

ELECTRONIC TECHNICIAN

Including 16 pages of
Circuit Digests

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Troubleshooting
ARCING & CORONA

April • 1957

50¢

SAVE MANY WAYS

You pay nothing extra for cabinet

Cabinets stack neatly with others

28 clearly identified compartments

Spend much less time ordering



with **IRC**[®] Resist-O-Cabinets

Four "Savingest" Assortments

IRC Resist-O-Cabinets come complete with a colorful all-metal cabinet and any one of four resistor assortments. All resistors are guaranteed fresh and packed in the cabinet at the factory. Cabinets are yours at no extra charge. They have 4 "non-spill" drawers with 28 clearly identified compartments. Design permits neat stacking.

Assortment	No. 3 2 Watt	No. 4 ½ Watt	No. 5 1 Watt	No. 6 Combination
Contents	80 BTB2 Fixed Composition and BW-2 Insulated Wire Wound Resistors. 33 different values from 4.7 ohms to 1 megohm.	100 BTS Fixed Composition and BW-½ Insulated Wire Wound Resistors. 28 different values from 47 ohms to 10.0 megohms.	83 BTA Fixed Composition and BW-1 Insulated Wire Wound Resistors. 28 different values from 47 ohms to 4.7 megohms.	91 resistors including 5 DCF 1 Watt Precistors and 86 ½ Watt, 1 Watt, and 2 Watt Insulated Resistors. Values from 47 ohms to 5 megohms.
List Price	\$26.40	\$17.00	\$20.75	\$23.54
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Radio and TV technicians who use IRC Resist-O-Cabinets call them the "savingest" resistor deal they know of. Here's why. You save time and trouble in ordering—all of the resistors most used in TV repair work are pre-selected for you. You save money—you not only get resistors at regular dealer price, but also a handsome all-metal cabinet at no extra charge. And you save time on the job—you know what you have—and you have what you want when you want it. To trim costs and fatten profits, buy resistors in IRC Resist-O-Cabinet assortments.

Wherever the Circuit Says



ELECTRONIC TECHNICIAN

Including
Circuit Digests

TELEVISION • ELECTRONIC • RADIO • AUDIO • INDUSTRIAL

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APRIL, 1957

FRONT COVER

With the coming of warm and humid weather, arcing and corona effects may become increasingly troublesome. That flash on the cover is the artist's version of what happens when his set goes "pffft." Don't miss the article telling you how to lick this problem; it starts on page 26.

FEATURES and ARTICLES

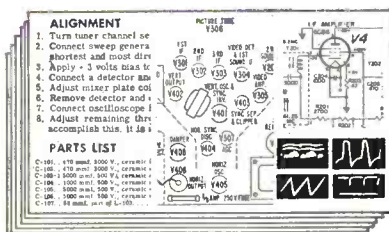
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AMP-128
MONTGOMERY WARD: TV Models
WG-4029A etc.
PHILCO: TV Chassis 7H20, 7H20-U
RCA: TV Chassis 5377

BIG LOAD

for little fellow



.... and away we go!

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SELENIUM RECTIFIERS REPLACED
BY THE M-500 SILICON RECTIFIER.

MOST SMART SERVICEMEN
ARE REJUVENATING WEAK T.V. SETS
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EMPLOYMENT OPPORTUNITIES

For further information about employment openings, write directly to address noted in advertisement, or to:

Personnel Dept.

ELECTRONIC TECHNICIAN

480 Lexington Avenue

New York 17, N.Y.

Positions Wanted

OVERSEAS position wanted for electronic-TV service technician with 1st class radio-phonograph and 2nd class telegraph licenses. Age 29, single. Sid Elliot, 731 S. W. 12 Ave., Miami, Fla.

ELECTRONIC TECHNICIAN seeks position in Southern Calif. Radio-TV repair for 8 years, last 6 years with own shop. Attended Coyne and Admiral service schools. Age 27, single. Joseph J. Halmo, 3216 Mall Court, Lansing, Mich.

TECHNICIAN with 25 years experience, mostly in radio-phonograph repair, seeks opportunity. Will relocate, prefer Calif. Salary \$75. Age 48, married. George D. Griffin, 322 West State St., Apt. 1, Ithaca, N.Y.

TEST ENGINEER, test equipment supervisor, engineering lab experience, 10 years in electronic industry with manufacturers. Seek advancement. Will relocate, prefer Florida or West Coast. Box E401, **ELECTRONIC TECHNICIAN**.

ELECTRICAL ENGINEER, graduate Clemson College, communications and radar officer, Lt. Colonel in reserves. Owns good servicing business for past 11 years. Speaks Japanese. Seeks challenging opportunity. Age 45, married. V. L. Bethea, 108 E. Gibson Ave., McColl, S. C.

HOW TO OBTAIN YOUR FREE LISTING

Simply write to the Personnel Dept., **ELECTRONIC TECHNICIAN** 480 Lexington Ave., New York 17, N.Y., briefly stating the following:

1. Your name, address and phone number.
2. Your experience and training, giving number of years.
3. Area in which you wish to locate. Will you relocate?
4. Optional: Salary requirements, age and marital status.

If you are interested, **DO IT TODAY!**

(Continued on page 6)

FREE



WE GUARANTEE YOUR FCC LICENSE

If you fail to pass your Commercial License exam after completing our course, we guarantee to continue your training, without additional cost of any kind, until you successfully obtain your Commercial license.

Here's proof FCC Licenses are often secured in a few hours of study with our coaching at home in spare time . . .

Name and Address	License	Time
Walter Eggers, Pacific Grove	1st	12 weeks
Paul Reichert, West Salem, Ohio	2nd	10 weeks
Harold Phipps, LaPorte, Indiana	1st	28 weeks
John H. Johnson, Boise City, Okla.	2nd	12 weeks
James Faint, Johnstown, Pa.	1st	26 weeks

WE CAN PROVIDE HUNDREDS OF NAMES IN YOUR AREA ON REQUEST

An FCC License can be your Guarantee of Success in Electronics

EMPLOYERS MAKE OFFERS LIKE THESE TO OUR GRADUATES EVERY MONTH!

Letter from nationally-known Airlines: "Radio Operators and Radio Mechanics are needed for our company. Periodic wage increase with opportunity for advancement. Both positions include many company benefits such as paid vacations, free flight mileage allowance and group insurance."

Letter from nationally-known manufacturer: "We have a very great need at the present time for radio-electronics technicians and would appreciate any helpful suggestions that you may be able to offer."

These are just a few of the examples of the job offers that come to our office periodically. Some licensed technician filled each of these jobs; it could have been you!

OUR TRAINEES GET JOBS LIKE THESE EVERY MONTH



CHIEF ENGINEER

"Since enrolling with Cleveland Institute I have received my 1st class license, served as a transmitter engineer and am now Chief Engineer of Station WAIN. Also have a Motorola 2-Way Service Station. Thanks to the Institute for making this possible."

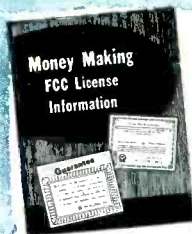
Lewis M. Owens, Columbia, Ky.



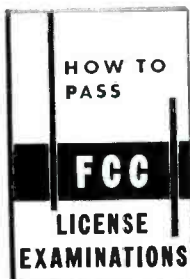
TEST ENGINEER

"I am pleased to inform you that I recently secured a position as Test Engineer with Melpar, Inc. (Subsidiary of Westinghouse). A substantial salary increase was involved. My Cleveland Institute training played a major role in qualifying me for this position."

Boyd Daugherty, Falls Church, Va.



MAIL COUPON TODAY AND RECEIVE



ALL THREE BOOKLETS FREE!

CARL E. SMITH, Consulting Engineer, President
CLEVELAND INSTITUTE OF RADIO ELECTRONICS
Desk RM-97, 4900 Euclid Bldg., Cleveland 3, Ohio

Cleveland Institute of Radio Electronics

Desk T-5 4900 Euclid Ave., Cleveland 3, O.

Please send Free Booklets prepared to help me get ahead in Electronics. I have had training or experience in Electronics as indicated below:

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|---|---|
| <input type="checkbox"/> Military | <input type="checkbox"/> Broadcasting |
| <input type="checkbox"/> Radio-TV Servicing | <input type="checkbox"/> Home Experimenting |
| <input type="checkbox"/> Manufacturing | <input type="checkbox"/> Telephone Company |
| <input type="checkbox"/> Amateur Radio | <input type="checkbox"/> Other |

In what kind of work are you now engaged?

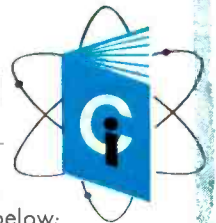
In what branch of Electronics are you interested?

Name Age

Address

City Zone State

Special Tuition Rates to Members of Armed Forces





How far can you go in Electronics without a Degree?



Bernie Roth examines ribbon from printer during Field Engineering Laboratory period.

Without a formal degree, 24-year-old Bernie Roth is already established as a Computer Units Field Engineer—handling a key responsibility with IBM. At the McGuire Air Force Base, a directional control site for Project SAGE, Bernie is part of a team maintaining an entire electronic digital computer system. In this assignment, he must stay abreast of all the most advanced electronic concepts—developing his professional know-how every day. “That’s what’s different about IBM,” Bernie says. “The graduate engineer has an advantage anywhere—but here at IBM the technician also can grow into managerial positions. IBM is one of the few organizations I know of that is willing to invest time and money in training the technical man—and then gauges his future ability strictly on performance.”

IBM instituted its program for specialized technical training many years ago. The theory behind this built-in educational system asked the question: Why should the capable man be denied the opportunity simply because he lacks a formal degree? The wisdom and foresight of IBM’s decision are reflected in the story of Bernie Roth—in the misgivings of his past—in the certainty of his future.

ELECTRONIC TECHNICIANS WANTED

The Navy steers Bernie on the right course

When Bernie graduated from Croton, N. J. High School in 1950, he received a general diploma—mathematics and science made up a small part of his curriculum. Enlisting in the Navy in 1951, Bernie proved his aptitude for technical work and was assigned to the electronics preparatory school in Jacksonville, Fla. Later, he attended the Class A Aviation Electronics School in Memphis, Tenn. . . . probably the most important phase of his naval training because it was in

electronic techniques. First of all, I studied basic circuitry. Then, I actually learned a new way to think—the ability to comprehend the whole from the assorted parts. The student must know how to form logic blocks, and in time, he should be able to design his own circuits. All of this proved especially helpful once I got out into the field. Later on, I studied the various input-output devices which are used as auxiliary units to the central computer. Finally, I analyzed the methods that supply the power for this electronic giant. Millions of

How does the future look to Bernie?

A happy and prosperous future is in the offing for Bernie Roth. And, based on the records of his older associates, he's confident that in five years' time he will qualify as a Systems Engineer, at the very least. The next steps going up the ladder are Group Supervisor and then Group Manager. "The real satisfaction in working with IBM is the opportunity to understand more and more about electronic techniques. And IBM is quick to recognize and reward improved ability through greater knowledge."



Here, he scans the schematic of computer circuits.



Bernie checks a unit in one of the operating consoles.



An outdoor man, Bernie takes full advantage of the New Jersey game preserve.

Memphis that he became convinced that a technical career was "Right up my alley." But an event that occurred during a furlough in the spring of 1955 put a brand-new light on Bernie's future.

Reports for training

Bernie smiled when he mentioned that his mother had a tendency to clip want ads. "It was just pot-luck that one of the ads she spotted was for IBM Kingston and Project SAGE." Soon afterwards, Bernie hopped a bus to Newark for an interview with the IBM representative. He took the required number of tests—talked over his hopes and ambitions, and "That's about all there was to it." In July, Bernie notified IBM that he was definitely available, and supplied the necessary references. Meanwhile, he made a study of IBM's history, its policies, its growth, and its future—all of which impressed him favorably. One day in September, Bernie received instructions to report to Kingston to begin training in the applications of electronic computers.

The material he studied at Kingston

"The Kingston program is a real experience, and quite an eye-opener in

watts are needed—a phenomenal amount. In general, I'd say that you couldn't find a better training ground for understanding the uses of electronic as well as electro-mechanical equipment."

How does Bernie feel about his current assignment?

"I'm responsible for the performance of the input-output devices—the auxiliaries that supply information to the central computer. The many Project SAGE outposts—picket ships, reconnaissance planes, Texas towers—flash their signals to the input devices which, in turn, correlate and compile the data. You might say the input devices prepare the food for digestion by the main electronic computer. This, incidentally, is one of the world's largest computers, which is built and tested at Kingston, then disassembled and shipped to a directional control site such as McGuire. Sometimes, I have the chance to assist in systems and displays. Now displays really fascinate me. There's a kind of television screen on which you can detect a plane, determine whether it's friendly or hostile, and where it's headed. My work is always different, never routine, and that's very important to me."

What about you?

Since Bernie Roth joined IBM Military Products and the Project SAGE program, opportunities are more promising than ever. This long-range program is destined for increasing national importance, and IBM will invest thousands of dollars in the right men to insure its success.

If you have 2 years' technical schooling—or equivalent experience—IBM will train you for 6 months as a *Computer Units Field Engineer*.

If IBM considers your experience equivalent to an E.E., M.E., or Physics degree, you'll receive 8 months' training as a *Computer Systems Engineer*.

After training, you will be assigned to an area of your choice. You receive salary, not wages, plus overtime pay. In addition, every channel of advancement in the entire company is open, and IBM is a leader in a field that is sky-rocketing in growth. And, of course, you receive the famous IBM company-paid benefits that set standards for industry today.

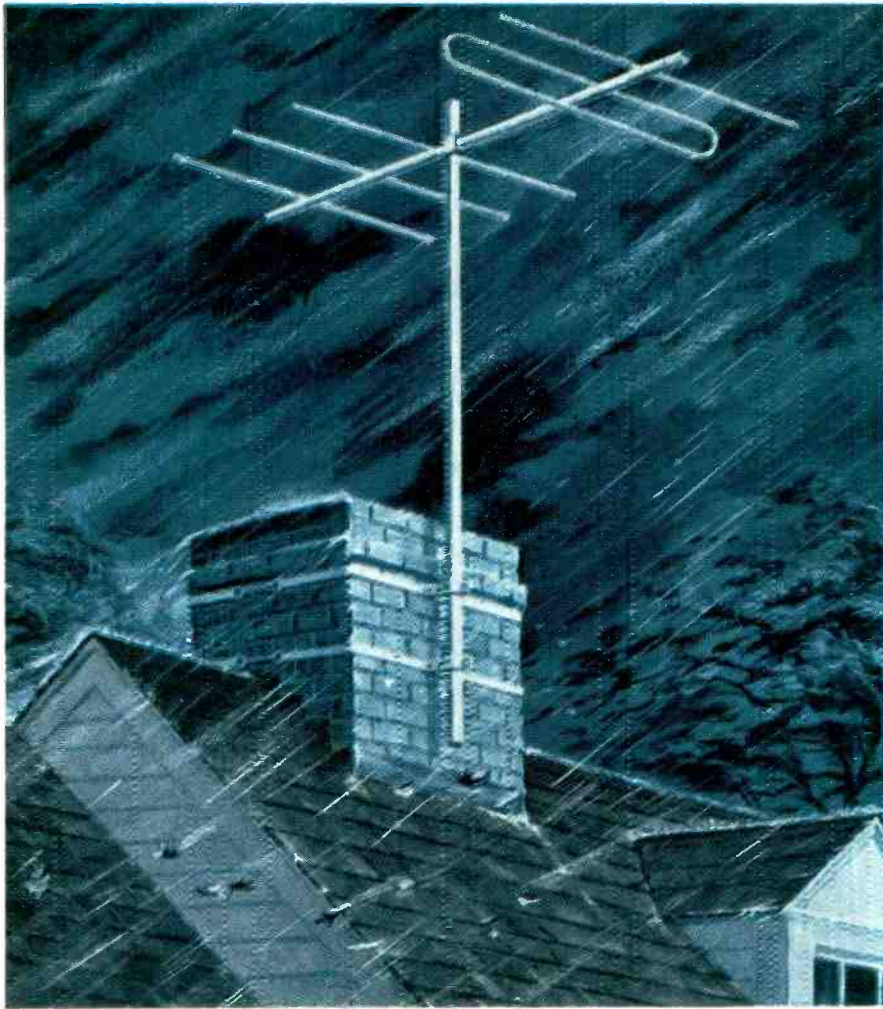
WHY NOT WRITE—today—to Nelson O. Heyer, Room 11504, IBM Corp., Kingston, N. Y. You'll receive a prompt reply.

CUSTOMER ENGINEERS: Opportunities are also available, locally, for servicing IBM machines, after training with pay.

IBM

MILITARY PRODUCTS

DATA PROCESSING • ELECTRIC TYPEWRITERS
TIME EQUIPMENT • MILITARY PRODUCTS



sturdy, steel **PERMA-TUBE** TV masting is corrosion proof

Perma-Tube, most famous name in TV masting, stays strong because it is corrosion proof. Perma-Tube is treated with vinsynite—then coated with a metallic vinyl resin base both *inside* and *outside*.

Perma-Tube is guaranteed to be free from rust in a salt spray test of 500-hours minimum to ASTM Specification 13 117-49T. Longer mast life is assured.

Resistance to bending in Perma-Tube is greater than in galvanized masting. Machine-fitted joints speed field assembly, insure close

tolerance for strength and rigidity. *Joints are stronger than the tubing itself.*

Five diameters of fitted joint Perma-Tube are available, ranging from 2½" OD to 1¼" OD. Telescoping masts can also be erected up to 50 feet high, using 10 foot lengths of high strength J&L 16-gauge Perma-Tube.

Get complete details on popular Perma-Tube TV masting. Write to the Jones & Laughlin Steel Corporation, Dept. 505, 3 Gateway Center, Pittsburgh 30, Pa.



Jones & Laughlin
STEEL ... a great name in steel

(Continued from page 2)

TV SERVICEMAN, 5 years bench and outside experience. Technical school graduate. Will relocate. Seeks industrial or research work. Age 23. single. Box E402, **ELECTRONIC TECHNICIAN**.

TECHNICIAN with 8 years radio, TV and transmitter experience seeks employment opportunity. 1½ years technical training. Will relocate. Age 27, married. John Gibson, 27 First Ave., Schumacher, Ontario, Canada.

ELECTRONIC SPECIALIST with lifetime experience in TV-radio-electronics has 4 years college training, holds 2nd class radio-phone license. Will relocate, prefer Florida, Texas or Calif. Age 49, single. Wilbert Maisoll, 600 Seventh St., Arkadelphia, Arkansas.

TECHNICAL WRITER with military radio and civilian radio engineering training seeks writing opportunity. 4 years journalism, 5 years lithography, plus investigation, sales correspondence and market research experience. Will relocate, prefer Southwest. Age 36, married. Kenneth E. Perry, 8921 N. W. 15 Ave., Miami 47, Fla.

RADIO-TV technician, Delehanty graduate, completing RCA course, seeks position in troubleshooting. Locate New York City. Salary \$60-\$65. Box E403, **ELECTRONIC TECHNICIAN**.

Business For Sale

ESTABLISHED 5 YEARS in Fairbanks, Alaska. Completely equipped for TV & Electronics, with apartment living quarters. Potential buying power 50,000. Ideal for two technicians. Full particulars and photographs. Box S451, **ELECTRONIC TECHNICIAN**.

TV RADIO service shop, Denver, Colo. Well established. Owner has other interests. Box S452, **ELECTRONIC TECHNICIAN**.

TV SERVICE shop doing \$12,000 year business in sunny South. Excellent opportunity. Reasonable. Box S453, **ELECTRONIC TECHNICIAN**.

SELL: TV-RADIO sales-service business established 37 years. Good following, moneymaker, \$2000 plus small inventory. Jack's TV, Bedford, Iowa.

"Business for Sale" and "Help Wanted" listings are available in this section to aid shop management and owners in obtaining qualified personnel or selling their business. This section is not open to manufacturers.

Cost for an announcement in this section is 25¢ per word, with numbers and address words counted. Remittance must accompany insertion order.

Those service shops wishing to have a box number listing instead of including their names and addresses may have one assigned for an extra charge of \$2. All inquiries directed to such box numbers will be routed directly to the shop inserting the announcement.



"I'M WITH UNIVAC"

People listen with interest when you say you're with Univac.®

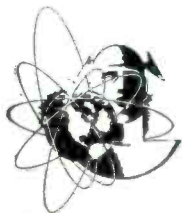
The mere mention of this world-famous organization sets you apart as someone interesting and important. And rightly so... for as a Univac engineer or technician you'll be involved in some of the most fascinating scientific work of our day. You'll contribute to research and development that are completely revolutionizing concepts of national defense, scientific research, business and industry.

The special pride you feel when you say, "I'M WITH UNIVAC", is just one of the many satisfactions of a career with Univac—world leader in the field of electronic computers. For top salaries, excellent working conditions and opportunities unlimited say: "I'M WITH UNIVAC."

IMMEDIATE OPENINGS FOR...

**FIELD LOCATION ENGINEERS • FIELD LOCATION TECHNICIANS
ENGINEERING WRITERS**

... AT PERMANENT COMPUTER INSTALLATIONS THROUGHOUT THE UNITED STATES



Send complete resumé to:

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DIVISION OF SPERRY RAND CORPORATION

MR. PHIL WILSON

Dept. SA-37

Univac Park • St. Paul 16, Minn.

Dealers Prove Winegard Color 'ceptor SELLS BEST!

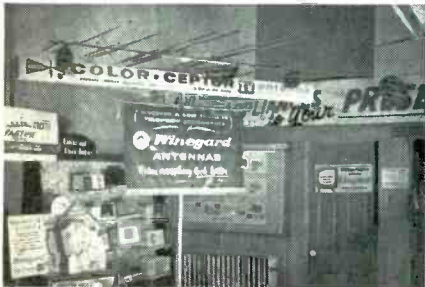
Thousands of dealers have proved conclusively that the Winegard Color 'Ceptor outsells any comparable TV antenna! This is the simple test that has convinced them: They've shown their customers the glistening gold-anodized Color 'Ceptor right alongside competitive types . . . and, when given the chance to choose for themselves . . . the vast majority of their customers invariably selected the Color 'Ceptor! The explanation's simple! Eye appeal is what clinches the sale. Your customers are no different than you. They are used to buying products that present a finished, quality appearance. They instinctively reject an item that is dull, drab and lifeless.

Anodizing Is Much More Than a Mere Beauty Treatment

The diamond-hard toughness of this anodized finish provides positive resistance against corrosion—prevents the Color 'Ceptor from ever turning black and ugly, and locks in, permanently, all the superb performance engineered into the Color 'Ceptor. You can sell this longer-life feature as a big advantage—and it makes real sales sense to your customers.

Second to None in Performance

A Winegard Antenna broke all long-distance reception records in 1956 (see Radio-Electronics Magazine, Jan. '57). Equipped with optional signal-boosting Power-Pack and patented "Electro-Lens" focusing, the gold-anodized Color 'Ceptor is unbeatable for long-distance reception . . . and clear, watchable pictures. Black-and-White or color! If the Winegard Color 'Ceptor won't bring in a station you want to see . . . nothing will!




Free Display Creates Sales Boom!

Here's the display that has sold thousands of Color 'Ceptors for dealers all over the nation. By getting the beautiful gold Color 'Ceptors out where folks can see them . . . dealers are building antenna sales volume they never realized existed! In fact, many dealers report they are now making more money selling Winegard antennas than they are on TV sets!

Get Full Information Now!

Don't you think it's time you shared in the spectacular success of America's most-wanted TV antenna? The coupon below will bring you eye-opening details. Mail it today!



Winegard company
Dept. C4, 3000 Scotten Blvd., Burlington, Iowa
Name _____

Please rush me free 4-color descriptive literature on your gold-anodized Color 'Ceptor and information on display material.

I'm interested in the complete line of new 1957 Winegard antennas.

Company _____
Address _____
City _____ State _____



Winegard Color 'ceptor TV Antenna

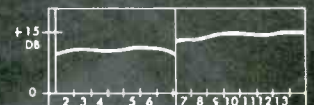
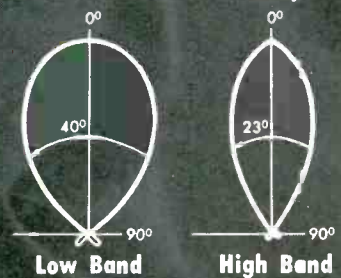
all 12 VHF Channel
Reception For Both
Black-and-White
and Color

Color so bright they sell on sight!

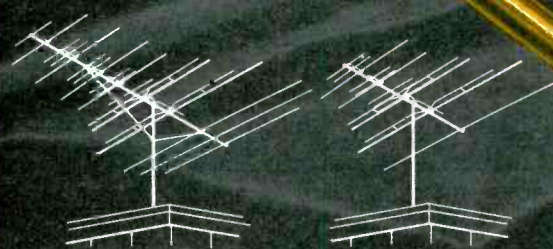
Note:

Each gold Color 'Ceptor you install helps sell another. Once folks see these bright gold antennas sprouting up in their neighborhood, they won't be satisfied until they own the gold antenna, too!

Horizontal Directivity



Gain Chart
CL-4X with Power-Pack



Color 'Ceptor
Model CL-4X — \$44.90

Color 'Ceptor
Model CL-4 — \$29.95

If Color 'Ceptor won't bring in a station you want to see . . . nothing will!

Exclusive Color 'Ceptor features

- Completely non-corrosive gold-anodized finish.
- Power-Pack—up to 47.1% more sensitivity.
- Pat. "Electro-Lens" — clearer pictures at greater distance.

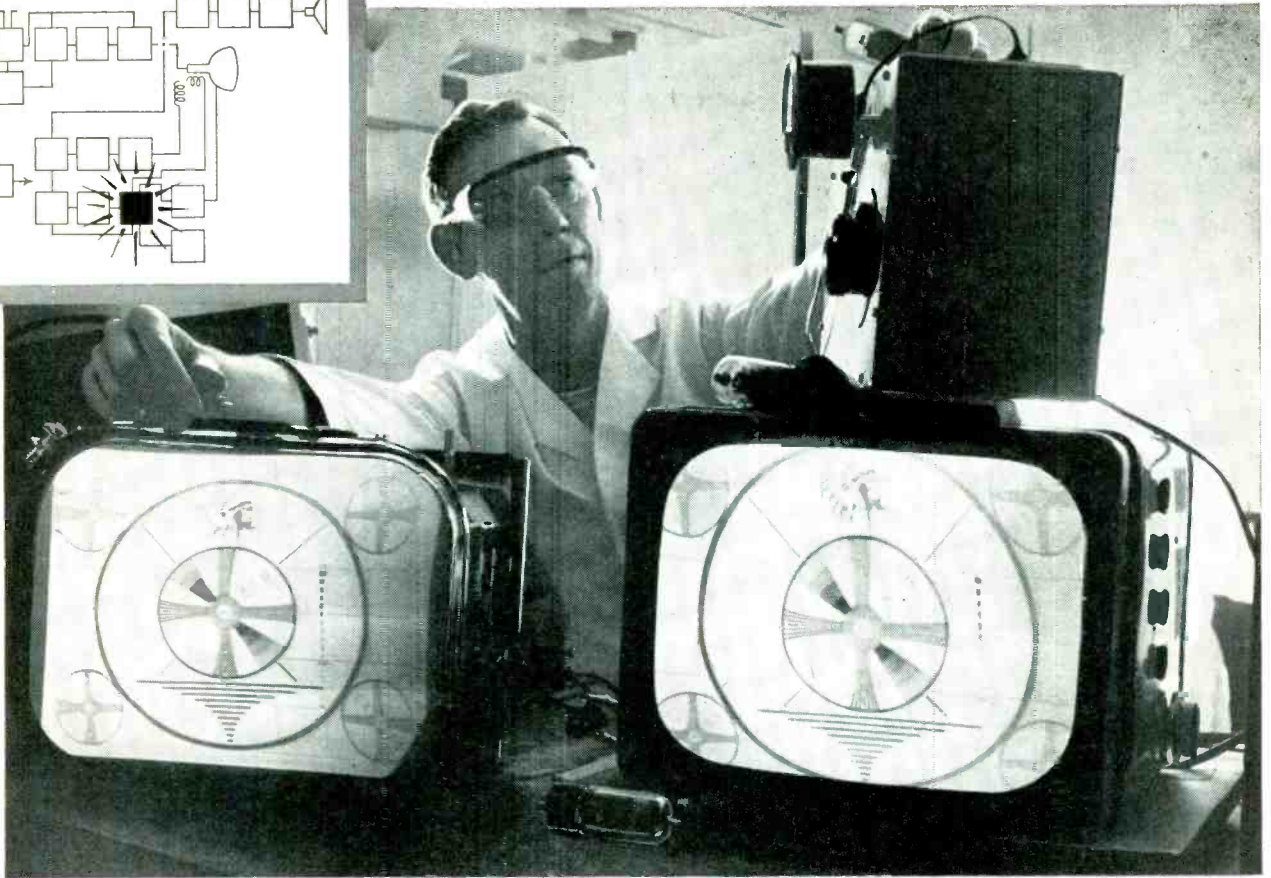
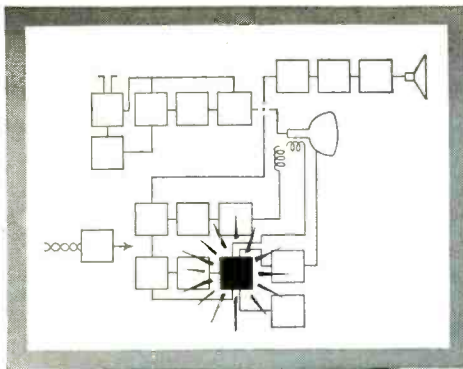
Winegard Color 'Ceptors are consistently advertised in leading national magazines your customers read!



 **Winegard Co.**

3000 Scotten Blvd., Burlington, Iowa
Cable Address: Western Union JRWCO

*Pat. No. 2,700,105 Copyright USA, 1957



ABOVE: A General Electric application engineer demonstrates, on set at right, superior sweep of G-E horizontal amplifier tubes. Every tube is tested at the

factory for zero-bias plate current and plate-to-screen current ratio—your assurance of exceptional sweep performance and top reliability.

General Electric horizontal amplifier tubes are quality-designed for full-sweep, long-life performance!

A WHOLE series of design advancements combines to make General Electric horizontal-sweep amplifiers high-quality, long-lasting tubes.

Enlarged plate areas cut plate and screen emission, two causes of shrinking raster and picture distortion. A specially processed screen grid increases heat dissipation, and new, improved beam plates prevent glass deterioration from electron bombardment of the bulb.

Also, the possibility of electrical leakage is sharply reduced. Maximum spacing between elements . . . mica slots . . . spraying of micas—these measures effectively combat harmful inter-element leakage by lengthening potential leakage paths.

All General Electric horizontal-sweep amplifiers have button-stem construction. This strengthens internal

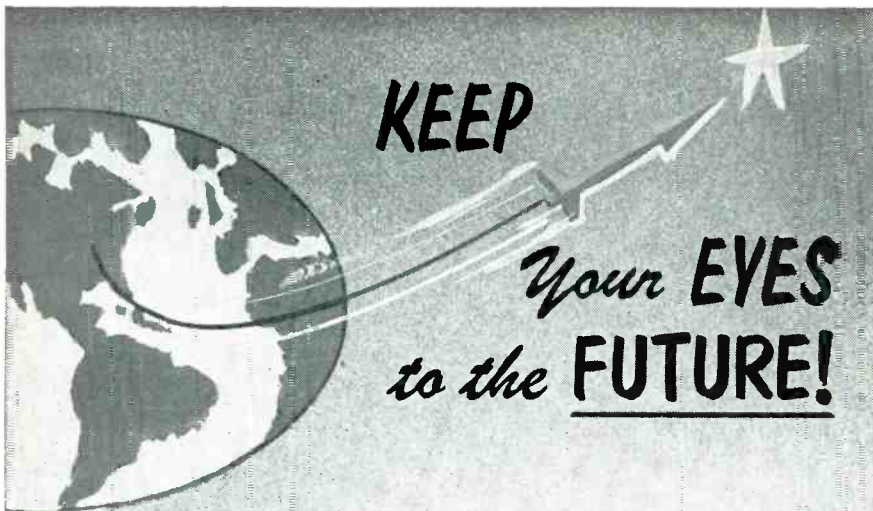
tube structure, and gives greater heat conduction for reduced electrolysis and air leakage. Advanced cathode-processing techniques assure superior operation at low line voltages, and finned or dimpled plate design lessens danger of "snivets"—dark, irregular, vertical interference on the raster.

Select a General Electric sweep tube every time you need a replacement! All G-E tubes have this same high quality that will win new service customers . . . keep your present customers satisfied. *Electronic Components Division, General Electric Co., Schenectady 5, N. Y.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

161-1A4



KEEP
Your EYES
to the FUTURE!

Do YOU Know

... the field of ELECTRONICS is the most advanced and fastest growing in the world, offering the largest range of jobs for technicians and engineers in history?

Do YOU Know

... PHILCO TechRep is the world's largest Field Service organization and because of this leadership can offer you—

- unlimited advancement
- opportunity to work any place in the world
- experience in the most advanced fields of electronics and guided missiles
- personal security, real challenge, top salary and compensation for your skills

Do YOU Know

- Philco electronic experts help prepare you for your TechRep Service career
- Philco's especially written Home Study Course keeps you posted on latest electronic techniques, including radar, guided missiles and transistors
- Philco provides financial assistance to continue your education

Do YOU Know

... Philco not only will help you select the position in Electronics best suited to you but can and will provide you with periodic reports as to the openings in our world-wide organization for which you may be qualified.

Get The FACTS About Your Future With Philco:

Send Now to Dept. 18D

for The Complete Story on What Makes The Philco TechRep Division —

"First In Employment Opportunities"
PHILCO TECHREP DIVISION
22nd & LEHIGH AVE., PHILADELPHIA 32, PA.

LETTERS

To the Editor

Rates for Intermittents

Editor, ELECTRONIC TECHNICIAN:

Regarding the charges on the "mysterious phono motor" job (Feb. 1957 issue, p. 29), I pretty much agree with you that we cannot penalize the customer because of our inexperience or oversight. However, the nature of this case dictates a higher than normal service charge inasmuch as a great deal of time had to be spent in locating this somewhat rare trouble.

At our shop we use the flat rate method of charging, which holds only for a steady, unchanging trouble. The intermittent trouble, regardless of type, automatically increases this flat rate by 100%. We feel this is fair to the customer and to us.

WAYNE LEMONS

A-1 TV & Radio Service
Buffalo, Mo.

Industrial Servicing

Editor, ELECTRONIC TECHNICIAN:

Our interest is in AM-FM two-way communications. We have had 12 years experience in the field, and have a well equipped shop. Any help you may be able to give us would be appreciated.

MILTON A. KENNEDY, JR.

Telephonic Communication Service
New Orleans, La.

... I have been in radio for 15 years and have a first class phone ticket. Our company is actively engaged in two-way communication work, TV radio and allied repairs. We would like to expand, and would be willing to add any necessary equipment to our already well equipped shop. Any help or advice will be greatly appreciated. Incidentally, since we subscribed to your magazine three years ago we have discontinued all other so-called popular monthly publications as we feel you are providing the best and most up-to-date information.

WREN HARRIS
President

Radio Communications &
Engineering Co.
Albany, Ga.

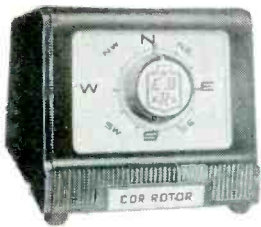
... I am much interested in industrial electronics and communications. In addition to radio-TV service, I have 9 years in servicing aircraft and mobile receivers and transmitters, both military and civilian.

ALVIN C. CRUMPTON

Crumpton's Radio TV Service
Tarrant, Ala.

... Starting with crystal radio at age 14, I have worked on practically

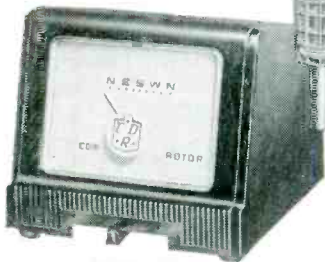
(Continued on page 12)



AR-22



TR-2

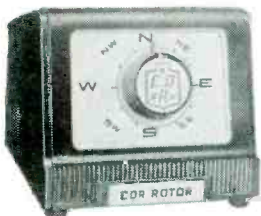


TR-4

CDR ROTORS



TR 11 and 12



AR 1 and 2

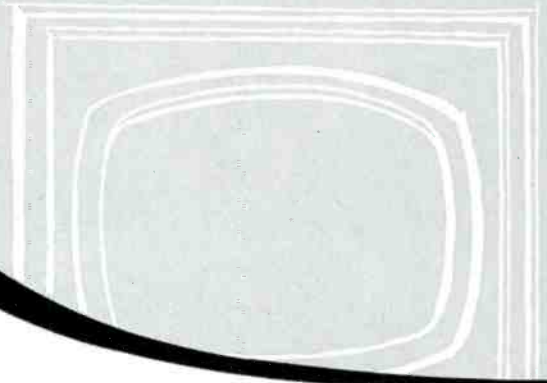
5-star feature...

1 the best color TV picture

the growth of color TV means an even greater demand for CDR Rotors for pin-point accuracy of antenna direction.

2 a better picture on more stations

CDR Rotors add to the pleasure of TV viewing because they line up the antenna perfectly with the transmitted TV signal giving a BETTER picture . . . and making it possible to bring in MORE stations.



3 tested and proven dependable

thousands and thousands of CDR Rotors have proven their dependability over years of unfailing performance in installations everywhere in the nation. Quality and engineering you know you can count on.

4 pre-sold to your customers

the greatest coverage and concentration of full minute spot announcements on leading TV stations is working for YOU . . . pre-selling your customers.

5 the complete line

a model for every need . . . for every application. CDR Rotors make it possible for you to give your customer exactly what is needed . . . the right CDR Rotor for the right job.



CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.



THE RADIART CORP.
CLEVELAND 13, OHIO



UNI-DIRECTIONAL

MODEL 737A

"MONOPLEX"



SEMI-DIRECTIONAL

MODEL 51

"SONODYNE"



BI-DIRECTIONAL

MODEL 315

"GRADIENT"

You have your choice of three

SHURE

moderately priced general-purpose microphones

Where quality is essential, yet cost is a factor—you can rely on these SHURE Microphones

FOR PUBLIC ADDRESS • HOME RECORDING • COMMUNICATIONS • PAGING AND INTERCOM SYSTEMS

MODEL 737A "MONOPLEX": Uni-directional, moisture-proofed crystal microphone—reduces feedback by 67%! Can be used under adverse conditions of background noise where conventional microphones would be practically useless. "Humi-seal" Crystal for trouble-free operation even in humid climates. High impedance unit with excellent response to 10,000 cps. Output -54.0 db. LIST PRICE \$46.00

MODEL 51 "SONODYNE": Semi-directional, dynamic microphone. Switch for low, medium, or high impedance makes it three microphones in one! Ideal for recording and "close-talking" applications. Frequency response is 60-10,000 cps, Output -52.5 db. Unusually rugged microphone; can be used in any climate, indoors or outdoors. LIST PRICE \$49.50

MODEL 315 "GRADIENT": Bi-directional high fidelity microphone with multi-impedance switch. Picks up sound equally from front and rear; is "dead" at sides. Ideal for interview broadcasting or group recording. Frequency response 50-12,000 cps. Provides exceptional voice and music reproduction. Particularly useful in installations where feedback is a problem. Output -57 db. LIST PRICE \$85.00

All three units have rugged, die-cast metal cases and are finished in a rich satin chrome.

SHURE BROTHERS, INC.

Microphones ~ Electronic Components

208 HARTREY AVENUE • EVANSTON, ILLINOIS

"In Electronics Since 1925"

(Continued from page 10)

everything in the electrical and electronic field, including TV, short wave transmitters, public address and medical diathermy machines. Like any good technician, my shop is equipped with several thousand dollars of excellent test equipment. I am interested in any work I can get in this field. Please accept my thanks for Electronic Technician, the best of several magazines which cross my desk.

TED JORGENSEN

Jorgensen Electric
Springfield, Ore.

. . . I would like to know more about entering the field of two-way radio communications.

R. H. HOOPER

Denver, Colo.

. . . I have been employed as an electronic technician in missile development, and am interested in securing a position as a factory representative.

IRVING N. SMUCKLER

Gardena, Calif.

. . . I am fully equipped in both experience and equipment to handle any electronics work, including mobile radio, industrial PA, intercoms and wired TV.

J. J. MUELLER

Electronic Service Co.
Manchester Depot, Vt.

• We are routing the interests and qualifications of the above readers, and the many others who have written, directly to manufacturers seeking local industrial electronic servicing depots.—Ed.

Editorial Guts

Editor, ELECTRONIC TECHNICIAN:

In the ARTSD News I had pointed out that the trade magazines had not raised their voices against captive service. After having the pleasure of reading "Factory Service: It Pays to Act" in your Feb. issue, I take back everything as far as ELECTRONIC TECHNICIAN is concerned. You are to be congratulated for the editorial guts it takes to bring this fight into the light. You should also be thanked for dropping the word "serviceman" from your magazine, using the term "technician" instead.

J. P. GRAHAM

Editor, ARTSD News

Associated Radio-TV Service Dealers
Columbus, Ohio

Preventative Maintenance

Editor, ELECTRONIC TECHNICIAN:

How often should moving parts in a TV set be cleaned, lubricated and protected against further corrosion? A few of my customers insist that it is all right to keep a set running for three or four years with just tube changes, not admitting that the picture shows signs

(Continued on page 14)

Mr. Service Dealer

Here's a complete merchandising program to start your spring portable battery season with a bang!

It's the **Power Packed Payoff**
on **PHILCO**
Portable Batteries

Order your portable battery requirements from your Philco Distributor on his special plan. Sell the batteries at regular profits . . . and in addition, get any of these extras at no extra cost to you.



1 FREE
10% EXTRA in Philco Portable Batteries

Order any combination of Philco portable batteries and get an extra 10% of the amount in Philco portable batteries of your choice.

2 FREE
with purchase of \$125.00 in Philco portable batteries
\$25.00 Silverplate Service for 6
in anti-tarnish chest



ROGERS
SILVERPLATE
Neida Ltd.
silversmiths

3 FREE
with purchase of \$250.00 in Philco portable batteries.
\$49.50 Bulova Watch

Choice of the shock resistant "President" for men or lovely "Anra" with expansion bracelet for ladies.



PLUS
New Philco Battery Display for Your Counter
Yours free with your Philco portable battery order.



See your Philco Distributor or mail coupon now!

PHILCO CORPORATION
ACCESSORY DIVISION PHILA. 34, PA.

Philco Corporation Accessory Division
"A" Street & Allegheny Ave.
Philadelphia 34, Pa.

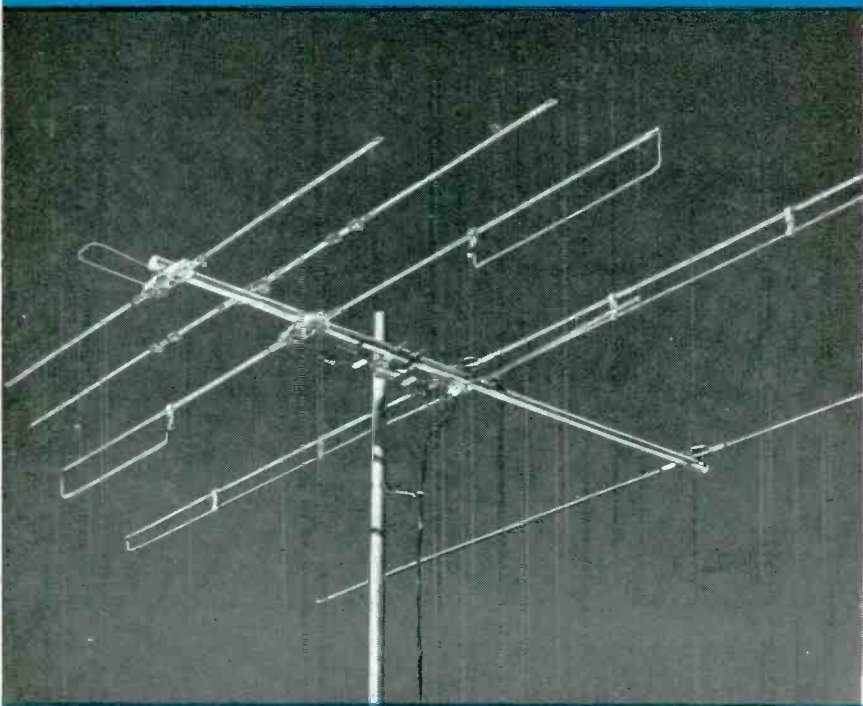
Please send information on the Power Packed Payoff on Philco portable batteries.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

PERFORMANCE



above all others

The TACO Topliner has been proved the finest performer—in side-by-side comparisons. In actual installations the Topliner provides the day-in, day-out performance so necessary to maintain *your* reputation with the customer.

Seeing is believing—use a Topliner on that next installation. See for yourself just how much better the Topliner works.

TACO *Topliners*
Trade-mark

TECHNICAL APPLIANCE CORPORATION, SHERBURNE, N. Y.

IN CANADA: Hackbusch Electronics, Ltd., Toronto 4, Ont.

(Continued from page 12)

of what they believe to be minor defects. My experience is that many sets which run over three years with only tube changes are difficult to get back in perfect running order. This treatment appears to be comparable to running an automobile without changing the oil or greasing the chassis.

FRED O. STILLMAN
Stillman's TV & Radio Service
Carteret, N.J.

IRE Info

Editor, ELECTRONIC TECHNICIAN:

I am interested in obtaining more information about the Institute of Radio Engineers. I am a communication service engineer, and our firm operates in the radio dispatch and TV fields.

MILTON E. REBMANN
Portland, Ore.

• Write to the Institute of Radio Engineers, 1 E. 79 St., New York 21, N. Y.—Ed.

Cartoons Free, But . . .

Editor, ELECTRONIC TECHNICIAN:

After publication of your cartoons, I understand the usual procedure is to throw away the printer's cuts. Could you send them to me instead of discarding them?

JEAN L. BEAUPRE
Beaupre Radio & Television
Thetford Mines, P. Q., Canada

• We'd be glad to do it, except the printer's labor charge for separating the cuts from the large "lock-up," plus packing and shipping, would cost more than making the cuts originally.—Ed.

Dead Letters

Editor, ELECTRONIC TECHNICIAN:

I have an invention for a color TV system better than the present screwball system. Enclosed is an article I wrote in 1953 describing it, plus an article on a dimensional viewing arrangement for TV described in patent 2,645,710. If you don't want to publish the color TV article, you may throw it into the waste basket. But should you not publish the article concerning the patent, this will indicate that your magazine is a dead letter number, and my interest in it will sink to zero. I have enjoyed your magazine at times, and hope I may continue to do so.

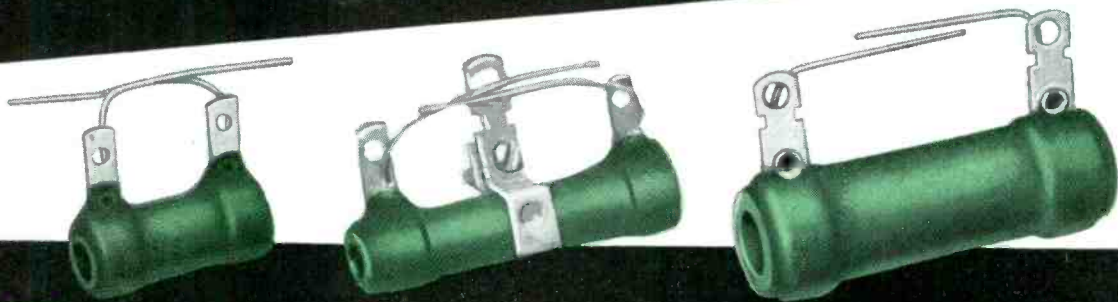
JULIUS HARTZ
New Orleans, La.

• The articles submitted were interesting, but more suitable for an engineering magazine, so they were returned. We hope reader Hartz will weigh the several thousand worthwhile items published every year against our reluctance to publish his material this time. Who knows . . . the balance may even show us to be "live" letters!—Ed.

INSTALL 'EM...



FORGET 'EM!



Greenohm*

**WIRE-WOUND
POWER RESISTORS**

You can count on Clarostat "Greenohm" power resistors — they won't let you down. "Greenohm" power resistors are used in the most expensive, critical electronic equipment where dependability is the prime requisite. You can have this same dependability, by insisting on "Greenohm" power resistors.



LOOK — Overload a "Greenohm" power resistor. Get it so hot you can light a cigarette from it...



THEN . . . plunge the over-heated "Greenohm" power resistor in cold water. No blisters, no cracks, in fact, it will work good as new.



* Reg. U.S. Pat. Off.

Ask your Clarostat Distributor for Greenohm Resistors

CONTROLS AND RESISTORS

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

In Canada: CANADIAN MARCONI CO., LTD., TORONTO 17, ONT.

News of the Industry

ALLEN B. DUMONT LABS. announces the appointments of **WILLIAM E. WHITTAKER** as Service Manager of the Receiver Div., **JOSEPH A. RICCA** as Manager of the Mobile Radio Communications Dept. and **STANLEY J. KOCH** as General Manager of the Tube Divs.

QUAM-NICHOLS CO. announces the promotion of **M. E. KRUMREY** to Manager of the Jobber Division.

ELECTRO-VOICE, INC. announces that **OTTO C. DEUTSCH** has joined its sales staff as a factory Sales Engineer.

FEDERAL TELEPHONE & RADIO CO. has appointed **JAMES CONTO** as Sales Manager of the Semi-Conductor Div.

TRIPLETT ELECTRICAL INSTRUMENT CO. announces that **NORM EDINGER** is now its Marketing Service Manager.

OXFORD ELECTRIC CORP. announces the appointment of **TOM BROWN** as new Sales Manager of the Distributor Division.

INTERNATIONAL RESISTANCE CO. announces the recent appointments of **ROBERT L. COLFAX** to Sales Manager of the IRC (Hycor Div.) and **OTHO C. LINDSEY** to Sales Manager of the company's subsidiary, **CIRCUIT INSTRUMENTS INC.**

TEXAS INSTRUMENTS INCORPORATED has launched its semiconductor distributor program with the signing of a subsidiary, **ENGINEERING SUPPLY COMPANY**, as its first distributor for semiconductor products.

RADIO RECEPTOR CO. is completing installation of imported equipment to manufacture a line of selenium rectifiers it claims will be smaller yet more efficient than any now on the American and Canadian markets. The new rectifiers will be trade named "Petti-Sel."

WINEGARD CO. is furnishing free a Color'Ceptor Antenna and display material to all qualified jobbers and dealers participating in a new Color'Ceptor antenna promotion recently launched by the company.

P. R. MALLORY & CO. INC. announced the unification of its battery activities into a single operation—The **MALLORY BATTERY CO.** This company is a division of **P. R. MALLORY & CO. INC.** with headquarters in Cleveland, Ohio.

BILL ASHBY, expert and lecturer on TV servicing, is again on an extended tour of the country with his Radio-TV Clinic. Underwritten by the **CORNELL-DUBILIER ELECTRIC CORP.** and sponsored by local Parts Distributors, the Clinic is scheduled for most of the major cities in the U. S.

OHMITE MFG. CO. of Skokie, Ill. manufacturer of resistors, rheostats and other electronic and electrical components, announces the opening of a New York City area office, located at 318 N. Bergen Blvd., Palisades Park, N. J.

CBS-HYTRON has announced a consolidation of all packing, shipping, testing and warehousing operations of its receiving tube plants in Salem, Danvers and Newburyport, Mass., in a modern warehouse on Parker St. in Newburyport.

PYRAMID ELECTRIC CO. announced a weekend at the Waldorf Astoria in New York plus \$100. cash in part of the grand prize to be awarded a serviceman and his wife in the **PYRAMID TWIST-MOUNT CAPACITOR CONTEST.** Contestants need only fill in the **PYRAMID** capacitor stock numbers of unidentified TV circuits.

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.

New 750 **B&K** TEST EQUIPMENT CALIBRATOR

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 $\pm 1\%$ 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 $\pm 1\%$ 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.

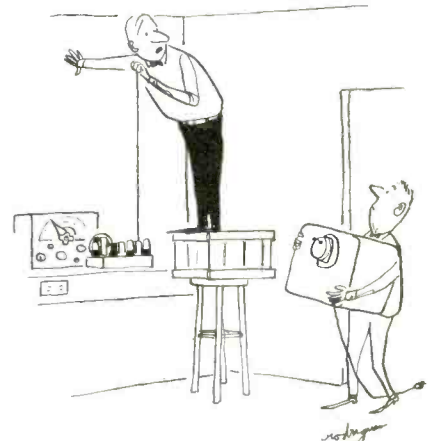
\$54⁹⁵ NET

See Your Distributor or Send For Bulletin 750-T

B & K MANUFACTURING CO.

3726 N. Southport Ave. • Chicago 13, Illinois

Agents of **DYNA-QUIK, CRY, DYNA-SCAN** and **CALIBRATOR**



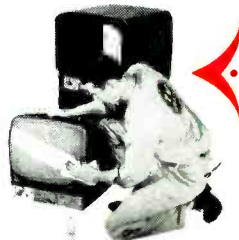
"I've never seen such a sensitive
R.F. trimmer!"

Have you seen your Independent Service advertising campaign?



**PICTURE TUBES DO
GET DIRTY! SO CALL YOUR
INDEPENDENT SERVICE-
DEALER AND...**

**Have your
Picture Tube
cleaned today!**



Just like windows and mirrors, the inside of the glass front on your TV set gets dirty. And the face of your picture tube — the TV screen — gets even more fogged up with dust and dirt, smoke and fumes. See for yourself. Have your picture tube cleaned today. You can't imagine how much clearer . . . brighter . . . and more enjoyable your TV picture will be!

**CALL YOUR INDEPENDENT SERVICE-DEALER
FOR HIS SPECIAL "PICTURE TUBE CLEAN-UP."**

He is *your* neighbor. He pays taxes in *your* community. His children go to the same schools and churches as *yours*. And he knows his standing and reputation depend upon the care and thoroughness with which he services your community's radio and television sets. What is more, he is trained to service any make of set. So patronize your neighborhood independent radio and television service-dealer.

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



This emblem is one way to identify your independent radio and television service-dealer. Look for it.



Ask him for CBS tubes. There are no better tubes made . . . and CBS tubes have this seal.

Advertisements like this are appearing every month in all local editions of *TV Guide* . . . telling millions of TV set owners why they should call their neighborhood independent service-dealers.

Ask your CBS Tube distributor how you can have *your* name, address and telephone number listed on adjacent pages in your local edition.

Join with other independent service-dealers . . . independent parts distributors . . . and CBS Tubes. Working together, let's build a strong independent service industry.

Identify yourself as an *Independent Service-Dealer*. Arrange for your *TV Guide* listing. Get the tie-in material *and use it*: Independent Service-Dealer decalcomania . . . window display . . . newspaper mats . . . postal cards . . . door knob hanger . . . and consumer booklet.

Tie In Today! Ask your distributor for your *TV Guide* listing . . . your display . . . and other supporting material. And for free, 4-page PA-131 flyer giving complete details on how you can profit by your independent service program.

Remember: Your continuous purchases of CBS tubes make this independent service-dealer campaign possible. So help keep it going. Say, "I want CBS tubes!"



REPLACEMENT OF A DEFUNCT GOOD HOUSEKEEPING SEAL NOT AS ADVERTISED THEREIN

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

Reps & Distributors

PAUL HAYDEN ASSOC., East Point, Ga., has been named by **ASTRON CORP.** as Southeastern sales representative.

THE MICHAEL SCOTT CO., Wellesley, Mass., has been appointed manufacturer's representative for **TELEX** and will cover Maine, N. H., Vermont, R. I., Mass. and Conn.

RYE SOUND CORP. has appointed three sales representatives. **PAUL HAYDEN ASSOC.**, East Point, Ga., will cover Va., North and South Carolina, Ga., Ala., Fla. and Miss.; **JERRY MERICAN** will cover Southern N. J., Eastern Penna., Md., Del., and District of Col.; **FRANK LEBELL CO.** will serve Northern Cal. and Northern Nevada.

THE ELLINGER SALES CORP. has been appointed as sales reps for **DUMONT** television picture tube sales covering the state of Illinois and the Eastern section of Wisconsin.

DAVID BOGEN CO. has appointed six new sales reps to handle **BOGEN** and **PRESTO RECORDING CORP.** audio products. **E. C. WHARFIELD** and **LEON S. BUSH** will cover the Rocky Mountain area; **E. L. BERMAN Co.** will represent **PRESTO** in Northern Calif.; **MICHAEL SCOTT** will cover **PRESTO** in New England; **MORRIS CUNNINGHAM & MITCHELL** will handle **BOGEN** products in Indiana; **W. H. ELLINGER SALES CO.** will cover Ill. and Eastern Wisc. for **PRESTO** and **NORTHWESTERN AGENCIES INC.** will cover **PRESTO** sales in the Pacific Northwest territory.

SIMPSON ELECTRIC extends the territories of two Midwest reps. The **R. C. MERCHANT CO.** of Detroit will now represent **SIMPSON** over the entire State of Michigan and **MACHERRSON-THOMAS INC.** of Indianapolis and Ft. Wayne will cover entirely the states of Indiana and Kentucky.

CENTURY ELECTRONICS CO. INC. announces the appointment of **DOUGLAS H. CARPENTER CO.**, New York City, as national sales rep for its line of television test instruments.

FREE

HOLE SAW*

WITH YOUR ORDER OF TWO DOZEN

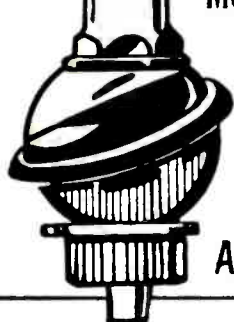


Ward 8-BALL ANTENNAS

MODEL TCF-3C

Most popular auto antenna style ever known—

- ★ designed for beauty
- ★ engineered for finest radio reception
- ★ easiest to install from the outside



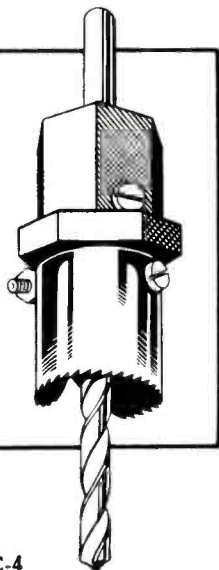
AND

DELUXE HOLE CUTTER

makes every installation a quick and simple job.

Cuts a 15/16" hole in the car body in one clean sweep. Made especially for **WARD 8-Ball** mounts including: Majorette and Tear Drop, Silveramic,[®] Dura-ramic,[®] Disappearing and Rear Mounts. Just the right size. Fits any 1/4" drill. It's a real timesaver.

* Given **FREE** with the purchase of 24 8-Ball antennas Model TCF-3C. Limited time only. See your distributor **NOW** before offer expires.



Ward PRODUCTS CORPORATION

A DIVISION OF THE GABRIEL COMPANY • Dept. ETC-4

1148 EUCLID AVENUE • CLEVELAND 15, OHIO



"I'm so glad you're home darling. Something just went wrong with our set!"

Rohn

only complete line of

TV and COMMUNICATION TOWERS

proven in Profits and Customer Satisfaction

look at these
ROHN exclusives

HOT DIPPED GALVANIZED

The finest, most durable finish is available for ROHN Towers and accessories . . . all done entirely on the ROHN premises under careful ROHN supervision.

UNEQUALLED DESIGN AND ENGINEERING

ROHN is the only design that has stood up over the years. ROHN has been first and foremost . . . and always the leader in new products to meet the changing demands.

MASS PRODUCTION FOR LOW COSTS

ROHN was the first to utilize mass production techniques to build a superior tower at the most competitive prices. This means no sacrifice in quality yet far greater profits for you.

UNIVERSAL CUSTOMER ACCEPTANCE

Thousands and thousands of installations prove the ROHN line first in customer satisfaction.

PIONEER MANUFACTURERS

Pioneers in tower manufacturing—and today one of the world's largest manufacturers of this type equipment. The ROHN Company was built on satisfaction on the part of distributor, dealer and customer alike.

COMPLETE LINE

Only ROHN offers a full line—one dependable one-stop source for all TV installation equipment. Save headaches, save shipping costs, save time . . . use ROHN unequalled service exclusively.

ALSO a full line of ROHN ACCESSORIES

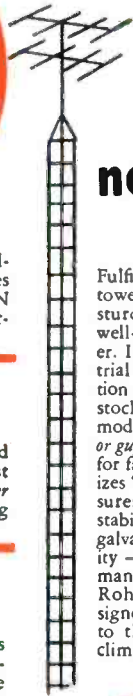
Rotor posts, house brackets, eave brackets, peak and flat roof mounts, instant drive-in bases, hinged base sections, telescoping mast bases, guying brackets, UHF antenna mounts, erection fixtures, variety of mounts and supports for masts or tubing,

tower installation accessories, TV service tables, mast and TV hot-dipped galvanized tubing, guy rings, "twister-anchors", rubber tower grommets, insulator sections, hinged rotor platform, accessory shelf and platform and dozens of other items. Get the complete catalog TODAY!

ROHN Manufacturing Company

116 LIMESTONE, BELLEVUE
PEORIA, ILLINOIS

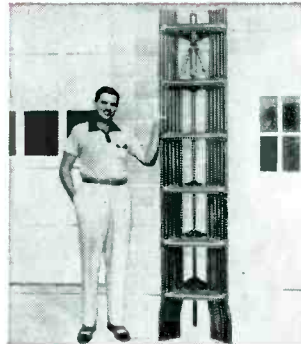
HIGHLIGHTS OF THE ROHN LINE



no. 6 tower

"All-Purpose" tower.

Fulfills 75% of your general tower needs—is structurally as sturdy—yet costs less than the well-known Rohn No. 10 Tower. Ideal for home and industrial installations, communication requirements . . . eliminates stocking many different tower models. Self-supporting to 50 ft. or guyed to 120 ft.! Easy to climb for fast, efficient servicing. Utilizes "Magic Triangle" which insures far greater strength and stability. Permanent hot-dipped galvanized coating. Dependability—a feature customers demand—is assured with the Rohn No. 6 Tower . . . designed to "stand up" for years to the rigors of weather and climatic conditions.

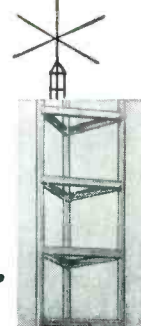


Package Tower*

"Space Saver"—cuts storage space 300% or more!

Popular PT-48 has almost 50' of sturdy tower within a compact 8' x 20" package! "Magic Triangle" design is adapted to a pyramid shape using a wide 19" base with progressively decreasing size upward. Decreases your overhead . . . easy to transport and assemble—cuts shipping costs. Galvanized throughout. Available in heights of 24, 32, 40, 48, 56 and 64 feet!

COMMUNICATIONS TOWER



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* pat. pending

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Editor's Memo

There is more than one side to every question, as we all well know. Or as the saying goes, there are three sides to every question . . . your side, my side, and the truth.

Your viewpoint is determined in large measure by your situation. Like the lawyer who could just as easily defend a client as prosecute him.

Part of the reason for a blind or biased viewpoint is self-preservation. You want to defend yourself and your interests. That's almost a basic law of nature. Another reason is the fact that most people can clearly understand much of what they actually come in contact with; it's more difficult for them to project their understanding into the minds of other people in different situations.

The lack of honest and articulate communication between diverse groups is another source of irritation and misunderstanding. Think of TV technicians and manufacturers. How much can the tech appreciate the pressures of market fluctuations, stock difficulties, and board of director pressures? Or can the manufacturing executive feel the shop owner's difficulties with customers, his lack of security or long hours of over-work?

Not too long ago, I was talking to an official of a large TV manufacturing company. This firm had been severely censured by TV technicians for its captive service operations.

"It's amazing," he told me, "how excited and angry servicemen can get just because we set up a few repair depots. Our whole servicing setup hardly amounts to anything when you consider the overall size of our operations. We certainly mean no harm. Why do they get so hot under the collar?"

I replied that TV technicians had a pretty substantial reason for becoming angry. Their livelihoods were at stake.

To illustrate my point, I recounted an old fable that had been told to me in my childhood. It's called the Lion and the Hare, and it goes something like this:

Once upon a time, the mighty king of beasts was chasing a hare, intending to devour the little creature with one mighty gulp. The frightened hare, spurred on by the lion at his heels, ran so fast that he soon outdistanced the panting lion.

The lion's companions roared with laughter. "Imagine," they teased, "a tiny ball of fluff, a little hare, was able to outrun you, the king of beasts."

"That is perfectly understandable," said the philosophical lion, as he shook his great mane. "I was running for my dinner. The hare was running for his life!"

Al Foman

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THIRTY-FIVE 8th PRIZES: 35 PYRAMID gift certificates entitling you to \$10. (dlr. net) of Pyramid capacitors at your distributor.

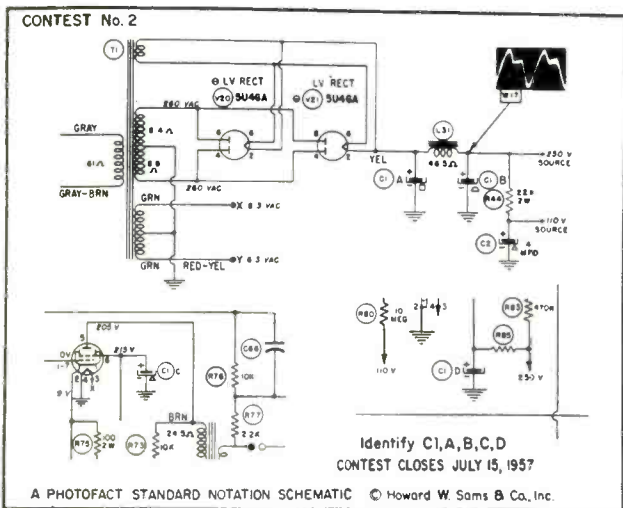
9th PRIZE: WALCO twin-point diamond phono needle. dlr. net \$30. For G.E. Var. Rel. Cartridge.

FIFTY 10th PRIZES: 50 WALCO needles for G.E. twin-point sapphires. \$3.50 dlr. net.

AND to all entrants a kit of 5 bypass and coupling capacitors featuring the Pyramid type IMP.

It's easy to win any one of 147 big prizes—just follow these simple rules: Identify the unnamed Pyramid T-M capacitor in the TV set schematic appearing on this page. Give the Pyramid stock number, name and model number of TV set. Then mail your entry to Pyramid. Use coupon on this page or obtain additional blanks from your distributor. A different schematic will appear in these servicemen's magazines for 4 months. Prizes will be awarded on a points-earned basis as follows: 5 points for Contest No. 1; 10 points for Contest No. 2; 15 points for Contest No. 3; 20 points for Contest No. 4; and 10 points each contest for neatness. Possible perfect score: 90 points. However it is not necessary to achieve a perfect score to be declared a prize winner.

So act quickly...send in your entries early each month...you can't lose.



JUDGES: M. Harvey Gernsbeck, editorial director, Radio-Electronics
Oliver Read, D.Sc., publisher, Radio & Television News
Howard W. Sams, chmn. board, Howard W. Sams & Co., Inc.



HELPFUL HINTS

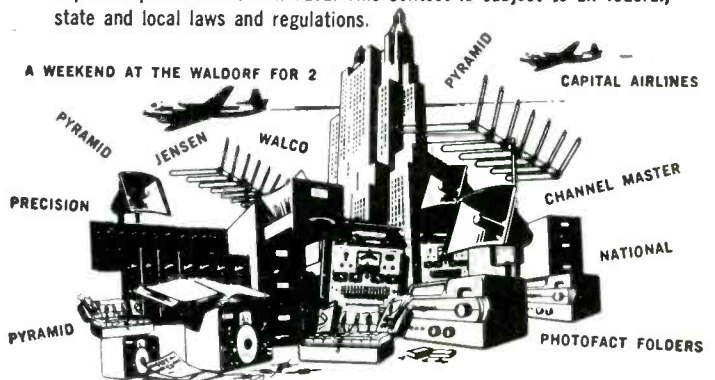
The unidentified capacitor in each entry will be a Pyramid Twist-Mount. All schematics are of TV sets made in the U. S. by a known manufacturer within the past 2 years.

Schematics for reference may be those published by the TV set manufacturers, Howard Sam's Photofacts, or by any other accepted publisher. You may enter as often as you like but be sure to include a box top (showing stock number) of any Pyramid Twist-Mount Capacitor, with your letterhead or business card with each entry.

WHO MAY ENTER

Any Radio-TV serviceman or employee of a Radio-TV service company may enter. Officers, employees, (members of their families) of Pyramid Electric Co. or its advertising agency are not eligible to enter the contest. All entries are limited to residents of the continental U. S. over 21 years of age.

All entries become the property of Pyramid Electric Co., none will be returned and the decisions of the judges are final. In case of ties, duplicate prizes will be awarded. This contest is subject to all federal, state and local laws and regulations.



MAIL THIS ENTRY BLANK NOW!

Pyramid Twist-Mount Contest, Dept J
Pyramid Electric Co.
P.O. Box 655, Tyler Park Station, North Bergen, New Jersey

Entry No. (1) (2) (3) (4)—(check one)—Is: Pyramid stock No. _____

Twist-Mount values _____

Set manufacturer's name _____ TV set model No. _____
I enclose a box top (indicating stock number) of any Pyramid Twist-Mount Capacitor together with my business card or letterhead or my employer's..

Contestant's name _____ Position _____

Contestant's address _____

City _____ Zone _____ State _____

Employer's Firm name _____

Employer's address _____

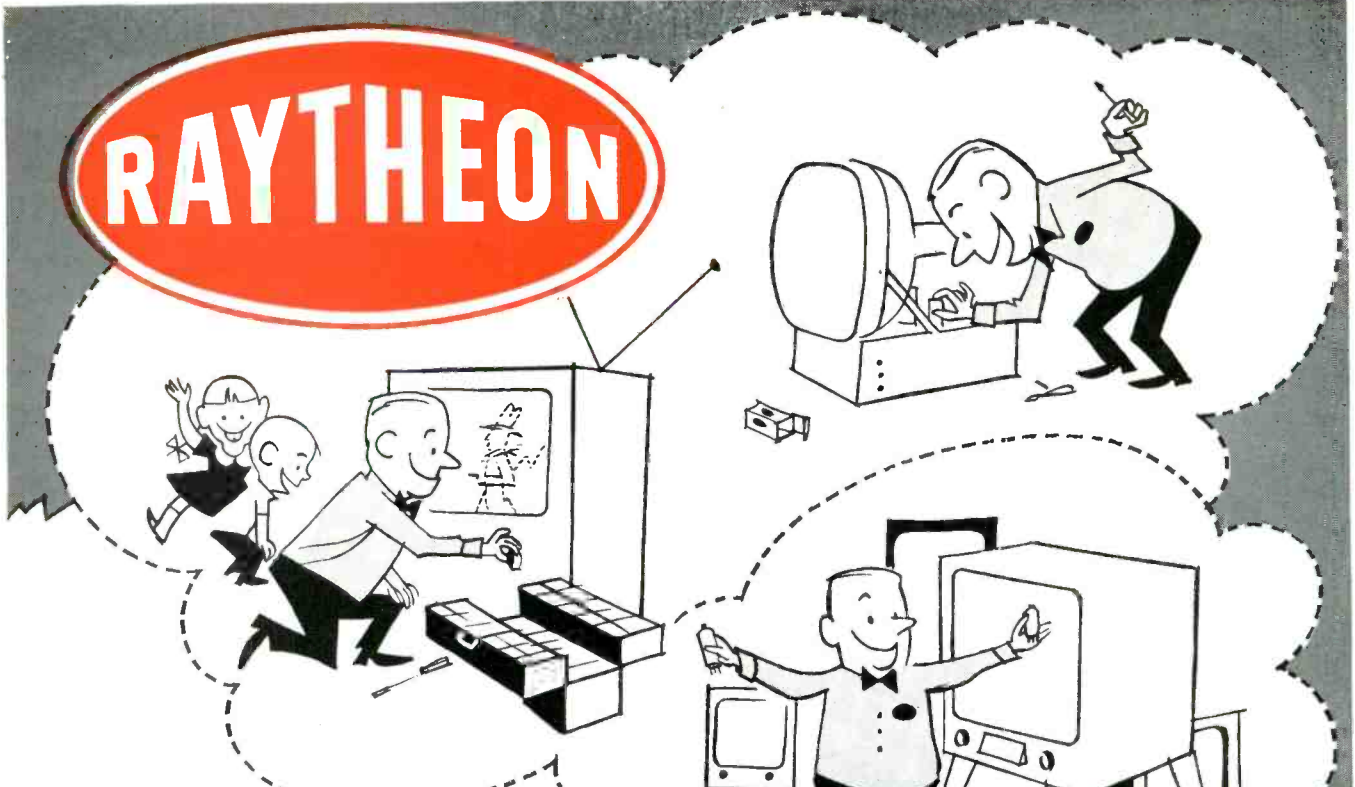
City _____ Zone _____ State _____

My jobber's name and address _____

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This ability to perform in many circuits makes Raytheon "All-Set" Tubes ideal for service dealer replacement work. Fill your Tube Carrying Cases and tube shelves with Raytheon "All-Set" TV and Radio Tubes and you'll be able to meet tube replacement needs of all sets.

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ELECTRONIC TECHNICIAN

Including
Circuit Digests

By the Seat of Your Pants

Years ago when aviation was in its adolescence, planes were flown and repaired in catch-as-catch-can fashion. The daring pilots and ingenious mechanics knew little of standard procedures. Instrumentation was for the future. Both commercial pilots and stunt fliers flew, so to speak, by the seat of their pants.

That they did so well despite these limitations is a testimonial to their skill and pioneering spirit. But today no responsible person would fly in such a haphazard way.

Aviation has grown complex and far reaching, demanding rigorous procedures, increased skills and adequate equipment. In short, industry maturity has brought the need for the Professional Approach, rather than the cut-and-try daredevil method.

The reason for discussing aviation here is to draw a meaningful parallel. There are hobbyists in both aviation and electronics, but it's the professional who is the backbone of the industry. Unfortunately, too many professional electronic technicians do not employ the Professional Approach.

Remember, as the electronic service industry matures—as it is—there will be little margin for business success unless your technique is professional.

The Professional Approach

The basis of the Professional Approach is the conviction that you and your efforts are performing needed and constructive functions, that you have a real career, that you are working to obtain a good livelihood for services efficiently rendered.

The Professional Approach means the use of rigorous methods in repairing defective equipment, taking advantage of manufacturer recommendations.

The Professional Approach means handling customers and co-workers with understanding and tact.

The Professional Approach means possession and effective use of adequate test equipment and facilities.

The Professional Approach means the continued study of new developments, and the upgrading of skills to offer expanded services.

The Professional Approach means the practice of sound business management.

The Professional Approach means active interest in industry associations.

The Professional Approach means the establishment of a technical library and reference files.

Mister, if you've been navigating by the seat of your pants, you'd better come around to launching the Professional Approach!

20,000,000 Circuits This Month

By way of contributing to the Professional Approach, this month we mark the printing and distribution among electronic technicians of our 20 millionth copy of Circuit Digests. From all reports this editorial bonus, provided without extra charge to subscribers during the past few years, has been instrumental in building many technical libraries of TV-radio-audio schematics and troubleshooting data. A Circuit Digest may cover up to several dozen different models and chassis.

Incidentally, you may be interested in a preview of the upcoming May issue, which will offer a double bonus in addition to the Circuit Digests section and regular features. First, you will find a comprehensive directory of electronic products, cross-referenced by manufacturer . . . the only complete product directory in the electronic service industry. The second bonus is a giant multi-colored chart of the electronic spectrum, showing all frequencies and applications authorized by the Federal Communications Commission. We're sure you will make year-round use of these references.

Tuning In the

MORE TEST INSTRUMENT kits are expected to be placed on the market by manufacturers of wired instruments. This month, Precision Apparatus Co., on its 25th anniversary, announced the formation of Paco Electronics Co. The Paco subsidiary is producing a line of kit test equipment to be sold through electronic parts jobbers, in addition to the regular Precision line of wired instruments.

AUTOMATION is apparently no better than the people who use it. In fact, it can be worse than no automation if it encourages negligence and conjures up a false sense of security. This was exemplified by the tragic New York Central Railroad crash near Ripley, N. Y., this past February. The engineer is reported to have driven through a yellow warning signal, probably relying on the electronic warning system to sound a whistle in his cab if the signal did not turn green. (The safety system employs an inductor, mounted on the rail, which is energized when the signal is yellow or red. This unit induces a current in the secondary system under the railroad engine, closing a circuit which automatically sounds the warning whistle in the cab.) The whistle failed to sound, and the engineer accelerated, plowing into a long freight train. An inspector later found that the raiiside inductor was defective.

ELECTRONIC CONTROL ELEVATORS installed in a skyscraper 10 years ago have already become old fashioned, according to the owners, Tishman Realty. They are spending over \$300,000 to bring the traffic-analyzing computer system up to date. The elevators, without attendants, even know when to pass a floor with a full car of passengers (it's done with an automatic load weighing device).

MICROWAVES AID TV SPOT COVERAGE



Microwave transmitter at left uses Narda horn instead of dish-type parabolic antenna to relay TV camera pickup from "crash unit" to main station. For parades and emergencies, the small horn allows increased flexibility while the camera is in motion.



THE IRE 1957 National Convention & Radio Engineering Show held in New York, March 18-23, attracted some 50,000 electronic specialists. The 800 exhibits displayed 17,000 different pieces of apparatus, worth about \$10 million. The 2.5 miles of booths required a megawatt of power to keep it going. It was quite a show.

ANTITRUST COMPLAINT filed against Jerrold Electronics for alleged violations concerning community antenna business has been strongly contested by Jerrold President Milton J. Shapp. He points out that his company is competing with some of the giants in the industry, is basically a small business, and has achieved its position by engineering innovations. Mr. Shapp intends to prove that no laws have been violated.

A FULL YEAR of operation at the Raytheon picture tube plant has been completed without a single day's loss of employment caused by injury or accident on the job. This safety record is not achieved by accident; planning and protective equipment such as gloves and goggles are important. How's your safety record?

ULTRASONICS is finding plenty of use in medicine, as well as industry. These above-sound vibrations are capable of making the heart, bladder and other organs contract and expand. For insect control, ultrasonics has been used in luring millions of the tiny pests to their death. One manufacturer of ultrasonic soldering irons and cleaners, Gulston Industries, is starting to sell his products through industrial electronic dealers and jobbers.

Picture



TV DESIGN TRENDS RCA and other manufacturers are now using on some sets, knobs that are secured from the inside of the cabinet. This is done to prevent inadvertent access to the metal chassis which may be connected to one side of the a-c power line as is often done in series-string receivers. Knobs and cabinet are removed as a unit. It is possible to remove the knobs only by releasing a knob retainer from the inside of the set. So put your crowbar away: know-how will do the job better than muscle.

TRANSISTOR AUTO radios will certainly dominate the field in a few years. One major producer, Motorola, reports that the company's entire car radio production is now transistor powered.

THE PRODUCTIVITY of automation will be vital in the coming years. By 1965, the U.S. will require 40% more goods and services. However, the labor force will increase only 14%, so electronically controlled machines will have to contribute toward making up the production difference.

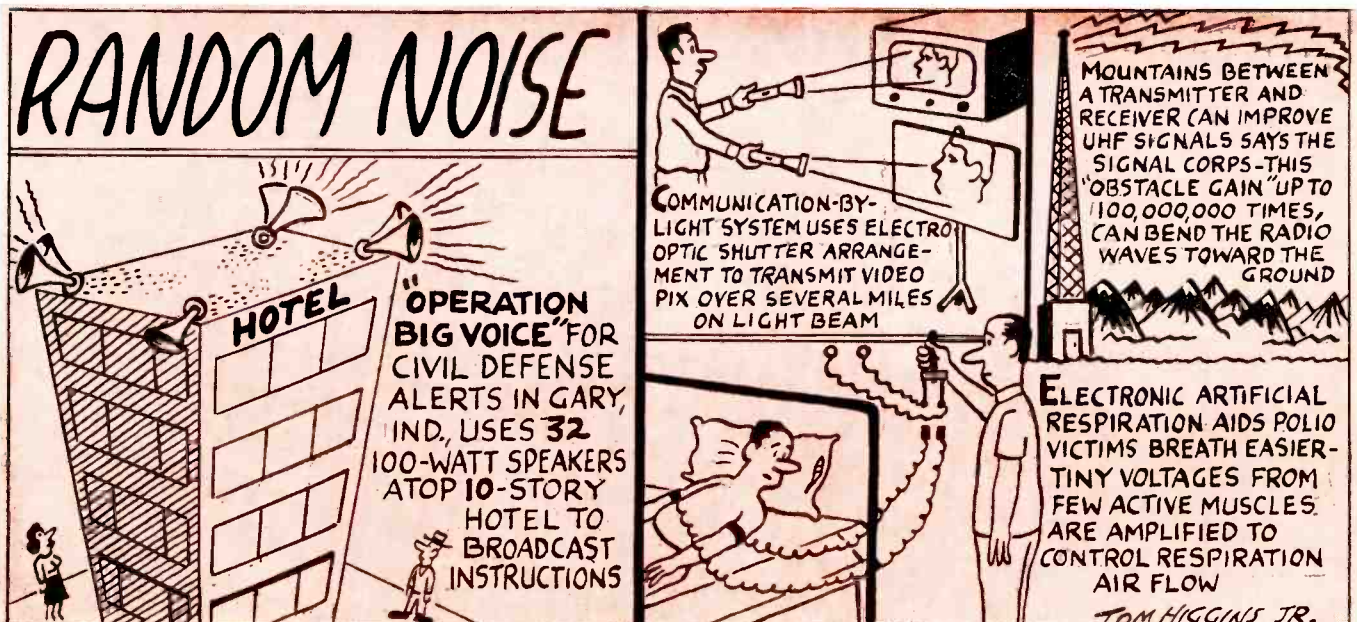
THE REPROCESSED TUBE RACKET exposed by **ELECTRONIC TECHNICIAN** back in July 1955 is coming home to roost on a few sharp operators. A grand jury in New York returned 18 indictments against 13 individuals for fraud in bilking the public and tube manufacturers. The defendants are alleged to have rebranded faulty receiving tubes with in-warranty codes, and returned them to the producers for new tube replacement. One manufacturer reports losing a cool \$1 million a year in this way. We wonder how many dollars technicians lose by buying those 39¢ bargains when they think the tubes being offered are new.

CALENDAR OF COMING EVENTS

- Apr. 9-10: First Annual Conference on Electronics in Industry, Campus of Illinois Institute of Technology, Chicago, Ill.
- Apr. 11-13: Ninth Southwestern I.R.E. Conference & Electronic Show & the Second National Simulation Conference, The Shamrock-Hilton, Houston, Texas.
- May 20-23: 1957 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- Aug. 16-18: National TV-Radio-Electronic Service Industry Convention, sponsored by NATESA, Sheraton Hotel, Chicago, Ill.
- Aug. 20-23: Western Electronic Show & Convention (WESCON), Cow Palace, San Francisco, Calif.
- Oct. 7-9: 1957 National Electronics Conference, Hotel Sherman, Chicago, Ill.
- Oct. 16-18: Institute of Radio Engineers' Canadian Convention, Automotive Bldg., Exhibition Park, Toronto, Ontario.

POWERFUL LABOR UNION drive is aimed at initiating the Guaranteed Annual Wage (GAW) in the electronic industry. The International Union of Electrical, Radio and Machine Workers of America (IUE) is pressing the GAW demand in contract negotiations with various manufacturers. IUE believes this would cut layoffs to a minimum and stabilize the market. The set producers are more inclined to think that GAW would stimulate overproduction and burden manufacturers with artificially high fixed costs.

CLOSED CIRCUIT TV will page visitors at the 1957 Electronic Parts Distributors Show, May 20-23, at Chicago's Conrad Hilton Hotel. Incidentally, this year marks the 20th Anniversary of the Parts Show.



Troubleshooting and Correcting

Whats the Difference Between Arcing and Corona in the TV

LEE SCOTT

• What causes the crackling, popping, sizzling, hissing, or snapping sounds which come out of a TV receiver? In all probability, it is arcing or corona occurring in the horizontal output or flyback circuit. Most of the time this trouble results in horizontal white flashes or streaks across the screen as in Fig. 1, which are accompanied by "popping" sounds from the loudspeaker. At other times, it can be heard and little or no picture distortion is seen. The flyback-circuit components, which can cause arcing or corona include

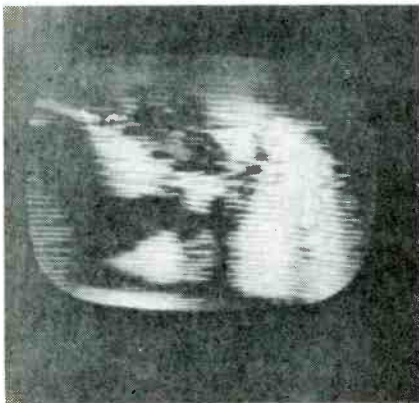


Fig. 1. Streaking due to arcing & corona.

the flyback transformer, yoke, width-coil, linearity-coil, high-voltage rectifier tube and associated circuit components including the wiring. Other components in the TV

receiver which sometimes arc, although rarely, include the power transformer, vertical-output transformer, ringing coils and focus coil.

Arcing and Corona

Arcing is a DC discharge, whitish in color and occurs in a straight line. Corona, on the other hand, is an RF discharge whose color is blue-green and usually bends between the two arcing points. Very often, corona occurs first in the flyback circuit. After it has burned, damaged and broken down the insulation in its path, arcing may develop. Finally resulting in permanent damage to the component. Once corona starts, it tends to maintain itself. Arcing may be heard as a crackling, popping, or snapping sound. Corona may be heard as a sizzling or hissing sound and in addition, it may be smelled as ozone.

Only if arcing does not occur within a component part can it be seen. Corona, on the other hand, cannot always be seen, even in a darkened room. One way to see corona, is to gradually raise the AC line voltage input to the set (using a 125-volt limit) with a variac or step-up transformer. If it still cannot be seen, then the suspected area should be probed with a hollow tube, about 1 foot long, used as a stethoscope, until the point of maximum sound is heard. This is the point at which the corona is being formed. The tube must be made of an insulating material, such as plas-

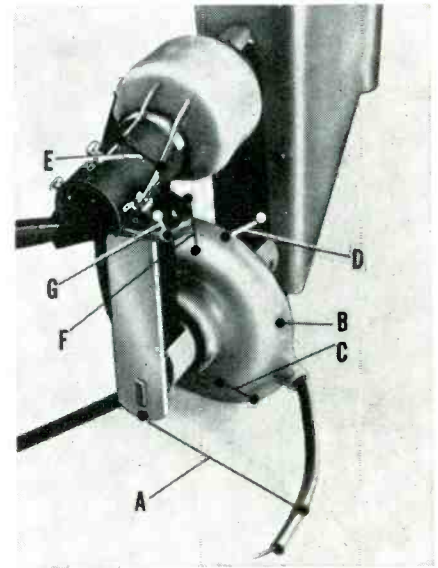


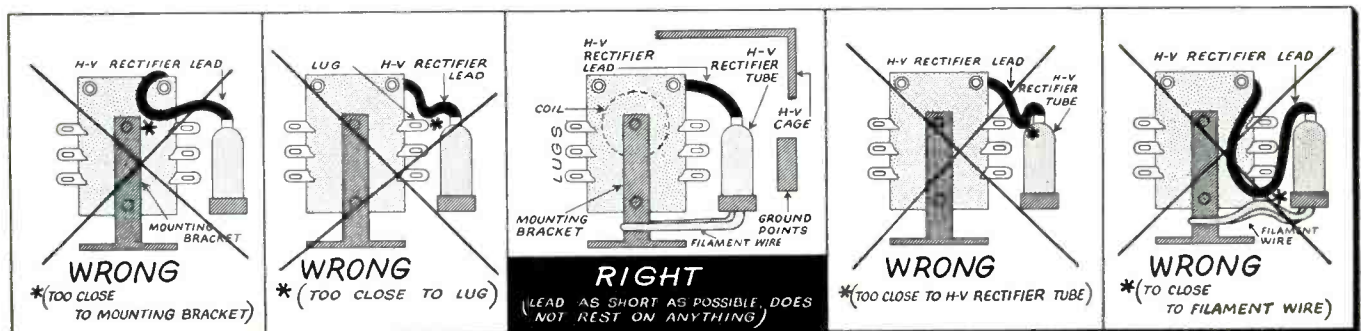
Fig. 3. Potential trouble spots on flyback.

tic, rubber, or cardboard to prevent high-voltage contact with the body. If the probe crosses the corona path, or even comes close to it, a change in the frequency of this hiss will be detected.

Cause and Elimination

Dust, moisture, defective components, sharp-edged metallic points, improper lead dress, and incorrect circuit operating conditions are the causes of corona. Dust may be removed by using a clean lint-free rag or an airhose; do not disturb the lead dress. A sharp-edged point may be a piece of solder, a screw, or even

Fig. 2. Improper lead dress due mostly to excessive lead length. A neat installation is usually trouble free. Center drawing shows proper lead dress.



Arcing and Corona

Receiver? How To Find It, Where To Find It and How To Correct It.

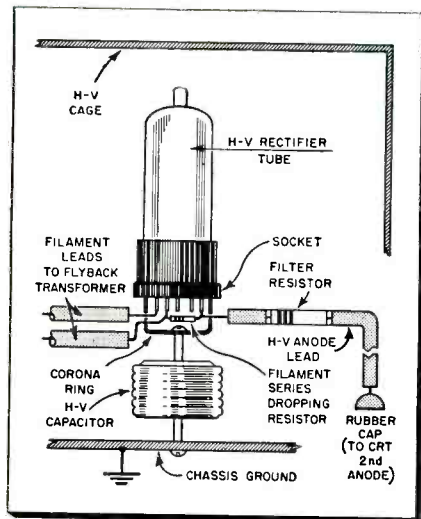


Fig. 4. High voltage rectifier and filter.

a loose strand of wire. The point should be filed until it is perfectly round, or a blob of solder may be placed around it. All metallic dust should be removed from the area to prevent the introduction of unwanted conduction paths. Applying anti-corona dope, or a high-dielectric plastic spray, such as an arcylic compound, in the corona area is often very effective in eliminating the corona.

A piece of high-dielectric plastic such as Mylar, placed in the corona path is also quite good. For example, corona from the high-voltage rectifier plate to the cage, a common occurrence, may be stopped by taping a sheet of plastic onto the cage at the corona point. If the above methods do not remove the corona, then check the operating voltages of the flyback circuit such as B+, boost, drive, etc., for abnormalities. Also, a defective component may be causing trouble. In general, arcing is treated in much the same way as corona.

Corona occurs at the plate of the horizontal output tube, flyback transformer high-voltage winding, or high-voltage rectifier plate. The latter is the most common place. Fig. 2, shows how to dress the h-v rectifier plate lead correctly to prevent corona. Although arcing may

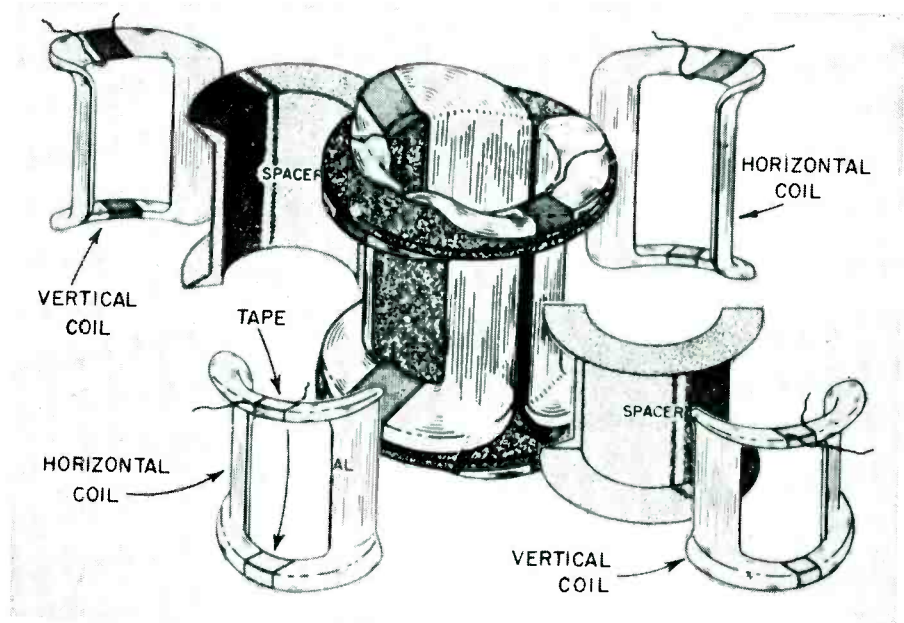


Fig. 5. Exploded view of deflection yoke showing relative position of coils & spacers.

occur anywhere in the flyback circuit, it most often occurs in the DC high-voltage section of the circuit namely: in the high-voltage rectifier tube filament circuit, including the filament lead, series-dropping resistor and socket; filter circuit including the barrel capacitor and series-dropping resistor; and the lead which connects the filter circuit to the second anode of the CRT.

Flyback Transformer

The flyback transformer is one of the most susceptible points for arcing and corona to take place. Fig. 3, shows a typical flyback and places where arcing and corona is most likely to occur. These include: A—arcing from the high-voltage lead to the metal bracket; B—arcing at one point on the h-v winding, this usually originates as corona and results in arcing, after the insulation has been damaged; C—corona or arcing between two points on the h-v winding; D—corona between the high-voltage winding and core; E—arcing between terminals of low-voltage winding; F—corona from the

high-voltage to filament leads; and G—arcing from the filament winding to core.

High-Voltage Components

Fig. 4, shows those points in the high-voltage circuit which are most susceptible to arcing. Arcing from the high-side of the capacitor to chassis ground is fairly common. This is often due to a dirty, damp capacitor surface which serves as the conduction path. Cleaning the surface with carbon-tet and spraying a plastic compound over it, or engulfing the capacitor with a sheet of plastic, should stop the arcing. In the same area, arcing sometimes occurs from the filament series-dropping resistor, the corona ring, a socket pin, or filter resistor, to chassis ground. These may be eliminated by using the methods just described. When arcing occurs across the resistor, it is advisable to check this component. This resistor, when it goes bad, usually changes in value and may climb as much as several megohms. The outside path between

(Continued on page 48)

Troubleshooting & Linearizing

Compensating for Distortion Due to Loss of Low-

ROBERT G. MIDDLETON
SIMPSON ELECTRIC CO.

• Of the various distortions encountered in oscilloscope operation (particularly in the older types), non-linear horizontal deflection is most common. Revamping of the horizontal system comes under the heading of advanced servicing or perhaps junior engineering, but there are many shops that prefer to tackle the job, rather than junk an otherwise useful scope.

Fig. 1 shows a typical sine-wave display obtained when non-linearity is present in the horizontal deflection system. This is a 60-cycle sine-wave pattern displayed on 30-cycle sawtooth sweep. The display is unduly cramped at the right-hand side of the screen, due to curvature in the sawtooth deflection voltage applied to the horizontal deflection plates of the CRT.

Fig. 2 shows this non-linearity or curvature in the sawtooth deflection voltage which is responsible for the distortion seen in Fig. 1. How to correct such non-linearity is the subject of this article. Fortunately, a little attention to the sawtooth oscillator, and to the horizontal amplifier will usually suffice to reduce such distortion to negligible proportions.

Loss Of Low-Frequencies

While the sawtooth oscillator may generate a non-linear waveform, the horizontal amplifier may also be at fault. Use another scope to signal-trace the circuits, in order to localize the point of distortion. Fig. 3 illustrates how a linear sawtooth waveform becomes distorted by passage through a horizontal amplifier having a poor low-frequency response.

One of the common deficiencies in the horizontal-amplifier circuit which introduces curvature into the sawtooth is a grid-capacitor and leak combination which has too short a time constant. For example, a 0.1- μf grid capacitor working into a 1-megohm grid leak resistor has

a time constant of 0.1 second. This time constant is too short to pass a 15-cycle sawtooth wave without introducing distortion in the form of curvature, due to low-frequency loss. Well, why not increase the time constant sufficiently so that the 15-cycle sawtooth is amplified in a linear fashion? This is more easily said than done, because a large grid capacitor tends to leak more—if we should increase the size of the grid capacitor to, say, 1 μf , it would be difficult to maintain a stable bias on the grid of the following tube. Furthermore, such a large capacitor also has a relatively large stray capacitance to ground (chassis) which impairs the high-frequency response of the circuit. Again, if we should increase the value of the grid leak to, say, 10 megohms, it would be very difficult to maintain stable operation of the following tube, because of traces of grid emission, gas, etc. Hence, practical considerations limit the value of grid capacitor and leak which can be used in the horizontal-amplifier circuit. However, this does not mean that

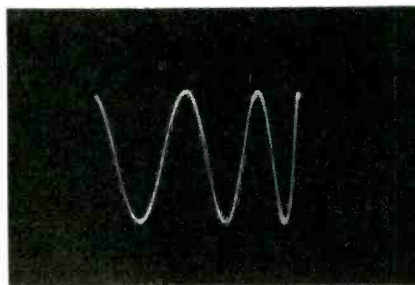


Fig. 1. Sine wave display cramped at right

Fig. 2 Curvature of saw-tooth waveform

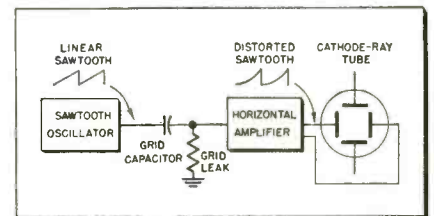
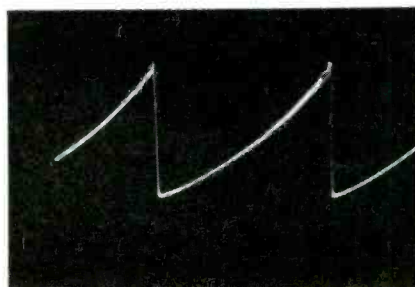
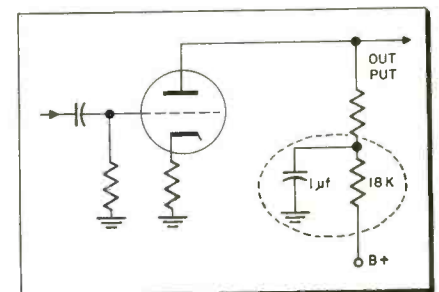


Fig. 3 Linear sweep may become distorted

Fig. 4 Low-frequency compensation circuit



we must settle for non-linear deflection. Quite to the contrary, adequate corrective circuits are available to provide the desired deflection linearity.

Low-Frequency Compensation

Low-frequency attenuation in the horizontal amplifier can be compensated for by the use of an RC network, as depicted in Fig. 4. Typical values utilized in a commercial scope are 18,000 ohms resistance, and 1 μf capacitance. This arrangement is a low-frequency boost circuit, and operates by providing an increasing value of plate-load resistance as the frequency becomes less. At low frequencies, the reactance of the 1- μf capacitor increases, placing the 18-K resistor in series with the plate-load resistor of the tube, and thereby increasing the amplification at low frequencies.

Scope The Scope

It is interesting to note that one scope can be used to check another, when making modifications of this kind. Of course, the scope used for check purposes should have good re-

Oscilloscope Deflection Circuits

Frequency Response and Causes of Limiting Action

response, so that the operator will not be misled by distortion in the check scope. It is also advisable to make use of a low-capacitance probe with the check scope, to avoid undue loading of the horizontal-deflection circuits, and possible distortion from this source. By this means, it is an easy matter for the operator to determine where the sawtooth distortion is entering, and to check the effectiveness of corrective measures. Thus, hit-and-miss approaches to the problem are avoided. Note that when low-frequency compensation is required, it can be applied at any convenient stage, such as the pre-amplifier stage indicated in Fig. 5. Correction applied at either end of the horizontal amplifier will restore sawtooth waveform, whether the distortion is occurring at one stage, or whether the distortion is a cumulative distortion contributed by two or three stages.

Distortion Due To Clipping

Although a cramped 60-cycle sine-wave display is often the result of poor low-frequency response in the horizontal amplifier, it must not be supposed that this is the only source of non-linear deflection. For example, Fig. 6 shows a distorted 60-cycle sine-wave display which is caused by cut-off in a horizontal

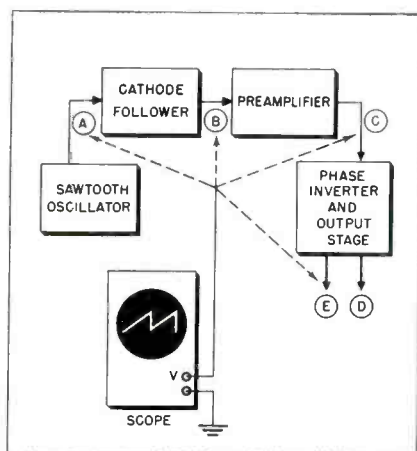


Fig. 5 Test points used in signal tracing

amplifier stage. Cut-off is caused either by low emission in a tube, by improper grid bias (such as from a leaky coupling capacitor), or by low plate voltage.

The test depicted in Fig. 5 serves to quickly localize the point of such distortion, after which the operator should proceed to change tubes, and to measure voltages. Sometimes overlooked is the "cold" plate terminal at cathode-follower stage. The plate of a cathode follower is usually fed B+ voltage through a dropping resistor, is grounded for a-c by means of a large bypass ca-

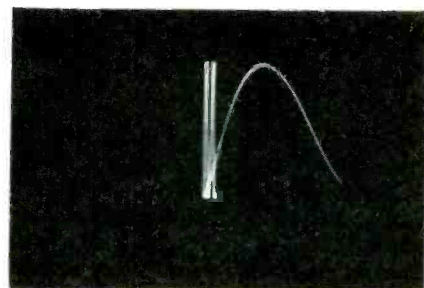


Fig. 6 Foldover due to cut-off distortion

pacitor from plate to ground. This bypass capacitance must be quite large in order to obtain good low-frequency response. If an electrolytic bypass capacitor in this position loses a substantial proportion of its capacitance, the low-frequency response of the cathode-follower becomes poor. The fault is shown by the presence of substantial a-c voltage at the plate.

Finally, unless adequate B+ voltage is available to the sawtooth oscillator, the generated sawtooth waveform will not approximate linearity. The output from a simple sawtooth generator is always exponential, but if the supply voltage is adequate, operation takes place over a sufficiently small part of the exponential curve which approximates linearity. •

Right or Wrong in Labor Relations

Can You Discipline a Worker For Being Abusive to His Boss?

What Happened

Jim Bowman was not at his work place. His boss went over to the men's room and yelled, "Bowman, come out of there, damn it!" Bowman came out promptly. "You've been in there twenty minutes," said the foreman. "You're a damn liar," said Bowman. "It hasn't been any more than ten." Bowman was fired for cursing the boss. He objected, saying:

1. I was in the men's room less than ten minutes, and I've got witnesses to prove it.



2. The foreman cursed me first.

3. Nobody else heard what I said, so what harm was done?

The boss' answer was:

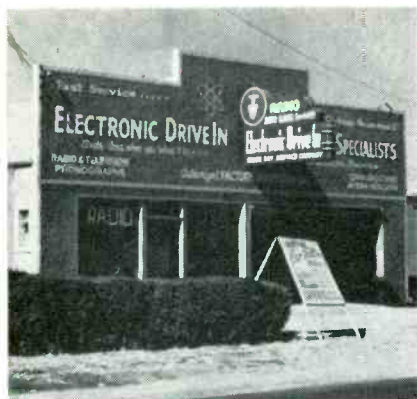
1. How long Bowman actually was in the men's room is beside the point. That's not what he was fired for.

2. He was fired for calling me a "damn liar." That's a serious breach of shop discipline.

3. Cursing a boss is cause for discharge, regardless of whether or not it's done before an audience.

(Continued on page 50)

Electronic Drive-In Attracts New Customers



Electronic Drive-In Sonoma, California

NEALE LESLIE

• A California radio and TV servicing firm has a new approach to

obtaining business called an "Electronic Drive-In" where they service automobile radios while you wait. Al Kraft and his partner, S. D. Castori, are strategically located in Sonoma; on the Sonoma-Santa Rosa highway about 50 miles north of San Francisco. Peak traffic conditions sometimes reach as high as 14,000 cars an hour.

The "Electronic Drive-In" is attractively painted, and has a large door in the front and rear of the shop. A customer drives in, has his radio repaired and drives out. The service department sports a masonite-topped bench 60 feet long and 3 feet wide. Ample fluorescent lighting brightens the work area and plenty of test equipment speeds servicing. There must be a substantial inven-



Shop is well equipped and illuminated

tory, Kraft points out, as the firm's big selling point is immediate service.

The customer is invited to see his radio tested. Before any major part is replaced he is consulted. Flat-rate charges, based on averages, are listed according to the job. The minimum automobile service charge for a radio is \$2.25. Included in this charge are bench tests, tube tests or replacement estimates for getting the radio back into operation, ad-

(Continued on page 51)

For Audio "Imaginicians"

Unusual applications for imaginative technicians

R. C. REINHARDT, PRES.
ATLAS SOUND CORP.

• As told to ELECTRONIC TECHNICIAN editors. The following sound applications are intended to spark the imagination of technicians who can expand their audio business by applying existing systems to specialized uses. Readers are invited to report any unusual audio installation they have seen or made.—Ed.

Attention Nimrods

Duck quacks, crow calls and predatory-attracting sounds made by wounded rabbits are helpful aids in bringing the game to the hunter. These calls are among those currently available on records intended for playing in the field. Here's an opportunity for portable record player sales. Addition of a high efficiency speaker, preferably weather-proof, takes greater advantage of the limited power available.

For the Birds

Our winged friends often cause a considerable amount of annoyance

or damage. Noise and dirt are some of their byproducts. Seagulls around reservoirs and pigeons on building fronts do not take kindly to loud sounds around 18 kc, and they may soon depart. Starlings are another trouble source, and records of these birds' calls when frightened may be obtained. When played over a sound truck with a high powered amplifier, the birds are encouraged to move elsewhere.

Jimmy Valentine Beware

There's more than one way to skin a burglar, and audio can help do it. A tape recording of a large dog barking can make a housebreaker take off without waiting to see the canine teeth behind the 50-cycle growl. Also, the public is accustomed to hearing bells and sirens; more attention will be paid by passersby to a very loud dog bark. The tape recorder can be started by a photocell or rubber mat step plate actuating a lock-in relay.

For night watchmen in factories and department stores, the intercom system used during the day for business messages can be used to monitor activities all over the plant. With



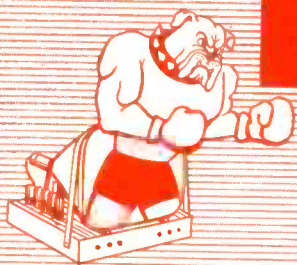
all remote stations on, listening to the central master can localize where glass is broken, water running, etc. Also, a battery operated bell actuated by a thermal element can be picked up by the intercom to spot fires.

Step Right Up Folks

The tape recorder message repeater can be an untiring salesman for gas stations, supermarkets and department stores. A different sales message can be recorded periodically. It can either repeat continuously or play only when actuated, such as when a car runs over the filling station pressure tube.

Real Cool

Gone is the day when private swimming pools belonged exclusively to Hollywood magnates. Today everyone has a pool (well almost everyone), so where's the distinction? Aha! So you install hi-fi in the pool . . . underwater. Submersible loudspeakers are available for those who want to take their pools out of the peasant class, and can afford the cost of doing so! •



"Tough Dog"

Corner

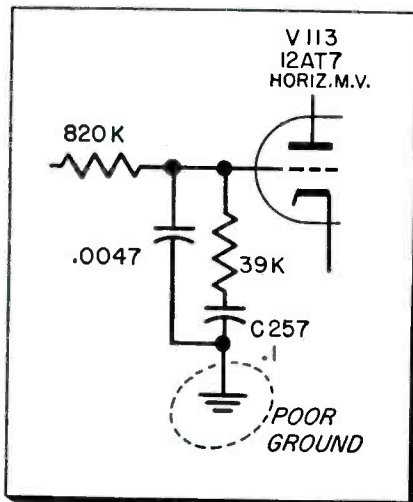


Difficult Service Jobs Described by Readers

Horizontal Gear Tooth

This receiver, a GE 21C137, "O" Chassis developed an unstable horizontal condition which started as a once-a-night defect and finally became permanent. After battling with the set for many hours and finally locating the cause of the condition, I am thankful that the owner didn't call for service when the set was still intermittent. I might still be working on it instead of writing about it.

After making the normal voltage and resistance checks in the horizontal phase detector and oscillator circuits, which were all in agreement with those published in the manufacturer's service notes, I checked the circuit with my scope and found some evidence of unwanted hum modulation on the horizontal multivibrator grid. Fine! All I have to do now is to find the filter that is causing the hum. That's what I thought. The B+ line was absolutely clean. What now? Where else could this hum come from? It could be ac-filament hum. I had already checked the tubes in that circuit, once in the customer's house and once more when I put the set on my shop bench. One more check wouldn't hurt—but it didn't help either. Back to the VTVM. Check everything once again. In checking the CRT socket resistances to ground, I found that pin #1 showed a slight resistance to ground. This is the grounded filament lead. In checking the ground connection for this lead, I found that the same chassis ground lug is used for C257, a 0.1 μ mf capacitor in the horizontal anti-hunt network at the multivibrator grid. The lug was not firmly attached to the chassis. I removed the leads from this lug and soldered them directly to a nearby ground. That was it. A recheck of the waveform display showed that when the poor ground existed, AC from the filament was



Poor ground introduces horiz. instability

introduced into the horizontal circuit. I also noticed a tendency to develop sound bars in the picture which could not be tuned out with the fine tuning control. Without investigating further, keeping in mind the source of my first difficulty, I checked and re-soldered the main ground lugs on the chassis. After re-soldering the ground on the secondary of the audio-output transformer, the sound bars disappeared. —D. Felin, East Meadow, N.Y.

• Judging from the number of tough dogs that have been sent in recently all dealing with troubles stemming from defective ground terminals, it may be good practice to check these points on all sets as a matter of standard procedure, es-

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pecially on those sets where the terminals are riveted or pressed into the chassis and not soldered. Mechanical vibration, metal fatigue and electrolytic or other corrosive action in time develops a resistance to ground across which all sorts of undesirable signal voltages are developed and fed into all sorts of undesirable places.—Ed.

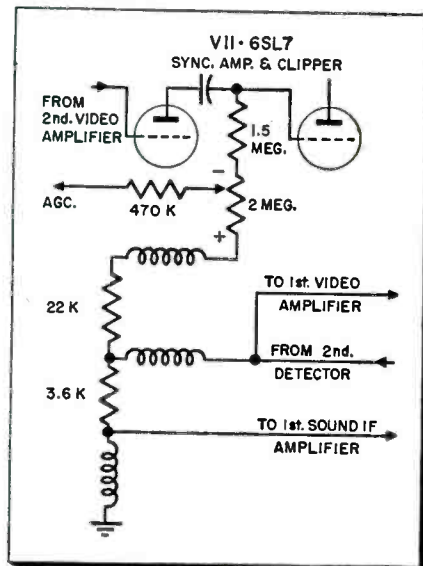
No Contrast Control

On this GE Model 14C101, the major complaint was lack of contrast and a minor complaint was long warm-up time.

The contrast control had no effect whatsoever on the dull picture. The i-f and the 2nd r-f tube grids are tied to the contrast-control center arm through their respective decoupling networks. These were checked with a VTVM. The varying

(Continued on page 52)

Low filament voltage caused loss of gain



Advanced Static and Dynamic

Prejudging Static Control Adjustment Facilitates and Speeds Up Con-

JAMES E. WEDDLE

• Due to manufacturing tolerances which introduce considerable variations in convergence problems among color receivers, it is essential that the technician who works with color possess the ability to accurately evaluate the effects of convergence adjustments as revealed by the patterns from a dot or bar generator. The following analysis of convergence problems will deal with some of the less well known aspects of the subject as applied to magnetically converged tubes, and will assume a knowledge of shadow mask tube structure and principles, including convergence circuitry, accessory components, and applications.

Fig. 1, illustrates the dot patterns, observed at the center and extremes of deflection along the vertical and horizontal axes of the screen, produced by the red, green and blue beams of the shadow mask kine-scope. The direction and amount of

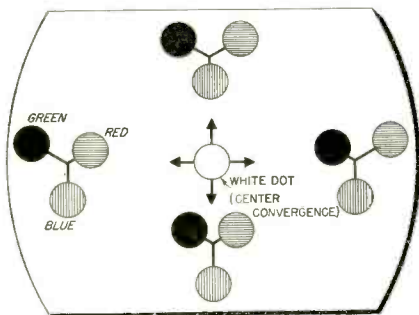
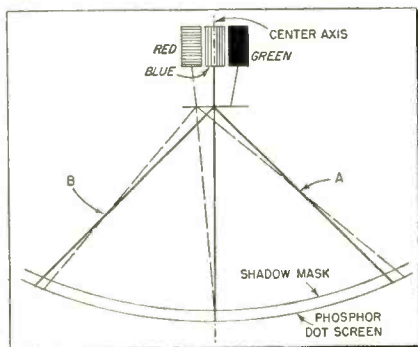


Fig. 1—Center convergence and relative displacement before dynamic correction.

Fig. 2—Off-center axis causes displacement.



relative displacement of each beam is indicated. The beams are adjusted for center convergence, and no dynamic waveforms applied. As these are the conditions normally prevailing at the start of a complete convergence adjustment procedure, a careful analysis of these patterns will reveal the basic nature of the problem to be overcome.

Of particular interest are the displacement characteristics of the red and green beams under horizontal deflection. Taking the red dot as our example, it is seen that its displacement is greater at the right hand side of the screen than at the left. The principal reason for this non-linearity of displacement is illustrated in Fig. 2, which shows deflection of the red and blue beams only for clarity, and may be explained, in considerably simplified form, as follows:

The red beam enters the field in a straight (original) path and is deflected to either side of its original path. Due to the inclination of the red beam's center of deflection, it converges with the blue beam further from the shadow mask under deflection to the right point A than under deflection to the left point B. Thus, on the phosphor screen, the red dot shows greater misconvergence at the right than at the left.

Although deflection of the green beam is not shown in Fig. 2, its angular relationship with the center axis of the tube causes its displacement pattern to be similar to that of the red beam, except that its displacement is greater at the left of the screen than at the right, as shown in Fig. 1.

The undeflected blue beam in Fig. 3, is inclined downward toward the center axis. Thus, its direction of displacement is downward, and non-linear under vertical deflection. The blue beam's pattern of displacement under horizontal deflection is linear since its undeflected path has no horizontal component of angular relationship with the center axis of the tube.

From the foregoing, it can be seen that the basic displacement char-

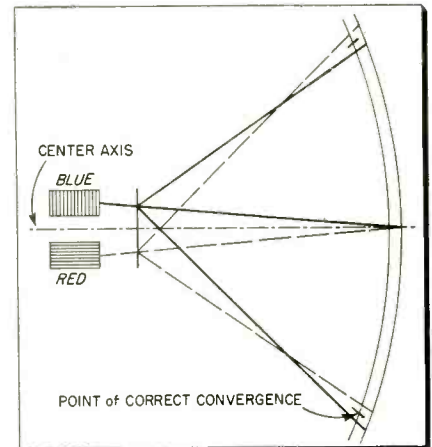


Fig. 3—Vertical displacement of blue beam.

acteristics of the three beams under deflection are independent of each other, and are due to the individual relationship of each beam's undeflected path with the center axis of the tube.

Dynamic Convergence

The objective of dynamic convergence adjustments is to cause the beams to converge along the horizontal and vertical axes of the shadow mask. To accomplish this, the center of deflection of each beam is altered during sweep, as shown for horizontal deflection of the red beam in Fig. 4. In this figure, the dashed lines show the altered center of deflection and resultant convergence at point A. Two facts should be kept in mind at this point: The convergence at the right hand extreme of sweep is due to the red beam's altered center of deflection and the original path of the red beam is governed by the static convergence adjustment. Since, as previously outlined, any change in the red beam's path is magnified under deflection, any adjustment of the static convergence control for the red beam in Fig. 4 would cause a greater displacement at the right hand side of the screen than in the center.

Therefore, if, in an actual case, the red beam were adjusted with dynamic controls for a symmetrical

Convergence Techniques

vergence Procedure. Advantages of a Dot and Cross-Hatch Generator.

pattern of divergence, as in the dot pattern of Fig. 5a, and then brought into convergence in the center by means of the static adjustment, the beams would again be misconverged at all points of deflection, as in Fig. 5b. The dashed lines in Fig. 5b indicate relative beam movements due to the static adjustment. Readjustment of dynamic controls would be necessary, with consequent disruption of center convergence, requiring another static adjustment, etc.

Static Displacement

Once the technician recognizes this problem, he can save much time and achieve a better job by developing a technique to compensate for it. The basic objective is to avoid, as much as possible, static control adjustment after dynamic adjustments have been made. One method of doing this is to displace the beam slightly in the center (with the static control) before proceeding with dynamic adjustments. Displacement should be in the direction opposite to that in which the beam will be moved by an increase of dynamic convergence. Dynamic adjustments will then bring the center and swept pattern into convergence simultaneously, or nearly so. The degree of center displacement from which to work depends on the individual receiver, and is determined by the amount of misconvergence of the swept beams, and consequently the amount of dynamic correction it will be necessary to apply. The rule of thumb is, the more dynamic correction necessary, the greater the center displacement to start with. It must be kept in mind that only the beam being converged should be adjusted for center displacement; the other two beams must be converged in the center.

In addition to interaction between static and dynamic controls, a further problem is introduced by interference between dynamic fields. That is, the magnetic field applied to the pole pieces of the red gun, for example, will set up a field between the green gun and blue gun pole pieces also and alter the necessary dynamic

adjustments for these beams. To minimize this effect, it is advantageous to preset all dynamic amplitude controls above minimum before proceeding with individual beam corrections. In this way, the net change necessary in any dynamic field will be a reduction. Phase and tilt controls should be preset roughly for equal displacement at extremes of sweep.

Such presetting of controls offers the additional advantage of reducing the separation between beams, so that most convergence adjustments can be made with reference to three overlapping dots which produce white, rather than to a reference blue. When beam separations are so great that it is necessary to use a single beam as reference for dynamic adjustments, blue must be used because of its linear displacement pattern under horizontal deflection.

This presents difficulties, because blue mixed with red or green produces magenta or cyan respectively; neither of which color is always easily distinguishable from its primary components when viewed in small separations as in a dot or line pattern.

It is sometimes recommended that a line pattern, either vertical or horizontal, be used in lieu of the dot pattern. The use of such patterns may appear convenient because they eliminate the visual evidence of one component of movement in the red and green beams, allowing simplified comparison of displacements between blue and another color. However, except for rough initial adjustments, line patterns are not satisfactory in conventional receivers for the following reason:

Magnetic Interaction

Although we have thus far assumed deflecting force to be equal for each beam, this does not hold true in practice. The deflecting force of a magnetic field upon an electron is maximum when the electron intersects the exact center of the field at right angles. Obviously, this con-

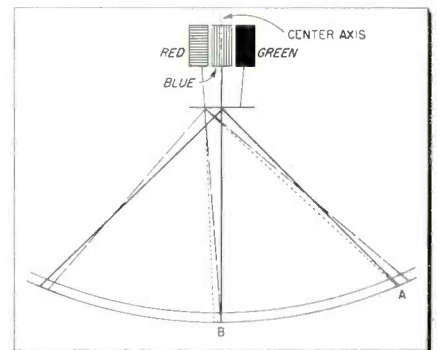


Fig. 4—Dynamic shift converges beam at right

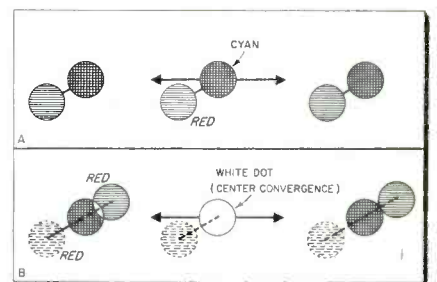


Fig. 5—Static adjustment after dynamic setting upsets symmetrical divergence pattern.

dition is not met for any of the three beams of a shadow mask tube. All three beams enter the field at an angle, and none intersect the center. Furthermore, the angles and positions of entry are varied by introduction of dynamic convergence correction. Thus, deflection of the three beams is not necessarily equal at any point of sweep.

Unequal sweep will show up in a group of dots as in Fig 6a. In this case, the red beam is unequally swept vertically with respect to the blue and green beams, and shows a vertical displacement only. If the beam were simply out of convergence, its displacement would be radial. Note that this displacement would not be seen in a vertical line pattern; the line would appear to be perfectly converged. Assuming that the deflection yoke is correctly positioned, careful adjustment of dynamic convergence will usually improve, if not eliminate, this condition. In severe cases, a compromise

(Continued on page 53)

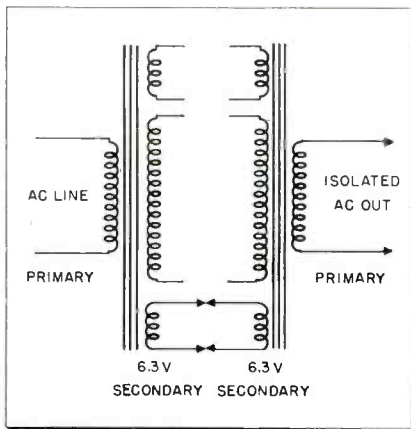
SHOP HINTS



Tips for Home and Bench Service by Readers

Emergency Isolation

When the shock hazard becomes a problem especially when working on radio or TV sets whose chassis are tied to one side of the a-c power line, an emergency isolation transformer can be quickly hooked up by using any two similar transformers. Care must be taken not to exceed the transformer's wattage rating. Two TV power transformers will do. Where there are multiple windings, it is best to use the heaviest; this is



Emergency power line isolation device.

usually the 6.3-volt filament winding. One transformer steps up as much as the other transformer steps down in a symmetrical back-to-back hookup, as shown in the diagram. (Less a very small loss; the amount depending upon the efficiency of the transformer.) Exposed leads should be taped.—B. O. Riis, Miami, Fla.

• Commercial isolation transformers are available. Some have provisions for raising or lowering the voltage to facilitate certain trouble shooting procedures.—Ed.

Noisy Tuning Condensers

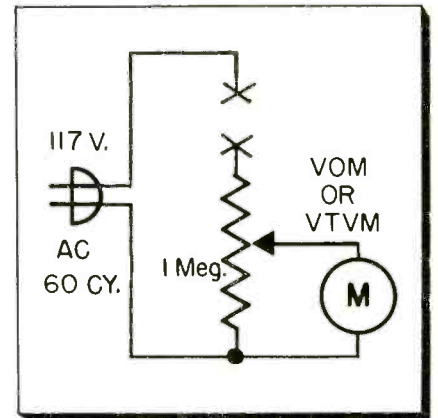
Curing a noisy tuning condenser by flashing with high voltage is a pretty well known trick by now. But that involves disconnecting all com-

ponents from the tuning gang, such as the antenna loop, rf transformer, etc. This can be quite a tedious job on some sets. A high-voltage supply must also be available. Even so, I have occasionally run into stubborn cases which just won't clear up, with the flashing and burning technique. The latest trick is one which requires no unsoldering or high voltage supply and even works in stubborn situations. Just grab that can of high-dielectric plastic spray and cover both the rotor and stator with a generous coating. Allow to dry thoroughly. The loose particles are trapped in the plastic. The gang works smoothly and without noise.—E. J. Comeaux, Sandusky, Ohio.

• When repeated complaints occur or when flaking becomes excessive, the best solution is to replace the condenser. If you must effect a permanent repair on the old job, then remove the tuning gang from the receiver and strip it of trimmer mica and screws. Immerse the gang in a bath of killed acid (muriatic acid with some zinc) until the coating has been removed. Then thoroughly wash in a bath of alcohol to neutralize and stop any further action. Avoid excessive "cooking."—Ed.

Capacity Readings With A VOM

A quick and inexpensive measurement of capacity can be made with your VOM or VTVM and a potentiometer. The device may also be used to match or pair new components. It consists of nothing more than your meter, an extra pair of leads and a linear potentiometer on the order of 1 megohm. The value is not critical. The only precaution is not to exceed the wattage and current rating; as the control is placed directly across the a-c line. The hookup is shown in the diagram. Even the line voltage is not critical. The important thing is to establish full scale deflection, using the a-c function and proper range. This is



Divider network permits reactance readings.

accomplished by shorting the test leads, at the points marked X and adjusting the pot. Graphs and charts could be plotted, but this is not necessary. To calibrate the meter, note the readings obtained from capacitors of known values. By using different potentiometer values and different a-c ranges, it is possible to obtain a fairly wide range of measurement. However, once the range and resistance have been selected and adjusted the scale will remain accurate.—Frank D. Witmer, Camp Hill, Penna.

• The above arrangement may also be used to determine the values of coils, chokes, yokes, etc. If 400-cycles, available on most signal generators, were used instead of the 60-cycle line voltage, even more accurate and wider range of readings would result.—ED.

Win \$5.00!

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Industrial Sound System

Combination Intercom, Music & Paging System



JACK DARR

• Much has been said about the theoretical aspects of this business. Here is a first hand account of an actual industrial combination intercom, music and paging system. The thinking and foresight that went into the original intercom-only installation really paid off when the management decided to expand this system.

The system located in a shirt factory had two ac-powered masters (one for the manager and one of the receptionist) connected in parallel and six two-way remotes which were able to initiate calls to the main office. To allow for future expansion of the system, and to make service work easier, more wires were run

than the system needed. Instead of a 6-wire cable, 8 was used. In addition a single shielded wire was run throughout the intercom system as a call-wire for incoming calls. Screw terminal strips were installed at about 50-foot intervals and junctions, over the entire system. (This was the result of much experience gained at an Air Force base during the war.) Whenever a station had to be moved the wiring was disconnected and shifted to another terminal board. The system was in operation again in a very short time. All wiring was color-coded. I used standard colors; brown-1, red-2, etc. Any code will do as long as it is written down.

Later, as anticipated, the plant was enlarged. This brought on an expansion of the intercom system, above

its original 6-remote station capacity. I lost the argument on this in the beginning; they bought the 6-position master against my better judgment. To cope with this situation some stations were disconnected from the receptionist's master and some from the manager's. Enough extra positions were gained to set the system up as needed. In addition to the demand for more remote stations, a background music system and paging facilities had to be incorporated. The intercom's 4-watt output was inadequate. More amplification was needed. After checking the plant area during working hours, to get an idea as to the background noise levels, I decided to try a 50-watt amplifier.

Several different departments with different noise levels had to be ac-

Fig. 1—Factory-floor plan showing the location and number of conductors, terminals, intercom master and remote units, and loudspeakers.

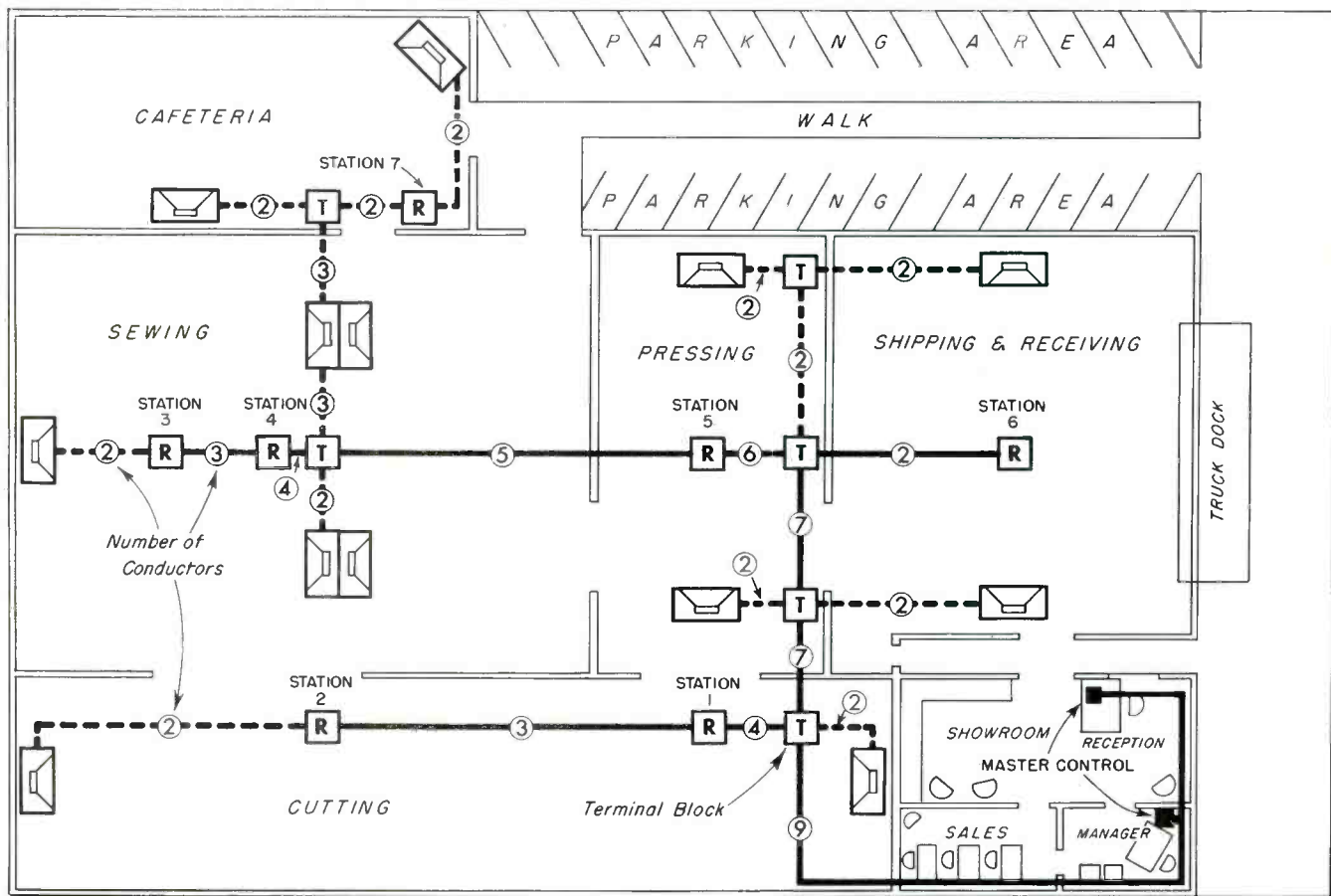




Fig. 2—Intercom, record player, amplifier and controls are easily reached by the receptionist.

commodated. The sewing and pressing section had a fairly high background noise level; cutting was long and narrow, it ran almost the full length of the building, approximately 200 feet; packing and shipping was fairly quiet. From past experience, I decided to use more smaller speakers operating at lower levels, rather than a few larger speakers running at higher levels. Because of this it was possible to affect a savings in the total cost of the speakers and amplifier power requirements. The units chosen were easily available, 6" x 9" PM's, similar to the type used in most auto-radios today and 8" rounds. Each of these can be driven to about 3 or 4 watts with fairly good results.

Loudspeaker distribution

Because of the concentration of high background noise, I used a total of 5 speakers in the sewing department. One was mounted on the rear wall and two back-to-back units were suspended from the ceiling beams over the machines about 12 feet from the floor. Taking advantage of the shape and slightly lower noise level of the pressing department, only two speakers were used. This department also receives some sound from one of the speakers in the sewing section. The shipping and receiving department, still quieter but of larger area, was also covered by two speakers. The cutting department, with its long tables, was the least noisy, so despite its length, two speakers were employed. Special attention was paid to proper phasing of all speakers for maximum efficiency. The completed installation

showing the loudspeakers, intercom units, wiring and terminal strips can be seen in Fig. 1.

Obtaining impedance match

The baffles, as shown in Fig. 4, were home made in the shop, using 1/4" plywood, lined with soft packing. The ends were slanted downward, to aim the sound where it was needed most. They were firmly constructed to prevent rattles and vibration. Additional wiring was run along the route of the previously installed intercom hookup. Although I originally thought vaguely of connecting all speakers in parallel, this came out to something like 0.5 ohm impedance. Therefore, a series-parallel connection was tried; apparently due to excessive losses in the small lines, which totalled almost 1,000 feet of wire, I didn't get sufficient volume. This forced me to use matching transformers at each speaker, to a 70-volt constant voltage tap on the amplifier. The transformers had convenient power taps to enable the proper preselection of volume level from each speaker. The

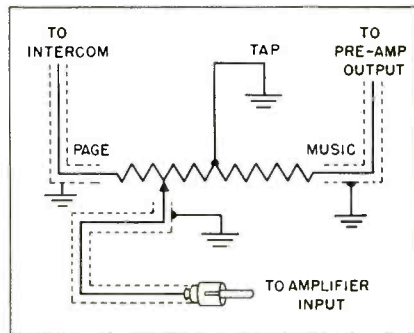


Fig. 3—The fader control is a linear 2-meg potentiometer having a grounded center tap.

overall volume was quite sufficient.

To furnish paging facilities, I connected station #6 of the receptionist's master intercom to the amplifier through a fader control. The record changer's signal was fed into the other end of the fader, which consisted of a 2-meg linear potentiometer equipped with a grounded center tap. The amplifier's input was connected to the slider, as in Fig. 3. To use; the fader is turned from "MUSIC" to "PAGE" and the call made on the intercom in the regular manner. The music is cut down and out during the page or announcement, to avoid interference. A phono cartridge equipped with dual diamond needles was used. The amplifier and changer are housed in a wooden cabinet and located next to the receptionist and her master intercom station. By using long-playing records, a single loading runs for several hours without attention.

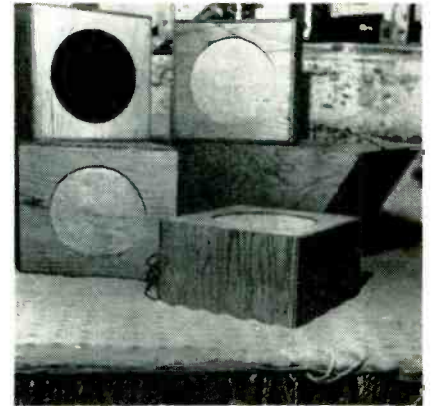

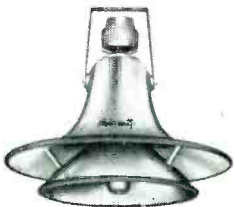





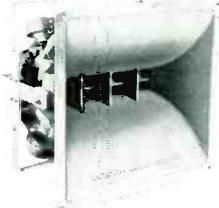






Fig. 4—Speaker baffles made from plywood.

This entire system uses standard, easily obtainable parts, and has been in service for over three years without a breakdown. The lack of trouble can be attributed to the preventative maintenance program which was included in an annual service contract. The system is cleaned and checked and weak tubes replaced every 3 months. This job has brought other customers to my door.

(Many other refinements to this system could have been added such as; an AM/FM tuner to relay news, sporting events, music and other interesting programs; individual speaker controls located near the intercom stations to enable conversation without undesired music and feedback; a small speaker and attenuator control located in the office to permit the receptionist to monitor the system or enjoy some background music. The more improvements you sell the more music the cash register will make.—Ed.) •

In one complete package University offers everything in loudspeakers for sound reinforcement... and public address—

 <p>REFLEX TRUMPETS</p>	 <p>RADIAL PROJECTORS</p>	 <p>WIDE-ANGLE HORNS</p>
 <p>HIGH EFFICIENCY DRIVER UNITS</p>	 <p>PAGING, TALK-BACK SPEAKERS</p>	 <p>OUTDOOR MUSICASTING</p>
 <p>EXPLOSION-PROOF SPEAKERS</p>	 <p>HIGH POWER SPEAKERS UP TO 720 WATTS</p>	 <p>SUBMERGENCE-PROOF SPEAKERS</p>
 <p>WIRED MUSIC SYSTEMS</p>	 <p>WEATHERPROOF LINE-MATCHING TRANSFORMERS</p>	 <p>ADAPTORS FOR DIVERSIFIED APPLICATIONS</p>

■ People have come to expect the highest standard of quality in a product bearing the University label. ■ This kind of public acceptance is something that University has consistently worked to achieve. First—by making available a complete variety of the finest commercial, industrial and high fidelity speakers and components. **Second**—by building the kind of quality into them that assures years of efficient, trouble-free service. ■ Find out for yourself why “**University sells on sound.**” ■ For information regarding products or technical data, write Desk Z-22, University Loudspeakers, Inc., 80 South Kensico Ave., White Plains, N. Y.



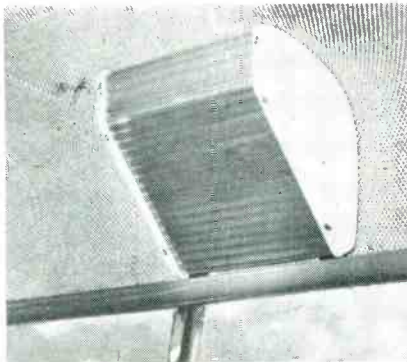
LISTEN... *University sounds better*



New Products for Technicians

Empire **SPEAKER KIT** →

"Car-Fi," is a new all-purpose rear-seat speaker kit designed and engineered for station wagons; can also be easily adapted to truck installations. Complete installation kit also includes a baffle and a 6" x 9" speaker. Quickly and easily installed—there are no holes to cut. Wires, brackets and screws are all concealed for that real professional look. There are models to fit all station wagons. Ivory and gold in color; list price is \$13.75. Empire Electronics Inc., 24625 John R St., Hazel Park, Mich. (ELECTRONIC TECHNICIAN 4-5)



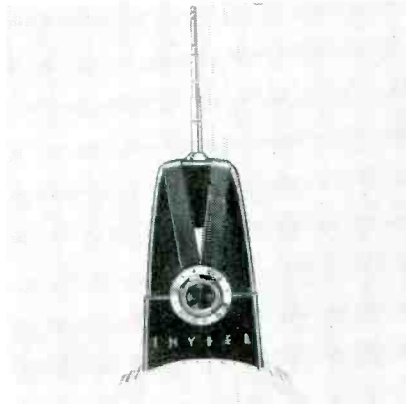
Tevco **ANTENNA KITS** →

For installation of TV antenna wiring and outlets in new construction. The 2 and 4-outlet kits include a multiple set coupler which permits the operation of more than one TV set on the same antenna. All materials meet VA and FHA requirements. Complete installation instructions and illustrations are printed on the outside of each package. There are 5 basic kits. Special units are available for special installations. Tevco Insulated Wire Co., 108 Prospect Ave., Burbank, Calif. (ELECTRONIC TECHNICIAN 4-6)



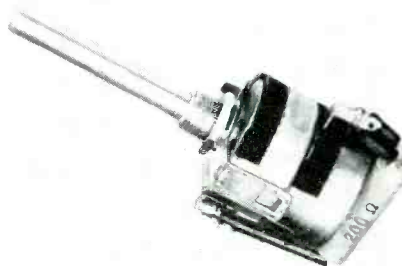
Snyder **ANTENNA** →

In a complete departure from the "rabbit-ear" type of indoor TV antenna, the new decor-designed antenna features a single staff and a 12-position selector. The result of 3-years of research, the new antenna, known as the "Imperial" Directronic 10-D, can be used equally well for b&w or color reception. The single staff comes in 4-telescoping sections and can be extended from 7½" to 48" in height. Sold with a 10-day money back guarantee. Snyder Mfg. Co., 22nd & Ontario Sts., Philadelphia, Pa. (ELECTRONIC TECHNICIAN 4-7)



Clarostat **CONTROLS** →

Three new miniaturized sound-system controls are characterized by their reduced depth and diameter. These constant impedance attenuators lend themselves to more compact housings or outlet boxes for controlling remote loudspeakers. Instead of the larger units heretofore available, the new CIT43 controls are based on the popular 1½" dia. potentiometers. Rated at 2-watts dc, these controls handle up to 4 watts of audio. Clarostat Mfg. Co. Inc., Dover, N.H. (ELECTRONIC TECHNICIAN 4-8)



GE **CHANNEL GUARD**

To relieve two-way radio users of the necessity of listening to transmissions of other operators sharing the same channel, a new tone-squelch system embodies a double-barrelled approach which combines the advantages of both tone squelch and conventional noise squelch. It provides one-way or two-way protection against unwanted calls, noise and disruptive interference. It is available in kit form for easy installation. It does not obsolete equipment currently serving in the industry. General Electric Communications Plant, Utica, N.Y. (ELECTRONIC TECHNICIAN 4-1)

Xcelite **TOOL KIT**

A new roll plastic kit contains 21 hand tools most frequently used by servicemen. It features 2 different combination handles, quick-change tool bits and a 6" extension shaft. In addition, the kit has a pair of long-nose and a pair of side cutting pliers, a 6" chrome-plated adjustable wrench, 9 nut-driver blades, a Phillips screwdriver, 2 regular screwdrivers and a ¾" and ½" reamer. Xcelite, Inc., Orchard Park, N.Y. (ELECTRONIC TECHNICIAN 4-2)

Vidaire **CROSSOVER**

A new Hi-Fi crossover network, the Model CN-5 is a high-pass filter designed to prevent low audio frequencies from reaching the high-frequency speaker, thereby eliminating a source of distortion in a 2-speaker system. The crossover frequency is approximately 2500 cycles. A treble control varies the high-frequency speaker output. For 8 or 16-ohm tweeters and woofers. Vidair Electronics Mfg. Corp., 576-80 W. Merrick Rd., Lynbrook, N.Y. (ELECTRONIC TECHNICIAN 4-3)

Bogen **AMPLIFIERS**

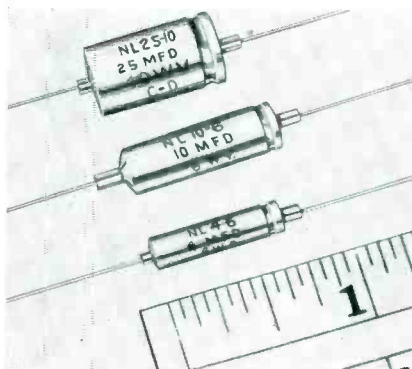
A new line of Challenger PA amplifiers, comprising 7 economy-priced models features versatility and control. They incorporate negative-voltage feedback circuitry, better response, lower distortion, excellent regulation, input controls and boost and cut type of bass and treble controls. Some units are designed to operate on any of 3 different power sources, 117-volt AC, 6 or 12-volt DC and include a built-in power inverter for phonograph operation. David Bogen Co. Inc., Route 4, Forrest Ave., Paramus, N.J. (ELECTRONIC TECHNICIAN 4-4)

More data on these new products are available to you free, unless noted otherwise. Fill in code number on coupon, page 40 and mail to Reader Service Dept., ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

New Tubes & Components

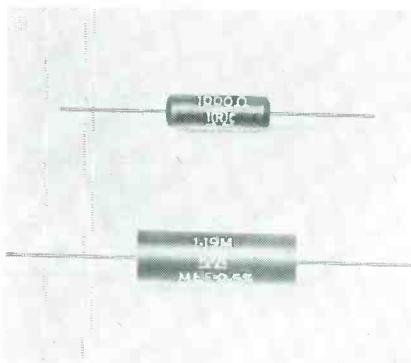
CD ELECTROLYTICS

New subminiature aluminum foil electrolytic capacitors are designed expressly for transistorized, printed circuits and other compact or miniaturized low-voltage d-c equipment. "Electomite" Type NL, is suitable for bypass, filter and coupling applications. Capacitances from 1.0 to 200 μ fd; up to 50 working volts. Advanced techniques in manufacture, provide these units with extremely low d-c leakage current and a far superior shelf life. Cornell-Dubilier Electric Corp., South Plainfield, N.J. (ELECTRONIC TECHNICIAN 4-14)



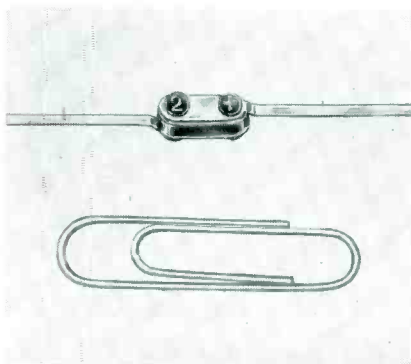
IRC RESISTORS

Available in two molded sizes, $\frac{1}{2}$ and 1 watt; these close tolerance units have a metallic resistive film firmly bonded to a specially compounded ceramic core. Designed to combine high accuracy and stability with low and controllable temperature coefficients. Types MEC and MEF resistors also provide low noise, low capacitance and low inductance which permits their use in high-frequency applications. International Resistance Co., 401 North Broad St., Philadelphia 8, Penna. (ELECTRONIC TECHNICIAN 4-13)



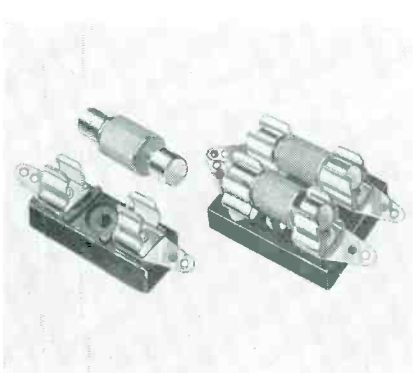
Siemens RECTIFIER

One of the tiniest selenium rectifiers of them all for the current and voltage they can handle is a 5-ma, d-c, half-wave rectifier which will handle up to 125-volts ac, with a resistive load. List prices range from 51¢ to 60¢. Several units may be connected for other circuits, such as bridge, center tap, doubler, etc., for use in test instruments, small power supplies, computers, control circuits, bias supplies and relays. Semiconductor Div., Radio Receptor Co., Inc., 240 Wythe Ave., Brooklyn 11, N.Y. (ELECTRONIC TECHNICIAN 4-16)



Bussmann MOUNTS

A new type of mounting block for silicon rectifiers is now available in either a single or double unit holder for radio and TV applications. Proper polarity is assured because the rectifier can be inserted in only one way. A key on one clip is so positioned that it engages the keyway on the positive pole of the rectifier. The negative side is not slotted, so it cannot be inserted into the clip the wrong way. Bussmann Mfg. Co., University at Jefferson St., St. Louis 7, Mo. (ELECTRONIC TECHNICIAN 4-15)



CMS PRINTED CIRCUIT SOCKET

A new right-angle octal socket, suitable for GT-type octal tubes and octal-base relays and coils, is mounted on a laminate base with a printed circuit supplying the connections to the socket and the component. Cleveland Metal Specialties Co., 1783 East 21st St., Cleveland 14, Ohio. (ELECTRONIC TECHNICIAN 4-20)

CBS TUBES

Two new tubes designed for use as 110° vertical-deflection or audio amplifiers are the 6DB5 and 12DB5. They are 9-pin miniature beam-power pentodes; electrically similar to the 6W6, except for heater characteristics. The 12DB5 incorporates a 600-ma heater with warm-up control characteristics for use in series strings. CBS-Hytron, Danvers, Mass. (ELECTRONIC TECHNICIAN 4-18)

Astron CAPACITORS

The new "AP" type combines a tough statite case with cement-compound end-seals, forming a completely impregnable barrier against all environmental conditions. Leads will not come loose or pull out even under soldering heat and stress. They are non-inductive, precision-wound paper tubulars with high-insulation resistance. Astron Corp., 255 Grant Ave., East Newark, N.J. (ELECTRONIC TECHNICIAN 4-19)

RCA 110° CRT

The 17BZP4—a new rectangular, 155-square inch glass picture tube with its 110° diagonal deflection angle and a $16\frac{9}{16}$ " diagonal envelope has an overall length of $12\frac{9}{16}$ " and a weight of only 10 pounds. This is 3" shorter and 5 lbs. lighter than the tube having the same size faceplate and 90° deflection. It operates without an ion-trap magnet. Tube Div., Radio Corp. of America, Harrison, N.J. (ELECTRONIC TECHNICIAN 4-17)

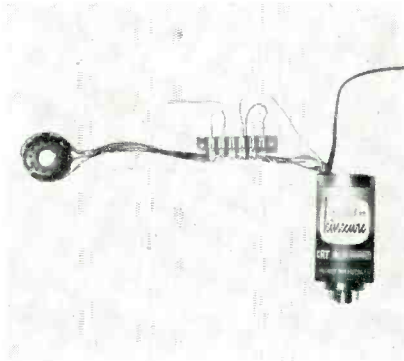
Signa-Glow C-R BRIDGE

Meterless capacitance and resistance bridge measures capacitance from 10 mmf to 200 mfd and resistance from 5 ohms to 50 megohms in 3 ranges each. A new Signa-Glow Null indicator, consisting of a pair of miniature glow lamps, show degree and direction of unbalance. Model CR-10 weighs under 2 lbs. Industrial Dev. Lab., Inc., 17 Pollock Ave., Jersey City 5, N.J. (ELECTRONIC TECHNICIAN No. 4-60)

Latest Test Instruments & Aids

Nu Life KINECURE →

CRT restorer instantly snaps the tube back to normal brilliance in 33 of the most common causes of failure. This new restorer contains unconventional elements which correct open cathode, open control grid, shorted grid to cathode and shorted cathode to filament. It can be used in series or parallel operation. Complete diagrammatic instructions tell how to correct individual or combination defects. Lists for \$9.95. Circuit Mfg. Co. Inc., 6211 Market St., Philadelphia, Pa. (ELECTRONIC TECHNICIAN 4-12)



Du Mont FREQ METER →

The portable Type 5890-A Frequency Meter featuring transistorized circuitry and extreme high stability is capable of servicing up to twenty transmitter channels. Previously, as many as ten dual frequency meters were needed to perform the same task. A crystal oscillator-harmonic generator, is controlled by one of twenty pre-selected crystals. Four additional crystals can be supplied to generate intermediate frequencies for receiver alignment. Allen B. Du Mont Laboratories, Inc., Clifton, N. J. (ELECTRONIC TECHNICIAN 4-30)



Kingston ANALYZER →

A unique wave form type portable absorption analyzer for TV trouble shooting is equipped with a ring-type probe. The probe is designed to slip over any tube and permits the serviceman to trace and isolate trouble without removing the chassis from the cabinet. The instrument follows the composite video signal from the antenna to the CRT, speaker, sweep and sync circuits, with minimum loading effects. Kingston Electronic Corp., 17 Tudor St., Cambridge 39, Mass. (ELECTRONIC TECHNICIAN 4-11)



Simpson INSTRUMENTS

A new line of rectangular panel instruments of modern design and styling is called the "Wide-Vue" line. The new instruments feature an open-face design and longer scale lengths. The 2½" size, for example, has the same scale length as a conventional 3½" panel instrument. Open-faced cover permits wide-angle readability. They are custom-built in 2½", 3½" and 4½" models with any practical range, in AC and DC. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill. (ELECTRONIC TECHNICIAN 4-31)

Century TRANSISTOR CHECKER

An inexpensive transistor tester, Model TC-1, is used with a V.O.M. This compact and durable instrument tests all transistors in or out of the set for current gain, leakage, opens and shorts. Also checks all crystal diodes. Comes with test leads that enable the serviceman to leave transistors in the circuit while checking. Batteries are included and have a service life almost equal to shelf life. Sells for \$6.95. Century Electronics Co., Inc., 111 Roosevelt Ave., Mineola, N.Y. (ELECTRONIC TECHNICIAN 4-32)

Sencore SUBSTITUTION BOX

This unit contains 36 of the most often needed resistors and capacitors, including two large electrolytics. Each component is individually switched so that it can be quickly substituted for a suspected faulty part, thus greatly decreasing servicing time and time needed to find trial replacement parts. Each part in the box can be replaced individually if they should become defective due to excessive voltage or current. Dealer net is \$12.75. Service Instruments Corp., 171 Official Road, Addison, Ill. (ELECTRONIC TECHNICIAN 4-9)

Federal SIGNAL GENERATOR

The new swept-frequency generator permits highly accurate and rapid production testing of electronic components. It is ideal for testing filters, audio amplifiers, loud speakers and similar devices when used in conjunction with a large-screen oscilloscope. The Model 200 K provides continuous amplitude-versus-frequency displays of high accuracy giving optimum design information in minimum time. The frequency range is 20 cps to 200 kc. Instrument Div., Federal Telephone and Radio Co., Clifton, N.J. (ELECTRONIC TECHNICIAN 4-10)

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Audio NEWS LETTER

There's plenty of interest and activity in the hi-fi market, as there should be. But don't forget the "lowfidelity" market; there are well over 30 million moderately priced phonos in use. This represents a most substantial field for needle, cartridge, motor and circuit component replacements.

Mrs. America (Mrs. Carl Deitmeyer, that is) is happily getting into the hi-fi act. Recoton reports that its 500 cartridge is installed in the hi-fi setup in Mrs. A's new model home . . . and that 10,000 fans viewed the audio-TV installation with interest.

April 30 is the deadline for dealers to enter Permo's "Dress-Up" contest keyed to the introduction of the new Fidelitone phono needle package.

Electrovox reports that the Walco Perpetual Profit Builder has boosted a New Jersey dealer's needle-accessory sales and inquiries 25 to 50%.

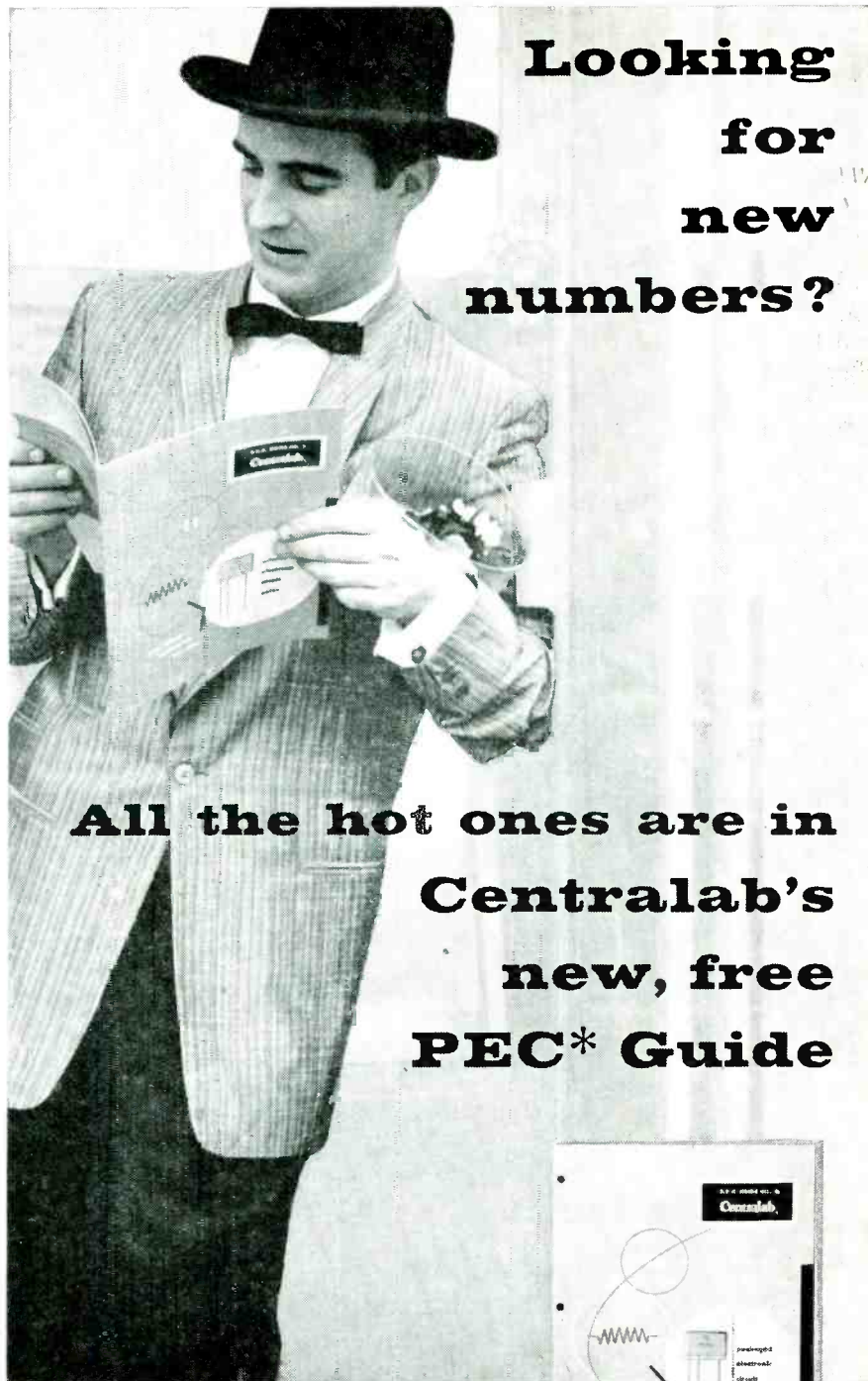
Westinghouse has decided to go after the hi-fi market.

"Understanding High Fidelity," a 56-page guide to home music systems published by David Bogen, has reached the 200,000 mark in sales since introduction three years ago. Price is 25¢ per copy.

"Mother's Helper" is the name of a new "Wireless Electronic Nurse" put out by Mark Simpson. The \$29.95 list intercom has a 300-ft. range.

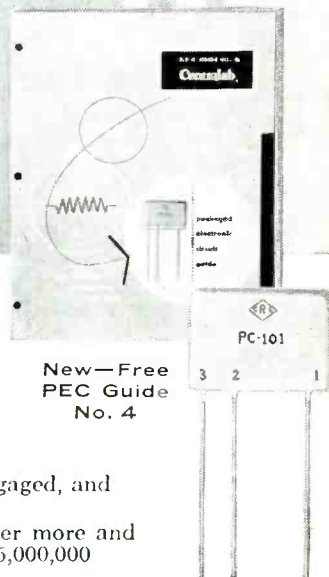
A six-station wireless intercom designed to operate on any one of six channels without interference with other system communications is available from Talk-A-Phone.

Jensen woofer and tweeter are incorporated in the new bookshelf-size 2-way speaker system made and sold by Eico for \$39.95.



Looking for new numbers?

All the hot ones are in Centralab's new, free PEC* Guide



Twenty-five fresh new beauties to choose from. Currently keeping company with the entertainment industry's most popular chassis.

Brand-new edition of the Discriminating Serviceman's Guide — loaded with vital statistics, on both the old favorites and the new models. Gives practical techniques for testing — how to tell good ones from bad.

Get the lowdown on what models have been engaged, and where, by 130 radio and TV manufacturers.

These are facts it pays to have — you encounter more and more of these slim, trim PEC's every day. Over 75,000,000 now in circulation.

These beauties are waiting to be picked up at your Centralab distributor. Write us for your copy of PEC Guide No. 4.

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Association News

NEDA Conference

An exploratory and unique meeting of representatives from every facet of the Radio and TV Industry, including manufacturers, distributors, service technician associations and RETMA was held at the Hotel Roosevelt in New York City on March 17, 1957. The luncheon and conference was sponsored by the National Electronic Distributors As-

sociation headed by Joseph A. DeMambro. Unfortunately, there was no firm agenda. In a round table discussion, some of the problems raised included honest advertising; the importance of informing the public of what to expect from their receivers and from their servicemen; educational programs; captive servicing and licensing. The subject of licensing caused a few ripples in the B+, but it was wisely bypassed.

A suggested 20-point program was read for informative purposes only. Until the legal department has had an opportunity to review the document, it shall have to remain locked

in the top drawer. It consisted of things the serviceman and the jobber should and should not do. It is quite conceivable that this document may become the basis for a code of ethics that will benefit all concerned.

RTA Adds Chapter

The Long Beach Radio-Television Technicians Assn. Inc. of California, has installed Victor Bangle as Pres. in its new chapter in the San Antonio unit in Bell, Calif. Sylvania and most of the parts distributors gave door prizes at a dinner dance.

TSDA On Licensing

Hopes for an adequate licensing bill, in California to cover those engaged in the TV radio repair business are simmering these days as its fate goes into the hands of the state legislature. Arthur Blumenthal, past president of the local TSDA and a member of the board of directors of the California State electronics association, suggested that all members of the association make their senate and assembly representatives aware of the bill and to know that it has the full backing of the local groups. As presently proposed, the bill would license businesses only and require the licensing of one technician per shop. Qualification of a licensee would include two or more years actual experience, or one year of recognized training plus one year of practical experience.

Edward Mitchell, Pres., believes that a self-service checker in a shop will pay for itself in the time spent checking tubes . . . if the dealer doesn't find the arcing damper or high voltage tube that breaks down after an hour, then he is considered a But, if the customer does his own checking and then doesn't find the offending tube, he rightfully blames himself and agrees that he's not qualified to work on the TV after all.

CRTSA Telerama

Telerama, a sponsored weekend at the Ritz Carlton Hotel, in Atlantic City, April 12, 13 and 14th, by the council of Radio & TV Service Assoc., of Philadelphia and the Delaware Valley. H. Gordon Delaney, President of Allied Technicians of N.J. reports that considerable interest in the program has been evoked among many of the 228 service associations contacted throughout the country. Plans for the occasion include presentations of newly-developed electronic products which the service industry will be called upon to main-

LZX 280SW (shown right)

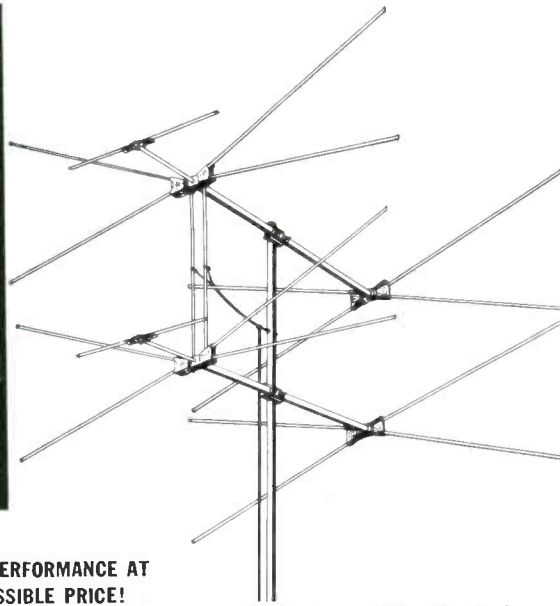
- QUICK-RIG design for speedy one man installation . . . Brand NEW!
- Double stacked array PLUS high frequency elements.
- All Aluminum Construction.
- Mounts on any mast up to 1 3/4"
- Complete with stacking bars.

(not shown)

LZX 180SW . . . same as 280SW (single stacked)

LZX 180 . . . QUICK-RIG 8 element "Mighty-X" Conical.

LZX 280 . . . QUICK-RIG double stacked "Mighty-X" Conical.

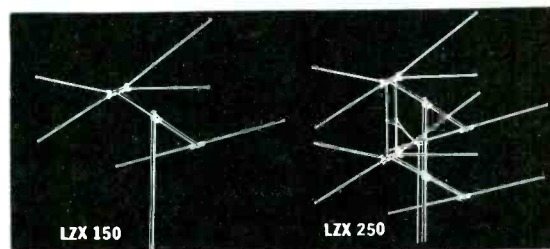
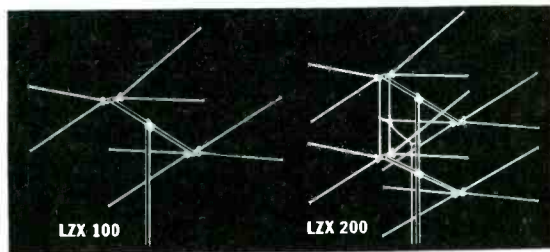


HIGHEST QUALITY PERFORMANCE AT THE LOWEST POSSIBLE PRICE!

12 new C-D TV antennas

Carefully tested under all conditions . . . each of these new models is guaranteed to be the best performing at the lowest possible price. QUICK-RIG . . . snap!! and its up.

- LZX 100 single array
- LZX 101 single array, unassembled
- LZX 200 8 element conical assembled, stacked array
- LZX 201 8 element conical unassembled, stacked array
- LZX 150 single array
- LZX 151 single array, unassembled
- LZX 250 6 element conical assembled, stacked array
- LZX 251 6 element conical unassembled stacked array



CORNELL-DUBILIER

Plants in South Plainfield, N. J.; New Bedford, Worcester and Cambridge, Mass.; Providence and Hope Valley, R. I.; Indianapolis, Ind.; Sanford, Varina and Fuquay Springs, N. C.; and Venice, California. Subsidiary: The Radiart Corporation, Cleveland, Ohio.



tain and an arcade of manufacturers exhibits. There will be business and technical discussions, conferences among association leaders to further common plans for growth, a floor show and a dinner. There are five-active associations in the Council and it is expected that another N. J. group will become a participant soon. They are being assisted by many of the parts jobbers, manufacturers in the area in the development of Tele-rama.

RATES Elects

In its second year and representing over 60% of the TV servicemen in its area, the Rockland Association of Television Electronics Services Inc., in N. Y. State, has elected the following officers for the coming period: John Schomburg, Pres.; Walter Smylla V.P.; Larry Critchlow, Sec.; Frank Dickinson, Treas. and Clifford Cooley, D. J. Gallo, Harry Kirk, Robert Danna and Robert Williams, on the Board of Directors.

It was the unanimous opinion of the members present at the last meeting that though they might be in favor of a licensing bill, the latest bill is not the solution to the problems confronting the public and the servicemen today. The members would like to hear from other associations in other parts of the country, regarding their opinions and experience on what constitutes a good licensing bill.

CRT Eliminates Video Amplifier

• One of the few basic design changes in cathode-ray tubes since the introduction of electrostatic focusing and deflection has been unveiled. The new tube, called the "Pure Signal" tube, is of "multiple beam" design and takes a signal directly from the crystal detector, eliminating the necessity for the video amplification circuitry section in the TV chassis. This tube reportedly opens the way for full utilization of transistors, as it can be transistor driven. According to the developers, Multi-Tron Lab., 4624 Washington Blvd., Chicago 44, Ill.

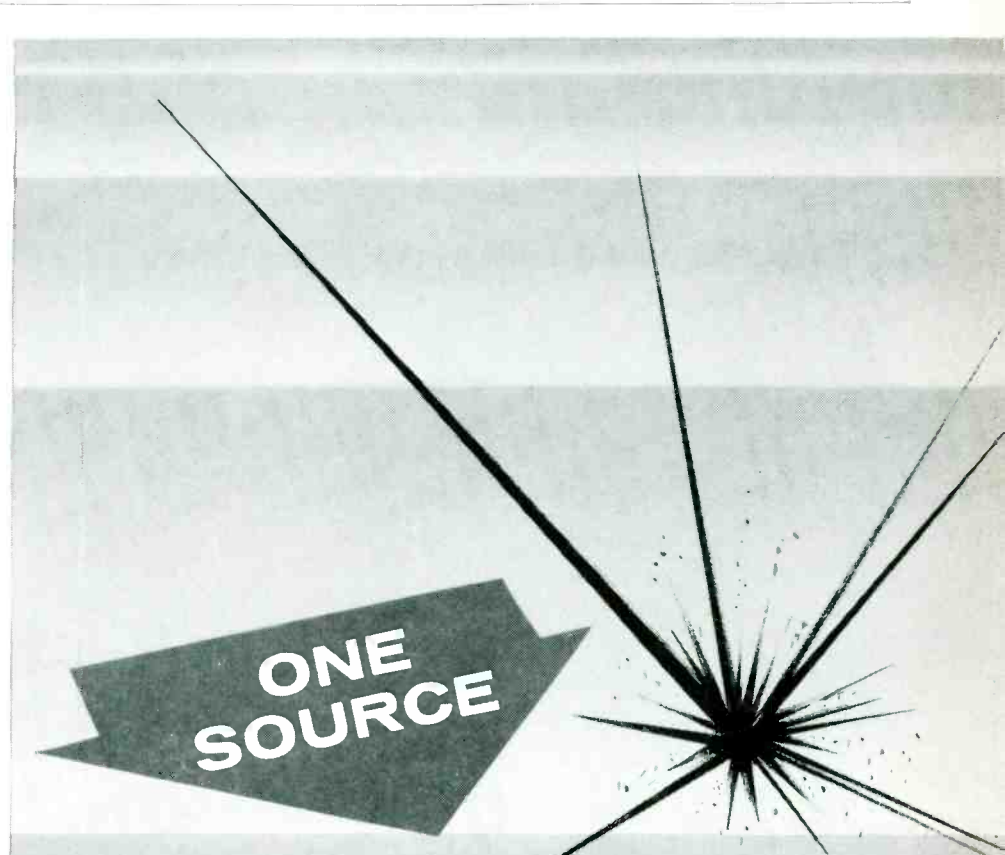
The "Pure Signal" tube promises immediate savings to harassed set manufacturers, caught between the anvil of rising production costs and

the hammer of increasing consumer price resistance. It promises production cost reductions of \$1.50 or more for each chassis unit. In 1957-58 chassis designs of the major manufacturers an average of 22 components can be eliminated, it is claimed, without changing picture quality or operating characteristics.

The "Pure Signal" tube poses minor retooling or redesign problems for either cathode-ray tube makers, or set manufacturers, as it can be adapted immediately to any bulb type now in use or projected for the coming season. Quantity pro-

duction of "pure signal" tubes poses no problems, as all design tolerances meet commercial tube manufacturers specifications and pilot model tubes are available now to set manufacturers under a licensing agreement, reports Multi-Tron.

The performance of these cathode-ray tubes are said to correspond favorably to the popular design electrostatic focus TV tubes. Cathode currents of 600 to 1500 μ a have been demonstrated with corresponding highlight brightness of over 60 ft. lamberts. Drive voltages are in the range of 7 to 15 volts. •



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New Books

PRACTICAL RADIO & ELECTRONICS COURSE. By M. N. Beitman. Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. 268 pages. Paper cover. \$3.95. (32-page answer booklet, 25¢.)

This fourth edition contains a home-study training text divided into 35 lessons. Instructive notes are helpfully printed in a column beside the main text. There are review questions and

problems at the end of each lesson, and the answer booklet gives the correct solutions. Coverage includes the elements of components, meters, audio, aircraft radio, industrial electronics and several other interesting subjects. An index and table of contents are unfortunately missing, but the book is nevertheless helpful and informative.

L-C OSCILLATORS. By Alexander Schure. Published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N. Y. 72 pages. Paper cover. \$1.25.

Here is volume 13 in the **Electronic Technology Series**. Clearly and concisely it covers oscillator elements, frequency, power, stability and other factors so

basic to the functioning of communication, industrial electronic and other similar devices. Numerous circuits are described, with helpful explanations about Colpitts, Clapp, Hartley and (to mention just a few) electron-coupled oscillators.

THE ELECTRONIC MUSICAL INSTRUMENT MANUAL. By Alan Douglas. Published by Pitman Publishing Corp., 2 W. 45 St., New York 36, N. Y. 247 pages. Hard cover. \$7.50.

For electronic technicians with the specialized interest in organs, tone-forming generators and other musical devices, this expanded third edition provides a wealth of explanatory data, including complete photos and schematics of a number of commercial units. Text and illustrations are clearly presented and authoritative.

THE RADIO AMATEUR'S HANDBOOK. Prepared and published by the American Radio Relay League Inc., West Hartford 7, Conn. 760 pages. Paper cover. \$3.50.

The 1957 Handbook is the 34th edition of the internationally-recognized and universally-consulted volume on radio communications. It has been published continuously since 1926. Over 1350 illustrations, including 502 tube-base diagrams. An appreciable amount of new equipment in all categories appears throughout the book. The basic theory sections include a chapter on semiconductors, in keeping with their growing importance to the art.

REPAIRING TELEVISION RECEIVERS. By Cyrus Glickstein. Published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N.Y. 212 pages. Paper cover. \$4.40.

Here is a basic text, broadly covering TV repair from the practical viewpoint. The early chapters focus on localizing the defective section, stage and component. The middle chapters cover typical troubles, such as video, sound, sync and power. The closing sections discuss general operation, hints and difficult troubles. A short chapter called "Timewasters in TV Servicing" mentions unnecessary checks, misleading readings and the like. More information on this important subject would have been appreciated, but that hardly detracts from the book's most substantial volume of valuable information.

RESONANT CIRCUITS. By Dr. Alexander Schure. Published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N.Y. 72 pages. Paper cover. \$1.25.

Another informative addition to the Electronic Technology Series, this text-book concerns itself with the elements of R, L and C resonance, both series and parallel. It's clearly written and easy to understand.



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BATTERIES: A portable radio comparative guide, covering eight major battery manufacturers, provides latest information on batteries for transistor sets as well as vacuum tube models for over 600 models of portable radios. This calendar-chart available free from Ray-O-Vac Co., Dept. 284, 212 E. Washington Ave., Madison, Wisc. (ELECTRONIC TECHNICIAN No. B4-1)

AUDIOFILE: This catalog describes, specifies and illustrates the products of more than 228 manufacturers of hi-fi and sound equipment. Contains over 1,000 pages and over 5,000 products are cataloged. Information and rates for AUDIOFILE available from Audiofile Div., United File-O-Matic, Inc., 60 Madison Ave., Hempstead, N. Y. (ELECTRONIC TECHNICIAN No. B4-2)

ELECTRONIC VOLT-OHMMETER: New 2-page form 225K lists features and specifications of new Electronic Volt-Ohmmeter Quali-Kit. Built around a 9" meter, kit features extra long meter scales, DC zero-center scale for galvanometer applications, built-in buzzer for fast audible continuity tests. Available from Hickok Electrical Instrument Co., 10523 Dupont Ave., Cleveland 8, Ohio (ELECTRONIC TECHNICIAN No. B4-3)

SELENIUM RECTIFIERS: A 52-page replacement guide, with detailed information on selenium rectifier replacements for hundreds of different TV and radio receiver chassis plus a variety of other electronic products, is available at \$1.25 from your local distributor or from Federal Telephone & Radio Co., 100 Kingsland Rd., Clifton, N. J. (ELECTRONIC TECHNICIAN No. B4-4)

RADIO MASTER CATALOG: The 1957 (21st) edition of The Radio-Electronic MASTER contains 1546 pages. It is the largest catalog published in the electronic industry. Over 125,000 items of 350 manufacturers. Gives detailed descriptions, specifications and prices. More than 11,250 illustrations. Available from electronic parts distributors or from United Catalog Publishers, Inc., 60 Madison Ave., Hempstead, N. Y. (ELECTRONIC TECHNICIAN No. B4-12)

PERSONNEL: A handsome illustrative brochure introducing all of the employees plus a history of the company, the workings of the engineering and production staffs of the Technical Appliance Corp., Sherburne, New York (ELECTRONIC TECHNICIAN No. B4-6)

CONTROLS & RESISTORS: Controls and resistors for nearly all standard applications are readily selected with the Condensed Catalog. Essential facts and figures, together with photos and dimensional drawings, provide all required information free from usual selling verbiage. Available from the Industrial Sales Dept., Clarostat Mfg. Co., Inc., Dover, N. H. (ELECTRONIC TECHNICIAN No. B4-5)

ANTENNA TOWERS: A colorful illustrated folder and price list describes antenna towers, mounting and installation equipment. KTV Tower and Communication Equipment Co., 5520 S. Shore Drive, Chicago, Ill. (ELECTRONIC TECHNICIAN No. B4-30)

ADDENDA

On page 32 in the March 1957 issue of *Electronic Technician*, Fig. 1, in the article on "How To Signal-Trace TV Circuits With Your VTVM," the value of the resistor should be 3.9 megohms. However, this value is not critical and the optimum figure will depend on the characteristics of the particular meter used. For example, only a 10,000 ohm resistor may be used with a VOM. This signal-tracing probe may be used on all sorts of indicating devices besides meters, such as audio amplifiers, oscilloscopes, etc.—Ed.

Next month a cumulative index of all Circuit Digests published to date will appear in the Circuit Digests section.



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New Products

Radion INDOOR ANTENNA

The new Model 185, V-8 Universal, can sit on top or be mounted on the back of a TV set with only two screws. Can be used for UHF and VHF reception. It is extremely compact and folds into a package size 14" x 2" x 1". A felt pad on the base protects cabinet finish. L.P. \$8.95. The Radion Corp., 1130 W. Wisconsin Ave., Chicago, Ill. (ELECTRONIC TECHNICIAN 4-52)

Walsco's STRIP-ER-CLIP

The new stripper and cutter features a seven-stop gauge which adjusts instantly to the correct wire size. Setting this gauge to protect against damaging wire conductors or strands, is easily done with the thumb. It strips and clips all wires ranging from 14 to 26 gauge. Made of heat-treated tool steel, it offers specially ground cutting edges for fast effortless clipping and a heavy insulated grip for comfort. The streamlined jaws are designed for use in cramped places. Dealer net \$1.39. Walsco Electronics Mfg. Co., 3225 Exposition Pl., Los Angeles 18, Calif. (ELECTRONIC TECHNICIAN 4-53)

PACO INSTRUMENT KITS

A new line of electronic test instruments in kit form has been launched by a newly formed division of the Precision Apparatus Co. Particular attention has been paid to ruggedness, ease of operation, simplicity of assembly and wiring, as well as appearance. The first 5-kits are; the model B-10 battery eliminator kit, with both 6 and 12-volt outputs; the Model C-20 resistance-capacity-ratio



bridge kit, with capacity ranges from 10 to 2,000 μfd and resistance ranges from 0.5 ohms to 200 megohms; the Model S-50, 5-inch oscilloscope kit, with 1-mc bandwidth; the Model T-60 tube checker kit, with free-point lever element selector system; and the Model V-70 VTVM kit with a total of 21-ranges. Three more kits will be released very shortly. Paco Electronics Co. Inc., 70-31 84th St., Glendale 27, N.Y. (ELECTRONIC TECHNICIAN 4-40)

Win-Tronix GENERATOR

TV convergence and linearity generator, provides optimum white dot pattern, white line crosshatch and horizontal or vertical bars. Auto-lock counter chain with AFC provides jitter-free patterns. Horizontal vertical sync pulse and 30 frame, 525 line interlaced raster with complete blanking of retrace lines makes the unit useful as a laboratory test pattern and sync generator. Simplified operation with only two controls, RF output attenuator and pattern selector. Dealer net \$129.95. Winston Electronics, Inc., 4312 Main St., Philadelphia 27, Pa. (ELECTRONIC TECHNICIAN No. 4-54)

RCP FLYBACKER PLUS

An accurate, comprehensive condenser checker in addition to being a speedy, ultra-sensitive flyback transformer and yoke tester. Accurately shows up leakage in mica capacitors. Tests all flybacks, yokes, and condensers without disconnecting them from the circuit or tests them individually not connected to anything. Tests are made at operating conditions of above 200 volts of pulsed power. Price \$42.80. Radio City Prods. Co., Inc., Easton, Pa. (ELECTRONIC TECHNICIAN No. 4-55)

(Continued on page 54)

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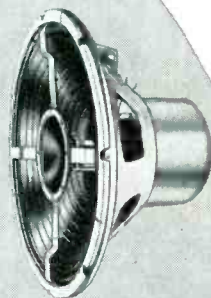
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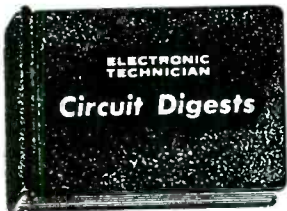
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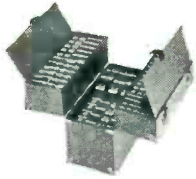
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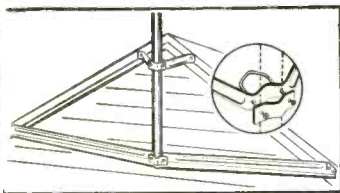
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Arcing & Corona

(Continued from page 27)

the resistor leads offers less resistance to the high voltage than does the resistor itself and hence the arcing.

Arcing which occurs between two pins of the rectifier tube socket often leads to tube failure. To remove the arcing, insert a corona ring, if the circuit does not already have one. Other ways to eliminate arcing include: spreading the socket pins further apart, applying a plastic spray, inserting a plastic sheet between the arcing pins, and slightly lowering the high-voltage output. The latter is accomplished by reducing the horizontal drive or inserting a 50,000 ohm, 1/2-watt, resistor in series with the anode lead.

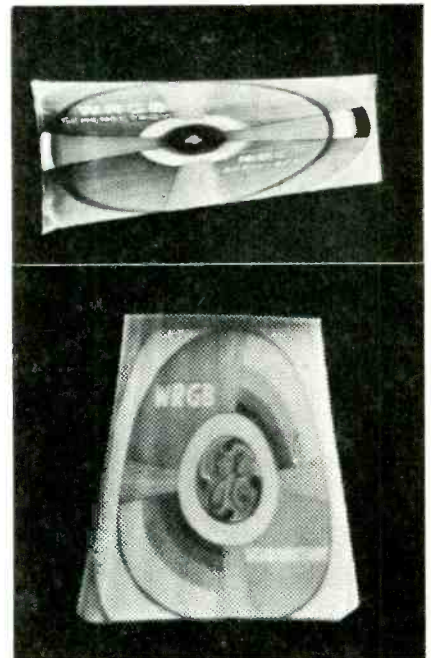


Fig. 6—Trapezoid due to shorted windings. Top view has defect in vertical winding, bottom shows defect in horizontal winding.

Arcing at the glass surface of the rectifier tube will cause periodic failure by eventually puncturing the glass. Cleaning the glass, correcting lead dress or using a new tube should eliminate the arcing. If it does not, then wrap a high-dielectric plastic tape spirally around the glass envelope, for about 1-inch, starting from the base.

A bad contact in the rubber cap which is connected to the CRT 2nd anode could also cause arcing. If the cap is worn or corroded, then it

should be replaced. The glass area around the connector should be thoroughly cleaned. Another source of trouble is a poorly grounded aquadag coating on the CRT. Many times the coating becomes worn away or damaged by the grounding straps. Either replace the damaged aquadag, or relocate the grounding straps to assure good contact.

Deflection Yoke

Arcing in the yoke, Fig. 5, usually occurs between the horizontal and vertical windings, between several layers of one winding, between a winding and core and between terminals. Arcing in the yoke invariably results in a shorted or partially shorted winding. Most often, the picture indication is a trapezoidal pattern, as shown in Fig. 6. Other symptoms may be a dark raster or no raster, and short height and

sheets or plastic tape between the arcing points, spray and redress any leads which may be affected. Frequently, however, by the time the technician gets to the yoke, it is too late.

Width and Linearity Coils

Because of the relatively low peak-to-peak voltages, 1/2 to 1-kilovolt, developed across these coils, they do not break down as often as flyback transformers and yokes. However, occasionally some do arc with the result that there is a loss

of high-voltage. Arcing in these coils occurs between the winding layers, the winding and the core and between terminals. See Fig. 7. In transformer-type width coils, arcing may occur between the primary and secondary windings.

Finally, the technician must have patience, peace, quiet and subdued light to eliminate the effects of unwanted man-made lightning. •

Figures courtesy of Ram Electronic Sales Co.

New Products begin on p. 38

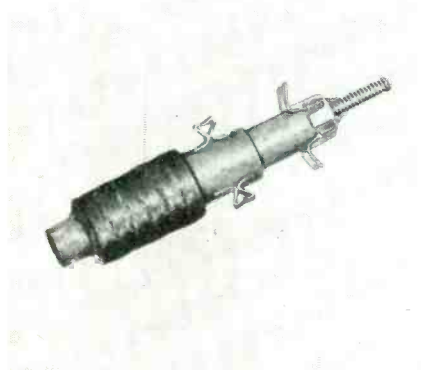


Fig. 7—A typical width or linearity coil.

width. Sometimes, if the arcing is stopped immediately after it has begun, and the windings have not been damaged, the yoke may be saved. To eliminate the arcing, insert plastic



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Labor Relations

(Continued from page 29)

Was The Foreman:
RIGHT WRONG

What Arbitrator Paul Hebert ruled: "The fact that objectionable language was first used by the boss, coupled with the employee's belief that he was not guilty of taking excessive rest time are facts that should be considered as a substantial mitigation of the proven offense of which the employee was guilty. The employee was clearly at fault in calling the boss a 'damn liar.' However, this was not overheard by anyone and it was not in the presence of other employees. Under the circumstances, the conduct, though improper and of a character to justify disciplinary action, cannot be said to justify the supreme economic penalty of discharge. Discharge was an unreasonably severe penalty and considering the factors in mitigation, cannot be sustained. The employee shall be reinstated with full rights, but without back pay."

Can You Discharge an Employee If He Exercises His Right of Free Speech on Company Property, But During Non-Working Hours?

What Happened

James Hammond's avocation was missionary work. When he took a job in a repair shop, he asked his manager for permission to make some missionary talks during lunch time and before starting time. His "sermons" were to be inspirational in tone and not denominational. His audience would consist only of those who wanted to listen to him. The manager told him he could give his talks as long as he didn't interfere with repair work.

Hammond stuck to this agreement and spoke only during lunch hour and before the start of work. For a while there was no objection from his fellow-employees, but then some objected, saying that the shop was no place for these sermons. The manager took note of these objections and asked Hammond to stop using company property for this purpose. Hammond paid no attention to this request but continued his talks. After several verbal warnings, the company fired him.

In Hammond's behalf, it was claimed that the company's action

Oelrich's Newest - loaded with features

FORM No. 125 Radio • TV • Appliance SERVICE INVOICE for Shop Jobs or Service Calls

- One-time Carbon Set
- Hard 3rd Copy
- Up to 24 Item Lines
- Claim Check
- Job Tag Section
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Size: 5 1/2 x 8 1/2. In triplicate with
call schedule on throw-away stub.
Ask for prices with your imprint.
SEE IT AT YOUR ELECTRONICS
PARTS JOBBER.

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Name _____
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CALL TAKEN AT	SCHEDULE FOR	MON	TUE	WED	THUR	FRI	SAT	SUN	MORNING	AFTERNOON	EVENING	
ESTIMATE ONLY	ESTIMATED COST	DATE	WINDSOR RADIO & TV SERVICE 4818 WEST IRVING PARK RD. CHICAGO 41, ILL. TEL. 9-1584									
NAME	MODEL	SERIAL NO.	REFERENCE	ROBES	LAST SERVICED	PROMISED FOR	HOME CALL					SHOP JOB
QUAN	TUBES	FACH	TEST	QUAN	PARTS & MATERIAL USED							PRICE
TOTAL											MAJOR LABOR PERFORMED	TOTAL PARTS SUMS
TECHNICIAN											TOTAL (C.O.D.)	
CLAIM CHECK NO. 362											WINDSOR RADIO & TV SERVICE	

violated the basic right to freedom of speech and worship.

Was The Company:
RIGHT WRONG

What A Three-Man Arbitration Board Ruled: "It is the opinion of the chairman that freedom of speech is not an issue in this case. The issue, as the chairman sees it, is whether or not the Company must permit its property to be used for purposes other than those for which it was established and is conducted. Certainly the Company cannot prohibit a normal interchange of ideas and expressions of opinion by employees, common in all shops, and a natural incident to places where men gather for work or other purposes. But it is an abnormal and essentially different purpose to which Rev. Hammond sought to use the premises. The fact that he did preach for some time without objection and without an order from management to desist does not, in the chairman's opinion, destroy the right of the Company to control the use of its property and the right to order the practice stopped after there was a complaint." Grievance denied.

Electronic Drive-In

(Continued from page 30)

justments to the radio, removing and replacing the radio in the car. Servicing is not limited to car radios, as all types are handled.

The business is strictly on a cash and carry basis. The customer saves \$5 by bringing the set to the shop himself. "We don't even keep a truck for service calls," said Kraft. This eliminates quite a fair amount of overhead. Castori is a specialist in television antenna installations and has a substantial share of the Sonoma business in that particular field. The bench is kept packed with television sets for repair, and it seems obvious that during slack periods the television servicing is bread and butter business for the Electronic Drive In. In addition to Castori and Kraft there are two part-time employees who work evenings and Saturdays. The store's hours are a little unorthodox. Kraft explained that most of the local customers use their cars during the day, and as a result a large percentage of the repair work takes place

(Continued on page 52)

for service and lab. work

Heathkit PRINTED CIRCUIT OSCILLOSCOPE KIT FOR COLOR TV!

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 O-10
\$69.50
Shpg. Wt. 27 lbs.



MODEL TS-4
\$49.50
Shpg. Wt. 16 lbs.

Heathkit TV

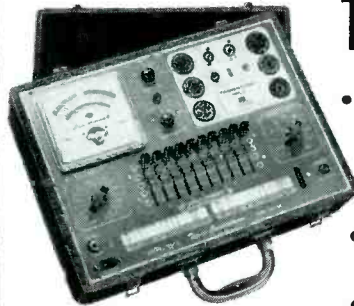
SWEEP GENERATOR KIT ELECTRONIC SWEEP SYSTEM

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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COMPANY
A SUBSIDIARY OF DAYSTROM, INC.
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Superior's New
Model TV-12

TRANS-CONDUCTANCE TUBE TESTER



FEATURES

- Employs improved TRANS-CONDUCTANCE circuit. An in-phase signal is impressed on the input section of a tube and the resultant plate current change is measured. This provides the most suitable method of simulating the manner in which tubes actually operate in Radio and TV receivers, amplifiers and other circuits. Amplification factor, plate resistance and cathode emission are all correlated in one meter reading.
- NEW LINE VOLTAGE ADJUSTING SYSTEM. A tapped transformer makes it possible to compensate for line voltage variations to a tolerance of better than 2%.
- SAFETY BUTTON — protects both the tube under test and the instrument meter against damage due to overload or other form of improper switching.
- NEWLY DESIGNED FIVE POSITION LEVER SWITCH ASSEMBLY. Permits application of separate voltages as required for both plate and grid of tube under test, resulting in improved Trans-Conductance circuit.

EXTRA FEATURE: Model TV-12 also tests Transistors

A transistor can be safely and adequately tested only under dynamic conditions. The Model TV-12 will test all transistors in that approved manner, and quality is read directly on special "transistor only" meter scale.

Model TV-12 housed in handsome rugged portable cabinet sells for only

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**SHIPPED ON APPROVAL
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Try it for 10 days before you buy. If completely satisfied send \$22.50 and pay balance at rate of \$10.00 per month for 5 months. —NO INTEREST OR FINANCE CHARGES ADDED. If not completely satisfied, return to us, no explanation necessary.

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

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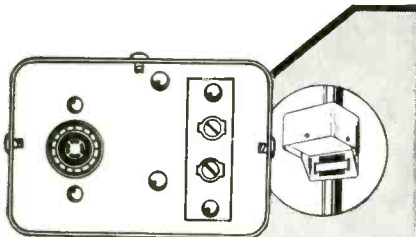


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improve reception as much as 6db

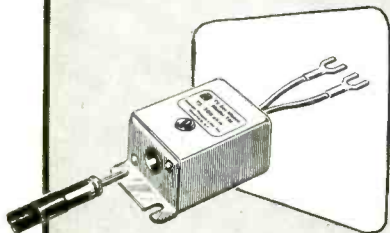
Eliminate Signal Losses, Smear, Ghosts and Other Picture-Degrading Conditions Resulting From Antenna-to-Line or Line-to-Set Mismatch.



B-T BALUN model MB

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Mounts on antenna mast or strut. Provides exact impedance match between 75-ohm unbalanced line and 300-ohm balanced line or antenna. Has 75-ohm coax fitting and 300-ohm screw terminals. Built into weather protecting cowl housing.



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Used at TV receiver to match 75-ohm cable to 300-ohm TV set input. Cable plug and jack permit quick, easy disconnect. Has heavy duty, 300-ohm output leads.

At electronic parts distributors. For complete accessory catalog, write to Dept. T-4.

BLONDER-TONGUE LABS., INC.
9-25 ALLING STREET, NEWARK 2, N. J.

(Continued from page 51)

at night. To meet the requirements of this business, the Electronics Drive In opens at 1 p.m. and closes at 10 p.m.

Kraft does everything he can to maintain a high standard of servicing efficiency. He holds regular radio refresher courses and then discusses and demonstrates latest servicing techniques to his employees.

The Electronic Drive In will later be extended to service all electronic equipment used in automobiles. Kraft and Castori foresee the time when owing to the increasing use of electronic devices in automobiles, their servicing will require technicians with special training in this field.

The Electronic Drive In is no flash in the pan. It has been an outstanding success and the firm plans to extend its operations across Northern California. •

Tough Dogs

(Continued from page 31)

effect of the contrast control on the grid voltages was negligible. Readings on both sides of the control were identical accounting for the lack of change in bias on the grids.

The schematic shows one side of the control tied to the video detector load and the other side to the sync clipper grid. It was surmised that grid leak action at the clipper stage under normal conditions should place a higher negative voltage on the side of the control opposite the detector load and that a defect in any stage preceding the sync clipper would deliver a weak signal resulting in poor grid leak action. After accomplishing many other tests and without success it was decided to look into the tube heater circuit. A check of filament voltages revealed the trouble.

The filament dropping resistor which was assumed to be bad because of the long warm-up period and which was going to be replaced after the contrast problem was cleared, was responsible for too low a filament voltage on all the tubes. This resulted in decreased efficiency and amplification of the r-f, i-f and sync tubes, causing the loss of contrast. Replacing the resistor restored the set to normal operation. —Frank A. Salerno, Queens, N.Y.

• A bird in the hand—Ed.

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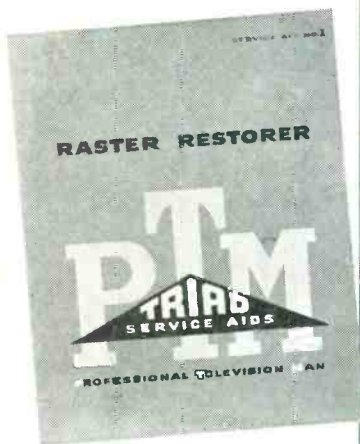
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PTM Service Aid No. 1 is a convenient, easy-to-read wall chart listing the logical steps which the Professional Television Man should use to pinpoint the defective sweep component when faced with a "lost raster." Get your free copy from your distributor, or write to us. Supply is limited.



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Convergence Techniques

(Continued from page 33)

adjustment may be necessary. The same thing can happen in horizontal deflection, with the unequally swept beam showing a horizontal displacement, as in Fig. 6b. In this case, the displacement would not show on a horizontal line.

Consequently, a line pattern can be misleading, and the dot pattern, which reveals the actual movement of a beam, should be used for all but rough adjustments. An alternative is the cross-hatch pattern, which reveals actual beam movement, but does not yield the detailed information of the dot pattern. However, the cross-hatch is useful in making yoke positioning adjustments, and in evaluating overall convergence.

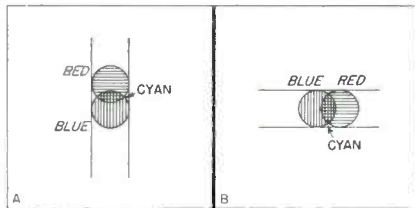


Fig. 6—Line pattern may hide displacement.

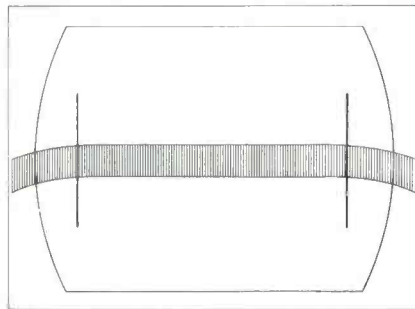


Fig. 7—Blue beam fixes convergence limits.

The time element of deflection introduces a slight lateral displacement in horizontal deflection of the blue beam, and this displacement, although very small, should be compensated for before the blue beam is used as a reference for convergence of another beam. This is easily done by bringing all three beams into center convergence, displacing the blue beam in the center as previously described, disabling the red and green guns, displaying a horizontal line pattern, and adjusting the blue horizontal amplitude and phase controls for maximum straightness of the blue line across the horizontal axis of the screen. The blue beam

(Continued on page 54)

Problem:

2 TV Sets
1 Antenna

Answer:



2-SET COUPLER

Model TV-42
Approved for Color TV
UHF, VHF and FM



Cost: ONLY \$2⁹⁵ LIST

Features:

- Matched resistive circuit
- Flat response—0 to 900 megacycles
- 12db inter-set isolation
- Easy to install
- Couples 2 TV sets without ghost or smear

Application:

In class A signal areas the B-T 2-Set Coupler provides the ideal low cost solution to the problem of operating two receivers from one antenna. There are other applications. For example, the TV-42 can couple a TV set and FM receiver to one antenna—or it can be used, in reverse, to couple or mix 2 antennas for one receiver.

Write for FREE BOOKLET—"TV for 2 or 3... or More"
Covers all types of Multiple TV Systems

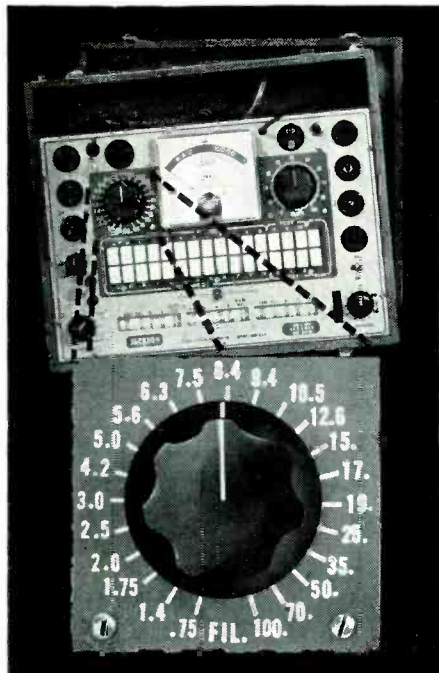
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(Continued from page 53)

will now be approximately converged horizontally. (Adjust static controls if necessary.)

While making the preceding adjustment, it will be noticed in the majority of receivers that it is impossible to achieve a perfectly straight blue line across the entire width of the screen. At some point on either side, the line will dip downward, as in Fig. 7. These points indicate the limits of horizontal convergence in the particular receiver being considered, and may be marked with a grease pencil or tape on the safety glass. Further horizontal convergence adjustments should be made with reference to patterns within these limits, disregarding any patterns which appear outside the marks.

By utilization of such inherent characteristics of color receivers now in use as those briefly outlined here, extremely good convergence can be achieved in most sets in a minimum amount of time. In addition, as the development of shadow mask receivers continues, more and more specialized and varied circuit arrangements and components may be expected to appear, such as the modified deflection yokes already in use in some current sets. Cognizance of basic factors involved in convergence will aid in avoiding misdirected efforts when dealing with such developments, as well as with conventional designs. •

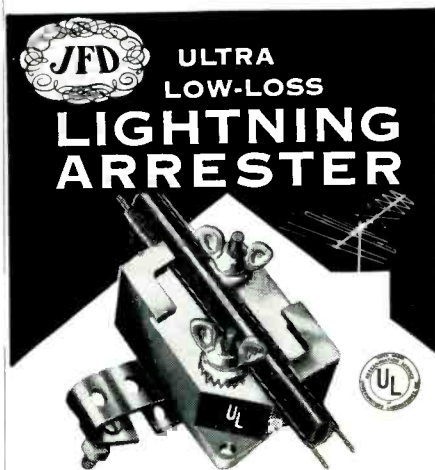
"DUMONT INSTRUMENT JOURNAL": A new quarterly technical journal to replace the "Oscillographer". Editorial content will feature articles on techniques and applications written by experts in all facets of the electronic instrument industry. Topics of the new journal will cover all electronic equipment including pulse generators, vacuum tube voltmeters and pulse transformers, as well as oscilloscopes. Allen B. Dumont Labs., Inc., 750 Bloomfield Ave., Clifton, N. J. (ELECTRONIC TECHNICIAN No. B4-23)

Vanguard ELECTRONIC SWITCH

Two separate electrical signals may be superimposed or separated as desired, for direct measurement or comparison on a single beam oscilloscope. The electronic switch model ES-17 provides a phase and frequency compensated 5 step input attenuator, short transfer time, wide range of input signals and regulated power supply. Vanguard Instruments Corp., Valley Stream, N. Y. (ELECTRONIC TECHNICIAN No. 4-61)



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3J6



35J6



CTM-1

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Because of the ingenuity of the Jensen design, you need only one universally applicable model in each speaker size. Your inventory requirements are lower than for any other speaker line—your stock investment is cut to the bone.

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Nom. Size In.	Model No.	Magnet Weight	DIMENSIONS		V. C. Diam. In.	List Price
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4	4J6 *	.85	4 1/8	1 3/4	1/16	3.60
4x6	46J6 *	.85	4 1/8 x 6 1/8	1 9/16	1/16	4.70
5	5J6 *	.85	5	1 15/16	1/16	4.05
5 1/4	525J6 *	.85	5 1/4	2 1/8	1/16	4.15
5x7	57J9	1.47	5x7 1/4	2 1/16	3/4	5.85
6	6J6 *	.85	6 1/16	2 3/16	1/16	4.35
6x9	69J9	1.47	6 3/8 x 9 1/8	2 1 3/16	3/4	6.50
7	7J9	1.47	7	2 1 1/16	3/4	6.25
8	8J9	1.47	7 1 1/16	2 1 5/16	3/4	6.25
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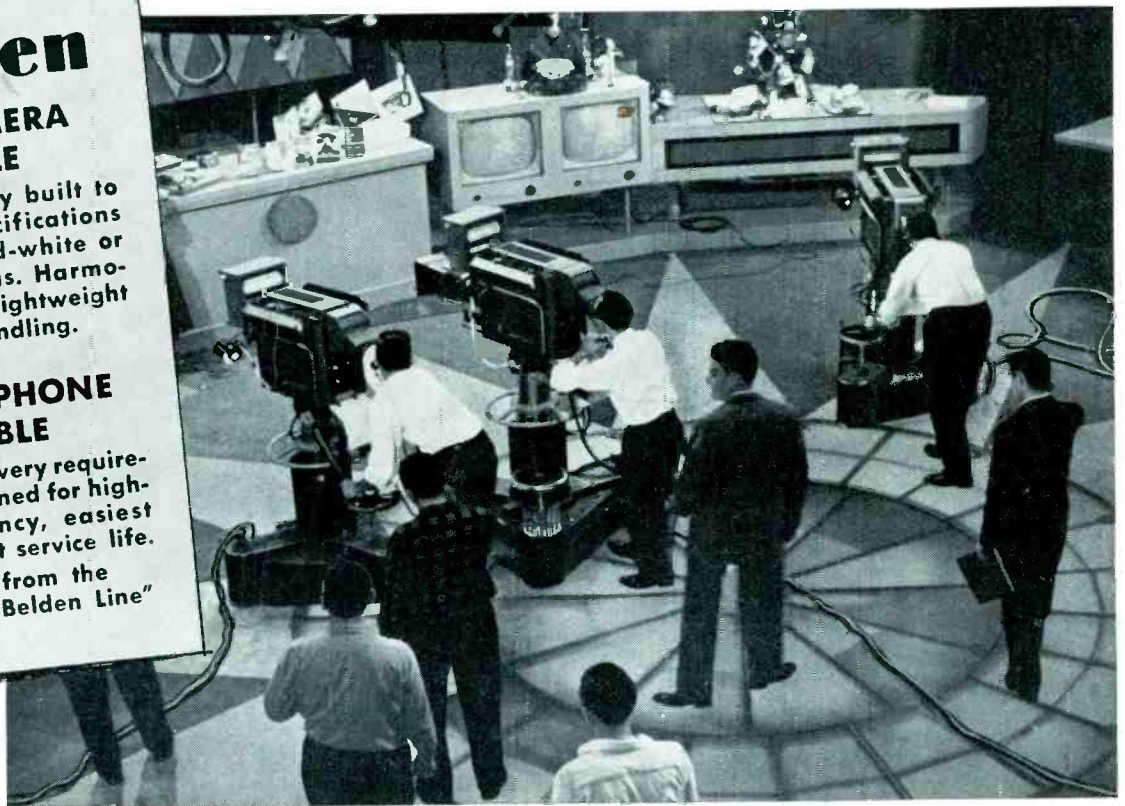
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