempting to extend sales in small communities, the two-step plan is being given up in favor of the conventional program.

Anyone near New York City who missed the High Fidelity Show at the New York Trade Show Building, Sept. 27-30, should have his ears examined. The 95 participating manufacturers had marvelously interesting (though sometimes too loud) displays.

DON'T MISS DEPT. The article "Starting a Sound System Business" in this issue.

CLIP THESE
FOR REFERENCE

NEW

HOTPOINT TV TUBE CHARTS

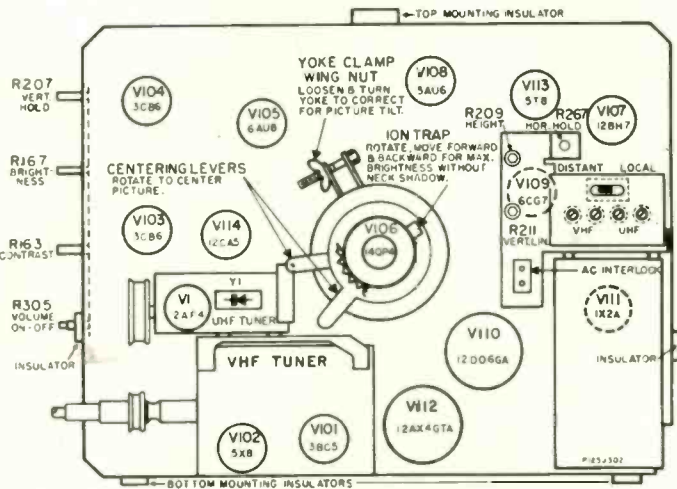
Hotpoint TV, America's newest major TV line, is now in the stores.

Complete service information is now available from Hotpoint TV Distributors. If you have not yet ordered it, these tube charts give you basic service information for use until your complete material arrives.

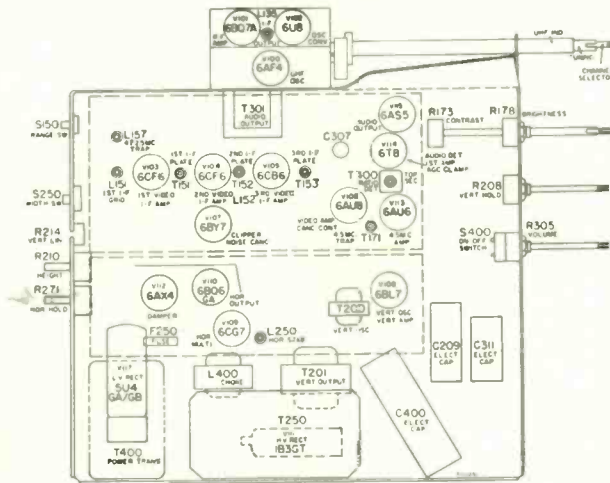
Published as a service
to servicemen by

Hotpoint Co.

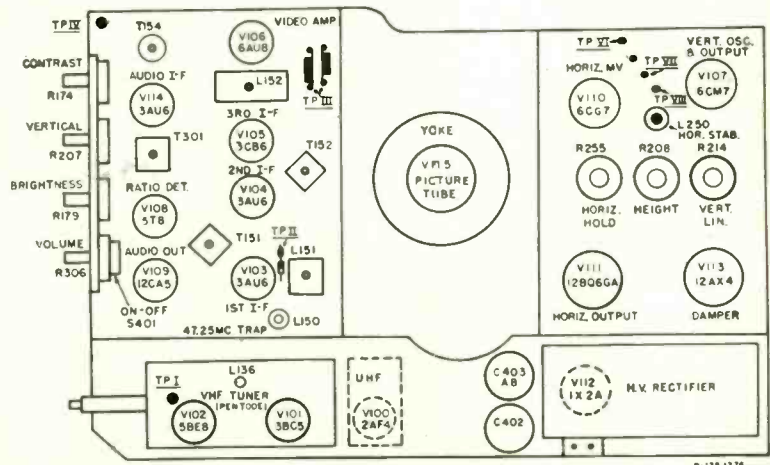
(A Division of General Electric Company)
5600 West Taylor Street
Chicago 44, Illinois



CHASSIS HS-Q-56—Covers Models 14S201, 14S202, 14S203 in VHF and UHF models.



CHASSIS HS-U-56—Covers Models 21S401, 21S451, 21S452, 21S501, 21S502, 21S551, 21S552, 24S801, 24S802 in VHF and UHF models.



CHASSIS HS-MM-56—Covers Models 17S301 and 17S302 in both VHF and UHF models.

New Books

CLOSED CIRCUIT AND INDUSTRIAL TELEVISION. By Edward M. Noll. Published by The Macmillan Co., 60 Fifth Ave., New York 11, N.Y. 230 pages. Paper cover. \$4.95.

Because of the extraordinary growth of TV for home entertainment, attention has been focused justifiably on the broadcast phase of TV. However, closed circuit TV is starting to grow substantially, and we may expect this phase to be exploited more and more in the coming years. This book lays the groundwork for technicians who will have to become more familiar with the transmitting end of TV to reap the servicing benefits. After a short review of present applications in factories, railroads, schools, operating rooms, banks, etc., the author presents the technical phase of picture transmission, scanning process, camera tubes and circuits, and various commercial systems. This informative volume fills an important need in the TV industry.

TRANSISTORS HANDBOOK. By William D. Bevirt. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N.Y. 410 pages. Hard cover. \$9.00.

One of the most comprehensive reference works on transistors, this book covers everything from characteristics to circuit analysis, pentode transistors to phototransistors, amplifiers to oscillators. Detail examination of many applications such as radios, TV receivers, computers and instruments is offered. About the only thing lacking is sufficient material on transistor servicing, but in all other respects this is a text of very considerable value.

TV TROUBLE TRACER. Prepared and published by Harry G. Cisin, Amagansett, N.Y. 48 pages. Paper cover. 50¢.

Covering some 70 common TV troubles in 40 categories, this concise volume speeds the location of defective tubes. One tube layout for each manufacturer's key 1956 chassis, said to represent 1200 models, is integrated with brief symptom-cause-remedy descriptions. Each tube is labeled by the kind of effect it has on the set's performance.

THE WORLD OF MATHEMATICS. By James R. Newman. Published by Simon and Shuster, 630 Fifth Ave., New York 20, N.Y. Four volumes, 2535 pages. \$20.00.

It is not at all unusual for advanced technicians to be highly interested in mathematics, particularly when presented as fascinating reading instead of dull formulas. These absorbing volumes are perhaps the best on the subject published to date. Here are some of the topics discussed: Mathematics and Logic; Laws of Chance; Can Machines Think?; Mathematics in Warfare; and many others.

(Continued on page 20)



from **MAINE**
to **CALIFORNIA**

Servicemen everywhere are acclaiming the outstanding performance of Aerovox "DURAMICS"—ceramic-cased tubular capacitors. No matter what the weather conditions... hot-and-humid or cold-and-damp... these superior capacitors have provided outstanding performance without costly call-backs.

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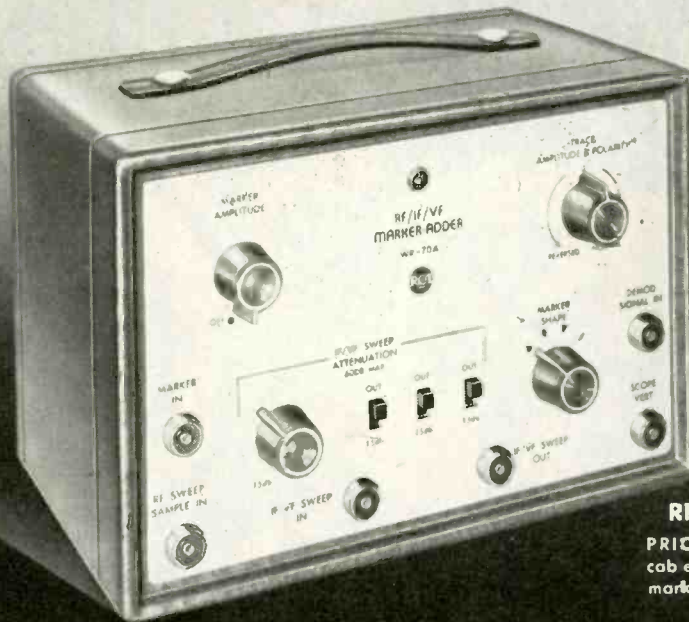


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**RCA WR-70A
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PRICE...\$97.50,* with four coaxial
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RCA WIDE-RANGE MARKER-ADDER

The RCA WR-70A Marker-Adder is designed for use in rf, if, and video sweep-frequency alignment of both color and black-and-white TV receivers. When used with alignment instruments such as the RCA WR-59C TV Sweep Generator, the WR-89A TV Calibrator, and an oscilloscope, the WR-70A produces narrow and distinct markers of high amplitude. Response-curve distortion is virtually eliminated, thereby simplifying trace-shape and frequency identification.

Note these important features:

- Front-panel control provides instant choice of four different marker shapes, permitting use of type of marker best suited to response curve being observed.

- Eliminates distortion of marker or of the sweep curve by the marker due to overloading of the TV receiver circuits because the marker is added to the sweep-response signal *after the sweep signal is taken out of the receiver*. The marker signal does not go through the rf, if, or vf channels of the receiver.
- Marker "suckout" by receiver circuits is eliminated—enables simple and precise alignment of traps.
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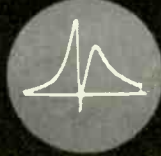
FRONT PANEL SWITCH PROVIDES INSTANT SELECTION OF FOUR DIFFERENT MARKER SHAPES



Narrow-band marker
for S-curve observation



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for tuner alignment



Negative-going marker
for trap adjustment



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You'll find it's
ALWAYS IN STOCK at your
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New Books

(Continued from page 18)

BASICS OF PHOTOTUBES & PHOTOCELLS. By David Mark. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. 136 pages. Paper cover. \$2.90.

The ability of a photocell to control a circuit in relation to the light striking the cell has been applied to many devices of definite interest to the electronic technician. This welcome book tells the whole story of these versatile photo-sensitive units, how they work and where they are used—from automatic industrial colorimeters to military sniper scopes. Clearly explained and well illustrated, this volume is to be highly recommended.

TELEVISION ENGINEERING. By S. W. Amos and D. C. Birkinshaw. Published by Philosophical Library, Inc., 15 E. 40 St., New York 15, N.Y. 272 pages. Hard cover. \$15.00.

This second volume on the subject, covering video frequency amplification, is a fairly deep technical analysis of the subject. Included are discussions on high and low frequency circuits, coupling and decoupling, phase equalizers, feedback and noise. Suitable for engineers and very advanced technicians.

ELECTRONICS DATA HANDBOOK. Edited by Nelson M. Cooke. Published by Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. 64 pages. Paper cover. 35¢.

Seldom has so much helpful data been published in so few pages. This second edition of what used to be called the *Radio Data Handbook* is an intelligent compilation of basic formulas, tables and electronic data of value to technicians and engineers alike. A small sampling of its contents includes mathematical constants, db relations, impedance formulas, wire table, tube interchangeability, RETMA color codes, log and trig tables.

MANDL'S TELEVISION SERVICING. By Matthew Mandl. Published by The Macmillan Co., 60 Fifth Ave., New York 11, N.Y. 460 pages. Hard cover. \$6.50.

This newly revised edition has been expanded to cover transistors, color TV and series filament circuits which were not included in the first edition four years ago. The same text organization has been retained, however. Some typical troubles related to the TV stages covered in a particular chapter are listed at the start of that chapter. A 12-page section cross-references symptoms with pertinent chapters, such as sound, video, sync, vertical, horizontal, power supply, antenna, etc. Three chapters are devoted to test equipment. This most informative reference book offers 314 illustrations to complement a clearly written text.

(Continued on page 22)

ASTRON "Staminized" CAPACITORS ARE moisture proof

Astron's Climatic Protection Processes Insure Real Staying-Power

Service technicians rely on a completely dependable capacitor . . . one which remains the same after the installation. And Astron builds them just that way.

Astron's climatic protection processes are many. Each designed to guard the quality of Astron capacitors against environmental and climatic conditions . . . Blue-Point® and Comet* paper capacitors molded in extra-rugged plastic . . . "SM" Minimate electrolytics, hermetically sealed in metal-cased tubulars . . . A wide range of hermetically sealed electrolytics "SM" Twist Prong . . . Hermetically sealed metallized paper, Metalite* Hy-Mets®, positive glass to metal seals.

You can put your trust in Astron, for behind each Astron capacitor is the meticulous quality control that insures you of real staying-power . . . over 10 separate production line tests are performed, plus 100% final inspection before any capacitor is sent out by Astron . . . your guarantee of top performance and call back elimination.

Remember your reputation is our business. Build it, guard it, protect it . . . Buy Astron.

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Save time, use handy Astron
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Safety Margin
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Safety Margin
"SM" Twist Prong



Safety Margin
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Blue-Point (R) Molded
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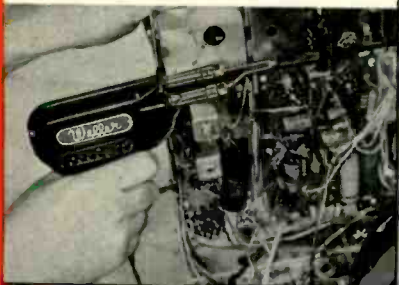
4 IDEAS

for getting even more use from your

Weller SOLDERING GUN

Your Weller Soldering Gun is the most useful tool in your shop. Service technicians find new, practical uses for it every day. Here are some time-saving applications:

1 CIRCUIT AND COMPONENT DEFECT ANALYSIS. Energized tip of Weller Gun is substituted for signal generator to find defective components in both audio amplifier section and picture circuit. Quickly uncovers thermal intermittance trouble.



2 REACHES COMPONENTS THROUGH CHASSIS CUT-OUTS. Weller Guns, with their long, thin electrodes, reach recessed tube sockets and connections through small chassis cut-outs. Pre-focused twin spotlights light up this hard-to-get-at work.



3 NEW SOLDER FOR CATHODE TUBE BASE PIN. Defectively soldered (or loose) base pin is re-sweated to remove imperfections. New solder is then applied to establish uninterrupted contact. Weller Gun is ideal for this type of repair.

4 SOLDERING BROKEN TERMINAL LEADS. Weller Soldering Gun permits controlled application of heat. Solder is maintained at correct viscosity. This enables serviceman to produce rounded joints and prevent corona discharge in high-voltage compartment.



Weller SOLDERING KIT 8100K IDEAL FOR

ALL SERVICE WORK



Complete kit for the price of the gun alone! Latest type Weller Gun — Model 8100, over 100 watts, with triggermatic heat control. 2 pre-focused spotlights. Reaches through small openings into dark places. Kit includes Wire Soldering Brush, wire-twisting Soldering Aid, Kester Solder. Top value at \$7.95 list.

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New Books

(Continued from page 20)

ADMIRAL TV TROUBLE-INDICATING TUBE LOCATION GUIDES. Edited and published by H. G. Cisin, Amagansett, N.Y. 48 pages. Paper cover. \$1.00.

Following the plan used in other books in this series, the models of Admiral sets from 1948 to 1956 are correlated with tube layouts and set faults to help locate the improperly performing tube.

TV MANUFACTURERS' RECEIVER TROUBLE CURES. By Milton Snitzer. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. 128 pages. Paper cover. \$1.80.

This is volume 8 in the popular series, covering servicing cures for sets made by manufacturers from RCA through Zenith. Like its successful predecessors, this book identifies troubles and correlates them with specific chassis and models. A very practical troubleshooting aid.

INTERNATIONAL DICTIONARY OF PHYSICS AND ELECTRONICS. Published by D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N.J. 1004 pages. Hard cover. \$20.00.

This monumental compilation of physical and electronic terms is one of the most comprehensive works of its kind. Everything from A battery to zwitterion is included. For advanced technologists, this imposing reference can be a veritable cornucopia of valuable information.

GUIDE TO BROADCASTING STATIONS, 1956-1957. Compiled by staff of "Wireless World." Published by Iliffe and Sons Ltd., Dorset House, Stamford St., London S.E. 1, England. 80 pages. Paper cover. 2 shillings, 6 pence (postage 4 pence).

This ninth edition lists some 700 European long and medium wave radio stations, plus close to 2000 short wave stations around the world running 1 kw or more. European TV stations are also listed.



"Looks like we go through the bar and music room to get at the set."

THOUSANDS OF SERVICE DEALERS

SATISFY CUSTOMERS
SAVE REPEAT CALLS

MAKE MONEY EVERY DAY with B&K



DYNA-QUIK MODEL 500 DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

Tests over 95%

OF ALL POPULAR TV TUBES*— IN SECONDS
It's easy and profitable to check all the tubes in a TV set with DYNA-QUIK—on every service call. Cuts servicing time. Creates more on-the-spot tube sales. Saves repeat calls, protects service guarantee.

DYNA-QUIK 500 measures true dynamic mutual conductance, completely checks tubes with laboratory accuracy under actual operating conditions right in the home.

Tests each tube for shorts, grid emission, gas content, leakage, dynamic mutual conductance and life expectancy. One switch tests everything. No roll charts. No multiple switching. Makes complete tube test in as little as 12 seconds. Large 4½-inch plastic meter shows tube condition on "Good-Bad" scale or in micromhos on scales calibrated 0-6,000 and 0-18,000. Used in home or shop, DYNA-QUIK is a proved money-maker!

*Including new 600 mil series tubes.

NET \$109⁹⁵

Dyna-Quik 500. Easily portable in luggage-style carrying case. Size: 15½ x 14¼ x 5½ in. Weighs only 12 lbs. Has 7-pin and 9-pin straighteners on panel.

DELUXE—PORTABLE

CRT MODEL 400

Tests and repairs
TV Picture Tubes



NET \$54⁹⁵

Deluxe CRT 400. With 4½-in. plastic meter. Weighs only 5 lbs. Luggage style carrying case. Size: 11 x 7¼ x 5".

Quickly spots and corrects picture tube troubles right in the home, without removing tube from set. Restores emission, stops leakage, repairs inter-element shorts and open circuits. Life test checks gas content and predicts remaining useful life. Grid cut-off reading indicates picture quality customer can expect. Eliminates tube transportation, cuts service-operating costs. Also saves money on TV set trade-in reconditioning. Earns dollars in minutes—pays for itself over and over again.

Proved In Use by Servicemen Everywhere.

See your B & K Distributor or send for facts on "Profitable TV Servicing in the Home" and Informative Bulletins 500-400-T



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Catalogs & Bulletins

R-R SUBMINIATURE DIODES

Line of subminiature germanium diodes are hermetically sealed and cased in glass. The diodes are available in most standard types, and also in a series of special high-conduction types signified by certain "DR" numbers. Some diodes in the DR series, for example, handle 150 v. and deliver 400 ma at plus 1 volt. Radio Receptor Co., Inc., Brooklyn, N. Y. (TECHNICIAN No. B10-35)

TELEVISION INVERTERS: Portable TV sets can be operated in moving vehicles or boats by utilizing television inverters operating from 6 or 12-volt storage batteries delivering 110 volts AC 60 cycles at output capacities of 100-150 watts. Literature available. American Television & Radio Co., 300 E. 4th St., St. Paul 1, Minn. (TECHNICIAN No. B10-36)

POWER RECTIFIERS: Bulletin MP-755 gives technical, mechanical and electrical data on automatic silicon power rectifiers made by Automatic Mfg., Div. General Instrument Corp., 65 Gouverneur St., Newark 4, N. J. (TECHNICIAN B10-57)

SPlicing KITS: 12-page color booklet containing instructions and application information for entire line of "Scotch-cast" brand splicing kits. Minnesota Mining and Mfg. Co., Dept. D6-196, St. Paul, Minn. (TECHNICIAN No. B10-37)

PANEL INSTRUMENTS AND ACCESSORIES: 12 page bulletin GEC-368H describing the features, application, construction dimensions and other data of 2½, 3½, and 4½ in. sizes. General Electric Co., Schenectady 5, N.Y. (TECHNICIAN No. B10-38)

VIDEO PROBE METER: Brochure describes the uses of a new test instrument designed to trace the video and carrier signal from the tuner to the picture tube. Illustrated with specifications and operating instruction. Research Inventions & Mfg. Co., 617 F St., N.W., Washington 1, D.C. (TECHNICIAN No. B10-39)

SELENIUM CONTACT PROTECTORS: "The A-B-C's of Contact Protection" is a bulletin explaining the operation and advantages of newly developed selenium protectors used to eliminate arcing between contacts and inductive circuits. Available from E. L. Shaw, Distributor Sales Dept., Components Div., Federal Telephone & Radio Co., 100 Kingsland Rd., Clifton, N. J. (TECHNICIAN No. B10-40)

TOOLS: Round and square-blade screwdrivers, combination-detachable, Phillips, clutch head screwdrivers, color-coded nut drivers, pliers and adjustable wrenches described with types and prices. Xcelite, Inc., Archard Park, N.Y. (TECHNICIAN No. B10-41)

SILICON JUNCTION DIODES: Bulletin DL-S 614 gives data on four new types of high conductance silicon junction diodes for use in precise signal rectification in circuits requiring high, uniform forward currents and extremely low back currents at elevated temperatures. Texas Instruments Inc., 6000 Lemmon Ave., Dallas 9, Texas. (TECHNICIAN No. B10-42)

HI FI COMPONENTS: "The A-B-C of Hi-Fi Selling" is a manual outlining market potential hi fi component products and how to promote sales through publicity and store promotion. Free American Electronics, Inc., 655 W. Washington Blvd., Los Angeles 15, Calif. (TECHNICIAN No. B10-43)

PRINTED CIRCUIT GUIDE: 12-page replacement manual covering 95 TV and radio manufacturers, listed alphabetically, with original part numbers and descriptions cross-indexed to the recommended Sprague replacements. Manual K-350 free from Sprague distributors or for 6 cents from Sprague Products Co., 65 Marshall St., North Adams, Mass. (TECHNICIAN No. B10-44)

(Continued on page 57)

SHOW ANY PICTURE or PATTERN

at any time — ON ANY TV SET



- For Servicing Black & White and Color TV
- For Merchandising and Advertising Promotions
- For Paging, Educational and Industrial Use

New MODEL 1000 **B&K DYNA-SCAN**

PICTURE AND PATTERN VIDEO-GENERATOR

3 SLIDE TRANSPARENTS ARE SUPPLIED

1. Indian Head Pattern
2. White Dot Pattern
3. White Line Crosshatch Plus One Clear Acetate

These are broadcast quality and assure high-definition TV images. You can also transmit slides of any subject you wish.

Simplify and speed servicing with this unique, new, COMPLETE FLYING SPOT SCANNER. Produces composite video and sync signal that operates any standard VHF black and white or color TV receiver. Easily reproduces standard Indian Head test pattern or any other pattern—in home, shop or store—for proper TV set alignment; enables you to make all color TV static and dynamic convergence adjustments with stable White Dot and White Line patterns. Can be used with one or more standard TV receivers or fed into master antenna system. Reproduces from any film transparency. Transmits messages typed or written on clear acetate. Size: 16½ in. long, 10⅞ in. high, 9½ in. wide. Net wt. 28 lbs. **\$199.95** NET

Model 950 Dyna-Scan Pickup and RF Generator Only

Make your own picture and pattern generator. Just connect Model 950 to any properly modified 10-inch TV set which acts as your external flying spot scanner. Size: 3½ in. high, 10½ in. wide, 5 in. deep. Complete with 3 slide transparencies and 1 clear acetate. Net wt. 5 lbs. **\$69.95** NET



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Association News

RATES Formed

The Rockland Association of Television & Electronic Services, N.Y., has been formed with 15 members. Officers are Pres. Larry Critchlow (55 E. Central Ave., Pearl River, N.Y.), VP Bob Williams, Sec. Tom Coleman, Treas. Frank Dickenson. Directors are C. Cooley, D. Gallo, H. Kirk, B. Danna and T. Watzka.

Long Island Fair

The first Electronics Fair of Long Island, sponsored by the Radio & Television Guild of L.I. for presentation Dec. 6-8 at the New York State U. in Farmingdale, N.Y., has been well received thus far, according to Chairman Robert Barasch. For more information write the Guild at P. O. Box 87, Bethpage, Long Island, N.Y.

ARTS Color Course

Assoc. Radio & Television Servicemen, Ill., is operating the pilot program, patterned after the RETMA upgrading course, of their new Color TV school. A Motorola color chassis was purchased by ARTS for shop use, and Simpson has loaned required test gear.

SRTT Color Demonstrator

The Society of Radio & Television Technicians, Van Nuys, Calif., now has a Dynamic Color Demonstrator (nicknamed the Iron Monster) to help teach color TV servicing. One of the few such teaching aids in the hands of technician groups, this unit, built by Irv Tjomsland of Dean's Electronics, is a kind of inside-out receiver.

How to Kill an Association!

(A memo from Ray Warthen, President of the North Bay Radio and Television Association, Vallejo, Calif.)

1. Don't attend meetings.
2. If you go, go late.
3. If the weather isn't pleasant, stay home.
4. Don't accept any office, it's easier to criticize.
5. Never approve anything your officers or committees do.
6. Don't pay your dues until you have to.
7. Don't bother recruiting new members.
8. Insist on official notices being sent you, but don't pay any attention to them when you get them.
9. Don't waste any courtesy at meetings. It's up to your officers to take it.
10. When you don't like something that's going on, say so, but under no circumstances offer any constructive suggestions.
11. DEVOTE MOST OF THE TIME TO TALKING; LET SOMEONE ELSE DO THE WORK.
12. If elected a delegate to a higher body or convention, don't bother about attending meetings.
13. Then you can come home and report the organization is in the hands of a political gang and there's no use trying to do anything about it.
14. LOOK FOR HIDDEN MOTIVES; DON'T CREDIT ASSOCIATION MEMBERS WITH ANY IDEALS.
15. Don't cooperate with any officer or committee; make them cooperate with you.
16. Remember, you know more than anyone else about everything. If they don't agree with you, they are wrong.

STOP LOSSES due to inaccurate instruments

CHECK AND ADJUST

Your Test Instruments
with **LABORATORY ACCURACY**



Designed by
MILTON S. KIVER
Author of the Book
"Servicing and Calibrating
Test Equipment."
Published by
Howard W. Sams & Co., Inc.

TEST EQUIPMENT CALIBRATOR

New 750 **B&K**

Calibrates VOM, VTVM and other meters, signal, sweep and marker generators and oscilloscopes.

Provides dc and ac voltages for checking voltage ranges of VOM, VTVM and other meters.

Standard resistances from 10 ohms to 10 megohms for checking reliability of each resistance range in VOM and VTVM.

Crystal oscillator generating harmonics over 300 mc for use as marker generator in all receivers, and to calibrate AM signal generator, and to align TV audio I.F. system.

Built-in tone generator for signal tracing amplifiers in all audio equipment. This tone also available at modulated RF.

Oscilloscope voltage calibrator in measuring peak-to-peak voltages of unknown waveforms.

Voltage Accuracy ±1% or Better

Avoid instrument errors that cause wrong decisions and time-killing rechecks in receiver testing. With the new, low-cost, laboratory-type Model 750 Calibrator you can quickly, easily check test equipment accuracy and make necessary adjustments.

Provides standard of ± 1% or better in all of its voltage sections—enables you to calibrate your test instruments like the labs do, and give better service at lower cost.

Model 750 Calibrator

Complete with 5 mc crystal. Operates on 110-120 v., 60 c. ac. Sturdy metal case. Size: 8 3/4 in. high, 8 in. wide, 5 1/2 in. deep. Net wt. 6 3/4 lbs.

\$5495 NET

See Your Distributor or Send For Bulletin 750-T

B & K MANUFACTURING CO.
3726 N. Southport Ave. • Chicago 13, Illinois
Makers of DYNA-QUIK, CRT, DYNA-SCAN and CALIBRATOR



Short description of a Small Efficient TV System...

1 antenna .. IN
8 set lines .. OUT
10 db signal .. GAIN

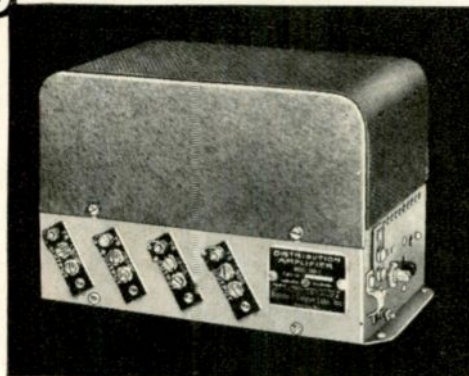
all with
 the



DISTRIBUTION AMPLIFIER

model DA8-B

approved
 for
 Color-TV



\$89⁵⁰ List

Ideal for garden apartments, motels, TV showrooms, deluxe home installations and other small TV systems. The DA8-B is a broadband, all-channel unit that requires no tuning, impedance matching devices, preamps or other special fittings.

Features and Specifications:

- Low noise all-triode circuit
- More than 10db gain on all VHF Channels
- Inter-set isolation in excess of 22db
- Provision for 75-ohm cable or 300-ohm twin lead
- Prevents overload through 10:1 gain control range
- Built-in power supply
- Designed for continuous duty operation

NOTE: For larger systems, Blonder-Tongue will furnish Free planning service on request.

Sold by Radio-TV Parts Distributors and Jobbers.

Write for Installation Details and FREE Booklet—"TV for 2. or 3. or More"

Dept. KK-18

BLONDER-TONGUE
LABORATORIES, INC.
 Westfield, New Jersey



Manufacturers of TV Cameras,
 TV Amplifiers, Boosters, Converters,
 Accessories and Originators of the
 Masterline and 'Add-A-Unit'
 Master TV Systems.

(Continued from page 25)

NATESA Convention

Robert Hester was elected president of the National Alliance of TV & Electronic Service Associations at NATESA's recent national convention. Other officers are F. B. Koepnick, Sec. Gen.; C. N. Burns, Treas.; R. Kidd, East. VP; P. P. Pratt, East. Sec.; R. Harmon, East Cent. VP; H. O. Eales, West Cent. VP; J. Driscoll, West Cent. Sec.; W. H. Burlingame, West VP; H. Stein, West Sec. Albert Saunders was retained as Educational Director.

Frank Moch, former NATESA head, did not run for the presidency again. He was, however, appointed Executive Director for a two-year period at a salary of \$12,500.

Some 712 people registered at the convention in Chicago. Actions taken included a "declaration of war" on manufacturer captive service, and adoption of an insurance plan.

RTA Exhibits

Radio-Television Technicians Association of Pasadena, Calif., will provide a booth display in that city's Home Show. In another action, Pres. Harry Coolidge was elected delegate to the California State Electronics Association (CSEA).

STTA Tax Fight

The Syracuse Television Technician Association, N.Y., is pressing that city's sales tax and zoning authorities to crack down on servicers who operate from their homes in residential areas, and who neglect to collect sales tax as required by law.

ARTSNY Address

To facilitate communications with other organizations and for other business purposes, Associated Radio-TV Servicemen of N. Y., has acquired a Post Office Box. Address is P.O. Box 32, Wyckoff Heights Station, Brooklyn 37, N. Y.

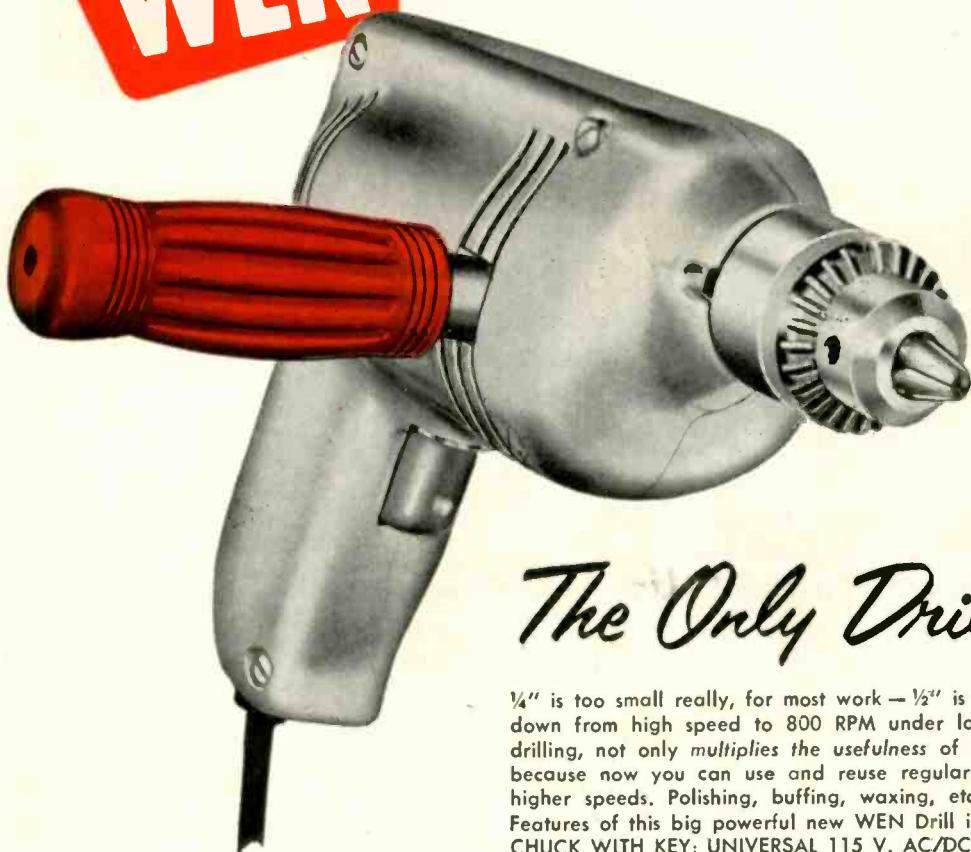


"Rejuvenator, huh? Hey, Harry!"

Revolutionary GEARED DOWN 3/8" Power Drill

IDEAL FOR RADIO-TV SERVICE WORK... DRILLS

WEN



STEEL
STONE
BRICK
CEMENT
WOOD
PLASTIC
EVERYTHING
PERFECTLY

The Only Drill You Need

1/4" is too small really, for most work — 1/2" is too big. This 3/8" is just right. Gearing down from high speed to 800 RPM under load, a speed suitable for all types of drilling, not only multiplies the usefulness of this drill, but also saves you money — because now you can use and reuse regular carbon steel bits — which burn up at higher speeds. Polishing, buffing, waxing, etc., go better too at this lower speed. Features of this big powerful new WEN Drill include GENUINE 3/8" JACOBS GEARED CHUCK WITH KEY; UNIVERSAL 115 V. AC/DC 2 AMP. MOTOR for ample power and torque; HELICAL GEARS for smooth, quiet operation and long life; STURDY HANDLE for maximum safety and convenience; 6 FT. CORD, rubber covered, heavy duty; LUSTROUS SILVER GRAY CASE; COMPACT DESIGN, length 9", height 6"; LIGHT WEIGHT, only 3 1/2 lbs. — and many other features never before combined in a drill at anywhere near this price. A price that gives you a superb new 3/8" geared down, multi-useful power drill for the cost of an ordinary 1/4" job.

MODEL 707
only \$26.95
LIST

ROUNDS OUT THE WEN LINE OF HIGH GRADE—LOW COST ELECTRIC POWER TOOLS FOR HOME AND SHOP

"Quick-Hot" ELECTRONIC SOLDERING GUNS—STANDARD & SPECIAL PURPOSE TIPS				ELECTRIC SANDERS—POLISHERS			ELECTRIC POWER SAW & TABLE		3/8" POWER DRILL
#199 \$7.95	#199 K KIT \$9.95	#288 \$9.95	#250 \$12.95	#202 \$13.95	#303 KIT \$16.95	#404 HEAVY DUTY KIT \$19.95	#305 \$29.95	#5-T-1 \$12.95	#707 \$26.95

YOUR DEALER HAS THEM OR CAN GET THEM FOR YOU

WEN PRODUCTS, INC.

5808 NORTHWEST HIGHWAY
CHICAGO 31, ILLINOIS

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



IN **23,000** CITIES AND TOWNS



WESTERN UNION
"Operator 25"

is sending customers to

RAYTHEON BONDED DEALERS



Ask your Sponsoring Bonded Raytheon Tube Distributor about "Operator 25" and the many other important advantages of being a Raytheon Bonded Electronic Technician.

RAYTHEON MANUFACTURING COMPANY
 Receiving and Cathode Ray Tube Operations
 Newton, Mass. • Chicago, Ill. • Atlanta, Ga. • Los Angeles, Calif.

Raytheon makes all these { Receiving and Picture Tubes, Reliable Subminiature and Miniature Tubes, Semiconductor Diodes, Power Rectifiers and Transistors, Nucleonic Tubes, Microwave Tubes



Excellence in Electronics

TECHNICIAN & Circuit Digests

CALDWELL-CLEMENTS CO., 480 LEXINGTON AVENUE, NEW YORK 17, N. Y.

Audio Today—The Roots Run Deep

Listen!

That's what Americans in every corner of the country are doing today—listening to the sounds of our times, listening to a quarter-billion loudspeakers. At home, at work and at play, sounds from marvelous electronic boxes are providing the entertainment and information which have become vital elements in our daily lives. The industry is expanding—color TV, portables, hi-fi, PA—and the coming year will offer \$1 billion in broadcast programs.

By its very nature, electronic equipment demands regular maintenance. The widespread use of audio parts and equipment demands more and more local sales outlets, both for initial and replacement purchases. Obsolescence of existing units is on the rise. As many electronic technicians have already discovered, here is a ready-made opportunity for a substantial sales and service program, a most profitable addition to existing TV-electronic work. Some even specialize in audio work.

By supplementing his existing radio-TV repair know-how with audio study and practice, the competent technician becomes fully qualified to expand his audio servicing operation.

By investing a moderate amount of money and sales effort, the local service shop can take advantage of its convenient location and grass roots contacts to merchandise audio products effectively.

Audio in the Home

Sound reproduction equipment in the home dominates the audio market. There are about 35,000,000 phonographs of all kinds—almost as many phonos as there are TV sets. Of these, an estimated 500,000 to 3,000,000 are in hi-fi sets (the exact number depending on how high a fi you consider truly hi-fi). In addition, there are close to 1,800,000 tape recorders in American homes. It takes plenty of man-hours, parts and equipment to keep these systems functioning.

Though not strictly an audio device, the radio or TV receiver contains a vital audio section. Since there are over 170,000,000 such sets in homes and automobiles, with at least one speaker in each, there is a huge audio replacement market within the radio-TV servicing field.

Audio in Business and Industry

As if the opportunities in consumer audio servicing weren't impressive enough, there's commercial audio servicing to offer a glowing attraction. A great many of the nation's 325,000 manufacturing concerns utilize public address, intercom, dictating and related audio equipment in their plants for communication and background music. Add to this the large number of retail establishments, such as department stores and restaurants, and the magnitude of audio in business becomes more striking.

The many applications of public address systems is almost a field in itself. Portable PA equipment will carry political campaign messages this fall, speakers blaring forth on car tops, at street corners and in meeting halls. Schools, auditoriums, stadiums and similar locations where many people congregate depend on audio equipment to extend the range of the human voice.

Audio Servicing and You

Now that we've looked at the impressive national scope of audio products, let's see how you, the service shop operator, fit into the picture. Generally speaking, audio servicing is not quite as competitive as TV repair. By supplementing present TV-radio work with some extra effort in the audio line, you should be able to increase your net income about \$500 to \$1500 per year, for a medium-size shop. With heavy audio service concentration, which includes technical savvy plus promotion, a net increase of \$2000 to \$4000 annually may be expected.

The shop that goes into more extensive audio equipment sales or rental takes the risk of all retail outlets. Depending on the type of store, location, display, promotion, inventory investment, etc., the audio merchandiser can profit as much as his talent and the winds of fortune allow. The sky's the limit.

In this issue you'll find an excellent article on how to start a sound system business. Considering how deep audio's roots are in this country, more audio servicing business should strongly appeal to you. It offers new challenges for you . . . and additional sources of income.

Tuning In the

UNPLEASANT COMMENTS are being heard from service technicians in certain metropolitan areas where factory service is being established. This despite manufacturer assurance that fair factory competition will raise service standards, and that the expanding business volume is big enough for everyone. Service associations have denounced these moves by set makers, not so much for the possibility of losing a small amount of business now, but for the greater menace that factory service can potentially swallow up the repair business. Even some parts jobbers are concerned over the prospect of more business going to factory distributors. The set makers involved point out that their primary aim is to bolster the reputation of their products, not gather servicing business for its own sake.

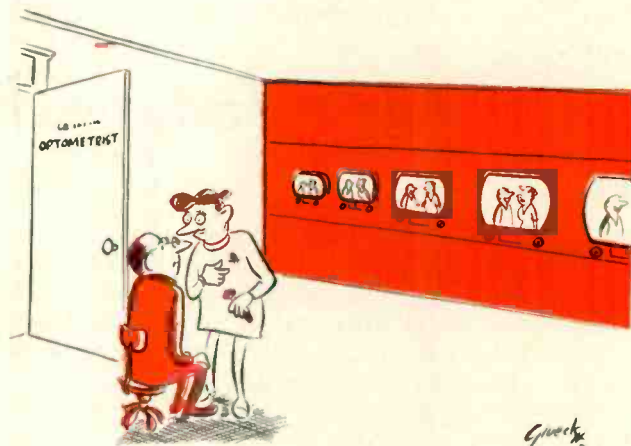
IF YOU KNOW A HAM in the U. S. who deserves special recognition for services rendered during 1956 in the pursuit of amateur radio, write to the Edison Radio Amateur Award, Electronic Components Div., General Electric, Schenectady, N. Y., for nomination rules. This annual trophy also carries a \$500 award.

ELECTROLUMINESCENCE may replace fluorescent and incandescent lamps as the light source of tomorrow. This phosphor-coated panels of any shape—even that of an entire wall—are made to glow when voltage is applied. But don't throw away your light bulbs yet; it may be some time before these electroluminescent panels are perfected.

PICTURE-PHONE



The Bell System's R&D organization has used an experimental "picture-phone" system to transmit over short and long distances. Pictures vary in size from 1" x 1½" to 2" x 3" and has good black-and-white contrast. A video band width of 600-cycles modulates a 1200-cycle carrier. This double-side-band AM signal lies within the transmission range of telephone lines.



ARE WE PROGRESSING? In 10 years a major share of the electronics business will come from products not now in production, says GE VP Dr. W. R. G. Baker. Growth potential of the electronics industry is unlimited and engineers are developing new products. Electronics is the fourth largest industry. 75 per cent of its more than 1,750,000 employees are working on jobs today that didn't exist 10 years ago. The electronics industry last year produced equipment and services at an annual going rate of \$9 billion, an increase of about 18 per cent since 1950. The industry may reach the \$15 billion level by 1960.

HOT DOGS IN 25 SECONDS. An RCA Whirlpool electronic range for \$1,200 now available. A Hi-Lo Microwave dial regulates power consumption of 4,000, 3,100 or 2,400 watts. Cooking is done by energy, rather than by heat, and features ultra high-speed browning. The phenomenon of electronic cooking, which heats foods but leaves containers and utensils relatively cool, eliminates the necessity of removing foods from cooking utensils prior to serving. The unit operates on 2450 megacycles, at the rate of one million microwaves per second, and plugs into 220 volts AC. Tests indicate that normal cooking time for a family of four, should average 30 minutes daily.

HOW MUCH BUSINESS? At the end of 1955, the TV-electronic industry was producing equipment and services at the annual rate of approximately \$9 billion, reports RETMA Pres. H. Leslie Hoffman. This shows an increase of some 81% since 1950. Forecasters expect industry billing to reach \$15 billion by 1960. Interesting note is that out of estimated 3600 manufacturers in the industry, about 50 account for more than 80% of the dollar volume of end equipment production, while 150 firms account for 80% of total components business.

Picture



BANK CREDIT ON COLOR TV is better than on black-and-white. For 10% down and 36 months to pay, instead of 24 monochrome months, tinted TV can be yours. Looks like those ultra-conservative bankers have faith in color's lasting value. Incidentally, unconfirmed reports reach our ears that 2/3 of all TV sets are sold on credit.

WHAT ARE TV ANTENNAS, replacement components or consumer products? Heretofore, those aluminum skyhooks have been strictly replacement-type items, with brand preferences determined by technicians and jobbers in the trade, not the consumer. Now, Channel Master has undertaken a \$250,000 advertising campaign in giant consumer publications to instill a sense of antenna brand preference in the consumer when she calls in the technician for an antenna job. This new approach puts the emphasis on the antenna as a consumer product.

TECHNICIAN'S DUMB GIRL FRIEND stopped by to ask if there's any new development in the match between Henry and Meg. She claims that since she's been using sidebands and loss pads, she really has a figure of merit. TDGF was embarrassed when her boy friend called to fix her TV set and remarked about the poorly aligned front end; but she put him right out of the house when he started talking about the horizontal hold.


CALENDAR OF COMING EVENTS

- Oct. 1-3: National Electronics Conference and Exhibition, Hotel Sherman, Chicago, Ill.
- Oct. 1-3: Canadian IRE Convention and Exposition, Automotive Building, Exhibition Park, Toronto, Canada.
- Nov. 2-5: High Fidelity Show, Palmer House, Chicago, Ill.
- Dec. 5-7: Second IRE Instrumentation Conference, Biltmore Hotel, Atlanta, Georgia.
- Dec. 10-12: Eastern Joint Computer Conference, Hotel New Yorker, New York, N. Y.
- Feb. 6-9: Los Angeles High Fidelity Show. Location still to be determined.

CLOSED CIRCUIT TV system in New York will allow programs and commercials to be pre-tested in up to 10,000 homes. Telestudios, in cooperation with Amplitel, is piping the programs to apartment houses with master systems. First 500 families to get the tests are in Wave Crest Gardens, Far Rockaway, N. Y.

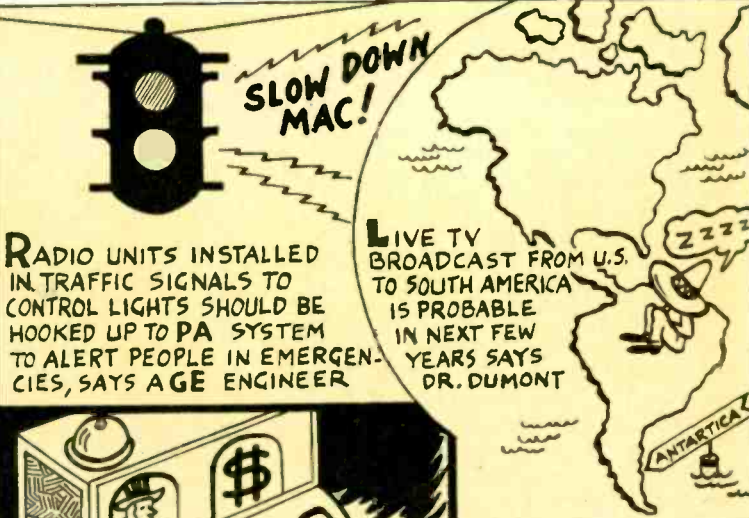
"SLALOM" ELECTROSTATIC FOCUSING of electron beams, recently discovered at Bell Labs in conjunction with traveling wave tubes, holds promise for scopes, photomultipliers and similar devices. In the ordinary traveling wave tube, the electron beam is constrained by a magnetic field to follow the axis of a metal helix. With slalom focusing (the name is taken from the analogy to a downhill obstacle skiing race), the electrons wind in and out between the individual turns of the helix.

RANDOM NOISE



SHORT TV PIX TUBES WITH 110° DEFLECTION AND NO ION TRAP WILL SHORTEN SETS NEXT YEAR—21" SET WILL BE LESS DEEP THAN WIDE—REDUCE TUBE WEIGHT 15-20% TOO

TOM HIGGINS JR.



RADIO UNITS INSTALLED IN TRAFFIC SIGNALS TO CONTROL LIGHTS SHOULD BE HOOKED UP TO PA SYSTEM TO ALERT PEOPLE IN EMERGENCIES, SAYS AGE ENGINEER

U.S. COLLECTED \$161,098,000 IN TV-PHONO-PARTS MANUFACTURER EXCISE TAXES DURING FISCAL 1956—THIS WAS 5th LARGEST CATEGORY AFTER CARS, GAS, TRUCKS AND TIRES

Audio Trends—Next Five Years

Industry leaders see growing role for technician sales and service.

TECHNICIAN asked top officials of various audio companies: "What is the most important technical, application or business trend that you foresee in the audio field over the next five years?" Their enlightening answers are of vital interest to every electronic technician.

"... high fidelity components have become neighborhood business"



Leonard Carduner
President
British Industries Corp.

Individual "custom" components, made by specialized manufacturers, were responsible for the initial consumer interest in high fidelity some years ago. Sales of such equipment have continuously risen through parts distributors, and are still going up. More recently, and in addition, there has been a growing trend to sales of components through audio dealers, and technicians, where there continues to be increasing activity, despite the emergence of "packaged sets." Each type of unit evidently has its place and finds its own type of customer. In fact, the demand for components has increased. As the various publicity media pay more and more attention to high fidelity listening, and describe the unique advantages of components over packages, high fidelity components have become neighborhood business—not only for original sales but, even more, for service and maintenance.

There already is a substantial market amongst owners of equipment which has been in use for some



years. In addition, there is the increasing replacement market, which these days covers not only record-playing equipment, but speakers, and also amplifiers, pre-amplifiers, and tuners. Here, the important factor is the upgrading of your prospects, who, as they have become familiar with the concepts of high fidelity and the names of the prominent products, have also become increasingly interested in replacing their old equipment with quality high fidelity components. Today, it is not enough to sell such a customer any record changer or speaker . . . he wants one that will give true high fidelity performance.

For the future, the greatest need of all is for competent technicians in neighborhood locations, who have interested themselves in high fidelity components, and are trained and ready to handle this equipment. Only through such service facilities, can the market be assured of long-range growth and stability . . . and there are profitable opportunities to be found everywhere, in filling this need.

"... an ever-increasing part in the . . . welfare of the technician"



Lawrence J. Epstein
General Sales Manager
University Loudspeakers

The Future exists because it is a matter of Time . . . but one's place

in tomorrow's Sun is determined by ambition, drive and preparation. As a part of the fabulous growth of the electronics industry, Sound, both "high fidelity" and commercial-industrial, has now broken through its own barrier; and will play an ever-increasing part in the economy and welfare of the technician.

The general public today accepts "hi-fi" as synonymous to phonographs and radio-phonograph combinations. General industry today considers plant-wide music and paging systems as a modern production tool, and are more and more finding room for Sound in their budgets. Ditto, the institutions.

This all adds up to a growing market for goods and services. If the body thrives on a balanced diet, so does a business; and your business to remain successful must weather the sometimes unstable aspects of TV and standard radio. I shall not endeavor in so few words to prognosticate trends, developments, etc. But, I state pure fact that there is a future and profit in Sound . . . for those who will but reach for it.

"... technicians . . . will enjoy a bigger replacement business"



Helen Staniland Quam
Distributor Sales Manager
Quam Nichols Co.

The advent of high fidelity (or more accurately, its emergence as a potent factor in radio-phonograph merchandising) will have tremendous impact on the industry in the next five years, and specifically on loud speaker design and production.

It must be recognized that the ag-
(Continued on page 58)

COLOR'CEPTOR

Designed for Perfect Color Reception on all 12 VHF channels

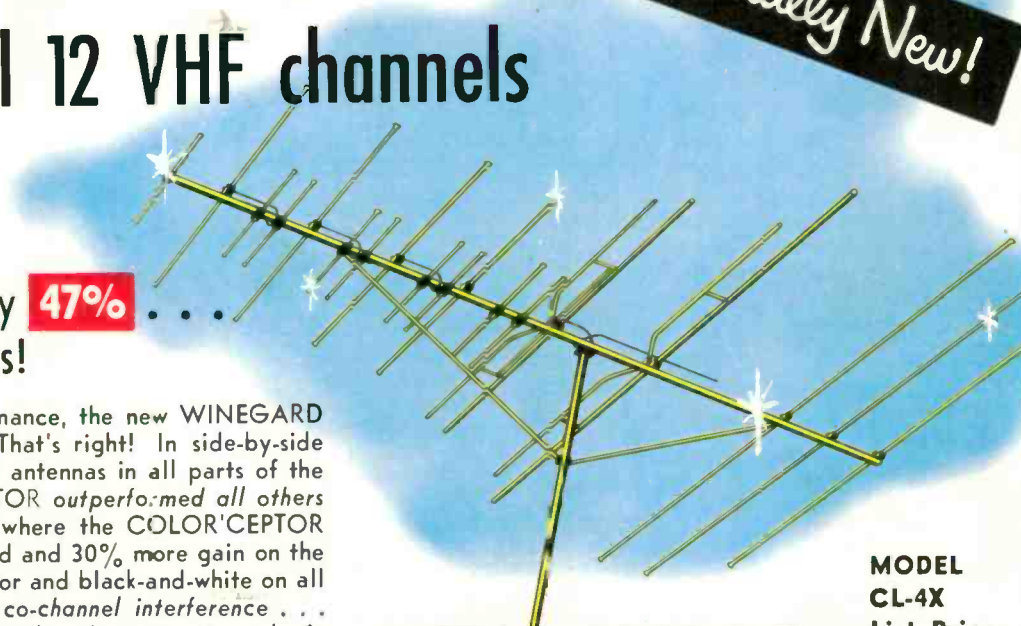
Sensationally New!

New **WINEGARD** Engineering Development Increases Antenna Sensitivity **47%** . . . Doubles Front-to-Back Ratios!

If awards were given for antenna performance, the new WINEGARD COLOR'CEPTOR would win them all! That's right! In side-by-side field tests, competing with other types of antennas in all parts of the United States, the amazing COLOR'CEPTOR outperformed all others tested. These tests included sensitivity (where the COLOR'CEPTOR averaged 47% more gain on the high band and 30% more gain on the low band**) . . . picture quality (both color and black-and-white on all 12 VHF channels) . . . ability to reject co-channel interference . . . consistency of reception in fringe areas under changing atmospheric conditions . . . and horizontal directivity (the ability to reject multipath signal reflection and ghosts).

These tests were conducted by fifty independent servicemen selected at random throughout the country, whose final decisions were in no way influenced by the Winegard Company. However, Winegard did furnish non-reactive 300 ohm line pads, into which test lines were terminated to insure accurate gain test results.

Besides being an outstanding antenna electrically, the new COLOR'CEPTOR is unmatched in quality of materials and workmanship. It comes in a beautiful gold anodized finish at no extra cost.



MODEL CL-4X
List Price **\$44.90**



MODEL CL-4
List Price **\$29.95**

WINEGARD **COLOR'CEPTOR** Gives You **Clear--HIGH DEFINITION** Pictures in

COLOR

BLACK & WHITE



**Model CL-4X with Power-Pack (see reverse side)

Here are the **FACTS!**

FIRST high gain all-VHF channel antenna expressly designed for Color TV!

FIRST with POWER-PACK. Gives exceptional signal boost on all 12 VHF channels!

FIRST all-channel 18-element yagi. Extra elements that give extra performance!

FIRST gold anodized aluminum antenna at no extra cost! (salt-spray tested for corrosion resistance)

FIRST dual-spaced Electro-Lens* director system (ask for Bulletin CL-1000 on engineering specifications)

NATIONALLY



WINEGARD

3000 Scotten Blvd.

BURLINGTON, IOWA

COMPANY

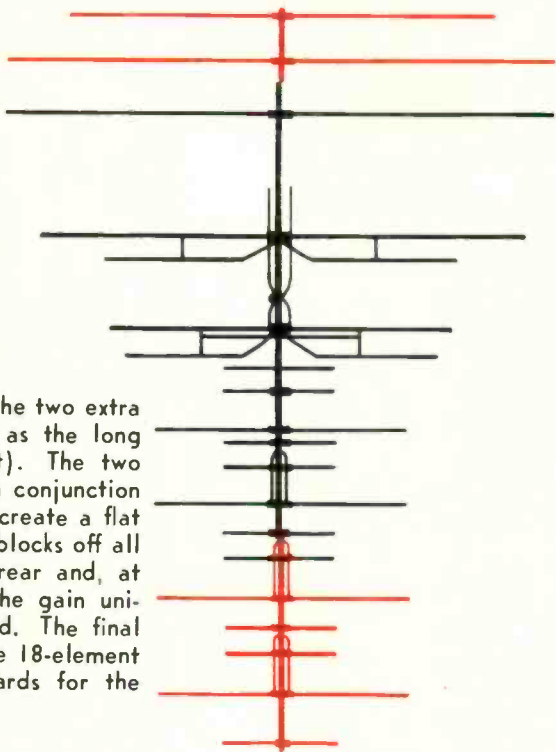
*Patent No. U. S. 2700105 and Canada No. 511984
Other Patents Pending

(see details on reverse side)

ADVERTISED

"Power Pack" gives Big Power Boost to COLOR'CEPTOR

The exclusive Winegard POWER-PACK converts the regular 11-element model CL-4 COLOR'CEPTOR into an *ultra-sensitive, super-powerful* 18-element all-channel yagi. The Power-Pack consists of three separate parts — the front five-element Electro-Lens director system (shown outlined in red) that gives a tremendous gain boost on both VHF bands . . . plus the two extra reflector elements (shown as the long red elements at the right). The two extra reflector elements, in conjunction with the regular reflector, create a flat tuned screen that literally blocks off all signals arriving from the rear and, at the same time, increases the gain uniformly across the low band. The final result is a high performance 18-element yagi that sets new standards for the industry!



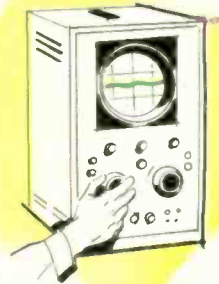
Power-Pack plugs in easily.

COLOR'CEPTOR CL-4	.....	\$29.95 list
POWER-PACK (PK)	.....	14.95 list
COLOR'CEPTOR with POWER-PACK CL-4X	.....	44.90 list
(NOTE: Standard gold anodized finish unless otherwise specified. Available on special order only in green or blue anodized finish or standard aluminum at same prices as above.)		
STACKING BARS (SB-4C)	.....	2.20 list
WEIGHT (Model CL-4) Net	.....	4 lbs. 14 ozs.
Shipping	.....	7 lbs. 8 ozs.
(Model CL-4X) Net	.....	7 lbs. 14 ozs.
Shipping	.....	10 lbs. 8 ozs.
OVERALL DIMENSIONS	WIDTH	LENGTH
CL-4	110"	78"
CL-4X	110"	122½"

WHY COLOR'CEPTOR IS FIRST CHOICE FOR COLOR TV RECEPTION

The fact that the antenna you are now using gives satisfactory black-and-white reception is no guarantee that this same antenna will give equally satisfactory performance on all 12 VHF channels in color. Even though you are located in a strong signal area . . . you need the COLOR'CEPTOR for perfect color reception.

The WINEGARD COLOR'CEPTOR is precision engineered and meets *all* the rigid requirements for perfect color reception, such as flat gain on *all* 12 VHF channels. In fact, the gain does not vary over ± 1.2 DB on *any* channel. The Winegard COLOR'CEPTOR also assures 300 ohm impedance match . . . unmatched front-to-back ratios, not on just a few channels, but on all of your stations . . . plus the *highest average gain* of any all-channel VHF antenna.



So, if you want the finest color reception possible, use the Winegard COLOR'CEPTOR. If you want crisp, *high definition* black-and-white pictures, use the COLOR'CEPTOR. If you want an antenna you can install with confidence of tested performance and unequalled results, you want the Winegard COLOR'CEPTOR by all means! No matter how close or how far you are from your TV stations . . . no matter what your reception problems may be . . . the new WINEGARD COLOR'CEPTOR guarantees you the very finest TV pictures possible.

© 1956, Winegard Co.

ATTENTION, Service Dealer!

Send coupon for complete details — TODAY

WINEGARD COMPANY
3000 Scotten Blvd., Burlington, Iowa

Please rush me the following:

- Name of nearest distributor
- Engineering specifications, catalog sheet and other promotional material available to help me sell COLOR'CEPTOR Antennas

FIRM NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MY NAME _____



WINEGARD

COLOR'CEPTOR

for
PERFECT COLOR RECEPTION

Getting Mileage Out of TV Receiver Test Points

Originally Intended to Facilitate Voltage Readings, These Conveniently Accessible Locations Can Be Used in Other Ways

MATTHEW MANDL

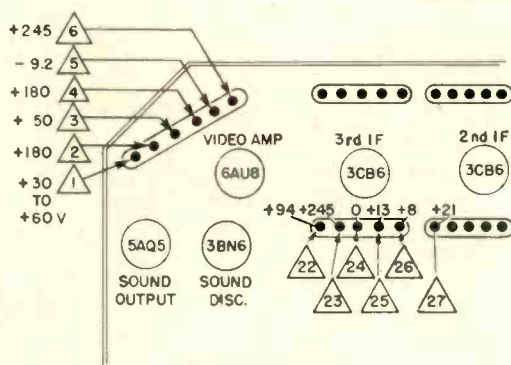


Fig. 1—Section of layout on Zenith 16Y20, showing locations of typical test points.

• Test points at the accessible outer portion of the chassis have been used quite frequently by manufacturers for a number of years to facilitate troubleshooting and servicing procedures. In modern TV receivers, the trend is to employ a considerably greater number of points than heretofore, to minimize the necessity for chassis removal in order to localize a defective stage or a misadjusted section.

Such test points are usually indicated on the schematic for the receiver, and are often given on the chassis layout illustration in the

service notes. In the latter instance, the representative dc voltage which can be read at each test point is given, or the purpose for incorporating the particular test point is indicated. Other than such data, however, no information is usually given as to how such points can be used to make additional checks to speed up trouble localization. Yet, in most instances, the test points provide the technician with a ready means for

obtaining such other information which can be used to shorten service time to a considerable degree.

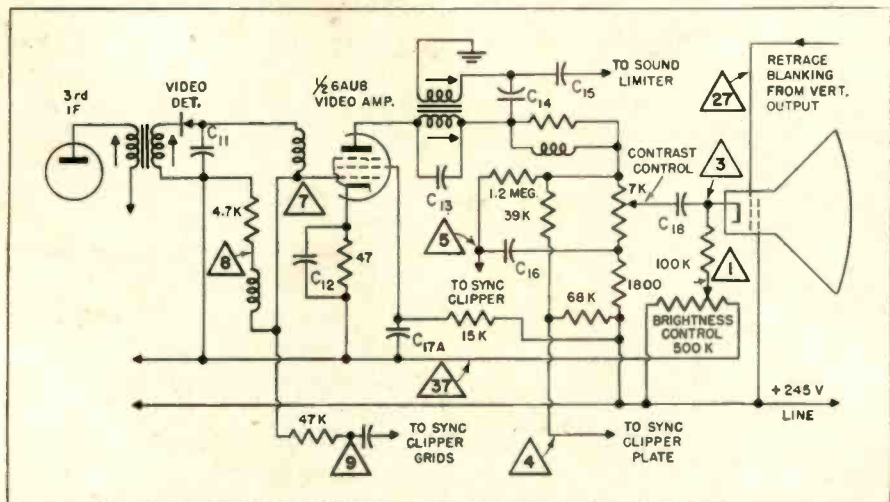
Test point locations can be used, for example, to expedite trouble localization in the home without the necessity for pulling the chassis. The technician may be able to form a quick judgment as to whether the chassis must be taken to the shop or whether repairs can be made on the spot. Even if the chassis has to be removed, trouble localization is facilitated when test points are available above chassis, since the necessity for locating various test points in the maze of wires underneath the chassis is avoided.

For the above chassis test points to have their greatest usefulness when checking in a customer's home, information which can be obtained from them should be procurable by use of a simple multi-tester or VTVM. It is not expedient, after all, to carry too much additional equipment to the home.

Either the multi-tester or the portable VTVM can, however, be employed for more purposes than simple voltage readings. The ohmic scales can be employed for continuity checking purposes, for resistance readings, and also to give a rough check of the approximate leakage of paper capacitors. Even though most vacuum-tube voltmeters have no current reading scale, the current flowing through a circuit can be ascertained by measuring the voltage across a resistor of known value. A simple division of the voltage value by the resistance will then tell how much current is flowing in the circuit. With the VTVM as a single unit being able to provide the information above, it becomes a valuable tool for use in conjunction with the externally available test points.

While all the different types of tests and measurements which can be made on a particular receiver

Fig. 2—Partial schematic corresponds to layout of Fig. 1, shows identifying triangles.



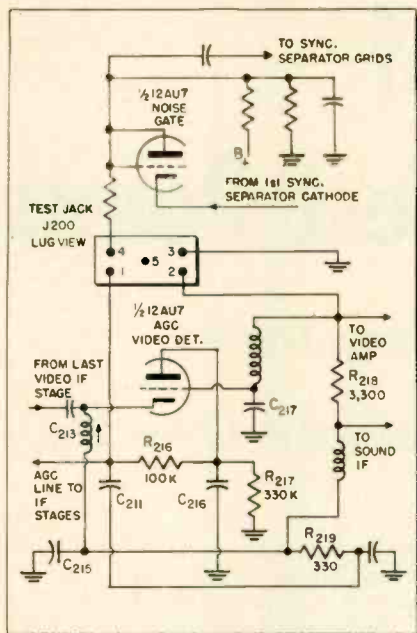


Fig. 3—Locations of test jack in the video detector circuit of a typical Philco set.

can't be enumerated here, procedures which are applicable to several receivers will be detailed, so that the service technician can apply similar procedures to other receivers he may encounter in the field.

Zenith Receivers

In a number of the late Zenith receivers, a considerable number of test points are available on the top side of the chassis. Such receivers include those with chassis No. 16Y20, 17Y20, 19Y22, and 22Y20 series. These receivers all use vertical chassis, and the chassis have a number of elongated holes cut out through which test points are available from terminal boards at the rear of the chassis.

A typical section of the board is shown in Fig. 1. In the service notes for this receiver the voltages available from the terminals are indicated as shown. Triangular identifying marks having number identifications are used which correspond to the chassis identifications. As shown in Fig. 2, the schematic for the receiver also indicates triangular reference points in which the number shown in any triangle corresponds to the test point triangle number shown in the layout drawing of Fig. 1. Since 11 such terminal strips are exposed to the rear of the television chassis, voltages for the various circuits can be read immediately and checked with the voltages given on the chassis layout drawing.

Obviously, the immediate availability of the numerous voltage points can help trouble localization

to a considerable degree. Virtually all vital voltage points are brought out for ready accessibility without the need for going to the underside of the chassis or pulling tubes to obtain access. (In series circuits tube pulling is of no avail anyway for voltage checks because of the open-filament circuit which occurs.)

However, voltage readings and tube testing will not localize all defects, and it then becomes necessary to resort to other checks. As an indication of how chassis test points can be used for purposes other than voltage readings, again consider the schematic shown in Fig. 2. This is the video detector and video amplifier section, with a germanium diode crystal used for the video detector and one-half of a 6AU8 for the video amplifier.

Sound Take-Off

The intercarrier sound take-off is procured by a transformer arrangement in the plate circuit of the video amplifier. The primary of this transformer, in conjunction with the shunting capacitor, form a parallel-resonant trap between the video amplifier plate and the picture tube. Since a parallel resonant circuit has a high impedance at resonance, this circuit, which is tuned to 4.5 mc, keeps this frequency from getting to the cathode of the picture tube and producing "tweet" lines on the screen. The secondary of the transformer comprises the sound take-off coil, and channels the 4.5 mc i-f to the grid of the sound limiter tube.

The triangle marked No. 3 makes available without chassis removal the point at the cathode of the picture tube. The voltage indicated for this triangle (Fig. 1) is 50 volts with no signal present and with normal setting of the controls.

Besides a voltage check here, however, continuity readings can be taken if trouble is suspected by shutting off the receiver and testing this

point against the triangular section No. 1. A reading between these two points will indicate whether or not the 100k resistor between the cathode of the picture tube and the brightness control is all right.

Since test point No. 3 is isolated from other points by capacitor C18 and the picture tube capacities, a VTVM placed across the two points (3 and 1) to read the ohmic value will give an accurate check. A value beyond the usual tolerance would indicate the need for replacement of the 100k resistor. An open resistor would make the brightness control inoperative, as would a resistor whose value increased to several megohms. A decreased value, or a shorted resistor, would make the bias abnormal, and hence the tube would exhibit symptoms of poor brilliance, even though the control were advanced fully.

Sync Take-Off

The triangular test point marked No. 4 is intended to provide a test at the sync take-off line, which feeds the composite video signal from the video amplifier to the sync clipper stage. The reading specified at this test point is 180 volts (see Fig. 1). However, leakage for capacitor C18, the coupling capacitor from the contrast control movable arm to the cathode of the picture tube, can be ascertained by taking an ohmic reading from test point No. 4 to test point No. 3. Since the coupling capacitor has an 0.1 mfd value, the charging of this capacitor when an ohmmeter is placed between test points 4 and 3 should be noted on the meter dial. For this test condition, the contrast control should be advanced to maximum to provide a minimum of resistance between point 3 and point 4.

TV TROUBLESHOOTING ARTICLES

Select list of features included in recent issue of TECHNICIAN.

Chasing External Ghosts: Causes and Cures—Sept. '56

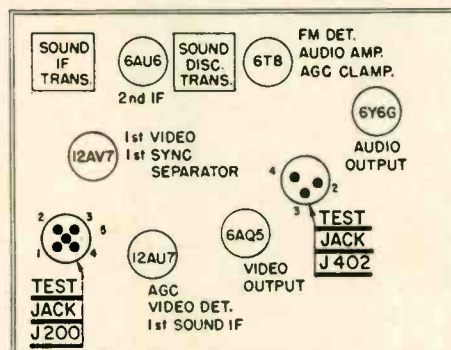
Troubleshooting in the Horizontal Sweep Section—Aug. '56

Horizontal Instability? Adjust That Oscillator!—July '56

Eliminating Vertical Retrace Lines—June '56

Diagnosing Defects in TV Picture Tubes—May '56

Fig. 4—Test points on R-F chassis of Philco receivers, models 52-T2110, 52-T2145X, etc.



The VTVM should be on the *R times 1 megohm* scale.

While an ohmic check of capacitor leakage is not always a reliable test, it will at least indicate whether or not a capacitor should be removed and re-checked out of the chassis with a capacitor checker or replaced by a new one. On the *R times 1 megohm* scale, meter sensitivity is high and inaccurate readings may result if the test probe ends are touched by the hand. Also, the leakage test is unreliable when applied to mica capacitors or other capacitors having small values. For inter-stage coupling capacitors, however, the VTVM provides a quick means for indicating some leakage, and a resistance reading below 500 megohms is cause for suspicion of a faulty unit.

It will be noted that test point 1 indicates a voltage reading of from 30 to 60 volts. The voltages existing at 1 and 3 depend, of course, on the setting of the brightness control. A change of control setting will alter the voltage on the cathode of the picture tube, and hence will alter the bias applied to the grid with respect to the cathode. As the control is advanced to give more picture brilliance, there should be a decrease of voltage of the cathode (less plus voltage at the cathode means a decrease in negative bias at the grid).

This factor can be verified by placing the VTVM across test points 3 and 27, with the negative terminal of the VTVM applied to test point 27 and the positive terminal applied to test point 3. As the brightness control is now varied, there should be a change in the negative grid bias

Fig. 5—Test jack in Philco sound circuit.

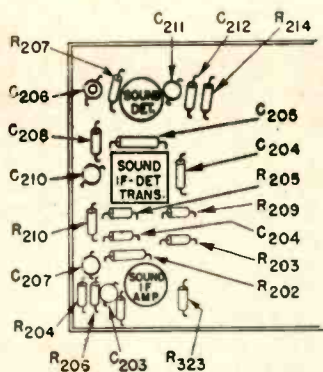
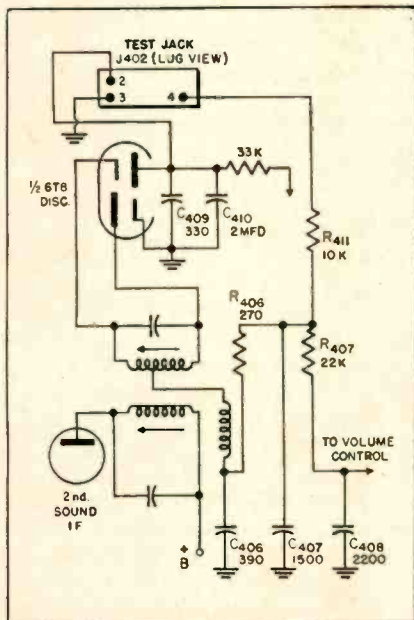


Fig. 6—Component side of printed board, partial view, showing locations in Admiral set.

ranging from a low reading of approximately 30 volts (for maximum brilliance) to a reading of approximately 60 volts (for minimum brilliance). If the control variation shows such a range, but the brightness does not reach a desired level, it would indicate that something other than this circuit is at fault. This could mean that the ion trap is misadjusted, or that insufficient high voltage is present and not permitting full beam velocity (hence, high brilliance).

Bias Measurement

For bias measurements, the voltmeter applied to points 3 and 27 is the most reliable method for ascertaining the exact grid voltage. If the voltmeter is attached to the test point 27 and ground, only the dc potential at the grid (21 volts) will be read. A variation of the control will not affect the grid voltage with respect to ground, but will only vary the potential difference which exists between *grid and cathode*.

From the schematic shown in Fig. 2, it will be evident that an ohmmeter check can also be made between test point 1 and test point 37 for checking the operation of the brightness control with the receiver shut off. With an ohmmeter check between these two points, the brightness control can be varied and the reading which is obtained will show the variation in resistance between one side and the movable arm. Any interruption of continuity will indicate a defective control. Intermittent operation of the control can also be checked, since the smoothness of resistance variation will be affected by a dirty resistance strip or one which is otherwise defective.

Similar procedures to the foregoing can be applied to the other test points available on the receiver chassis. Continuity and ohmic checks can be made in the sync circuits,

video circuits, and sound circuits. Test points for the various Zenith receivers differ from those shown here, but the foregoing illustrations at least show the possibilities which such test points make available with respect to expediting servicing. A study of a particular schematic will suggest other tests. Thus, a primary inspection of the test points indicated in a servicing schematic is well worthwhile in terms of time saved in trouble localization.

Philco Receivers

Some Philco receivers employ test jacks on top of the chassis. Typical receivers of this type are the Philco dual-chassis receivers, chassis types 41, 44, D-1, D-4, etc. Fig. 3 shows a video test jack between the agc-video detector tube and the noise gate tube. Fig. 4 indicates the location of the test pack on the r-f chassis layout.

The test jack can be utilized during video i-f alignment, since pin no. 1 gives access to the agc line, while pin no. 2 gives access to the video-detector load resistor, R218. Pin no. 3 is a ground connection for use with the other pins when making checks.

A picture which has excessive contrast, or exhibits other faults which may be caused by troubles in the agc line, would indicate a check from pin no. 1 to pin no. 3 using the dc scale of the VTVM. Changing from one station to another would vary the bias voltage which is read between these two points. If the setting of the fine tuning control is changed, there should also be a change of the negative agc voltage existing at pin 1 with respect to ground. Absence of voltage here, or the presence of voltage but without variation, would call for a check of the agc line or the agc tube.

Sound Test Jack

Fig. 4 also shows the sound test jack, J402. In Fig. 5, the location of this jack in the circuit is shown. Here, again, pin 3 is the ground reference pin for use with pins 2 and 4 when making checks. Pin 2 gives a point at one plate of the ratio detector in the sound section, while pin 4 provides a test point prior to the volume control at the output of the detector.

An inspection of Fig. 5 will indicate that test points 2 and 3 can be employed for making an ohmmeter test to see whether capacitors C409 and C410 are shorted. Capacitor C410 reduces AM interference and filters (Continued on page 60)

Make Your Start in the

Basic Equipment Needs, Sizing up and Setting up on PA

OLIVER BERLINER,
OBERLINE, INC., HOLLYWOOD, CALIF.

• Some very good extra money may be made by supplying portable public address systems on rental to civic organizations, clubs, schools, churches and business concerns. These systems would consist of microphones and record players, loudspeakers, and amplifying equipment.

As many events requiring a sound system take place at night, this arrangement lends itself perfectly to those who have other business during the work week or day. Such functions as meetings, parties, church services, dances, stage productions, sports activities, etc., are all in need of sound reinforcement; and your principal job will be in seeking out these many potential customers and persuading them to give you and your facilities a trial.

The radio and TV service technician should not mislead himself into thinking that, because amplifiers are simpler than TV sets to repair, sound systems are easy to design and operate. Only through considerable experience can one look at a building and decide how to handle its acoustics and inherent noise levels. Should you use a few high-power speakers or many low-power units? Should they be horns or cones? Should they be clustered or spread out? How many microphones, and

what type? How much audio power will be necessary? Will acoustic feedback be a problem?

The answers are the result of a survey of the application and your past experiences with sound. However, let us consider here an example of a rather routine rental job. Take for instance, a high school dance from 9 p.m. to midnight, in the gymnasium with a typical 9-piece orchestra.

First of all, we would arrive no later than 8 o'clock and park near an entrance to the gym, moving the truck (or car) after unloading, if necessary. Do not leave your equipment unattended for any great length of time. Incidentally, it may be wise to have it insured against loss or damage, and also against the possibility of one of your components accidentally hurting someone (falling loudspeaker, tripping over a cable, electric shock, etc.).

Most gymnasiums are somewhat reverberant and also are rectangular in shape. Since this is to be a dance, and for exuberant school children at that, the noise level may be quite high. If the orchestra is against the long wall, I would hang a large cone loudspeaker assembly on the wall on each side of the orchestra, far enough away from it to minimize the chances of sound *throwback* to the microphones, and with the speakers considerably over the heads

of the crowd for maximum *throw* of the sound. See Fig. 1. If the orchestra is in a corner or against a short wall, I would use two wide-range horns for a long throw. See Fig. 2. If it is a square dance, twice as many loudspeakers may be required for absolute coverage of the "calls."

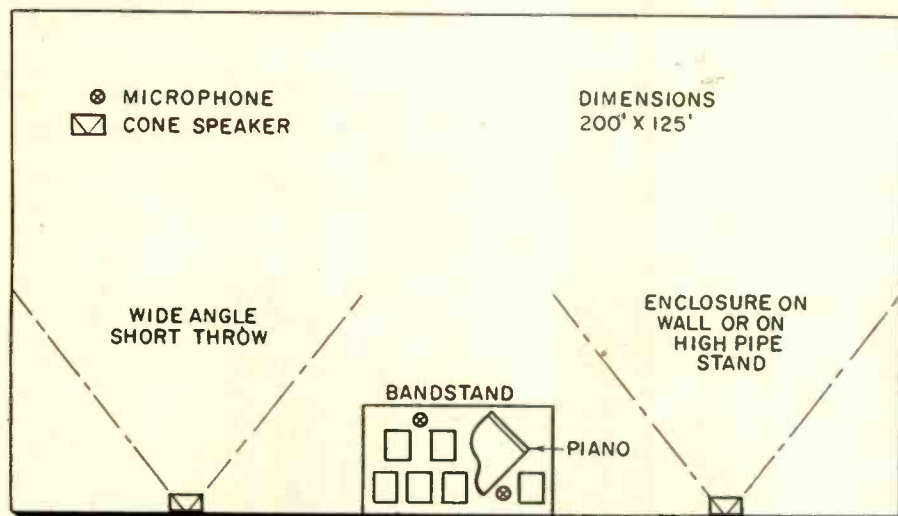
In most cases, the orchestra will really not need sound reinforcement; but I would use two microphones—one for piano pickup, the other for general orchestra pickup and for vocals. A 25-watt amplifier will have more than enough power and with careful experimenting with tone control settings to meet acoustic conditions, maximum level with minimum feedback will be achieved.

Dismantling Equipment

Equipment striking (take-down) time is usually less than half the set-up time. By the time this is done, though, most dancers will have left and you will be able to find a convenient parking and loading spot for your vehicle. Gather all your equipment just inside the building door until you are ready to get your vehicle and load it. Thus a 3-hour dance will require 4½ hours of on-the-job time, plus travel time, and this should be considered in pricing. One word of caution—never ask the help of guests or officials, and try not to enlist the aid of building employees in the handling of your equipment. Not only will they resent work that you are being paid to do, but, if they should accidentally damage your equipment, you cannot hold them responsible.

One of the best ways of gaining experience in this business is to observe other permanent and rental sound systems throughout the city. These may be found in churches, halls, schools, factories, theatres and offices; and you should have little difficulty in being able to take a look at them. Observe the types of loudspeakers and microphones used and make note of their placement and use. Determine whether or not they properly accomplish their purpose, for it is useless to pattern your plan after a poor installation. Incidentally, these very same poor installations

Fig. 1—Setting up PA system for dance where bandstand is located against long wall of hall.



Sound System Business

Jobs, Getting Business, Facilities, Pricing



may mean more business for you.

Available at nominal or no cost are handy helps and guides issued by leading manufacturers of PA equipment in general, or of PA speakers, microphones, amplifiers, and other specific types of units, all of which provide a wealth of information regarding application, placement and operation. Carefully study the catalogs of the important sound products manufacturers; for they provide concise information as to the specifications of the various components. You will ultimately have to refer to these anyway, when it comes time to determine the make and cost of the equipment you wish to buy. (For the names of such manufacturers refer to the industry-wide directory in May issue of **TECHNICIAN**.)

The majority of professionals use amplifiers built by major manufacturers. For a busy audioman there is little or no cost saving achieved by building his own amplifiers. However, even a man experienced in radio and TV servicing will find many previously unencountered problems when he builds a power amplifier. Oscillation, motor-boating, distortion, frequency response and hum suddenly take on major significance here.

Reference Data Lacking

There are virtually no available books on the subject of practical PA work. This is probably due to the large amount of trial and error methods and divergent personal opinions that exist in this field.

This does not mean that sound is purely an art. Systems like that at the Hollywood Bowl were installed only after exhaustive measurements were conducted. However, most installations cannot financially support sound surveys of this type; and of course this is usually completely impossible on rentals. The result is that the audioman must rely upon his past experience and profit by his mistakes and those of his competitors.

After you have become acquainted with the various types of microphones, amplifiers and loudspeakers,

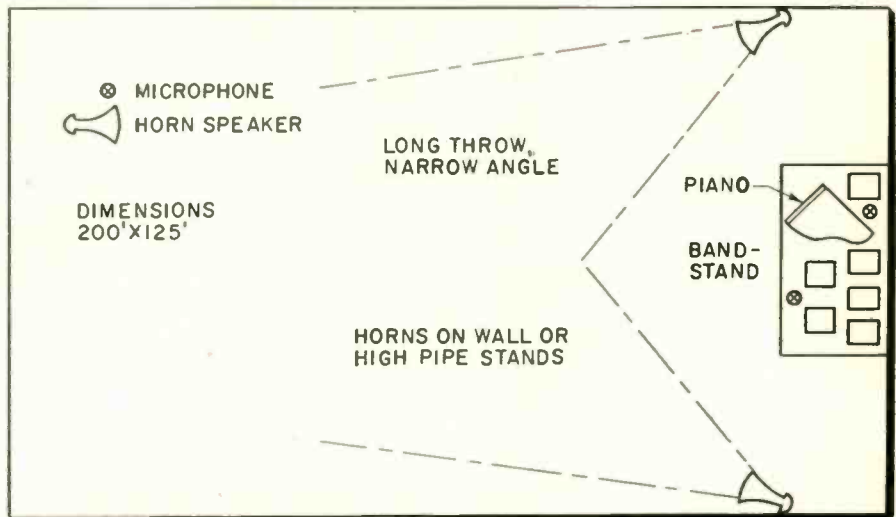


Fig. 2—Setting up PA system for dance where bandstand is located against short wall of hall.

their ratings and basic applications (something that is of the utmost importance), it will be time to determine the sound system needs of your potential customers. First, ascertain who those customers will be; and after this, the uses to which they will normally put a PA system. This will be your guide in the selection of equipment to rent to them.

The smallest basic system should consist of a small pressure microphone (these are rugged, compact, easy for the laymen to use, and inexpensive) with floor stand; a three-speed record changer with crystal cartridge; an amplifier of 15 to 30 watts audio power, having two microphone inputs and one phonograph input, plus tone control (s); and two 15-inch PM loudspeakers, each in a portable enclosed cabinet. I would suggest two 25-foot microphone and two 50-foot loudspeaker extension cables. Such a system can become a functional part of a larger equipment array as the quantity and size of the jobs you do increase.

As time goes by, you will be called upon to make bigger and more complicated installations. These manifest themselves in a number of ways; but I like to break them down into three basic types: (1) multiple speaker (high-power)—single microphone; (2) single or twin speaker (low or medium power)—multiple microphone; and (3) multiple

speaker—multiple microphone. Examples of these three basically more complicated systems are: (1) paging in a large building; (2) church services to be "piped" into another room; and (3) stage productions (especially outdoors), and sports.

Equipment for Big Jobs

The decision as to whether or not to tackle these jobs is extremely critical. If you decide to go in for this, be certain that you have the know-how and equipment. Such accessories as headphones, mixer amplifiers, volume-indicator meters, power amplifiers, speaker matching transformers and monitor amplifiers will be required from time to time.

The amount of rental equipment that you have is governed by the extent of business you are able to get; consequently, it is difficult to recommend a more pretentious outfit than the one described earlier. However, you might consider expanding your equipment line-up to encompass more or less the following items:

- 4 low impedance microphones with 25-ft. cable, various acoustic types
- 4 microphone floor stands (2-section or 3-section)
- 4 microphone desk stands
- 2 microphone boom stand attachments

(Continued on page 49)

Color Signal Generators

Two Basic Types, with Variations, Discussed. One Can Be

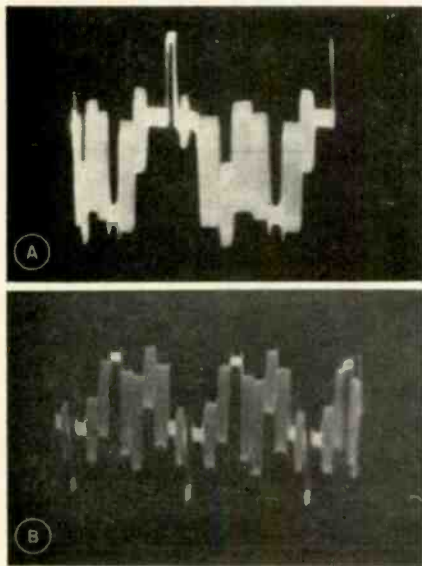
ROBERT G. MIDDLETON
CHIEF FIELD ENGINEER
SIMPSON ELECTRIC CO.

• Color-TV servicing requires somewhat better performance from test equipment than that demanded by black-and-white TV servicing, also a better knowledge of test-equipment characteristics and applications on the part of the practicing technician. Completely new instruments, such as color-bar generators, have made their appearance.

There are two general types of color generators in current use. The simpler and less expensive type provides some form of *rainbow* signal, while the more elaborate generators provide an *NTSC* signal. The difference between the types can be clarified by a review of their respective waveforms.

Two examples of an *NTSC* color-bar generator pattern are illustrated in Fig. 1. These are observed by application of a wide-band scope to the output of the picture detector in a color-TV receiver. By way of comparison, the output from a *keyed* rainbow generator (also providing horizontal sync) is shown in Fig. 2. The output from a simple rainbow

Fig. 1—Two examples of signal from *NTSC* color bar generators, observed at video detector of receiver, on a wide-band scope.



generator (without sync provision) is seen in Fig. 3.

Since the simple rainbow generator has the least complex waveform, discussion starts to best advantage with this unit. The simple rainbow signal is a sine-wave voltage, having a frequency equal to 3.58 mc minus 15,750 cycles. In other words, the rainbow signal has a frequency which is almost—but not quite—equal to the color-subcarrier frequency. Actually, the frequency of a rainbow signal is less than that of the color subcarrier (3.579545 mc) by one horizontal scan interval (15,750 cycles). This type of signal is known variously as a *rainbow signal*, an *offset color subcarrier*, a *sidelock signal*, or as a *linear phase sweep*. A rainbow signal produces a characteristic color spectrum on the screen of a color-picture tube as depicted in Fig. 4. This spectrum sweeps through various shades of red, blue, and green, and provides useful information concerning operation of receiver circuits and of the adjustments of the chrominance controls.

Generating the Signal

The simplest method of generating a rainbow signal is to use a Chromatic Probe in combination with conventional alignment equipment. The probe circuit is shown in Fig. 5. The method of driving the probe from a pair of alignment generators is depicted in Fig. 6, from which is seen that one generator operates at the picture-carrier frequency, while the other generator operates at the offset color-subcarrier frequency. The probe actually acts as a modulating device, wherein the picture-carrier voltage is modulated by the offset color-subcarrier voltage. Output from the probe is applied directly to the antenna-input terminals of the receiver. No simpler method of obtaining a color display can be asked for.

Of course, rainbow signals are also available from specialized rainbow generators. The simplest of such instruments provide the same sine-

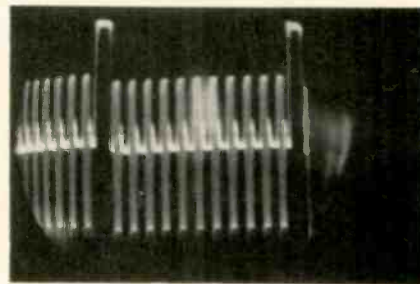


Fig. 2—Output of keyed rainbow generator.

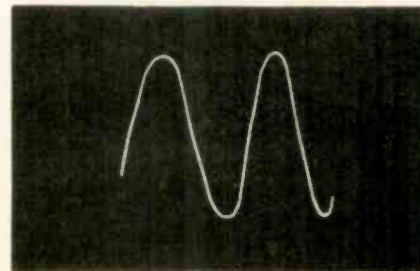


Fig. 3—Output of simple rainbow generator.

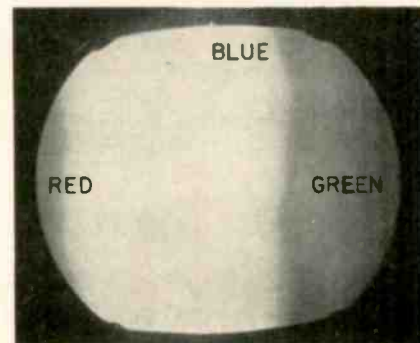


Fig. 4—Rainbow pattern shown on pix tube.

wave signal as does a chromatic probe, while the more elaborate rainbow generators provide such added facilities as horizontal sync, keyed patterns, sound carrier, etc. Such an elaborated rainbow signal, providing horizontal sync and a keying signal to break up the rainbow into 10 color bars, separated by black bars, has been shown in Fig. 2. This type of signal is more stable, and provides for more accurate adjustment of the chrominance controls than does a simple rainbow signal. Note in Fig. 2 that 11 signal groups appear; the first operates as

and Their Applications

Set Up in Elementary Form in Shop with Existing Equipment

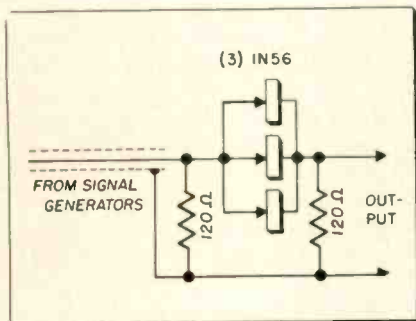


Fig. 5—Schematic for the chromatic probe.

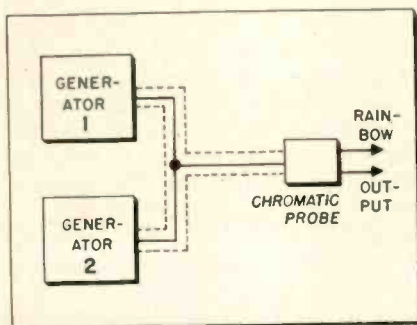


Fig. 6—Two generators used with chromatic probe to provide rainbow signal. Generator 1 is set to video-carrier frequency; generator 2 is set to offset color subcarrier frequency.

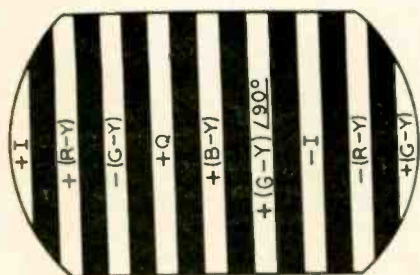


Fig. 7—Keyed rainbow generators will generally provide these color-difference signals.

a burst signal, and is invisible, being blanked out during horizontal retrace. The remaining 10 signal groups operate as color bars, having hues corresponding to the signals diagrammed in Fig. 7. These are all color-difference signals.

By offsetting the color-subcarrier signal in a rainbow generator by more than one horizontal scan, more than one rainbow can be displayed on the screen of a color picture tube.

For example, Fig. 8 shows a succession of rainbows which is obtained from a chromatic probe, when the color-subcarrier generator is operated several scan intervals below the color subcarrier. However, it is standard practice in service operations to use only one rainbow in receiver tests. No more than one is generally necessary.

Color Phasing Control

Note, too, that if the subcarrier generator is adjusted below the color subcarrier frequency (3.579545 mc), the rainbow appears with reds on the left, blues in the middle, and green on the right; but, if the subcarrier generator is operated above the color subcarrier frequency, the order of the colors is reversed, with green on the left, blues in the middle, and reds on the right. This is an essential point to observe in operation of any rainbow generator, as otherwise the operator could be misled into believing that the color phasing control of the receiver was misadjusted.

Controls of keyed rainbow generators must be set correctly, or the desired signal output will not be obtained; Fig. 9 shows incorrect numbers of signal groups resulting from improper adjustment of the keying multivibrator in the generator. Fig. 10 depicts the result of improper adjustment of the sync amplitude control. It is evident that a wide-band scope (flat to 4 mc) is the best instrument available for checking the operation of color generators.

Low Capacitance Probe

A scope is often used with a low-capacitance probe in color-TV service; such a probe reduces the loading on high-impedance circuits by a factor of 10 times. Proper adjustment of R and C values in the probe to match the particular scope in use is essential, or color signals and others with high-frequency content may be distorted. The typical effect of probe misadjustment on an NTSC color-bar signal is illustrated in

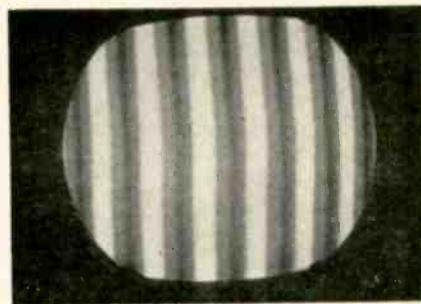
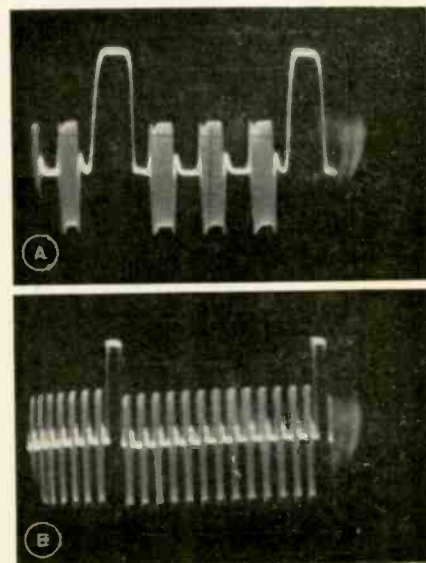


Fig. 8—Several rainbows can be obtained by offsetting the subcarrier generator several scan lines below color-subcarrier frequency.

Fig. 11. Briefly, the adjustment of R and C values in the probe must be such that a 10-to-1 attenuation of the signal is obtained at both high frequencies and at low frequencies. Test frequencies of 60 cycles and 3.58 mc are useful in this regard. Some technicians prefer to use a square-wave generator for probe adjustment, and to adjust the service controls for 10-to-1 attenuation of a 10-kc square wave.

The chief difference between a keyed rainbow signal and an NTSC color-bar signal is in the provision of a Y or luminance signal. The (Continued on page 50)

Fig. 9—Incorrect number of signal groups when keyed rainbow generator is misadjusted.



Smear and Phase Shift:

Distinctions between Various Types: Tunable and Nontunable,

A. R. CLAWSON

• Smudged formations of larger areas of either black or white information on a TV screen typifies smear. The smearing or spreading is particularly noticeable on block lettering and the like.

The cause may lie in any section that handles the video signal. The trouble then, can arise in any stage from the tuner through the i-f system to the pix detector, the video amplifier and output to the crt. The agc system, since it affects various stages in this path, may also be involved.

The technician will encounter two distinct types of smear. Recognition of their causes will aid him in the diagnosis.

The smear may remain fixed on all channels with all settings of the tuning control. No appreciable change results in the smear originally present, even though a new breed may arise while manipulating this control. This is fixed smear.

With another type, its character is altered as the fine tuning control is

varied. Such a smear has a definite polarity and may resemble rings from excessive peaking of the video amplifier. Fig. 1 shows such a case. Note the white and the black following the cross from this cartoon. Also note the resemblance to ringing.

While tunable smear may result in the phase shift type just shown, it may also produce a spreading out of the outlines at the ends of the solid whites or blacks. Phase shift smear has a distinct change of polarity, such as white to black, while the "spreading" variety does not.

Phase shift type, as the name implies, is caused by excessive phase shifting of the low frequencies. The spread-out variety is caused by low amplitude of the lower frequencies of the television video signal. Both may occur simultaneously. In fact, they often do.

The first step in localization is to try adjusting the fine tuning control for best picture. If the smear still remains on all channels, then check the i-f alignment—more on this point later, provided that tuning does alter the appearance of the smear.

Tunable smear on one channel may be caused by the misalignment of that channel on turret type tuners. The fine tuning control can not cover enough of a range to reach the point of best picture. Remedy is adjustment of the oscillator slug on that channel. A similar adjustment on non-turret types will correct such tunable smears due to improper front end alignment. The phase shift type of smear is the predominant characteristic here.

If Alignment

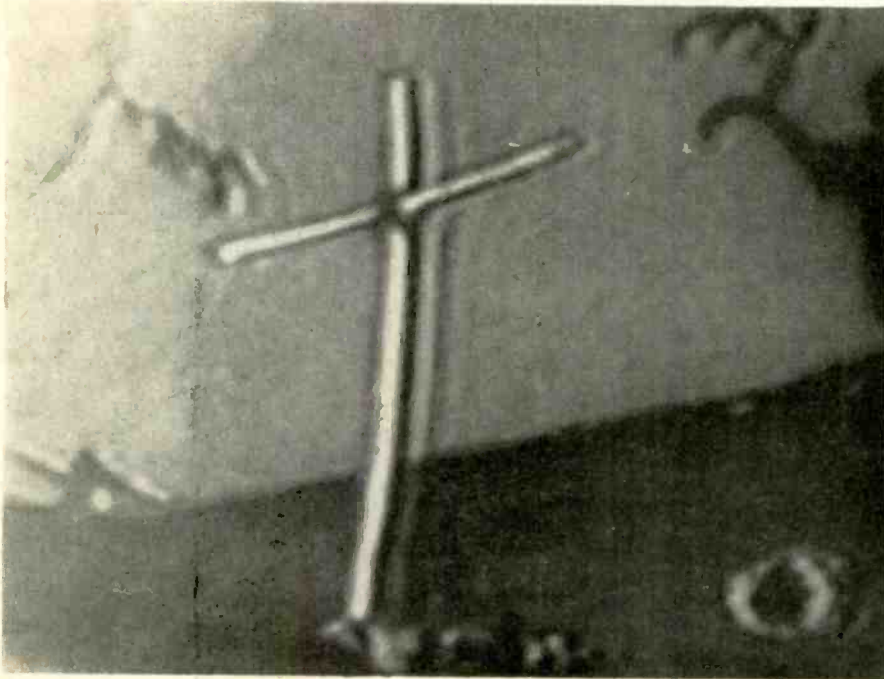
Improper i-f alignment can cause either or both types of smear, but the character will change as the fine tuning control is varied. The resonant circuit near the low-frequency region of the i-f response is the one that needs adjustment. The reason is shown by the curves of Fig. 2. Note that the low frequency portions of the video signal are centered about the picture carrier on the slope of the ideal response curve of Fig. 2A.

Now suppose we have curves of the types of Figs. 2B and 2C. There will be a deficiency in the low frequency amplitude in one having the character of Fig. 2B while phase shift and loss of amplitude will surely follow one like Fig. 2C. In both instances, the sync may be poor since the sync is primarily at the low-frequency end also.

The remedy is i-f realignment with particular attention to the low-frequency portion of the i-f response curve. The work should be performed with a sweep generator and a scope but slight adjustment of the low frequency trimmers may be attempted if they are so marked that the technician can return them to their previous settings. (Note that "low frequency" means the adjustments about the picture carrier in this instance—not to the actual frequency!)

Closely allied to tunable smear due to overloading. This is caused by faulty action—usually setting—of the automatic gain control circuit or its adjustment. Where there is a control, the smear can be corrected

Fig. 1—Example of phase-shift type of smear. Note polarity reversal, resemblance to ring.



Low-Frequency Problems

Smudge-Type and Phase Distortion. Where to Look for Trouble

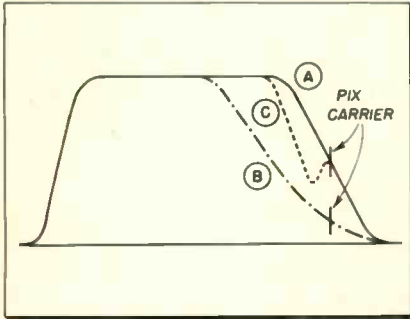


Fig. 2—Variations in low-frequency portion of i-f response curve. A—Proper response. B—Poor i-f amplitude. C—Ringing in i-f.

in the field by making a mark at the previous control setting so that the technician can return to it, then seeking a better one. Attempted adjustment will indicate if the agc is responsible.

Smear from agc overload will be varied from station to station. The strong stations will overload the set more than the weak, and this will provide a working clue to such trouble.

Detector Load

Another check for agc smear is measurement of the peak-to-peak voltage across the detector load (or input to the video amplifier, if this is given) and comparison with values quoted on the schematic or accompanying tables. If the signal voltage is unusually high, you have a case of agc trouble to cure rather than smear, which is only a result of the trouble, in this case. A scope or a peak-reading voltmeter is used for this check.

The picture detector and the video amplifier are fixed by design, and all smears in them remain fixed with the exception of those caused by stage overloading and by improper electrode voltages. With improper electrode voltages, the voltmeter will quickly reveal the cause. In such cases, overloading is not the result of excessive input signal. However, the remarks on agc-caused smear do apply here with equal force.

A simple test for excessive signal

is reduction of the input signal through insertion of a potentiometer, which is hooked up like a volume control in an audio system, although it is handling the video.

A number of other causes for smear both in video amplifiers and detectors as well are worth mention. These are listed here but not necessarily in order of frequency:

1. Improper tubes. Substitute for bad tubes as is customary with other troubles.

2. Coupling capacitors (C_c of Fig. 3). These may have lost their capacity and thus present too much impedance to low frequencies while still permitting the highs to pass through with little loss.

3. Any other increase in the series resistance between tubes, such as the shunting resistor on a series peaking coil. It may have opened, so disconnect and check.

4. Improper value of the low frequency compensating resistor (R_{LF}) also known as the decoupling resistor, since it performs two tasks. Check with the ohmmeter. This change will produce both the phase-shift and the smeared-out varieties.

5. The low-frequency compensating capacitor (C_{LF}) may have lost its capacity. Test by shunting with another capacitor. This will produce the same type of symptoms as noted in 4.

6. Excessive leakage of this same capacitor will produce phase-shift symptoms that remain fixed as the fine tuning is varied. Since the capacitor is usually connected to B-plus, there will be a resulting drop in voltage on the plate. If the capacitor is disconnected, the voltage will rise. This is a test for such leakage. Check further by substitution.

7. Leakage of the screen bypass capacitor, C_{BS} of Fig. 3. Here, too, the unit can be tested by the voltmeter for lowered voltage and then by substitution.

8. Excessive value of the low-frequency compensating resistor (R_{LF}) can produce a smear due to deficiency of the high frequencies with excessive lows.

9. Improper value of the load resistor (R_{LOAD}) is productive of smear. Check with the ohmmeter.

10. Low value of the grid resistor is also productive of smear. It too can be tested with the ohmmeter.

11. A gassy tube remains which may be the picture tube. Check for gas or substitute.

Localization of smear may be aided if it is first determined whether the type in question is of the phase-shift or smudge variety. The phase-shift type, for example, can only occur as a result of some change in circuit impedance. To illustrate this point, the low-frequency compensating network has been partly redrawn in Fig. 4.

At all times, the low-frequency compensating capacitor (C_{LF}) is in parallel with its own leakage resistance, which has been shown in Fig. 4. Normally, this leakage resistance

(Continued on page 59)

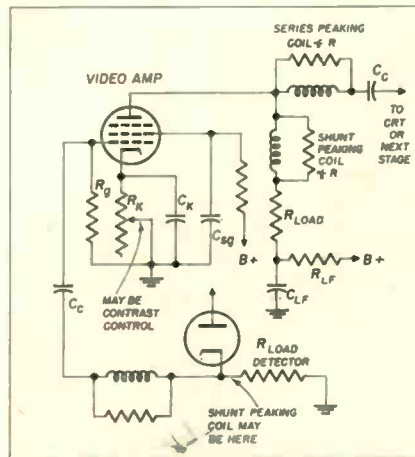
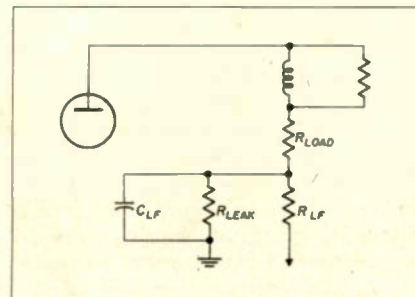


Fig. 3—Typical video detector and amplifier stage, showing components involved in smear.

Fig. 4—Partial circuit shows i-f compensating capacitor in shunt with own leakage R.



The Art of Techmanship

*How to be an electronic whiz
without knowing a ground from a hole in the chassis.*

ALBERT J. FORMAN, EDITOR
TECHNICIAN & CIRCUIT DIGESTS

• Some time ago, a fellow named Potter wrote a few books, *One Upmanship* and *Gamesmanship* among others, which cleverly described the techniques for lifting oneself by one's social bootstraps above one's contemporaries. Thanks to this pioneer effort, one need never be at a loss simply because one lacks knowledge, experience, skill and luck.

Based on Potter's Principles, after several years of research a specialized form of One Upmanship, called Techmanship, has been evolved. Techmanship is defined as "the art and science of being an electronic whiz without knowing a ground from a hole in the chassis."

Although a good deal of practice is required for the expert exercise of Techmanship techniques, only three basic elements are required to become an apprentice Techman.

1. A Techman must be polite.
2. A Techman must have a nimble faculty for expressing different approaches to a subject.
3. A Techman must have spent at least one hour studying selected rudiments of TV-electronics.

The rewards of becoming an accomplished Techman are great indeed. One is practically assured of increased prestige, being sought after for dinner parties, and elevation in his chosen career. Some of the nation's foremost business executives have achieved eminence in Techman fashion. You too can reap the benefits of becoming a Techman.

The underlying theory guiding Techmanship activities is extraordinarily complex, so a thorough presentation of principles will not be offered at this time. However, we shall endeavor to convey the essence of Techmanship with examples of standard maneuvers employed by Techmen in action. These stratagems are divided into two classifications, Laymen for your use with the electronically uninitiated, Specialist for your activities with qualified elec-

tronic technicians and engineers. The two may be interchanged, but not without some element of risk.

Layman

The Bagatelle: Here the object is to make the entire electronic science appear so simple to your uninformed listener, such a trifle, that you are truly puzzled that some people do not understand it. If you are called upon to explain, say, the operation of radar, pause to reflect a moment (as if you are applying yourself to the imposing task of reducing a mountain of data to one sentence), wrinkle your brow, then show a relieved expression and say: "There's nothing to it at all. All of the electrons are like ping-pong balls. If you push them in the right way, they bounce around and detect airplanes and things. Simple, eh?" This same kind of explanation holds for TV, automation, two-way radio and electron microscopes.

The Quagmire: This approach, particularly suited for those impressed by ponderously complex statements, might handle the subject of hi-fi like this: "To say hi-fi means true sound reproduction is oversimplification to the point of neglecting the essence. Hi-fi is the resonant physiological reaction of the ear's basilar and tectorial membranes to heterodyne frequencies generated by the alpha feedback circuit according to Fletcher-Munson parameters." Not one layman in a million would challenge this statement.

The Romance: The experienced Techman would never allow a statement such as "electronics is a complex science with so many practical applications" to go unnoticed. He would immediately point out to the layman that electronics is a miraculous creation, enabling human beings to rise with poetic grace above the vulgar limitations of their ten fingers. It is a romance, nay, a passion, an angel of mercy, which serves the artistic emotions. Pressed for an illustration, you can dare anyone not to see and feel the artistry-in-motion of an interference-ridden TV picture.

The Vision: For a Techman to be content with a layman's appreciative expression regarding today's fabulous electronic services is to show poor understanding of Techmanship principles. It's tomorrow that counts, for "in the coming years the electron will bring us electrobots to do all our chores, weather control, thought transmission and healthy lifetimes over 200 years." Should anyone have the temerity to challenge this as being a lot of malarky, bow to his superior knowledge (a Techman must be polite), declaring: "My years of study are in electronics, and I know the direction latest laboratory developments are taking for the benefit of man. However, since you probably have a broader background in eugenics, meteorology and encephalography, I may be mistaken." The rest of the audience will know the upstart can hardly sign his name; they'll think he's an ass and you're a prophet.

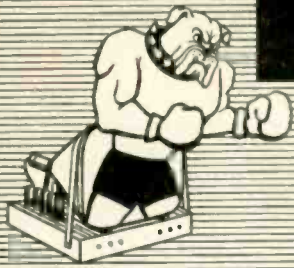
Specialist

In dealing with people who know their electronic onions, The Techman is never at a loss. His stature will skyrocket as with laymen, but care must be exercised to say neither too little nor too much.

The Word Fragment: This approach, combined with The Eloquent Smile, utilizes a serious facial expression, head nodding in agreement. When the company in the Techman's presence has a TV station background, for example, and the talk is revolving around "feeding diplexer and super-turnstile in quadrature," he will murmur: "Mumble-mumble of course, discontinuity mumble mumble-ocity of propagation." To any "What did you say?" queries, he will wave them aside with a "just elaborating on the theoretical aspect of your statement. We're in full agreement."

The Basic Principle: No matter how complex the conversation may turn, the Techman can always return to the fundamentals. Chances are non-Techmen have either forgotten them,

(Continued on page 62)



"Tough Dog" ⁷⁸

Corner



Difficult Service Jobs Described by Readers

Critical Vertical Hold

Recently, I serviced a Zenith 19R21 in which the vertical hold was both critical and intermittent. After the usual tube testing and substitution, the set was brought to the shop. The sync signal was found to be good right up to the vertical oscillator, but the natural frequency of the oscillator was shifting slightly up and down. However, all the components in the circuit checked out OK. The break in the case came when we observed that the brightness control was acting as a vertical hold control. The picture would roll up or down according to the setting of the brightness. Even light and dark scenes would cause the picture to roll. Boost voltage readings varied about 50 volts according to the setting of the brightness control. All tubes in the high voltage section were changed, no help. A resistance check of the high voltage transformer showed a high resistance which varied from 600 to several thousand ohms in the high voltage portion of the coil. Oddly, no visible effect was noticeable in the brightness or horizontal hold. A new transformer cleared up the trouble.—George L. Smith, Tracy, Minnesota.

IF's and Oil

The complaint on a Westinghouse chassis No. 2273-122, was bad oscillator drift on all channels and intermittent snow in the picture. The set had drifted so bad that channel 6 came in on channel 5. The tuner, No. 124001-1, didn't have enough range on the oscillator adjustment to correct the drift. The customer, a do it yourself addict, said the trouble started after he had put in a new 21" picture tube. Another repair man had also been called, before me, to fix the set. He tried a new tuner and tuner dial with no success and finally gave the job up. A check on the tuner and front dial looked OK, so

the signal generator and scope were set up. The IF's were way off frequency. After spending many hours, because the transformers wouldn't respond to adjustment, the cans were taken apart. An oily substance seemed to be clinging to the outside of the windings. Sure enough by replacing several IF coils the set went back to normal operation. The intermittent snow was caused by a bad 6BQ7 tube. The customer denied having spilled anything on the set. The chassis looked OK but anything can happen. Wonder why my car isn't running right today; maybe I'll try to fix it myself.—G. P. Oberto, Richmond, Va.

No Raster

This Motorola TS-23B melted some profits away, but it could happen on most any cathode coupled multivibrator circuit.

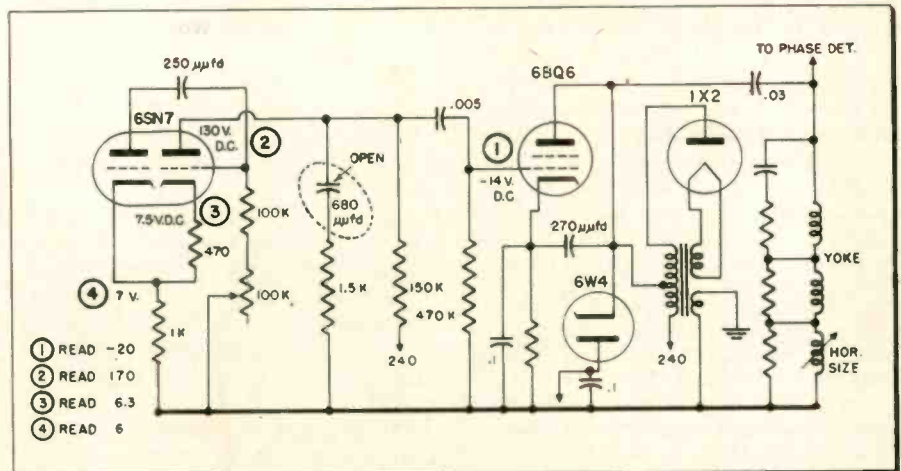
Touching the 1X2 plate cap with a screwdriver produced a very weak R.F. arc. The usual routine of "lifting" the 1X2 and CRT leads yielded no results. Tubes were substituted, to no avail. Insufficient drive was at first suspected. The 6BQ6 grid bias

was measured. It read -20 volts, as compared to -14 volts on the schematic. Removing the 6SN7 horizontal multivibrator killed the bias. Thus apparently ending the insufficient drive theory. Cathode and screen voltages of the 6BQ6 were normal. Next suspect, the yoke and flyback transformer circuits. No luck, everything checked out. End of that miserable day. Bright and early the next morning I decided to go over it once again. The set was turned on. Thanks to some shadows over the picture tube, I happened to see a very dim and narrow raster. It was also out of sync. Adjusting the horizontal hold would not bring the sync in, but it did make the raster a little brighter; still not bright enough.

Because of this hint, I decided to recheck the multivibrator, in spite of more than adequate bias. Pin 2, the plate of the output section, read 170 volts instead of 130 volts. The cathode had 6 volts in lieu of 7 volts normal. All other points were right on the button. One other effect was noted, when touching the plate, pin 2, with the meter probe, the

(Continued on page 60)

Horizontal Multivibrator—Motorola TS-23B

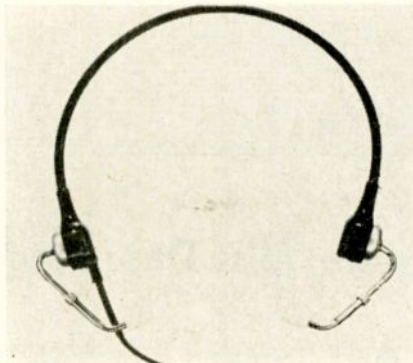


New Audio Products

Telex TWINSET



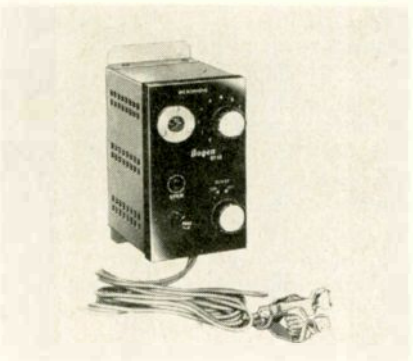
Nothing touches the ear, at the wearer's option the ear tip can be made to "float." The twin magnetic receiver with adjustable tone arms rests lightly (1.6 oz.) at the temple. Monocord is used, and can be plugged into either receiver. Reduces listening fatigue. Special cord with built-in volume control also available. Applications include amateur and commercial communications, monitoring and transcribing. 64 and 1000 ohm impedances. Telex, Inc., Electro-Acoustic Div., 1633 Eustis, St. Paul, Minn. (TECHNICIAN No. 10-2)



Bogen AMPLIFIER



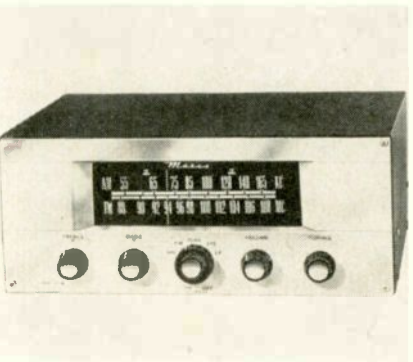
A practical transistor public address amplifier designed to operate from a 12v battery delivers 4-watts. Ideal for emergency cars, buses and portable PA systems. The BT12 is ready for immediate use. Features low current drain, rugged construction, light weight, small in size and ease in mounting. The panel provides for microphone and speaker connectors and has easily accessible volume control, power on off switch, and fuse holder. David Bogen Co., Inc. Route 4, Forrest Ave., Paramus, N. J. (TECHNICIAN No. 10-6)



Masco MUSIC MASTER



Presents a high fidelity FM-AM tuner and 10 watt amplifier on one chassis equipped with pre-amplifier, bass and treble controls, AFC and a compensating loudness control. Utilizes an Armstrong FM circuit with limiter and Foster-Seeley discriminator. Both AM and FM circuits were designed for maximum sensitivity and selectivity. The model AFR has a flywheel tuning control and shock mounted sub-chassis. List Price \$162.50. Mark Simpson Mfg. Co., Inc., 32-28 49th St., Long Island City 3, N. Y. (TECHNICIAN No. 10-4)



Rauland AMPLICALL



Intercom system has up to 30 buttons and lights. The universal master has station signal lights and pleasing chime signal. Calls remain registered and identified during absence of person signalled. The steel cabinet is finished in a two-tone simulated embossed leather effect. Several different models are available varying in number of stations and type of service. Economy systems with up to 12 positions are also featured. Rauland-Borg Corp., 3513 W. Addison St., Chicago 18, Ill. (TECHNICIAN No. 10-8)



Alsto AIR DUCT AUDIO

"Registered Music" system provides background music for every room in house by running a wire from record player, TV or radio to a special speaker attached to duct work of any air heating system. Alsto Co., 4007 Detroit Ave., Cleveland 13, O. (TECHNICIAN No. 10-66)

Brociner AUDIO AMPLIFIER

The Mark 20 is a printed circuit 20 watt integrated high fidelity amplifier. Controls provide for tape monitoring, rumble filter, loudness compensation, program selection, phono turnover and roll-off and separate bass and treble controls. \$99.75. Brociner Electronics Corp., 344 E. 32 St., New York, N. Y. (TECHNICIAN No. 10-5)

National SYNFFONETTE

Space saving (8"x14"x9") complete speaker-enclosure system may be used horizontally, vertically, wall or ceiling mounted. Essentially flat frequency response from 90-12000 cps. Suitable for quality PA, intercom and extension speaker. List Price \$29.95. National Co., Inc., 61 Sherman St., Malden, Mass (TECHNICIAN No 10-7)

Cabinart ENCLOSURES

Hi-Fi speaker enclosure kit has face lifted. The new model K-12 and K-15 kits feature heavy mouldings and side grills. Assembled it looks like the unfinished birch version of the factory finished Rebel and with the same acoustical qualities. Also available are pre-finished kits that make up into a hand rubbed finish in Korina or Mahogany. Prices start at \$36.00. G & H Wood Prods. Co., Inc., 99 N. 11th St., Brooklyn, N. Y. (TECHNICIAN No. 10-14)

Fannon Electric MUSI-TALK

Combination radio-intercom-door answering system easily installed. Simultaneous use of radio and intercom is possible. Music may be piped to as many remotes as desired. One or more rooms can be monitored from any one or more locations. You can answer the front door or baby sit from any location in the house. Consists of one master, one weatherproof door speaker and four indoor speakers, plus 200 ft. of wire. List price \$129.50. Fannon Electric Co., Inc., 98 Berriman St., Brooklyn, N. Y. (TECHNICIAN No. 10-3)

SHOP HINTS



Tips for Home and Bench Service by Readers

Gun Holster

Instead of letting the soldering gun flop around the workbench, a wood stand built on a 45° angle keeps it



Soldering-gun holder.

handy for instant use. Cut a hole in the upright piece of wood to receive the gun body. See illustration.—*Edward Mayo, Sarasota, Florida.*

Antenna Orientation

How many times have you wished you could be sure that you were getting the most out of that outdoor antenna by having it properly oriented. When the direction, of the location of the signal source, is known with reference to your installation, it becomes a very simple



Stick points to station.

matter to properly face the antenna by using a compass. As shown in the photograph the round broom stick, or what's left of it, is pointed 7° W of N toward the TV station. Much time and effort is saved.—*Harry J. Miller, Sarasota, Florida.*

Insulated Screwdriver

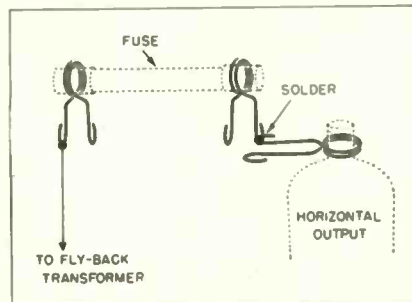
A piece of rubber tubing or plastic hose slipped over the shank and tip of a screwdriver serves as a screwdriver holder and insulator. It can be used to pry control knobs loose. The tubing also acts as padding to prevent scarring.—*Stanley Clark, East Bradenton, Florida.*

Shock Hazard

When bench servicing a TV chassis where only the CRT remains in the cabinet there is always the danger of shock from the joint of the H.V. extension wire and the short lead from the chassis. I have a 12" length of 1" O.D. polystyrene tubing that slides over this joint and is kept in place with a piece of scotch tape at one end. This does away with any chance of a short or shock. Any type of insulated tubing will do, as long as it will not breakdown under high voltage.—*Jim Harmon, Silver City, New Mexico.*

Quicky Fuse Mount

On sets not already equipped with a fused flyback and where space permits, I have been able to modify and satisfy at a very nominal cost. Simply by soldering 2 spring clips and affixing them to the top of the



Improvised fuse holder.

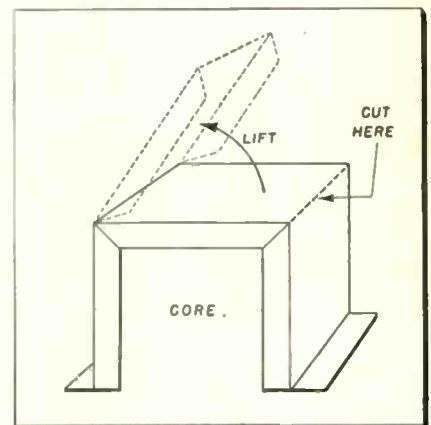
6BG6 or 6BQ6. Place an appropriate size fuse between these clips and the lead from the high voltage transformer. Of the 2 clip sizes available, select the smaller one to hold the fuse.—*Hyman Herman, Flushing, N. Y.*

Buzzing Radio

An ac-dc set was brought in with the complaint of intermittent buzzing noises, which were finally traced to an unexpected source. On a similar complaint, you are advised to check the pilot bulb, if any, on the set. In this receiver, the bulb appeared to have a steady normal glow, but the guess is that it was arcing. In any case, replacing the light corrected the buzzing condition. I now make it a routine practice, on complaints of this nature, to make a quick test of the pilot bulb before anything else is attempted.—*S. Sandler, Providence, R.I.*

Printed Circuits

When removing the blocking transformer mounted on a printed circuit board as in the Admiral 17X series, where the metal legs of the transformer are soldered to the board, applying the soldering iron to these legs could be ruinous to the circuit.



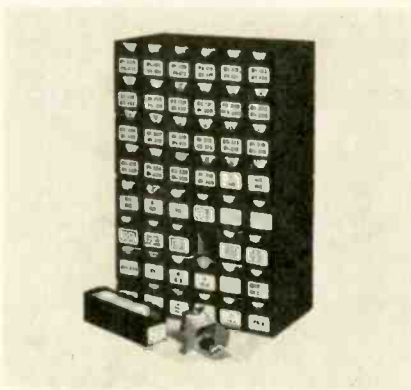
Cut and lift to remove core.

This can be overcome by simply unsoldering the leads of the transformer from the printed circuit. With a small metal saw, cut one corner edge of the transformer's mounting frame, bend the top strip back, pull out the core and coil assembly, slide a new one in, reposition the top and solder the cut closed.—*Harry J. Miller, Sarasota, Fla.*

New Tubes & Components

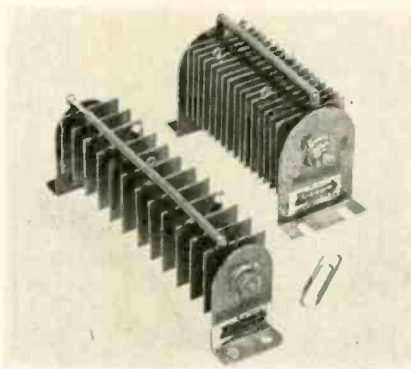
IRC CONTROLS

The 2 new dealer parts stocks at \$49.90 and \$99.90 plus a conversion stock at \$21.45, make possible the biggest volume control coverage. Each provides an amazingly wide selection of both carbon and wire-wound exact duplicate and standard controls. Also announced (not illustrated) are 6 new Resist-O-Cards, displaying virtually all values of 1/2, 1, and 2 watt carbon composition resistors, which can hang right at the workbench. International Resistance Co., 401 N. Broad St., Phil. 8, Penna. (TECHNICIAN No. 10-55)



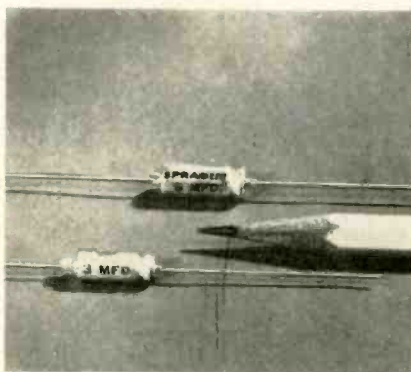
Federal 45V-RECTIFIER

A new line of 45-volt selenium rectifiers in standard sizes from 1 1/8" to 2" square has been announced. The units are made possible by advances in production techniques. The cells exhibit high stability and very low reverse or "leakage" current, making them ideal for use in magnetic amplifiers. The rectifiers will permit savings in cost and space by reason of the fact that fewer cells will be needed to achieve a desired voltage rating. Federal Telephone and Radio Co., 100 Kingsland Rd., Clifton, N. J. (TECHNICIAN No. 10-52)



Sprague LITTL-LYTIC

The smallest hermetically-sealed aluminum electrolytic capacitors made, for use by radio-TV servicemen and electronic equipment manufacturers. Originally developed for military and computer equipment, these tiny capacitors feature extreme reliability at a reasonable price. Ideal for replacements in such equipment as transistor radios, hearing aids, pocket-sized wire recorders, and all other miniature units using small electrolytics. Sprague Prods. Co., 65 Marshall St., N. Adams, Mass. (TECHNICIAN No. 10-51)



Sylvania 10" CRT

Coming soon 2 new 10" tubes with and without aluminizing, gray filter glass, 90° deflection and electrostatic focus. They are 1 lb. lighter and have a screen area of 56 1/2 sq. in. (An increase of 3 sq. in.) Sylvania Electric Prods., Seneca Falls, N. Y. (TECHNICIAN No. 10-53)

Ram FLYBACKS

3 new "better-than-original" flybacks for replacement of GE parts. Ram X133 delivers 18 KV with a B+ of 300 v. and boost voltage of 680 v. It replaces General Electric RTO-149-1, 150, 151, 151-3, 161, 166, 166-5. Ram X134 is used in the GE 14" Portable TV set, replaces GE part numbers RTO-165, 165-1, 175, 175-3. It delivers 14 KV with a B+ of 135 v. and boost of 300 v. Ram X135 replaces GE part numbers RTO-179, 179-4 and 183. It delivers 17 KV with B+ of 320 v. and boost of 575 v. Ram Electronics, 50 S. Buckhout Ave., Irvington, N. Y. (TECHNICIAN No. 10-58)

GE TV TUBES

9 miniatures. They are types 6BN4, 3BN4, 2BN4, 5BK7-A, 4BC8, 6BC8, 6CF6, 3CE5 and 4CE5. The 6BN4, 3BN4 and 2BN4 are 7-pin medium-mu triodes VHF RF amplifiers. The 5BK7-A is a 4.7v, 600 milliamper heater version of the 6BK7-A cascode amplifier. The 4BC8 and 6BC8 are 9-pin medium-mu twin triode, cascode RF amplifiers with 600 milliamper heaters. The 6CF6 is a 7-pin sharp-cutoff gain-controlled IF amplifier having a 300 milliamper heater. The 3CE5, 3.15v .600A heater and the 4CE5, 4.2v .450A heater, are 7-pin sharp cut-off pentodes used as wide-band RF amplifiers. General Electric Co., Schenectady 5, N. Y. (TECHNICIAN No. 10-56)

Raytheon CAR RADIO & TV TUBES

4 new TV tubes the 8BA8A, 8CM7, 17AX4GT and 17DQ6 and 2 auto radio types 12AF6, 12CN5 announced. Both 12AF6, RF or IF amplifier, and 12CN5, IF amplifier, are heater-cathode type pentodes, miniature construction, designed to operate with plate and screen voltages supplied directly from a 12 v. battery. The 8BA8A, a medium-mu triode & sharp cutoff pentode is used as a sync separator & video amplifier and the 8CM7, vertical deflection amplifier is a medium-mu dual (dissimilar) triodes, are heater cathode type miniatures using 450 milliamper, controlled warm-up, heaters. The 17AX4 damper, a diode and the 17DQ6 horizontal deflection amplifier a beam pentode are heater-cathode type having a 450 milliamper rating and controlled warm-up heater. Raytheon Mfg. Co., 55 Chapel St., Newton, Mass. (TECHNICIAN No. 10-54)

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Sound Business

(Continued from page 39)

- 4 50-ft. microphone extension cables
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- 1 50-watt amplifier, 4 microphone inputs
- 4 horn speakers, 15-ohm
- 4 cone speakers, 15-ohm, in enclosure
- 4 50-ft. loudspeaker extension cables
- 4 100-ft. loudspeaker extension cables
- 1 record changer attachment, 3-speed
- 1 pair headphones, 10,000 ohms or higher
- 1 tape recorder, 2-speed
- 4 speaker-to-speaker cable coupler adaptors
- 1 set, 70-volt line-to-speaker matching transformers
- 4 heavy-duty adjustable-height floor stands, for mounting speaker enclosure or horn.

This array will allow you to have three separate sound systems operating simultaneously, or one very large system, or anything in between.

The beginner may wish to save money by the use of high-impedance microphones which eliminate the need for input transformers. While this is all right, it limits the possible length of the cable due to extreme loss of high frequencies in long high-impedance cables. If you must do this, use a microphone that has both high and low impedance output connections with a 2-conductor shielded cable so that you may convert to low impedance by the addition of the input transformer when your installations become more frequent and more extensive. You may also save cost at the beginning through the use of cheaper loudspeaker cabinets with open back (with some resultant loss of quality and level).

Cable connectors should be highly standardized from the start, with different types for microphone as against loudspeaker circuits, to eliminate the chances of error in hookup. I find it advantageous to have cables completely detachable at the microphone, loudspeaker, and amplifier, so that all cables are available even though not all input and output components are to be used.

Before purchasing any equipment, it is essential to look into the matter of competition and pricing. If your investigation should indicate that there is no competition, this might be due to the fact that there really is no local demand for such services.

If there is competition, and there probably will be, be sure that there are not too many outfits in the business. However, if you do find that you can take business away from your competitors and (more important) create new business by convincing potential customers of the benefits of your service, then it will be worthwhile studying the business situation.

The sound system rental business is characterized by a relative lack of advertising. The more established firms will advertise or at least be listed in the SOUND SYSTEMS section of the classified telephone directory; but since most customers for rental sound equipment have



Fig. 3—Elementary system consisting of dynamic mike, 3-speed changer, 15-watt amplifier, and wide-range speaker-enclosure.

only occasional call for it, and at widespread and/or irregular times, there is little else one can do. Direct mail advertising, especially at holiday times, is sometimes effective; but outside of this, it is hard to catch a potential customer at the time when he needs you, with the result that your advertising may be thrown away rather than used or filed.

Consequently, you will have to consult your newspaper to learn of coming events, and then get in touch with the sponsor, preferably by phone—and be sure to follow it up. Because commercial sound is still very much of an art, a job well done is your best advertising. People who observe the installation will find out who did it when the time comes for their own event. People who are not acquainted with your work will ask those who are.

Some observation of your competitors should bring out two things: first, the type of equipment they are using (which may or may not agree with the types you would use); and second, the prices that they charge. You may be tempted to reduce your rates in order to get established;

but your competitors' prices are probably pretty fair already, and you will eventually find that you must keep prices in line with theirs to make a fair profit, depending on your overhead.

Job Pricing

Rental prices are arbitrary, at best, and are not very closely related to your cost of rental equipment. For example, if you charge \$2.50 a day for rental of a microphone costing you \$50, you may not be able to get \$5.00 a day for a microphone which costs \$100. In the case of a system having two microphones, stands, amplifier, two loudspeakers, and necessary cables, you might charge \$15.00 a day, 50 percent more on a weekly basis, and half of that total for each ensuing week, provided that the customer picks up, operates and returns the equipment himself. Perhaps you would charge \$25.00 for the dance rental with operator described earlier in this article, provided that you did not have to travel too far to get to the job.

One increasingly critical condition is the matter of unions. If you are supplying equipment and operators for stage productions employing IATSE personnel, these people may walk off the job in the event that you are "not union." Although you have every right to be there in non-union status, the management will blame you for any work stoppage due to a walk-off and you will not be hired again. If stage work is of importance to you, your company will probably have to sign a union contract and have union men or put you in the union. If you decide to go into sales and permanent installation of equipment in buildings under construction, an IBEW arrangement may be necessary.

The high fidelity trend has not made much of an inroad into commercial sound system rentals, although it is starting to affect permanent installations. Naturally, you will want to use the widest range equipment possible; although horn speakers—essential to PA rental work—leave something to be desired. Your principal concern for the most part here should be in providing clean, articulate sound with ample volume and smooth complete coverage of the necessary area.

After you have had some experience in this business, you may find yourself enlarging to encompass not only rentals, but sales of commercial and high-fidelity home equipment, disk and tape recording, and consulting audio engineering. •

Signal Generators

(Continued from page 41)

service NTSC generators usually have controls permitting the operator to switch off the Y signal from the color difference signal, for specialized chrominance circuit checks. Thus, Fig. 12 shows a group of color-difference signals from an NTSC bar generator, with the Y signal "off." The waveform appears very sharp and clean, because it is obtained by applying the output from the color-bar generator directly to the vertical-input terminals of the scope.

The beginner is usually surprised to note that the waveform obtained at the output of the picture detector in a color-TV receiver is degraded to some extent by passage through the signal circuits. Thus, we have seen in Fig. 1 how a complete NTSC color-bar signal, when checked at the output of the picture detector, may acquire a somewhat fuzzy appearance, due to the addition of tube

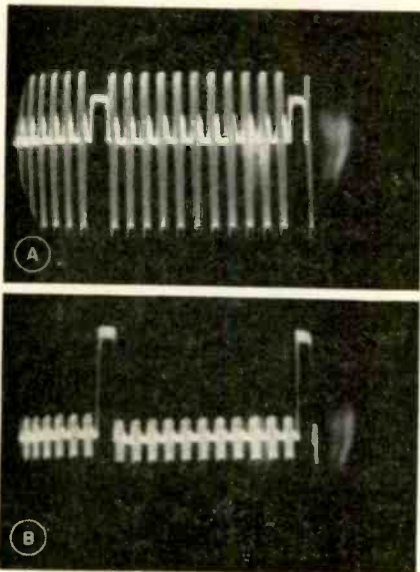


Fig. 10—Inadequate (A) and excessive (B) sync amplitude, resulting from improper adjustments of generator sync-voltage control.

Fig. 11—This distortion of an NTSC color-bar signal is produced by misadjustment of the low-capacity probe to its companion scope.

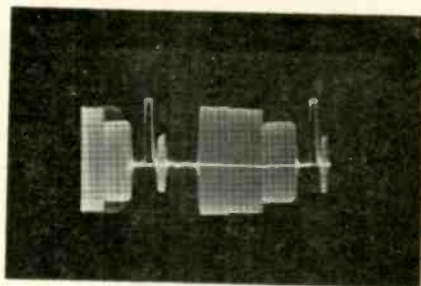
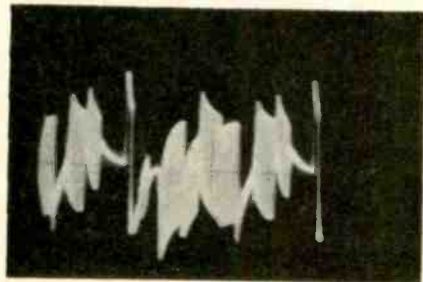


Fig. 12—Chrominance (color-difference) output from NTSC generator with Y output "off."

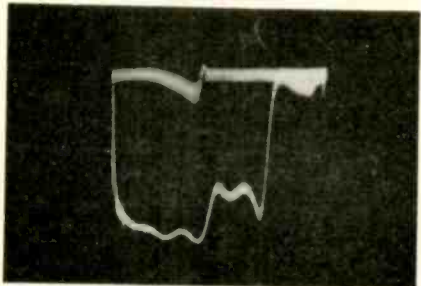


Fig. 13—Interference in the response curve of a Y amplifier, caused by cross-talk with the vertical and horizontal sweep circuits.

and circuit noise. Moreover, a certain amount of overshoot and ringing may also be apparent in the detector output, resulting from circuit response which is somewhat short of ideal. Thus, although the individual cycles in the burst, for example, although easily displayed and counted on the screen of a good scope when checking the generator output directly, are not so easily checked at the receiver output.

In some cases, the vertical oscillator may produce some degree of cross-talk with the signal at the output of the picture detector. This is the situation seen in Fig. 1A. By adjustment of the vertical-hold control, the video waveform may be zero-beat with the interfering vertical-oscillator voltage, so that the interference "stands still" in the pattern. This is often a very useful method of identification.

This situation is analogous to vertical-sweep interference in sweep-frequency displays, familiar to alignment workers in black-and-white servicing. Such interference, encountered in a sweep-frequency check of the Y amplifier in a color receiver, is illustrated in Fig. 13. Both horizontal and vertical pulse interference is evident in the photo. The vertical interference is seen as a substantial irregularity in the zero-volt reference line. Elimination of such interference can be effected during alignment and other test procedures by temporarily unplugging the vertical and horizontal output tubes, if practicable. ●

Video Detector

"No picture, just lines," that was the customer's description of her troubles. This is possibly the most frequent complaint from new set owners, but this was a 3 year old set and an old customer. No point in going into details on how to adjust the horizontal hold control so the technician takes the call slip confident that a new 6SN7 will be all that is required.

Examination of the set changed the situation completely, as the customer had described it there was no picture and no sound. There were lines, vertical lines, in fact a perfect example of a 200kc note.

The trouble must be in the tuner, IF strip or video amplifier, the tubes in these circuits were pulled in turn but not changed. The logic here being that if a tube is pulled and no change is seen on the screen then obviously that tube is not the cause of the trouble. Only one tube, the 6AU6 video amplifier removed the oscillation, a new tube was tried but with no effect. Now, apparently the fault had been localized to the video stage but not the tube in that circuit.

The chassis was now pulled and the video components checked visually. The only obvious source of trouble seemed to be in the location of two peaking coils, one in the grid circuit, the other in the plate of the video amplifier tube, which were closer together than normal. Moving these coils apart removed the oscillation but did not produce a picture. A new 6AL5 video detector restored the set to normal.

Moving the peaking coils together again now produced no oscillation.

The first reaction of the technician in a case like this is to blame the manufacturer, but the set worked with the coils in their original position. We can say that any wasted time was due to the technician not substituting new tubes. The real answer is that every day we learn something new about service work and that's what makes it interesting.
—K. Bramham, Vancouver, B.C.



"We'll have a picture in a minute. The boy next door is putting up the antenna now, for half price."



100% FULLY SATURATED NTSC* STANDARD TV COLOR BAR GENERATOR

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MODEL 656XC

Absolutely necessary for accurate color TV receiver servicing. **\$495.00** NET

Designed for use with all TV color systems approved by F. C. C.

- ✓ Completely self-contained . . . no complicated external synchronizing connections.
- ✓ Crystal controlled: (0.05% accuracy). Sub carrier and horizontal framing.
- ✓ Produces clearly defined wave forms to provide ease of alignment and assure minimum possible error.
- ✓ NTSC standard phase and brightness: This NTSC standard signal was used in designing all color TV receivers, and is now used by TV manufacturers.
- ✓ Self Checking: Assures operator that generator is producing accurate NTSC standard signal at all times.
- ✓ Generates 3 primaries, 3 complements plus black and white. (An important feature of this equipment is that white is produced by adding the 3 primaries.)
- ✓ In addition to color bars this instrument generates the necessary signals for I, Q, R-Y and B-Y for demodulator alignment.
- ✓ Also, White-Dot-Crosshatch patterns: (20 vertical and 15 horizontal, less those in blanking). (Vertical lines only or horizontal lines only). (Small size white dot pattern of 300 dots, less those in blanking).
- ✓ 3.58 MC sub-carrier output of 1 volt peak-to-peak is pro-



vided for trouble shooting and alignment of color synchronizing circuits.

- ✓ Output is either R.F. or Video. Equivalent vestigial side band modulation.
- ✓ The Model 656XC is preferred for its accuracy, stability and long trouble-free operation. This instrument was designed and built in cooperation with leading color TV receiver manufacturers, and is specified by them for their field service engineers.



MODEL 660

WHITE DOT COLOR DISPLAY GENERATOR

Provides either of 3 patterns on the screen of any color TV receiver:

White Line Crosshatch; 20 vertical and 15 horizontal, less those in blanking.

White Dot (small size); 300 dots, less those in blanking.

Color Display Pattern; crystal-accurate blended in sequence of orange, red, magenta, blue, cyan, green.

Model 660 features the necessary high degree of stability not found in Variable White-Dot generators. In the 660, all frequencies generated are crystal controlled and locked together with extreme stability.

Frequency of chrominance (color) signal is exactly crystal controlled to reduce possibility of alignment errors. This feature permits increased accuracy over ordinary color generators which use a free-running oscillator.

RF output frequency is in preset channels, 2 thru 6, to allow easy selection through a built-in switching arrangement.

Small dot and crosshatch size down to two lines in both horizontal and vertical planes.

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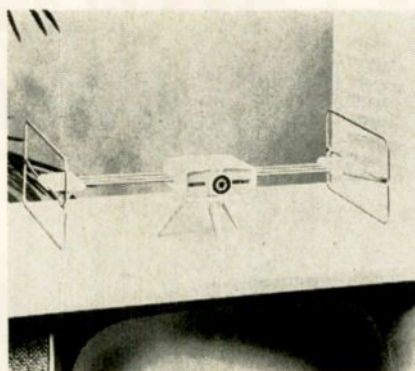
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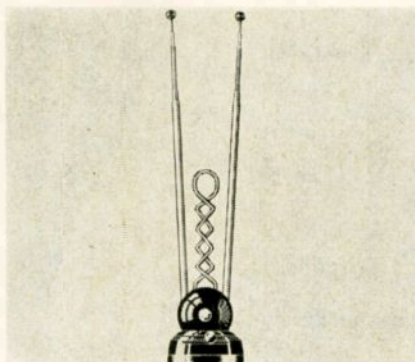
Channel Master **SHOWMAN** →

Only 19 inches from tip to tip and has no extendable rods. This indoor antenna is a complex electronic instrument with "Metro-Dyne" tuning, a 12-channel variable inductance tuner which operates on the same principle as the TV set itself. The "Metro-Dyne" knob is tuned to a specific channel just as the set is. When the knob is turned, a metallic slug is moved. An auto-transformer maintains a close 300 ohm impedance match. List price \$17.95. Channel Master Corp., Ellenville, N. Y. (TECHNICIAN No. 10-25)



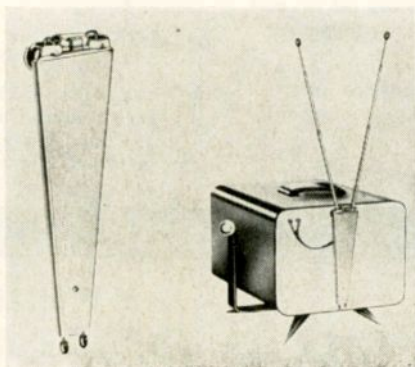
Snyder **SLIDE SWITCH** →

A new "Slide Switch" indoor television antenna, has 6 different positions, to provide the clearest picture on any channel, helps eliminate ghosts and snow. A criss-cross phasing element and the three-section staffs help enhance the quality of the new antenna, which is effective for B & W or color television, FM, VHF and UHF. Elements are in aluminum (Model 66A) or in polished brass (Model 66B) \$3.45 and \$3.95 respectively. Snyder Mfg. Co., 22nd & Ontario Sts., Philadelphia, Pa. (TECHNICIAN No. 10-23)



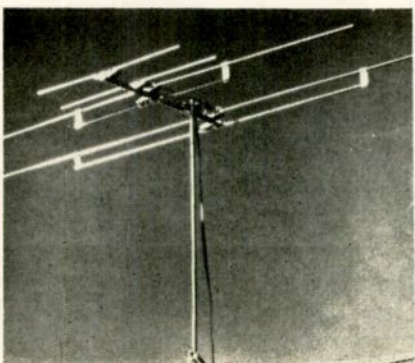
JFD **TUK-A-TENNA** →

JFD's answer to the demand to remove the unsightly indoor antenna look from the living room. When not in use the Tuk-A-Tenna folds down out of sight. It can be attached in minutes behind any TV set. Individual swivel ball-joints permit pivoting of dipoles in any direction for maximum signal pick-up. An aluminum cover hides the dipole elements when not in use. Available in 3 or 4-section dipoles, with or without a cover from \$8.95 to \$12.95 JFD Mfg. Co., Inc., 6101-16th Ave., Brooklyn 4, N. Y. (TECHNICIAN No. 10-28)



Winegard **UMBRELLA-EASE** →

Guaranteed picture improvement and simplified "Umbrella-Ease" installation are major points of the new line. Factory assembled, elements snap permanently into place for easy installation. Bases are adaptable to any common roof angles. Aluminum anodizing in colors improves antenna performance and looks better. Some models are complete factory-assembled installations, which the customer can carry home and mount. The color beam illustrated retails for \$17.95. Winegard Co., Burlington, Iowa. (TECHNICIAN No. 10-26)



Hi Lo **TELESCOPING ANTENNA**

The spiral indoor antenna, which covers channels 2 to 83, uses the familiar spiral design of other Hi Lo Antenna, but incorporates a few features of telescoping dipoles. This enables the TV set owner to obtain maximum performance. The antenna swivels on ball and socket in any direction. Model 404 sells for \$12.95 and model 505 for \$14.95. Hi-Lo TV Antenna Corp., 3540 N. Ravenswood Ave., Chicago, Ill. (TECHNICIAN No. 10-20)

Telrex **"CONICAL-V-BEAM"**

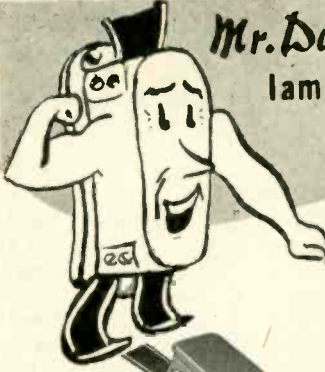
Designed for the replacement market as a low-price, good-quality, durable, simple-to-install TV antenna. Named the "Quickie," it is easy to assemble. This, all-aluminum conical is rugged in design. Exclusive radiator assembly with swing clamp automatically position the elements. Easy snap-in positioned-reflector assembly provides positive locking. Q-2X single bay \$9.05, Q-4X two way stack \$19.30, Q-8X four bay stack \$42.25. Telrex Labs, Asbury Park, N. J. (TECHNICIAN No. 10-19)

Telco **"SPEED-RIG"**

A fully assembled, snap open type of outdoor TV antenna promises faster installation. It can be completely installed in a matter of minutes. Sturdiness has not been sacrificed in the antenna's simplified construction, and it is composed of weatherproofed materials. The serviceman simply swings the elements into position and then spreads them apart until they snap into place. An exclusive feature is the wing nut and twist lock that secures the elements against any further movement. Single bay list price \$9.75, 2-bay with tie bars \$19.95. Telco Electronics Mfg. Co., 919 Taylor Ave., Rockford, Ill. (TECHNICIAN No. 10-22)

Walsco **"SUPER WIZARD"**

This unique all-channel VHF antenna includes several advanced features. It combines two driven elements with a special design phasing harness to assure maximum gain, sharp directivity, and superior back-and-side rejection. A patented "Phase Reverser" shield is credited with transforming pattern and impedance characteristics to equal a multi-element, twin-driven yagi on the low band and a 3 bay yagi on high channels. Can be stacked. "Umbrella" snap-out rig reduces installation time. The 4240 carries a three year unconditional guarantee. Walsco Electronics Corp. 3225 Exposition Place, Los Angeles 18, Calif. (TECHNICIAN No. 10-18)



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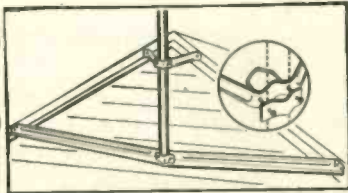
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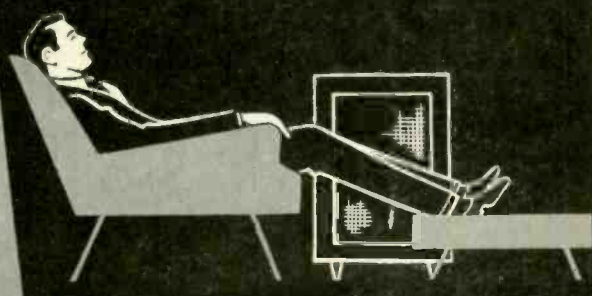
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A new plastics box containing ten fuses. Box is designed to fit all conventional dispensers. Advantage of plastic box is that contents are immediately visible to the distributor and dealer as to the number of fuses contained in the package. In addition to the visual advantage, each box can be used for other purposes. Sightmaster Corp., 111 Cedar St., New Rochelle, N.Y. (TECHNICIAN No. 10-70)

Controla-Tone REMOTE CONTROL

Controla-Tone remote volume controls for TV and radio allow the viewer to either raise or lower the volume from his viewing position across the room. This patented design permits quick and easy installation on practically any TV or radio set by the set owner or by a service man. Suggested retail price is \$6.95. Continental Mfg., 601 City National Bank Bldg., Omaha, Neb. (TECHNICIAN No. 10-68)

B & K CALIBRATOR

Quickly checks test equipment accuracy and easily helps make necessary adjustments. Calibrates VOM, VTVM, signal generators, oscilloscopes and other meters. Supplies 2, 5, 25, 100 and 300 volts D.C. 1% or better. Resistance ranges are 10, 100, 1K, 10K, 100K and 10



megohms. Accurate crystal oscillator generates over 300 mc within .1%. Plug-in crystal facilitates use as a marker generator. With 5 mc crystal the model 750 is \$54.95 net. B & K Mfg. Co., 3731 N. Southport Ave., Chicago 13, Ill. (TECHNICIAN No. 10-30)

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...was the Professor's pitch!

Yes, sir, the old time medicine showman sure made some high, wide and handsome claims about his particular brand of "cure-all". Trouble was, his elixir's performance rarely matched his claims. That didn't matter to the Professor, though, he'd made his pitch and was miles away by the time the customer found he needed a specialist. Now, today, most of us try to keep our customers happy — keep them coming back. And most of us realize that today's "cure-all" claims are just as hard to swallow as the old timer's snake oil . . . nobody really profits from a "cure-all" substitute except the "Professor"! It stands to reason that when a phonograph manufacturer, for instance, puts a pickup cartridge into his product, it's because that particular cartridge is best for the job. No substitute is exactly the same. So, for highest performance, for full profit markup, for complete customer satisfaction, don't rely on "cure-all" substitutes! Always replace with Astatic original and direct replacement cartridges.

ASTATIC IS THE WORLD'S ONLY COMPLETE LINE OF PICKUP CARTRIDGES!

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NEW! Ask your distributor for the latest Astatic Cartridge Cross Reference and Needle Listing CRC-56.

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Color-animated plastic point-of-sale signs for permanent outdoor and indoor brand identification are now being mass produced. Color animation is achieved by a revolutionary device known as "Dynalite." It works on the principle of



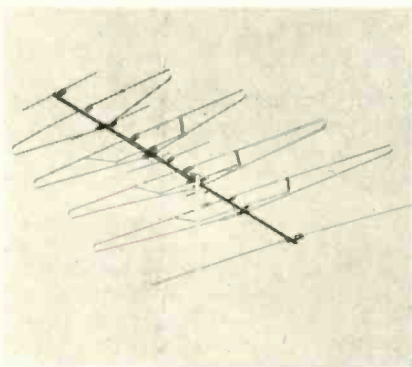
circling prismatic light and furnishes what appears to be a perpetually moving rainbow-hued barrage of light. Such animation serves as an attractive, compelling eye-catcher which can be used to light-up store windows at night as well as in the daytime. Tel-A-Sign, Inc., 960 W. 122nd St., Chicago, Ill. (TECHNICIAN No. 10-72)

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Electronic Technicians

Trio WING DIPOLES

The 1957 Zephyr features the new "Wing" director and retains the principal of stagger tuning, which gives the flat frequency response necessary for good color reception. Greater band width, single lobe pattern and excellent



impedance characteristics were accomplished by stub matching, a new phasing system and complementary spacing of the active elements. The variance in gain on channels 2-6 is only 1 db and on channels 7-13 only .5db. From \$18.95 to \$34.95. Trio Mfg. Co., Griggsville, Ill. (TECHNICIAN No. 10-27)

Snyder TV TABLES

Models TT-1 and TT-2 are part of a new line of TV tables which can be assembled by anyone within two minutes and which can be turned in the direction of the viewer by fingertip pressure. Completely portable, the tables are designed to hold at least 200 pounds of

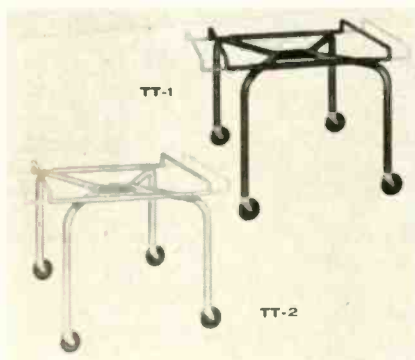


table-model TV receiver with ease. Suggested retail price for Model TT-1 (in satin black finish) is \$5.95 and \$7.95 for Model TT-2 (shiny brass and satin black finish). Weight is 9 lbs. packaged. Snyder Mfg. Co., 22nd & Ontario Sts., Phil., Pa. (TECHNICIAN No. 10-69)

Titchener TV TUBE MOUNT

A new impact-resistant TV tube mount, fabricated of soft steel wire, costs as low as one-third of conventional mounts. During drop tests, where a TV set is dropped from 12 to 30 in., this welded wire tube mount holds the tube intact, even after extensive cabinet damage. E. H. Titchener & Co., 67 Clinton St., Binghamton, N.Y. (TECHNICIAN No. 10-71)

Star's PIN STRAIGHTENER

The new JE 20 combination sub-miniature tube pin straightener and cut off tool speeds alignment and trimming of tube leads for both inline and round base sub-miniature tubes. It is used as follows: feed leads into straightener until tube base bottoms. Align leads, and cut to desired lengths. Star Expansion Prods. Co., 142 Liberty St., N.Y. 6, N.Y. (TECHNICIAN No. 10-73)

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DY-19A Yoke for Sylvania 100-0009

DY-20A Yoke for Sylvania 100-0004

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News of the Industry

CBS-HYTRON opens modern 57,000 sq. ft. warehouse in Chicago. **ROBERT M. JACKSON** appointed as merchandising coordinator.

WILLIAM G. TUSCANY to head sales of semi-conductor section and **EARL CLEMICK** to handle sales in packaged electronic circuits for **CENTRALAB**.

CODY ADVERTISING INC., gets 2 appointments, **MERIT COIL** and **SHERWOOD ELECTRONICS**.

COLEMAN TOOL & MACHINE CO. announces 3 representatives, **LEON S. BUSH CO.**, **SHERWOOD P. FRENCH** and **ERNEST L. WILKS CO.**

DUMONT promotes **PETER WEIL** to assistant manager of the technical products division. **MURRAY FINK** appointed N.Y. field sales manager.

ELECTRONIC INDUSTRY SHOW CORP., is the new name of the Radio Parts & Electronic Equipment Shows, Inc. Newly elected officers are **WILFRED L. LARSON** Pres., **JEROME M. KIRSHBAUM** V.P., **WILLIAM J. MORELAND** Sec., and **J. A. MILLING** Treas.

ERIE RESISTOR CORP., is building a large modern ceramic plant in State College, Pa., which will be named **TECHNICAL CERAMICS**. Another new plant will be started sometime in October in Hawthorne, Calif., to mass produce electronic and mechanical assemblies. **GEORGE OSBORN** named as manager of the **ERIE-PACIFIC WORKS**.

GENERAL ELECTRIC has announced its intention to make direct factory TV service available in all areas where dealers and customers demand it. Mr. **WILLIAM L. PARKINSON**, planning study manager, also suggested the best course for independent service people is one of expansion and growth to handle the steadily increasing volume of business. **HENRY F. De LONG** has been appointed general manager of the CRT department.

JACK GILBERT ASSOCIATES appoints **DICK FELIX** as account executive.

EUGENE V. Di SCIULLO named eastern sales manager for **HYCON ELECTRONICS**.

Reps & Distributors

R. S. LOHMANN CO., is now representing Michigan jobber and industrial accounts.

MEDAL MFG., appoints **ROBERT ROUTMAN** to head sales and advertising activities for their antenna division.

MERIT appoints **MINGINS-SHAW ELECTRONIC SALES** as N.Y. representative.

PHILCO announces executive promotions, **HAROLD W. SCHAEFER** as VP and general manager of the appliance div. **LARRY F. HARDY** as VP in charge of consumer products.

HERMAN J. SCHORLE appointed director of manufacturing for **PYRAMID**.

RMS and **AMES MFG. CORP.**, appoint as sales representatives, **JAMES L. GRANTLAND** and **HARRY A. MAAS**. **EUGENE KNELOFF** named as advertising and sales promotion manager.

RECOTON appoints **VERNER O. JENSEN CO.**, to represent them in the NW.

JOHN F. RIDER PUB., names **A. J. NELSON CO.**, as representative.

SENTINEL's service parts dept. at Evanston, Ill. has moved to 340 E. Superior St., Ft. Wayne, Indiana.

SKOTTIE ELECTRONICS names 2 representatives, **HENRY J. ABBOTT** and **WALLY SHULAN & CO.**

NAT KOPF joined **HERMAN H. SMITH INC.** as sales representative.

SNYDER MFG. is going automation. **GUS SNYDER** director of production hopes to increase production and uniformity.

SYLVANIA names **JOHN A. MAYBERRY** NW district manager of electronic products distributors sales, **ROBERT F. SCALISE** as a field sales representative and appoints **DE-MAMBRO RADIO SUPPLY** as a new distributor.

TODD-TRAN names 2 representatives, **FRED D. VORE** and **TELESCO INTERNATIONAL**.

ROHN appoints 5 representatives, **THE RAY BRIDGE CO.**, **THE HILKER CO.**, **SID LEVINE & ASSOCIATES**, **E. W. OSZMAN** and **BURT C. PORTER CO.**

Catalogs & Bulletins

(Continued from page 24)

QUICK SELECTION TUBE CHART: Chart classifying 52 tube types in the 600-milliamper series and 24 types in the 450-milliamper series according to elements, typical service, heater voltage, maximum ratings, and gives average characteristics. General Electric Tube Sales, 1 River Rd., Schenectady, N. Y. (TECHNICIAN B10-1)

COIL & TRANSFORMER REPLACEMENT GUIDE: 128 page guide containing accurate and complete coil and transformer replacement information. Covers 20,000 models and chassis and 155 brand names of manufacturers—almost every TV set produced up to early 1956. "Repl Guide" also contains 6½ pages of fly-back schematics which provides quick reference information. Available from electronic parts distributors throughout country. Merit Coil & Transformer Corp., Chicago, Ill. (TECHNICIAN B10-2)

ELECTRONICS CATALOG: 356-page catalog listing over 27,000 items, including latest hi-fi components (plus 34 complete hi-fi systems), TV chassis, boosters, rotators, UHF converters, table model and portable phonographs, recording equipment and public address amplifiers and complete systems. Amateur receivers, transmitters and other gear. Catalog No. 160 available free on request. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (TECHNICIAN No. B10-3)

SPRAY-PAINT BROCHURE: An illustrated folder about self-spraying paint and tips on getting the most out of push-button painting. "Spra-Koat" comes in 24 different colors and finishes. Copies may be obtained from General Cement Mfg. Co., 400 S. Wyman St., Rockford, Ill. (TECHNICIAN No. B10-4)

MICROPHONES: Catalog "56" contains technical data and general information on microphones, microphone cartridges, microphone accessories, phono pickup cartridges and magnetic recording heads. Questions have been anticipated so that persons buying products described will find the kind of information needed to properly evaluate usefulness of a given model. Free from Shure distributors or Shure Brothers, Inc., 222 Hartweg Ave., Evanston, Ill. (TECHNICIAN No. B10-5)

PANEL INSTRUMENT DATA: Form 81556-T is a comprehensive new panel instrument data sheet containing full-size scales of various types of panels as well as dimensional diagrams of round, rectangular and special instruments on which panels are used. Typical external shunt, illustrated for purpose of showing mounting dimensions, as well as illuminated meters are also shown. Triplett Electrical Instrument Co., Bluffton, Ohio. (TECHNICIAN No. B10-6)

AUDIO VISUAL CATALOG: Two-color catalog illustrates and details new line of equipment including a low-priced transcription unit for the playback of records up to 16", inexpensive record players for kindergarten and classroom use, hi-fi record players for music appreciation classes, as well as hi-fi transcription machines combined with P. A. systems. Available without charge from Audio-Master Corp., 17 East 45th St., New York, N. Y. (TECHNICIAN No. B10-7)

PLATE ASSEMBLY GUIDE: Specifications of ceramic plate assemblies, including circuit diagrams, constants, functions and cross reference section are contained in a new twenty-page pocket size plate assembly guide. Also included is a 10-page section of important replacement information complete with manufacturers part numbers and correct Aerovox equivalent. Free from Aerovox distributors or for 25¢ from Aerovox Corp., Advtg. Dept., New Bedford, Mass. (TECHNICIAN No. B10-9)

BEST IN



SOUND

Made to the highest requirements of leading set manufacturers, Tung-Sol Tubes are perfect replacements for all sets. Bank on Tung-Sol's brand of quality—tops in the industry. It's the sure way to avoid callbacks that eat into profits. Tell your supplier you'd rather have Tung-Sol tubes.

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RECEIVING TUBES

TUNG-SOL makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.

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KESTER SOLDER COMPANY
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SOLDER

Trends in Audio

(Continued from page 32)

gressive promotion of hi-fi during the past few years has catapulted it into public consciousness and made it a by-word for better audio. Since the heart of hi-fi is the speaker, manufacturers will be called upon to find new applications, improvements and refinements of design to meet the demands being made upon radio-TV producers for better instruments.

For while hi-fi has and will continue to have a multitude of meanings, it will engender a demand for better sound reproduction which in turn will affect the service technicians, who are the first to feel the impact of growing popular demand for better sound systems, and who will enjoy a bigger replacement business.

" . . . increasing demand for a quality product"



Joseph N. Benjamin
Vice-President
Pilot Radio Corp.

We have noticed two extremely important trends in the audio field which we feel will be of increasing importance over the next five years. The first is the increasing demand for a quality product. We find that audio equipment is not bought on price alone but that the purchaser has more than average knowledge of the equipment he is buying and looks for such desirable features as tubes used within their ratings, transformers of good size and design, wide range of tone controls, etc. He is willing to pay a little more to get the quality he wants.

We also see a trend developing whereby dealers can reach the entire prospective high fidelity market by selling both separate components and the same components assembled into a package. However, it is not

enough to take any cabinet that will accommodate these components, but considerable thought and design must be employed in planning a cabinet, which together with the speaker system, will give true high fidelity performance with freedom from audio feedback or microphonics, as well as adequate ventilation to insure safe operation.

Smear & Phase Shift

(Continued from page 43)

is so high that its affect on the circuit is negligible and it may be disregarded. Under these conditions, C_{LF} acts together with R_{LF} not only as a low-frequency boost network, but also to prevent severe phase shift at the low frequencies. If leakage in C_{LF} should increase (that is, if leakage resistance should be reduced), this lowered resistance bypasses the capacitor and tends to nullify its effect on the circuit. Thus the phase distortion inherent in the circuit goes uncorrected.

Similar defectiveness in other capacitors in this circuit will have similar undesirable results. Any of the coupling capacitors (C_C) may be involved. If series resistance rises too high or shunt resistance becomes too low, phase shift becomes more evident.

Apart from the poor sync that results from low-frequency troubles and is therefore a symptom of such troubles, inspection of a test pattern, where available, will also yield clues to poor low-frequency response. Where the vertical wedges of the pattern tend to become heavily black as compared to the relative greyness of the horizontal wedges, the absence of adequate low-frequency response is indicated. •



"He must have been a Hi-Fi fan . . . all he took were two 6V6's and some speaker grille cloth."

for service and lab. work

Heathkit PRINTED CIRCUIT OSCILLOSCOPE KIT FOR COLOR TVI

① Check the outstanding engineering design of this modern printed circuit Scope. Designed for color TV work, ideal for critical Laboratory applications. Frequency response essentially flat from 5 cycles to 5 Mc down only 1½ db at 3.58 Mc (TV color burst sync frequency). Down only 5 db at 5 Mc. New sweep generator 20-500,000 cycles, 5 times the range usually offered. Will sync wave form display up to 5 Mc and better. Printed circuit boards stabilize performance specifications and cut assembly time in half. Formerly available only in costly Lab type Scope. Features horizontal trace expansion for observation of pulse detail — retrace blanking amplifier — voltage regulated power supply — 3 step frequency compensated vertical input — low capacity nylon bushings on panel terminals — plus a host of other fine features. Combines peak performance and fine engineering features with low kit cost!



MODEL
0-10
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Shpg. Wt.
27 lbs.



MODEL
TS-4
\$4950
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16 lbs.

Heathkit TV SWEEP GENERATOR KIT ELECTRONIC SWEEP SYSTEM

② A new Heathkit sweep generator covering all frequencies encountered in TV service work (color or monochrome). FM frequencies too! 4 Mc — 220 Mc on fundamentals, harmonics up to 880 Mc. Smoothly controllable all-electronic sweep system. Nothing mechanical to vibrate or wear out. Crystal controlled 4.5 Mc fixed marker and separate variable marker 19-60 Mc on fundamentals and 57-180 Mc on calibrated harmonics. Plug-in crystal included. Blanking and phasing controls — automatic constant amplitude output circuit — efficient attenuation — maximum RF output well over .1 volt — vastly improved linearity. Easily your best buy in sweep generators.



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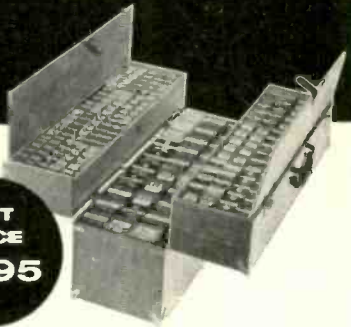
New Beauty . . . New
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Model XX "Thrift Kit"

High in quality, low in price . . . the most attractive tote box on the market today!

- Length — 16½"
- Height — 13"
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★ COVERED IN BEAUTIFUL NEW BLUE TEXTURED LEATHERETTE

Model 22 "Super" Ideal for more extensive tube requirements; over 2200 cu. in. of usable space. Attractive, long wearing blue textured fabric covering.

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Here's big news! These new economy models will make the trade stop and stare! Never before has famous Mastra quality been offered at such bargain prices! Write for information on our complete line. Custom-built boxes available for specialized purposes.

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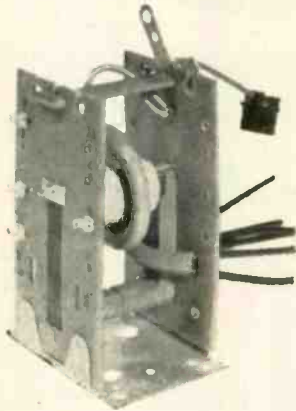


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For exact replacement in over 60 G. E. models and chassis. HVO-59 replaces G.E. parts RTO-125, 126, 127. HVO-61 replaces G. E. parts RTO-129 & 130. Both feature Merit's NEW anti-corona ring plus exact lead color coding! Another in Merit's line of exact replacement transformers, yokes and coils—as always, the most complete in the industry. And Merit is the only manufacturer of these products who has complete production facilities for all parts sold under their brand name.

MERIT

MERIT COIL AND TRANSFORMER CORP.
4427 N. CLARK ST., CHICAGO 40, ILLINOIS

Getting Mileage

(Continued from page 37)

noise, hence serves a useful function in this circuit. An abnormal leakage here would also indicate the need for replacement.

An ohmmeter test between pins 4 and 3 in Fig. 5 will ascertain whether or not one of the bypass capacitors is shorted. If, for instance, C406 is shorted to ground, a reading between test points 4 and 3 would provide an ohmic reading of the 270-ohm resistor, plus the 10,000-ohm series resistor between test point 4 and the junction of R406 and R407. If capacitor C407 is shorted, a 10,000-ohm reading would be obtained from the series resistor R411. If capacitor C408 is shorted, a reading of approximately 32,000 ohms would be obtained. (R411 plus R407 to ground.)

Other Receivers

The test points of other receivers can also be utilized in a similar fashion to the methods outlined here. Resistance measurements can be taken and continuity checks made in addition to the voltage readings specified for the various test points. In some receivers, such as the Admiral Models T2301Z, T2327Z, T2337Z, etc., printed circuit chassis are used. The printed circuit section is underneath the chassis but various resistors, capacitors, and other components are above the chassis and on the same side as the tubes. A section of the component side of the printed circuit assembly is shown in Fig. 6. Since each component is identified by number, it is a simple matter to make checks using these components as test points with respect to the schematic section. Thus, virtually all circuits can be tested without chassis removal in terms of voltage, continuity, and resistance measurements. •

Tough Dog

(Continued from page 45)

high voltage came in. This was it; the plate loading was defective. The coupling condenser was substituted and proved nothing. Load resistors were next, still no results. The only component left was the peaking condenser a 680 μ f. It couldn't be leaking or shorted, the plate voltage was high not low. In the interest of be-

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THE 1957 Zephyr Line

FOR DISTANCE



FOR EXTREME DISTANCE



FOR THE MAXIMUM



Only

ZEPHYR ANTENNAS HAVE:
"WING" DIPOLE "WING" DIRECTOR
DOUBLE TRANSPOSITION PHASING
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TRIO

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GRIGGSVILLE, ILLINOIS

EXPORT SALES DIV., SCHEEL INTERNATIONAL INC.,
4237 N. Lincoln Ave., Chicago, U.S.A.
Cable Address: HARSHEEL

ing thorough, I shunted another cap across this innocent looking component. Presto, plenty of high voltage, -14 volts on the 6BQ6 grid, 130 volts on the 6SN7 plate, and 7 volts on the cathode. The open peaking condenser increased the plate load impedance. The higher plate voltage resulting from the reduced plate current caused the multivibrator frequency to decrease. This in turn increased the flyback time enough to prevent proper transformer action. Since the multivibrator pulse output increased in amplitude, the 6BQ6 grid drive had also increased.—*Alfred Consiglio, The Bronx, N. Y.*

Shattered Safety Glass— Pix Tube OK

The customer called and told us they were watching a program when the entire front safety glass "exploded." We picked up the receiver, a GE, and found that despite the shattered glass, the pix tube was fine and the set played OK. We figured out that the cause must have been temperature instead of crt implosion. The day the glass went it was about 98° all day, and the set



Glass shattered to crystals, set still plays.

had been playing for 3 hours, making it hot enough for the glass to expand more than its fit would allow. When we removed the glass from the cabinet, we noticed it was very tight around the edge of the frame (no doubt too tight when installed). The glass remained intact, though it was like crystallized sugar, until we turned the set face down. Then all the glass fell out in crystals, except around the edge, which had to be pried out because it was so tight.—*Dick Carpenter, Tama, Iowa.*

THE GREATEST VALUE IN TEST EQUIPMENT



MODEL
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A real value leader . . . accurate, compact, rugged, and low in cost. Has a combination of 28 functional ranges, simplified by a single dial. Ideal for radio and TV servicing, and for all 'round electronic and electrical measurement needs. At leading distributors, or write for literature. WESTON Electrical Instrument Corporation, Newark 5, N. J. A subsidiary of Daystrom, Inc.

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The Quality Line

the Talk of the Industry

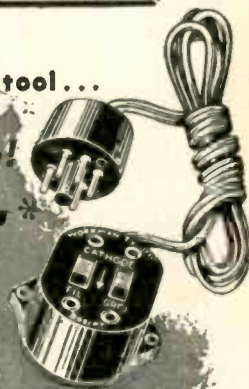


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PAYS FOR ITSELF — with the first use.

REPAIRS PICTURE TUBES — in the set.

GIVES LONGER PICTURE
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TWO MINUTE OPERATION
— saves \$40 tube.

SIMPLE AND EASY TO USE
— and fits into your kit.

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WORKMAN TV INC. TEANECK, N. J.

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Electronic SPECIALTIES

NEW!



**a Volt-Ohmmeter
you can carry in
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MIDGETESTER**
MODEL 355

**SELF
SHIELDED!**

The world's first practical shirt-pocket volt-ohmmeter. Rugged and accurate. Not affected by any outside magnetic influences. 10,000 Ohms per volt AC and DC! Fourteen ranges: 5 for AC voltages, 5 for DC voltages, and 4 for DC resistances.

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including probe leads

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WORLD'S LARGEST MANUFACTURER
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IN CANADA: Bach-Simpson, Ltd., London, Ontario

Art of Techmanship

(Continued from page 44)

or never knew them in the first place. For instance, in a conversation about the practical problems of troubleshooting a color TV receiver's matrix section, the Techman would contribute: "Let's return to the basic principles underlying the whole question. Grassmann's third law, derived over 100 years ago, states that 'sources of the same color produce identical effects in a mixture regardless of their spectral composition.' Expressed as $C_1 + C_2 = (R_1 + R_2)R + (G_1 + G_2)G + (B_1 + B_2)B$, you can derive the solution to your matrix problem." Remember, a Techman must spend at least one hour in study.)

The Authoritative Statistic: A Techman's resourcefulness with statistical findings yet to be found can bring crowning glory. Should any electronic specialist have the idea that printed circuits are difficult to service, it would be pointed out that research report No. 11739-A, published on Feb. 21, 1956 by the National Bureau of Standards (or Bell Labs, RETMA, Stanford Research Institute, etc.), covering 18,560 printed circuit boards, conclusively proved that servicing was completed in 22.7% less time than conventional wiring. Who would dare contradict this?

The Grand Departure: It is not amiss, at the opportune time to shift the focus of attention to a new topic, and then reverse the field to the original subject before too many inquiries are invited. Among a group of semiconductor specialists discussing obstacles to achieving less transistor quiescent collector voltage drift, a brief comment that the problem is akin to one encountered by the Techman in a synchrocyclotron project where accelerating potential fluctuated, will make the semiconductorites take notice that there is someone in their midst to be reckoned with.

Techmanship Society

At this point, it is to be hoped that the examples cited above will give the reader at least a preliminary appreciation of the art of Techmanship. Full exploration of the approaches described, along with hundreds of others and the underlying theoretical concepts, are exhaustively presented in the six-volume work, *Principles and*



Little Devil COMPOSITION RESISTORS

Meet all MIL-R-11A requirements. Rated at 70C rather than 40C. Available in 1/2, 1, and 2-watt sizes in all standard RETMA values.

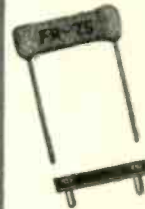


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Vitreous-enamelled. In 5, 10, and 20-watt sizes.

TYPE AB POTENTIOMETERS

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



FR-7.5 FUSE RESISTOR

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

WRITE FOR STOCK CATALOG

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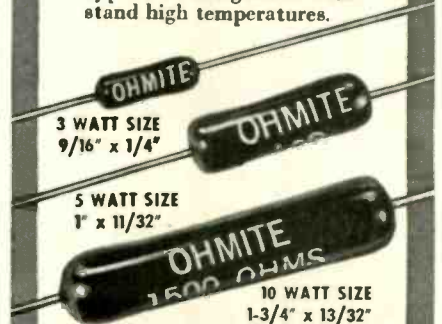
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**DEPENDABLE
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Eliminate call-backs due to faulty replacements. Use Ohmite components.

AXIAL-LEAD RESISTORS

Vitreous-enamelled, power-type units designed to withstand high temperatures.



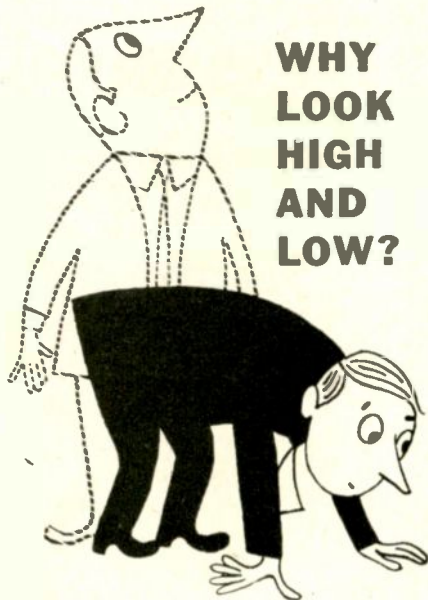
3 WATT SIZE
9/16" x 1/4"

5 WATT SIZE
1" x 11/32"

10 WATT SIZE
1-3/4" x 13/32"

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WHY LOOK HIGH AND LOW?

C-D IS THE ONLY COMPLETE LINE OF ELECTROLYTICS



No matter what you need in electrolytic capacitors - C-D has it. Every type, shape and rating... all of consistent high quality proven by outstanding field performance.

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THERE ARE MORE C-D CAPACITORS IN USE TODAY THAN ANY OTHER MAKE. PLANTS IN SO., PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND PUNQUAY SPRINGS, N. C.; SUBSIDIARY, RADIART CORP., CLEVELAND, OHIO.

Practices of Techmanship: A Guide from Nonentity to Entity.

Further information may be obtained, along with application forms for membership, from the Techmanship Society, Room 639, 480 Lexington Ave., New York 17, N.Y. •

THE TV SERVICE CALL

By Walter S. Andariese

I venture out to many homes, Both near and miles away. Some are average, others dreary, Many somewhat gay.

Yes, they vary from very happy To something like a morgue, But the TV is my mission, Be it new or some old "dog."

I spot its tell-tale symptoms And hope to fix it fast. No matter what the time consumed, The repair I make will last.

The job is done; content are most; The bill is paid, my service tipped. Yet others gripe at any charge; They claim that they've been gyped.

But in thinking things over, 'Bout what's happened in the past, There's one thing that makes me quiver, Something I'd love to blast!

Its not the half ruined chassis The owner tried to repair, Nor his barking, sniffing canine With its long and shaggy hair.

Even the "know-it-all" customer With his own spare tube supply, Is one of many irksome things To which I could comply.

That thing I fear the most of all, The thing that does annoy, Is not a balky TV set, It's a MONSTER!!-the owner's little boy.



"Al's been rather careful since he got stung with that 16,000 volts."

HQ For the 5 TOP-QUALITY brands of

STANDARD BRAND TUBES

AT SENSIBLE PRICES!

- 90-day RETMA guarantee • First quality only Brand new • Individually boxed • No rebrands, rejects, or rownshd "bargains"

FREE! Newest handy air-mail order form for your ordering convenience. Write for your free copy • Lists ALL popular TV & radio types • Makes mail-ordering a real pleasure • Orders over \$25.00 (with remittance) post-paid.

Table with columns for TYPE, EACH, TYPE, EACH, TYPE, EACH. Lists various tube models and their prices.

We stock over 1000 other types including Diodes, Transistors, Transmitters and Special Purpose types. WRITE!

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512 Broadway, N. Y. 12, N. Y. Call us day or night 24 hour telephone service Walter 5-7000



"Oh, him, sir?
He's carrying the
JENSEN NEEDLES."

IMPROVE YOUR CASH POSITION

Child Psychology—
Tells How to Collect

JACK BEDFORD

• All is well until the time comes for the customer to pay his bill. After you have completed the repair job, itemized your bill and justified your charges, the crucial moment arrives. There are many approaches to solving this problem in an amicable manner. Presented here are a few examples of a basic psychological technique used in raising children. That is to give the person a choice between two things.

When a request for service is made, and after all the pertinent information is obtained, ask the customer—"Do you want me to bring change, or do you plan to pay by check?" (If a collection problem is anticipated.) Either way the ice has been broken and the chances are that you will be paid. If you do not hit pay dirt, you may hear this, "I was sure the check book was here, but my husband must have taken it with him," or "When I called you on the phone, I forgot this was the day to pay the milkman. He took all my charge." Well what can you do? Upset the adjustments you made, pull the tubes you put in, or pull the customer's hair out. None of these things will make the customer happy, neither will you collect for the time you spent. Give the person the benefit of the doubt, and give him a choice as follows, "When would you prefer to pay—the tenth or the fifteenth?" If the call was made on the sixteenth, select two days not in the distant future. The 20th, and 25th might be appropriate.

If the bill is too large for the customer to pay all at one time, give him a choice between two different



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manufacturers of electronic equipment since 1928

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methods of payment. Both the amounts and dates due should be agreed upon in this manner. Accounts due at a minimum, means cash in the bank at a maximum. •

CIRCUIT DIGEST INDEX

Last complete Circuit Digest index appeared in April 1956 issue, index addenda in August 1956. A new complete index will appear in an early forthcoming issue.



3 big reasons why QUIETROLE
Reg. U. S. Pat. Off.

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- 3 RELIABILITY

The original product for quieting noisy controls and switches . . . the universal lubri-cleaner for TV and radio . . .

Say "QUIETROLE" to your distributor . . . be sure you get it.

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NO GOO!
NO GRIME!**

Carried by recognized jobbers everywhere!

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IN CANADA: Active Radio & TV Distributors
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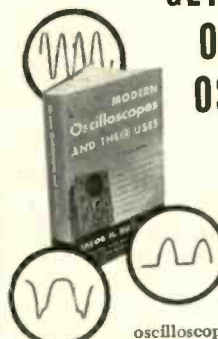
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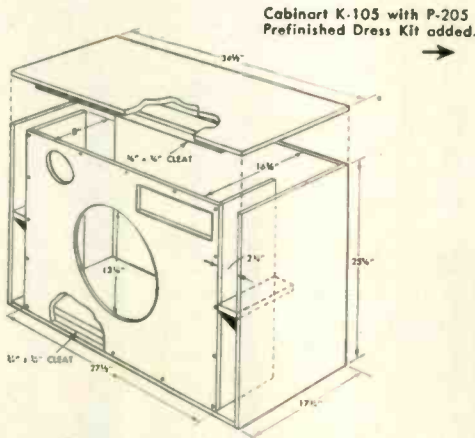
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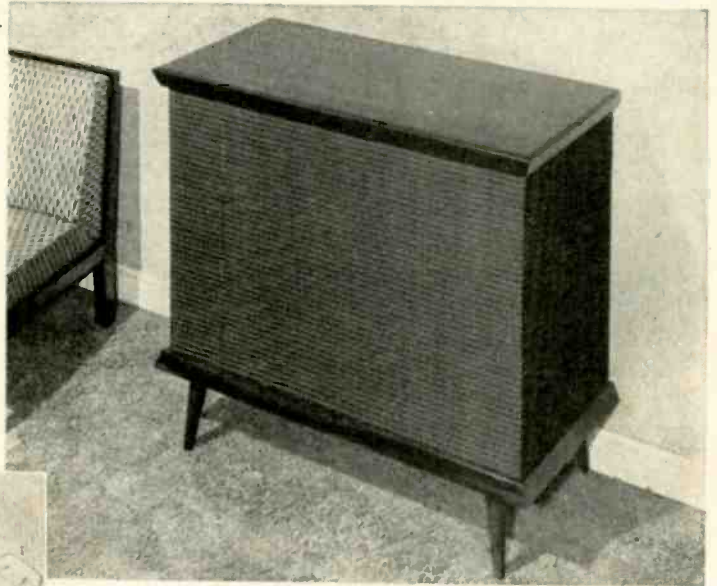
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3-Way	15"	Triplex	KT-32	169.50	Corner® Bass-Ultraflex	K-103	48.00	P-203	39.00
3-Way	15"	Triplex	KT-32	169.50	Low Boy Bass-Ultraflex	K-105	48.00	P-205	39.00
2-Way†	15"	—	KT-21	99.50	Corner® Bass-Ultraflex	K-103	48.00	P-203	39.00
2-Way†	15"	—	KT-21	99.50	Low Boy Bass-Ultraflex	K-105	48.00	P-205	39.00
2-Way†	12"	Concerto	KT-22	73.00	Corner® Bass-Ultraflex	K-107	39.00	P-207	36.00
2-Way†	12"	Concerto	KT-22	73.00	Low Boy Bass-Ultraflex	K-109	39.00	P-209	36.00
2-Way†	8"	Contemporary	KDU-10	24.75	Corner® Bass-Ultraflex	K-111	23.00	P-211	25.00
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