ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

REPLACING NEEDLES

50¢

February • 1960

Here is the new Standard Coil Tuner Replacement and Repair Program that enables you to offer better service to your customers at greater profit. Now Standard Coil Products provides the tools that will enable you to cash in on the profitable tuner repair and replacement market.

TUNER REPLACEMENT LISTING IN SAMS PHOTOFACT

Starting in January, Standard Coil tuner replacement listings will appear in all Sams TV Photofact. Tuner replacement information will be right at your finger tips. Standard Coil is the *only* manufacturer ever to provide this service.

NEW TV TUNER REPLACEMENT GUIDE

Lists original equipment TV tuners with the Standard Coil equivalent replacement for each. Also includes major mechanical replacement parts for all Standard Coil Tuners —those used in original equipment as well as the universal replacement. Eliminates all guesswork—minimizes your tuner repair and replacement problems.

48 HOUR FACTORY GUARANTEED REPAIR SERVICE

Standard Coil's special service department set-up assures factory guaranteed repairs—*on a 48 hour in-plant cycle!* All repaired tuners carry a *six month warranty* on defective workmanship and parts failure (excluding tubes). Gives you more time for additional service calls—promptly returns your customer's set to like new operating condition.

DEFECTIVE TUNER TRADE-IN ALLOWANCE

Tuners which can *not* be repaired can be traded in against a new replacement tuner which carries a full *twelve month factory guarantee.* See your Standard Coil Distributor for complete details on how trade-ins can increase your tuner sales and profits—create greater customer satisfaction.

JUMP ON THE STANDARD COIL PROFIT WAGON TODAY!

For additional details, see your authorized Standard Coil Distributor or write to:

Standard

Coil Products Co., Inc.

2085 North Hawthorne Avenue, Melrose Park, Illinois

ELECTRONIC TECHNICIAN

Including SERVICE Magazine

World's Largest Electronic Trade Circulation

Address all mail to
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Telephone YUkon 6-4242

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Printed in U.S.A. by Hildreth Press.

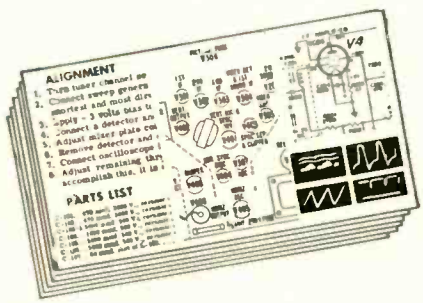
February, 1960

FRONT COVER Phonograph needle replacement work is an important activity of many service companies—there are some 40,000,000 needles in current use. The wide variety of cartridges and corresponding needle types demand a good understanding of removal-installation methods. See the article, "How to Change a Needle," starting on page 40.

FEATURES and ARTICLES

DEPARTMENTS

CIRCUIT DIGESTS

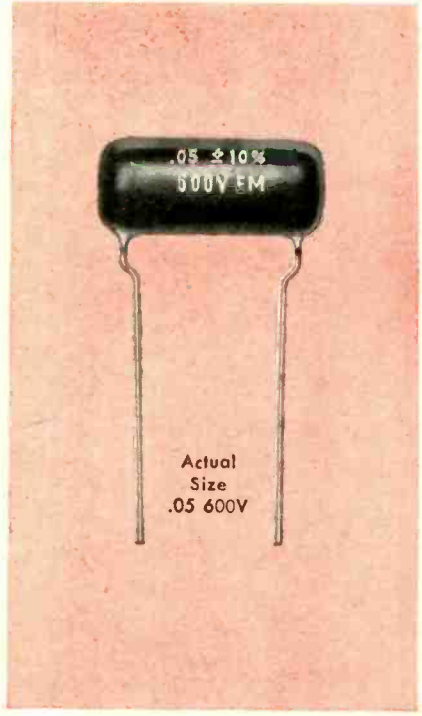


IN THIS ISSUE

(16 pp. latest schematics—see last page)

CAPITOL: Stereo Phonograph Models 930,933
GONSET: Citizens Band Transmitter-Receiver Model G-12
MOTOROLA: TV Chassis TS-433
WESTINGHOUSE: TV Chassis V-2384-1, 2384-2
ZENITH: TV Chassis 16E21, 16E21Q, 16D21, 16D21Q

the BIG SWITCH is to MINIATURIZED ELMENCO dp dipped mylar*-paper capacitors



The revolutionary LOW COST capacitor that puts an end to "Call-Backs"

RELIABILITY . . . Elmenco dp Mylar*-Paper Capacitors have achieved a reliability that meet missile and computer requirements. They are thoroughly and continually tested during production to insure outstanding performance. For example a 0.1 mfd. dp capacitor operated at full rated voltage and at 105°C will have a life expectancy of more than 7,168,000 unit hours.

MOISTURE-PROOF . . . Elmenco dp Capacitors are specially processed and vacuum dipped to obtain solid impregnation and a rugged moisture-proof coat designed to withstand *4 times more humidity* than the best molded capacitors used in the past.

MINIATURIZED . . . These capacitors are 50% smaller than other brands and can be used in printed circuit and transistor application. Thousands of service technicians are switching to Elmenco dp quality Capacitors. Why not see your Arco distributor today and get the best.

For full information write for Bulletin TF60.

* Dupont Trademark

ARCO electronics inc.
64 White St., New York 13, N. Y.
Branches: Dallas 19 • Los Angeles 35

Look for the Arco dp 5-PAK on the big blue and yellow display rack!

Each value packed 5 to a 5-PAK in transparent bag for your convenience.

Editor's Memo

I have long sympathized with the much publicized complaints of school teachers that they are underpaid. Of course, as many a service technician knows, teachers have no monopoly on this unfortunate situation. As a matter of fact, too many technicians take home less pay than teachers even though they work 10 to 20 hours per week longer.

It comes as an unhappy piece of news that the Executive Council of the American Federation of Teachers has frowned upon an experimental plan to bring airborne TV courses to some five million students in the Midwest. This pioneer project is supposed to start next fall with a $4 million grant from the Ford Foundation. An airplane flying at 20,000 feet over the Indiana area would transmit the educational programs, consisting of 24 full length courses on film, with 144 lessons for each course.

The teachers are ready to condemn the project before it even starts, calling it a grandiose scheme. It is apparent that concern over the students' welfare plays a smaller role in the objections than the feather-bedding attitude of wanting as many teachers on the payroll as possible.

More teachers are not needed as much as better teachers employing new techniques to disseminate their instruction.

A teacher of today who recognizes the need for new equipment and techniques in education is the teacher who will be needed tomorrow.

We hope this experimental project is successful and will teach its small-minded detractors that progress is possible—even in education.

One may say that the teachers' motivations should not be ascribed to crass commercialism. But I am reminded of a little tale which is a commentary on the unperceptive eye.

A missionary in darkest Africa was walking along a path, when he came face to face with a ferocious lion. The missionary was not armed and could not escape. Thinking that this was the end, he fell to his knees and began to pray. The lion gently knelt beside him.

"Good Lord," said the missionary, "you are a good Christian king of the beasts. Just think—I feared you were going to eat me!"

"Silence!" roared the lion. "I'm saying grace."

Al Forman

LETTERS
To the Editor

More On Licensing

Editor, ELECTRONIC TECHNICIAN:

Who are the men that favor TV repair licensing, and those that do not? Do most experienced repairmen not care one way or the other? I have met repairmen, very good technical men, who were never self-employed and who were always so preoccupied with bench work that they seldom had time to experience the human element of this repair business—the element which could prove to have limited their ability to foresee certain disadvantages of licensing. Their underlying motive for desiring licensing has been found to be, usually, the concern—and a rightful one—that men in their category are so shamefully underpaid. Some bosses want licensing. They feel it will stimulate business for those licensed. Maybe at first, but in the long run, will the customer continue to recognize the protection value of licensing?

OSCAR SCHECTAR
Schectar TV Service
Pittsburgh, Pennsylvania

Don't Forget Radio

Editor, ELECTRONIC TECHNICIAN:

You may have lost sight of the fact that there are communities in this day and age where radios outnumber TV sets. In this neck of the woods, there are two TV stations available, one 60 miles and the other 35 miles away. That's far from the selection available in New York. Hours are 1:00 PM to midnight. Radio still plays an important part in home entertainment. Despite the fact that TV uses four times as many tubes, about 50% of the tubes around here go to radio replacements.

JERRY KOUTNIK
Koutnik Radio Shop
Bellaire, Michigan

• *There are 167,200,000 radios in use in the U.S. and 53,100,000 TV sets as of the beginning of the year. Nationally speaking, most servicing income is derived from TV.—Ed.*

Win Friends

Editor, ELECTRONIC TECHNICIAN:

May I have your permission to reprint the article "23 Ways to Win Friends" from your July '59 issue? We want to run it in the monthly periodical published by the Buffalo Radio Institute Alumni.

D. KOWALCZYK
North Tonawanda, New York

• *We are pleased to extend permission, provided our standard copyright credit accompanies the reprint.—Ed.*

(Continued on page 8)

EXCITING NEWS FROM RCA!

Announcing a new plan to give your store

THE SUCCESSFUL LOOK

FIND OUT
HOW THIS PLAN CAN HELP YOU:

- Attract new customers
- Display and merchandise your products and service more effectively
- Utilize your present floor space to far better advantage
- Increase the efficiency of your service operation

SEE NEXT PAGE FOR IMPORTANT DETAILS..

Your Store...Key to Successful Sales with the new RCA STORE IMPROVEMENT PLAN

Your skill, experience and integrity are the basic qualities that help you sell your service to the public. The appearance of your store can impress them with these facts —invite them inside to call on you with confidence.

The components shown here—and many more—are all available from your Authorized RCA Tube Distributor under the new RCA Store Improvement Plan. With minimum effort on your part, they will help you give your store *the successful look* inside and out. *No expensive store renovation is required.* No fancy, impractical blueprints are offered. Instead you are provided with carefully thought-out components that increase the business potential of any shop—big or small, old or new.

THE SUCCESSFUL LOOK—OUTSIDE

STORE FRONT

PROFESSIONALLY INSTALLED WINDOW DISPLAYS— CHANGED EVERY SEASON

With this plan, your store window becomes a strong invitation to new customers. It will be decorated and fitted with attractive seasonal displays—prepared by RCA—without any fuss or bother on your part.

RCA ILLUMINATED WINDOW VALANCES—ALSO USED AS IN-STORE MODULAR DISPLAY PANELS

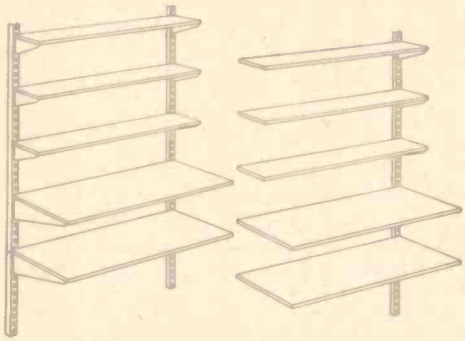
Here's a brand new idea that can be used to decorate your store window—or the interior of your shop as shown in the "Sales Area" photograph on opposite page. A choice of two- or four-foot lithographed panels, in gold-finished satin steel, gives you complete flexibility in designing your own customized illuminated window valance. Complete with hanging hardware and fluorescent lighting.

A good looking store front is your first opportunity to convert a passerby to a customer. The RCA Store Improvement Program offers you the elements to make your store front a working partner in your business.

Talk to your Authorized RCA Tube Distributor about this exciting plan right away. Ask him for your copy of RCA's new Store Improvement Guide (4F257), with a complete list of the components available and the order forms to secure them. Find out how easily and quickly you can add those few extra touches to your store to give it that Successful Look for 1960.

SALES AREA

The interior of your shop should be an important sales aid. Here, good first impressions can be reinforced, to make it easier for you to sell your products and services.



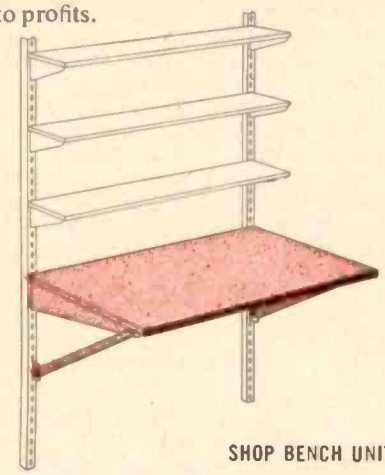
RCA DISPLAY AND STORAGE SHELVING UNITS

Attractive, sturdy shelving helps you display your merchandise more effectively for added sales. The RCA Plan offers basic four-foot shelving units, with add-on units to fit every need. Units may be set up in a variety of arrangements—and are easily disassembled and re-arranged.

THE SUCCESSFUL LOOK—INSIDE

SERVICE AREA

An efficient service area, providing faster, better organized work flow, is an important key to profits.



SHOP BENCH UNITS

These sturdy benches mount on shelving units to provide additional storage and work space, efficient work flow, better use of floor space. They save you time and money.

**ADDITIONAL SALES AIDS—
TO HELP BRIGHTEN
YOUR PROFIT PICTURE**

Eye catching sales accessories can draw attention to the services you offer. Sales-boosting accessories include illuminated clocks, signs, product display units, door bars, streamers, decals, service auto lights—even uniforms.

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

(Continued from page 4)

Subscription Lapse

Editor, ELECTRONIC TECHNICIAN:

I inadvertently let my subscription to ELECTRONIC TECHNICIAN lapse, and am anxious to reinstate it as soon as possible. I miss both the information carried and the schematics.

W. J. OEDING

Oakland, California

On The Ball

Editor, ELECTRONIC TECHNICIAN:

I never expected to get back issues lost when I was moving around. When I received them in the mail, you'll never know how happy it made me. Thank you for being on the ball. I don't understand how anyone in the TV-radio business can afford to be without ELECTRONIC TECHNICIAN.

STANLEY VALEVICH

Phoenix, Arizona

Company Address

Editor, ELECTRONIC TECHNICIAN:

I'm trying to locate the address of Pacific-Mercury, which I understand is on the West Coast. Can you help me?

ANDREW LANG

Ridgewood, New York

• *It is Pacific-Mercury Television Mfg. Corp., 5955 Van Nuys Blvd., Van Nuys, Calif.—Ed.*

No Schematic, No Sale

Editor, ELECTRONIC TECHNICIAN:

I have tried to obtain a schematic diagram of the printed board used in the Sonic 660 NV hi-fi amplifier. A visit to the makers of Sonic equipment brought out the fact that they do not have any wiring diagrams for this model because they bought the boards. We would like to recheck everything before returning the unit to its owner. Although we can get it working, we'd like to be sure it's working as it was intended. It would seem that the best way to handle such a situation is not to purchase equipment which does not have schematics available. This will be my future action.

BERNARD J. FOLEY

Glendale, New York

Legislation

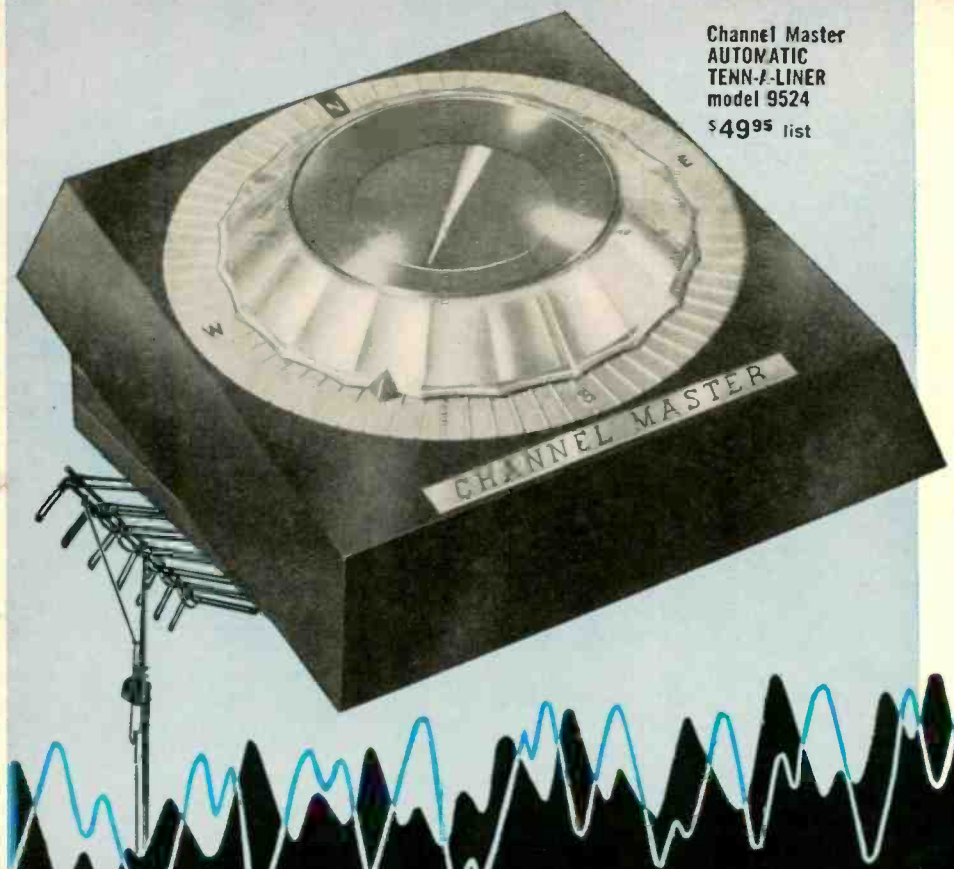
Editor, ELECTRONIC TECHNICIAN:

The voters of Escambia County, Florida, recently voted down a law which proposed the establishment of an Electronic Control Board. This law was so written that if it had passed, it could have provided for a legalized monopoly of the entire electronic sales and service in this county. The county vote against it was about 4 to 1. The majority of the independent electronic servicemen in this county feel that there should be some way of informing the people as to who is the "tube swapper" and who is qualified and trained. We certainly want to keep the legislative powers out of business here in our county.

TITUS E. KIRKSEY

Pensacola, Florida

(Continued on page 12)



Channel Master
AUTOMATIC
TENN-A-LINER
model 9524
$49.95 list

Hits TV stations right on the nose! The Channel Master Automatic Tenn-A-Liner is the only rotator that **aims the** antenna within **one degree** of the precise transmitter location.

Superior parallel circuit delivers a full 29 volts to the rotator, producing higher torque that easily turns even the heaviest antennas. Fewer moving parts—all fully protected from weather extremes — contribute to long, trouble-free service.

For these and other reasons, you can recommend and install the Automatic Tenn-A-Liner with full confidence of customer satisfaction.

from the top of the roof...to the back of the set...

CHANNEL MASTER

works wonders in sight and sound

Premium tube features at no extra cost. Channel Master Electron Tubes are designed for use in television, AM/FM radio, and high fidelity systems. They offer the same outstanding performance, quality, and value you've come to expect from all products bearing the Channel Master name.

Rigid manufacturing controls assure consistent performance characteristics, exact tolerances, long life, low noise, and maximum gain. Channel Master Electron Tubes are engineered to provide the best possible results.

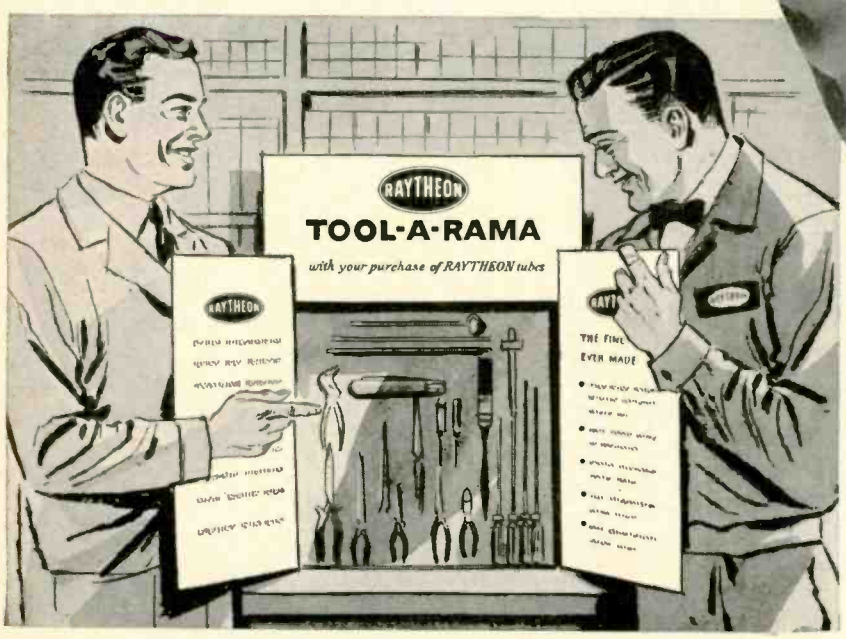
For happier customers, fewer callbacks, higher profits ... put Channel Master tubes in the sets you service.

CHANNEL MASTER CORP. ELLENVILLE, N. Y.

TV ANTENNAS • ACCESSORIES • TRANSISTOR RADIOS
STEREOPHONIC HIGH FIDELITY COMPONENTS

Announcing the Exclusive

TOOL-A-RAMA



Look for this display at your Raytheon Distributor's store. See for yourself why Raytheon guarantees these are the finest tools ever made!

Raytheon

PROMOTION

Next to his tube stock, a service dealer's most valuable assets are the tools he uses in the performance of his daily business. Now, the world's finest service tools are available to service technicians exclusively through Raytheon Distributors.

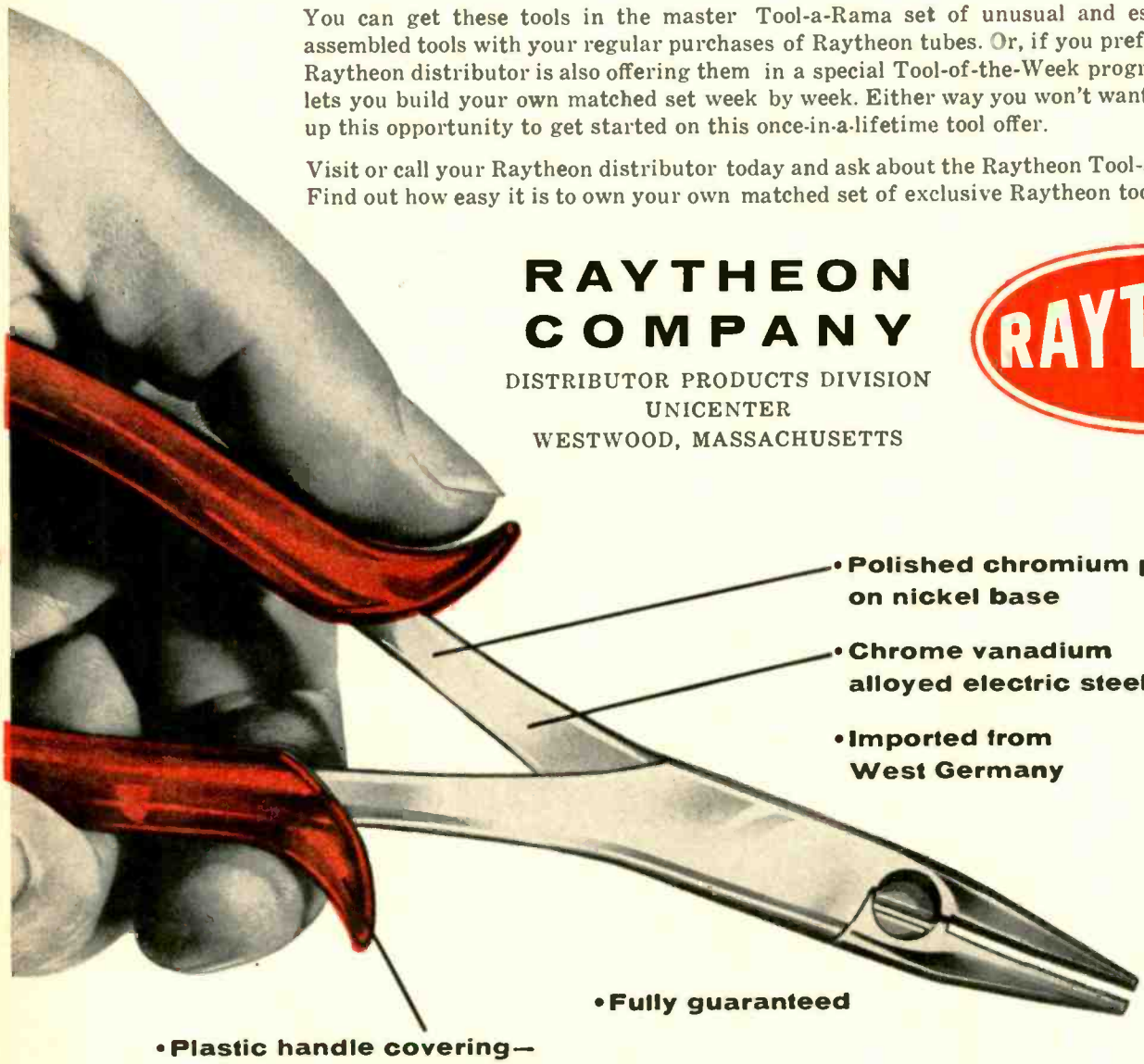
Raytheon takes pride in announcing the most exciting service tool program ever offered in the industry. Without a doubt, these tools, precision-crafted in West Germany, are the finest tools you've ever seen or used. Surgeon-quality in design and appearance, they have the "heft and feel" that tells you at once they are designed and manufactured to the very highest quality standards.

You can get these tools in the master Tool-a-Rama set of unusual and especially assembled tools with your regular purchases of Raytheon tubes. Or, if you prefer, your Raytheon distributor is also offering them in a special Tool-of-the-Week program that lets you build your own matched set week by week. Either way you won't want to pass up this opportunity to get started on this once-in-a-lifetime tool offer.

Visit or call your Raytheon distributor today and ask about the Raytheon Tool-a-Rama. Find out how easy it is to own your own matched set of exclusive Raytheon tools.

RAYTHEON COMPANY
DISTRIBUTOR PRODUCTS DIVISION
UNICENTER
WESTWOOD, MASSACHUSETTS

RAYTHEON



- Polished chromium plating on nickel base
- Chrome vanadium alloyed electric steel
- Imported from West Germany
- Fully guaranteed
- Plastic handle covering—insulated for 10,000 volts

(Continued from page 8)

GE Service Policy

Editor, ELECTRONIC TECHNICIAN:

Thank you for your letter requesting clarification of a reported change in General Electric's TV service policy. Our policy has not changed from that which was stated in our release of Jan. 6, 1959. The Company is vitally concerned with customer satisfaction, and is necessarily active in such service matters as supplying replacement parts, training technicians and supporting dealer service. In addition, where required by local market conditions, our distributors will provide warranty service to the customer. In such cases, and these are few, each dealer may choose one of three alternatives:

1. Perform consumer service with his own personnel.
2. Contract with an independent service dealer.
3. Arrange for consumer service by the distributor.

Our distributors establish in such cases, an amount calculated to cover the distributor's anticipated labor costs for the warranty period. It is not only possible for independent service dealers to compete with this arrangement, the service dealer actually has considerable advantage over distributors in servicing the dealers' customers. As a matter of fact, distributors often select one or more service dealers to perform warranty service.

The recent General Electric press conference was reported by the press to have dealt with a widening of General Electric factory service. Actually, the questions which prompted Mr. Cordiner's replies were concerned with the broad area of consumer products. He referred to one experiment which involves the separation of local distributor service management from overall local distributor management to test for improved service and efficiency. These operations involve major appliance service. Mr. Cordiner said further, and he clearly prefaced his remark with the phrase "and this is just a conjecture," that possibly these operations may be widened.

Our policy of working with independent TV service dealers to assure the best possible service to the consumer has not changed. We recognize that independent TV service dealers perform the majority of service provided to General Electric television receiver owners.

S. R. MIHALIC,
Manager-Product Service
General Electric Company
Syracuse, New York

News of the Industry

JERROLD ELECTRONICS' J-Jacks closed circuit TV distribution systems will be installed in new high schools located in Washingtonville, and La-Grangeville, N.Y.

P. R. MALLORY Distributor Div. has declared HUBERT A. LINDSEY, Service Dept. Mgr. of Curlee Tire & Appliance Co., Statesville, N.C., winner of their "Go Places With Mallory" contest for his statement on "Why I like Mallory components."

JOHN F. RIDER PUBLISHER has made a wall display available as part of the recently published Rider Books TV-Transistor-Radio Manual, Vol. 26. The 11" x 14" sign can be hung or displayed and is aimed at bolstering confidence in the operations of the service shop.

ZENITH has established a wholly-owned subsidiary, ZENITH SALES CORP., which will perform the marketing function for the parent company. L. C. TRUESDELL is Pres. of the new corporation, with CLIFFORD J. HUNT, Vice Pres.—Distribution; ERIK ISGRIG, Vice Pres.—Advertising; and JOHN A. MIGUEL, Vice Pres.—Export. ZENITH RADIO CORP. announced that the company has produced more than one million TV receivers in 1959, a new record, and expects this year to achieve the greatest percentage of total industry sales in its history.

(Continued on page 18)

Now

FOR THE FIRST *time*

2 year guarantee on ASTRON "Twist-Prong" and "Minimite" electrolytic capacitors

2 year GUARANTEE

ASTRON®

BUILD YOUR REPUTATION with the only capacitor line that offers a full TWO year performance guarantee

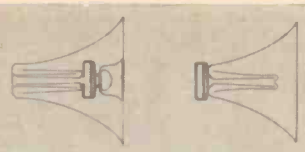
The Red Seal is your guide to quality and economy. Astron Guaranteed Twist Prong Capacitors are available through all better distributors now displaying the Red Seal.

Look for the Red Seal Capacitor Display Cabinet at your "DISTRIBUTOR"

ASTRON®

ASTRON
CORPORATION
255 GRANT AVENUE • EAST NEWARK, NEW JERSEY

SEND IMMEDIATELY FOR OUR NEW ALL INCLUSIVE REPLACEMENT CATALOG.



CONVERTIBLE DRIVER

Only E-V offers a line of drivers suitable for every horn type. The *same* driver can be used on reentrant horns for maximum economy, or installed in compound horns for lowest distortion.

NEW CONVERTIBLE DRIVERS

Ideal for any horn type

- First with Ceramic Magnets
- First with Edge-Wise Wound Voice Coils
- First with Dual Concentric Centering

The new E-V convertible drivers have all the characteristics needed to satisfy critical sound jobs where excellent power handling, high efficiency and wide range must be combined *PLUS* the ability to be used interchangeably in compound or reentrant horns. This unusual versatility is accomplished without compromising the performance quality of any horn type. Tonal balance allows good musical reproduction while providing the rising frequency response necessary for clear, crisp voice projection. "Peaked" response is eliminated. Both the high and low frequency range is limited only by the horn design. The drivers are rugged, weatherproof and engineered to permit easy diaphragm replacement in the field on either type horn. Available with 16 or 45 ohm voice coils or with built-in 70.7 volt line constant voltage transformers. Engineered with careful attention to detail, these new drivers are easier to install with push-type polarized connectors plus a cable strain relief for highest reliability.

DC30A

30 Watts
150-10,000 cps
$27.50 List

DC30T

30 Watts
With 70.7 V.
Transformer
150-10,000 cps
$37.00 List

DC40

40 Watts
140-11,000 cps
$36.00 List

DC40T

40 Watts
With 70.7 V.
Transformer
140-11,000 cps
$46.50 List

DC50

50 Watts
140-11,000 cps
$47.00 List

DC50T

50 Watts
With 70.7 V.
Transformer
140-11,000 cps
$57.50 List

RING REFLECTOR

Conventional P.A. horns use smoothly rounded paths at both critical reentrant sections. This technique is satisfactory for small radius bends but only E-V uses the exclusive ring reflectors to increase output in the vital presence region by as much as 7db. Result — clearer speech — better balanced music.

NEW RING REFLECTOR REENTRANT HORNS

Wide range with economy

Model AR-150
List Price $31.00 (less driver)

Revolutionary E-V ring reflector extends the high frequency range, increases intelligibility and provides more natural sound. New horn development gives this round horn maximum penetration over a larger area at lowest cost. Rubber damping ring eliminates resonances. Heavy spun aluminum bell, rugged aluminum die cast mounting plate plus precision die cast reentrant tubes assure long lasting performance. Accepts E-V or other standard drivers with 1⅜"-18 thread.

Model FR-150
List Price $37.00

An ideal reentrant horn for car-top installation or wherever a low silhouette is needed and where bass response cannot be sacrificed. Stacks easily for multiple speaker operations. For maximum economy, this low cost medium angle horn provides good coverage and smooth response. Rugged fiberglass horn has Mesa Tan color molded in. Adjustable mounting allows best coverage. Accepts E-V or other standard drivers with 1⅜"-18 thread.

AND THAT'S NOT ALL . . .

Paging and
Talk Back Speakers

Model 847
List $47.00

Model 844
List $34.50

Virtually every sound job can be done better, easier and cheaper with the complete line of E-V compatible sound products. E-V's leadership in microphone and speaker design can assist you in the solution of your toughest sound problems.

COMPOUND HORNS

New designs expand the time-tested "CDP" for usefulness where wide-angle *OR* concentrated coverage is desired. Each horn can use concentrating or diffraction horn above 1000 cps for maximum versatility.

NEW COMPOUND HORNS THE FINEST SOUND AT ANY PRICE

Model FC-100
List Price (less driver) $47.50

E-V exclusive! Dual compound diffraction horns permit the widest range while reducing distortion far below any other projector design. Two diffraction horns give uniform wide angle coverage over the entire frequency range. Use any E-V Convertible Driver. Low-frequency horn cut off, 100 cps; air column length, 58"; sound distribution, 90° x 120°. Mesa Tan weatherproof fiberglass.
The FC-100 is available with 30 watt driver installed. This is the popular 848 "CDP" (not illustrated). Widely used where sound quality is critical. LIST PRICE — $75.00.

Model AC-100
List Price (less driver)
$44.50

A new compound horn in the famous E-V tradition but with round bell for maximum concentration. Offers extremely high efficiency for maximum penetration and longest throw. No attenuation of highs as in conventional directional horns. Compound design lowers distortion for highest intelligibility. Takes any E-V Convertible Driver. Low-frequency horn — cut off, 100 cps.

Weatherproof Full
Range Speakers

Musicaster List $86.50
Musicaster II List $120.00

all from Electro-Voice®

For complete information write Dept. 20T COMMERCIAL SOUND DIVISION
ELECTRO-VOICE, INC. BUCHANAN, MICHIGAN
better products for better sound

YOU'RE AS SUCCESSFUL GENERAL ELECTRIC'S

AS YOU WANT TO BE WITH NEW PSM* METHOD!

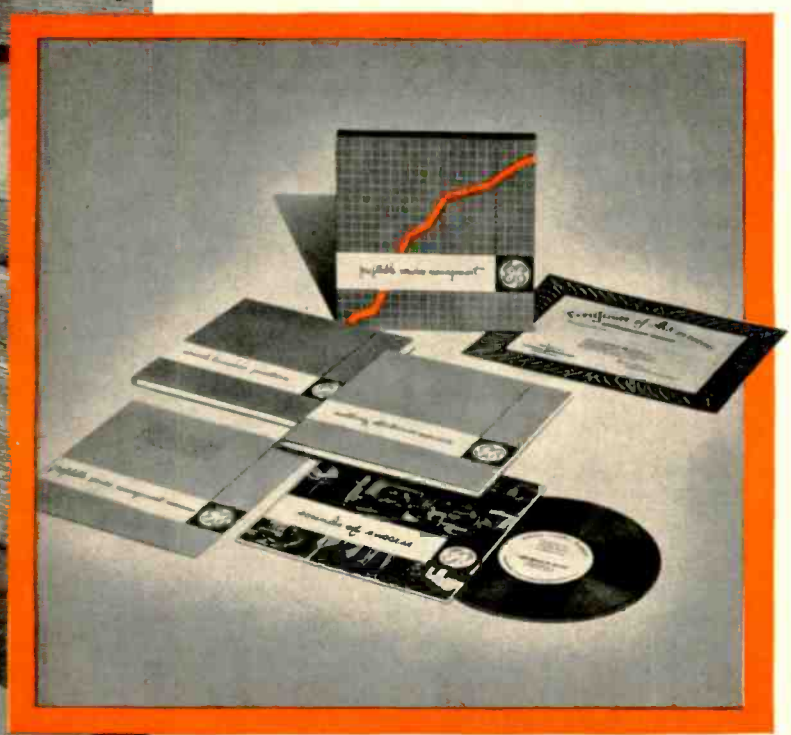
*PROFITABLE SERVICE MANAGEMENT

Earn the good things of life for yourself and your family by following the Profit signposts on every page of General Electric's PSM* Method! The engraved Certificate which says you have completed this instruction program, will mean new success for you as a TV technician.

Says Dr. John K. Pfahl of Ohio State University, under whose direction the new General Electric program was prepared: "The electronic service dealer must be, at the same time, a technician, good businessman, and sales manager." You learn step-by-step how to realize these aims, by following General Electric's Profitable Service Management Method. You are shown how to *assure* a satisfactory profit margin, not merely hope for it—how to increase business by methods others have found unfailingly effective.

In the LP record "Sounds of Success" you will hear from the lips of experienced TV technicians just how they have built greater incomes. After completing the two volumes of instruction that make up the study course, a questionnaire is available to check your acquired knowledge, prior to receiving your Certificate.

All come handsomely packaged for your bookshelf. Check the highlights of General Electric's PSM* Method given below! Then see your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*



HERE ARE SOME OF THE MANY SUBJECTS YOU WILL STUDY:

BOOK NO. 1. "SOUND BUSINESS PRACTICES"

BUSINESS FOR PROFIT: Your reasons for owning a business...How much money should you make?...How to make your business profitable.

PLANNING YOUR BUSINESS: Planning expansion...Cash planning...Shop planning.

ORGANIZING YOUR BUSINESS: Overhead costs...Pricing...What it costs you to make a service call...What it costs you to make a shop repair...Inventory control...Credit organization...Choosing a form of organization.

CONTROLLING YOUR BUSINESS: Why use records?... What records are needed...Taxation...Use an accountant.

BOOK NO. 2. "SELLING ELECTRONIC SERVICE"

ARE YOU ATTRACTING NEW CUSTOMERS?: Attracting new business...Businesslike appearance...Effective selling... Good identification...Basic market research.

PROMOTING YOUR BUSINESS: Advertising technique... Advertising campaign planning...Special offers...Seasonal planning...Customer contact.

KEEPING YOUR CUSTOMERS SATISFIED: Customer relations...Customer grievances...Guaranteeing repairs...Building new customers.

Progress Is Our Most Important Product

GENERAL ELECTRIC

311-401

(Continued from page 12)

ENTRON, INC. has named JAMES CARTER Dir. of Publications.

GENERAL TRANSISTOR INT'L. CORP. has appointed WALTER S. BOWER Pres.

PYRAMID ELECTRIC has announced the appointment of MARIO A. DEMATTEO as Gen. Sales Mgr.

ITT announces the appointment of ALFRED DI SCIPIO to the newly-created post of Vice Pres. and Dir. of Marketing.

GRANCO PRODUCTS will occupy a 63,000 sq. ft. building in Kew Gardens, N.Y., to become the company's permanent home.

XCELITE has announced the retirement of F. BIRNEY FARRINGTON, founder and Pres., and the election of ARCH WARDEN as Pres.

HOFFMAN ELECTRONICS reports the appointment of P. L. "PARSH" HENRY as Gen. Mgr. of HOFFMAN SALES CORP. of CALIF., a subsidiary.

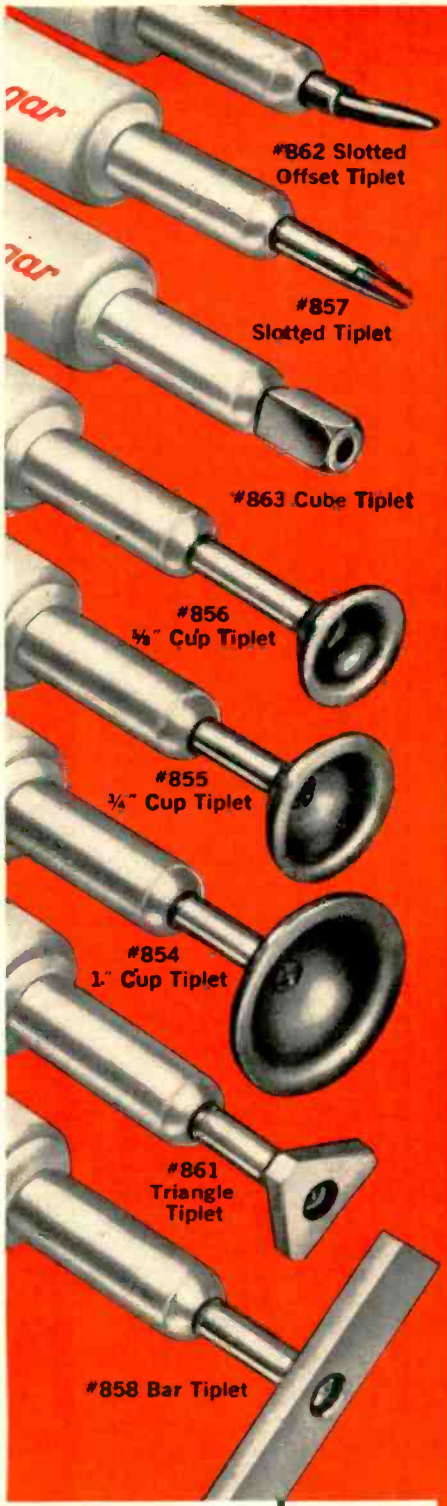
DELCO RADIO is offering one week advanced training to electronic technicians who work on their products in the field. A student must be sponsored by a DELCO Electronics Distributor, who has the necessary application blanks.

IRC has made the following appointments to newly-created positions: WALTER H. CANFIELD, Promotion Mgr. of the Marketing Div.; and EDWARD S. WEYL, Dir. of Business Planning of IRC Co. of Philadelphia.

CORNELL-DUBILIER announced the following key appointments: ROBERT J. REIGEL, Merchandising Sales Dir.; ARTHUR WILLIAMS, Commercial Products Sales Dir.; GLENN M. RONK, Military & Industrial Sales Dir.; and WILLIAM M. ROBINSON, Chief Engr. of paper and film capacitors, filters and pulse-networks.

RCA has organized their home instrument activities under the two major functions of operations and marketing with the following appointments: JACK S. BELDON, Pres. RCA SALES CORP., will have responsibility for the entire range of marketing activities for RCA home instrument products; and DELBERT L. MILLS has joined RCA as a Div. Vice Pres., Home Instrument Operations. EWEN C. ANDERSON has been appointed to the newly-created position of Executive Vice Pres., Staff, RCA. RCA SERVICE CO. announced the appointment of ANTHONY L. CONRAD as Pres. Heading Government Services will be STEPHEN D. HELLER.

(Continued on page 20)



NOW

Make Money on Printed Circuit Repairs

. . . it's easier than you think with the new

Ungar®

DE-SOLDERING TIPLETS®

You pocket more profit on printed circuit repair jobs with these exclusive interchangeable Ungar De-Soldering Tiplets. Specially shaped to remove 9 out of 10 components! No more improvising with make-shift tools!

Repairs are easier, safer and 70% faster because each tiplet is designed to apply just the right amount of heat simultaneously to all soldered contacts without heat radiation damage. No more de-lamination problems! No more ruined printed boards!

Tiplets shown at left are available individually . . . List Price 75¢ each, or . . .

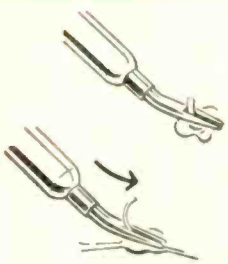
Special Introductory Kit

Lifetime Metal Case contains #776 Handle, Super HI-Heat Unit, #857 Slotted Tiplet, 3 cup Tiplets and #858 Bar Tiplet. . . . . List $7.95

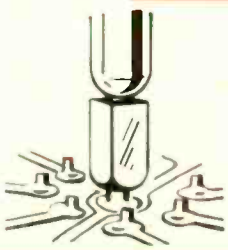
Order from your Electronic Parts Distributor now!

Ungar Electric Tools, Inc.

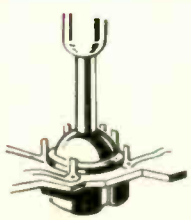
4101 Redwood Ave., Los Angeles 66, Calif.



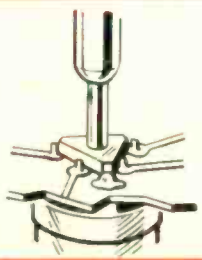
Offset Slotted Tiplet straightens leads, tube tabs and small wires bent close to board.



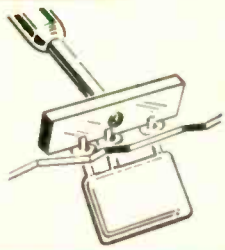
Cube Tiplet removes center pins of tube sockets and harness leads.



Cup Shaped De-Soldering Tiplet removes solder from circular multi-lug components in one operation.



Triangle Tiplet melts solder on leads of electrolytic capacitors simultaneously.



Bar Tiplet simultaneously melts solder on all multiple straight line network components.

(Continued from page 18)

WINGARD is sponsoring a daily "Paul Harvey News" program over 210 local ABC radio stations.

CHANNEL MASTER has reported a substantial increase in the use of aluminum masts in the installation of TV antennas.

TECHNICAL APPLIANCE reports the appointment of GERARD J. WHITE as field engineer to work closely with TACO distributors, dealers and reps.

GENERAL ELECTRIC has introduced the first TV sets using a new 23-in. square cornered picture tube which does not require an attached safety plate.

CBS ELECTRONICS Transistor Home-Study Courses were awarded by CRAMER ELECTRONICS at the N.E. Electronics Research & Engineering Meeting.

SARKES TARZIAN has appointed REINCKE, MEYER & FINN, Chicago, as advertising agency for its Semiconductor Div. and its new Magnetic Tape Div.

PHILCO and CBS ELECTRONICS jointly announced the signing of a cross-licensing agreement covering the manufacture and sale of semiconductors.

VOCALINE Communications Products Div. made the following appointments: EDWARD MANVILLE, Sales Mgr. and RALPH ROUTSONG, Marketing Mgr.

ALPHA WIRE has recently opened a new Pacific Div. of factory facilities, warehouse and offices at 1871 S. Orange Dr., Los Angeles 19, Calif. DONALD RAPPAPORT will head the new div. as Mgr.

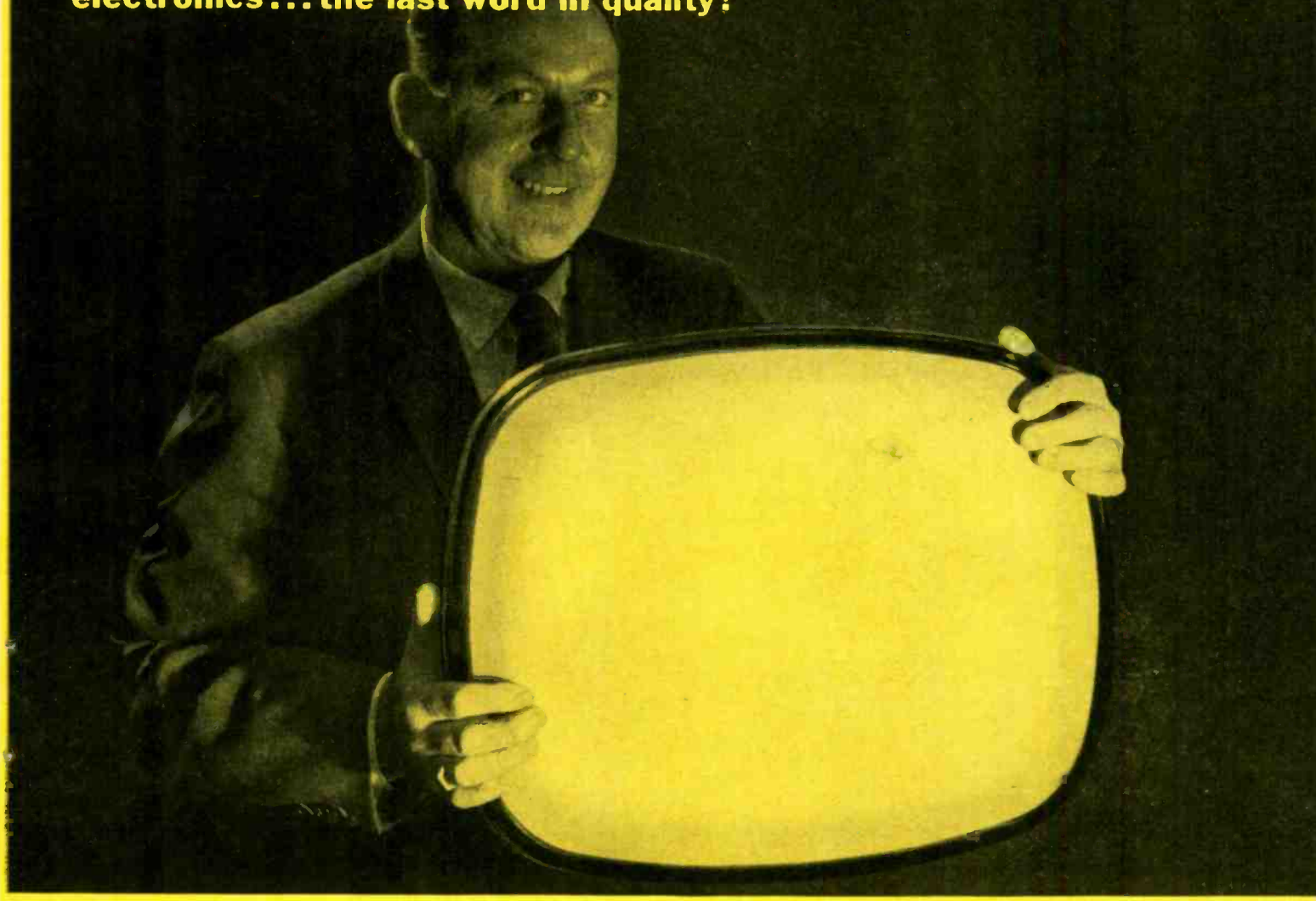
SENCORE is celebrating their 10th anniversary during 1960. The company now has two plants, over 15,000 sq. ft. in Addison, Ill., and recently passed the milestone of selling their one millionth unit.

TUNG-SOL has elected the following Vice Presidents: FRANK J. EHRINGER, Gen. Mgr. of the Automotive Products Div.; BURTON R. LESTER, Gen. Mgr. of the Semiconductor Div.; and DR. R. BURTON POWER, JR., Engineering. The company announced further appointments as follows: HAROLD F. COOK, Sales Planning Mgr.; ROBERT E. BILBY ,Advertising & Sales Promotion Mgr.; DONALD A. BEWKES, Mgr. of Production Planning & Customer Service; and GEORGE A. JOLLIE, JR. was promoted to the OEM Headquarters Sales Staff.

PHILCO® THE FIRST NAME IN ELECTRONICS

...THE LAST WORD IN QUALITY

For all CR tube replacements, use PHILCO STAR BRIGHT 20/20 ALUMINIZED TUBES. Their premium quality reflects Philco leadership in creating the revolutionary S-F (semi-flat) Picture Tube and many other famous firsts in the industry. In addition, you can offer your customers the double protection of Bond and Warranty. For the newest advances in CR tubes, look to Philco—the first name in electronics...the last word in quality!



SEE YOUR PHILCO DISTRIBUTOR TODAY!

PHILCO ACCESSORY DIVISION

WORLD-WIDE DISTRIBUTION

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

PHILCO CORPORATION ACCESSORY DIVISION
ATTN. Carl Areschaug
P. O. Box 3635
Philadelphia 25, Pa.

If you service television and radio receivers and would like to receive valuable promotional mailings from Philco, attach this coupon to your Company letterhead and forward to above address.

NAME_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

ET-2

[illegible] S. W. 18th Ave.
Portland 5, Oregon
September 22, 1959

Westinghouse Electric Corp.
600 St. Paul Ave.
Los Angeles 17, California

Gentlemen:

We are constantly seeking improved products to recommend and sell to our customers, and we are pleased to inform you that Westinghouse receiving tubes and picture tubes fall into that category.

We changed over exclusively to Westinghouse tubes approximately January 1st, of this year. Since it was a new product to us, we kept complete records of tube failures and customer call backs. Our call backs due directly to tube failures were reduced by over 50 per cent.

It is with complete confidence that we recommend and sell your quality Gold Star picture tubes. The picture quality is excellent, and the tubes are exceeding our greatest expectations. In the past nine months, we have used approximately 500 picture tubes, and as of now have only replaced three. Two of which were defective out of the carton, and only one failed in actual use. In fact, we are so confident in the life of the picture tube, that we are now guaranteeing our picture tube replacements for three years.

We have gained two things by the use of your tubes. Greater customer satisfaction, and more net dollars for us due to the very minimum amount of tube failures.

Please thank your Engineers and Quality Control Department for the fine product that they are putting in our hands to sell to the consumers.

Sincerely yours,

ACE RADIO & TV SERVICE

Philip Blank

Philip Blank

PB:jd

"call backs reduced by over 50%!"

"It is with complete confidence that we recommend and sell your quality Gold Star picture tubes."

"We are so confident in the life of the picture tube that we are now guaranteeing our picture tube replacements for three years."

"We have gained...greater customer satisfaction, and more net dollars for us due to the very minimum amount of tube failures."

We can't think of a thing to add. Except, perhaps, that your local Westinghouse electronic tube distributor will be happy to introduce you to the line. If your distributor doesn't carry them yet, give us his name. We'll send someone over to enlighten the poor fellow.

YOU CAN BE SURE...IF IT'S Westinghouse

Westinghouse Electronic Tube Division, Elmira, N.Y.

Reps & Distributors

MICHAEL SCOTT CO. has appointed WALTER T. HYNES to the post of Office Sales-Administrator.

ROCHESTER RADIO SUPPLY has been joined by ANTHONY G. SCHIFINO as Executive Vice Pres.

SILICON TRANSISTOR CORP. reports the appointment of PHILADELPHIA ELECTRONICS, INC. as distributor.

ELECTRONIC INSTRUMENT CO. named ROBURN AGENCIES, INC., N.Y.C., as the company's new export representatives.

BLONDER-TONGUE announces that representation for Va. and W. Texas is now being handled by LAND-C-AIR SALES CO. and HYDE ELECTRONICS CO., respectively.

SENCORE honored JIM FLORA as their "Rep of the Year," an award based on the greatest volume of sales made by any rep organization for the company throughout the nation.

SLATE & CO. will soon move to their new building at 3960 Merritt Ave., The Bronx, which features an acoustically designed hi-fi/stereo showroom and demonstration room which their customers may use.

ENTRON appointed JOHN MUSTICO sales rep for the new line of master TV antenna systems equipment, covering So. N.J., Va., Md., E. Pa., Del., and Wash., D.C. JACK BROWN ASSOC. will cover the territory of N.Y.C., N.Y. State and No. N.J.

DE WALD RADIO has appointed the following reps: IRVING ROSE ASSOC., N. Ill. and Wisc.; WORLD WIDE PRODUCTS, INC., Fla.; ROBERT REISS ASSOC., New England; FRED WAMBLE, Sales, N. & S. C., Ga., Ala., Miss., Tenn.; ROBERT M. MINTHORNE CO., Wash., Ore., Alaska, Vancouver I., Canada.

HOFFMAN Semiconductor Div. has named the following distributors: RADIO ELECTRONIC SUPPLY CO. and RISSI ELECTRONIC SUPPLY CO., Michigan; and C & G RADIO SUPPLY CO., Northwestern U.S. The Consumer Products Div. has appointed three new Eastern distributors as follows: CERULLO ELECTRIC SUPPLY CO., N.E. Pa.; IGOE BROS., N.Y.C., Long Island, Richmond Co., 14 No. N.J. Cos., and Fairfield and the S. halves of Middlesex and New Haven Cos. in Conn.; and VERMONT ELECTRIC, state of Vt.

ONLY and ONLY V-M *has* ***"ADD-A-TRACK"*** *the MOST Practical, the MOST Useable, the MOST Unusual Feature ANY Top Tape Recorder has to Offer!*

WHAT IS "ADD-A-TRACK"? "Add-A-Track" is an exclusive V-M feature that allows the user of a V-M 'tape-o-matic'® Model 720 to record vocal or instrumental music or voice alone. Any tape recorder can do that, you say? *Wait just one minute!* After the user does this, he simply rewinds the tape and, while listening to the first recording, records the musical accompaniment or "second" voice on another track of the tape, which in the playback will be heard as a simultaneous recording.

HOW DOES IT WORK? Suppose you play the piano and would like to hear how you would sound playing a duet with yourself? *Here's how:* With V-M's Model 720, you simply set up for regular recording, play the number, rewind, turn the SELECTOR knob to ADD-A-TRACK and then record your accompaniment. In the playback, the first recording is heard through an accessory amplifier-speaker (as V-M Model 166) while the second recording is being heard from the tape recorder itself. Pre-recorded "Add-The-Melody" tapes are also available on the market.

IMAGINE the unlimited applications of this exclusive feature to teaching and learning... in Education... in Business... in Industry, in addition to its appeal for pure "home entertainment"!

V-M Model 720 is a NEW FOUR-TRACK TAPE RECORDER with the *"TOP TWELVE" SELLING FEATURES*

- PLAYS ALL STEREOPHONIC TAPES (2-track, 4-track, either stacked or staggered)
- RECORDS AND PLAYS-BACK MONOPHONICALLY
- CATHOPTIC TUNING EYE FOR PROFESSIONAL-QUALITY RECORDING RESULTS
- A HIGH QUALITY, HIGH FIDELITY MICROPHONE (included)
- BLUE-GRAY LEATHERETTE CASE—COMPLETELY PORTABLE —ONLY $225.00† list
- MODEL 166 AUXILIARY AMPLIFIER-SPEAKER—$75.00† list

†Slightly higher in the West

AND...V-M Puts You in the Tape Recorder Business...

No costly inventory investment... a complete "sales activity" package includes display fixtures, point-of-sale, promotions... *EVERYTHING!* V-M's giant *"Family Pleasure Package"*—an irresistible consumer buying incentive. It's a complete V-M created kit of entertaining and educational "things-to-do" with a tape recorder for the whole family. BIG "How-To-Do-It" Manual included.

You'll immediately spark real interest and create profitable sales with this colorful counter-high *V-M Tape Recorder Sales Center.* Versatile, utilitarian, hard-hitting display fixture has space for a V-M tape recorder, plus extra profits in display of V-M tape editing kit and accessory mike stand. It effectively displays V-M "Family Pleasure Package."

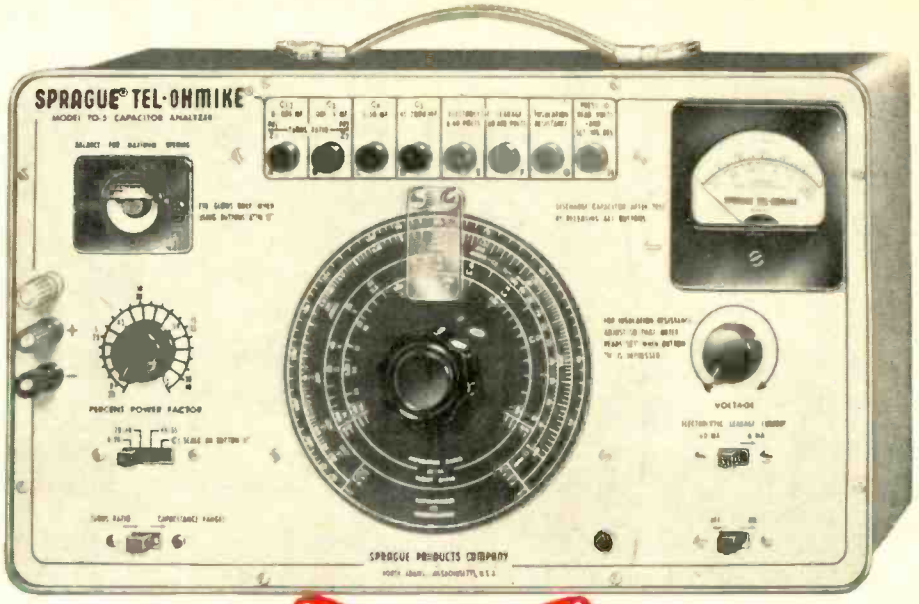
Stay on the "Right Track" with "ADD-A-TRACK"... ONLY from V-M!

your choice for music is

the Voice of Music®

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

TRY THE TO-5



TEL-OHMIKE®
capacitor analyzer

measures all 4 . . . plus

1 CAPACITANCE	2 POWER FACTOR	3 LEAKAGE CURRENT	4 INSULATION RESISTANCE	extra feature TURNS RATIO
Measures up to 2000 μf in five overlapping ranges . . . including an accurate 1 to 100 μμf range, exclusive with Sprague.	Power factor of electrolytic capacitors is measured by the highly accurate bridge method. Reads up to 55% in three ranges for convenience in measurement.	Leakage current of electrolytics is measured directly on the meter, with exact rated voltage up to 600 v. applied from continuously adjustable power supply. Two ranges—0-6-60 ma.	Insulation resistance of paper, ceramic, and mica capacitors is read directly on meter . . . up to 20,000 megohms.	In addition to its function as a complete capacitor analyzer, the TO-5 also measures the turns ratio of power and audio transformers.

SPRAGUE'S TO-5 TEL-OHMIKE Capacitor Analyzer is one of the fastest and surest ways of measuring . . . capacitance, power factor, leakage current, insulation resistance, and turns ratio. The compactness and accuracy of this easy-to-use instrument make it ideal for general industrial laboratory testing.

The jumbo rotating dial makes meter reading easy. You don't have to turn your head to read this bridge. Special color-keyed pushbuttons permit instant range selection . . . and allow automatic safety discharge of capacitors after testing. Magic-eye tube simplifies bridge balancing for capacitance and power factor measurements.

TO SEE THE TO-5 TEL-OHMIKE IN ACTION . . . CALL YOUR ELECTRONIC DISTRIBUTOR TODAY!

This 4-in-1 test instrument is only 8⅞" high, 14⅝" wide, and 6⅛" deep . . . weighs a mere 12½ pounds. The complete price for . . .

MODEL TO-5 (115 VAC/50-60 cy) . . Only **$83.90 net**

Also available: Model TO-5X for 115-230 V/25-60 cy . . . $89.90 net
Model TP-5RM for rack mounting . . . . . $93.90 net

SPRAGUE®
world's largest capacitor manufacturer

SPRAGUE PRODUCTS COMPANY, DISTRIBUTORS' DIVISION OF SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASS.

Catalogs & Bulletins

CONNECTORS: Bulletin PR259 is a colorful, 8-page, circular covering "Supercon" electrical connectors. Includes illustrations, charts and prices. Superior Electric Co., Bristol, Conn. (ELECTRONIC TECHNICIAN B2-8)

DIODES: Articles on referencing and instrumentation with zener diodes, and output regulation utilizing the switching action of zener diodes, are contained in Rectifier News, RN-1159. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN B2-5)

TRANSISTORS: A new 16-page brochure, G-200, describes a complete line of PNP and NPN transistors most widely used by original equipment manufacturers. Specifications, characteristics and applications are included. General Transistor Corp., 91-27 138th Place, Jamaica 35, N. Y. (ELECTRONIC TECHNICIAN B2-4)

CAPACITORS: Literature covers a complete line of new subminiature, round and flat, paper-dielectric capacitors. Type designated as "MF" for subminiature flats, and "MR" for subminiature rounds, they are especially suited for the close stacking and assembly requirements of miniature electronic devices. Capcon, Inc., 61 Stanton St., New York 2, N. Y. (ELECTRONIC TECHNICIAN B2-1)

NEWSLETTER: Information about electronic industry advertising, sales administration, supervision, directory listings, books, pamphlets, opportunities, methods, publicity, marketing ideas, etc. are now available in a newsletter. A free sample copy is available upon request from Electronic Advertising Service, 8526 Eleventh Ave. South, Minneapolis 20, Minn. (ELECTRONIC TECHNICIAN B2-3)

(Continued on page 98)

PHILCO® THE FIRST NAME IN ELECTRONICS

. . . THE LAST WORD IN QUALITY

All Philco UNIVERSAL AND HIGH FIDELITY SPEAKERS are audio-engineered for top performance. Your Philco Distributor has a complete line—from miniature "Space-Saver" speakers to complete High Fidelity Systems. For all TV, Home and Auto Radio replacements, as well as Inter-com Systems and special applications, choose Philco—the first name in electronics . . . the last word in quality!

AUTO RADIO REAR SEAT SPEAKER KITS for all cars.

REPLACEMENT SPEAKERS for all makes of TV and radio receivers.

HIGH FIDELITY SPEAKERS and speakers for all special purposes.

SEE YOUR PHILCO DISTRIBUTOR TODAY!

PHILCO ACCESSORY DIVISION

WORLD-WIDE DISTRIBUTION

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

PHILCO CORPORATION ACCESSORY DIVISION
ATTN. Carl Areschoug
P. O. Box 3635
Philadelphia 25, Pa.

If you service television and radio receivers and would like to receive valuable promotional mailings from Philco, attach this coupon to your Company letterhead and forward to above address.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

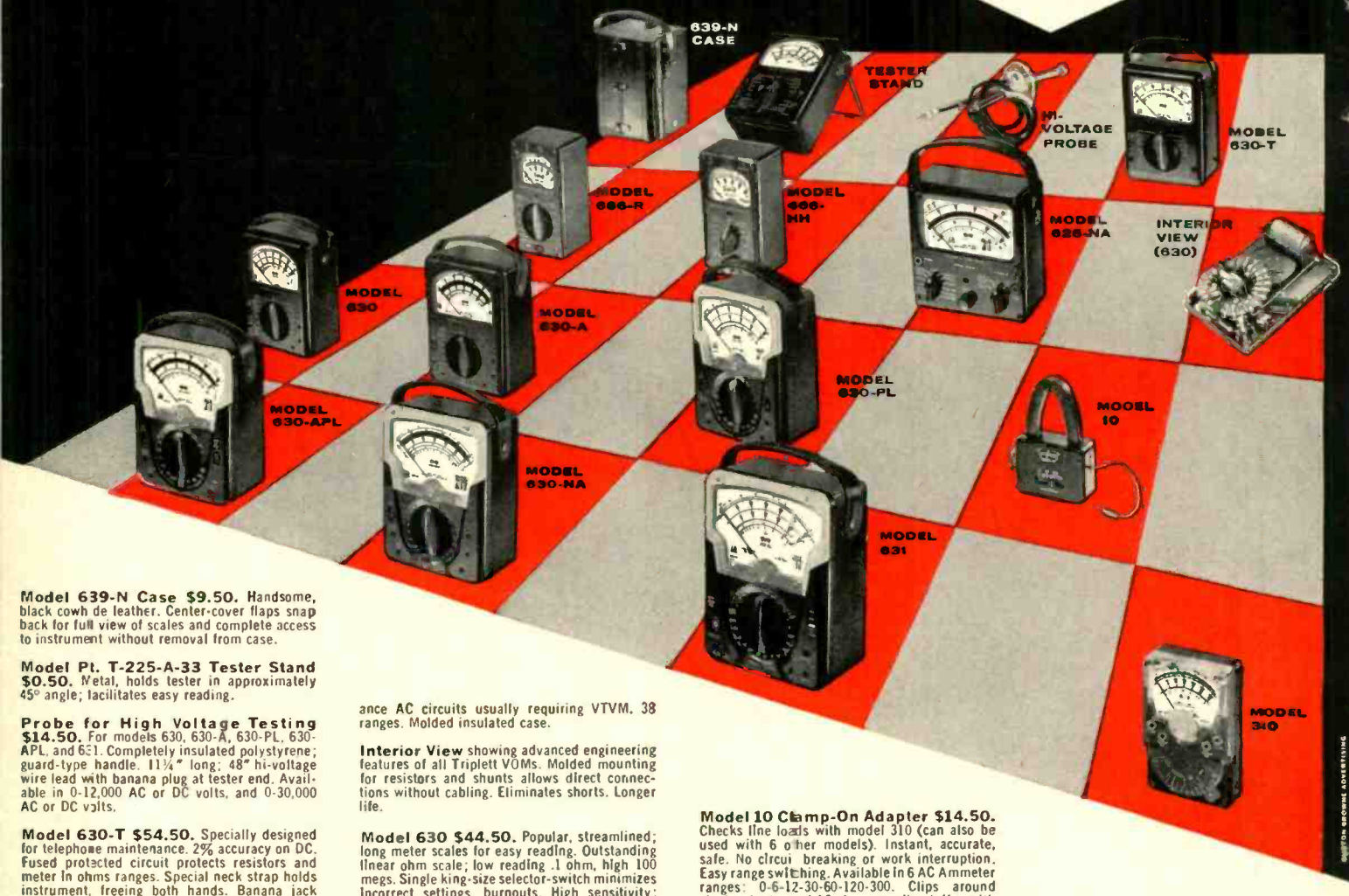
ET-2

. . . the smartest move you can make

is to **TRIPLETT VOMs**

. . . the world's most complete line of VOMs for every purpose!

TRIPLETT
Quality. . .
First to last



Model 639-N Case $9.50. Handsome, black cowh de leather. Center-cover flaps snap back for full view of scales and complete access to instrument without removal from case.

Model Pt. T-225-A-33 Tester Stand $0.50. Metal, holds tester in approximately 45° angle; facilitates easy reading.

Probe for High Voltage Testing $14.50. For models 630, 630-A, 630-PL, 630-APL, and 631. Completely insulated polystyrene; guard-type handle. 11¼" long; 48" hi-voltage wire lead with banana plug at tester end. Available in 0-12,000 AC or DC volts, and 0-30,000 AC or DC volts.

Model 630-T $54.50. Specially designed for telephone maintenance. 2% accuracy on DC. Fused protected circuit protects resistors and meter in ohms ranges. Special neck strap holds instrument, freeing both hands. Banana jack connectors eliminate all shock hazard. Completely insulated case protects from ground.

Model 666-R Pocket VOM $29.50. Hand size, ideal for electrical maintenance. With recessed range knob it fits easily into case. AC rectifier pre-calibrated unit for easy replacement. Banana jacks at panel top prevent leads falling over meter dial. Single king-size selector switch minimizes incorrect settings, burnouts. 20 ranges. Molded case streamlined, fully insulated.

Model 666-HH Pocket VOM $27.50. Compact, hand-size; 3" meter integral with panel, adjusted to 400 microamperes at 250 millivolts. Only 3 jacks necessary for all ranges. 19 ranges.

Model 625-NA $54.50. Dual sensitivity for extra ranges; large mirror scale for super readability. 3-color meter scale 5" long. 6" instrument, 0-50 microamp. AC volts at 10,000 O/V for checking many audio and high impedance AC circuits usually requiring VTVM. 38 ranges. Molded insulated case.

Interior View showing advanced engineering features of all Triplett VOMs. Molded mounting for resistors and shunts allows direct connections without cabling. Eliminates shorts. Longer life.

Model 630 $44.50. Popular, streamlined; long meter scales for easy reading. Outstanding linear ohm scale; low reading .1 ohm, high 100 megs. Single king-size selector-switch minimizes incorrect settings, burnouts. High sensitivity: 20,000 ohms per volt DC; 5,000 AC. Molded, fully insulated case.

Model 630-A $54.50. Laboratory type; ½% resistors for greater accuracy. Long mirrored scale eliminates parallax. Banana jacks, low resistance connections; high flux magnet increases ruggedness. Single king-size selector switch minimizes incorrect settings, burnouts. Molded fully insulated case.

Model 630-PL $44.50. Instant-vision, wider spread scales; streamlined case; handsome modern design. Unbreakable window. Outstanding linear ohm scale; low reading .1 ohm; high to 100 megs. Single king-size selector switch minimizes incorrect settings, burnouts. 5 to 500,000 cps frequency response in AC measurements. DC Polarity Reversing switch. High sensitivity: 5,000 ohms per volt AC; 20,000 ohms per volt DC.

Model 10 Clamp-On Adapter $14.50. Checks line loads with model 310 (can also be used with 6 other models). Instant, accurate, safe. No circuit breaking or work interruption. Easy range switching. Available in 6 AC Ammeter ranges: 0-6-12-30-60-120-300. Clips around single wire to read AC. Amperes direct. Use with adapter 101 to instantly divide 2-conductor cords. Molded case fully insulated, black plastic with engraved white markings.

Model 630-APL $54.50. Laboratory type with ½% resistors, more accurate movement. Long mirrored scales eliminate parallax. Unbreakable window. Single king-size switch minimizes incorrect settings, burnouts. 5 to 500,000 cps frequency response in AC measurements. DC Polarity Reversing switch. High sensitivity: 5000 ohms per volt AC; 20,000 ohms per volt DC. Molded case fully insulated.

Model 630-NA $74.50. Super DeLuxe with 70 ranges—nearly double conventional types. Frequency compensated from 35 cps to 20 kc. Temperature compensated. Accurate within 1½% full scale reading on DC. Large open front meter easy to read. Unbreakable window. Mirrored scale. Meter protection against overloads. Molded fully insulated case.

Model 631 Combination VOM and VTVM $64.50. Two fundamental units at the price of a single tester. The No. 1 instrument for all electronic men. Battery operation assures VTVM stability and long life. Sensitivity PLUS. 1.2 volt (VTVM) range is equal to more than nine million ohms per volt. Large easy to read meter with unbreakable face. Single king-size selector switch minimizes incorrect settings, burnouts. Molded case fully insulated.

Model 310 $34.50. The only complete miniature VOM with 20,000 ohms per volt and selector range switch. Self-shielded against strong magnetic field. Rugged, high torque, barring instrument. Unbreakable plastic meter window. Converts to common probe—frees one hand—by fitting interchangeable test prod into top. Standard sensitivity 20,000 ohms per volt DC, and 5,000 ohms per volt AC. Accuracy 3% DC. Molded fully insulated case.

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TRIPLETT ELECTRICAL INSTRUMENT COMPANY
BLUFFTON, OHIO

ELECTRONIC TECHNICIAN
Including SERVICE Magazine

He Profits Most Who Serves Best

Rotary International Motto

It seems incongruous for a business that serves the general public to neglect profit-making "extras"—but this is largely true within the TV service industry.

Although a mature industry in some ways, TV shops generally effect a rather immature retail sales outlook. Whether this business negligence is due to lack of training or foresight is not as important as the result: TV technicians are remiss in bringing home that extra, legitimate profit. The customer loses by not being made aware of the added enjoyment that is available.

True, service is the nucleus of your business, but does this mean it should be the only phase of it? Why impose a limitation on your earnings? Many businesses earn the major part of their profit through allied extras. For example, automobile sales profits are greatly enhanced by selling accessories.

Numerous organizations spend considerable sums to get their salesmen within talking range of a customer. Home TV service technicians not only have natural access to customers, they are also welcomed as experts in their field, and as such, can easily sell accessories allied to their profession.

What is wrong with talking extras while repairing a TV set or making out a service bill? How many extra speaker sales have *you* lost? Or installing a phone tap? Or head phones? Or transistor radios? Or multi-set couplers? Or batteries? Or needles?

How about an L or T pad to control the extra speaker's volume independently?

A recent TV manufacturer's survey revealed that 51% of the people enjoying night-time bedroom TV fall asleep with the set on. Why not help these viewers by selling and installing clock-timers?

A printed list of sales-installation reminders with accompanying prices can be offered for the customer's perusal while servicing his set. Slick salesmanship is not required or desired. Many items just sell themselves.

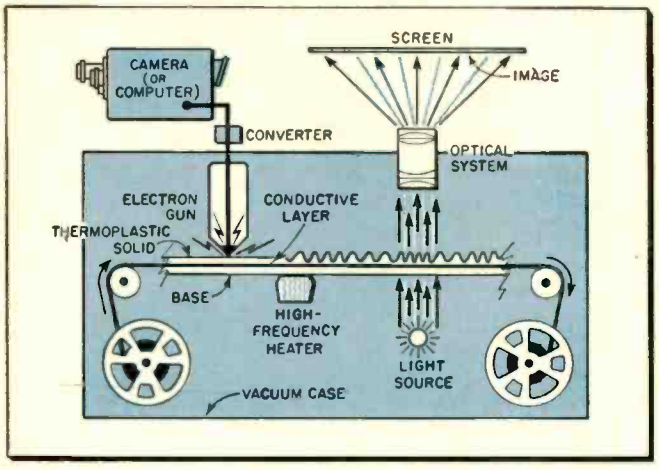
The opportunity offered by effortless low-pressure selling of extra merchandise and service is almost limitless. Don't be instrumental in making your customers do-it-yourselfers and surplus store shoppers. They need your service talent. Properly handled, customers are appreciative and willing to pay for extras—if only you'd let them know they're available.

Tuning In the

THE NATIONAL BUREAU OF STANDARDS has decided to follow the recommendations of the International Committee on Weights and Measures to use new prefixes for denoting multiples and sub-multiples of units. In addition to the 8 numerical prefixes in common use, which are given in the table below, the Committee expanded the list by adding the 4 prefixes marked with an asterisk. Thus, for example, 10^{-12} farad is called 1 picofarad, and is abbreviated 1 pf.

MULTIPLES AND SUB-MULTIPLES	PREFIXES	SYMBOLS
$1\,000\,000\,000\,000 = 10^{12}$	tera*	T
$1\,000\,000\,000 = 10^{9}$	giga*	G
$1\,000\,000 = 10^{6}$	mega	M
$1\,000 = 10^{3}$	kilo	k
$100 = 10^{2}$	hecto	h
$10 = 10$	deka	dk
$0.1 = 10^{-1}$	deci	d
$0.01 = 10^{-2}$	centi	c
$0.001 = 10^{-3}$	milli	m
$0.000\,001 = 10^{-6}$	micro	μ
$0.000\,000\,001 = 10^{-9}$	nano*	n
$0.000\,000\,000\,001 = 10^{-12}$	pico	p

THERMOPLASTIC TV RECORDER



New GE process records pictures on film electronically. Technique may have a profound effect on TV, movies and computers. In operation, picture signals from TV camera or converter modulate electron gun scanning film. Electrons are deposited on thermoplastic film (there is no emulsion) which is heated and softened by an r-f heater. This distorts the film surface in proportion to electron density, producing an image which may be viewed optically. System operates in a high vacuum (0.1 micron). Recording is immediate, editing is visual. Film may be erased and reused.

"You need a new TV set, and incidentally, that's a free estimate."

ELECTRONIC TEACHING machine developed at New York Institute of Technology instructs the student, tests him, corrects his errors, and makes him report the information until he has learned it. The machine never loses its patience. The $1200 unit combines records, intercom and closed circuit TV systems. A teacher (human variety) sits at a master control in another room, and can speak to the students indivdually or as a group.

IMPORTS of electronic products into the U. S. during the first 9 months of 1959 totaled in excess of $48.8 million, and were more than 2½ times those of the same period in 1958, while exports declined 5% to $261 million, the Electronics Div., Business and Defense Services Administration, U.S. Dept. of Commerce has reported. Among the increased imports were "radio apparatus and parts." The rapid rise in these imports —from $3.4 million in 1955 to $28.2 million in 1958 to $43.3 million during the first 9 months of 1959—is attributable principally to the increased shipments of radios from Japan. Other principal suppliers are West Germany, the United Kingdom and the Netherlands. The U.S. is by far the most important single foreign market for United Kingdom electronics producers, accounting for $17.2 million in 1958.

Imports into the U.S. of radios, radio-phonos. and TV receivers from West Germany in 1958 totaled $10.2 million; sound recording and reproducing equipment, $3.9 million. Significant among current Japanese shipments of electronic products to the U.S. are radio receivers—principally transistor portables. Japanese shipments of radio receivers of all types (not including radio-phonographs) to the U.S. numbered 641,208 in 1957; 2,506,920 in 1958 and 3,900,222 in the first 9 months of 1959; valued at $5.3 million; $17.9 million and $37.5 million, respectively.

Picture .....

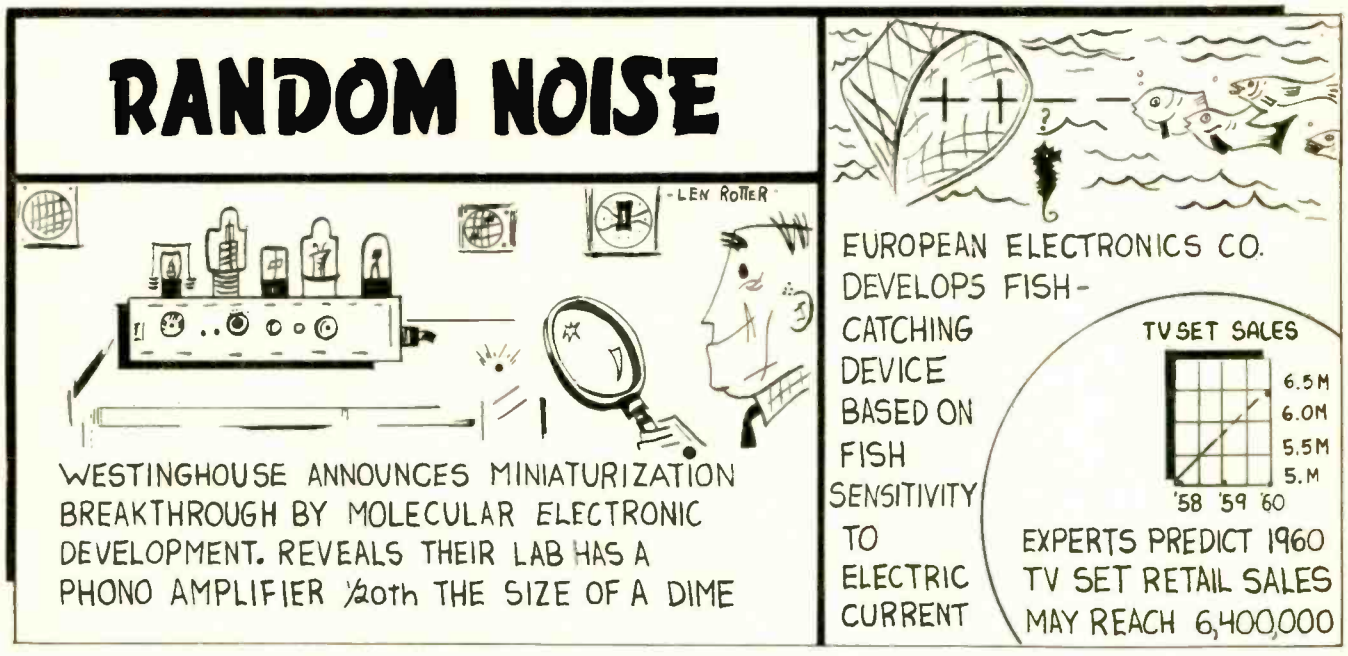
COLOR PICTURE concepts advanced by Dr. Edwin H. Land (Editor's Memo, June 1959) have been studied by a special Electronic Industries Association subcommittee. The EIA recommendation is that Land and others be encouraged to continue their investigations, but that the Standard FCC color TV signal be left unchanged at this time. The FCC signal contains the information for present three-color reproduction, as well as the binary color system outlined by Land. It will be recalled that the binary system, which appears to contradict Maxwell's 100 year old color laws, utilizes two black-and-white photo separation negatives taken through red and green filters, respectively. The red-filtered positive is projected with red light, the green with white, unfiltered light. The resulting "two color" picture produces practically all colors of the original scene.

MOST POWERFUL transistorized computer, is the way IBM describes its Model 7090. Several of these units are being shipped to Sylvania for incorporation in the Air Force's BMEWS—Ballistic Missile Early Warning System. The computer can simultaneously read and write electronically at the rate of 3 million bits of information per second. It can find stored data in 2.18 millionths of a second. Industrial applications include inventory control, production control and accounting. Two 7090's will form the nerve center of American Airlines' SABRE reservation system. A typical 7090 system sells for $2,750,000 in U.S. currency. Or if you're a little short on cash, it rents for $65,000 per month.

CALENDAR OF COMING EVENTS

Feb. 25-26:	American Institute of Electrical Engineers, Atomic Energy Commission, The Institute of Radio Engineers and the National Bureau of Standards: 7th Scintillation Counter Symposium, Hotel Shoreham, Washington, D.C.
Mar. 21-24:	IRE National Convention, Coliseum and Waldorf Astoria Hotel, New York, N.Y.
Mar. 24-25:	IRE Professional Group on Human Factors in Electronics, 1st Annual Symposium, Bell Telephone Laboratories Auditorium, 463 West St., New York, N.Y.
Apr. 4-7:	1960 Nuclear Congress & Atomic Exposition, New York Coliseum, New York, N.Y.
Apr. 18-19:	Conference on Automatic Techniques, Sheraton Cleveland Hotel, Cleveland, Ohio.
Apr. 20-22:	S.W. IRE Regional Conference & Electronics Show, Shamrock-Hilton Hotel, Houston, Tex.
Apr. 29-May 1:	Producers of Associated Components For Electronics, Annual Meeting, Nevele Hotel & Country Club, Ellenville, N.Y.
May 2-4:	National Aeronautical Electronics Conference, Baltimore and Miami Hotels, Dayton, Ohio.
May 3-5:	Institute of Radio Engineers, American Institute of Electrical Engineers and Association for Computing Machinery; Western Joint Computer Conference, Jack Tar Hotel, San Francisco, Calif.
May 16-18:	Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.

TRANSISTORIZED TV made by Sony will be marketed in Japan at a retail price of about $200. It weighs 13 lbs. with 2-lb. rechargeable 12-volt battery, and contains 23 transistors, 14 diodes, 8" picture tube and built-in antenna. On ac, it draws 15 watts.



Install TV Vertical Blanking Circuits

Minor Component Additions Can Enhance TV Picture Quality

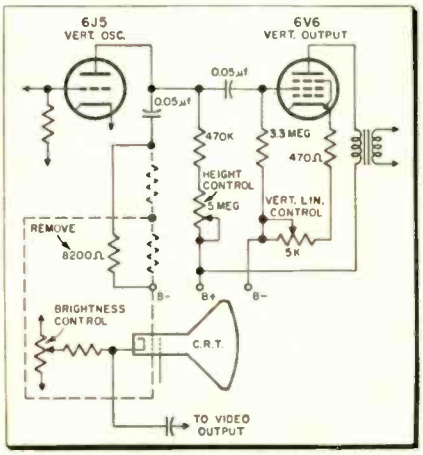
EDWARD C. KILEY

• A large number of relatively old small and medium screen TV receivers are being used without vertical retrace blanking circuits. An undetermined number of additional large screen sets are also operating without retrace blanking or with inadequate blanking provisions.

Most receivers in this category can be improved by simple circuit changes or additions. Alterations are usually performed by a technician at the time of another repair, or when a general overhaul is required.

If a CRT test indicates normal emission and the video drive to its grid or cathode is proper, vertical retrace lines should not appear on the screen when the set's contrast and brightness controls are adjusted to optimum points. If typically bright retrace lines do appear and can be eliminated only by lowering the brightness below normal or by adjusting the contrast to the overload point, then the vertical retrace blanking circuit is non-existent or inadequate.

Fig. 1—On some small screen Motorola and similar circuits, remove the original single resistor and substitute two values approximating 5600 and 2700 ohms as indicated by dotted lines. Exact value of each resistor may be determined with potentiometers.



Design Considerations

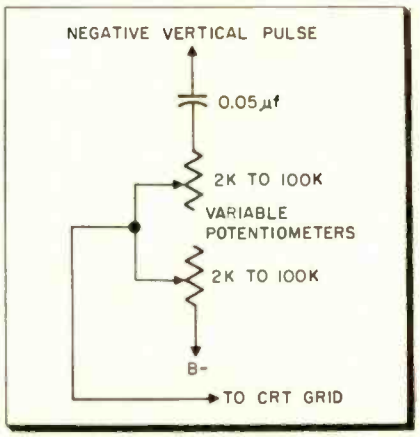
It is generally agreed that vertical blanking pulses should not be applied to the driven element of a CRT, although possible, when certain precautions are observed. It is advisable, therefore, to feed the blanking pulse to the cathode, when the grid is being driven, and vice-versa.

In all vertical retrace blanking circuits it is likewise obvious that a *negative* going spike must be applied to the grid of the CRT or a *positive* pulse at the cathode.

In certain dual-chassis TV sets, for example, some old Philco's, certain difficulties may arise because of extended cabling arrangements between the units. In this case it is recommended that a request be made direct to the manufacturer for detailed information on vertical retrace blanking conversions. Little difficulty will be encountered in those sets with fully integrated chassis.

Leads carrying a vertical pulse from chassis to CRT should be dressed away from all other CRT leads, and coupling capacitors used in the conversion circuit should be rated at 600 d-c working volts.

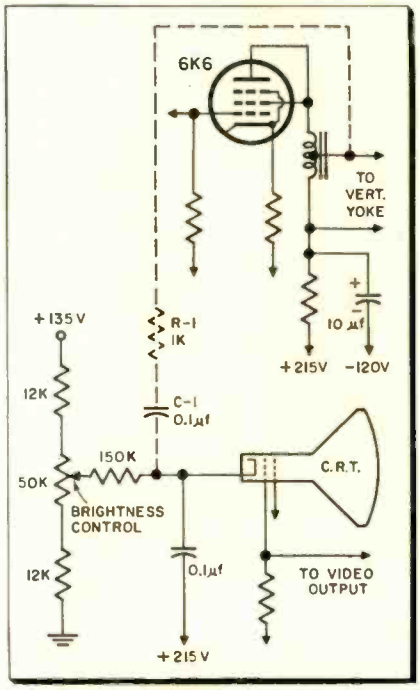
Fig. 2—When two resistors are required, optimum resistance values can be quickly determined by inserting two potentiometers in the circuit.



Practical Examples

In some old sets where a circuit arrangement approximates that illustrated in Fig. 1, dotted lines indicate added components needed for the blanking circuit. The CRT grid was originally connected directly to B—. An 8200 ohm resistor was connected to the vertical discharge capacitor, C-1, and also to

Fig. 3—In this and comparable circuits, a positive vertical retrace blanking pulse is obtained from the transformer center tap.



the B— point. The changes necessary to provide this circuit with vertical retrace blanking are as follows:

1. Remove the 8200 ohm resistor and disconnect the CRT grid from the B— point.
2. Connect a 5600 ohm and a 2700 ohm ½ watt resistor in series and attach the lead from the 5600 ohm resistor to C-1.
3. Attach the lead from the 2700 ohm resistor to B— and the CRT grid lead to the junction point of the two resistors. This arrangement will provide a negative vertical spike of approximately 25 volts p-to-p to the CRT grid.

If any difficulty is encountered with this arrangement, connect two 10k potentiometers in series, as illustrated in Fig. 2, adjusting each resistor until optimum results are obtained. Next, with a VOM, measure the circuit resistance provided by each pot, and substitute this amount with two fixed resistances as previously described. In this particular circuit the total resistance must remain approximately the same as originally designed, since the vertical discharge time-constant is involved.

In some 1949 sets utilizing the circuitry shown in Fig. 3, only two parts are necessary—a 0.1μf capacitor, (C-1), and 1K resistor (R-1). If confirmed maximum results are desired, use a capacitor substitution box to obtain optimum value for C-1, and a 2K variable resistor for arriving at a close value for R-1, as illustrated in Fig. 4. A positive vertical spike of approximately 50v p-to-p is applied to the CRT cathode.

Fig. 5 illustrates another type of vertical circuit used in some RCA

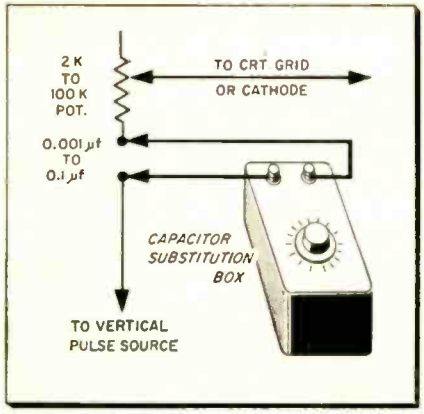


Fig. 4—Exact values of resistance and capacitance can be selected by using a variable resistor and capacitor substitution box.

and other sets having similar circuits. A positive vertical spike is applied to the CRT cathode from the vertical output transformer through a 1K resistor and a 0.1μf capacitor.

Fig. 6 illustrates a portion of the vertical component section of some RCA sets manufactured in 1951. Dotted lines indicate wiring and component additions.

Many different TV receivers with CRT sizes ranging from 17" to 21", were manufactured in 1951 and 1952 minus retrace blanking circuits. Obviously, specific instructions cannot be given for all types. However, Fig. 7 illustrates two circuit configurations, indicating typical grid and cathode component variations encountered in many of these sets. Vertical retrace blanking networks are shown in dotted lines.

You don't have to slough off customer complaints concerning retrace lines with, "It's in the design of the set." It's not a difficult job and is helpful in building your reputation as an expert technician. •

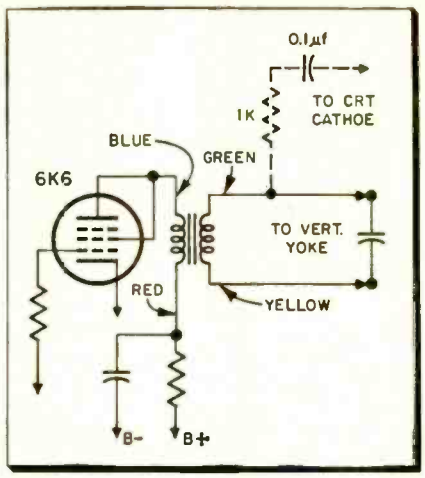


Fig. 5—In some RCA and similar circuits the positive vertical pulse is obtained from the green lead transformer terminal.

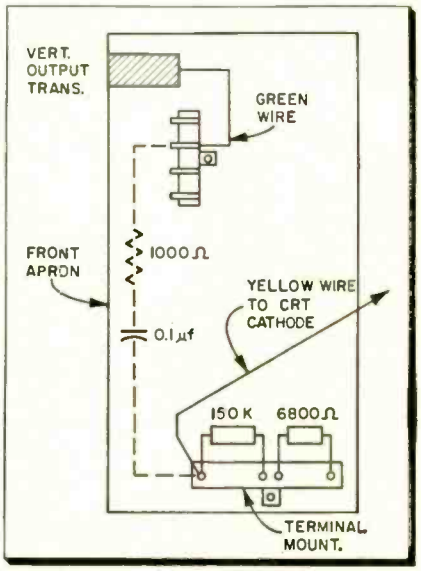
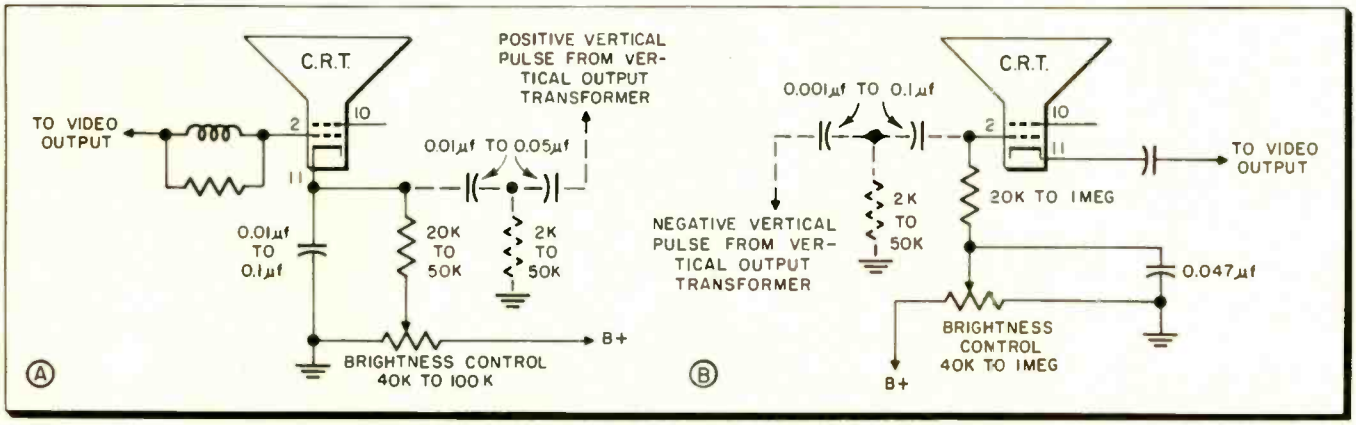
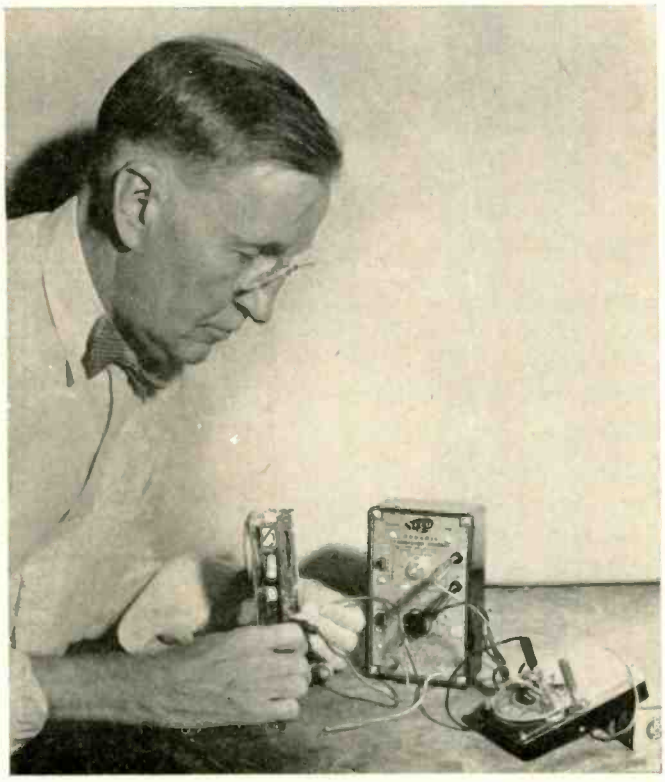


Fig. 6—Front chassis section of some 1951 RCA TV's illustrates simplicity of adding a positive vertical pulse to the CRT cathode.

Fig. 7 (A)—A number of grid-driven large screen TV's were made without vertical retrace blanking provisions. Circuit components vary as indicated, depending upon specific set. (B)—Other similar large screen sets with cathode drive were made having wide circuit variations. All of these sets can be improved by experimentally adding two condensers and one resistor as illustrated in dotted lines.



Exploring Dynamic Transistor Testers



Instrument's Use Of A-C Signal Extends Test Applications

Fig. 1—A dynamic service-type transistor tester includes pin jacks for metering the output with a VTVM or oscilloscope.

JACK HELMI

• Static transistor testing techniques are fairly well-known. Dynamic transistor testers, on the other hand, are generally unfamiliar to service technicians, although well-known to engineers.

In a static transistor tester, current flow through one or more transistor elements is measured under one or more d-c circuit conditions. Gain, for example, is measured by employing the transistor as a simple d-c amplifier. In a dynamic transistor tester, the transistor is operated as an oscillator or as an a-c amplifier with an a-c signal applied.

Testing a transistor by operating it as an oscillator and measuring its output is a technique employed in at least one commercially available service transistor checker. Pin jacks are sometime provided so the output can be metered with an a-c voltmeter, VTVM, or scope, as is common with many service-type testers. See Fig. 1.

An example of the circuitry used in an oscillator-type checker is shown in Fig. 2. The transistor being tested is operated as a blocking oscillator, deriving its power from a self-contained 1.5 volt battery. The frequency at which the transistor oscillates varies from 150 to 12,000 cps and depends mainly upon the type of transistor being tested. The pulsed output of the oscillating transistor is fed to an NE-51 neon lamp which glows only when the transistor oscillates.

When testing transistors to determine if they are operative or defective, the base current control (R-1) is set to the "O" position of its dial scale. The neon lamp will glow if the transistor being tested is functional. It will not glow if the transistor is open, shorted or excessively leaky.

Transistor beta (gain) is determined by advancing the setting of the base current control until the neon lamp goes out and noting the dial scale reading at which this occurs. When matching transistors, those which stop oscillating at approximately the same dial setting possess similar characteristics. The external meter or scope indications can be used as further basis for comparison of transistors.

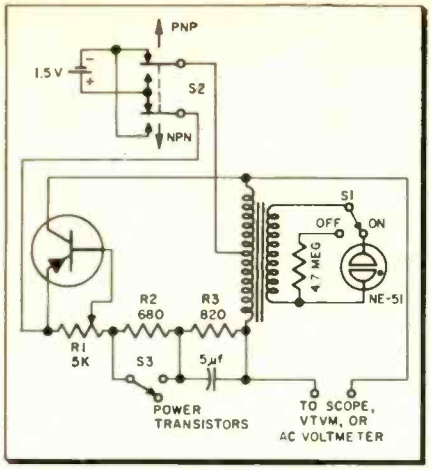


Fig. 2—A blocking oscillator type transistor tester is self-powered by a 1.5 volt battery. Neon lamp glows when transistor oscillates, and doesn't if it is open, shorted or leaky.

To permit testing of both PNP and NPN transistors, the instrument contains a front panel switch (S-2) with which the polarity of the 1.5 volt battery can be reversed to accommodate the type of transistor to be tested. Another switch (S-3) cuts in a 680-ohm resistor (R-3) which reduces circuit feedback to enable testing of power transistors.

A front panel socket is provided for plug-in transistors and retractable clip leads permit testing of loose, lead-type transistors. In addition to loose transistors, testing of transistors without removing them from the circuit can also be done, simply by connecting the clip leads to the transistor leads.

In another dynamic transistor tester with which in-circuit testing of transistors is also possible, the transistor is employed as an amplifier. A fixed frequency signal is fed to the transistor. Gain (beta) is determined by measuring the level of both the input signal and the output signal with a tuned a-c VTVM, and comparing the two signal indications. Fig. 3 shows a block diagram of this tester which is equipped with a 12 volt battery and a selector switch for setting bias to 3, 6 or 12 volts. In-circuit testing of transistors is made possible by feeding the signal in and taking it out at low impedance, nullifying the effects of equipment circuitry.

Lab Instruments

More sophisticated dynamic transistor testers are, of course, available. They're usually fairly heavy and are designed for permanent positioning. In discussing laboratory instruments, it would be remiss to ignore dynamic testing of transistors by an assortment of selected test equipment. The more complex audio oscillator-millivoltmeter-oscilloscope test set-up illustrated in Fig. 4 has aided many labs in their quest for empirical data through dynamic tests. However, individual dynamic lab instruments are readily available. Such an instrument is shown in Fig. 5, using a built-in signal oscillator.

Input impedance, voltage feedback ratio, output admittance, emitter-input current gain, base-input current gain and collector saturation of transistors can be measured with this lab-type transistor test set.

In this instrument, a small 1500-cps signal, obtained from an internal oscillator, is applied to the transistor being tested. This a-c signal is superimposed on the quiescent d-c at various circuit points. The resulting a-c voltages at other circuit points are then measured.

These measurements are made at one frequency. However, by also using a variable frequency oscillator and a wide-band VTVM, the tester

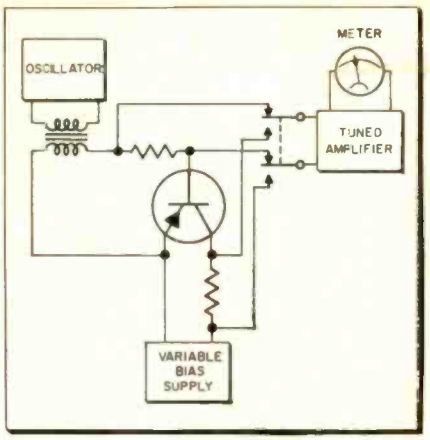


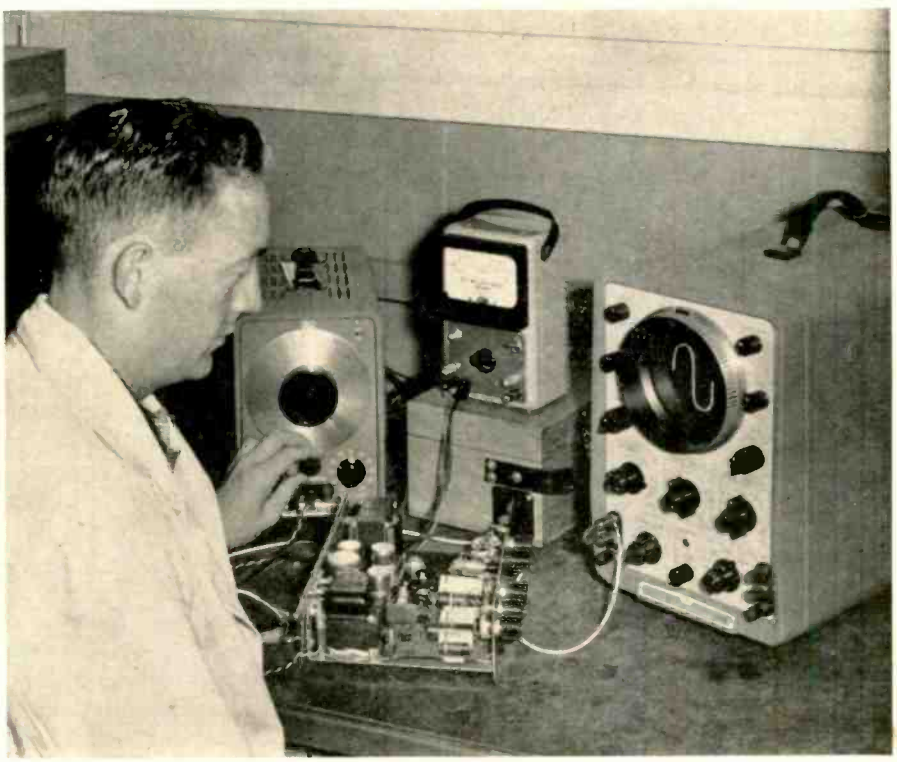
Fig. 3—In-circuit transistor testing is accomplished by employing the transistor as an amplifier—feeding a fixed frequency signal in and taking it out at low impedance.

can also be used for measuring alpha cut-off, beta cut-off and collector capacitance. Controls are provided for adjustment and measurement of d-c emitter current and collector voltage.

In addition to checking transistors to see if they are normal, this kind of tester can be used for determining the characteristics of transistors under d-c operating conditions not listed in transistor spec sheets. It can

(*Continued on page 57*)

Fig. 4—Separate test instruments (audio oscillator, milli-voltmeter and oscilloscope) are being used to make under-operating-condition transistor equipment tests.



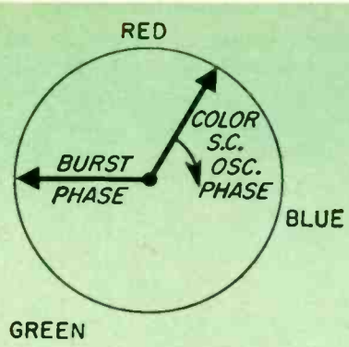


Fig. 1—When the color sub-carrier oscillator and color burst drift out of phase, the sub-carrier oscillator feeds incorrect phase information to the color detectors—causing one or more "rainbows" to form on the screen.

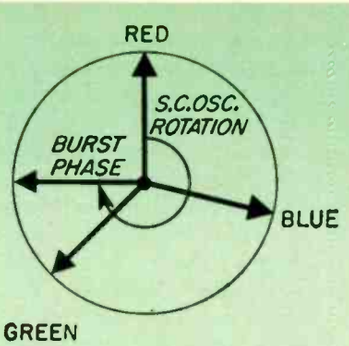


Fig. 2—As the sub-carrier oscillator vector rotates unlocked from the color burst phase, the vector passes successively through the phases of red, blue and green—driving the 3 CRT color guns out of sync.

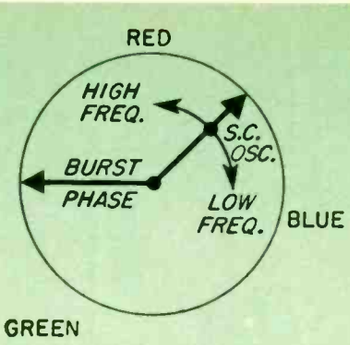


Fig. 3—Representing the average chroma signal against which the sub-carrier oscillator beats, the burst vector rotates counter-clockwise. When the sub-carrier oscillator frequency is too high, its vector moves in a red-green-blue sequence. When too low, it moves in a red-blue-green sequence.

Checking-Out Color TV Rainbows

Analyze Picture Rainbows Caused by Loss of Color Sync

ROBERT G. MIDDLETON

• If color TV is considered an infant industry, the almost ½ million color sets in use throughout the U. S. make it a pretty large baby. And as babies will—suddenly they're grown.

Will you be caught service-wise short when this maturity is reached? Reports indicate the prospect of color catching on soon as being nearer to fulfillment than ever before.

Although the major part of a color TV set requires only basic black and white service techniques, the color section does present problems for the inexperienced color TV technician. Understanding what symptoms indicate which defect is a prime consideration of service work. In the case of color TV, this means color picture analysis.

Color Sync

A common color TV problem is picture "rainbows." Rainbows appear in the picture when color sync is lost. Analyzing the rainbows can give many clues concerning faulty receiver operation. The reason for rainbows forming due to color sync loss is "free wheeling" of the sub-carrier oscillator with relation to the color burst. Observing the picture can determine how far the sub-carrier oscillator is off frequency and in which direction.

Fig. 1 shows what is meant by "free wheeling" of the oscillator. The oscillator phase is normally locked with the burst phase. When color sync is lost, we realize that the two vectors are not locked together, but instead, they rotate at an arbitrary speed relative to each other. Hence, the oscillator gives false phase information to the color detectors.

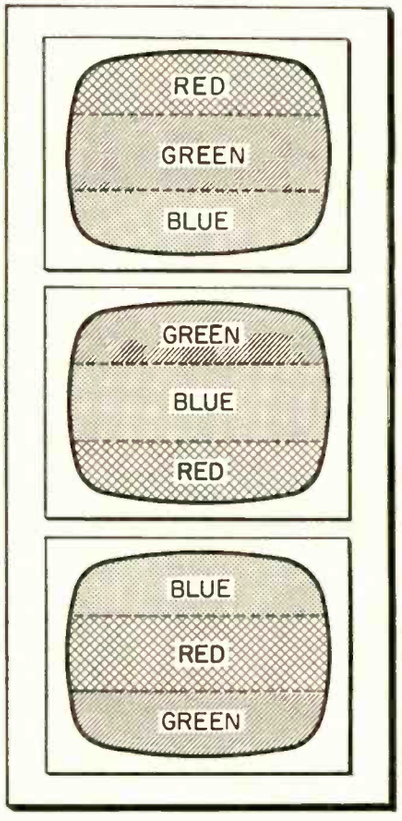
Hue corresponds to phase, as seen in Fig. 2. With loss of color sync, the oscillator phase sweeps through red, green, and blue phases in turn. The guns in the color picture tube are likewise driven out of turn (sync), and we see rainbows in the picture instead of true colors.

These rainbow patterns tell us whether the color subcarrier oscillator is running high or low in frequency. They also tell us how many cycles the oscillator is off frequency.

Rainbow Motion

It is often important to note the motion of the rainbow pattern. This information, along with an observation of the number of rainbows on the screen, tells us whether the oscil-

Fig. 4—When the color sub-carrier frequency is running higher than the burst frequency, a horizontal rainbow, in color sequences of either RGB, GBR or BRG is seen.



lator frequency is too high, or too low, and about how much. Remember that the vertical sweep is completed in 1/60 second.

Accordingly, when the color-subcarrier vector completes one rotation in 1/60 second, we observe one horizontal rainbow on the screen. Or,

1) One horizontal rainbow on the screen shows that the color subcarrier oscillator is off-frequency 60 cycles.

Now, we will observe that if the color-subcarrier vector does not quite complete one rotation in the time of one vertical sweep, the rainbow will be a bit incomplete, and must be completed after the start of the next vertical sweep. On the next sweep, the completion of the next rainbow is further delayed. Or,

2) Downward drift of the rainbow on the screen shows that the color-subcarrier oscillator is running somewhat below 60 cycles.

On the other hand, if the color-subcarrier vector completes its rotation before the vertical sweep is completed, we have one rainbow and a fraction of another rainbow displayed on the screen. On the next sweep, the next rainbow is completed a bit earlier. Or,

3) Upward drift of the rainbow on the screen shows that the color-subcarrier oscillator is running somewhat above 60 cycles.

If the subcarrier is off by 15,750 cps, one horizontal scan, one *vertical* rainbow will appear. When it's 31,500 cps off 3.58 mc, two vertical rainbows will appear, etc.

Rainbow Hue Sequence

We have seen that when the color-subcarrier oscillator is 60 cycles off frequency, we observe one rainbow on the screen of the picture tube. By observing also the sequence of hues in the rainbow, we next determine whether the subcarrier oscillator is operating 60 cycles above burst frequency, or 60 cycles below burst frequency.

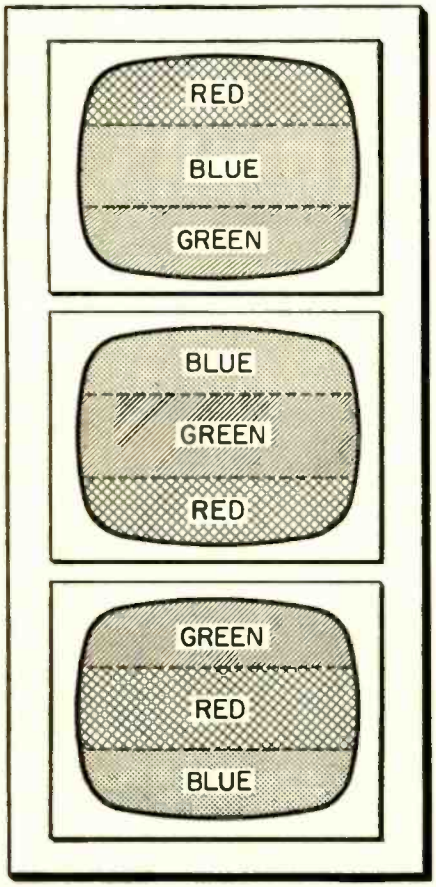
Remember that the vertical scan progresses from the top of the screen to the bottom. Remember also that, as shown in Fig. 3, the subcarrier oscillator vector rotates in reverse direction when the oscillator frequency is high, as compared with its direction when the frequency is low. When the subcarrier oscillator frequency is higher than burst frequency, the rainbow develops in the sequence red, green, blue, etc. But when the subcarrier oscillator frequency is lower than burst frequency, the rainbow develops in the sequency, red, blue, green, etc. Thus,

4) When we observe any one of the three patterns shown in Fig. 4, we know that the color subcarrier oscillator frequency is higher than burst frequency.
5) When we observe any one of the three patterns shown in Fig. 5, we know that the color subcarrier oscillator frequency is lower than burst frequency.

This is all very cozy, but how do we make a rainbow stand still so

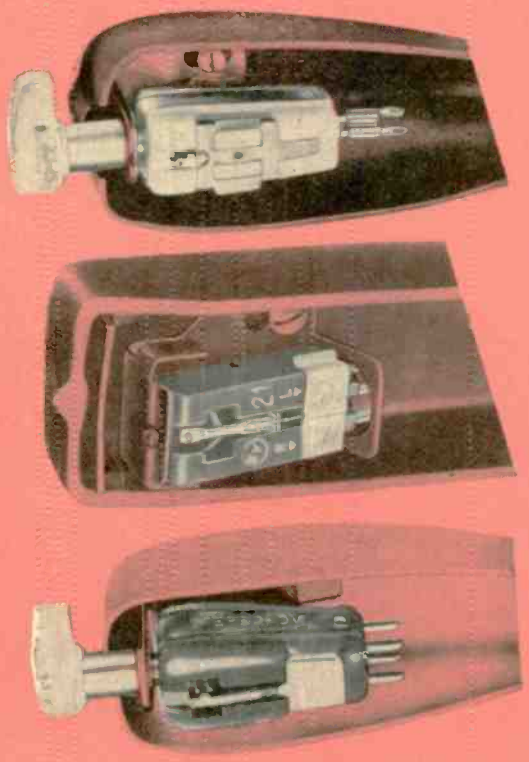
(Continued on page 66)

Fig. 5—When the color sub-carrier frequency is running lower than the color burst frequency, a horizontal rainbow, in color sequences of either RBG, BGR or GRB is seen.

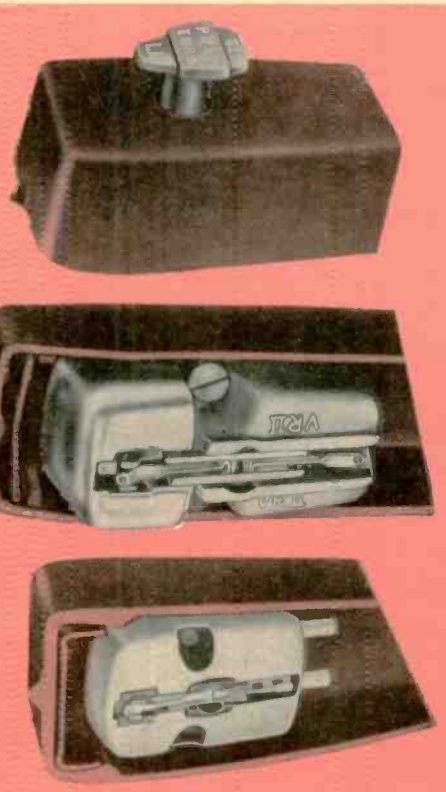


Color-Picture Symptoms

Symptom	Cause	Cure
Horizontal rainbows.	Loss of color sync.	Adjust horizontal-hold control correctly. Adjust color-afc balance control correctly (balances color-sync system). Tune plate tank of reactance tube accurately (determines free-running frequency of subcarrier oscillator).
Change in hue of actress' dress as she walks across the scene.	Variation of chroma peak voltage during forward scan. (This is sometimes caused by technical difficulties at the transmitter—see text).	Use correct values of components in the grid circuits of the bandpass amplifier and chroma demodulators. A scope and rainbow signal will show where the chroma peak voltage is falling during the horizontal scan interval.
Color drop-out in picture.	Faulty operation in chroma channels or color-killer circuit. (Note: Always use a scope with a low-capacitance probe to check chroma signals).	Signal-tracing, starting at the picture detector, and proceeding through the video amplifier, bandpass amplifier, chroma demodulators, and color-sync/color-killer circuits will localize the trouble. Then, make voltage and resistance checks to find the faulty component.
Some colors off-hue in picture.	Phase distortion in the signal circuits.	Check alignment of r-f, i-f, and bandpass amplifiers.
All colors incorrect.	Range of color-phasing control is incorrect.	Adjust color-afc potentiometer for balance (zero volts to ground with burst present). Adjust plate tank of reactance tube for color sync with weak burst. Adjust master phase control, if required.
Color picture varies as antenna lead-in swings in wind.	Standing waves on the lead-in.	Make a workmanlike installation, keeping lead-in free from metal surfaces, kinks, and mechanical damage. Use a 6-db resistive pad at the receiver input terminals, if necessary—this cuts down standing waves twice as much as it cuts the signal.



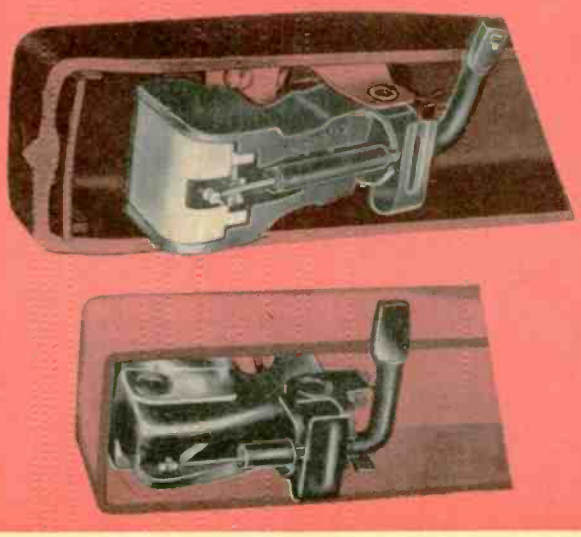
SNAP-ON—To remove needle from the Ronette monophonic (above), Electro-Voice Stereo (center) or the Ronette Stereo (below), grasp the wide metal clip and pull down. With the needle assembly out, a replacement is installed by simply snapping one in place. Make sure front part of the needle is properly engaged in the yoke.



SLIDE-IN—To remove G-E's VRII needle (center) or RPX (below), press down on the spring-loaded knob (shown above) to push needle assembly out of the recess. Then, grasp needle and pull it forward and out. To replace needle, slide it in, and release the spring-loaded knob. Check to see that needle is centered between the two poles. Old-type needle change required removing knob and then the entire assembly.

How to CHANGE A NEEDLE

CRANK-TYPE—The needle arm is snapped out of the cartridge sideways—to the right of tone arm—by pressing down on the spring clip, allowing it to discharge the needle assembly from both the Sonotone Stereo (above) and Mono (below). When snapping needle back in cartridge, be certain fore part is well engaged in metal fork.

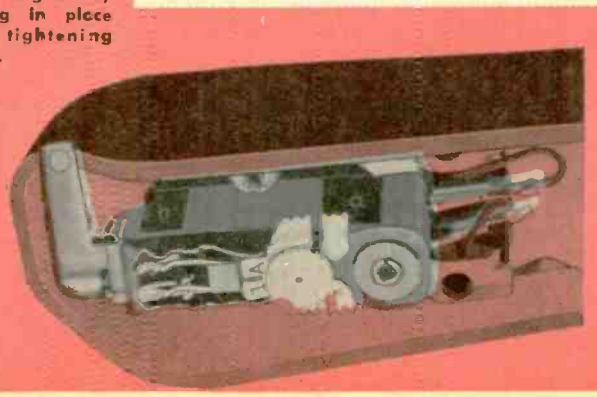


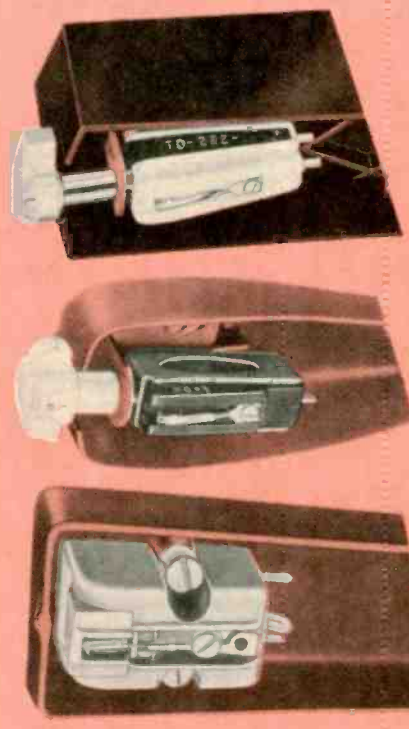
CHARLES WEIGAND,
CHIEF ENGINEER,
FIDELITONE, INC.

KNURLED - KNOB —Shure's Mono unit holds the needle by a knurled knob. To remove, unscrew knob and pull entire assembly forward. Needle is changed by sliding in place and tightening knob.

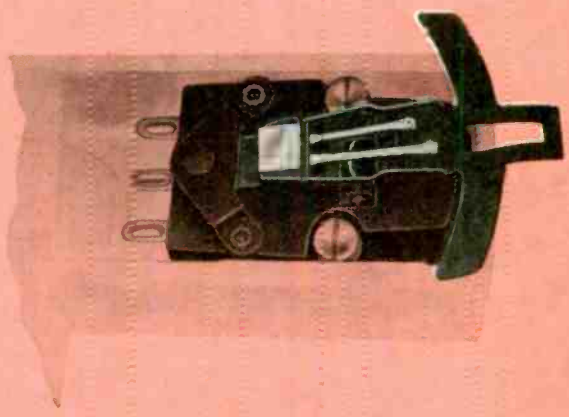
• In the past decade high fidelity has become as commonplace in the American home as the gramophone was a generation ago, placing increased responsibilities and demands on the sound technician.

Today, the ability to change any of the many kinds of phonograph needles quickly and efficiently is an indispensable skill. In addition, the

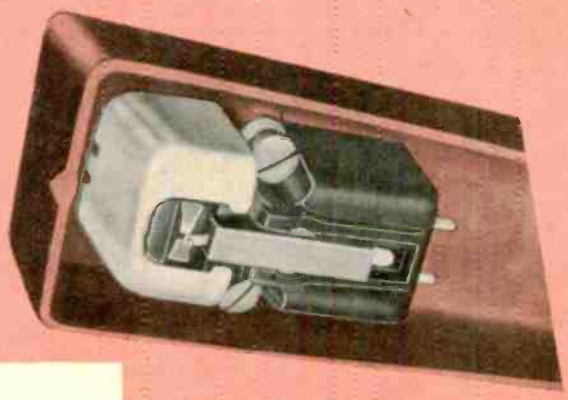




SCREW-MOUNTED—The needle assembly can be removed from the Ronette Mono (top) and the Columbia Stereo (below) by removing the small securing screw. Replacement is made by setting the needle in place and tightening the screw. The Astatic Mono (center) screw does not come out and the needle is shaped like a horse-shoe. The needle slides into the screw's body. Advantage is: screw can't be lost.



SNAP-IN—The needle is removed from this RCA Stereo cartridge by prying up from the rear of the copper needle clip with thumb nail and pulling down with the other hand. Assembly then drops out. New needle snaps in place.



FRICTION-HELD—On G-E's VR-22 Stereo, take out the two mounting screws, and remove cartridge. Run a small wire through hole in the top of cartridge, pushing out needle assembly.

Phonograph Service Requires Diverse Needle Replacement Techniques

service technician must be able to locate the source of trouble in the needle-cartridge area, and come up with a fair estimate of how often a needle needs changing.

Popularization of stereo is making the job even more complex. Consequently, what once was a simple chore performed by almost anyone in the home, is rapidly becoming a more complicated task.

For example, in changing almost any needle, the technician is faced with two problems. He must know how to remove and replace needles in all kinds and makes of cartridges, and he must get the correct needle in the proper cartridge. Fortunately, there are only about eight ways in which needles are held in the cartridge of playing arms of either monophonic or stereo turntables and record changers. These include snap-on, plug-in, screw-mounted, slide-in, snap-in, knurled knob, crank type, and friction hold.

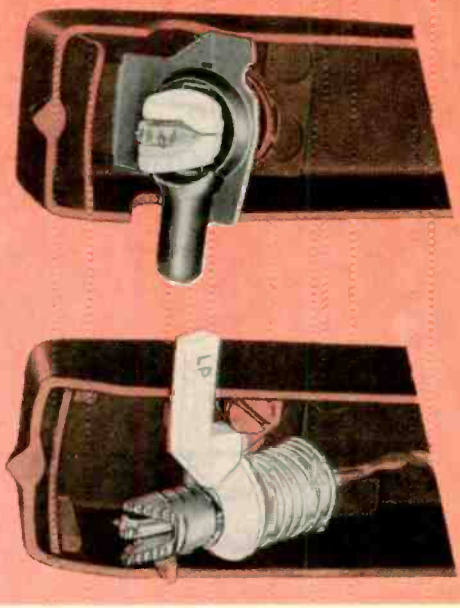
The illustrations presented here show the principal needles used with typical cartridges. When called on to replace what often appears to be a faulty or worn needle, the alert serviceman must be able to tell whether the difficulty is in the needle or in the cartridge.

In such cases, always make sure that friction-fit needles are firmly seated so that all movements of the stylus tip are transmitted to the cartridge elements. When the needle becomes loose, an intermitted garble sound often is produced.

Needles of the screw-in and snap-in type present a distinct problem. The forward part of the needle must be engaged in the yoke-type cou-

(*Continued on page 70*)

PLUG-IN—Needle assemblies can be removed from either Webcor (top) or the Electro-Voice by grasping front of the needle and pulling plastic cap forward. The entire housing, including needle & cartridge comes out. New assembly is just plugged-in.



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

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By Leo G. Sands. This informative text covers the many electronic devices used on boats, including radiophone, sound systems, direction finders, depth sounders, steering devices, radar and power sources. Schematics are given for commercial units now on the market. Information on troubleshooting is provided. Soft cover, 232 pages plus pullouts. Price **$3.95.**

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BASIC AUDIO

By Norman Crowhurst. This reference uses the picture book technique. Vol. 1 covers acoustics, mikes, speakers and networks. Vol. II explains amplification, coupling, distortion, response and circuit performance. Vol. III examines feedback, supplies, lines, oscillators, recording and, very briefly, stereo. Soft covers, 368 pages, $2.90/vol.; $8.70 per 3-vol. set. Hard cover, in single binding, $9.95.

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Also See New Books on Page 96

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Shop Hint And

Pick Your Favorites And Win Valuable Prizes For Yourself

SHOP HINT #1

Magnetic Soldering Iron

We use a number of pencil type soldering irons in our shops. To keep them handy when needed, and yet out of the way, I have attached a small magnet to each handle, as shown in Fig. 1. The iron sticks to the metal chassis. This makes it especially handy on cabinet and rack equipment. The magnets were taken

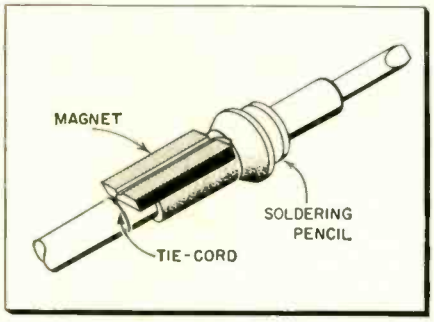

Fig. 1—Magnet holds solder iron to chassis, metal rack, etc., for safety and convenience.

from magnetic door catches and held in place by #16 copper wire.—*Paul R. Foster, Ogden, Utah.*

Since most of these pencil type soldering irons can accommodate a 6 or 7 watt intermediate base light bulb in place of the iron tip, this arrangement is also convenient on home service calls to light up the inside of a TV cabinet.—Ed.

SHOP HINT #2

Control Replacement

I recently had a Silvertone 21" TV receiver in the shop with vertical chassis and printed circuit boards facing front. The vertical linearity control was burnt out. Normal replacement would have meant pulling the chassis and possibly the vertical horizontal sync board as well. These controls were the reversed type with the shafts through the control cover.

In an effort to avoid removing the chassis, I proceeded as follows: Remove the metal cover, the shaft and all the innards from the old control, leaving only the fiber base mounted on the board. Then, take the metal cover and sweat it back-to-back on a standard control, which in this instance was 5000 ohms at ½ watt. Install the original control to the fiber base of the control still mounted to the printed board. Then, bend the tabs and, if necessary, solder on each side. Jump the lugs and a new control is installed without pulling the chassis from the cabinet or disturbing the printed circuit board. This procedure saves me immeasurable time.—*Robert E. Maroney, Glenside, Pa.*

SHOP HINT #3

Tube Socket Repair

On occasion, a tube socket pin may break and a spare pin is not readily available. Rather than replace the entire defective socket with a similar type usually stocked, repairing the socket will save considerable time and avoid the possibility of a wiring error.

Cut the bakelite of a similar type

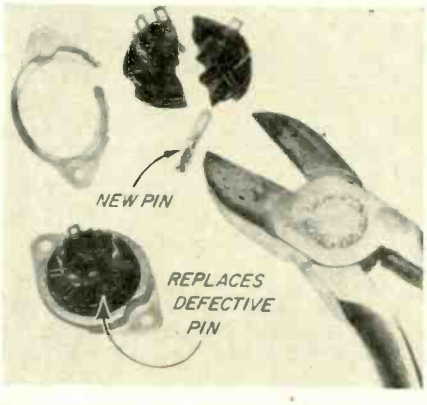

Fig. 2—A new socket pin avoids time-consuming replacement of an entire defective socket.

socket with a pair of diagonal cutters and remove a good pin. See Fig. 2. Then, remove the broken pin of the original socket by exerting pressure from the bottom with a small punch or screwdriver. Insert the new pin into the original socket from the top of the chassis, pulling it through with needle nose pliers.—*M. E. West, Lenoir, N. C.*

SHOP HINT #4

Determining Open Resistor Values

Occasionally I receive a set in the shop for which I have no schematic. This doesn't pose a great problem

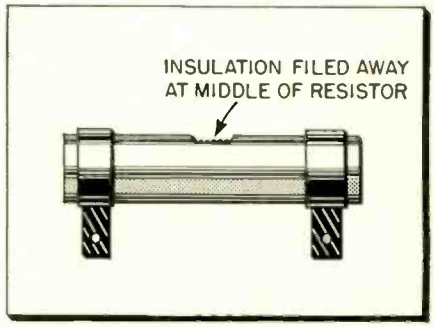

Fig. 3—Exposing center coils of a burnt wirewound resistor helps measure its value.

as far as locating the trouble, but a problem does arise when the defective part is not marked with its value. I have found this especially true of wirewound resistors which are seldom marked, or have had their markings burned away by the high temperatures at which these units operate.

To determine the original value of an open wirewound resistor, I file away the insulation at the middle of the resistor, as shown in Fig. 3. This exposes a few turns of the winding. Using an ohmeter I measure the resistance from this midpoint to each end. One of these readings will be infinity, indicating the open half. The reading obtained on the good half when multiplied by two will be approximately equal to the original value of the resistor. A reading will usually be obtained on one half since it is uncommon for more than one turn to open.—*Albert J. Krukowski, West Springfield, Mass.*

Tough Dog Contest

And The Technician-Authors Named At The End Of Each Item

SHOP HINT #5

Splicing Aid

Did you ever want to check a resistor or capacitor but hesitated to disconnect a flock of wires at a tube socket or other tie point because of difficulties in proper resoldering? Here is an easy way to overcome this problem, equally useful in handwired or printed circuit sets. Take a length of #22 bare tinned wire and two sizes of twist drills; one size to equal the thickness of the lead on one-half watt resistors and one size to equal the thickness of the lead on two-watt resistors. I use only two sizes. Wind the wire tightly on the shank of the twist drill, leaving a small space between the windings. Make the spirals three eighths to a half inch long.

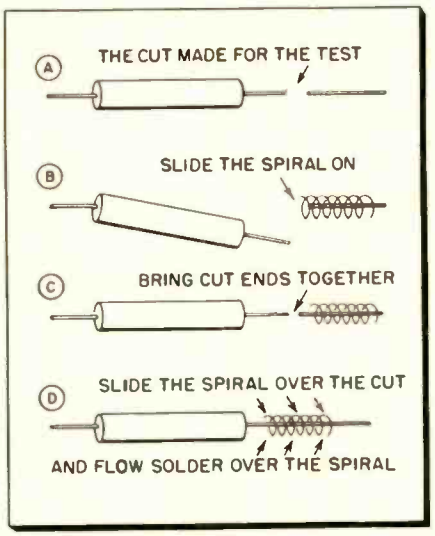

Fig. 4—After a lead is cut and component tested, slide a tight fitting tinned wire spiral over both ends, centering spiral over cut. Crimp spiral ends and solder.

Now cut the lead on the resistor or capacitor to be checked, leaving an equal amount of lead on each side of the cut. Make the test you desire and then slide a spiral over one end of the cut, bring the ends together and then slide the spiral back so that it covers the cut, as illustrated in Fig. 4. Crimp both ends of the spiral lightly with long nose pliers. Flow solder over the spiral and you

CONTEST RULES

Indicate your choice of the best 1959 Shop Hint and Tough Dog by circling the appropriate nomination number on the entry form. Tell why you chose them, using additional paper if necessary.

ELECTRONIC TECHNICIAN'S Board of Editors will be contest judges. Subscribers choosing the Hint or Dog securing the most reader votes will be eligible to win a prize. Winners will be selected by the Board of Editors, based on the best reason for choosing the winning Hint or Dog.

Contest entries are open to readers of ELECTRONIC TECHNICIAN Magazine professionally engaged in electronic service work. Contestants are under no obligation and are not required to send any consideration or purchase anything in order to enter the contest. Persons employed by ELECTRONIC TECHNICIAN Magazine, advertising agencies, etc., and their relatives, are not eligible to enter the contest.

Entries must be postmarked no later than March 31, 1960. Winners will be announced in the magazine.

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are back in business in a minimum of time and effort with a neat, secure splice. I make up a few dozen in advance, having plenty on hand when needed.—*Joseph J. Momeno, St. Louis, Mo.*

TOUGH DOG #1

Unstable Sync

A Silvertone model 6170 was taken to the shop for no raster. The repair was more or less routine. An open electrolytic condenser in the boost supply was causing a drop in high voltage and the consequent loss of raster, so I replaced it.

I air tested the set, adjusted the tuner slugs and made my delivery. Once the chassis was bolted into place, however, I found much to my surprise that the set did not perform well at all. Out of the seven operating channels only two programs would hold still. The others had very poor vertical stability with practically no lock whatsoever.

My first thought was that a tube might have gone sour so I checked them. With that possibility out of the way I looked at the indoor antenna and tried a new one but the poor vertical sync was still with us. I wanted to blame the reception area, as the location was in the midst of many apartment buildings, but my better judgment told me not to.

The perplexing fact about the whole situation was knowing that the set performed fine in the shop. I wondered if something had been jarred or moved during transport to bring on the trouble so I pulled the chassis out of the cabinet and inspected it, paying close attention to the sync output and integrator circuits. Everything appeared to be in order.

At this point the customer, who in the meantime was busying herself in the kitchen, walked in and asked how things were coming along (probably wondering what was taking so long). I sadly confessed that the situation could be better and then asked if the set had ever acted this way before. Indeed it had—in fact, she said, ever since the set had been previously repaired.

Now I tried to put the pieces together. The picture rolled before I took the set away; didn't while in the shop and now was rolling again. I remembered something. A piece of metal strip in the bottom of the cabinet. In a flash it came to me—the picture tube and its harness were not grounded and that was probably the trouble. The grounding strap had been broken off on the previous repair and had fallen to the bottom of the cabinet. I took it out, soldered it back into place, and when the set was switched on again the pictures all snapped right into place with perfect vertical stability. —*Frank A. Salerno, Long Island City, N.Y.*

TOUGH DOG #2

Over-Heating Flyback

This RCA KCS-68C had no high voltage when brought to the shop. Tubes had been substituted in the home and failed to correct the trouble.

After checking voltages at the horizontal oscillator and determining that proper waveforms of correct amplitude were arriving at the grid of the 6CD6 horizontal output tube, the fly-back was checked with a fly-back tester and it proved defective.

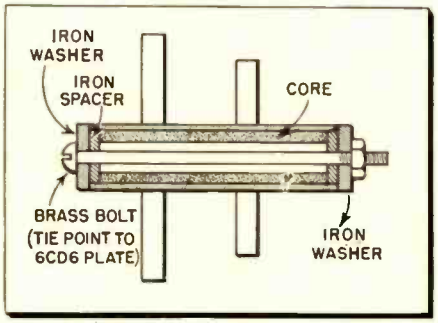

Fig. 1—Loss of normal raster width and severe overheating of transformer resulted from use of metal washers in this flyback.

A new direct replacement transformer was installed and high voltage was restored. However, the raster barely filled the screen and in a short time the insulating material on the flyback became soft, indicating overheating. I next changed the horizontal output and damper tubes, checked and adjusted grid drive, width and the horizontal linearity coil. All voltage checks in the horizontal output and damper section indicated no cause for doubt in this area.

A closer inspection of the fly-back transformer revealed that the coil form at one end was overheating and gradually heating the rest of the transformer. Tests showed that in one minute of operation the head of the brass screw and washer would heat up to the point where it would burn my hand on contact. The brass screw was used as a tie point to the 6CD6 plate and removing this connection did not affect heating. See Fig. 1. The transformer was dismantled and inspection disclosed all the elements necessary for small-scale induction heating—the high frequency current-carrying work-coil and metal washers representing the work-piece in the magnetic field. I remembered about thermal conduction from the work-piece in induction heating gradually heating other parts and reassembled the transformer with fiber washers substituting for the iron washers and spacers.

The set now performed correctly with width to spare. The transformer showed no signs of overheating after many hours of continuous use.—*Howard E. Chace, Southbridge, Mass.*

TOUGH DOG #3

Dynamic Voltage Divider

This particular tough dog, a Westinghouse TV chassis V-2216-1, was brought in with a complaint that, "it loses the picture when the channels are changed."

Our three operating channels were checked. Good video, audio and sync were present. Tubes were tapped and visual inspection was made, but no trouble symptoms showed up. After about fifteen minutes of operating, the set was checked again. This time when another channel was switched in, a severe case of overload with complete loss of sync developed. Tubes were substituted along the video signal path without improvement. When the 6T8 audio amplifier and agc clamper tube was removed from its socket the picture became normal.

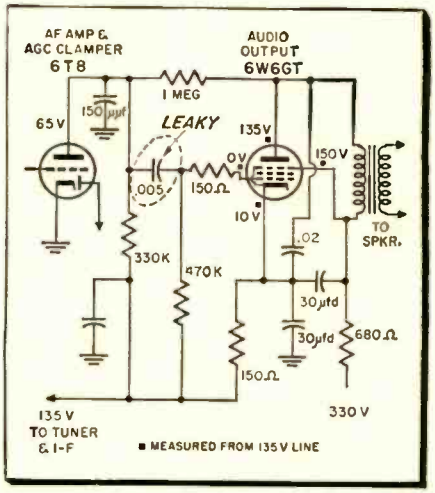

Fig. 2—Defect in grid circuit of audio output tube caused intermittent loss of video.

A new tube was installed and the picture still remained normal. I thought that was it; that is until I tried changing channels—the trouble

(Continued on page 93)

Preview of 1960

L. Berkley Davis,
General Manager,
Electronic Components Div.
General Electric Co.

• Substantial increases in sales of semiconductors and sustained high volume production and use of receiving tubes, power tubes and cathode ray tubes will feature the electronic components industry in 1960.

Highlights of trends for the year:

1. Semiconductor sales will reach $550 million, a 37 percent increase over 1959's $400 million; included are estimated sales of 130 million transistors (53 percent over 1959) for a total of $315 million.

2. Receiving tubes will remain as the mainstay of the industry, with 435 million new tubes placed in service in home entertainment equipment and industrial and military gear—about the same level of tube usage as in 1959.

3. Power tube sales will hit a new high of $300 million, representing a continuation of the previously-predicted 10% annual growth trend—with the greatest increase in tubes for military end-purposes.

4. TV picture tube sales will total 13 million units (up 5%) selling for approximately $260 million—with more than half of the tubes sold for replacement.

Semiconductors Up 37%

Industry sales of semiconductor components of all kinds will exceed half a billion dollars in 1960. By the end of the year the industry will have sold about $550 million worth of its goods. This is an increase of 37% over sales in 1959 when the industry achieved a volume of $400 million.

The approximately 130 million transistors which will be sold by the industry in 1960 represents a 53 percent increase over 1959 sales of 85 million units. The industry dollar volume for transistors will increase from 1959 sales of $225 million to a 1960 sales volume of $315 million. 1960 transistor sales break down into a $45 million consumer market, $120 million industrial market and a $150 million military market.

In the semiconductor rectifier area, industry sales will increase by about 18%, from $78 million in 1959 to $92 million in 1960. In terms of growth rate, sales of controlled rectifiers can be expected to essentially double as an increasing number of industrial and military equipment manufacturers move the design of their products from the development to the production stage. Sales of low current germanium and silicon rectifiers will account for almost half of the industry's rectifier sales.

Tunnel diodes which were first introduced by General Electric in small sample quantities in the third quarter of 1959 will continue to be widely discussed and experimented with during 1960 but samples will be limited to small quantities pending the development of circuits. Within the next few years, however, the use of tunnel diodes in high frequency circuits will build up rapidly.

Receiving Tubes Strong

Receiving tube production and usage will continue at about the same high volume level as in 1959, with emphasis on design of more specialized conventional types and development of unconventional devices such as micro-module units, ceramic tubes, and photoconductors.

In 1960, about 435 million new conventional receiving tubes will be placed in service in the United States in both original equipment and as renewals in TV sets, radios, phonographs, industrial and military electronic equipment during 1960.

Of the 435 million tubes, however, approximately 20 million will be imported. Sales of the remaining 415 million domestic-made tubes will total about $345 million.

Sales of commercial tube types made here will amount to about $275 million, with over half in the renewal market. Of the commercial tubes that go into original equipment, the bulk will be used by television set manufacturers who will buy nearly 100 million for this purpose domestically.

Sales of high reliability tubes for aircraft, industrial and military equipment will be approximately $70 million, with about 70% purchased by manufacturers of new equipment. Sales in 1960 of industrial and military tubes for replacement in vital electronic equipment will increase approximately 13 percent over 1959 to a total of $9 million.

Receiving tube design efforts will concentrate in obtaining increased depth of knowledge of materials usage and processing to enable tubes to attain higher performance in the ever-increasingly difficult environments faced in the Space Age.

Power Tubes Up 10%

Power tube industry sales in 1960 will reach a new high of $300 million, representing a continuation of the previously-predicted 10% annual growth trend.

The greatest increase will be in sales of tubes for military end-purposes. High-performance tubes are required for the establishment and maintenance of extensive detec-

(*Continued on page 56*)

Preventive Maintenance

Competent Mobile Service Requires Periodic Inspection

ALLAN LYTEL

Since mobile radio is a business tool, breakdowns are costly. To minimize such losses, a periodic maintenance program should be followed, using the proper specialized instruments necessary for optimum results. Test instruments, such as frequency meters, modulation meters, grid-dip meters and field strength meters not only permit quality maintenance, but assist in meeting FCC standards.

• Servicing mobile radio equipment is in many ways quite different from servicing home broadcast radio and television. Because the mobile radio is a business tool, not a medium of entertainment, the customer truly needs the radio for every day use. True, if the user is a trucker, he can still employ the truck if the radio does not work. However, the loss of income because of less efficiency is a serious handicap.

Consequently, the mobile-radio user may consider the cost of periodic checks and preventive maintenance in much the same way as the lubrication of his truck—both are required for minimum uninterrupted service.

Test Equipment

Mobile radio servicing is a challenging business. To successfully meet the challenge, quality test equipment is needed. This equipment must be accurate, stable and suitable to the special requirements of mobile radio. A tube tester, VTVM, multi-meter, signal generator and battery eliminator are normally found in a TV repair shop and are useful for many service aspects of mobile radio. However, for some mobile servicing, equipment must be far more accurate than usual test equipment. Other specialized instruments, not used for TV or radio servicing are also required.

A frequency meter covering all bands is needed to maintain the transmitter on its assigned frequency. Designed for mobile radio work, it should be accurate to 0.005% or better, and cover the required frequencies.

A modulation meter is needed for checking transmitter deviation (bandwidth) of the FM carrier. This deviation must not exceed 15 kc and the meter must respond to peaks of the audio-voltage—not average values.

Dummy r-f loads are also required to simulate actual conditions of operation and, also, to prevent interference by radiation of the signal.

Although not absolutely essential, a grid-dip meter is often useful. This is a calibrated instrument which permits the resonant frequency of a tuned circuit to be determined without applying power to the circuit. At the same time it can be designed to act as an absorption type wave meter.

Typical instrument-types are shown in Figs. 1, 2 and 3.

Preventive Maintenance

Mobile radio service technicians find periodic routine inspections of transmitting and receiving equipment helpful in detecting trouble "before it begins." Routine maintenance checks also cover many FCC requirements. Among the items on this check list are:

Operating frequency: Operating frequency must conform to FCC regulations and is checked periodically with an accurate frequency meter.

Modulation swing (deviation from the center frequency during modula-

Fig. 1—The illustrated AM/FM signal generator covers frequency range of 10 mc to 470 mc. Calibration is accurate to 0.5%.

Fig. 2—This transistorized frequency meter is battery-powered for in-the-field mobile communication equipment maintenance.

For Mobile Radio

Program And Accurate Test Instruments

tion.): Depending upon the operating frequency of the transmitter, modulation swing must be maintained within limits specified by the FCC, i.e., ± 5kc or ±15kc, as the case may be under present regulations.

Resonant tuning of the doublers, triplers and the final amplifier stage: The r-f circuits of a transmitter require periodic checking to insure efficient operation. Before making adjustments the transmitter must be connected to a dummy load. An initial precaution must be observed. If a power amplifier is detuned at full power the tubes can draw excessive plate current and be damaged. Consequently, the plate or screen voltage to this stage is normally reduced while the transmitter is roughly tuned. Also, the transmitter is keyed only for very short periods, until approximate tuning is accomplished.

Tuning of the transmitter is normally achieved by adjusting the tuned circuits to resonance. Tuning should follow the specific recommendations of the equipment manufacturer. Briefly, if milliammeter jacks are provided in the grid and/or plate circuits, the procedure is relatively simple. Each grid circuit is tuned for maximum current reading and each plate circuit is tuned to "dip" or minimum current reading. The final amplifier is adjusted in the same manner and then the antenna loading network is adjusted for maximum power transfer to the antenna. If the final amplifier has a jack in its cathode circuit, all circuits are tuned for a "dip" or minimum reading on the milliammeter. Final touch-ups are made until no further change appears. Prior to placing full power on the final amplifier the antenna tuning should be adjusted to accept maximum output.

Power input to the final r-f amplifier: Power input to the final amplifier must not exceed that specified on the station license.

Operating voltages: A measurement of receiver and transmitter terminal and operating voltages is a significant check.

Inspection for loose, damaged, or broken parts: The entire mobile receiver-transmitter unit should be kept clean, inspected carefully for broken parts and tube substitution checks made, noting any changes in performance. Tubes indicating microphonics, low emission or other abnormal conditions are changed with known good tubes, previously tested in equipment under operating conditions. Testing high gain r-f or i-f tubes on service-type tube checkers is a questionable procedure.

Fig. 3—The grid dip meter shown can be used to check transmitter frequency of parallel resonant circuits without applying power.

Associated equipment, including selective calling, speaker amplifiers, remote control devices, etc., are checked for proper operation and inspected for broken or worn parts.

Power-source inspection: The primary power source for a fixed (base) station includes power line feeders, fuses, relays and switches. There is little to check concerning the input power except for variations in line voltage. Power supplies, however, whether vibrator, dynamotor, or rectifier, require inspection. Brushes, connections, capacitors, and vibrators are all important items. Vibrators, for example, are normally replaced when voltage outputs begin to drop.

Power for mobile radio equipment is provided by the battery-generator system. All items require careful inspection. Water level in the battery should be checked. Condition of the electrolyte is tested with a hydrometer. Battery connections should be kept clean and secure with terminals covered with a thin film of petrolatum.

Vehicle generators have an extra burden with mobile radios and they should be inspected often. Brushes are renewed when necessary. The fanbelt drive should be checked. Voltage-regulators also require inspection and connections tightened. Condition of the wiring should be noted.

Relay fuses and cables: Relay contacts should be examined and burnished if necessary. In any type of radio, the fuses and fuse holders should be examined and cleaned, if necessary, using fine sand-paper—not steel wool. Power cables should be checked for breaks and plug connections kept clean. Connecting cables should be examined for signs of wear, weathering or poor mating of the plugs. This is particularly important where equipment is mounted in the trunk or on top of cabs.

Antenna: Antenna inspection is also a part of routine maintenance. Its location on a vehicle is usually a compromise between best operation and protection. Physical damage is common, particularly for those extending beyond the top of the car or truck roof. Check antenna transmission lines periodically.

Mobile radios are rugged and designed for use in vehicles. However,

because of conditions under which operation takes place, an overall visual inspection can often uncover areas of possible trouble. The amount of equipment attention depends largely upon its use-time. A transmitter may require slight re-tuning to compensate for tube characteristic changes and aging of components. Again, the manufacturer's instructions for readjustments should be closely followed.

Receiver Checks

Visual alignment of the receiver, employing a scope, sweep and marker generators, is basically similar to FM receiver alignment and is considered the most rapid and reliable method. Alignment is seldom required in mobile equipment, except when parts have been replaced.

Receiver calibration can be accomplished in a number of ways, including the use of a heterodyne type frequency meter and harmonics from an internal or external crystal standard, capable of beat-adjustment against any WWV frequency on an ordinary communications type receiver with variable bfo. A stable r-f signal generator can be accurately checked in the same manner and used to calibrate the receiver directly.

Troubleshooting

In addition to requiring periodic slight re-tuning to compensate for tube characteristic changes and aging of components, transmitters will naturally break down and become inoperative.

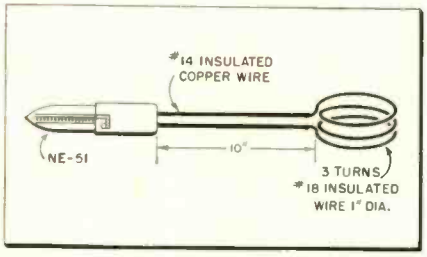

Fig. 4—An r-f probe can be constructed, as shown to determine if a transmitter oscillator or multiplier stage is operating. When coil-end is brought close to the grid or plate lead of a working circuit, lamp glows.

Generally, a defective transmitter requires an initial check of the d-c supply voltages, after which a check is made of the crystal oscillator stage. Defective tubes can be eliminated in the process. This can be achieved in a number of ways. A VOM measurement of negative voltage on the grid of the first doubler tube, following the oscillator, or a milliammeter can be employed for reading current in the grid circuit of this tube.

Many technicians use a small low current lamp or low fractional wattage neon lamp circuit, shown in Fig. 4 to probe the circuit's r-f power at a tube input or output. The lamp will light when the turns of wire are brought close to the grid or plate lead.

If a grid dip meter is sufficiently sensitive, it can also be employed in the absorption wavemeter function position in the same manner. Other technicians, however, rely almost wholly upon checking each stage with a milliammeter in the grid or plate circuit, depending upon transmitter circuit provisions.

Replacement of component parts require normal care. Parts must be exact and of similar electrical characteristics. When components are replaced in receiver or transmitter r-f sections, original lead dress should be undisturbed and original component lead lengths should be carefully duplicated. •

Illustration Credits: Alto Scientific Co., Dumont Labs, Inc., Marconi Instruments

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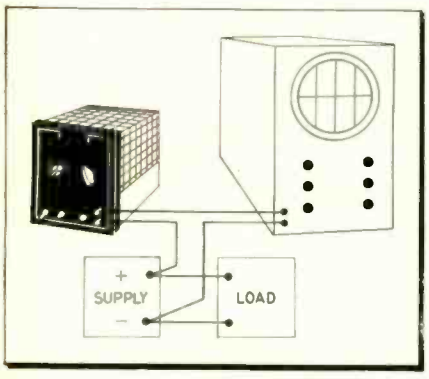
Acme SCOPE-O-TROL

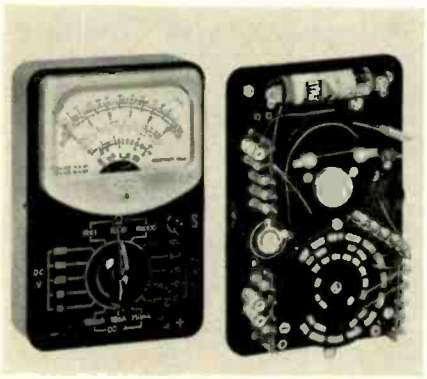
Designed for coupling to an oscilloscope, this new instrument features: input, 115 volts 60 cps; output, 0-300 volts d-c; voltage adjustment in 75 volt steps for coarse adjustment, with fine adjustment potentiometer, 0.25 volt/degree; ripple, less than 1μv RMS;



and current limiting and short circuit protection. It was developed to observe on the oscilloscope the regulation, ripple, transient response and other characteristics of d-c power supplies by removing the d-c component. Acme Electric Corp., Cuba, N. Y. (ELECTRONIC TECHNICIAN 2-1)

Olson MULTI-TESTER KIT

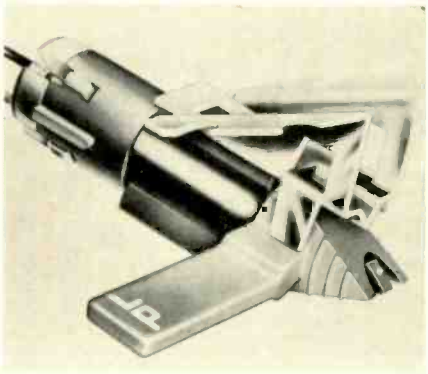
Model TE-139 16-range multi-tester has an overall accuracy of 3% of full scale on d-c ranges; and 5% of full scale on a-c ranges. Uses 1% shunts and multiplier resistors. Some of the features are: high input resistance of 20,000 ohms per volt d-c and 10,000



ohms per volt a-c; ranges, a-c and d-c volts, 0-10, 50, 250, 500, and 1,000 volts; d-c current, 0-500 microamperes, 0-10, 250 ma. Construction has been simplified; only the wiring has to be done. $13.91. Olson Radio Corp., 260 S. Forge St., Akron, Ohio. (ELECTRONIC TECHNICIAN 2-8)

Sonotone CARTRIDGE

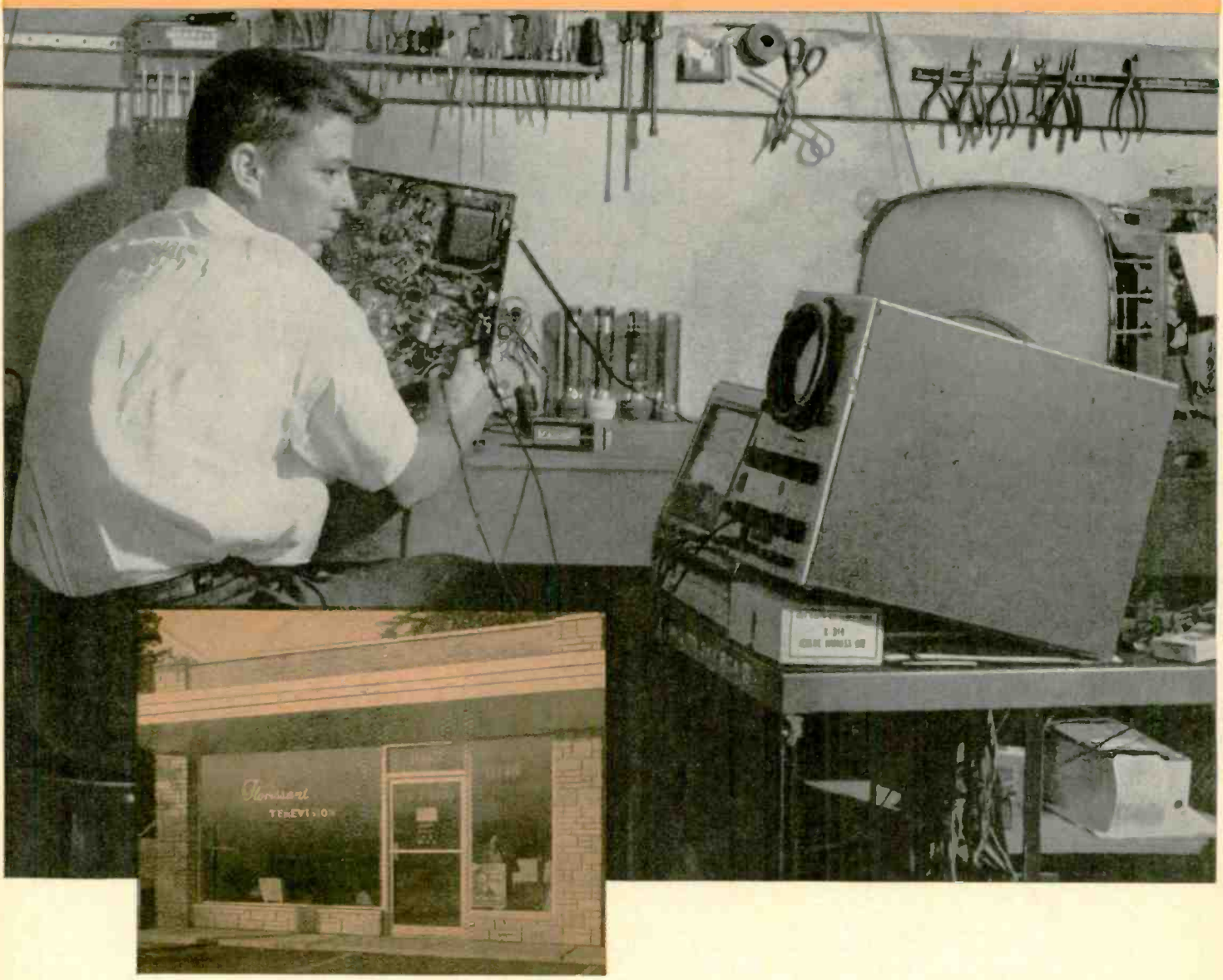
Budget-conscious hi-fi fans will welcome a new economy mono ceramic phono cartridge, the model 11T. It is a one-channel turnover "pickup" which plays stereo records without damage to the grooves. It features equal compliance in all directions and a 0.7 mil



jewel tip. It reproduces the complete listening spectrum. Smooth from 20 to 20,000 cycles, the frequency response is flat out to 15,000 cycles with a gradual rolloff beyond. Complete with mounting bracket and sapphire tips. $5.45. Sonotone Corp., Elmsford, N. Y. (ELECTRONIC TECHNICIAN 2-12)

TV Shop Owners AL GOGEL and TOM WALSH Say:

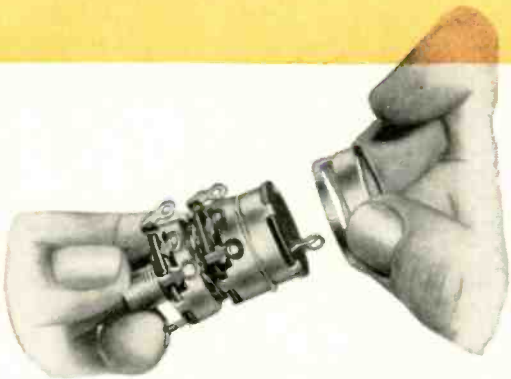
"Performance and flexibility why we prefer



Al Gogel is a co-owner of Ferguson Television Sales and Service Company, Ferguson, Missouri, and Florissant Television, Florissant, Missouri, suburbs of St. Louis. After training at the American Television School, he started his own service shop.

Nine years ago, Al teamed up with Tom Walsh and opened the store in Ferguson. They recently expanded into a new store in adjoining Florissant, and now employ one bench technician and three servicemen, with three trucks making 25 to 30 calls a day. They handle the warranty work on auto radios for the area's four major new car dealers, plus repair work for other dealers and used car lots.

...two good reasons MALLORY components"



"In our business, using quality replacement parts is as important to steady growth as fast, courteous service is. That's why we use Mallory parts whenever we can; we know we can depend on their quality. We particularly like the Gem tubular capacitors and Sta-Loc® controls.

"There are two good reasons why we prefer Sta-Loc: first, naturally, is performance. There's never a call-back on these controls. Second, there's their flexibility. We can get any control we need with Sta-Loc—immediately—without having to check every distributor in town."

Thousands of technicians have discovered that the flexibility of Mallory Sta-Loc controls spells real convenience. You can get any of over 38,000 types of single or dual controls—even the hard-to-find ones—made to order by your distributor in just 30 seconds. No more shopping, no more waiting. Convenient, too, because you can replace the line switch by itself, without unsoldering the control connections. As for dependability, you can always depend on Sta-Loc controls to work long and quietly.

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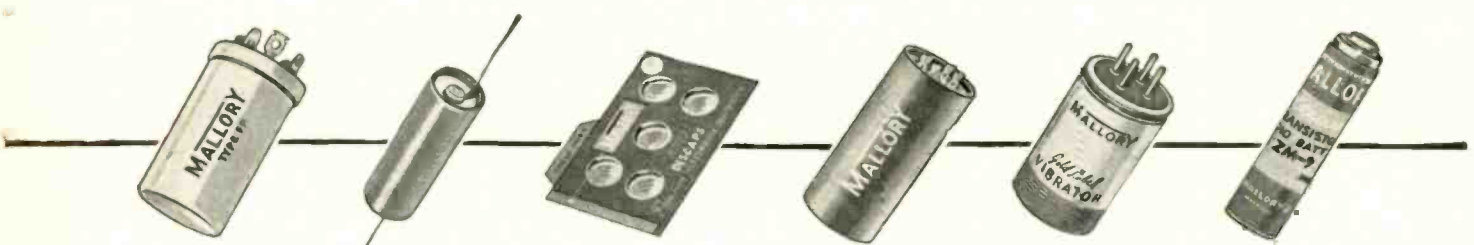

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Made by the world's largest producer of ceramic disc capacitors. Long the original equipment standard. Supplied in a handy 3x5" file card package.

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Economically priced filter capacitors. Top performance proved in service and backed by years of Mallory experience. Hermetically sealed.

GOLD LABEL® VIBRATORS

The quietest vibrator ever made . . . for the best in radio servicing. Buttonless contact design gives longest life, sure starts for sure customer satisfaction.

MALLORY MERCURY BATTERIES

Unequalled for transistor radios . . . last several times longer, give steady power, stay "live" for years when idle. "First in space" in U. S. satellites.

*Trademark of Radio Materials Company, A Division of P. R. Mallory & Co. Inc.

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T 16

Components Preview

(*Continued from page 47*)

tion, control and communications systems.

The demand for power tubes for industrial applications will hold steady in 1960 at 1959's healthy rate. User industries will not only continue to operate at a brisk pace, but will continue to expand capacity, thus maintaining good replacement and original equipment markets. The use of ignitrons and thyratrons will yield, in some cases, to the pressure of solid state devices; however, there will continue to be good demand for tubes in many new applications where tubes offer technical or economic advantages.

Sales of transmitting tubes will increase approximately 5% to supply the needs of an increasing number of sockets in communications and broadcast systems.

Cathode Ray Tubes Up 5%

Nearly 13 million TV picture tubes will be sold by the industry at approximately $260 million during 1960, an increase of 5% over the number of tubes sold in 1959.

More than half of 1960's sales will be used for replacement and the remainder in new TV sets. The large majority of picture tubes sold by the industry in the replacement market will continue to incorporate reused glass.

Manufacturers of TV sets will feature sets using the new 23 and 19-inch square-cornered picture tubes as well as shallow cabinets.

In the areas of industrial and military cathode ray tubes, there will be a rapidly expanding market for very high resolution recording tubes, and for tubes to be used with fully transistorized drive and sweep circuitry. •

Seco TUBE TESTER DATA

Announced are the latest tube listings and set-up data to bring up-to-date the Seco model 107 tube tester. Also, this information is included in the new 107 flip-chart kit, designated as part No. FC3-260. $2.00. Seco Electronic Mfg. Co., 5015 Penn Ave. South, Minneapolis, Minn. (ELECTRONIC TECHNICIAN 2-10)

Transistor Testers

(Continued from page 37)

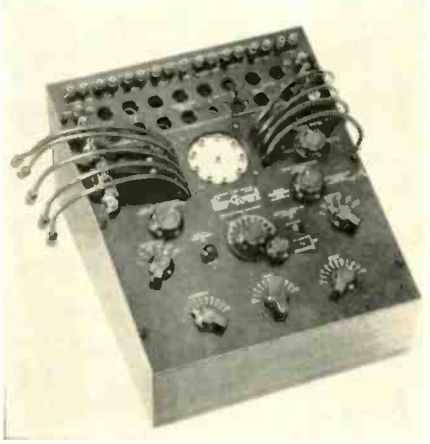
also be used for classifying transistors of the same type number which have differing characteristics. Also, with such a tester, used transistors, which are still serviceable, may be evaluated to determine if they can still be used in other than their original applications.

Ironically, this transistor test set uses tubes instead of transistors in its own circuits.

Fig. 5—This self-contained lab-type instrument provides comprehensive measurements of transistor characteristics. In addition to testing transistors dynamically, d-c operating characteristics can be determined.

A vacuum tube bridge instrument, which tests tubes with extreme accuracy, can now be used for testing transistors by using an adapter plate which is equipped with three different types of transistor sockets. See Fig. 6. Plug-in as well as lead-type transistors can be accommodated. Various adapters permit testing of almost every type of tube and transistor.

Fig. 6—A highly accurate bridge-type unit tests tubes, and by using transistor sockets and leads, almost any type transistor can be checked. Though primarily a lab instrument, it is useful for servicing unconventional or critical circuitry. Any of its electrodes can be set-up to serve as a control lead.



While primarily a lab device, this instrument is used for production testing of transistors and can be extremely useful when servicing critical or unconventional electronic equipment. It can be set-up to make measurements with any of the electrodes serving as the control electrode.

Measurements are made by employing a bridge circuit. An a-c signal is applied to both the input and output. The output current, which results from the application of the input signal, is balanced by an equal and opposite current applied to the output. See Fig. 7. From the settings of calibrated attenuators, when the test circuit is balanced, the desired information can be determined. In addition to this instrument, an external oscillator and null detector are required.

While some of the dynamic transistor testers discussed here are not

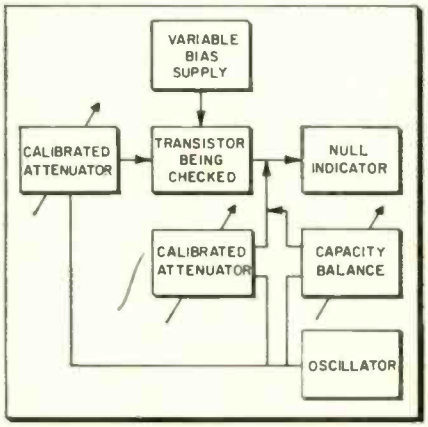


Fig. 7—The bridge-type instrument, shown in block diagram form, operates by application of an a-c signal to both input and output from a common source. 180 degrees out-of-phase, the output currents are balanced by calibrated attenuators. Test results are read directly from the attenuator dials.

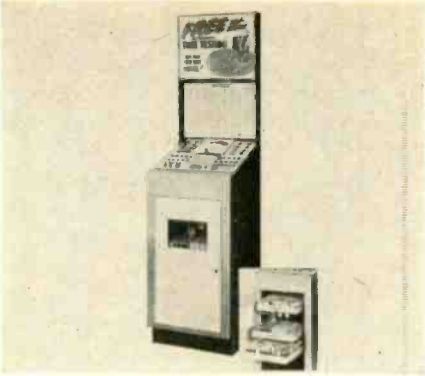
portable enough for use on service calls or too costly for the typical service shop, they should be of interest to the technician engaged in servicing computers and industrial electronic devices in which the functioning of transistors must be maintained within narrow limits.

While static transistor testing methods are often adequate, a dynamic test will show up that transistor which passes muster on d-c, but which balks when used in a high frequency or high impedance circuit, or in a high speed switching application. •

Illustration Credits: General Radio Co., Owen Labs, Inc., Seco Mfg. Co. Photo Credit: Cyril Glunk.

Mercury TUBE TESTER

Model 201 self-service tube tester checks emission, shorts and gas of over 800 tube types, covering over 99% of all TV and radio tubes including the newest series-string TV tubes, OZ4s, one volt tubes, magic eye tubes, hi-fi and foreign tubes; and will accommodate future tube types. Model 201-F, (floor model) illustrated, has a tube storage cabinet with removable tube storage trays, which can store 400 tubes. $158.50. Available also in counter model 201-C. Mercury Electronics Corp., 77 Searing Ave., Mineola, N. Y. (ELECTRONIC TECHNICIAN 2-2)

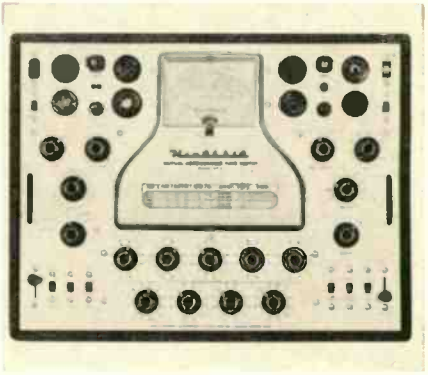


EMC CHECKER

Model 801 measures condensers for actual value, leakage and power factor. Features include an in-circuit checker. Model 801 detects open condensers above 50 μμf not shunted by an excessively low resistance value and detects shorted condensers up to 20 μf (not including electrolytics) that are not shunted by less than 10 ohms. It checks: capacity values in 4 ranges from 10 μμf to 5,000 μf, and resistance in 4 ranges from 0.5 ohms to 500 megs; also windings and power factor. Wired, $38.95. Kit, $24.95. Electronic Measurements Corp., 625 Broadway, New York 12, N. Y. (ELECTRONIC TECHNICIAN 2-20)

Heath TUBE TESTER

TT-1 mutual conductance tube tester provides tests of transconductance and grid current in multi-element tubes; and will also check diodes and rectifiers, voltage regulators, low-power thyratrons and electron-eye tubes. Values are read on an illuminated dial from 0 to 24,000 micromhos. Indicates



down to ¼ microampere on grid current tests. Has built-in variable d-c power supply, illuminated meter, constant tension illuminated dial chart, removable line cords, 110 v. a-c outlet and blank socket on panel for future tube types. $134.95. Heath Company, Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 2-6)

G-C Free Chemicals

During the month of March, TV servicemen are going to receive free chemicals. A pair of two-for-one special offers redeemable at leading parts distributors will be featured in the firm's advertising appearing in the March issues of prominent service magazines. Two coupons redeemable for merchandise will give the details. One provides for a free 6 oz. can of G-C Spra Kleen (No. 8666) with the purchase of a 16 oz. can of G-C Zero-Mist Spra Koat (No. 8667). The other offer will give a free 1 oz. bottle of G-C De-Ox-Id (No. 19-1) "miracle cleaner" with the purchase of a 2 oz. bottle of G-C Red-X high voltage Corona Dope (No. 50-2). For further information write to G-C Electronics Co., 400 S. Wyman St., Rockford, Ill.

GET more! DO more! MAKE more!

PROFIT PROFESSIONALLY ON EVERY CALL WITH

NEW B&K LOW-COST PROFESSIONAL Model 550 DYNA-QUIK

DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

Model 550

NET $119.95

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Get More for Your Money
—IN SPEED, ACCURACY, AND VALUE

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—SAVE CALL-BACKS, SAVE COST

Sell More Tubes
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Tests Each Section of Dual-Section Tubes Separately

Great new value in professional quick-check at small cost. Provides more tube sockets to test more tubes faster. Accurately checks most of the TV and radio tubes usually encountered in everyday service work. Tests each section of dual-section tubes separately. Measures true **dynamic mutual conductance**. Checks tubes for shorts, grid emission, gas content, and leakage. Completely tests each tube in seconds, checks average TV set in a few minutes, in home or shop. One switch tests everything. Fast, convenient reference listings on socket panel. Patented circuit provides automatic line voltage compensation. 7-pin and 9-pin straighteners on panel. Handsome, luggage-type carrying case. Net, $119.95

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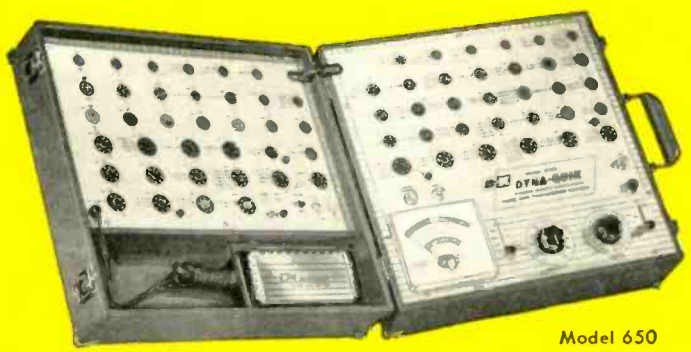

Model 650

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B&K MANUFACTURING CO.
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Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

Measure Your Service Operations

Statistical Study Provides Yardstick for Evaluating Travel, In-Home Repairs, Callbacks, Pricing and Number of Sets Repaired

ANDREW E. KIMBALL
MANAGER, MARKETING RESEARCH
REC. TUBE DEPT., GENERAL ELECTRIC CO.

• As a television-radio service dealer, do you know how your business practices compare with other similar dealers in your industry? Do you know how your pricing formula compares with the majority of dealers? Your percent callbacks? Your average service bill? Your service charge for home calls? Your average sales volume and profit per employed technician? Do you know if your operating trends are consistent with or contrary to the trends of the industry?

If you do not have some conception of these facts, you may be missing a meaningful opportunity to better understand your business and more intelligently set your business policies and goals. The increasing competitiveness of today's electronics servicing industry creates a growing need for you to carefully measure and plan for your individual business.

Unfortunately, accurate statistics are very rare in the electronics service industry. No comprehensive trade association or government data are collected and published, as is the case in most other industries.

Recognizing this problem and desiring to perform a service to our dealer customers, the Marketing Research Section of General Electric's Tube Department recently conducted an extensive survey among a nationwide sample of 4,000 service dealers. This survey was conducted to develop operating characteristics data for the "typical" full-time service dealer in different sizes of city and in different dealer size categories. A summary and analysis of the findings of this study are presented to enable you to compare your policies and operating characteristics with those of the "typical" dealer in your category. It should be pointed out that substantial variations exist in the answers to many of the questions so that the average should be used only as a rough benchmark. Also, the "typical" dealer may not be the best dealer. However, comparison with the average will present a challenge to explain why your own operations are different.

TABLE I

PERCENT OF TIME SPENT

SIZE OF CITY (POPULATION)	TRAVEL TO AND FROM JOB	SERVICE TIME IN HOME
OVER 100,000	35%	65%
10,000-100,000	28%	72%
UNDER 10,000	33%	67%

TABLE II

TV Sets Repaired Weekly

By City Size	By Dealer Size: Less than 1 tech. 1955	1959	1-3 technicians 1955	1959	Over 3 technicians 1955	1959
Over 100,000 pop.	25	28	41	41	102	109
10,000-100,000 pop.	28	29	36	49	56	70
Under 10,000 pop.	19	22	37	42	(not available)	

Service Job Characteristics

1. Travel time vs. repair time on typical service job in the home.

It is important for the service dealer to recognize in his pricing structure the large amount of unproductive travel time involved in his operation. The service charge or hourly rate must be calculated to adequately compensate for this time. Table I shows that travel time amounts to about one-third of time required for the average service job in the home.

Dealers in both large and small cities tend to spend more time traveling than do dealers in middle-size cities. This is undoubtedly a reflection of traffic congestion and scope of area covered in large places and the extension of coverage into rural areas surrounding small cities.

The percentages shown for travel time have not changed significantly since 1955.

2. Mileage radius of customer coverage in 1959 vs. 1955

Small service dealers in large cities tend to have a smaller area of coverage now than in 1955, undoubtedly due to increased competition, especially from new dealers in suburban areas.

Service dealers in medium and small size cities tend to have larger areas of coverage now than in 1955. This may be due to increasing saturation of TV in outlying areas, as well as the physical growth of these cities.

The area of customer coverage since 1955 has tended to increase more for large dealers than for small dealers. It may be assumed that one of the reasons for this condition is that these dealers are larger *because* they have

TABLE III

Percent TV Callbacks

By City Size	1955	1959	% Change '55-'59
Over 100,000 population	8%	5%	—37%
10,000-100,000	7	5	—29%
Under 10,000	6	5	—17%

been more aggressive in expanding their scope of coverage in giving service over a broader area.

3. Percent of TV set repairs made in owners' homes

The typical service dealer does most of his television set repairing in customers' homes. The proportion of home repairs is obviously much greater when the picture tube is not replaced.

When the picture tube *is not* replaced, 75-80% of repairs are made in the home by the typical dealer. Although variations exist, only 15% of dealers do less than half of set repairs in the home. No significant differences exist by dealer size, city size, or between 1955 and 1959.

When the picture tube *is* replaced, less than half of such repairs are done in the home. This is true among all types of dealers, except small dealers in large cities. Small dealers tend to do more replacing of picture tubes in the home than do large dealers, probably because they don't have specialized bench technicians in the shop and, in many cases, have less adequate shop facilities. Dealers in large cities do more replacing of picture tubes in the home than do dealers in small cities. This is undoubtedly due to the greater travel difficulties of the large metropolitan area. It is apparently more economical for such dealers to replace tubes in the home than to transport the set to and from the shop.

4. Average number of TV sets repaired per week

Table II illustrates changes in average number of sets repaired per week between 1955 and 1959 by dealer size and city size. Figures include sets repaired in both home and shop.

Increases between 1955 and 1959 have occurred in nearly all categories of city and dealer size. This is a result of increases in number of sets in use as well as increases in the average age of sets.

Although the average dealer experienced an increase, about one-fourth of service dealers reported a decrease between 1955 and 1959 in sets repaired per week. This is due to factors such as increased competition from other dealers in mature TV areas, growing competition from tube checkers in many areas, and shifting of some dealers from service activity to more emphasis on set sales.

5. Percent of TV service jobs requiring callbacks

A rather striking trend in servicing experience during the past few years has been a definite decline in percentage of callbacks. As shown in Table III, this trend has occurred in all sizes of city and has decreased an average of about 30% since 1955.

Reasons for the decline in callback rates may be assumed to be improving ability of technicians and improved quality of both sets and components. A small percentage of dealers (18%) reported a callback rate in excess of 10%. Because such a small number report serious callback problems, it would appear that limited technical ability and/or use of inferior quality parts may be the cause of their poor results.

Pricing the Service Job

One of the most critical business decisions a service dealer must make is how to determine a charge for his services which will provide for an adequate hourly rate plus a fair return on his business investment.

1. Pricing formula or practices used by service dealers

Our survey revealed that many different pricing formulas are being used by service dealers for setting

(Continued on page 89)

TABLE IV

TV Service Pricing

	Percent of Dealers 1955	1959
a. For Home Calls		
Minimum service charge + parts + labor at hourly rate	57%	53%
Minimum service charge + parts + standard price for specific repair	22	26
Combination of the above	11	11
Minimum service charge + parts	7	7
Standard price for specific repair + parts	3	3
	100%	100%
b. For Shop Work		
Labor at hourly rate + parts + pickup and delivery	51%	46%
Base technical fee + parts + standard price for specific type of repair + pickup and delivery	31	35
Combination of above	7	7
Flat rate for type of repair + parts	4	4
Minimum service charge + parts	2	2
Others	5	6
	100%	100%

TABLE V

SIZE OF CITY (POPULATION)	PERCENT OF DEALERS CHARGING EXTRA FOR DISTANT CUSTOMERS
OVER 100,000	65%
10,000-100,000	82%
UNDER 10,000	91%

TABLE VI

Criteria for Establishing Higher Fee

	Percent
Miles	42%
Time + miles	34
Time	8
Fee beyond city limits	3
No answer or other	13
Total	100%

TABLE VII

Average Minimum Service Charge

By City Size	1955	1959
Over 100,000 population	$4.50	$5.00
10,000-100,000	4.00	4.50
Under 10,000	3.50	4.00

TABLE VIII

Average TV Repair Bill (excluding CRT Replacement)

	In Home		In Shop	
By City Size	1955	1959	1955	1959
Over 100,000 population	$8.50	$10.50	$20	$25
10,000-100,000	8.25	9.50	15	18
Under 10,000	8.00	9.00	12	15

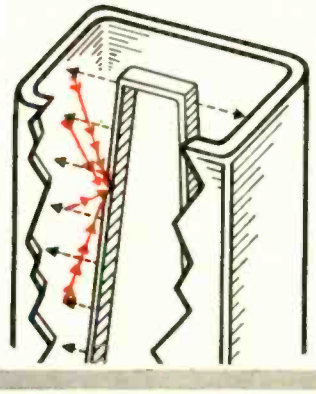
My new plates behave like plates... not filaments

(FORGET YOUR LOW-VOLTAGE RECTIFIER PROBLEMS)

HOW BACK EMISSION IS ELIMINATED

Back emission from overheated plate to filament causes most rectifier failures. Reverse current mounts . . . filament is stripped . . . overheats . . . burns out.

That's why the new CBS 5U4GB plates are of non-emissive material, are larger, and run cooler. These and many other advance engineered features make the new CBS 5U4GB the best you can buy. Here's typical proof. Dynamic "blast" tests brutally cycle the tube between 4 and 6.8 volts with 800 volts plate potential. Yet back emission is just measurable . . . less than one milliampere!



"My new plates don't heat up and start acting like filaments. They can't because my plate material is designed not to emit wrong-way electrons. So back emission can't build up and burn out my filament. And you aren't pestered with premature failures."

That is right. The new CBS 5U4GB offers you *total reliability* . . . proved in performance by leading TV and radio set manufacturers. You, too, can profit from the *total reliability* of CBS tubes. Just replace with CBS . . . always.

TOTAL RELIABILITY... proved in performance

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2 Cartridges: Ceramic and crystal phono cartridges: stereo and monaural, plug-in and conventional, with diamond or sapphire styli . . . a complete line is covered in literature. (2B2: Astatic Corp.)

3 Test Equipment: Literature is available covering: Model 1070 Dyna-Sweep circuit analyzer; model 550 Dyna-Quik tube tester and model 650 Deluxe Dyna-Quik portable tube and transistor tester. (3B2: B&K Mfg. Co.)

4 Two-Way Radio: The "580" Fleetcom VHF-FM mobile radio, featuring compactness, lightweight, full power output and interchangeable chassis, is covered in new literature. (4B2: Communications Co.)

5 Training Course: Subjects covered, cost to students and where the school is held are some of the points covered in a circular on a transistor training course. (5B2: Delco Radio)

6 Phono Needles: 700 needles are listed, with cross-reference information on cartridges and record speeds, in the 1960 edition of Duotone's annual chart. (6B2: Duotone Co.)

7 Tuners: How trade-ins can increase TV tuner sales and profits is described in literature. Tuners, which can not be repaired, can be traded in against a new replacement tuner which carries a twelve month factory guarantee. (7B2: Standard Coil Products Co.)

8 Rectifiers: Literature covers directly interchangeable tube replacement silicon rectifiers S-5251 and S-5018. Features include greater current capacity, temperature versatility and no warm-up period. (8B2: Sarkes Tarzian, Inc.)

9 Converter: Literature covers the "Electral," a device which converts car battery power from 12 volts d-c to 110 volts a-c, to permit the use of electric appliances. (9B2: Terado Co.)

10 Tools: The supplement to Vaco master catalog SD-56 consists of a 4-page illustrated folder holding individual catalog sheets and price lists. 8½"x11". Kalamazoo punched. (10B2: Vaco Products Co.)

11 Tube List: A listing of recommended tube stocks, and suggested quantities of each, to be kept in a tube caddy, is broken down to show the most frequently used types and those seldom used. (11B2: Vis-U-All Products Co.)

12 Two-Way Radio: The "Commaire," model ED-27, crystal controlled, double conversion superheterodyne class D citizens band radio, equipped with "Silent-Aire" squelch, is covered in literature. (12B2: Vocaline Co.)

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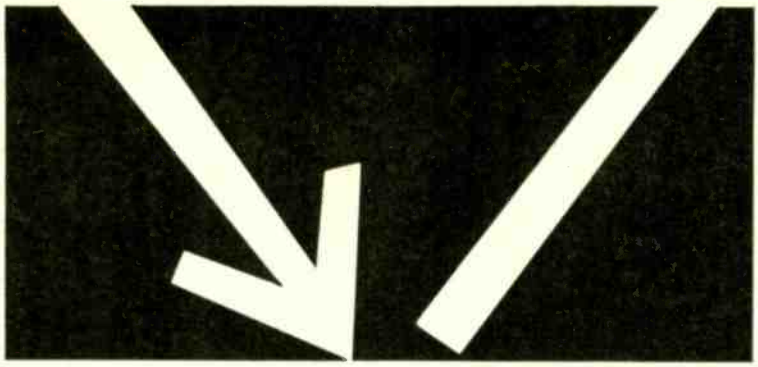

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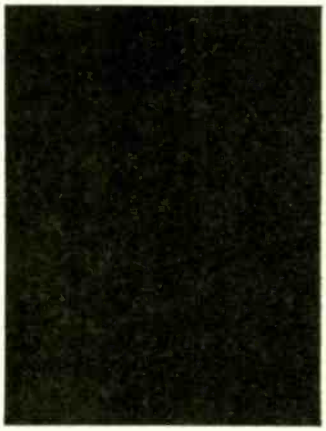

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1-18				St. Louis	Dallas	Salt Lake City
1-25		Atlanta	Detroit			
2-1	Union					
2-8				Omaha	Memphis	
2-15	Pittsburgh	Jacksonville				Los Angeles
2-22	Pittsburgh		Cincinnati			
2-29				Kansas City		
3-7	Tarrytown	Charlotte		Kansas City	Dallas	Portland
3-14			Cleveland			
3-21				Omaha	El Paso	
3-28	Boston	Atlanta				Los Angeles
4-4	Boston		Chicago	Minneapolis		
4-11				Minneapolis	Houston	
4-18	Union	Washington	Milwaukee		Houston	San Francisco
4-25		Washington				
5-2			Cincinnati	Omaha		Portland
5-9	Buffalo				Okla. City	
5-16		Atlanta	Detroit	St. Louis		
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6-6	Tarrytown		Chicago		Dallas	
6-13		New Orleans				San Francisco
6-20	Philadelphia			Denver		
6-27			Cleveland		Memphis	Salt Lake City

Color TV

(*Continued from page 39*)

that we can see what sequence primaries occur? Sometimes rainbows stand still; but sometimes they do not. In this regard, it may be noted that some operating controls have residual coupling with the color subcarrier oscillator, and are able to affect its operating frequency slightly. The principal controls in this regard are the color-phasing control and the horizontal-hold control.

If you manipulate these controls, you will usually be able to make a moving rainbow stand still, so that you can clearly see the sequence of the hues. However, if this is inadequate, take a floating tube shield and slip it experimentally part way over the color-subcarrier oscillator tube. This couples some stray capacitance into the oscillator circuit, and will change its operating frequency slightly—and you will be able to stop a fast rainbow in this manner.

Adjusting the 3.58 mc oscillator may stop rainbow motion for a moment. If this trial is successful, the 3.58 mc oscillator is usually good.

Multiple Rainbows

Of course, we do not always have a single rainbow displayed on the screen of the picture tube. Sometimes we have two rainbows. When we observe two rainbows, we know that the subcarrier oscillator is 120 cycles higher or lower than burst frequency. If the rainbows are standing still, we know that the frequency difference is exactly 120 cycles.

When we fix our attention on one of the rainbows, and observe the sequence of hues from top to bottom of the vertical scan, the same principles hold as illustrated in Figs. 4 and 5. Operation of the subcarrier oscillator below burst frequency generates the color sequences of RBG, BGR, or GRB, in a direction from top to bottom of the screen. On the other hand, operation of the subcarrier oscillator above burst frequency generates the color sequences of RGB, GBR, or BRG, in a direction from top to bottom of the screen.

You will find the same characteristics in three-rainbow, or four-

rainbow displays. So, it is apparent that when the principles of rainbow generation are clearly established in mind, it is a simple matter to determine the frequency of subcarrier oscillator operation rather closely. Then, by a look at the circuit diagram, and using our knowledge of circuit action, we can clear a great many inconsequentials out of the way, and concentrate on circuit components.

Since color appears on the CRT, this indicates that color signals are getting through the bandpass amplifiers, demodulators and CRT. This limits the defect to the burst channel, 3.58 mc oscillator at incorrect frequency (though it is operating), and afc-reactance circuits.

Hue Reproduction

Because the color picture tube is non-linear, and the light output increases faster than the applied signal voltage, a corrective measure is required. This is called gamma correction, and is accomplished at the transmitter by use of non-linear amplification whereby the signal output does not increase as fast as the signal input.

Gamma correction compensates for the non-linear characteristic of the color picture tube, but introduces another distortion in the form of poor detail when highly saturated colors are transmitted. This is particularly the case for highly saturated reds and blues, in which areas the picture detail is impaired most.

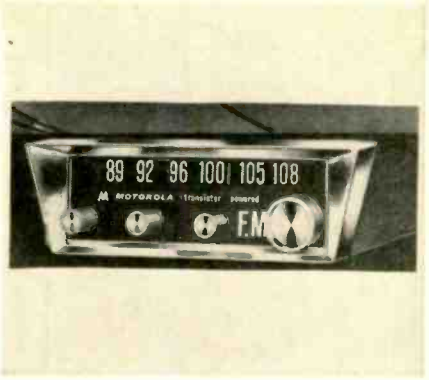
Unfortunately, gamma correction also introduces an error in many of the hues, both of a fixed and varying nature. This compromise is based upon non-linearities which are introduced, causing a color (or hue) change as the saturation is varied. Hue and saturation are no longer independent.

From a practical point of view, this means that when an actress walks across the stage, her dress may appear to change color somewhat as the level of the lighting varies. You have probably noticed this tendency in some program material.

Insofar as the service technician is concerned, the best compromise adjustment at the receiver is to set the hue control for the best flesh tones, and relegate any residual hue distortion to the less critical colors. ●

Motorola FM CAR RADIO

Model FM-900, claimed to be America's first mass-produced transistor-powered FM car radio, is a compact, complete, unit including its own speaker to operate independently of or in addition to the car's AM set. Designed for under-the-dash installation, it can be used in any 12 volt domestic automobile built since 1955, or in any other 12 volt vehicle having a negative ground ignition system. It is powered by 3 transistors and 7 tubes and has 15 watts peak power, 50 to 15,000 cps. Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Ill. (ELECTRONIC TECHNICIAN 2-7



Here's the ad a newspaper wouldn't dare print

DO NEWSPAPERMEN TAKE PAYOLA?

Yes! Reporters and columnists have been publicly exposed for being on the payroll of individuals interested in planting slanted stories. Newspapermen have admitted taking exorbitant fees for "goodwill" appearances. And they have been exposed for lying about non-existent attempts to bribe them.

What about the thousands of newspapermen—the overwhelming majority—who never took a nickel that they didn't sweat for? Are they unjustly smeared by inflating the stories about a few of their unethical colleagues?—You bet they are.

But that's exactly what the World-Telegram is doing in its series of distorted reports on "The Great Service Slump." Its first report doesn't even mention the fact that there are honest and dependable service technicians. This series is nothing more than shoddy, sensational journalism at its worst.

The truth is that service technicians bear the brunt of abuse because they must repair products all too often priced to sell, instead of made to wear well.

In the TV-electronic maintenance field, specialists with extensive technical training are working long hours for modest pay. A 1959 study by the Bureau of Labor Statistics showed that the average skilled technician worked 47 hours per week, and earned $86.50—far below many semi-skilled production workers. And there are no pension arrangements either.

Most important, contrary to the misleading implications of the World-Telegram series, almost all CONSUMERS ARE SATISFIED WITH THEIR PRESENT TV SERVICE. A survey of TV owners by Elmo Roper showed that 90% were satisfied, 77% noting very good. Only 4% were not satisfied.

Yes, there are newspapermen who take payola, and crooked technicians who soak their customers. Fortunately, these unappetizing specimens are rare, so newspapers and service technicians continue to carry out their important missions in a manner which does great credit to their respective professions.

Prepared by ELECTRONIC TECHNICIAN Magazine
World's Largest Electronic Maintenance Publication
480 Lexington Ave., New York 17, N.Y.

The World-Telegram and Sun, a major New York City daily newspaper, started another one of those shopworn "exposes" of the TV-appliance service industry. A few incompetents and sharp hustlers were described, with the implication that these men were representative. The first couple of articles in the series didn't mention the other 99-44/100% of service technicians who do a good job at a fair—or even too low—price.

To place the story in proper perspective for *World-Telegram and Sun* readers, ELECTRONIC TECHNICIAN prepared the ad shown on this page. We asked the newspaper to publish our statement—and we would pay regular advertising rates.

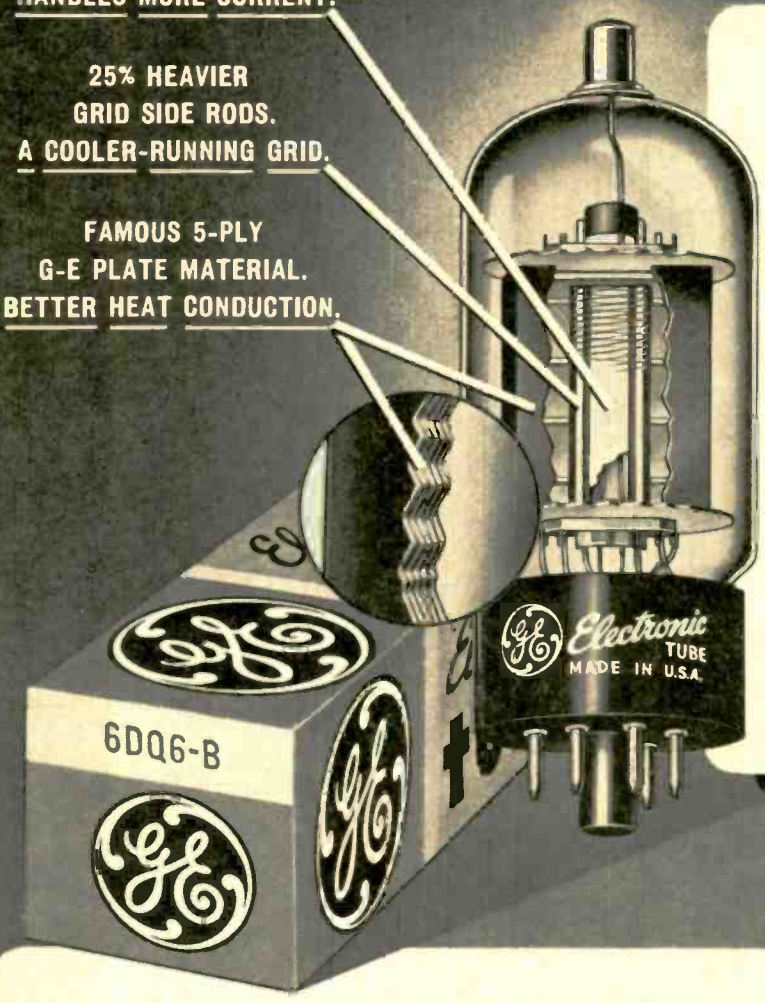
THE NEWSPAPER REFUSED! Evidently controversy is all right, as long as it is not critical and does not tell the other side of the story.

We urge every reader to stand up and make his voice heard whenever he reads an unjustified, disparaging attack on the TV-electronic service industry.

20% LARGER CATHODE.
HANDLES MORE CURRENT.

25% HEAVIER
GRID SIDE RODS.
A COOLER-RUNNING GRID.

FAMOUS 5-PLY
G-E PLATE MATERIAL.
BETTER HEAT CONDUCTION.



**HIGHER ELECTRICAL RATINGS.
MORE TUBE IN EVERY RESPECT!**

- **17% higher max plate dissipation than the 6DQ6-A—17.5 w vs. 15 w.**
- **17% higher max screen dissipation—3.5 w vs. 3 w.**
- **25% higher avg DC cathode current—175 ma vs. 140 ma.**
- **25% higher peak cathode current—550 ma vs. 440 ma.**
- **15% higher zero-bias plate current (typ. operation)—345 ma vs. 300 ma.**

Your Big NEW Business-Builder: G-E 6DQ6-B!

Hand-tailored for servicing the new 23" television sets... gives you better-than-ever performance in older TV's!

The Service-Designed 6DQ6-B is General Electric's brand-new horizontal-sweep tube with big performance *designed in*. Example: the 15% higher zero-bias plate-current characteristic gives ample sweep in the new 23" TV sets with their high sweep angles...it also means extra sweep capability in other television sets, for extra safety factor, fewer complaints and service callbacks.

Type 6DQ6-B is more dependable in every way...huskier, runs cooler. Check the construction features above! Same improvements apply to new G-E companion types 12DQ6-B and 17DQ6-B. Fully interchangeable with prototypes. See your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

311-301

How To Change A Needle

(*Continued from page 41*)

pling which is attached directly to the cartridge element. If these needles are not properly secured to the yoke, intermittent garble or no sound at all will result.

In reluctance type cartridges, such as the GE, the technician should make such that the magnetic vein is equally spaced between the pole pieces and that it does not touch the pole pieces. Static sounds will result if the vein comes in contact with the pole pieces. Also, the serviceman must make sure the needle is not bent and that it does protrude out beyond the guard.

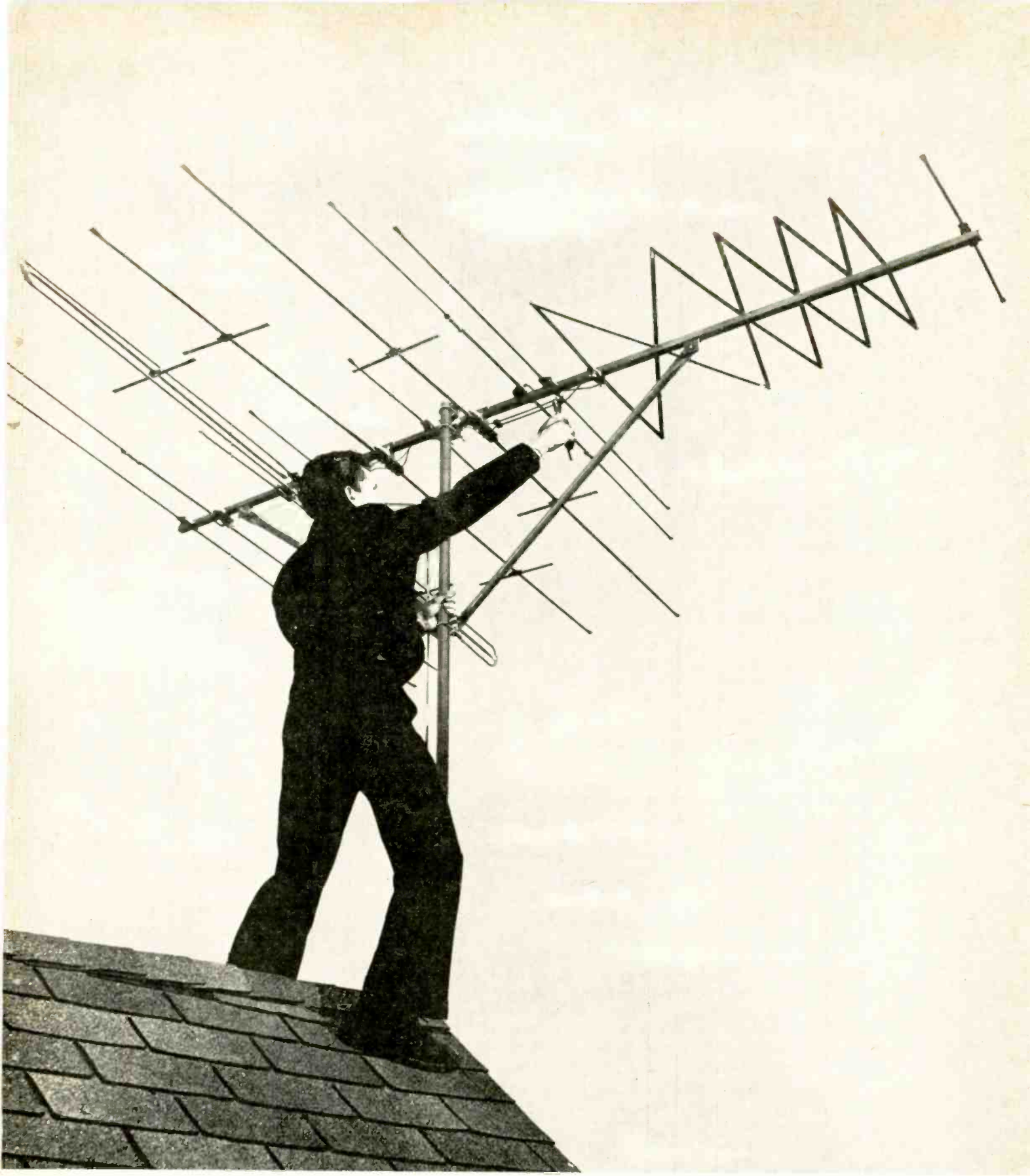
Worn Needles

However, if there is any reason to suspect that poor reproduction is being caused by a worn needle, an examination under a microscope is in order. A worn needle soon will make itself heard. Unfortunately, when this point is reached, the needle is already harming records.

As a needle wears, it becomes flat along the sides. This creates a grinding effect on the inside of the record's sound grooves, shearing off the tiny corners which produce the high notes and distorting the character of the sound.

A good way for the service technician to check on this is to find out how many hours the customer has played his machine since changing needles. For example, a diamond-tipped needle may be played about 750 to 1500 hours. The person who owns a sapphire tipped needle can usually play it safely up to 60 hours. This assumes using the correct tracking pressure indicated by the manufacturer.

A good rule of thumb can be applied to the average phonograph owner, who probably does not keep any record of the hours he plays his machine is this: under normal use a sapphire needle should be changed every two or three months, and a diamond tip every one or two years. This generalized rule is naturally subject to needle pressure, record cleanliness, handling and other variable considerations. •



The Businessman in the Service-Technician Suit knows that the service-dealer leaders of tomorrow install JFD Hi-Fi Helix Colortennas today. He relies on JFD for uncompromising performance...quality...durability to build confidence and insure complete customer satisfaction.

THE BRAND THAT PUTS YOU IN COMMAND OF THE MARKET

JFD

JFD ELECTRONICS CORPORATION
BROOKLYN 4 NEW YORK

New Audio Design Concept

• A stereo hi-fi design created for Alcoa's "Forecast" collection of outstanding futuristic designs using aluminum is shown in Fig. 1.

The Forecast Music Sphere, as it is called, is a three-foot aluminum globe mounted on a tubular shaft atop a four-legged stand. Extending speakers telescope into the main body when the system is not in use. The front of the enclosure is a hemi-

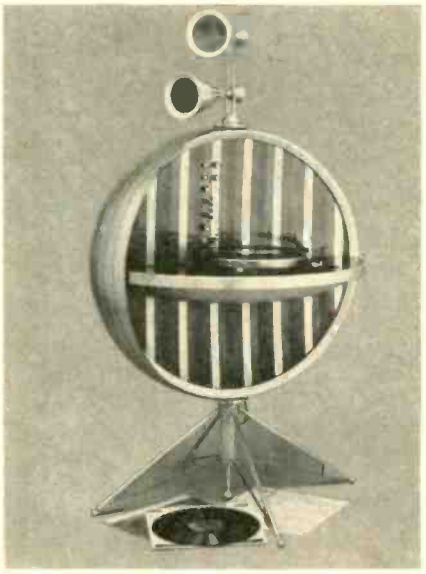


Fig. 1—A stereo hi-fi unit enclosed in an aluminum dome is a new design concept.

sphere, which rotates about the vertical shaft, telescoping around the rear portion to expose turntable and amplifier controls.

The unit represents a radical departure in appearance and is a new concept for the living-space realities in today's home. There are no immediate plans to place the unit in production. •

"Turn it on."

NEW PRODUCTS

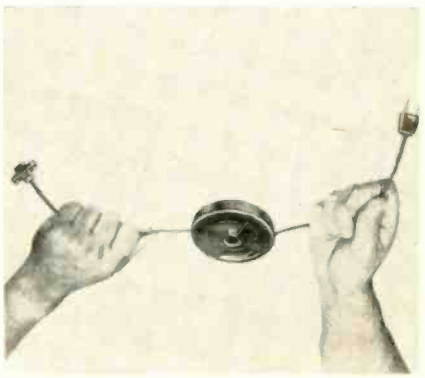
Eveready BATTERY DISPLAYER

A complete transistor radio battery department, in less than a square foot of counter space, is provided by the new Eveready battery displayer, assortment No. 75. The unit displays 44 Eveready transistor radio batteries selected from the 5 best-selling types

which power over 95% of all transistor radios. On the back of the display are a handy price schedule and battery cross-reference data. Included is a free display streamer for show window or wall. National Carbon Co., 30 E. 42nd St., New York, N. Y. (ELECTRONIC TECHNICIAN 2-21)

GE REEL

A new cord take-up reel, with a 9' capacity, is a convenient holder for cheater cords. It stores the cord neatly, eliminates loose, tangled cords in the tool box and keeps the cord ready for



instant use. In use, the cord is pulled out to lengthen and reeled in to shorten. After use it is rewound by twisting the spindle. Price, about 39¢. General Electric Co., Wiring Device Dept., Providence 7, R. I. (ELECTRONIC TECHNICIAN 2-22)

For More Information On NEW PRODUCTS Circle Code Numbers, p. 64

kills TV tuner noise fast while it cleans and lubricates!

Walsco

CONTACTENE

IN THE HANDY SPRAY CAN

MAKES SPEEDIER SERVICING A CINCH

For eliminating noise on controls, switches, tuners and other mechanical components, there's nothing better than fast-acting, easy-to-use WALSCO CONTACTENE in the handy spray can. Fast-drying Contactene lubricates as it cleans, is absolutely non-oxidizing. Specially compounded solvent removes coatings of oxide, grease, dirt and corrosion without harming metal or insulation. Always use Walsco Contactene . . . the complete cleaner-lubricant in one handy can.

No. 80-12 Giant 16 oz. size only $1.49 Dealer Net

Also available in 6 oz. size No. 80-06

WALSCO PHONO DRIVES

. . . the only complete line of replacement phono and recorder drives and belts on the market, includes all the latest model turntables and changers.

WRITE for your free copy of the big Walsco Catalog. Send postcard today!

Walsco **ELECTRONICS MFG. CO.**

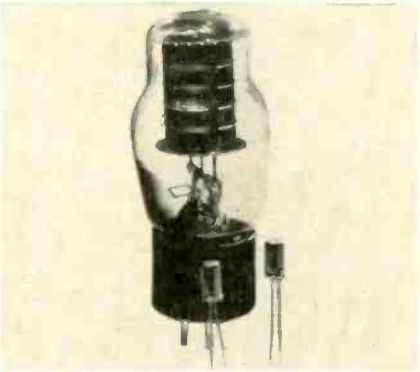
Division of Textron Inc.

West Plant: Los Angeles 18, California • Main Plant: **ROCKFORD, ILLINOIS, U.S.A.** • Canada: Atlas Radio Corp., Ltd., Toronto 19

YOU CAN GET WHAT YOU WANT FROM WALSCO!

Hoffman REGULATORS

Type RS-6, single anode, and the twin anode unit Type RT-6 are offered in a new low cost line of silicon zener regulators. RS-6 has a reverse breakdown voltage of 6 volts ±1 volt and a maximum dynamic impedance of 15 ohms. RT-6 has 20 ohms of maximum dynamic impedance at the same reverse breakdown voltage. Both types are rated at 10 ma, DC. For higher voltages, the



regulators can be wired in series combinations. Applications include voltage regulation for 12 and 24 v. mobile power systems, replacement of gaseous tube regulators and reference units, biasing and coupling elements in transistor circuits, etc. Prices are $1.80 each in lots from one to 99. Hoffman Electronics Corp., Semiconductor Div., 930 Pitner Ave., Evanston, Ill. (ELECTRONIC TECHNICIAN 2-24)

Raytheon TUBES

Ten new receiving tubes, added to the firm's replacement line, are: three half-wave rectifiers, 6DE4 and 17DE4 octal based for TV damper applications and 50DC4, a 7-pin miniature rectifier for use in intercom systems and small audio amplifiers. The 6DQ6B is an improved version of the 6DQ6 and the 6DQ6A and can be used in place of either. A 7-pin duo-diode triode, the 12EL6 is found as a detector in radio receivers. Six of the new offerings are 9-pin miniatures. The 5BW8, a duo-diode pentode is used in phase detector-audio amplifier applications. The 6EU8 is a pentode-triode found in TV mixer oscillator applications. A triode-pentode, the 6GH8, is a horizontal amplifier in TV receivers. The 6GK6, a power pentode, and the 6DT8, a dual triode, are used as audio or video output amplifiers or Class A amplifiers, respectively. Raytheon, Distributor Products Div., Unicenter, Westwood, Mass. (ELECTRONIC TECHNICIAN 2-9)

WIN PRIZES!

Enter the Shop Hint & Tough Dog CONTEST

Rules and entry form are on page 45

Audio NEWS LETTER

BLONDER-TOGUE publishes a counter give-away listing of the nation's FM and FM-AM radio stations, arranged by state, city, frequency and call letters.

GLASER-STEERS introduces the GS-400 4-speed stereo record changer @$47.50, less cartridge.

ARGOS announces a Tuning Tube which is mounted in an enclosure to match the speaker and eliminate undesirable boom.

STROMBERG appoints Arthur J. Hatch, Jr., as vice president and general manager of the Special Products Div.

LAFAYETTE announces the TruTest Stereo/5 amplifier @$10.45. This 4-tuber measures 4 1/2" H x 5 1/2" W x 4 1/2" D.

OLSON announces the AM-147 stereo amplifier-preamp @ $69.95. Ratings are 15 watts/channel, hum —79 db. Also: Model RA-338 FM tuner @$35.95 with afc is rated at 3.5 μv sensitivity for 20 db quieting, and Model VC-213 variable high pass filter @$3, which allows accurate volume balance between woofer and tweeter.

REK-O-KUT announces the KK-1 Stereo Konnector Kit @$2.49 to provide quick connection between any arm and amplifier. They are offered in 18-unit counter racks. The company also publishes the 12-page booklet, "How to Build Your Own Audax Paraflex Speaker Systems," @25¢.

ROBINS INDUSTRIES introduces 100" rolls of 1/2" mylar splicing tape @50¢; package of 12 tape clips @40¢; and changer and turntable covers packaged in a see-through bag. The firm also publishes the 128-page "How to Get the Most Out of Tape Recording," @$1; and data sheet on recording heads for Wilcox-Gay.

(Continued on page 80)

SUPERIOR'S NEW MODEL 77

VACUUM TUBE VOLTMETER

WITH NEW 6" FULL-VIEW METER

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

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

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

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

SPECIFICATIONS

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

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

Comes complete with operating instructions, probe, leads, and steamlined carrying case. Operates on 110-120 volt 60 cycle. Only.. **$42.50**

SUPERIOR'S NEW MODEL TW-11 **STANDARD PROFESSIONAL**

TUBE TESTER

★ Tests all tubes, including 4, 5, 6, 7, Octal, Lock-in, Hearing Aid, Thyratron, Miniatures, Sub-miniatures, Novals, Sub-minars, Proximity fuse types, etc.

★ Uses the new self-cleaning Lever Action Switches for individual element testing. Because all elements are numbered according to pin-number in the RMA base numbering system, the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TW-11 as any of the pins may be placed in the neutral position when necessary.

★ The Model TW-11 does not use any combination type sockets. Instead individual sockets are used for each type of tube. Thus it is impossible to damage a tube by inserting it in the wrong socket.

★ Free-moving built-in roll chart provides complete data for all tubes. All tube listings printed in large easy-to-read type.

NOISE TEST: Phono-Jack on front panel for plugging in either phones or external amplifier will detect microphonic tubes or noise due to faulty elements and loose internal connections.

EXTRAORDINARY FEATURE

SEPARATE SCALE FOR LOW-CURRENT TUBES: Previously, on emission-type tube testers, it has been standard practice to use one scale for all tubes. As a result, the calibration for low-current types has been restricted to a small portion of the scale. The extra scale used here greatly simplifies testing of low-current types.

The Model TW-11 operates on 105-130 Volt 60 Cycles A.C. Comes housed in a handsome portable saddle stitched Texon case. Only **$47.50**

SUPERIOR'S NEW MODEL 83

C.R.T. TESTER

Tests and Rejuvenates ALL PICTURE TUBES

ALL BLACK AND WHITE TUBES

From 50 degree to 110 degree types —from 8" to 30" types.

ALL COLOR TUBES

Test ALL picture tubes—in the carton—out of the carton—in the set!

- Model 83 is not simply a rehashed black and white C.R.T. Tester with a color adapter added. Model 83 employs a new improved circuit designed specifically to test the older type black and white tubes, the newer type black and white tubes and all color picture tubes.
- Model 83 provides separate filament operating voltages for the older 6.3 types and the newer 8.4 types.
- Model 83 employs a 4" air-damped meter with quality and calibrated scales.
- Model 83 properly tests the red, green and blue sections of color tubes individually—for each section of a color tube contains its own filament, plate, grid and cathode.
- Model 83 will detect tubes which are apparently good but require rejuvenation. Such tubes will provide a picture seemingly good but lacking in proper definition, contrast and focus. To test for such malfunction, you simply press the rej. switch of Model 83. If the tube is weakening, the meter reading will indicate the condition.
- Rejuvenation of picture tubes is not simply a matter of applying a high voltage to the filament. Such voltages improperly applied can strip the cathode of the oxide coating essential for proper emission. The Model 83 applies a selective low voltage uniformly to assure increased life with no danger of cathode damage.

Model 83 comes housed in handsome portable Saddle Stitched Texon case—complete with sockets for all black and white tubes and all color tubes. Only **$38.50**

RCA RADIATION COUNTER

MADE TO SELL FOR $150 — OFFERED FOR ONLY $47.50 NET

(Much less than cost of Manufacture.)

INDICATES RADIOACTIVITY IN 3 WAYS!

1—BY NEON
2—BY PHONE
3—BY METER

Endless experiments and discoveries in the new exciting field of nuclear energy are made possible when you acquire this finely built and engineered device. In the past, a rugged counter which was suitable for the prospecting of radio-active ores such as uranium, thorium and radium, was unsuitable for laboratory work due to the inability of combining accuracy with ruggedness. Conversely a laboratory counter, while being extremely sensitive, could not withstand use in the field where it would be subjected to abuse and abnormally hard knocks. In the laboratory where determination of intensity (counts) of a reading are necessary, the WF-10AWB provides sensitivity for surpassing many laboratory counters.

SPECIFICATIONS

Employs the extra sensitive 1B85 Bismuth Type Geiger Counter Tube. Sensitivity is .05 Roentgens per hour (1 MR/HR=2,000 counts per minute). • Three counting ranges: 0-100/1,000/10,000 counts per minute. • Handy reset button. • Ideal for survey work because the complete unit weighs only 5½ lbs. • Sight and sound indications by neon flashes and headphone. Then when an indication is obtained you switch to meter reading for exact measurements. • Decontamination easy with damp cloth applied to the weather-proofed aluminum case. • A radioactive specimen is included for instrument checking and experiments. • Included at no extra charge—U. S. Atomic Energy Commission booklet titled "Prospecting with a Counter." • R.C.A. Model WF-10AWB comes complete with self-contained batteries which provide over 200 hours of intermittent operation.

Comes with complete set of batteries, carrying strap, headphone, radio-active specimen and A.E.C. booklet Only **$47.50**

SHIPPED ON APPROVAL

NO MONEY WITH ORDER — NO C. O. D.

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

MOSS ELECTRONIC, INC.
Dept. D-723 3849 Tenth Ave., New York 34, N. Y.

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

Name .....
Address .....
City ..... Zone .... State .....
All prices net, F.O.B., N. Y. C.

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

☐ Model **TW-11** . . . Total Price $47.50 $11.50 within 10 days. Balance $6.00 monthly for 6 months.

☐ Model 83 Total Price $38.50 $8.50 within 10 days. Balance $6.00 monthly for 5 months.

☐ **RCA Radiation Counter . . . Total Price $47.50. $11.50 within 10 days. Balance $6.00 monthly for 6 months.**

(Continued from page 78)

FANON announces the FW-50 two-station wireless intercom @ $89 list. Each station employs a four-tubes amplifier and silicon rectifier.

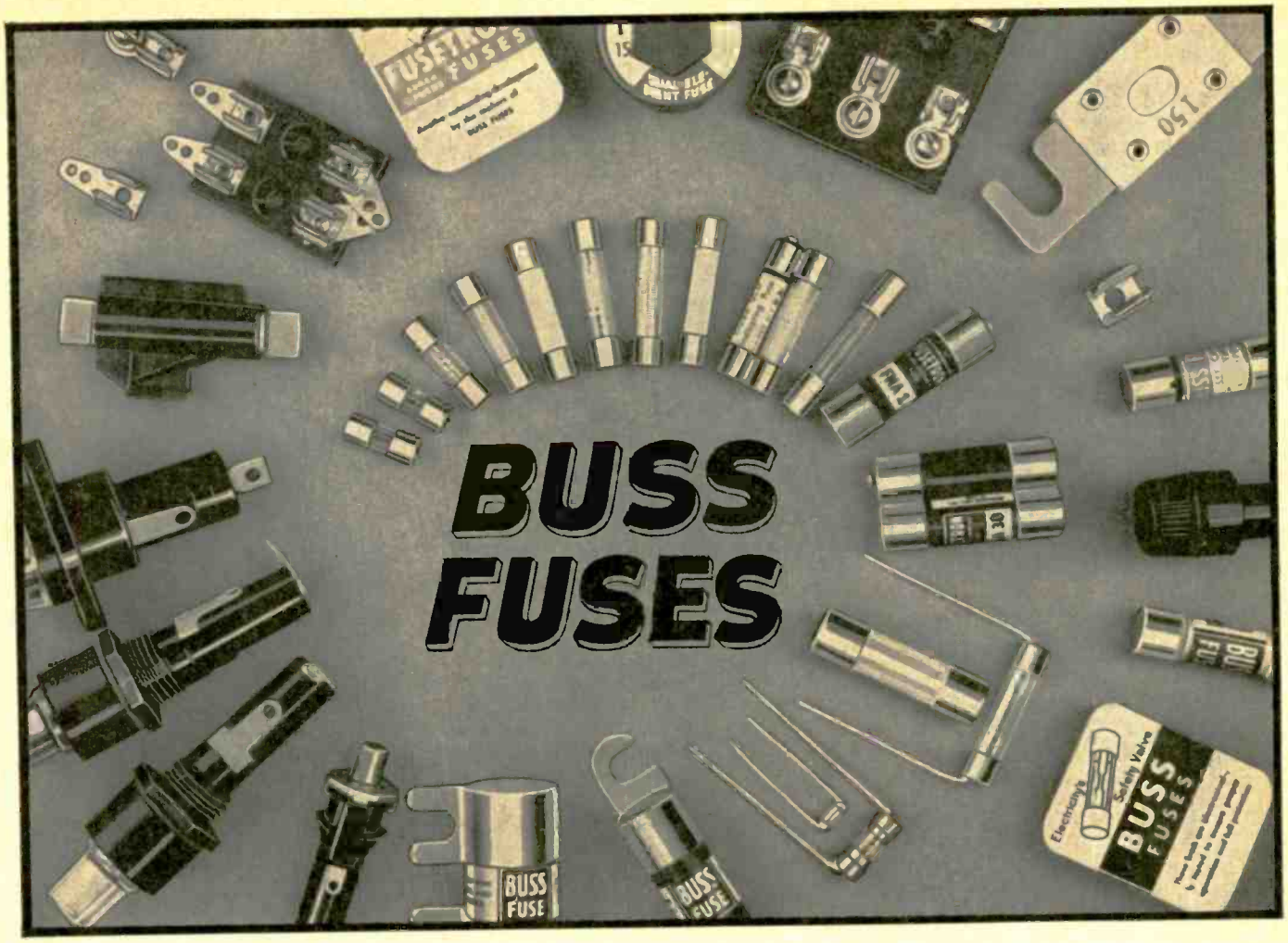
MINNESOTA MINING has reissued its 4-page glossary, "99 Tape Recording Terms." Copies from Dept. E9-520, 900 Bush Ave., St. Paul, Minn.

PHILCO will market a line of hi-fi and stereo components in 1960. Included are the PF-65 Stereo-Phone speaker system, RT-400X AM/FM stereo tuner, PR-80 preamp/amplifier and related units.

RCA's stereo line offers swing-out consoles in which extra speaker can swing from the side of the cabinet or be detached. Diamond styli are more widely used. An optional remote control balances speakers.

SHURE offers to make a free stereo conversion for owners of M12 or M16 integrated mono tone arms who buy an M21 Stereo Studio Dynetic cartridge. Upon purchase, the owner sends a certificate and the arm to the factory. After conversion, the arm can be used with the mono and stereo cartridges interchangeably. The company has also set up a coop student training program with several universities. Roger Anderson has been named manager of the firm's cartridge section.

BETTER BUSINESS BUREAU is concerned with advertising claims for three-channel stereo—and perhaps four and five channels to come. BBB sought our counsel in this matter, and we advised them to go slow since there could be honest semantic differences in defining channels. So BBB has sent queries to package and component makers to poll opinions on the propriety of calling the receiving end of a two-channel transmission system three-channel. Most component producers appear ready either to abandon the three-channel claim, or to specify it more accurately as a "blend" or "derived" channel.



TWO-WAY PROTECTION

Dependable BUSS Fuses protect your customer's equipment . . .

help safeguard your profit and reputation

Whether you sell or install fuses — it doesn't pay to handle one that may open needlessly or fail to protect when trouble occurs. Such fuses are a threat to your profits and reputation for service and reliability.

You and your customers can depend on BUSS and FUSETRON fuses. Why? Because if they're not right, they never leave our plant. Every BUSS and FUSETRON fuse is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

So why take a chance? Standardize NOW on genuine BUSS and FUSETRON fuses . . . fuses that unfailingly protect against electrical faults and by so doing, also helps protect your profits, helps you maintain the goodwill of your customers.

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

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

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

260

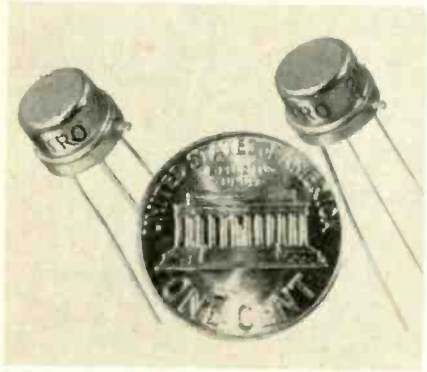
BUSS fuses are made to protect - not to blow, needlessly.

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

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS
McGRAW EDISON

Industro TRANSISTORS

Announced is Type 2N1356, an improved floating base replacement for type 2N396A. Floating base construction eliminates the possibility of contact shorts caused by "hot cans" touching. This PNP germanium alloy junction transistor is designed for mili-



tary and industrial computer use. Also available in this series are types 2N1353, 2N1354, 2N1355 and 2N1357. They are floating base replacements for types 2N384, 2N395, 2N396 and 2N397. Industro Transistor Corp., 35-10 36th Ave., Long Island City 6, N. Y. (ELECTRONIC TECHNICIAN 2-25)

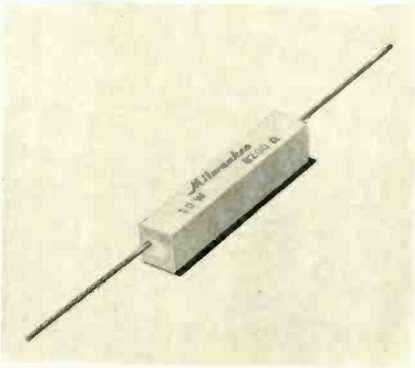
Knight VOM KIT

A pocket-size test unit, 2-⅜"x3¾"x 1½", the No. 83-Y-708 VOM kit reads in 13 ranges at 1,000 ohms per volt d-c sensitivity. The ranges are d-c volts. 0-5-15-50-150-500; a-c volts 0-15-50-150-500; d-c milliamps, 0-1-10-100; ohms, 0-30,000 (1,200 ohms mid-scale).

It has a front-panel zero-adjust, 2½" meter with two-color scale, and 5% shunts and multipliers, and is supplied complete with battery and test leads. $9.95. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (ELECTRONIC TECHNICIAN 2-26)

Milwaukee RESISTORS

Adding to its already extensive line of resistors, this firm is now producing the very popular "bathtub" resistor in 5 watt capacity from 5 to 6,000 ohms and in 10 watt capacity from 5 to 15,000 ohms. These "bathtub" resistors are also produced in 4 watt, 7 watt, 15 watt



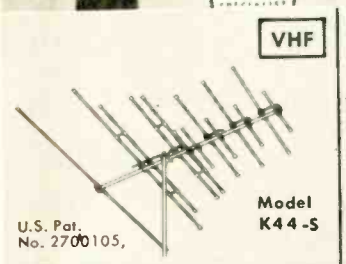
and 20 watt capacity on special order for O.E.M. users only. All of the firm's resistors are ceramic encased and have waterproof encapsulation. Milwaukee Resistor Co., 700 W. Virginia St., Milwaukee 4, Wis. (ELECTRONIC TECHNICIAN 2-27)

Winegard's

"K" SERIES, NEW, PLAIN-ALUMINUM ANTENNA LINE

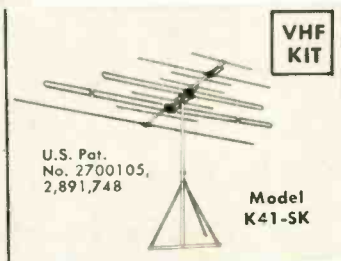
Now, Winegard introduces a complete new series of plain aluminum antennas in addition to Winegard's incomparable line of GOLD ANODIZED TV and FM antennas. Winegard "K" Series antennas are priced so you can meet any competitive situation . . . at the same time, you can give your customers a much better antenna for the money.

Compare "K" Series antennas with plain aluminum models offered by others. See for yourself how *much more* you get from Winegard. You'll find a "K" Series model for every reception requirement. Ask your Winegard distributor or send in the coupon below.



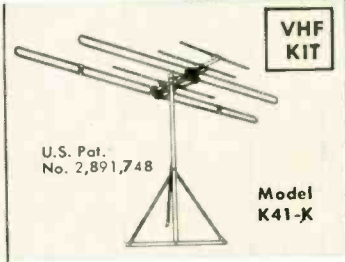
POWERCEPTOR

Four 9 and 11-element models with fold-out driven elements. Electro-Lens director system. All-channels 2-13. List $19.50 and $21.50.



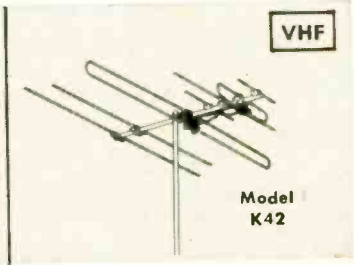
SUPER POWERBEAM

Three complete fringe area kits. Patented tripod roof mount; Chimney mount; Mast and guy wire mount. All channels 2-13. List: $26.20 $29.35 $36.70.



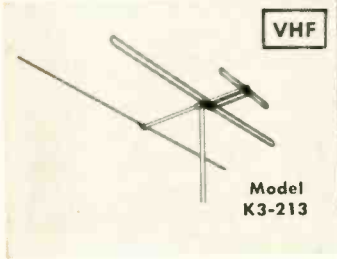
POWERBEAM

Complete kit including patented universal tripod roof mount. Excellent for primary and near-fringe areas. All ch. 2-13. List, $14.95.



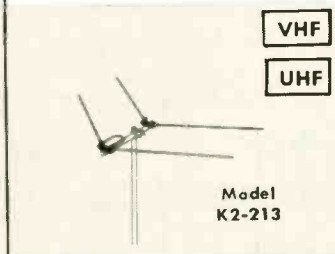
POWER PIX

Ideal replacement for old style "Con Yagis". Full-power gain on all channels 2-13. Stacking increases power 84%. List, $13.00



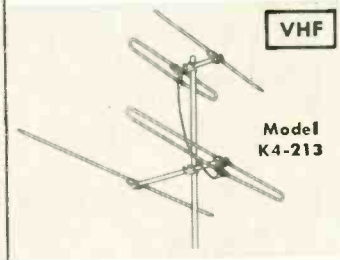
INLINE

Well-built standard inline for all (VHF) channel coverage in primary areas. Dual moisture-barrier insulators. List, $6.60



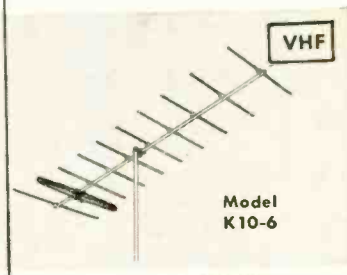
VEE

Improved version of the popular "Vee". Reflector has inductance loading coil for more uniform gain and frequency response. List, $5.55



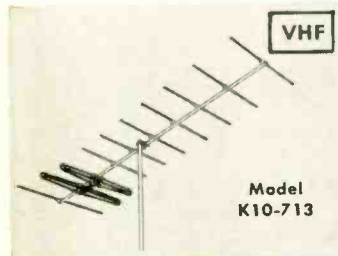
HI-LO

For use in city and suburban areas. List, $7.90. HI only, List $2.60 only, List $5.05. Includes one-piece, wrap-around mast clamp.



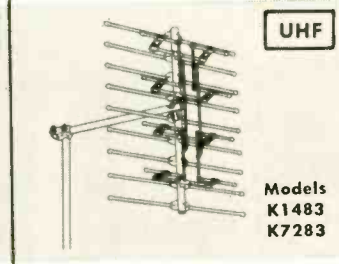
CUT-TO-CHANNEL

Complete series of wide-spaced 5-element and 10-element cut-to-channel yagis. Center bar of driven element snaps out for stacking. List, $4.90



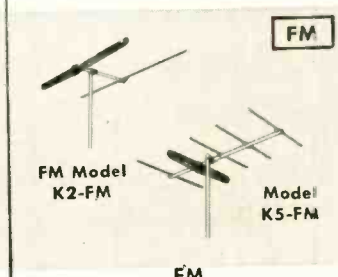
BROAD-BAND

Complete series of wide-spaced 5-element and 10-element broad-band yagis. Center bars of driven elements snap out for stacking. List, $7.20



UHF COLINEAR

High gain antenna with exclusive offset maunt. Stacks horizontally for greatest efficiency. Regular UHF or Translator UHF model, List $9.80.



FM

Two-element and 5-element wide-spaced FM yagis for improved reception on 88-108 mc. Directive, high-gain design. K2-F M, List $5.05 K5-FM, List $13.80

GET THE DETAILS

The Winegard Company
3019-2 Scotten Blvd.
Burlington, Iowa

Please send technical bulletins on the following "K" Series models:

_____

_____

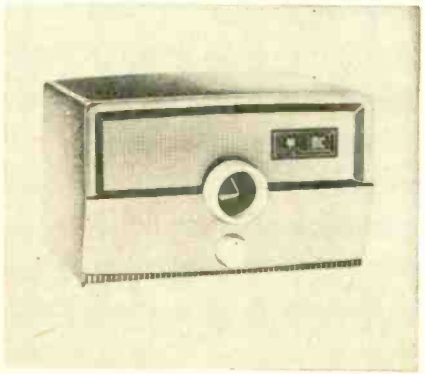
_____

Name_____

Address_____

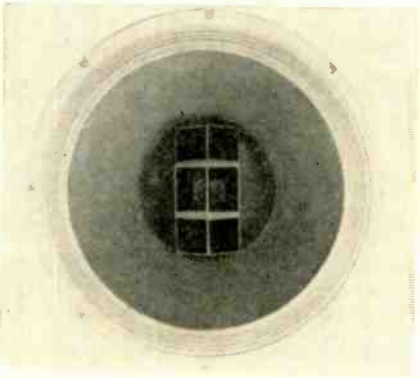
Monitoradio FM TUNERS

Two new 115 v ac-dc operated receivers giving 100 kc selectivity, drift compensated, with 10 μv sensitivity are: Model PR-35, tunes the 30-50 mc band, and Model PR-155 tunes 152-174 mc. A temperature compensated superhetrodyne circuit minimizes drift. Ratio detector minimizes noise under "no signal" conditions. Designed for police, fire, forestry, pipeline, taxi, civil defense, marine, transportation and industrial uses. The radio and 4" P.M. speaker are housed in plastic cabinets. Monitoradio Division, I.D.E.A., Inc., 7900 Pendleton Pike, Indianapolis 26, Ind. (ELECTRONIC TECHNICIAN 2-28)



Altec Lansing SPEAKER

A new Duplex speaker, the 15 inch model 605A, is said to incorporate improvements in bass and treble, yet maintain many of the attributes of its predecessor, model 604D. A 25 cps cone resonance and lighter voice coil contribute to its range. A crossover network with a high frequency balance control is provided. Frequency response is reported as 20 to 22,000 cps. Other specifications include: 16 ohms voice coil impedance, 35 watt power capacity and 1,600 cps crossover frequency. $175.00 Altec Lansing Corp., Anaheim, Calif. (ELECTRONIC TECHNICIAN 2-29)



Collaro RECORD CHANGER

A new stereo automatic intermix changer, model TC-99, features a 6½ lb. non-magnetic turntable. Performance specifications reported exceed NARTB standards for wow, flutter and rumble. A heavy duty 4 pole motor, precision balanced and screened with triple interleaved shields, provides a 25 db reduction in magnetic hum. There is a difference of less than one gram tracking pressure between the top and bottom of a stack of records. Price is $59.50, slightly higher in the West. Rockbar Corp., 650 Halstead Ave., Mamaroneck, N. Y. (ELECTRONIC TECHNICIAN 2-30)

NEW PRODUCTS

For More Information On NEW PRODUCTS Circle Code Numbers, p. 64

Chemtronics "TROL AID"

Non-inflammable and containing miracle activated cleaner VC5, "Trol Aid" lubricates and restores controls and switches. It will not affect electrical properties nor harm insulators. It does not contain "Carbon-Tet." Eight-ounce

aerosol can with free spray aid and wall mount, $1.98. Three-ounce caddy size, $.98. Two-ounce bottle with applicator, $.79. Chemtronics, Inc., 122 Montgomery St., Brooklyn 25, N. Y. (ELECTRONIC TECHNICIAN 2-4)

Terado "ELECTRAL"

A new 52-watt device for car battery power conversion from 12 volts d-c to 110 volts a-c, to permit the use of electrical appliances such as radios, phonos, razors, lights, dictation ma-

chines and small tape recorders is operated by plugging into the cigarette lighter in the car. Housed in a leatherette finish case, 3" x 2¼" x 5½". $24.95. Terado Co., 1064 Raymond Ave., St. Paul 8, Minn. (ELECTRONIC TECHNICIAN 2-11)

RCA Electronic Instruments

"PREFERRED BY PROFESSIONALS"

GENERATORS

WR-46A VIDEO DOT/CROSSHATCH GENERATOR

A "must" for making color-TV static and dynamic convergence adjustments in the home or shop. Derives sync from station-tuned TV set and reinserts highly stable video dot, bar or crosshatch patterns to picture tube grids or video amplifier grids. $179.50* (complete with cables, instruction book).

WR-61B COLOR-BAR GENERATOR

For checking overall operation of color-TV receivers and a "must" for adjusting and troubleshooting color phasing and matrixing circuits. Generates signals for producing 10 bars of different colors simultaneously. $295.50* (complete with cables, TV-input adapter, instruction book).

WR-99A CRYSTAL-CALIBRATED MARKER GENERATOR

To supply a fundamental frequency rf carrier of crystal accuracy for aligning and troubleshooting color, black-and-white TV, FM receivers and other electronic equipment operating in 19 Mc to 260 Mc range. $242.50* (complete with output cable, two phone tips, instruction book).

WR-49B SIGNAL GENERATOR

For alignment and signal tracing of AM/FM receivers, low-frequency signal tracing and alignment of TV vf/if amplifiers. Six ranges—85 Kc to 30 Mc. Internal 400 cps modulation. Low rf signal leakage! DC blocking capacitors at rf and af output terminals prevent damage to instrument or external circuits. $79.50* (complete with shielded cable for rf and af output, instruction book).

WR-69A TELEVISION/FM SWEEP GENERATOR

For visual alignment and troubleshooting of TV rf/if vf circuits and other electronic equipment. IF/video frequency ranges 50 Kc to 50 Mc, TV channels 2 to 13, plus FM range—88-108 Mc. Sweep width 0-12 Mc or more. Output level—0.1 volt or more. Attenuation ratio 60 db or more below maximum output. $295.00* (including all cables, instruction book).

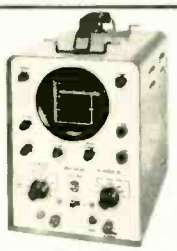
WR-70A RF/IF/VF MARKER ADDER

To be used with WR-69A, WR-99A or similar electronic equipment. Eliminates waveform distortion due to overloading receiver during visual alignment techniques by adding markers after the rf signal is demodulated. $74.50* (complete with cables, instruction book).

SCOPES

WO-91A 5-INCH, COLOR-TV OSCILLOSCOPE

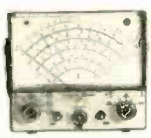
High-performance, wideband oscilloscope ideally suited for color-TV, black-and-white TV, and other electronic applications. Dual bandwidth (4.5 Mc, 0.053 volts rms/in.), (1.5 Mc, 0.018 volts rms/in.). Internal calibrating voltage and calibrated graph screen. Includes special direct/low cap shielded probe and cable. $239.50* (Includes ground cable, insulator clip, instruction book).



NEW! WO-33A SUPER-PORTABLE OSCILLOSCOPE

A low-cost all-purpose scope you can carry anywhere—only 14 pounds—ideal for in-the-home servicing of black-and-white and color TV, audio and ultrasonic equipment. High gain and wide bandwidth to handle the tough jobs! Rugged and compact—scaled 3" graph screen. Only $129.95,* complete with low-cap direct input probe, cable, power cord and cord carrying brackets. (As an easy-to-assemble kit, WO-33A(K), only $79.95*).

METERS and TUBE TESTERS



WV-98A SENIOR VOLTOHMYST®

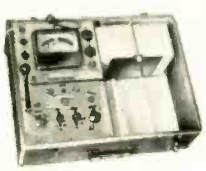
For making accurate ac and dc voltage measurements as well as measuring resistances from 0 to 1,000 megohms. Measures peak-to-peak values of complex waveforms. Ruggedized, die-cast aluminum case. Large, easy-to-read 6½-inch meter! A fine VTVM for electronic technicians and engineers! Includes special dc/ac—ohms shielded probe and cable. $79.50* (complete with ground lead, alligator clip, instruction booklet).

NEW! WV-77E VOLTOHMYST®

To measure AC and DC voltages, 0 to 1,500 volts; resistances from 0.2 to 1,000 ohms. Famous RCA VoltOhmyst quality at a low price! Separate scales, 1½ volts rms and 4 volts peak-to-peak, for accuracy in low ac measurements. Fuse-protected ohms-divider network. Complete with ultra-slim probes, long flexible leads, only $49.95.* (Easy-to-assemble kit, WV-77E(K), only $29.95*).

NEW! WV-38A VOLT-OHM-MILLIAMMETER

To measure AC or DC voltages, 0 to 5,000 volts; resistances 0 to 20 megohms; DC current 0 to 10 amps; power −10 to +50 dbm. **Exclusive special ranges for transistor servicing:** 1 volt, 250 mv −50 μa and 1 ma full scale. Fuse-protected ohms divider network. Polarity reversing switch. Big meter (5½"). Buy of a lifetime at $43.95.* (Easy to assemble kit, WV-38A(K), only $29.95*).



WT-110A AUTOMATIC ELECTRON TUBE TESTER

Especially designed for TV and general electron-tube service testing through automatic punched-card selection of correct test conditions on wide variety of tubes. Checks vacuum-tube rectifiers under high-current conditions. $199.50* (complete with 263 punched cards, 24 blank cards, card punch, instruction book).

There's an RCA test instrument to help you do every job better, and easier—and to save you valuable time. Plus a complete line of test accessories: video multimarkers, TV isotaps and bias supplies, probes and cables. See your Authorized RCA Electronic Instrument Distributor for complete information. *User Price (Optional)

RADIO CORPORATION OF AMERICA

Electron Tube Division **Harrison, N. J.**

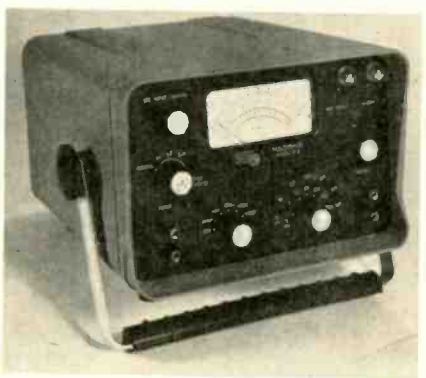
Moeller POWER ISOLATOR

Model 30 power isolator provides isolation to line-operated devices without providing a common ground. The isolation allows only milli-microamps of 60 cycle current to flow from its output to line ground. The loading of the output to ground is less than 2μμf and

greater than 50,000 megohms. It provides up to 300 VA at 115 VAC 60 cycles. It is designed for use with oscilloscopes, meters, amplifiers, signal generators, etc. Moeller Instrument Co., Electronics Div., 132nd St. & 89th Ave., Richmond Hill 18, N. Y. (ELECTRONIC TECHNICIAN 2-31)

SIE VOLTMETER

The firm's latest series R-2 voltmeter measures a-c and d-c voltages from 1 millivolt to 1,000 volts full scale in 14 ranges, and midscale resistances from 10 ohms to 10 megohms in 7 decade ranges. Accuracy is better than 1% on d-c. On



a-c, it is better than 2% from 20 cps to 100 kc and 5% from 10 cps to 1 mc. All d-c reading are upscale with indicator lights showing voltage polarity. Southwestern Industrial Electronics Co., 10201 Westheimer, Houston 19, Texas. (ELECTRONIC TECHNICIAN 2-32)

WIN PRIZES!

Enter the Shop Hint & Tough Dog CONTEST

Rules and entry form are on page 45

Measure Service

(Continued from page 62)

charges on home calls and shop work. Table IV lists the major practices, in order of importance, and shows changes in such practices between 1955 and 1959.

2. Higher service charge for distant customers

Dealers were asked whether they have a higher service charge for distant customers and, if yes, what criteria were used in setting the extra fee. Responses to these questions are shown in Tables V and VI.

It is apparent that most dealers charge extra for serving distant customers. This practice is more frequent by dealers in small cities and towns, undoubtedly because a greater part of their business is done in outlying rural areas. Miles traveled and time plus miles are the most common criteria for setting the extra fee.

NEXT MONTH
in ELECTRONIC TECHNICIAN,

Andrew Kimball describes the operating details of TV service, including: advertising, tube sales, hours worked, annual volume, dollars invested . . . and more.

3. Minimum service charge for home calls

Nearly all dealers use a pricing formula which includes a minimum service charge for home calls. The average charges by dealers in different sizes of city for both 1955 and 1959 are shown in Table VII. (ELECTRONIC TECHNICIAN's May 1956 survey reported national "basic house" *average* as $3.93.)

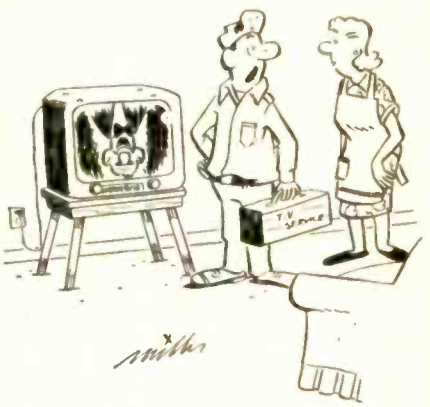
The highest service charges for home calls exist in larger cities. In all city size groups there has been an increase in the average service charge since 1955 of about 10%. Over 50% of dealers surveyed reported an increase in minimum charges, 41% kept the same rates, while 7% stated that they had lowered the minimum service charge.

The minimum service charge among dealers reporting ranged from a low of $2.00 to a high of $8.00. Despite this wide range, over 90% of dealers charge between $3.00 and $6.00.

4. Average service bill per TV repair job (excluding CRT replacement)

The average TV service bill for both home calls and shop work is higher in larger cities, as shown in Table VIII. This is related to higher service charges and labor rates in the larger communities. (ELECTRONIC TECHNICIAN's May 1956 survey reported national "total house" *average as* $7.82.)

The average service bill per job has increased substantially since 1955 in all city size groups. This is associated with increased labor rates, components cost, equipment costs, etc. •



"This won't take more than a few minutes to correct."

Computer Services For Small Business

I. J. Seligsohn
Computer Services Div.
Corp. for Economic & Industrial Res.

• High-speed digital computers are today helping many small businesses cut operating expenses and handle an increased volume of work. These computers are still so costly that only very large corporations can afford to buy or lease them. But the small businessman can turn to computer services organizations that sell the time of large computers on an hourly basis. The businessman pays only for the time it takes to solve his particular problem. Because a high-speed computer can perform many millions of calculations in an hour, a wide range of problems can be economically solved in a relatively short time. By making use of computer services organizations, a small businessman can take advantage of the most powerful data processing machines available, without making any capital investment and without hiring additional personnel.

Computer services organizations can enable the small business manager with a limited staff to cope with many complex problems in such fields as engineering, production, distribution, marketing, and accounting. They can help him to operate more efficiently and take on more work. Above all, perhaps, they can provide him with data that until now were the exclusive province of much larger corporations.

Typically, a computer services firm has one or more large electronic digital computers on its premises. These computers operate by counting series of electronic pulses which represent "digits" or numbers. They can solve any problem that can be expressed by numbers, and are thus general purpose computers.

If you, as a small businessman, consult a computer services firm, you will be offered two major types of services to help solve your problem: programming services, and computing machine services.

First, a computer analyst carefully studies your problem, and tells you whether a computer solution is feasible and economical; in your situation, he helps in determining whether the problem that brought you to the computer services organization is complex or difficult enough to warrant a computer solution. When the analyst has finished his work, he turns the problem over to computer "programmers." These specialists prepare the instructions that tell the computer exactly how to solve your problem.

"Why are programmers necessary?" you may ask. The answer is: Because computers really aren't giant brains—they can't solve problems on their own. They're more like computing slaves who can do no more than just what they're told to do. Of course, they do perform their computations at incredibly fast speeds. That is what makes them so valuable.

The programmers write a detailed series of coded instructions, called a program. This program is tailor-

made to solve a particular problem on the computer. If your problem is one that is common to many businesses, there may well be a program already in existence to solve it. In such a situation the programmer takes the proper program out of the organization's program library—and applies it to your problem data. This saves you time and money.

But even if your problem requires the preparation of a brand new program, you pay for only the programming services for that particular problem. You have no overhead costs of maintaining a programming staff just to solve an occasional problem.

You are charged only for the time it takes the computer to process your set of data. This charge usually is based on an hourly rental of the computer. If you are to be a large user of computer time, rates are often figured on some other periodic basis. Most small businesses, of course, rent time on a computer by the hour. They want the benefits of fast, accurate computer solutions, without the large overhead of buying or renting their own computer full-time.

The computer services firm does, of course, have a large overhead. But it is divided among many jobs and clients. Often, computer services organizations plan to keep their machines running two shifts a day, sometimes around the clock.

What will it cost you to take advantage of computer services—to have your problem programmed and solved on a computer? At one end of the scale many large computer manufacturers have formed computer service subsidiaries. They sell computer time at around $650 to $750 per hour. Programming time costs an average of $15 per hour.

At the other end of the scale, small independent computer services firms sell computer time (on the same types of equipment as the big companies use) at around $350 an hour. Programming costs average $15 an hour, but can go down to around $8 an hour for simpler problems. Of course, for recurring problems, where existing programs can be applied to new data, there are no programming costs. A charge is made only for computer running time.

Certain background facts are worth considering in relation to these broad cost ranges. For one thing, large computers are so expensive to buy and become obsolete so quickly that over 90 percent of all computers are rented from the manufacturers, rather than purchased. The rental cost alone can be $500,000 to $800,000 or more a year. One computer services firm with two machines pays $1,350,000 a year in rent. For another thing, the installation and start-up costs for a single machine run around $800,000. Finally, the operating cost for a single machine averages an additional $235,000 a year.

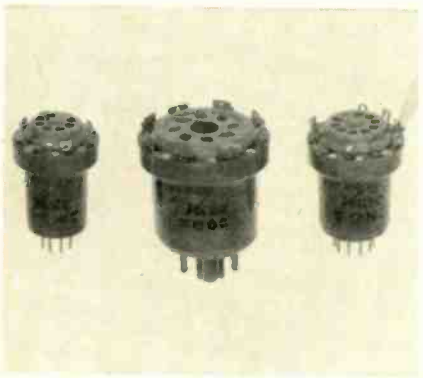
The important question for small firm operators is: "What do computer services cost *in terms of what we get out of them?*" Many companies have found that the answers they got led to profits which more than offset the expense. In such conditions every delay in getting the needed data amounts to a charge against profits.

Some small business owners even consider the typical rates to be a bargain. As one man put it: "For a few thousand dollars in computer service costs, I'm saving many man-months of work, and I've boosted my profits by $10,000 per year. •

(Courtesy Small Business Administration)

Vector ADAPTERS

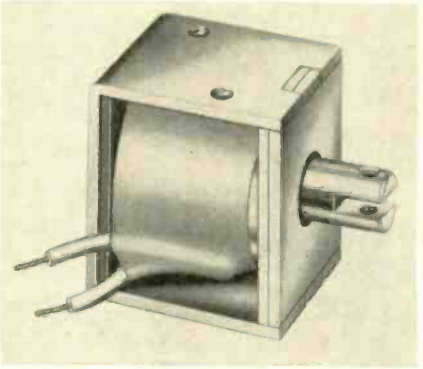
Announced is a new line of curent test adapters which permit exact tube circuit current measurement in operating equipment without cutting leads or computation. Supplied singly or in a set of 7,8, and 9 pin types, the adapters are insterted in the tube socket between



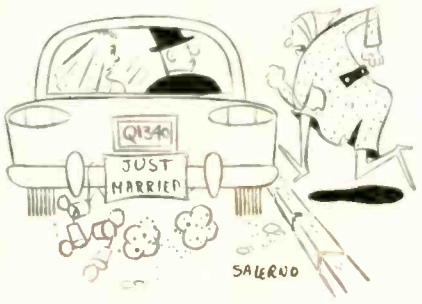
chassis and tube. Current readings are made by inserting the provided dual sided test prod in the test tabs. The tabs permit current readings when the two 30" leads from the product are connected to an ammeter. Vector Electronic Co., 1100 Flower St., Glendale 1, Calif. (ELECTRONIC TECHNICIAN 2-33)

Guardian SOLENOID

No. 28 midget solenoid, available a-c or d-c, intermittent or continuous duty, has tapered plug and plunger for greater power. Plunger strokes from



1/16" to ½" with a lift of over 41 ounces. Overall dimensions: 1⅛"x1"x 1-3/16". Weight: approximately 3½ ounces. Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill. (ELECTRONIC TECHNICIAN 2-23)



"But you MUST come fix it. There's no picture!"

Contest

(Continued from page 46)

came right back again. At this point the schematic was studied. See Fig. 2. A keyed agc is used, and the audio output tube acts as a B+ voltage divider. The 135 volt line from the cathode of the 6W6 supplies the i-f and tuner stages. The 6T8 was removed and again the picture recovered. Suspecting a defect in the delay circuit, I monitored the tuner agc voltage with the tube in and out. There was no change. From past experience I have learned the merits of the oscilloscope and waveform measurements when everything seems normal, and still a trouble persists. So, I put it to use on this problem.

The scope showed a normal keying pulse at the plate of the agc tube but the composite video signal at the control grid was barely 25 volt peak-to-peak, instead of 30 volt peak-to-peak. Going back to the output of the video detector, a 3 volt peak-to-peak signal was present instead of the normal 5 volt signal.

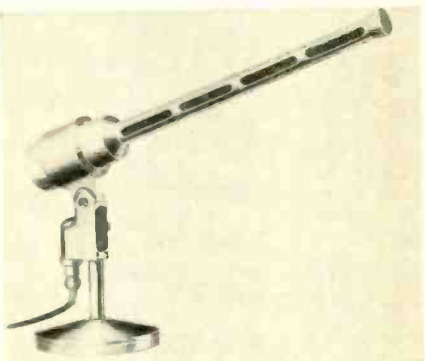
Assuming normal signal strength at my bench, if agc is below normal, an even greater output at the detector would occur, rather than smaller. Proceeding further, B+ voltage checks were made in the i-f stages which led to what was supposed to be the 135 volt line from the cathode of the audio output tube. It was down to 110 volts. The plate and screen voltages on the 6W6 tube were normal which meant a greater than normal voltage drop existed across the tubes. A bias measurement next showed 30 volts instead of the normal 10 volts. A search for defective components in the grid circuit paid off by finding a leaky 0.005 mf coupling capacitor. Replacing the capacitor cured the trouble.

As to why the picture seemed to behave with the 6T8 removed—the excessive bias was the result of direct current from the plate of the 6T8 tube through a parallel path around the plate load resistor through the leaky coupling capacitor and the 470,000 ohm grid resistor. Reduced B+ voltage to the tuner and i-f stages was just enough to make this an excellent borderline case.—*Robert Samodell, Cleveland, Ohio.*

For Contest Rules and Entry Form . . . See Page 45

EV MICROPHONE

Model 644 "Sound Spot" is a highly-directional dynamic microphone, which utilizes a combination of cardioid and distributed front-opening designs. It rejects random noise, reverberation and feedback without sacrificing frequency response. It also retains "on-mike" presence despite extended working distance. Response is 40 to 12,000 cps, and it can be used at either 150 ohm or high impedance. It employs Alnico V and Armco magnetic iron in a non-welded magnetic circuit. Electro-Voice Inc., Buchanan, Mich. (ELECTRONIC TECHNICIAN 2-13)



Association News

California

TSA, San Francisco, board of directors elected William Finnerty as its new prexy following the resignation of John McWilliams because of extraordinary business pressures.

TSDA, San Carlos, is studying a State License program to determine if such a bill should be prepared for introduction to the State Legislature. Some provisions of the Kansas City license law are being studied.

Florida

'Phone Ads Being Dropped

TESA, Miami, reports "many shops . . . dropping their display ads in the next telephone directory." Some of the reasons given are: Too many shady operations using display space. Resentment over so many classifications. Won't compete with extravagant and misleading claims found in many ads. Don't get enough calls from the ad to pay the cost. Plan spending ad budget in other media.

Missouri

Anti-Licensing

TEAM, St. Louis, opposing the Kansas City Ordinance to regulate the TV repair business, reports Mayor Bartle will not set up the board of examiners to administer the law while the Ordinance is in litigation. TEAM reports: TEAM and its two stalwarts. Woodson and Bivins, have effectively blocked the administration of what is called one of the most flagrant violations of constitutional rights by a suit for injunction against the Ordinance. Commenting further, W. C. Pecht, editor of TEAM News, states "Just as a license itself can not cure every ill of the industry the alternative can not be a thing in itself; it must be many things. We will go further and faster when we stop seeking a miracle and look for the practical solution to each problem . . . just as we do in the innards of a receiver. When someone invents a spray that can repair all the different defects in a set with one shot, it will be exactly the right time to expect a license law to accomplish a similar miracle."

New Jersey

TSCTSA, Pennsouken, reports the recent Tri-State Council of TV Service Associations has selected "Vanguard" as the official Tri-State paper. Officers elected were: Pres.,

James Mayhart, TSDA, Del.; V. P., Joseph Papovich, AETA, N. J.; Sec'y., Leon Skalish, TSDA, Del Co. Pa.; Treas., Joseph Eberhardt, ARTA, N. J.

New York

WNYEC, Buffalo, elected the following officers: Pres., Fred Ditondo; V. P., Lester Marschall; Treas., Clarence Thielke; Sec'y., Elmore L. Bement and Sgt.-at-Arms, James Archibald.

North Carolina

1st TV Journeyman Cards Issued

NCFEA, High Point, informs that their instruction program for upgrading and certifying practicing TV technicians is showing results. The project is conducted jointly by NCFEA and the North Carolina State Department of Public Instruction. 12 graduates of the first class, members of RTTA, the local affiliate, have been issued cards certifying Journeyman TV Serviceman status.

Ohio

ETAT, Toledo, elected the following officers: Pres., Floyd Harper; V. P., Fred Mueller; Sec'y.-Treas., Quentin Hannan.

ARTSD, Columbus, elected officers for 1960 as follows: Pres., Ed Cooper; V. P., Herman Francis; Treas., Don Blazer; Rec.-Sec'y., Ed. Brownfield; Cor.-Sec'y., Dan Fisher.

Pennsylvania

Retail "Wholesalers" Blasted

TSA, Delaware Valley, urged its members to "take a new look" at area wholesalers who have "made a practice of selling parts to retail customers." The report continued: "We have talked, we have discussed, we have done just about everything possible to work with some of the offending distributors. . . . The next time you wait in line, behind retail customers, remember these words—there are other distributors. Patronize the distributor of your choice. Give him your support. And remember always—'Loose Distribution Deserves Just Retribution!'"

Cornell-Dubilier CAPACITORS

Added to the "Tiny Mike" series is a new low-voltage, miniature ceramic disc capacitor, designated as Type H. Operating temperature range is +10°C to +85°C; working voltage is 50 volts d-c. Three sizes are available: 0.350" dia. x 1/8" thick; 0.500" dia. x 1/8" thick and 0.625" dia. x 1/8" or 3/16" thick. Cornell-Dubilier Electric Corp., 1006 Hamilton Blvd., South Plainfield, N. J. (ELECTRONIC TECHNICIAN 2-5)

Channel Master TV COUPLER

A new version of the Matchmaker 2-set TV coupler, model No. 0036, features new insulation-piercing terminals and interlocked coil forms. It is housed in a smartly compact, unbreakable Dylene case; and packaged in a see-through plastic container, trimmed in pure gold. Six couplers are packed in a colorful carton which converts into a counter display. These couplers can be installed outdoors or indoors and they provide all-weather reception as moisture cannot be trapped within the case. $5.42. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 2-3)

New Books

Book marked with an asterisk (*) may be obtained prepaid from Electronic Marketers, Book Sales Division of Electronic Technician

*ENCYCLOPEDIA ON CATHODE-RAY OSCILLOSCOPES AND THEIR USES. *By John F. Rider and Seymour D. Uslan. Published by John F. Rider Publisher, Inc. 1,356 large pages, hard cover. $21.95.*

The second edition of this monumental encyclopedia arrives almost a decade after the initial edition—in greatly enlarged and revised form. The one volume work comprises a breathtaking cross-section of oscilloscopes and their uses in every conceivable field and application. From "how-it-works" to "how-to-use-it" is so thoroughly covered that it invokes a sigh of delight and admiration.

Scope applications, with accompanying waveforms, include TV, radio, medicine, automotive, automatic control, ultrasonics, watch timing . . . ad infinitum. Comprehensive chapters include: Audio Frequency Circuit Testing, Visual Alignment of AM, FM, and TV Receivers, Observation of Voltage Waveforms in TV Receivers, Engineering, Medical and Scientific Applications;—23 chapters in all, besides appendices. In addition, specifications and diagrams of all American-made oscilloscopes are published to enable technicians and engineers to better appraise a scope they wish to purchase or repair one they own.

Illustrations, in keeping with the tremendous editorial and research accomplishment, are lavishly interspersed throughout the book. Its attractive red, gold and black cover should find welcome repose in every electronic school, technical association, public library and substantial electronic service company reference bookshelf.

SIMPLIFIED RADIO SERVICING BY COMPARISON METHOD. *Edited by M. N. Beitman. Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. 47 pages, soft cover. $1.50.*

This revised 1960 edition covers a technically-limited outline of servicing radios by the comparison method. Commencing with descriptions of components, reading schematics and other fundamental material, the manual progresses to troubleshooting methods for home and auto radios, including printed circuitry. Though the contents may be stimulating to the beginning student, the experienced technician will probably find it too elementary.

*TUBE REPLACEMENT GUIDE. *Published by Harry G. Cisin. 49 pages, soft cover. $1.00.*

The 1960 expanded edition includes receiving tube, picture tube, foreign tube and transistor substitutions in a 5½ x 8½ inch manual. Substitutions

listed may be made without socket changing or rewiring. Although not an all-inclusive substitution reference, its handy size should make it a natural for TV tube caddies.

***BASIC ELECTRONICS, Vol. 6.** *By Van Valkenburgh, Nooger & Neville, Inc. Published by John F. Rider Publisher, Inc. 136 pages, soft cover. $2.90. Cloth binding. $3.60.*

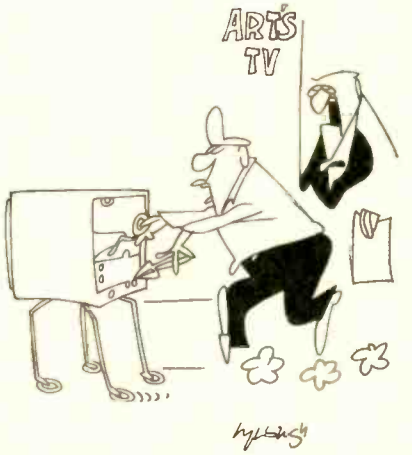
A continuation of the "Basic Electronics" series, the contents of volume 6 covers operation of semiconductor devices, transistor circuits and, in the second half of the book, fundamentals of frequency modulation. The subject matter is presented in the easy-to-read format so successful with Navy electronic courses. The abundant illustrations complement the clearly written text and aid immeasurably in understanding the material.

***PRINTED CIRCUIT DIAGNOSIS MADE EASY.** *By C. P. Oliphant. Published by Howard W. Sams & Co. 63 pages, soft cover. $1.00.*

Printed circuit servicing is analyzed in this new booklet by correlating sample service problems to available service literature. Sample PC manufacturer's service literature includes Admiral, RCA, Sylvania and Delco. One chapter is devoted to diagnosis with only the schematic, while another includes board illustration. The edition may assist technicians in further familiarizing themselves with printed circuits.

A PICTORIAL HISTORY OF TELEVISION. *By Daniel Blum. Published by Chilton Co., 56 & Chestnut Sts., Philadelphia 39, Pa. 288 large pages, hard cover. $10.*

This completely non-technical, though highly entertaining, collection of photos presents the many entertainers and programs whose famous faces have graced TV screens for the past decade. There's a touch of nostalgia about seeing many programs long gone from the airwaves.



"Take the casters off to fix it . . ."

(Continued from page 28)

RELAYS: Catalog #100 covers a line of commercial and military thermal time delay relays. Ortron Electronics Corp., 29 Lincoln Ave., Orange, N. J. (ELECTRONIC TECHNICIAN B2-11)

TOOLS: A catalog sheet outlines the coming Spring promotion which will be sold through the firm's distributors. Weller Electric Corp., 601 Stone's Crossing Rd., Easton, Pa. (ELECTRONIC TECHNICIAN B2-9)

ANTI-STATICS: Two new compounds, #79 and #79-OL, for application to many different plastic parts, including radio and TV cabinets, are covered in a 4-page folder. Merix Chemical Co., 2234 E. 75th St., Chicago 49, Ill. (ELECTRONIC TECHNICIAN B2-7)

SOLDERING IRON HOLDER: A circular describes a new soldering iron holder, which is ruggedly constructed of perforated steel, and cadmium plated. Diameter up to ¾". LaGrange Welding & Machine Co., Moores Mills, Pleasant Valley, N. Y. (ELECTRONIC TECHNICIAN B2-6)

CAPACITORS: Four-page data sheets, Reference File CE-1.02, describe flat, glass-dielectric wafer capacitors for printed circuit, modular or encapsulated assemblies. They meet performance requirements of MIL-C-11272A. Capacitances range from 1 to 10,000 μμf at 300 DCVW. Corning Glass Works, Bradford, Pa. (ELECTRONIC TECHNICIAN B2-2)

ANALYZER: Volume 1, No. 5, of "The Panoramic Analyzer" covers Techniques of Swept Audio Measurements. It outlines how tedious point-by-point measurements of audio-frequency response and distortion can be avoided. Panoramic Radio Products, Inc., 514 S. Fulton Ave., Mt. Vernon, N. Y. (ELECTRONIC TECHNICIAN B2-10)

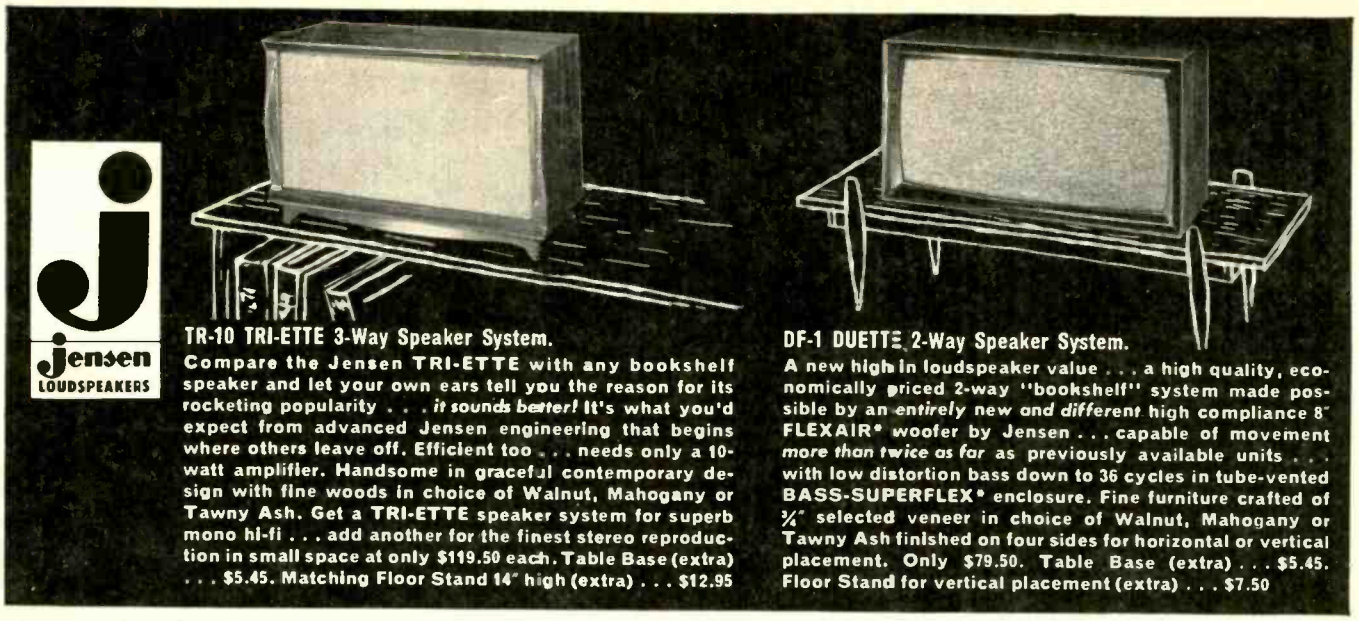
SAFETY GUARD KNIVES: Heavy-duty aluminum knives introduce an exclusive element with its sliding metal guard which assures safety during carrying, handling and storage. The sheet also includes data and illustrations of the firm's line of cutting tools and accessories. X-acto, Inc., 48-41 Van Dam St., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN B2-12)

Tube Bill Changes

The rough draft of the bill to regulate tube sales in New York State was published in the Jan. 1960 issue of Electronic Technician. As anticipated, several revisions have been made. The sections pertaining to out-of-brand-name warranty and surplus tubes have been deleted for further modification and consideration.

INDEX TO ADVERTISERS
February, 1960

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.



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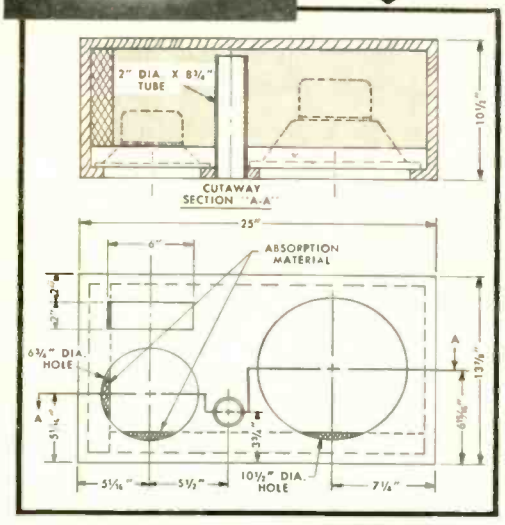

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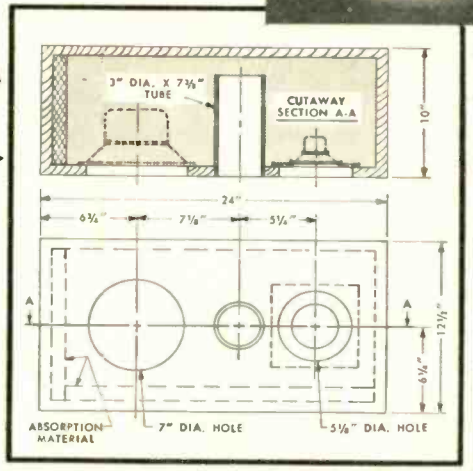

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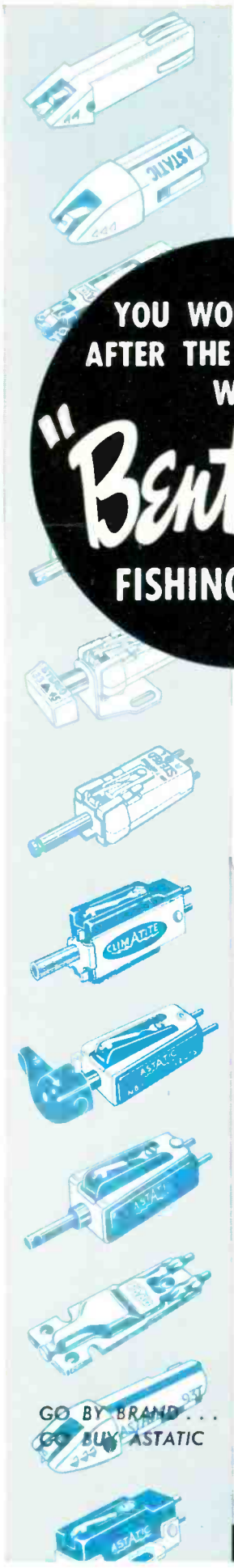

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