ELECTRONIC TECHNICIAN

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Circuit Digests

50¢

February • 1957

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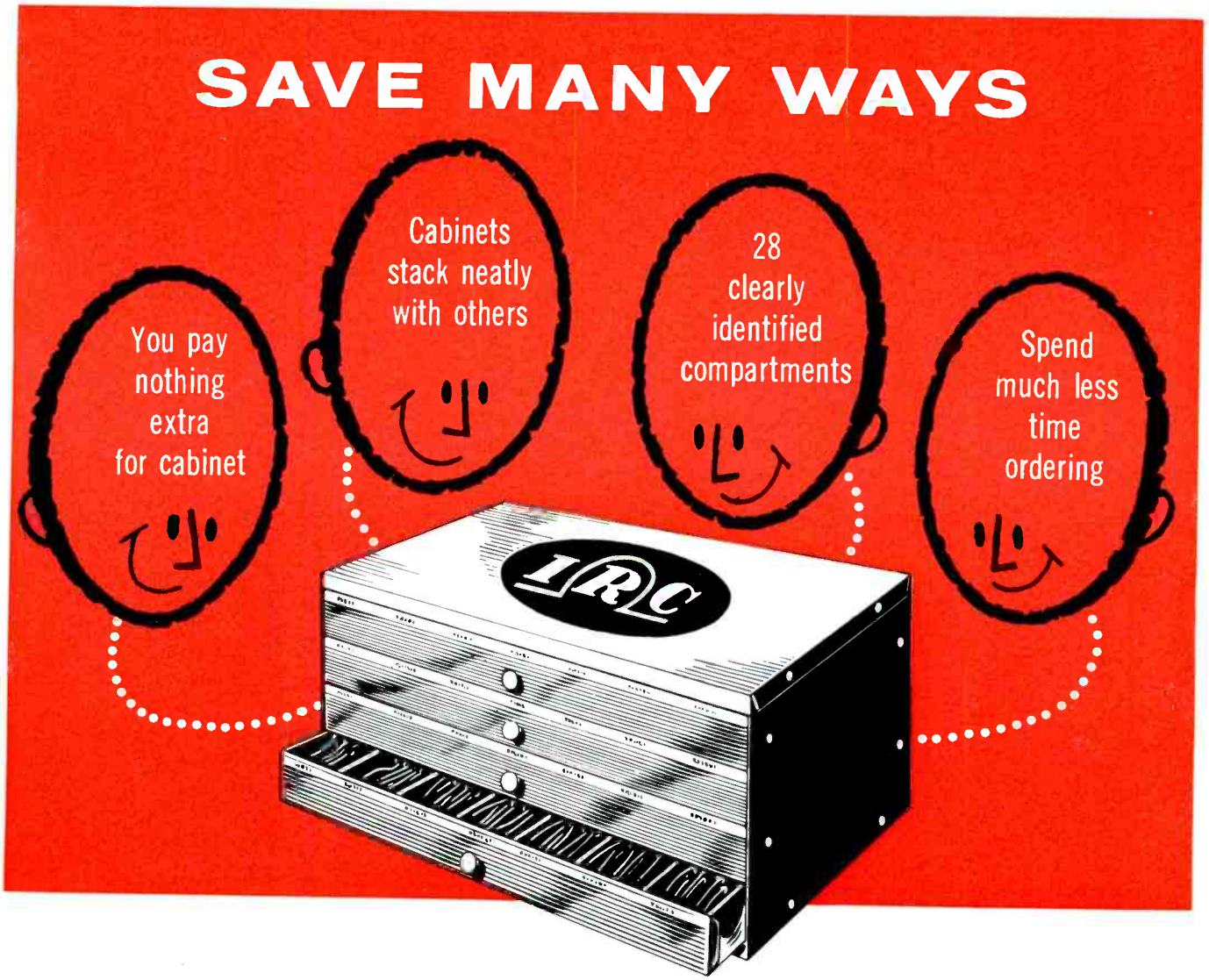

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Contents	80 BTB2 Fixed Composition and BW-2 Insulated Wire Wound Resistors. 33 different values from 4.7 ohms to 1 megohm.	100 BTS Fixed Composition and BW-½ Insulated Wire Wound Resistors. 28 different values from 47 ohms to 10.0 megohms.	83 BTA Fixed Composition and BW-1 Insulated Wire Wound Resistors. 28 different values from 47 ohms to 4.7 megohms.	91 resistors including 5 DCF 1 Watt Precistors and 86 ½ Watt, 1 Watt, and 2 Watt Insulated Resistors. Values from 47 ohms to 5 megohms.
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Wherever the Circuit Says — IRC®

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FEBRUARY, 1957

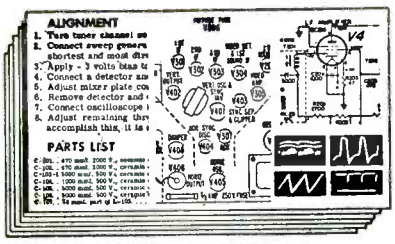
FRONT COVER

Those marvelous little semiconductors, transistors, are finding their way into more and more applications once exclusively the domain of vacuum tubes. Portable radios constitute one of the largest markets at present, but industrial electronic controls, TV, mobile communications and audio also offer great potential. For an enlightening article on dynamic testing of transistors, see page 31.

FEATURES and ARTICLES

DEPARTMENTS

CIRCUIT DIGESTS



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HOTPOINT: TV Chassis "U" series
WESTINGHOUSE: Transistor Radio Chassis V-2278 series

Editor's Memo

The TV industry seems to be plagued with giveaways. Some dealers give away free antennas. Some manufacturers give away lip service to technicians. Some distributors give preferential discounts.

Perhaps the most popular giveaways are those found on TV programs. The fact that video shows pass around the kilobucks is only part of the story. To make a program appeal to viewers (and consequently sponsors), there must be tension in the air. The quiz show contestant must sweat it out, worry, and reflect the fear that one wrong word costs him $64,000.

I don't think we've reached the ultimate in video giveaways, but I suspect that a tongue-in-cheek proposal by Phil Silvers (Sgt. Bilko, that is) is just about as far as anyone can go. Comedian Silvers suggests a new program called "A Million or Your Life!" The contestant would go before the camera faced with two guns pointed at him. Only one is loaded, but he doesn't know which. A string tied to each trigger is offered the contestant, who selects one of the two. Then he yanks the cord. If he is fortunate enough to have chosen the unloaded gun, there's a harmless click, and the jovial master of ceremonies hands the lucky fellow $1 million. On the other hand, if the contestant chose the other gun . . . WHAM. And out come the undertakers to clean up before the next contestant. Brother, will that keep the viewers glued to their sets!

Basically there are two types of giveaways, intentional and hidden. In the intentional group, we'd have to include the service shop I dimly recall passing during a hot summer's day. The sign in the window said "$25 Reward for Any TV Set We Can't Fix." Another worthwhile giveaway came from a shop which gives lollipops to children accompanied by their parents. Other useful giveaways include prizes (How many resistors in the jar?), low-cost business reminders, birthday cards . . . practically anything that makes customers think well of you.

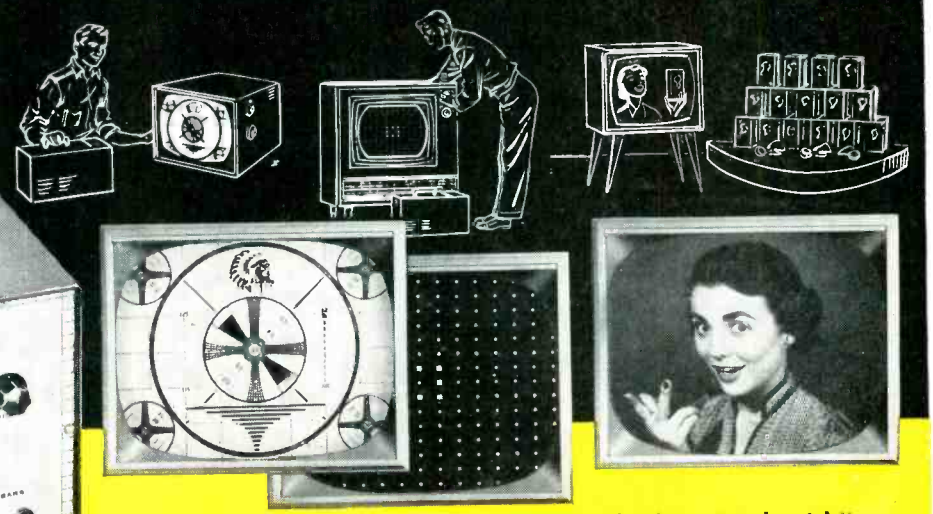
The hidden giveaway, on the other hand, is usually the most costly and the least productive. There's the customer giveaway, whereby patrons are driven to your competitors by sloppy appearance, telephone discourtesy or lack of personal manners. There's the profit giveaway in cutting prices. There's the employee giveaway where good men leave because of low pay or poor working conditions. And on and on with hole-in-the-pocket business operations.

The fellow who has enough hidden giveaways is close to the contestant who pulled the wrong string on "A Million or Your Life!"

Al Forman

SHOW ANY PICTURE or PATTERN

at any time—ON ANY TV SET



For Both Black & White and Color TV

Provides standard Indian Head Test Pattern for proper TV set alignment, and stable White Dot and White Line Patterns for color convergence adjustments.

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Provides closed circuit TV system. Transmits pictures or messages for advertising, educational and commercial visual communication.

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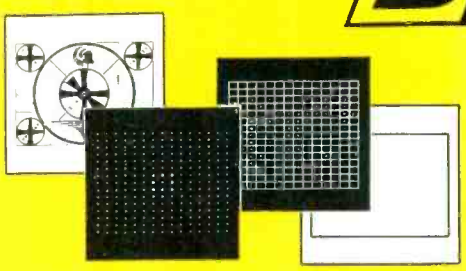
B&K DYNA-SCAN

PICTURE AND PATTERN VIDEO GENERATOR



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1. **Indian Head Test Pattern**
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These are broadcast-quality transparencies, and assure accurate, high-definition TV images. You can also transmit your own transparencies of any subject you wish. The clear acetate can be used for special messages. Extra transparencies and acetate available.

Make the most of this *Complete Flying Spot Scanner*. It produces a composite video and sync signal that operates any standard black & white or color TV receiver. Can be used with one or more TV sets or fed into a master antenna system or community antenna system. Maximum resolution capability is well in excess of 450 lines; band width in excess of 5 mc. Projects and reproduces pattern or picture with high definition from any slide transparency. Transmits messages typed or written on clear acetate. Makes convenient stand-by and break-in for community distribution operation. Rugged, compact, portable, and ready to operate. **NET $199.95**

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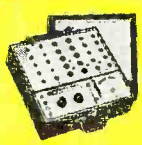

Model 500 DYNA-QUIK
Dynamic mutual conductance tube tester. Accurately tests tubes faster. Net, $109.95

Model 400 CRT
Cathode Rejuvenator Tester. Tests and repairs TV picture tubes. Net, $54.95

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Designed to check and adjust test instruments with laboratory accuracy. Net, $54.95

From the originator
of the 6BQ6GT • 6CU6 • 6DQ6

TIPS ON REPLACING HORIZONTAL AMPLIFIERS

No one tube satisfactorily replaces the 6BQ6GT, 6CU6, and 6DQ6 . . . or their heater-voltage variations. CBS knows because, foreseeing the need for each of these three families of horizontal amplifiers, CBS originated the 'BQ6, 'CU6, and 'DQ6. The latter two were designed: 1. With increasingly greater safety margins to combat high voltage and heat. 2. With improved sweep characteristics.

In general, replacement of each tube should be with the original type. But in some sets, larger, wider-angle picture tubes using higher voltages place overloads on the original horizontal amplifiers. Here replacement should be a step upwards at a time: 'CU6 for 'BQ6 . . . 'DQ6A for 'CU6. Following these rules will give reliable safety margins and neither too little nor too much sweep, especially important in receivers with no horizontal width control.

Another good rule is to replace them all with CBS tubes. The reason is logical. It's better to use CBS originals . . . because CBS has had more experience in making them better.

Reliable products through Advanced-Engineering

CBS-HYTRON, Danvers, Mass.
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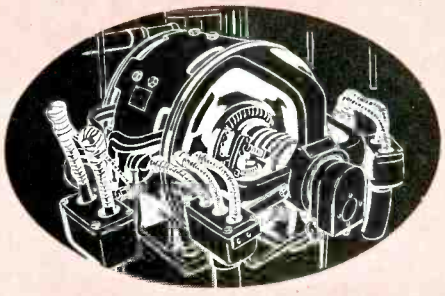
Plastic Electrical Tape



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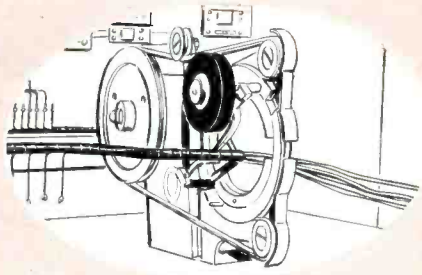
Oil and dirt proof. Provides neat, positive insulation for all high voltage motor leads.

efficient, low cost insulation for the manufacture

PRODUCTION

Conforms to provide a safe, strong insulating seal in wiring harness.



and maintenance of electrical equipment

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The perfect insulation for splices and terminals in junction boxes.

VERSATILE—Dutch Brand Plastic Electrical Tape offers maximum versatility and performance . . . especially where space is limited . . . it stretches 150%...conforms to irregular surfaces.

DURABLE—resists galvanic corrosives, rot, mildew, fungus, severest weather, and is not affected by water, oil, grease, acids or alkalies.

ECONOMICAL—the variety of sizes and widths available permit maximum tape economy for each job. Dutch Brand polyvinyl Plastic Electrical Tape .007″ thick for general use; .010″ thick tape for heavy duty protection and for use with power driven taping machines; and .020″ thick tape for extra heavy duty where abrasion and wear are met.

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New Books

RCA RECEIVING TUBE MANUAL. *Prepared and published by Radio Corp. of America, Tube Div., Harrison, N.J. 352 pages. Paper cover. 75¢.*

More than 575 receiving tubes and 75 picture tubes, including color types, are presented in this newly expanded manual, RC-18. Like preceding editions of this authoritative reference, basic tube theory and applications are covered, in addition to technical specifications, basing diagrams and operating conditions.

REFERENCE DATA FOR RADIO ENGINEERS. *Prepared and published by International Telephone and Telegraph Corp., 67 Broad St., New York 4, N.Y. 1150 pages. Hard cover. $6.00.*

Don't be fooled by the title. This valuable reference is for every electronic specialist, engineer or technician. It is the fourth edition, improved and expanded; the first three editions sold over 150,000 copies. Formulas, constants, graphs, circuits, etc., cover radio, TV, radar and practically every other phase of the industry. New and revised subjects include semiconductors, magnetic amplifiers, feedback controls, computers and patent practices, to name a few. It's a whale of a book.

RAPID TV REPAIR. *By G. Warren Heath. Published by Gernsback Library, Inc., 154 W. 14 St., New York 11, N.Y. 224 pages. Soft cover, $2.90; hard cover, $4.60.*

Here's a comprehensive volume concentrating on the practical troubleshooting problems encountered by TV technicians. Both common and unusual faults are presented, discussing symptoms and service for each. An interesting feature is the alphabetical grouping of faults, rather than classification by subject. For example, under "F" we find, among other things, Flashes in Pix, Flicker, Focus, Foldover, Fuse, etc. It is clearly and concisely written.

TRAINING MANUAL ON ANTENNAS, Vo. 1. *Prepared and published by TechRep Div., Philco Corp., 18 & Courtland Sts., Philadelphia 40, Pa. 221 pages. Paper cover. $1.93.*

Antenna fundamentals, propagation, transmission line theory, coupling circuits and andionospheric refraction are a few of the topics covered in this most informative and well illustrated book. While the text is advanced so far as coverage of microwaves, waveguide and antenna construction is concerned, high-powered mathematics have been eliminated, making the material easily read and understood by electronic technicians generally. For anyone planning to enter the communications field in particular, this book is most highly recommended.

1957 OFFICIAL REGISTRY OF RADIO SYSTEMS IN THE INDUSTRIAL SERVICES. *Edited by Ethel V. Sleeper, Published by Communication Engineering Book Co., Radio Hill, Monterey, Mass. 153 pages. Paper cover. $5.00.*

This comprehensive listing of communications systems, compiled from FCC records, tells name and address of each licensee, transmitter location, call letters, mobile units authorized, frequencies and equipment manufacturer. Since the FCC does not issue an equivalent publication, this is an important reference.

TELEVISION ENGINEERING HANDBOOK. *Edited by Donald G. Fink. Published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N.Y. 1496 pages. Hard cover. $18.00.*

One of the most exhaustive works on the subject of television, this giant volume draws on many sources for its authoritative material. There are 1159 illustrations and the index contains 4500 entries. Standards, color, transmitters and receivers are a bare few of the multitude of subjects discussed in this excellent, but costly, handbook.

(*Continued on page 61*)

the world's finest mast at today's lowest prices!

...because only Channel Master manufactures telescoping masts in its own steel tubing mill.

CHANNEL MASTER®

new SUPER-MAST

Packed with new features that reduce installation time...cut costs...deliver sturdier antenna support—with the greatest convenience and safety.

NEW! EXCLUSIVE! DUAL T-NUT CLAMP

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Dual Clamp has 2 T-Nuts to accommodate standout insulator and locking bolt. Eliminates nuisance and cost of additional nut buckle snaps.

NEW! EXCLUSIVE! FREE TURNING GUY RING AND BEARING FOR EACH SECTION

—can never bind or jam

Extra large square guy ring for greater stability.

COMPLETELY INTERLOCKED

Can't pull out! Each mast section has swaged neck, expanded bottom.

Can't slip down! Each mast section rests on a heavy-duty co ter "platform" pin. Bottoms are notched to automatically align locking-bolt holes.

Can't twist or turn! Sections are securely locked in place by a sturdy L-Bolt with man sized lever that makes it easier to tighten without tools.

EASY TO TAKE DOWN!

Both the Dual T-Nut Clamp and Guy Rings are positioned below each joint. This allows the mast to be completely collapsed without removing the clamp or the standout insulator, and without jamming.

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HOT-DIPPED GALVANIZED
ZINC-COATED Inside and Out

Available in 20, 30, 40, and 50 foot models. All models are 16 gauge for top 2 sections.

Also Available *Straight-Away telescoping mast for economy installations.*

Now Channel Master offers you the widest selection in TV wire.

- *New UHF Tubular Transmission Wire*
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- *New Low Priced Addition to VHF Flat Ribbon Transmission Line*
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CHANNEL MASTER EXTENDS MASSIVE NATIONAL ADVERTISING CAMPAIGN

MILLIONS OF AMERICANS WILL CONTINUE TO READ AND REMEMBER CHANNEL MASTER LARGE SIZE ADS IN AMERICA'S LEADING PUBLICATIONS.

CHANNEL MASTER CORP. ELLENVILLE, N. Y.
the world's largest manufacturer of television antennas and accessories

Here's your first line of defense against one of TV's biggest service problems

Sylvania Deflection Tubes

—upgraded and triple-tested for dependable performance in TV's hardest working deflection systems

Notice how much more rugged the Sylvania wafer stem mount looks (left). That's because the wafer stem results in shorter construction with more points of support and heavier, sturdier leads.

If you haven't yet tried these new Sylvania deflection tubes—you're in for a pleasant and profitable surprise.

They've been carefully redesigned and thoroughly tested to meet the challenge of hard-working deflection systems, tightly engineered circuits and the "runaway" conditions which often result when components age and change in value.

Sylvania's wafer stem construction minimizes the effects of electrolysis resulting from gases driven off by high tube operating conditions. The wafer stem provides wider spacing between leads and permits the use of heavier lead wires.

The wafer stem adds mechanical ruggedness to these tubes by providing three-point support and reduces internal arcing by increasing the spacing between the plate pigtail lead and the tube mount.

These improvements were made as the result of thorough testing and experimentation to determine points of breakdown in earlier types. Now, these tests serve as important quality control measures for the production of these new deflection types.

SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
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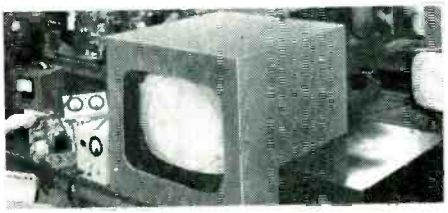
Test No. 1—Static Life Test

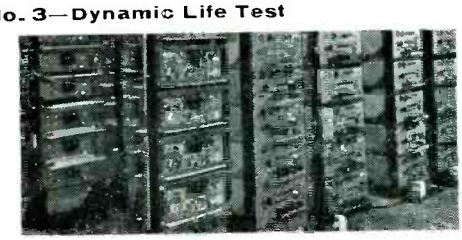


The static life test operates the tube under dc circuit conditions near maximum plate and screen dissipations and dc cathode current. Characteristics are controlled for maximum and minimum values and is considered at the end of its life when characteristics drop below or rise above specified limits.

Test No. 2—TV Life Test

Sylvania deflection tubes are testing in stock models of representative TV manufacturers. Tests are conducted at accelerated line voltages so that tubes are operated at a considerably high level. These accelerated conditions of 130-volt line increase failure rate 2.37 times to provide important design and production information which results in better quality and dependability for you.

Test No. 3—Dynamic Life Test



These dynamic life test racks enable Sylvania to approximate TV set operating conditions which can be controlled. Thus, an operating standard is established against which all deflection tubes can be tested.

Look for and specify Sylvania's new deflection tubes in the new carton.

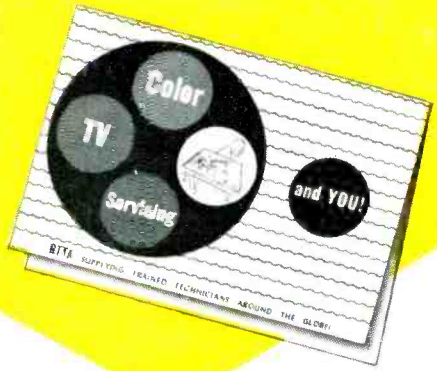
Learn how you can earn this famous course in COLOR TV SERVICING

Sylvania has just taken another step in its continuing effort to help the independent radio and TV service dealer. Your Sylvania Distributor can tell you how you can earn the popular Radio-Television Training Association's Color TV Technician course. RTTA is one of the most respected names in home study training methods—has trained thousands in the fundamentals of black-and-white TV and is now doing the same in color servicing.

A Sylvania Exclusive!

When you earn RTTA's color course offered by Sylvania you get a special supplementary lesson in full color. It's a Sylvania extra which serves as a capsule survey of color television which will help you with lesson details.

See your Sylvania Distributor or mail the coupon below and find out how you can start learning color TV right away.



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LETTERS

To the Editor

Caveat Emptor

Editor, ELECTRONIC TECHNICIAN:

The December 1956 issue of ——— magazine carries ads on tubes selling for 36¢ to 43¢ each. I wonder if these could be new, seconds or rejects. Some of them are listed as set-tested tubes. Does this mean they have been in somebody's set for several years? Could you please advise, as your article exposing gyp tubes (July 1955) is still in my mind.

FRANK KRANTZ
Krantz Radio & TV Service
Philadelphia, Pa.

• *When tubes are offered below the lowest prices charged TV set makers by tube manufacturers, and the ads do not state that the tubes are new, remember the saying: "Let the buyer beware."—Ed.*

Decal, Decal, Who's Got the Decal?

Editor, ELECTRONIC TECHNICIAN:

Why is it almost impossible to get decals and metal signs from distributors or manufacturers? I need a couple of decals and an outside metal sign, but can I get it? RCA and GE ads say get it from the distributor, but the distributor doesn't know from nothing. It would be nice if they'd get together.

DAVID V. CHAMBERS
Harrington, Del.

Article Length

Editor, ELECTRONIC TECHNICIAN:

Please try to finish articles on one page or the following page, instead of ending with a little on a few pages in the back of the magazine.

L. LYMAN BROWN
Forest Park Radio Co.
Springfield, Mass.

• *One editing philosophy is to cut the dickens out of an article to make it fit a fixed space. The second approach is to retain the technical meat and adjust the space to fit the article's natural length, even if it isn't always an even page. We prefer the second method, and most readers seem to agree.—Ed.*

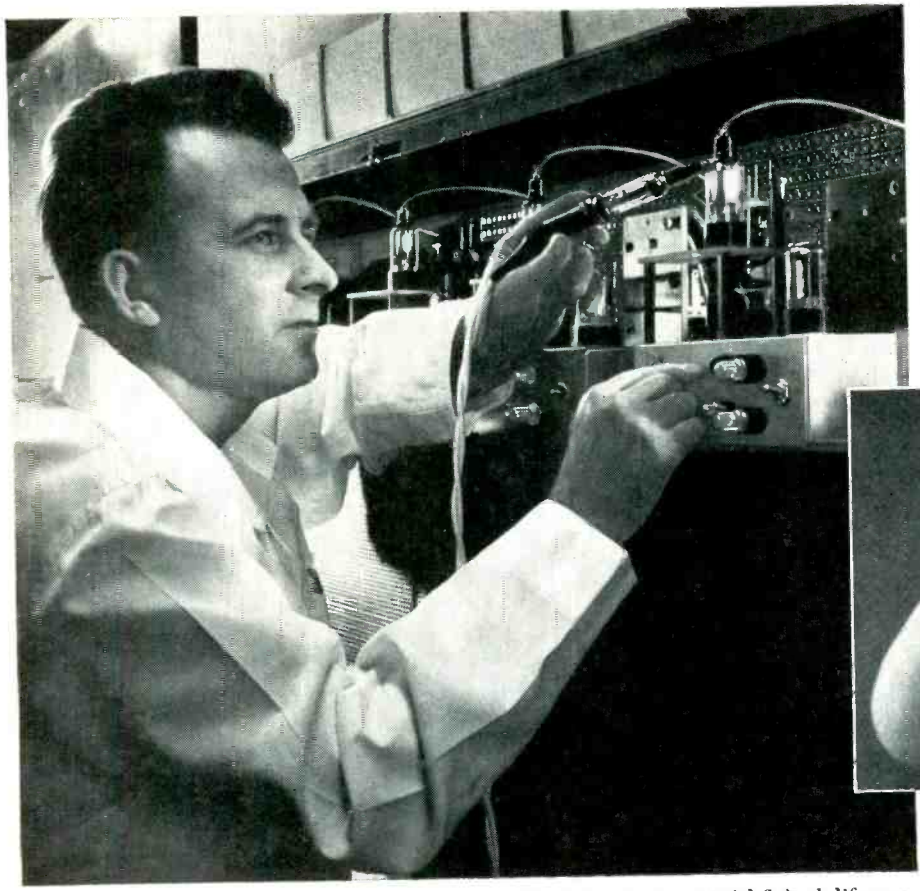
Lost Ground

EDITOR, ELECTRONIC TECHNICIAN

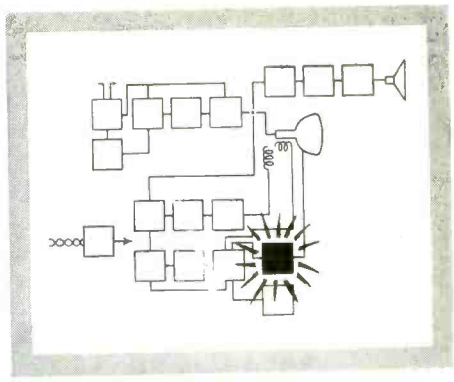
In your November 1956 issue of Electronic Technician, there is an article in the "Tough Dog" corner entitled, "Sound in the Sync." The circuit as drawn couldn't work. The 6AU6 couldn't conduct because of no DC return for the cathode.

JOS. S. DORSCH
Pittsburgh, Pa.

• *Connect bottom of cathode resistor to ground.—Ed.*



ABOVE: A General Electric technician checks rectifier tubes during special flyback life test.



ABOVE: Tungsten "lightning rod" in G-E high-voltage rectifier tubes shields the filament from electrostatic pull of high anode voltages. Shorts, broken filaments are sharply reduced.

"Lightning rod" in G-E high-voltage rectifier tubes minimizes filament pull-out, adds hours of service!

High-voltage rectifier tubes handle high anode voltages. These create an electrostatic pull on the fragile filament, and can cause it to short or break. In General Electric's service-designed 1B3-GT and 1X2-A/B, a tungsten post shields the filament . . . cuts filament-to-plate shorts and pull-out . . . enables you to install long-life tube performance in your customers' sets.

Other special design features of G-E high-voltage rectifier tubes further help you build customer goodwill. A highly adhesive filament coating cuts arc-overs, extends tube life. Bulbs are ringed with conductive material to prevent bulb-charging, a condition which causes streaking of the television-viewer's picture.

After manufacture, tubes receive a 100% flyback test and a dynamic flyback life test—both at the maximum ratings met in big-screen set operation. You can install Types 1B3-GT and 1X2-A/B with confidence their superior performance and long service life will bring customer satisfaction.

There are General Electric tubes with the same business-building high quality for every socket in every set you service. Phone your G-E tube distributor today! *Electronic Components Division, General Electric Company, Schenectady 5, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

161-1A2

Do you need a Degree for success in Electronics?

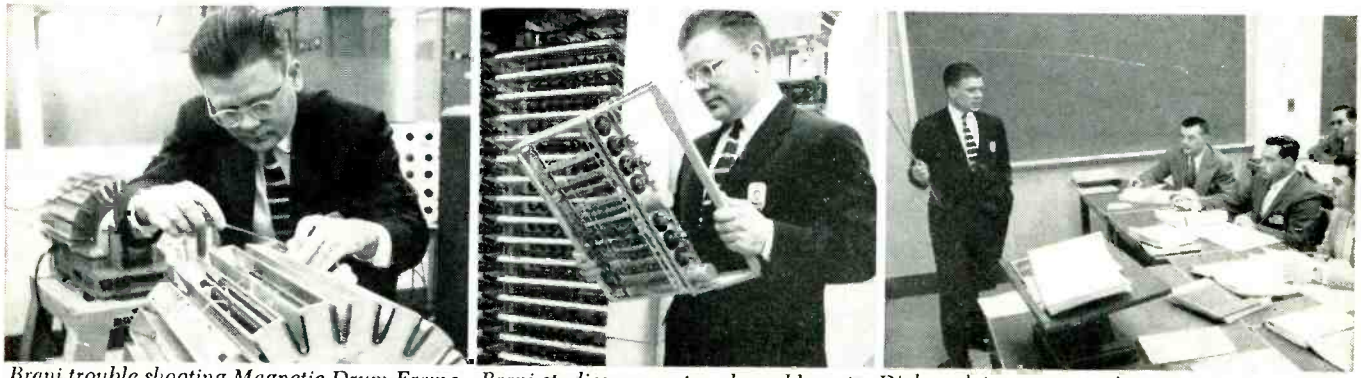
"Not necessarily," says Dick Brani, 33-year-old Field Engineering Instructor in Project Sage at IBM—Kingston, New York. "Oh, sure—I'm aware of my limitations to design electronic equipment even though I am qualified to maintain it. That's the biggest advantage of a formal degree. The point is . . . there are many responsible management positions opening all the time in IBM for men like myself . . . and comparable positions elsewhere would probably require an engineering degree."

Some seven years ago, IBM took the initiative with respect to technical training within its own organization. It realized, even then, that a great number of intelligent and otherwise capable men were falling by the wayside merely because they lacked 4 years of college engineering. Statistics indicated that because of financial difficulty or improper high-school preparation, close to 50% of the potential engineers in the country became lost in the educational shuffle. While some people with less foresight ignored the fact or bemoaned it, IBM did something about it. Consequently, fellows like Dick Brani can now enjoy more satisfying, more rewarding work than ever before.

Great Interest in Mathematics. While Dick was attending Boys' High in Brooklyn, his principal academic interest was mathematics. And, like many other young fellows of that era, Dick was realistic about his future. He decided his best bet might be business accounting. When Dick graduated in 1940, he accepted a position with a New York banking firm. It was not until Dick entered the Army in 1943 that he had the opportunity to pursue a more advanced form of mathematics, an A.S.T.P. training program at Lehigh University. This all-too-brief experience convinced Dick that he should make his career in a field that was in some way related to electrical technology.

Postwar Education. Discharged with the rank of Staff Sergeant, Dick returned to Allentown, Pa., to marry a girl he had met while enrolled at Lehigh. During this period, he successfully supported his family and himself selling various lines of food. In the evening, however, Dick continued his study of radio, TV, and electronics at the Allentown Branch of the Temple Institute. In two years' time, he graduated and secured an F.C.C. license. His technical career was beginning to take shape.

IBM Looks Especially Good. Glancing through an issue of *Time Magazine* one evening, Dick happened to read an article about Thomas J. Watson, Jr., the president of IBM. The story emphasized Mr. Watson's great faith in the future of electronic computers . . . the wonderful promise it holds for the ambitious, intelligent young man. Some time later, Dick spotted a classified ad describing IBM's association with Project Sage. Phil-



Brani trouble shooting Magnetic Drum Frame. Brani studies computer pluggable unit. Dick explains computer logic to a Systems Class.

33-year-old Dick Brani feels that technicians can grow into more responsible positions.

adelphia was one of the work locations available after training. That was all Dick Brani needed.

Asked to Become an Instructor. When Dick was three-quarters of the way through his nine month computer systems course, he was invited to remain at Kingston as an instructor. "It was like a bolt out of the blue," he recalls. "I knew I'd enjoy teaching, but I always thought it was out of the question. I accepted all right, and I can't tell you how much I've enjoyed helping these fellows and watching them grow within the organization. For instance, there's a fellow in my class right now whose education is limited to correspondence school. He's in the top third of his class, and has a real future with IBM—all because he has the native talent and is willing to work."

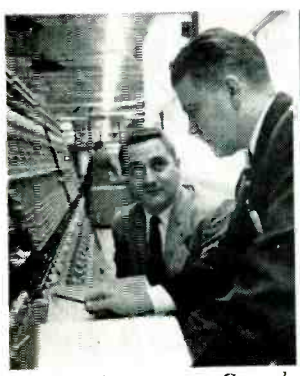
What Does Dick Brani Teach? "Actually, I teach three separate courses for technicians in field engineering. One is computer systems testing, which is for the more advanced student. This training lasts for 33 weeks—a long time, perhaps, but it's well worth it. Another is a program of 24 weeks' duration that deals with computer input-output units. Finally, I teach a course in computer units displays. This also lasts for 24 weeks. Each one of these courses is an education in itself." Experience has shown that IBM's educational programing is most successful. Men accepted receive their training with no strings attached—no contracts. Upon graduation the road to success is wide open in *all* divisions of the corporation.

The World's Largest Electronic Computer. "This computer is really fantastic. It contains approximately 1,000,000 parts, and it's housed in a building 4 stories tall. Information is filtered in from Texas towers, picket ships, reconnaissance planes—even ground observers. Every object in the sky is analyzed. Then it checks each object against available traffic data and identifies it as either friendly or hostile. It can make suggestions, but it can't send a Nike missile against a 'baddie.' Only authorized personnel can make that decision."

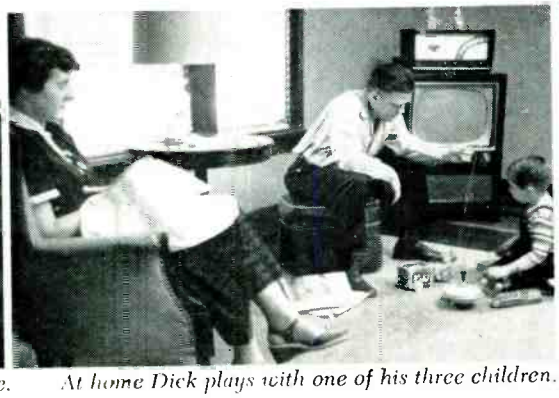
What About Dick's Future? "Well, right now, I'm doing work that most technicians couldn't touch with a ten-foot pole. I know of few companies where technicians are actually doing engineering work. I guess it's a matter of approach. Both kinds of companies will get the job done, but IBM prefers to think in terms of the man, encouraging him to grow into more responsibility. You might say that IBM gets more out of the man, and in the final analysis, it seems a lot more efficient from the corporation's and employee's viewpoint. Personnel policy at all levels—management, engineering, or technical—is the same. The future is wide open."

Just recently, Dick bought a home in Saugerties, near Kingston, where his wife Betty and their three children, David, 9, Sharon, 7, and Paul, 3, enjoy a pleasant, contented life together. Occasionally, in the summertime, Dick plays softball with his co-workers. But his family is—and always will be—his predominant interest.

What About You? Opportunities in the Project Sage program of long-range national importance are still growing. If IBM considers your experience equivalent to an E.E., M.E. or Physics degree, you'll receive 8 months' training, valued at many thousands of dollars as a Computer Systems Engineer. If you have 2 years' technical schooling or the equivalent experience, you'll receive 6 months' training as a Computer Units Field Engineer, with opportunity to assume full engineering responsibility. *Assignment in area of your choice.* Every channel of advancement in the entire company is open. All the customary benefits and more. WRITE to: Nelson O. Heyer, Dept. 9402, IBM, Kingston, New York. You'll receive a prompt reply.



At the Maintenance Console.



At home Dick plays with one of his three children.

Customer Engineers: opportunities are also available, locally, for servicing IBM machines, after training with pay. Consult your nearest IBM office.

IBM MILITARY PRODUCTS

DATA PROCESSING
ELECTRIC TYPEWRITERS
TIME EQUIPMENT
MILITARY PRODUCTS

EMPLOYMENT OPPORTUNITIES

for electronic technicians

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

Personnel Dept.
ELECTRONIC TECHNICIAN
480 Lexington Avenue
New York 17, N.Y.

Positions Wanted

SERVICE MANAGER, electronics, TV and air conditioning, with one of largest eastern distributors. Member of a RETMA committee, national officer of CETA. Seeks opportunity for advancement. Box E201, Electronic Technician.

TV-ELECTRONIC service technician seeks to relocate in California, Texas or Arizona. T. Zier, 5616 14th Ave., Brooklyn 19, N. Y.

TV-AUDIO serviceman, 6 years experience, seeks position in Chicago. Previous employer out of business. Not married. Box E202, Electronic Technician.

TV BENCHMAN seeks position in electronics field. 7 years experience as TV benchman in department store, 1 year circuit analyst with GE, Radio Electronics Institute graduate. Age 33, married. Yukie Motoike, 1918 W. Roscoe St., Chicago 13, Ill.

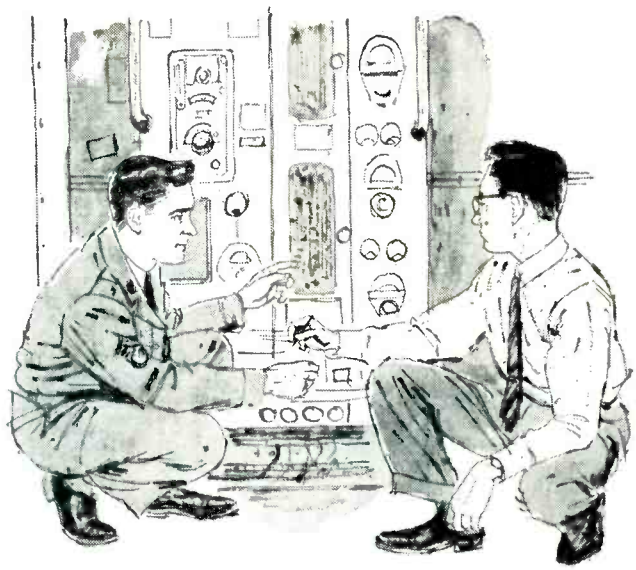
SENIOR LAB TECHNICIAN 21 years experience in electronics, mobile radio, radar and loran. FCC first class radiophone and class A amateur licenses. Former Air Force inspector. Wishes to locate in Florida. Age 41, married. Box E203, Electronic Technician.

Starting this month, we are listing announcements of readers who are seeking new jobs or the opportunity to buy a service business. There is no charge for this service. Within the limits of space available, announcements will be published on a first-come first-served basis at the discretion of the Personnel Dept.

While names of technicians seeking positions will be withheld on request, we reserve the right to furnish such names to prospective employers; or in the case of someone seeking to buy a business, to such prospective sellers.

(Continued on page 18)

YOU'RE SERVING YOUR COUNTRY AND SERVING YOURSELF... WHEN YOU'RE A TECHNICIAN WITH RCA SERVICE COMPANY



Why RCA for your next (and best) position as a technician? Because you value the opportunity to serve your country on projects like RCA's . . . vital to free world military supremacy. Because new and advanced challenges appeal to you far more than routine work. Because you're happy and satisfied only when your sense of accomplishment is strong.

What fields of technical work does RCA open for you? Instructing—Field Engineering—Equipment Maintenance—Equipment Installation—Test and Repair—Technical Writing—Factory Field Support.

What locations can you choose with RCA?
You may choose work with RCA at Alexandria, Va.; Cocoa Beach, Fla.; Cherry Hill, N.J.; or Tucson, Ariz.

Talk to RCA Engineering Management in Person!
Will an RCA representative be near *you* in the next 60 days?
Here is our partial schedule . . .

March 18, 19—Milwaukee
March 20, 21—Ft. Worth
March 23, 24—St. Louis
March 25, 26—Kansas City

March 28, 29—Chicago
April 1, 2—Denver
April 5—Salt Lake City
April 8, 9—Columbus

April 10—Winston-Salem
April 11, 12—Detroit
April 13, 14—Dallas
April 17, 18—Atlanta

To arrange confidential interview when we are in one of the above cities—or in a mutually-convenient area—send your resume, today, to:

Mr. James Bell, Employment Manager, Dept. Y-14B
RCA Service Company, Inc.
Cherry Hill, Camden 8, N.J.

RCA SERVICE COMPANY, INC.

AR-22

TR-2

TR-4

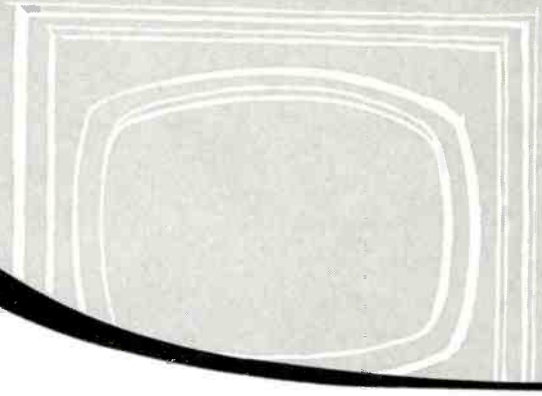
5-star feature...

1 the best color TV picture

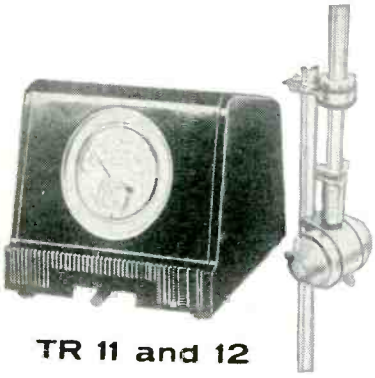
the growth of color TV means an even greater demand for CDR Rotors for pin-point accuracy of antenna direction.

2 a better picture on more stations

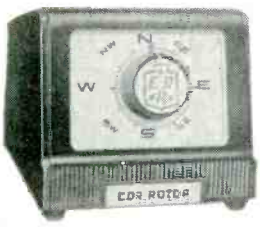
CDR Rotors add to the pleasure of TV viewing because they line up the antenna perfectly with the transmitted TV signal giving a BETTER picture . . . and making it possible to bring in MORE stations.



CDR ROTORS



TR 11 and 12



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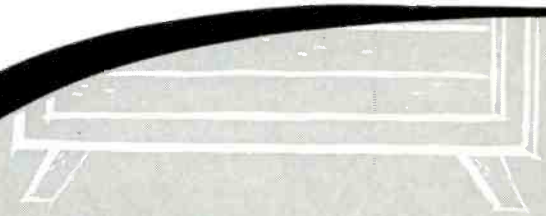


3 tested and proven dependable

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

4 pre-sold to your customers

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

5 the complete line

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

CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

THE RADIART CORP
CLEVELAND 13, OHIO

(Continued from page 14)

HOW TO OBTAIN YOUR FREE LISTING

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

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

If you are interested, DO IT TODAY!

●

"Help Wanted" and "Business For Sale"

Service for TV-Electronic Shops

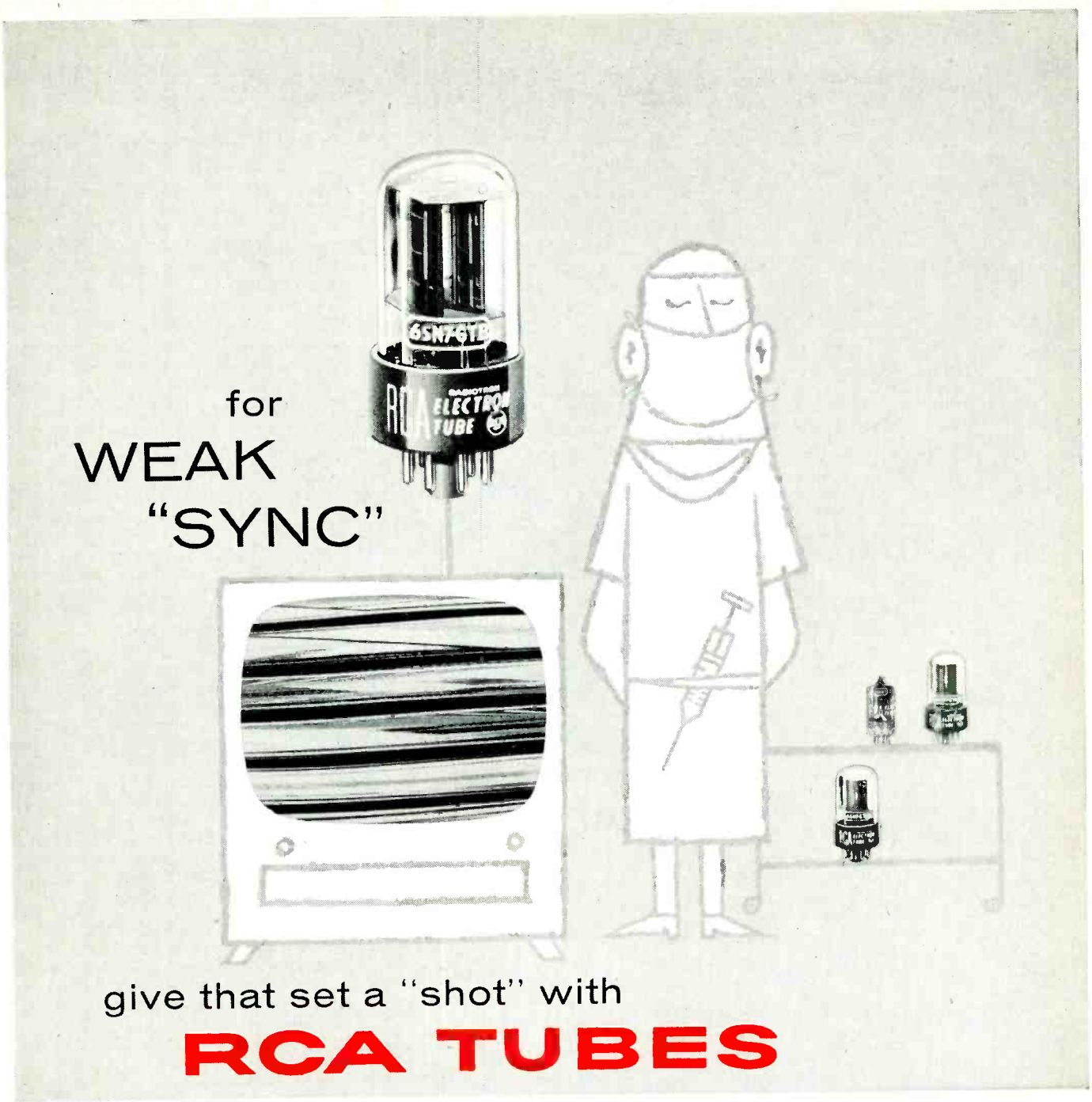
Starting soon, special paid "Help Wanted" and "Business for Sale" sections will be started by ELECTRONIC TECHNICIAN to aid small shops in obtaining qualified personnel or selling their business. This section is not open to manufacturers.

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

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

If you are looking for technician personnel or a buyer for your business, write the announcement, add the cost at 25¢ per word (plus $2 for box number, if any), and send payment along with announcemnt to:

Personnel Dept.
ELECTRONIC TECHNICIAN
480 Lexington Avenue
New York 17, N.Y.



for
WEAK
"SYNC"

give that set a "shot" with

RCA TUBES

When the picture symptom is "unstable sync"—check into that sync separator, sync amplifier, video if, and video amplifier, *and use RCA Tubes when you replace.*

Designed and built to some of the tightest electrical tolerances in the tube business, RCA Tubes are the answer for replacement types that *fit the circuit.* Take the RCA-12AU7 and 6SN7-GTB, as examples. In these types, plate current cutoff characteristic is extremely uniform from tube to tube. And stability is excellent—even under wide variations in heater voltages. When you replace—go 100 per cent with "RCA's", and watch your bench-time drop. When you order—tell your distributor "RCA only" and watch your profits grow.

RECEIVING TUBES
Radio Corporation of America
® Tube Division Harrison, N. J.

Catalogs & Bulletins

Available to you free, unless noted otherwise. Fill in code number on coupon page and mail to Reader Service Dept., ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

PHONO-NEEDLE GUIDE: A new up-to-the minute phono-needle guide with latest cartridge-to-phonograph-to-phono-needle data. Helps dealer to choose the correct phono-needle in the shortest possible time. The 6th Edition Recoton Reference Guide is available from Recoton Corp., 52-35 Barnett Ave., Long Island City 4, N. Y. (ELECTRONIC TECHNICIAN No. B2-2)

HI FI: New catalog, designed for architects, decorators and builders, explains what high fidelity is and how each component functions. Specifications for installation and complete technical descriptions of each component are given. Available free from Custom Engineering Dept. H. H. Scott Inc., 385 Putnam Ave., Cambridge, Mass. (ELECTRONIC TECHNICIAN No. B2-3)

PHONO ARMS: "How Good is Your Arm?" is a 16-page booklet with illustrations which discusses the various basic problems involved in the design of a really good, professional-quality arm at a modest price. Written in easy to understand language, it covers resonance, tracking, tracking error, torsional resonance, pivot design, etc. Available free from Fairchild Recording Equipment Co., 10-40 45th Ave., Long Island City, N. Y. (ELECTRONIC TECHNICIAN No. B2-4)

HOW TO MAKE MONEY: a 40-page illustrated book entitled "How to Make Money in TV, Radio & Electronics" outlines a radio FM & TV course. Available free from Radio-Television Training Association, 52 E. 19th St., New York 3, N. Y. (ELECTRONIC TECHNICIAN No. B2-5)

SERVICING COURSE: Free circular gives complete facts on the newly published TV Servicing Course. Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. (ELECTRONIC TECHNICIAN No. B2-6)

SIGNAL TRACER: Two interesting pamphlets, J-781 & J-782, describe the complete line of components for a transistor signal tracer complete with instructions, schematic and parts list. Thordarson-Meissner, Seventh & Bellmont, Mt. Carmel, Ill. (ELECTRONIC TECHNICIAN No. B2-7)

TOP JOBS: A 24 page illustrated book "How to Reach the Top Jobs in Television Servicing" describes the course and equipment available from National Radio Institute, Washington 9, D. C. (ELECTRONIC TECHNICIAN No. B2-8)

(*Continued on page 52*)

Audio NEWS LETTER

It's a long, tedious job, but hi-fi owners are starting to get the message that the audiophile who wants $500 worth of performance out of a $500 system must have his equipment maintained regularly. Otherwise he might as well have a properly performing $200 system.

Leading newspapers like the New York Times have published articles explaining that peaking hi-fi gear is not a quick job like replacing a tube in a TV set. It's not enough for the equipment just to work; it must operate at maximum capability. That takes time, and time is money, but it's well spent say the newspapers. Our thanks to the Times, News, Heralds and Dispatches across the country for doing this needed missionary educational work.

It wouldn't be amiss for audio technicians to use the same approach with their customers.

Imported audio products have gained very substantial acceptance in this country, with British-made units leading the way. One basic restriction on foreign-made mechanical products of any type is limited information and facilities for servicing. It's gratifying to note that importers of record changers and the like are keenly aware of this, and are directing their attention toward making sales and service data available to technicians.

The Audio Engineering Society meeting at Los Angeles' Ambassador Hotel, Feb. 7-8, features several interesting technical papers, including: "Transformerless Amplifiers in Stereophonic Applications"; "A Marriage — Radio-Frequency to Audio for Extended Range"; "How Much Audio Power?"; and "An Objective Evaluation of Multispeaker Systems and Single Speaker Systems."

for all set replacement work!

You'll save yourself trouble if you standardize on Raytheon "All-Set" Tubes for replacement work.

Here's why:

Raytheon "All-Set" Tubes are designed to give perfect service in many makes and models of receivers because Raytheon sells Tubes to almost every set manufacturer. To satisfy the many and varying needs of so many manufacturers, these tubes must combine top quality performance and dependability. This successful combination makes Raytheon "All-Set" Tubes tops for replacement.

Always use Raytheon "All-Set" Tubes to satisfy your "all-set" customers.

TV-Radio service is your business . . . serving you is ours

RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

Newton, Mass. • Chicago, Ill. • Atlanta, Ga. • Los Angeles, Calif.

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

RAYTHEON ®

Excellence in Electronics

ELECTRONIC TECHNICIAN
Including Circuit Digests

Factory Service: It Pays to Act!

Few events in this history of TV servicing have so widely stirred electronic technicians to action as the relatively recent growth of factory service. Electronic technicians have spoken up in protest, angry meetings have been held, letters and telegrams sent to interested parties, brand preference has been used as an economic weapon, and even legal action has been taken.

These actions are producing favorable results!

Before we examine new developments affecting factory service, let's state our definitions of two key terms. We define factory service as repair service offered to the public by TV manufacturers, their subsidiaries or distributors, in competition with the service offered by independent technicians and dealers. Captive service is factory service that is presold with the TV set to the dealer.

Technician Attitudes

Electronic technicians have shown essentially unanimous opposition to captive service, and for good reason. They never get the first opportunity to start competing with the manufacturer.

There is a less unified attitude toward factory service. Some technicians oppose it without reservations. A few regard it as acceptable competition. But most appear ready to live with it provided certain abuses are eliminated, particularly large-scale promotion ("We made your set—we can fix it best"). Blended with the resentment is the appreciation that factory service outlets have been influential in keeping prices up at a reasonable level.

Manufacturer Attitudes

TV manufacturers in factory service claim their only interest is building the reputation of their products. This is probably true, but they have not always gone about it wisely. By the same token technicians have not always been fully successful in upgrading their skills or cleaning their own house.

General Electric has been one of the most severely criticized manufacturers. Recently, in response to the actions of many technicians, this company announced an excellent training program and a modified policy regarding its relations with the independent. Here are a few key points from the new GE policy:

1. Parts will be made available through parts jobbers and technicians generally.

2. Product service advertising program in *Life* and *Saturday Evening Post* will be discontinued. Ad mats for local distributor ads will not contain expressions which can be interpreted by independent servicemen as derogatory.

3. A depth course in management and shop plans layout will be available through tube distributors; establishment of a b-w and color technical service school for independents.

4. *Distributors will appoint independents as authorized GE TV repair stations, and company financing will sponsor independent technician ads and commercials.*

We commend General Electric for this program. But we sound this note of caution: Since GE distributors are empowered to formulate their own policies, unless the parent company exerts its "friendly persuasion" to eliminate captive service and limit factory service promotion and activities, the intent of this program favorable to independents will be nullified.

A start in the right direction has been made. Action by independent electronic technicians, and particularly their associations, has been instrumental in bringing it about. It certainly pays to act!

Tuning In the

WHAT HUMANS CAN'T DO in factories is done by industrial electronics in an increasing number of cases. Example is the detection of a pin hole in tin plate sheets which come screaming off the steel mill lines at 2000 ft. per minute. A light source and photoelectric control can spot the flaw immediately while the sheets are moving, even if the hole is only 0.001 in. That's about half the width of a human hair.

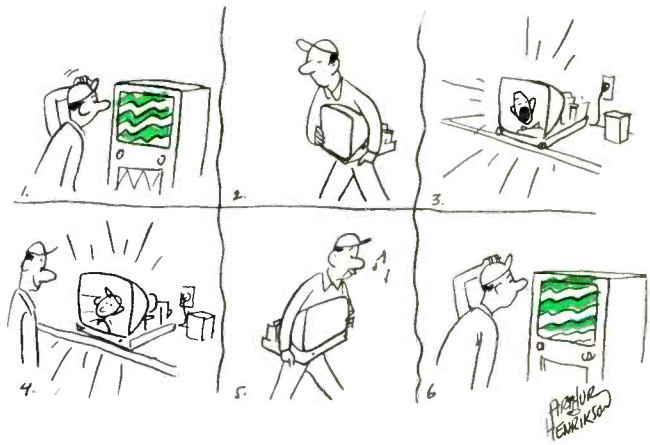
"WHO'S WHO in Television, Radio, Electronics and Telecommunications" is being compiled by Martin Codel's Television Digest. *This all-industry encyclopedia of biographies is due off press after mid-1957.*

HOT STUFF. New components, developed for electronic applications in guided missiles, can operate at 800°C. That's almost 150° hotter than the melting points of aluminum or magnesium.

LEGAL EAGLES are sharpening their claws in some high level litigation. Latest battle is Philco's $150,000,000 suit against RCA, GE and AT&T charging monopolistic practices in the operation of the industry's huge patent pool. A Justice Dept. suit against RCA is currently pending, and RCA denies violation of the anti-trust laws, contending that patents are broadly available for use at low royalty rates.

AUTOMATION IN THE HOME

The kitchen of tomorrow (or the day after tomorrow), as envisioned by RCA Whirlpool engineers, offers a self-propelled serving cart (far left) dispatched by predesignated control; a remotely controlled mobile floor cleaner (lower left); and automatic meal makers (rear). All this and more is controlled by the control panel (left center). Plenty of repair opportunities for electronic technicians!



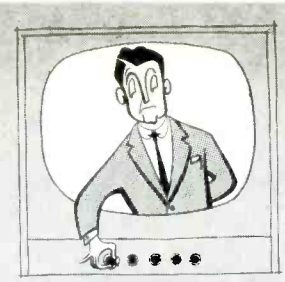
TV BAIT ADS have landed a few too-sharp technicians in court. The crackdown has taken place in Detroit, where the city's Television Board of Examiners cooperated with the Better Business Bureau to put the squeeze on come-on price ads.

AUDIO BUSINESS is where you find it . . . and if you keep your eyes open you find plenty of it. Take Sam Sperling's Starling Electronic in Brooklyn. They do plenty of TV and hi-fi work, and they keep their eyes open. They noticed that in some of the giant housing projects the apartments had more than their share of electrical interference causing havoc on AM. On a TV call, they demonstrate how FM tuners such as Granco or others can give static-free reception. Sometimes the tuners are hooked up to the TV. It's a genuine service to customers, and profitable too.

AN ELECTRONICALLY CONTROLLED automobile turntable brings customers of the drive-in National Bank of Hyde Park right up to the teller's window. The Chicago bank also features closed circuit TV, photoelectric traffic control and intercoms, major electronic elements for today's modern business methods . . . and electronic technicians do the installation and repair work.

SEMICONDUCTOR prices have been dropping, reflecting the upward trend in the use of transistors and diodes for consumer and industrial products. General Electric "entertainment" transistors average under $1.25 each to manufacturers, or 46% lower than a year ago. Price reductions on its line of industrial silicon rectifiers of 20% to 43%, and 33% cuts for germanium rectifiers stacks in quantities of 30 to 99, have resulted from increased volume and greater process know-how. Another firm, Texas Instruments, has cut VHF transistor prices 50% in quantities, and other silicon transistor and rectifier costs by 10%.

Picture.....



GOVERNMENT REGULATIONS may be annoying at times, but you'd better not neglect them. For example 40 New York City employers repeatedly failed to submit quarterly payroll reports on time, constituting a violation of the State Unemployment Insurance Law. Result: A total of $2,530 in fines.

FOURTH ANNUAL BRAND PREFERENCE survey for electronic components is being conducted this month by Brand Name Surveys of Chicago. Questionnaires are being mailed to more than 20,000 radio-TV service technicians throughout the U.S. Results will be used by participating manufacturers to improve their products, facilitating use in servicing, so it's a good idea to fill out the questinnaire if you get one.

PERSONALITY in the news. Harry Resnick, Channel Master president, attracted national attention by spearheading the drive to open the new Ellenville National Bank, successor to the Home National Bank which was closed after finding a $1,300,000 shortage.

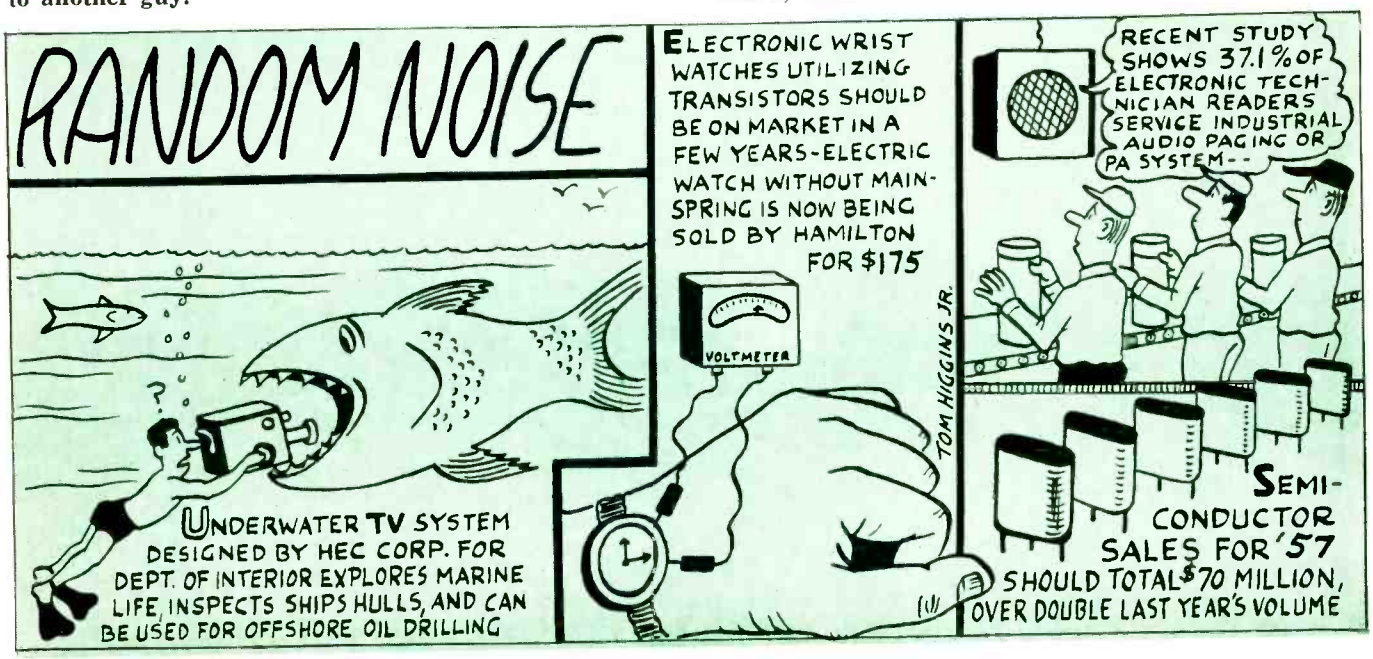
TECHNICIAN RHYME (How to Retire Young): "Just patch the set and get it going; the customer's not one for knowing his set will soon break down again. When it does, he'll call and then, I'll stick him with another bill—I'll really put him through the mill! I put up my antennas less the standoffs and with poor lead dress. Pretty soon they need more work; that means more profits; I'm no jerk!" That's how Screwdriver Joe operates, then sits back and simply waits—and still can't see the reason why, when they call again, it's to another guy.

CALENDAR OF COMING EVENTS

Feb.	6-9:	Los Angeles High Fidelity Show. Ambassador Hotel, Los Angeles, Calif.
Feb.	6-9:	San Francisco High Fidelity Show. Hotel Whitcomb, San Francisco, Calif.
Mar.	3-6:	1957 Annual Convention of National Education Assoc., Dept. of Audio-Visual Instruction, Sheraton Park Hotel, Washington, D. C.
Mar.	18-21:	IRE National Convention, New York Coliseum and Waldorf-Astoria Hotel, New York, N. Y.
Apr.	9-10:	First Annual Conference on Electronics in Industry, Campus of Illinois Institute of Technology, Chicago, Ill.
Apr.	11-13:	Ninth Southwestern I.R.E. Conference & Electronic Show & the Second National Simulation Conference, The Shamrock-Hilton, Houston, Texas.
May	20-23:	1957 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
Aug.	20-23:	Western Electronic Show & Convention (WESCON), Cow Palace, San Francisco, Calif.
Oct.	7-9:	1957 National Electronics Conference, Hotel Sherman, Chicago, Ill.

Something new in
EMPLOYMENT OPPORTUNITIES!
See pages 14 and 18

CLOSED CIRCUIT TV can help industry and institutions lower costs by extending visual communication, data transmission, property protection, material handling and demonstration, to mention a few uses. A free survey form, describing typical installations, is available from Blonder-Tongue Labs., 9-25 Alling St., Newark 2, N.J.



Field Report on Troubles

Inherent difficulties, tough dogs, intermittents

LESTER A. BRYAN

• Recent field experience on the General Electric TV receivers, chassis models M, MM, S, and ST, has revealed a few inherent troubles. In many cases patient troubleshooting technique was required. Experience, subsequently, enabled the technician to make a few quick checks, locate the trouble, and accomplish the repair in record time. Resulting in achieving more customer good will and appreciation.

M Models

The most often encountered difficulties in the 14 inch portables are horizontal instability, low or distorted sound, and loss of contrast.

In the case of the horizontal instability, if the set uses a balanced selenium diode unit as a horizontal phase detector, change it and the trouble will be cured. This unit, Y251, Fig. 1, shows a marked tendency to become unbalanced. It is believed that the diodes change value because of heat; therefore be careful not to overheat the new unit when soldering it on the printed circuit board. The G.E. part number for this

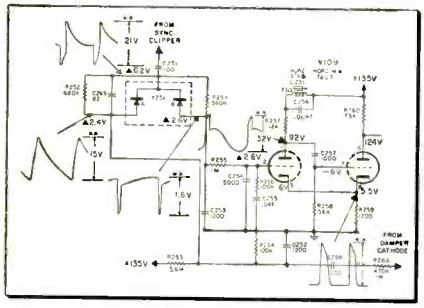


Fig. 1, Horiz. phase detector & oscillator.

unit is RER 023. The two diode units may be checked with an ohmmeter, taking both forward and reverse measurements. Any marked difference in readings of the two diodes indicates the unit is not matched, and should be replaced.

In those 14 inch portables that do not use the balanced diode, as a horizontal phase detector, horizontal instability is caused by insufficient filtering in the power supply. The usual culprit in this case is C402A, part of a four section electrolytic condenser, part number RCE 219. It has been found in these receivers that if there is more than one volt of B+ ripple in the 5AN8, horizontal phase detector, and 7AU oscillator,

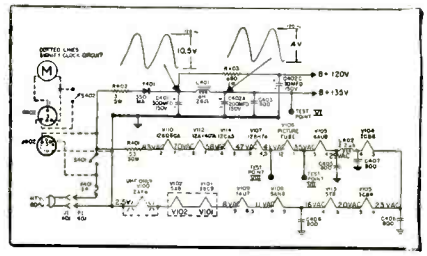


Fig. 2, GE chassis, model M, power supply.

that the horizontal hold is very unstable. The ripple voltage should be about .4-volts and can be checked on a scope. See Fig. 2.

Sound Trouble

The sound troubles in this model can usually be blamed on the discriminator transformer, T301, part number, RTD 020. Changing it cures the trouble. This component may show open, open intermittently, change ohmic value, or the tuning slugs may be subject to travel due to vibration. It is well to remember that one side of the speaker is grounded, and that the black lead must go to ground.

Loss of Contrast

The loss of contrast, usually accompanied by a decrease in sound volume, is caused by an intermittent short in the video amplifier tube, a 6AU8. However, simply replacing the tube will not cure the trouble, because the high current thru the contrast control R163, part No. RRW 338 in Fig. 3, has caused it to open or change value. Check it on an ohmmeter. If it does not read 0 to 600 ohms, replace. This is a cathode bias resistor and any change in value will cut off the tube or otherwise reduce the gain of the video amplifier.

MM Models

G.E.'s new 17 inch portable has shown a repeated tendency toward horizontal instability, and the blowing of the 2 amp. fuse in the power supply. The model MM uses the same horizontal phase detector unit as the late model 14 inch portables and the same trouble develops; the two units become unbalanced.

When you get one of these sets with a blown fuse, don't replace the fuse till you've made this check. Short out the blown fuse and watch for smoke or overheating, especially watch the 15k ohm resistor located directly above the horizontal output tube. If this chars, replace the dual 1000-volt condenser, located next to the 15k ohm resistor, in the vertical output line going to the yoke. This unit has a tendency to become shorted. Even if only one section is shorted, replace the entire unit. If a dual unit is not available, it can be replaced with two separate condensers of like value and 1000-volts or better.

Another cause of a blown fuse, is loose metal tube shields on the VHF tuner, touching the B plus resistor located directly above them. It will probably be necessary to replace this resistor as well as the fuse if it has opened or changed value, due to high current. An exact replacement part may be necessary, due to space limitations. To prevent recurrence of the tube shield short, tape the shields.

S and ST Models

Getting away from the portables and into the line of table and console models, "S" and "ST" series, can be identified by the push-pull, on-off switch, we find the common troubles are horizontal instability, poor sound, vertical roll, vertical stretch, inconsistent tuning on both VHF and UHF, and finally low B+ and low filament voltages.

in General Electric TV Sets

and loss of sync, become routine and quick repairs.

As in the portables, the horizontal instability is corrected by replacing the RER 023. The sound trouble is cured by replacing the discriminator transformer, a RTD 021, in the "S", and a RTD 022, in the "ST" models. The RTD 023 in the 17 inch portable does not seem to develop much trouble.

The vertical roll may be due to a number of items all easy to check. Try a new 6BL7 first, but this alone will not usually clear it up. Now check to see if the picture is centered correctly, by pulling down the height control. If not, adjust the centering arms, just behind the yoke, until it is. Many times, the height control has been misadjusted to compensate for poor centering of the picture. The vertical oscillator and output circuits are critical in these receivers and misadjustment of height and linearity controls will result in vertical instability. If rolling persists after the above has been done, reduce the brightness control until the screen starts to black out. If one horizontal strip is darker than the rest of the screen, due to hum caused by a cathode-to-heater short in the 6X8, in the front end, change the 6X8. Finally if the vertical hold control does not hold in the middle of the range with vertical fallout on each side, the vertical hold control does not have sufficient range over which to work. Usually there is vertical fallout on the low side of the control and none on the high or clockwise side. In this case add a 120k resistor in series with the vertical hold control between the center arm and ground as in fig. 7. This should center the vertical hold range. Sometimes different 6BL7's will be capable of restoring the correct range without adding the 120k ohm resistor.

Vertical stretching is often due to a shorted condenser C212, **Fig. 4, in** the vertical blanking circuit. When replacing, use a capacitor with a higher voltage rating to keep the trouble from recurring.

Occasionally a set owner complains that he has trouble in tuning in a station on VHF. The trouble here is that the fine tuning assembly is probably slipping. Check the aluminum cover on the front of the tuner, the one with the numbered holes in it, to see if the middle is pushed out, around the shaft opening. This cover, and a strong spring, behind the fine tuning assembly, apply tension to the fine tuning assembly. The spring in this case seems to be too strong. The cover can be straightened with finger pressure. Replace the small washer just behind the cover with one much larger in diameter, the larger the better. Do not obstruct the channel tuning holes in the cover.

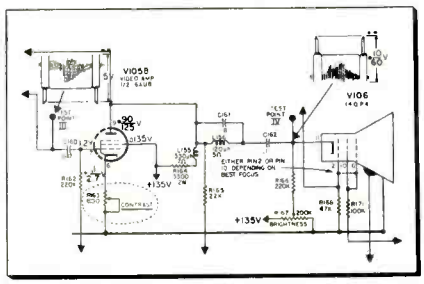


Fig. 3, Video amplifier and output stage.

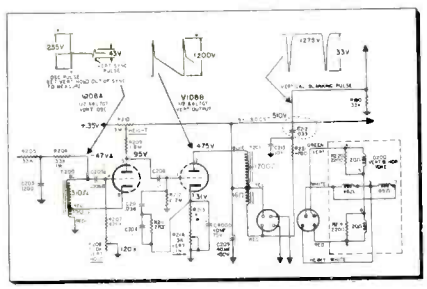


Fig. 4, Vertical oscillator & output stage.

On the "S" and "ST" chassis **many** power transformers have been condemned needlessly because of low voltages, both B+ and filament. The symptoms are intermittent or no reception, and of course vertical and horizontal sync trouble. First, using the low ohm scale, check the resistance between the center taps of the power transformer and chassis. The reading should be zero. If not, check the ground connection. The resistance from this point to the connector and the chassis are of dissimilar metals and after a period of time a resistance develops. The cure is to establish a good bond from the connector to the chassis.

One final tip, when it's necessary to bring one of the top tuning chassis into the shop, take the entire chassis and picture tube assembly mounted on the removable plywood board. •

When replacing the horizontal phase detector use two RED-006 germanium diodes instead of the dual selenium unit PER-023. Current production now uses these germanium diodes. There are 2 types of RED-006.—Ed.

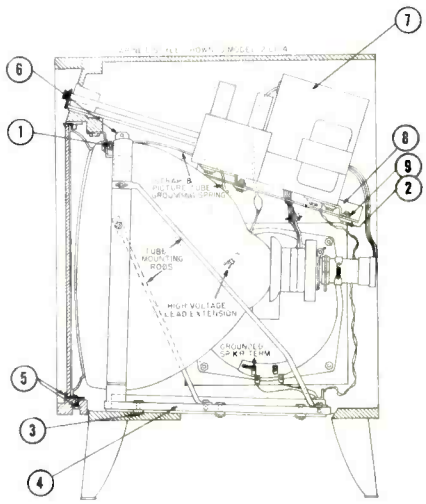


Fig. 5, Cut-away view of Loboy models.

1. Assembly securing nut (2). Must be removed before tube and board can be pulled out of cabinet. 2. Chassis mounting screws (4). Remove screws and slide chassis out with mounting braces. 3. Board securing screws (6). After removing chassis, remove all 6 screws, 2 top assembly nuts and both speakers, slide entire picture tube board assembly out of cabinet. 4. Picture tube mounting board. 5. Bottom glass channel and cork cushions. To remove glass and mask, remove screws along front cabinet rail and pull channel forward. Glass, bottom rail and side rails will come out together. In some models these screws are covered by a snap-out baffle. Pull out baffle to reach screws. 6. Strap assembly clamp. Clamp nut must be loosened before CRT is removed from board. 7. Chassis assembly. 8. Cabinet side rail; supports chassis assembly. 9. Chassis mounting brace.

Outdoor Hi-Fi and Public-

Background noise level indicator, application guide and

LAWRENCE X. SHAW

• Past experience, actual test, or an application guide, available from speaker manufacturers, help in the choice and physical installation of outdoor public-address systems. Even then there are some special factors to consider in paging and high-fidelity installations.

Outdoor PA System

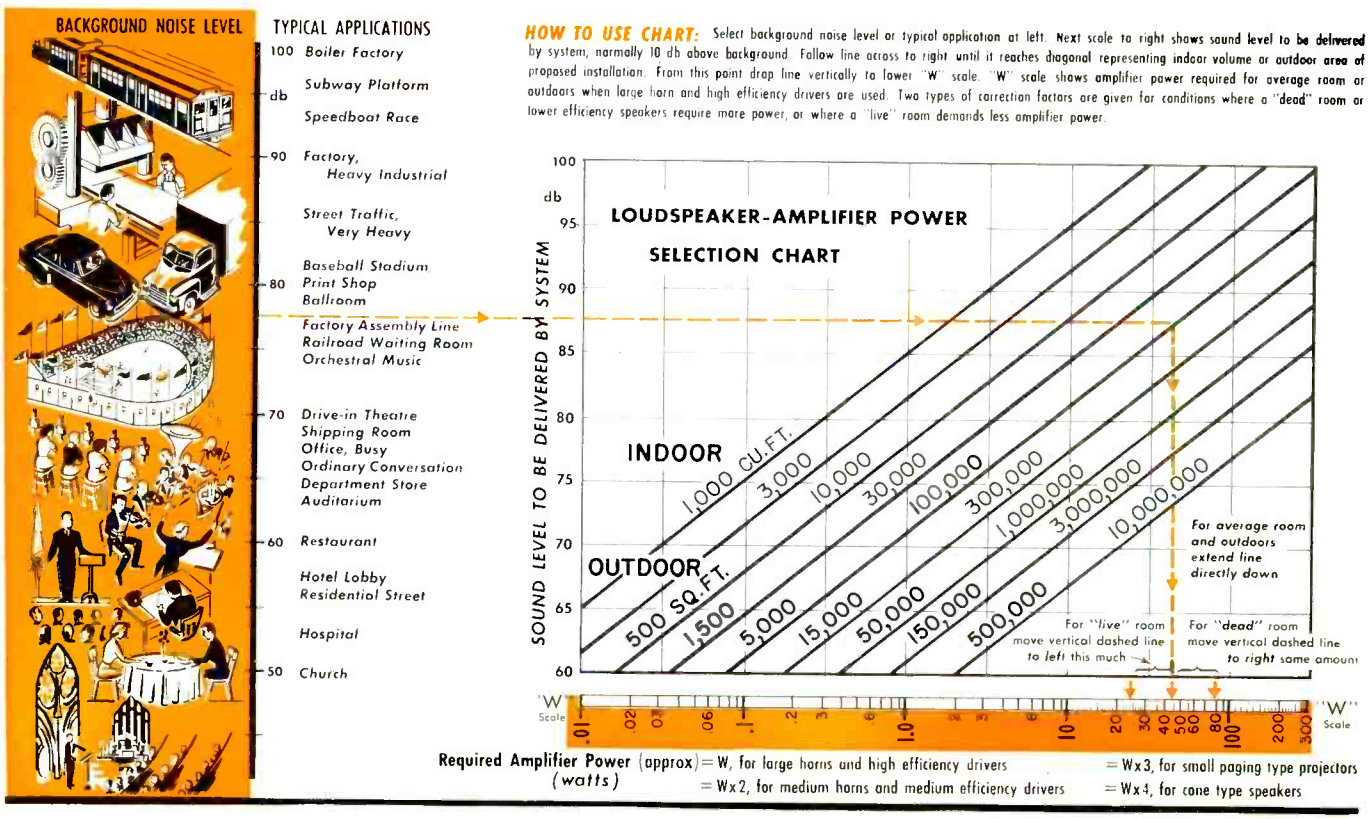
Traffic control, on an artificial lake for pleasure pedal-boats calls for one type of a special outdoor paging system. The general shape and size of the area to be covered is shown in the sketch and photograph Figs. 1 & 2. The size of the area is approximately 2.5 million square feet. The sound system application guide in Fig. 3, may be extended to accommodate larger areas by drawing approximately equidistant square-feet lines parallel to those already printed. The next two lines represent about 1.5 and 5 million square feet respectively. The normal sound level required is about 10 db above the background noise.

Background Level

The background noise level is made up of many elements and is dependent upon acoustic conditions. From the background noise level indicator in Fig. 3, it is possible to determine some typical levels based on previous surveys. Time and availability of equipment, permitting it is possible to actually measure the noise level.

On a busy day clanking boats, flying aircraft and winds up to 20-mph brought the background noise level up to 60-db in this normally quiet and serene area. The background level plus the sound intelligence level equals 70-db and from the chart it can be seen that a 50-watt amplifier would be adequate when combined with a high-efficiency speaker system.

It is more economical to conduct sound power through wires than through atmosphere; in other words the more speakers properly placed the better; however from a price point of view, some compromises can be made by judiciously selecting directional speakers and carefully orienting them so as to provide coverage where needed. The trumpets are mounted on top of the boathouse roof with their axes aimed about 100 feet from the farthest side of the lake. Most of the lake is covered by the speakers independently while their combined output delivers power to



Address System Requirements

speaker efficiency chart aids selection of components.

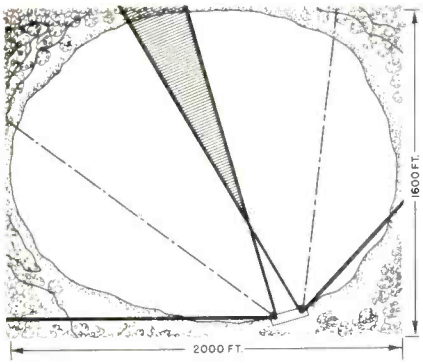


Fig. 1 Birds-eye view of artificial lake.

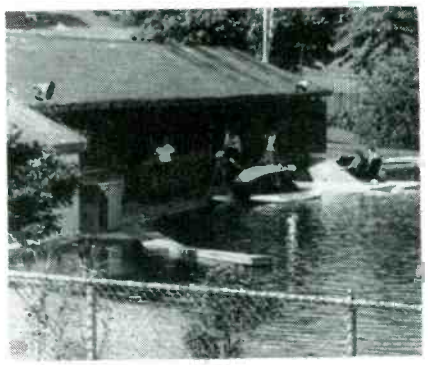


Fig. 2 Speakers mounted on boathouse roof.

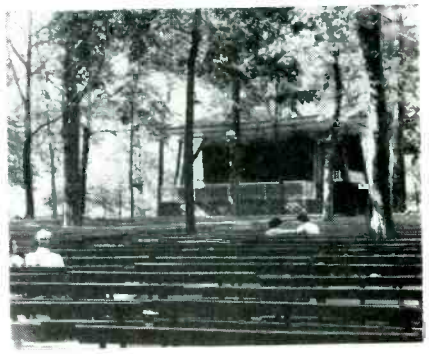


Fig. 3 Music Grove speaker installation.

the far middle region. Near the boathouse, plenty of sound drifts down from the two speakers. A cardioid-type microphone is oriented and permanently mounted, to minimize the effects of feedback even at full volume. Thus alleviating future operational difficulties.

In another special type of outdoor system, the purpose is to reinforce the acoustical output of a full orchestra. Frequency response is important in high quality orchestra reinforcement work. High frequencies tend to

(*Continued on page* 56)

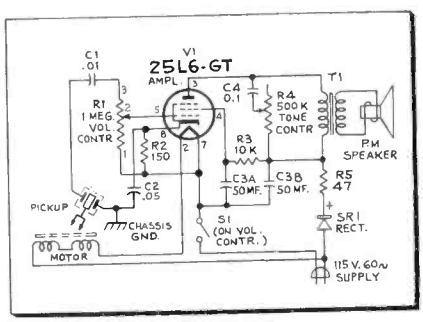
Case of the Mysterious Phono Motor

JOHN M. BOLIN

After an experience like this, I am ready to take a drink. I won't even mention the brand name because this could happen on any record player and amplifier using a 95-volt motor in series with a 25L6 tube. It all started out as an ordinary repair job. The customer complained that the record player would slow down, then speed up to normal, and then slow down again. This happened continuously. Very confidently, I removed the horseshoe clip on the spindle, removed the turntable and turned on the unit to examine the way the motor and drive wheels were running. Everything seemed to be operating smoothly, and except for a little dirt, I could find nothing wrong. Undaunted, I cleaned and oiled everything as it should be done. I assembled the unit, confident that all was well, and that the job was finished. All I could say was, "Nuts." The trouble was still there.

I stripped the phono down once again and couldn't find anything wrong. So I concluded that the trouble must be in the motor itself. After telling the customer it would take a week to get and install a new motor, I promptly ordered one. When the motor arrived, I didn't waste any time, I installed the unit, turned on the power, and you guessed it, it behaved exactly in the same miserable way. What to do now? When in doubt, change a tube, so I did. That was it. It worked. Who could have been so smart as to suspect a defective intermittent, filament in a tube as being the cause of the erratic action of the phono motor. I might add that at no time was there any indication from the amplifier that it was not functioning properly. Also, how much would you charge the customer?

Record player & one-tube audio amplifier.

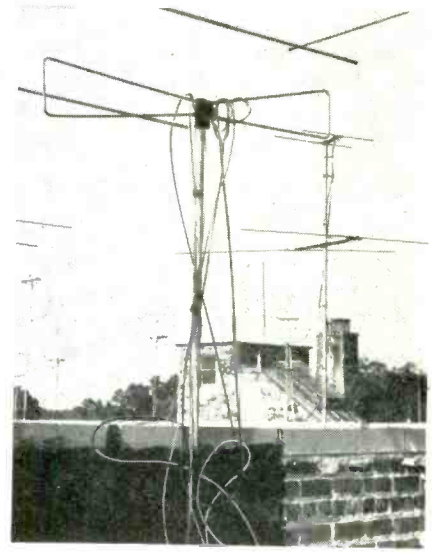


Our view is to charge the customer for the 25L6 tube plus the normal service charge and chalk up the rest to experience. An honest approach should bring more satisfaction than a questionable dollar. However, we wonder if readers consider our view "smart business."—ED.

The TV Antenna One Man's Experience

MORRIS BLEIWEISS

• Before entering a customer's home to service the TV set, I look up at the antenna and lead-in wire and observe the general condition. This may not be feasible in multiple-dwelling units and apartment houses. So if it is not the first check made, it should still be accomplished before completing the service call. In some cases I've discovered obvious defects ranging from loose and broken leadins to missing elements and broken mounts. Potential difficulties due to excessive corrosion of chimney straps and deteriorated insulation of lead-in wire can be ascertained.



Even neighbors were troubled by this one.

Customers appreciate this thoroughness even before the set is examined. Can you hear them saying, "At last I have found a serviceman who will do a good job"? Also important is a little question and answer session concerning reception at different times on different channels with particular attention to the effects of wind and rain. A lead-in having defective or contaminated insulation will cause all sorts of queer effects on a rainy day. It may "suck out" one or more channels or only part of a channel. It may cause a channel to come in unusually strong. How many times have you run into a situation in which an improved

(Continued on page 57)

Dynamic Testing

of Portable Transistor Radios

Signal Tracing; Signal Injection; Automatic Volume Control Action; Voltage, Current & Resistance Tests

JAMES A. McROBERTS

• Dynamic tests speed servicing of transistor radio sets. Rapid localization of inoperative stages minimizes point-to-point checking, unsoldering, and soldering activities. However, a few preliminary checks should be made and some precautions observed before digging into the chassis.

Check the battery voltage with the receiver turned on. While the set will work with a few volts less than maximum, it is best to work with a fresh battery. Check for overall current drain. Avoid shorting transistor elements to each other, and to circuit ground. Avoid continuity checks with a transistor in the circuit. It is possible to damage the transistor. Misleading resistance readings are obtained when the transistor is in parallel with the circuit under test. It will conduct when a small voltage is applied to its terminals. Solder quickly and avoid overheating.

Why a dynamic test? The best way to check a transistor is by substitution. There is no known reason why a transistor should fail in itself. Failure can be attributed to moisture, heat, and mishandling. Other external conditions which cause applied voltages and current to exceed the maximum ratings are the factors to contend with when the set has been working. Unlike a tube radio then, it is not unusual to check the circuit before attempting to check transistors, particularly if it is soldered into the circuit.

Test Points

The diagram in Fig. 1, shows a typical transistor radio. A quick look at this figure tells us that the radio is the familiar superheterodyne type, and it very much resembles its predecessor, the vacuum tube type. With a few exceptions, the basic trouble-shooting procedure is pretty much the same. By using either the signal-tracing or signal-injecting method, the technician can quickly isolate the trouble. Very briefly, a good place to start is between the 2nd detector, and 1st AF amplifier. Signal at point A immediately indicates that the difficulty is somewhere between the speaker and this point. Additional check points in this direction would be points B and C. Had there been no signal present at point A, the next logical step would have been point D, followed by a check at point E, if necessary. As a matter of fact any systematic procedure is acceptable.

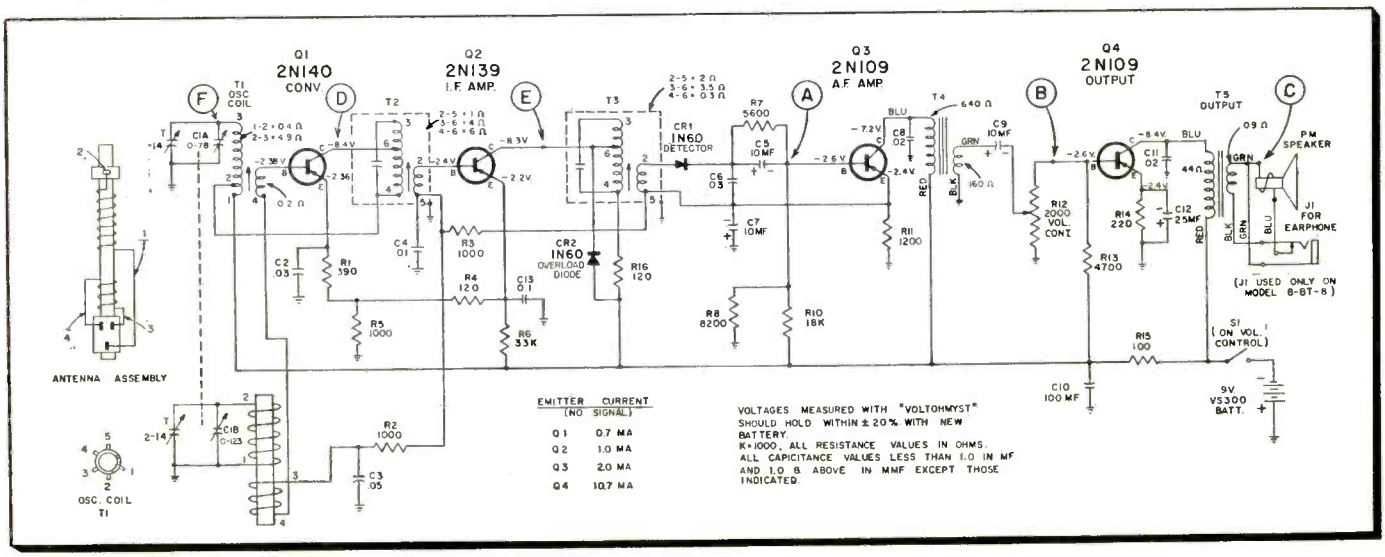
The advantage of progressively "cutting" the number of circuits to be tested in half is that, in one check, you can determine which half is harboring the defect. It is important to use the proper amplitude and frequencies when injecting a signal into the various test points. An audio test signal of about 400 cycles can be used at test points A, B and C. At points D and E, the modulated IF frequency of the receiver, usually 455 kc, should be used. Any frequency within the tuning range of the receiver can be used at point F.

AVC

One of the major differences encountered in transistor radios is the action of the automatic volume control. The purpose remains the same, to maintain the carrier-voltage at the 2nd detector at approximately the same level, regardless of signal

(Continued on page 58)

Fig. 1—Logical test points on a typical battery-operated pocket radio. RCA Chassis No. RC-1169, RC-1169A. Series 8-BT-7, 8-BT-8.



Selenium Rectifier Testing

Non-linear device tested under operating conditions. Forward & Reverse Current. Voltage Drop. Dynamic Resistance.

A. R. Clawson

• Selenium rectifiers steadily grow in number employed, as well as in variety of use, in all types of electronic equipment. Some TV sets employ a matched pair used as dual-diodes, in the horizontal AFC circuit. Proper testing for this application is more exacting than for seleniums in a simple power supply. Even power supply rectifiers should be tested more thoroughly than is commonly practiced.

There are basically four different characteristics to look for when trouble shooting a selenium rectifier: forward and reverse current, voltage drop and peak-voltage rating. Peak-voltage ratings are not likely to depreciate excessively, unless the rectifier has been damaged. As in testing a fuse, to find out how much current it will require to make it blow, after the test is completed, besides having a set of figures, you also have a blown fuse. In other words the test can consume the product. Suffice it then to visually observe the selenium for sparking, arcing and smoke while performing the various tests under actual operating conditions.

Many other characteristics such as frequency response, capacitive reactance and ambient temperature range, are taken into consideration by both the rectifier manufacturer and the TV set designer. Except for certain special applications the technician in the field is not likely to encounter difficulties caused by changes in these particular characteristics. It is important however, to be aware of what could happen.

One time honored practice entails measurement of resistance with an ohmmeter in both forward and reverse directions. It is far from a satisfactory check because, with different ohmmeters, and even with different ranges on the same meter, the readings will vary. The applied current and voltage is low and is different from meter-to-meter and range-to-range. Since selenium rectifiers in power supplies utilize higher currents and voltages, and since it is also a non-linear device, it should be checked at or near the actual operating conditions.

Visual Inspection

Bent plates, loose plates and foreign objects between the plates can be detected by a visual inspection. Sparking causes small black spots to appear, and are quite visible. If the number and size of the spots are small, the rectifier may still have a sufficient amount of good metal left to perform its assigned task. Prolonged sparking will eventually eat away enough material and render the unit completely useless. Another visual symptom is discoloration. This is due to excessive heat caused by abnormally large currents. The heat may melt one side of the outer metal coating and cause it to run as well as discolor.

A sure fire test is to simply replace the suspected unit. If all else is well, either it works or it doesn't. A new unit which has not been properly aged, may not perform satisfactorily if suddenly inserted into a circuit. Seleniums should be aged by an intermittent application of voltage and current, less than the full rated value, for about one hour. A cycle of 5 minutes on and 5 minutes off is satisfactory. The reverse current depends on aging to a greater extent than the forward current. Reverse resistance forms and increases gradually. Both forward and reverse current heat the unit.

Shunting

Shunt a suspected unit with one known to be good. If the B+ voltage rises to normal, then the suspected unit is bad. It is a good practice to replace the selenium when the B+ increase is 10% or better. It is important to observe polarity, and correct any defects, in the filter, or "outer" circuits, which may have been the cause of the rectifier "blowing its stack" in the first place. A word of caution here might be appropo. A defective or improperly aged selenium, with a high reverse current flow may damage the electrolytic filter capacitors. These condensers present a very low resistance to current when it is of opposite polarity.

The selenium rectifier should be tested under actual operating condi-

Fig. 1—Bread-board setup determines voltage drop & forward current. Dynamic resistance is found by multiplying readings on meters A_1 & V_1.

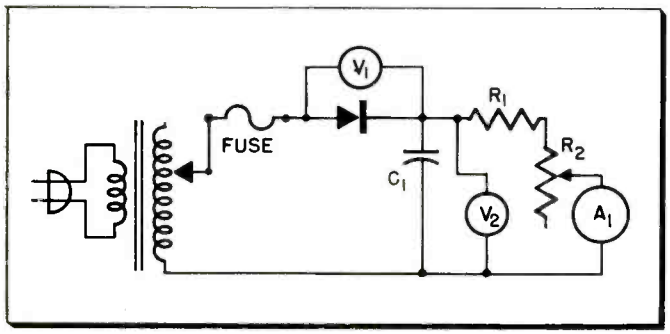
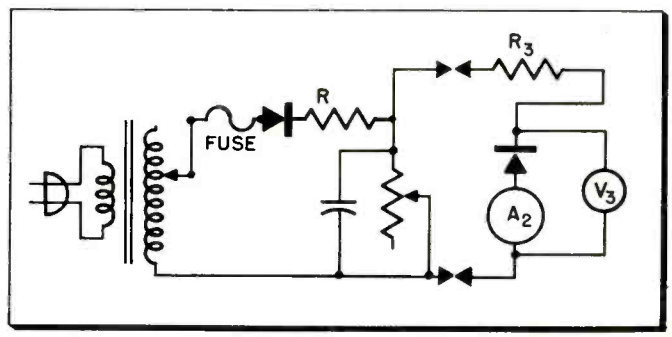


Fig. 2—Reverse current and reverse dynamic resistance is determined by connecting the rectifier back-to-back, to oppose the flow of current.



tions, or as close thereto as practical. It is possible to obtain a professional looking rectifier tester from test-instrument manufacturers. For the technician who enjoys the mechanics of basic electronic manipulations, the procedure is straight-forward and simple. The test set up is shown in Fig. 1. The values of the various parts used depend on the voltage and current ratings of the rectifier under test.

Let us consider a half-wave rectifier designed for use on a 117-volt line at 75 ma. A regular ¾ ampere fuse can be used. Due to the action of capacitor C_1 and the rectifier about 120 to 130-volts DC, with some ripple, can be expected, depending upon the voltage drop across the selenium and the value of the condenser. (Peak-to-peak AC-line voltage varies approximately between 150 to 160 volts.) At 130 volts and 75 ma, the total resistance of the circuit is about 1733 ohms. R_1 can be rated at 1000 ohms at 10 watts or better and assures a minimum amount of resistance in the circuit at all times. R_2 is a rheostat having the same ratings as R_1.

Start with all the resistance of R_2 in the circuit and gradually reduce it until the full rated load of the unit under test is reached. If a variable line-voltage source is used, the gradual application of power will help prevent undesirable and damaging surges of current. A good rectifier will enable the expected readings. Where more than one rectifier is used as in voltage doublers and triplers, etc., the difference in readings of each unit should be within 2% and no more than 5%, if reasonably long life is expected. For proper operation in AFC circuits the dual diodes should be within 1% of each other. To maintain balance the units should be matched. This test provides most of the information wanted including forward current and voltage drop. It is a simple matter to determine the forward dynamic resistance of the unit, if desired. Multiply the voltage drop across the rectifier by the current in the circuit.

Reverse Current

To determine the amount of reverse current, connect the selenium rectifier to a suitable DC source of proper potential, and observe polarity. Fig. 2, utilizes the same test set up as before, except that the unit under test is added back-to-back to buck the flow of current. The surge resistor R_3 is similar to resistor R_1, in Fig. 1, and limits current flow in this circuit in the event of a defective or improperly aged rectifier. Reverse current can now be read on meter A_2. Inverse dynamic resistance can be determined in the same manner as the forward resistance. •

Business Decisions That Affect Your Tax Return

This article is based on information supplied by the American Institute of Accountants, and checked for technical accuracy by the Internal Revenue Service.

• Long-range tax planning in today's business world of high tax rates is no longer "big business foolishness." Last-minute tax worrying with no year-around tax thinking can result in the loss of sizeable savings for small and medium-sized businesses when it comes time to file a tax return.

For example, assume that last summer you were forced to replace your air conditioner (or test instruments, truck, etc.) You shopped around and found you could either sell your old unit to a private party for $500, or a dealer in town would give you a trade-in allowance of $500 on it. That seemed like six-of-one — half-a-dozen-of-another to you; so without thinking—or worrying—about tax matters you traded in the old air conditioner.

To prove how such a seemingly simple business decision such as this can affect how much tax you will have to pay, let's assume further that the air conditioner which you traded had originally cost $2500 and that you had taken $1000 in depreciation on it. This meant its cost for tax purposes was $1500, and you were going to "lose" $1000 whether you accepted the dealer's trade-in allowance of $500 or sold to the private party for $500.

Sell or Trade?

So far still six-of-one—half-a-dozen-of-another, but now since you elected to trade-in your old air conditioner, let's see how you can claim a deduction on a tax return for your $1000 loss. The answer is simple. You can't. All you can do is add the amount of the loss to the cost of your new unit, and eventually receive tax credit for your loss in the form of slightly higher depreciation deductions.

On the other hand, if you had made a bona fide sale of your old unit to the private party and a separate purchase of a new unit from a dealer, you would have established a $1000 loss which could be claimed as a loss deduction on a tax return and used to offset regular income.

It is not always true, of course, that a loss deduction on the tax return is worth two in the bush of depreciation, but a general rule to consider when you are trying to decide whether it would be more advantageous taxwise for you to sell or trade-in an asset is: sell "loss" property to obtain a deduction, and trade "profit" property to avoid the tax which must be paid on any profit realized from the sale of an asset.

You may find that you have sold yourself into a capital gains tax or traded yourself out of a loss deduction if you have not figured your depreciated costs correctly. This is a matter you should discuss with a certified public accountant. Not only can he verify the accuracy of your mathematical computations, but he can also explain the advantages and disadvantages of the various methods used to compute depreciation. It could be that the method you used or are using is not the one most suited to your business needs from a tax standpoint.

Depreciation

For example, if you asked a CPA whether you should use the straight-line or declining balance method to depreciate your new air conditioner, one of the first questions he might ask you would be: what are your cash requirements and what are your profits likely to be? If you are thinking of expanding and need additional cash within the next few years, he might recommend that you use the "new" declining balance method to compute depreciation.

The declining balance method

(*Continued on page* 58)

Miller Effect in Radio

Not Strictly for the Engineer, This Phenomenon Is Met

M. G. Goldberg

• Whether you have ever taken the trouble to become familiar with the Miller Effect or not, the fact remains that you come into contact with it every time you perform a tuning operation on any radio or TV receiver. The textbooks tell us that, whenever we change the load in the plate circuit of a vacuum tube, we also automatically change the capacitance (and impedance) at the grid or input. This phenomenon is the one recognized as Miller Effect. Leaving tricky mathematics behind, let us see what this means in the receivers we service.

The plate, cathode and grid of an ordinary triode may be regarded as three metallic (therefore conductive) elements or plates that are spaced with respect to each other in a definite relationship. In Fig. 1A, accordingly, we have shown these three elements as three plates.

We also know that, if we take a pair of metallic or other conductive plates and separate them by a nonconductor or dielectric (such as air, glass, mica, ceramics, etc.), we have a capacitor. The value of the capacitor will depend on the size of the plates, the spacing between them, and the dielectric. In Fig. 1A, therefore, we have one capacitor from grid to cathode (which we shall call Cgk) and another capacitor from grid to plate (Cgp).

In Fig. 1B we show a simple triode amplifier stage with signal Eg fed to the grid input. This signal appears in amplified form in the plate circuit as Ep. If the gain of the tube is, say 20, and we feed a ½-volt signal into the grid, a 10-volt signal will appear at the plate. Similarly, if a 1-volt signal is introduced at the grid, it will show up as 20 volts at the plate. Among other things, the gain depends on the value of the load resistor. If there were none present, there would be no gain. The plate would then be tied right to the cathode (through the B supply) and input capacity would be the sum of Cgk and Cgp.

Cgk Doubled

For illustration, let's assume that the actual capacitances of Cgp and Cgk are equal. They actually are in some triodes. In a case like this, since both capacitances are effectively across the input (Fig. 1C), the *total* input capacity is twice that of the more obvious *grid* input capacity (Cgk) alone. Where there is a plate-load resistor and there is gain through the stage, input capacity increases still more than the obvious amount of Cgk. Let us see how this comes about.

To begin with, a signal voltage applied to the input is immediately impressed across capacitance Cgk. Like any other capacitor, Cgk becomes charged up. At the same time, the input voltage is being amplified, and appears in the plate circuit in this amplified form. Now, referring back to Fig. 1B, notice that this plate signal, amplified 20 times, is coupled right back to the grid circuit through plate-to-grid capacitance Cgp through what we may rightly call a feedback circuit. Therefore, an *additional* charge is being applied to the input circuit that is considerably greater than the charge across Cgk due to the input signal alone. Thus, while the value of Cgk has not changed, the effective *total* input capacitance (which is not made up exclusively of Cgk) is increased substantially more than 20 times, in this case.

If either the gain of the stage or the size of the input signal is increased, the amplified signal at the plate is increased. Since the latter is the voltage that feeds back to the input through Cgp and places an additional capacitive charge on the input, either an increase in gain or an increase in the input signal will increase the effective input capacitance. Similarly, a decrease in gain (or in input signal) will decrease the effective input capacitance of the stage.

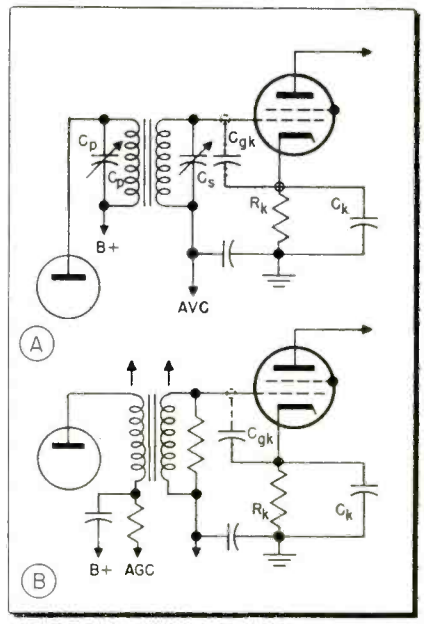
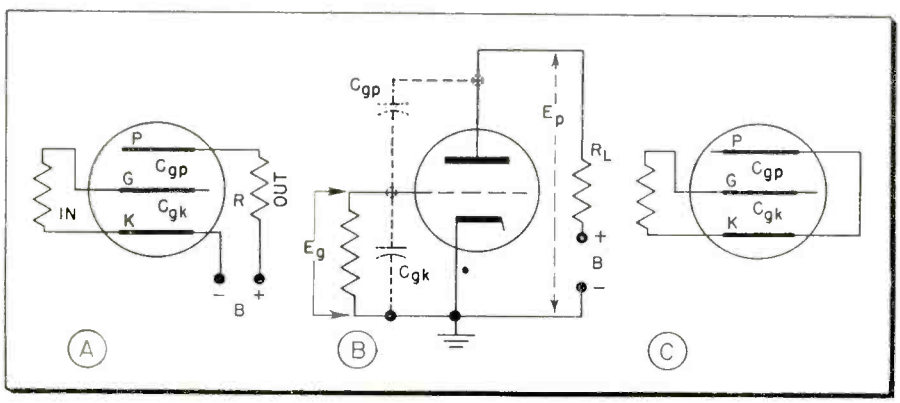


Fig. 2A—In AM i-f stage, large capacitors shunt i-f coils. B—Coils in TV i-f stage.

Fig. 1A—Tube electrodes form capacitors. B—Plate-grid feedback. C—No load in circuit.



and Television Circuits

by the Technician Daily in Standard AM & TV Receivers

As a result, we have an input capacitance to the stage which does not remain fixed, even once stage gain is predetermined. It is as though we had wired a self-adjusting trimmer capacitor across the input that increased when strong signals came in and decreased when weak signals were present. This Miller Effect becomes particularly important when we are dealing with stages using tuned circuits. Obviously, a changing capacitance in such a circuit can dynamically detune, retune and mistune the circuit, depending on such a variable as the strength of the incoming signal!

This generally undesirable action can be minimized, to a certain extent, by choice of tubes. Triodes have very high Cgp capacitance values, and the degree of Miller Effect depends on Cgp. In the pentode, there are other grids—the screen and suppressor—that shield the control grid from the plate. Thus, Cgp is drastically reduced in pentodes as compared to triodes. With the feedback path cut down so heavily, Miller Effect is also drastically reduced. Thus in tuned circuits—such as i-f stages—where Miller Effect can least be tolerated, we are most likely to find pentodes.

High Frequencies Most Affected

In an ordinary AM i-f circuit, the tuning capacitors (Cp and Cs) shunted across the coils, as shown in Fig. 2A, may vary from 100 to 200 mmfd, or even more. In such a circuit, the changes brought about by Miller Effect will not be significant. A change of 1 to 3 mmfd is likely due to variations in signal and avc action, and this will scarcely alter the i-f response curve. In TV and other high-frequency circuits, however, the *only* tuning capacitances across the i-f coils may be those small ones due to tube wiring and interelectrode capacitances, as in Fig. 2B. Thus, any appreciable change in either of these can radically disturb amplifier response.

We cannot use large tuning capacitances in TV, as this would necessitate reducing the inductance of the coils to values so low that little gain would be developed per stage. For instance, in a typical 40-mc i-f stage the inductance may consist of 8 to 10 turns of wire on a small form, assuming approximately 10 mmfd as combined wiring and interelectrode capacities. If we were to shunt the inductances with 100 mmfd capacitors to minimize Miller Effect, the coils would have to be reduced to around 3 turns each and our stage gain would drop to perhaps one third of its former value.

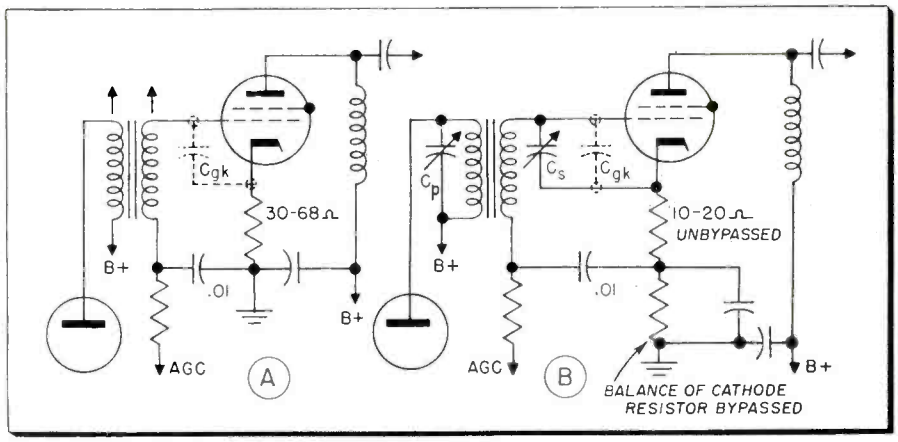


Fig. 3—Two ways of counteracting Miller Effect in TV i-f amplifier design are illustrated.

One of the simplest expedients, and probably the one most often used to compensate for variations in input capacity with variable input signals is shown in Fig. 3A, while 3B shows another but less often used method. The former is familiar to all technicians as it is almost universally used in TV amplifier circuits and dispenses with any cathode capacitor. This lack of cathode bypassing reduces the gain of the amplifier stage by a small amount, but this loss may be partially overcome by using higher voltages, higher gain tubes, higher values of shunting resistance or any one of a number of other possibilities. Due to the absence of the capacitor, a certain amount of degeneration takes place because both input and output currents flow through the resistor (but in opposite phase relationship), thus cancelling almost completely the undesirable effects of the Miller Effect previously mentioned.

It will be seen from Fig. 3B that a smaller value of unbypassed resistor is required than is the case in Fig. 3A, as this resistor is directly in the tuned circuit where a smaller value is more effective in controlling the input capacitance changes. However, this circuit variation calls for two additional components and is seldom used in standard circuits, although equally as effective in operation as the method shown in Fig. 3A.

Aside from its important effect on i-f and r-f amplifier operations, Miller Effect enters into the design of radio and TV circuits in other ways. As already mentioned, the effect is most pronounced in tubes with high grid-to-plate capacitance (Cgp), such as high-mu triodes. Designers of high fidelity audio equipment must take this consideration into account when building equipment that will handle the upper audio frequencies without attenuation.

Since the input of any tube shunts the output of the stage preceding, a high input capacitance to a given stage represents capacitance shunted across the output of the preceding stage. Therefore, it would not be advisable to follow a pentode stage using a high value of plate resistance with a high-mu triode. The capacitance which shunts the plate load resistor of the first stage, pro-

(*Continued on page* 60)

Get More From Your Tubechecker

Dynamic determination of interelectrode leakage & transconductance builds customer confidence and reduces comebacks.

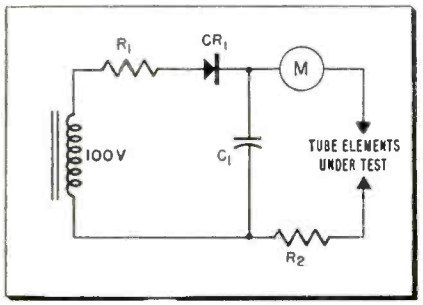
THOMAS CHABRAK & WILLIAM HARTZ
WESTON ELECTRICAL INST., CORP.

• It is very possible that many electronic servicemen aren't taking advantage of a larger income through more legitimate sales of receiving type vacuum tubes. What is more important, it is possible that many servicemen are losing satisfied customers because they fail to notice and replace receiving tubes that are not performing as they should.

No one can argue against the substitution method of replacing defective tubes as being a quick, and probably the easiest method of getting a radio or television set to working again. However, the set may not be working at its peak afterwards—to say nothing of how long it will continue to work at all—because there may be tubes remaining that are on the verge of going dead. This sort of defect is very difficult to find when substituting tubes to remedy set trouble. To get maximum set performance and customer satisfaction, all receiving tubes in the defective circuit section should be tested on a tube checker.

Various sources of statistics estimate that approximately 90% of the failures in electronic equipment are the result of receiving-type tube deterioration. Most servicemen are familiar with inter-electrode leakage in tubes as a cause of failures. It is an established fact also, that of the many measurable characteristics of vacuum tubes, mutual conductance is the one characteristic most closely associated with actual circuit operating performance; but probably the most unfamiliar. Mutual conductance is also referred to as transconductance, or merely Gm. Regardless of what it is called, low Gm as well as excessive interelectrode leakages are detrimental, and a portable tube checker is the most expedient means of measuring them right in the customer's home. It might be well to review what interelectrode leakages and Gm are in order to clarify the fact that improper quantities of these parameters are harmful.

Fig. 1 Equivalent leakage-test schematic.



Interelectrode Leakage

Interelectrode leakage is the actual leakage of electrons between elements in the tube because of a lack of resistance between the electrodes; i.e., grid to cathode, grid to plate, etc. This can be caused by faulty construction—the electrodes being too close together, by dirt between the electrodes, or even by the presence of gas molecules in a faulty vacuum. Interelectrode leakage is inversely measured in ohms; that is, the higher the reading in ohms the lower the leakage, and vice-versa.

A very satisfactory leakage test circuit provides a switch which, when operated, effectively isolates each of the tube elements and switches them individually or collectively into series with a voltage source, a rectifier, current limiting resistor and a meter as in Fig. 1. For a valid leakage test, a minimum of 100-volts should be applied, and the tube allowed to reach operating temperature. The reading in ohms then is actually the dynamic resistance existing between the electrode that is isolated and all of the other electrodes. Eliminating leakage defects by substituting tubes is not reliable. Neither is the neon-bulb type of short circuit test reliable since it depicts leakages of 250,000 ohms in the same way as leakages of 2 megohms—one being acceptable in some cases and the other intolerable. One, two or three tubes having interelectrode leakages of 2 megohms or less can produce a 60 cycle hum bar in a TV picture. Substituting one tube at a time will not necessarily correct such a condition. All tubes in the RF and IF stages, and possibly in the video amplifier should be carefully checked.

Transconductance

Gm, or transconductance is the ratio of the change in plate current to the change in grid voltage. This ratio is determined while the plate voltage is held constant. Gm is a rough indication of the design merit of the tube, and is usually measured in micromhos.

Portable tubecheckers generally do not have the circuitry to depict readings of Gm to match those specified in tube manufacturer's data.

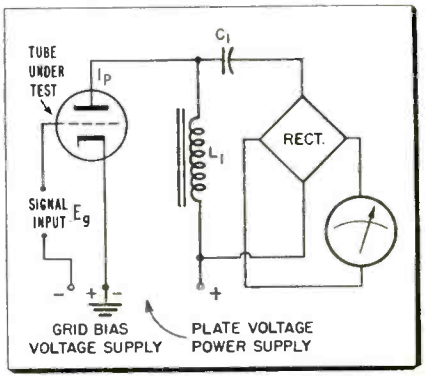


Fig. 2 Basic transconductance-test circuit.

To do so, all stipulated potentials would have to be applied to the tube. This limitation does not lessen the value of a proportional type transconductance tubechecker however, since most tubecheckers reflect that portion of the tube characteristics curve which is important in determining the relative merits of the tube. The name proportional transconductance tubechecker is used to clarify the fact that proportional values of voltage are applied to the elements of the tube under test.

A simplified diagram of a tubechecker's Gm measuring circuit is shown in Fig. 2. The plate circuit

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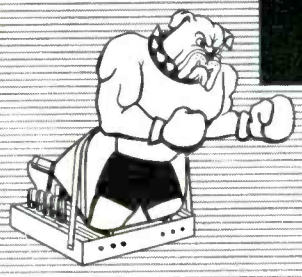
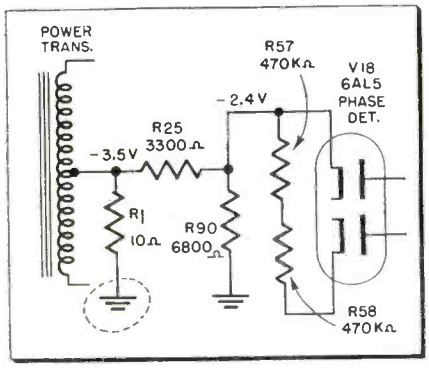


"Tough Dog" Corner

Difficult Service Jobs Described by Readers

Intermittent Jitter

This set was brought into the shop 3 times in 5 weeks with the same complaint: intermittent horizontal jitter. The condition would be present for a few seconds, then disappear, sometimes for days. Voltage, resistance and scope checks were of no help. The first 2 times the set came in, certain components were changed on the basis of past experience. The



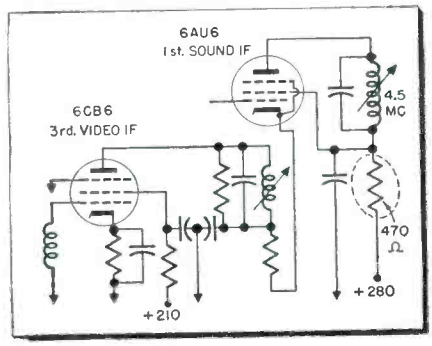
Zenith 28F23 horizontal phase detector.

next telephone call from our disgruntled customer proved that "Past Performance" is as infallible in TV servicing as it is in horse racing. A careful visual recheck of all the components in the affected circuits turned up a clue; small paint blisters on the ½-watt resistor R 90. The normal —2.4-volt potential across this resistor would not cause it to fry. So something must be increasing that negative voltage. Tracing back along the line we came to the center tap of the power transformer, which is in a separate chassis, with its high-wattage 10-ohm resistor R_1 tied to ground. That was the trouble. It was tied to ground; not soldered. Someone had goofed. The poor electrical connection would effectively increase the resistance of R_1 to ground, shooting the negative voltage applied to the horizontal-phase detector way up; thus greatly disturbing the horizontal stability, as well as this TV technician. *Hal Rosen, Levittown, Pa.*

Weak Sound and Picture

This Magnavox model CT 362 had weak sound and washed out, almost negative video. It had all the earmarks of poor AGC action, so voltages were checked on the control grids of the 1st IF and RF amplifier tubes. (2nd IF is not tied to AGC in this set.) The AGC voltage checked about normal. Voltage measurements on the IF plates were made next. The 3rd-IF-plate voltage seemed a bit lower than expected so the schematic was referred to. Although there were no reference voltages to make comparison with, it was noticed that the plate supply for the 3rd-IF tube is derived from the cathode of the 1st-sound IF which is hooked up in a voltage-divider network. (In much the same manner as the sound-output tube is used in many sets.) A resistance measurement was made across the 470-ohm, 1st-sound-IF-plate and screen-load resistor and it was found to have gone up in value. Hence the low voltage on the sound-IF plate, and in turn the low voltage on the 3rd-video-IF plate which caused the weak sound and video. Replacing the resistor returned the set to normal. *Frank A. Salerno, Long Island City, N.Y.*

Magnavox CT 362. 3rd-video IF and 1st-sound IF hooked up as a voltage-divider network.



Insufficient Width

This CBS Model 7T307 was in the shop a couple of times with the same complaint; insufficient width. The first time it was brought in, it looked like the outside serviceman had flipped. The set checked out OK in the shop. The servicer insisted that he had a width problem in the customer's home and that he had changed the 5U4, horizontal oscillator and output tubes. He said there was some improvement but not enough and the width adjustment was already set for maximum.

The next thought that occurred, was that perhaps the customer's home was inadequately wired and suffering from a low-line voltage condition. Sure enough when I reduced the line voltage, down went the width; just enough to cause the customer to complain. The width control on this set consists of a 15,000 ohm potentiometer in series with a 10,000 ohm resistor in the screen circuit of the horizontal-output tube. I shunted the 10,000 ohm resistor with a 47,000 ohm, 2-watt job and increased the screen voltage. This procedure enabled me to get more width and eliminated the need for premature replacement of the 6DQ6. *Frank Philips, Brooklyn, N. Y. Care must be taken not to exceed tube and flyback current rating. Current can be calculated by measuring the voltage drop across the cathode resistor; average current should not exceed 120 ma. Refer to manufacturers data.—Ed.*

Industrial Electronic

Equipment for protecting factories based on electronic principles

• The most up-to-date developments in electronic protective equipment are now generally available to private industry. These physical security systems, designed and manufactured by Research Products, Inc., were formerly supplied only to governmental agencies for use in the protection of sensitive areas and files.

This equipment includes various new types of burglar alarms and protective systems that can provide security over a broad range of situations. Among the items are a transistorized, battery-operated alarm system that signals an intruder's approach within six feet of safes or files. An "electronic fence" that creates an invisible detection trap around the walls of large buildings, restricted unwalled interior areas and the perimeter of large outdoor areas. An audio alarm system that makes possible protection of sensitive areas with limited guard forces, by instantly signalling sounds as soft as light footsteps. A small alarm carried in a simulated camera case to provide "watch while you sleep" protection for couriers transporting cases of documents or valuables. Tap-proof cable to provide absolute security and safety against unauthorized interference with private intercommunication systems. A security kit, contained in a handy dispatch case, to detect attempts to "overhear" classified or competitive information in company conferences or conversations. A pocket-sized, battery-operated power amplifier and speaker providing loud-speaker listening convenience for earphone-type radio receivers, recorders and amplifiers.

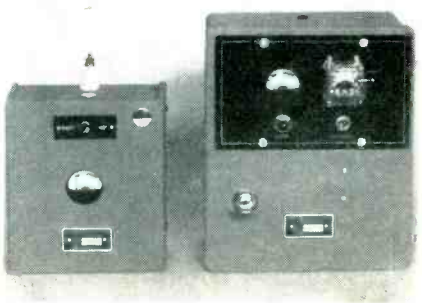
The "heart" of one type of system is a transmitter radiating balanced electromagnetic waves picked up by two detecting antennas. When an intruder approaches from three to eight feet of the sensitive antenna array, the balanced voltage of the detectors is disturbed, and an alarm is immediately passed on to plant guards or to a central protective station.

Since it functions independently of the type of soil in which installed for outdoor use, and does not depend on the capacity balance of the system to earth ground, it will not only deter intruders walking or crawling on the ground but also those insulated from the ground, as on stilts. It can be installed vertically on fences when space is limited, or with a triangular wide-base construction that makes it impossible for anyone to propel himself over the entire area of sensitivity or surreptitiously tunnel under it. "Fail-safe" features cover every possible aspect of guarding against malfunction.

Automatic compensation by the unit's circuitry elements eliminates any danger of misleading alarms occurring because of atmospheric changes, such as rain, snow, fog, or extreme dampness or dryness. There is no possibility of interference with the system by broadcasting and short wave radio transmitters in the vicinity, or even temporary interference from high-voltage wires, lightning discharges, leaks in fluorescent fixtures, motors, or transformers. At the same time, it is designed to avoid any radiations that would cause harmful interference with communications equipment operating in the installation or nearby. Each pair of detectors will handle from 500 to 1000 feet of an antenna-line run. However, since one transmitter unit can service as much as a 10,000-foot perimeter, additional zones can be readily added with only the addition of simple detectors and zone panels. •

Battery operated transistorized burglar alarm system creates an intrusion-proof security barrier for several feet around protected objects, such as safes and files, by utilizing modern electronic principles. The object or assembly being protected is its own antenna. Intruders cannot approach or outwit this alarm.

Security alarm for the protection of safes and files was especially designed for industrial plants and large government installations maintaining their own on-premises guard forces. The small control unit is located in the area being protected, while the guard panel is located in the central office.



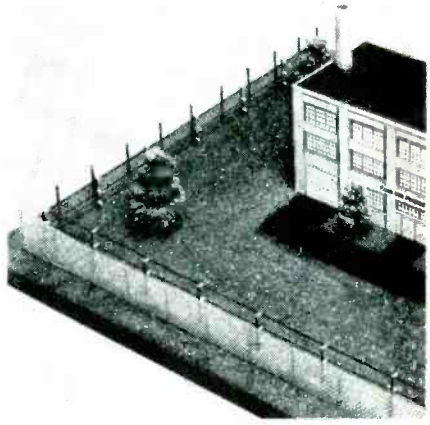
Completely transistorized audio amplifier contains its own batteries that will operate for 3600 hours. It has a standard phone jack to provide connection for high or low impedance output. Among accessories available are a metal detector, a radio-frequency probe and other electronic devices.

Security Devices

is flexible, tamperproof, reliable & suitable for all size areas.

Self-contained battery-powered transistorized burglar alarm provides "watch while you sleep" protection for containers of currency and other valuables carried by couriers and messengers. A shrill and markedly audible signal is set off if an intruder enters the area of protection.

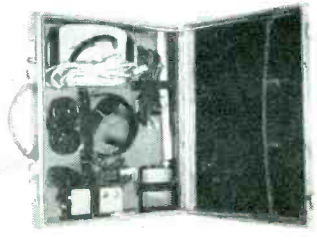
A small but powerful power amplifier and speaker utilizes 3 transistors. Its self-contained batteries will operate for over 700 hours. It is a practical and easily-handled accessory for any earphone-style tape or wire recorder, radio receiver, or amplifier. The unit is used in place of an earphone.



An entire industrial area can be secured from intruders with the electronic-fence alarm system. The inside, 3-wire fence shown, illustrates how an invisible electronic field is created around the perimeter of the area.

A transistorized audio-alarm system sounds a warning when the slightest noise occurs in a protected area. The slightly larger receiving unit is placed in the guard office and contains a speaker to amplify the warning signal. Two annunciators check the systems operation and indicate an alarm condition. Tampering triggers alarm. This equipment can be used alone or in conjunction with other alarm systems.

Sound-D-Tect electronic security kit provides privacy for oral communication of classified and competitive information. This equipment is capable of detecting most types of unauthorized eavesdropping. Designed to forestall "leaks" or restricted data that must be discussed orally. Typical situations involving its use would be to check the security of conference rooms where such private sessions occur.



Coming Next Month

Thyratron and Ignitron Control in Industrial Electronics.

An insight into the heart of industrial electronic controls. Financial benefits and highly interesting service techniques are in store for the electronic technician.

An explanation of the tubes and basic operation plus methods of control, some typical circuits and typical applications will be presented.

Don't miss this article in March 1957 Electronic Technician!

They Never Come Back

Breakdown of customer relations drives customers away.

CLIFFORD H. GOLDSTEIN

• Every day thousands of customers enter sales and service stores. They leave disgusted without being waited on. They never come back. These customers have reasonable gripes about counter service. What are these gripes? Since customers are moved to action by feelings, the best way to understand their motives is to practice the psychology of empathy or "put yourself in the other man's shoes." "Do unto others as you would have them do unto you." The corollary of empathy has been in literature for centuries. Empathy has been kicked around the laboratories of psychologists for decades. But it was not until business learned that by having employees, particularly those who meet the public, practice this concept, that more money could be made, did empathy gain the respectability of everyday language.

Take the first "suppose." Your first day on a new job; you go out to eat lunch. In the morning you've picked up dust on your clothes from picture tubes, etc. In short, without a name designation on your shirt like "AL'S TV," you look like a day laborer. You need a couple of pair of underwear and intend to purchase them after a quick snack. You anticipate a few extra minutes of leisure, to smoke or enjoy a coke, before returning to your VTVM and scope.

First come, first served

So you enter the nearest haberdashery store. It's close by, and conveniently located. Other gents have the same idea; but they're office workers, white-collar men. You finally note it's your turn next. The clerk, however, acts otherwise. His attention sweeps past you, without noticing you, to a fair haired boy. You know that he entered the store after you, but you overlook this oversight. You'll be next, you think. Again, the clerk has other ideas. You glance hastily at your watch. "Don't want to be late," you mutter loud enough for the clerk to hear. But his ears cut off before they reach your frequency, as he waits on another neatly dressed, acting junior executive. Your feet shift impatiently. You become a clock watcher. Anger creeps up your neck. "I wouldn't treat a dog this badly," you vow as you storm out. You never come back.

Who's kidding?

Maybe you wouldn't treat a dog that badly. But if you have a sales and service shop, chances are you have treated some of your customers, or would be customers, that badly. You probably have committed the same cardinal sin the haberdashery clerk did; You judged a man's purchasing potential on the basis of his outward appearance. When he walked out, you probably kidded yourself, "He only wanted a raft of tubes tested free, anyway." Don't judge a customer's buying power by his external appearance. Put yourself in another man's shoes. Your wife asks you to walk over to the ice-cream parlor and get a quart of cherry-vanilla. The Sugar Bowl's radio is tuned to the Army-Navy football classic. After every play the countermen poise their ice cream scoops in mid-air and begin quarterbacking the last play. You're patient. Finally, you hear, "Your order, Mister," and you pay for the cream. When you get home you discover strawberry and banana instead of cherry-vanilla.

You say, "It can't happen in my shop." We hope it doesn't. But it probably has. Maybe you and your countermen don't talk, eat and breathe football, but unless the lesson is remembered you will practice talking and eating and breathing your hobby during working hours. Hi-Fi, baseball or something else will consume your attention while the customer stews unless you take preventive measures.

You must have had occasion to go to a manufacturer's parts department, well armed, you thought, with all the information needed, for the replacement of a defective part. You had the set model number, and even the value of the component; only to have the counterman ask you, "What's our code number?" To your surprise you discover the counterman knows only code numbers, nothing about schematics and circuits. You blunder, fuss, and waste time. Two hours later with the help of Rider's you find the code number. Meanwhile you're mad at the clerk on general principles, and damn the manufacturer for not hiring an electronics technician to distribute parts, at wholesale, over the counter. Look at yourself a little closer. You probably have wasted a couple of hours of someone else's time, in your shop. Allow me to cite a personal experience. This TV Sales and Service shop caught my eye because every display was animated. It was different from the usual display of faded dummy tube cartons, or the undersides of 10 inch TV. I entered the shop to compliment the owner on his customer-luring display.

No catalog

The shop owner and a customer were haggling about the replacement number of a battery, the shop owner didn't have, in the original manufacturers line. The customer wanted the replacement on the spot. The owner, not stocking the manufacturers replacement, didn't know what battery to substitute. Yet, I'll bet he received free cross-reference literature from the manufacturer or his distributor. I'll wager further that it will crop up when the owner gives his shop its next thorough cleaning.

So what, electron chasers ask, does this article boil down to. Simply this; Customers leave your shop taking their dollars with them. They never come back. The reasons for this self-imposed exile are: customers feel they are put off because of their appearance, delayed because of interstaff conversation and gossip, and lost time because the men who wait on them are "not on the ball." The beef about interstaff bull sessions suggests its own solution. As does the lack of technical information. So that there can be no doubt about "who's next?" a "Take-a-Check" type system is economical. Prestige is added and nobody bucks the line not even a glamor gal. •

SHOP HINTS

Tips for Home and Bench Service by Readers

Vector Socket

Inverted wafer socket permits testing tube voltages from top of chassis. In many receivers, particularly in early model radios and some portables, components and wiring completely block the path of the underside of a tube's socket. In the absence of a commercially available test socket, and when it becomes necessary to take readings from above the chassis, a wafer socket, with its lugs flattened, can be inserted between the tube and its socket. The exposed lugs provide readily accessible test points. Note, the wafer socket should be inverted, and the lugs should not come in contact with any chassis hardware. There may be occasion to modify the wafer socket to make it fit into tight places. This can be easily accomplished with a file or grindstone. *Joseph Amorose, Richmond, Va.*

Improved Sensitivity

A fairly recent model TV receiver had a very annoying case of RF interference with its typical herringbone design superimposed on the picture. Since this interference persisted at all times it seemed likely to be coming from the set itself. Quite by accident it was found that when a hand was placed on the shell of the 6AC7 video-output tube, the interference would be completely eliminated. Further investigation disclosed that pin 1 was grounded to the chassis by means of a lead about 1½" long. By bending the lug of pin 1 and soldering it directly to the chassis, the RF radiation is eliminated.

It is interesting to note that in receivers cured of this or any other type of RF interference the sensitivity of the sets is also improved. RF interference when picked up as a signal effects the AGC voltage and tends to reduce the sensitivity. *B. O. Riis, Miami, Fla.*

SHOP HINTS WANTED

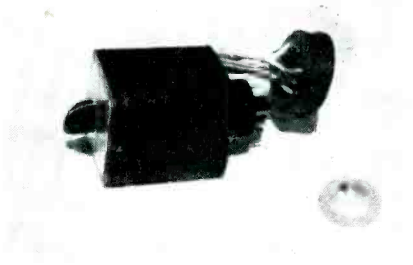
ELECTRONIC TECHNICIAN will pay $5 for acceptable shop hints. Unacceptable items will be returned. Use drawings to illustrate wherever necessary. A rough sketch will do as long as it can be followed. Send your hints to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, Caldwell-Clements Co., Lexington Ave., N. Y. 17, N. Y.

Base and Rebase

As a result of heat, age and handling, tube bases become separated from their glass envelopes and electrode leads. It's easier to get a Camel (African or North Carolinian) through the eye of a needle than it is to get all of these errant wires back into their proper base pins at the same time. Loss of time and patience often dictate junking the dismembered tube. But with CRT and other expensive tubes and tubes for which no replacement is available, I use this shop kink. Shorten leads to approximately half the original length and form a small hook on the end of each lead. Connect 10" lengths of hookup wire to these leads using a hook joint. Solder and if desirable use spaghetti. Thread lengthened leads through the appropriate pin in the base. Keep the joint as small as possible and pretin the wire to facilitate soldering into the tube base. Use glue or cement, slide tube base home, bend wire over pins, clip excess and solder. *Robert L. Gordon, Jackson Heights, N. Y.*

Color CRT Test Adapter

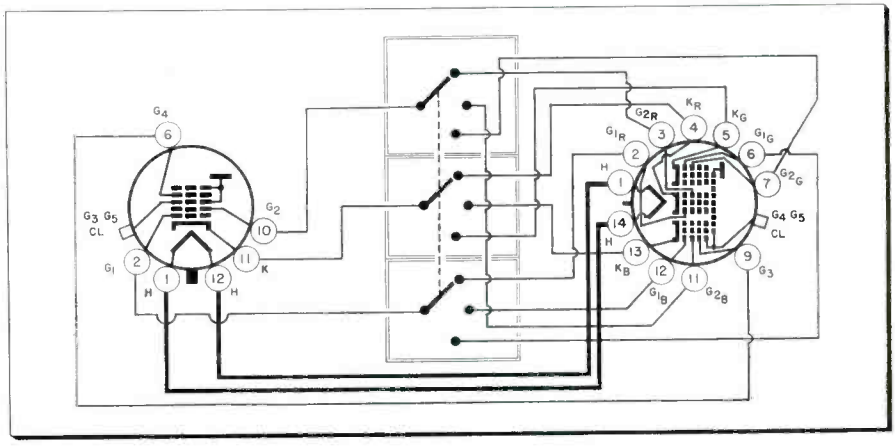
Versatile tester will check color CRT's on B&W tube checker, or regular tube checker with adapter. Simplicity, ease of construction and low-cost features make this a desirable project between service calls. Extremely flexible it tests each section of the color CRT individually. A 3-pole, 3-throw rotary switch (Mallory #1313L) is the heart of the gadget. It is enclosed in a 2¼" x 2½" x 3" box. A Motorola color CRT socket part number 733,794 is available already wired. The wires are



Completed version of color CRT test adapter.

fed into the box and protected with a rubber grommet. A 6-pin CRT base removed from a dud, is mounted on the box by drilling a small hole through the key projection and bolting. In addition to the small hole drilled in the box to accommodate the bolt, another hole is needed to allow the wires to pass through. Again it is advisable to use a rubber grommet. The electrical wiring is simple and is easily determined from the diagram. As a finishing touch a CRT-base cover is used to protect the pins while the gadget is in the tool kit. *Clarence H. Peger, Cleveland, Ohio.*

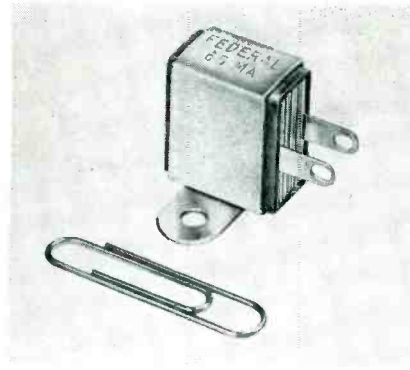
Schematic for color CRT test adapter showing simplified version of socket connections.



New Tubes & Components

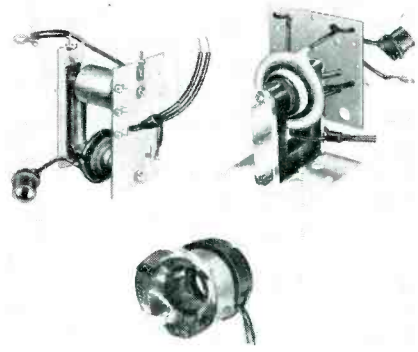
Federal RECTIFIER

A new type of 65-mil selenium rectifier with a metal "wrap-around" design offers major advantages over conventional designs. The rectifier has its individual cells placed flat against each other instead of being placed on a center shaft with an air space between cells. Center mounting shafts with associated nuts and washers are eliminated, giving more rugged construction and greater protection against contamination. Federal Telephone and Radio Co., 100 Kingsland Road, Clifton, N.J. (ELECTRONIC TECHNICIAN 2-6)



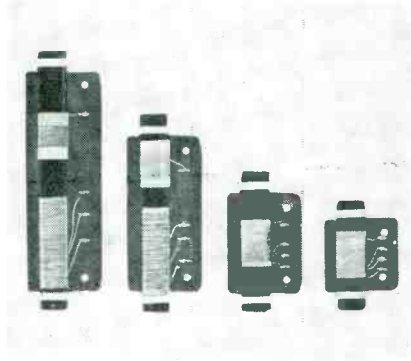
Stancor EXACT REPLACEMENTS

New exact replacement TV components for Airline, Coronado, Firestone, Hoffman, Raytheon and Truetone include the following: DY-22A deflection yoke, for Hoffman, HO-250 flyback for Raytheon and HO-251 flyback for Airline, Coronado, Firestone, Raytheon and Truetone. These new products are part of policy to provide the serviceman with difficult to obtain exact replacements as well as the more popular units. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 2-5)



Superex LOOPSTICKS

Eleven different new flat transistor loopsticks are now available, in 4 sizes from 2¾" to 7" and in several inductance ratings. Features of these new transistor components include complete electrical adjustability, compactness, maximum signal transfer and increased selectivity. Each loopstick is packed with full installation instructions including 9 suggested circuits and a summary of transistor-receiver design. Superex Electronics Corp., 4-6 Radford Place, Yonkers, N.Y. (ELECTRONIC TECHNICIAN 2-2)



Amperex Tubes

The 6146 beam-power tetrode is designed for use either as an RF-power amplifier and oscillator or as an AF-power amplifier and modulator, in both mobile and fixed equipment. It is an extremely rugged and compact tube, and is characterized by high power sensitivity and high efficiency. 90-watts of audio are available with class AB_2 operation. The 6907 twin tetrode is designed for class C amplifier service in mobile and airborne communications equipment. Also announced, welding ignitrons are now guaranteed for two years actual service. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L.I., N.Y. (ELECTRONIC TECHNICIAN 2-1)

RCA TRIODE-TETRODE

The 6CQ8 is a 9-pin miniature tube with a 450-ma controlled warm-up-time heater. It is especially useful as a combined oscillator and mixer tube in tuners of TV sets utilizing a 40 mc IF. The triode unit of the tube is not only useful as a VHF oscillator but also as an RF amplifier, phase splitter, sync clipper and sync separator. The tetrode unit is also useful as a sound or video IF amplifier tube. RCA Tube Division, 30 Rockefeller Plaza, New York 20, N.Y. (ELECTRONIC TECHNICIAN 2-4)

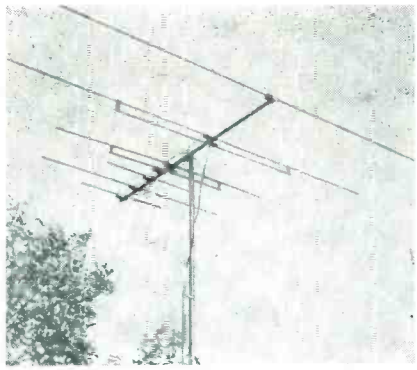
Raytheon TUBES

Eleven new tube types added to the replacement line are the 2B3, 2CY5, 3AF4A, 4BU8, 4DT6, 5CL8, 6AW8A, 6BG6GA, 6BU8, 8CN7 and 12AV5GA. Except for filament ratings the following tubes are similar to their prototype; 2B3, 3AF4A, 4BU8, 4DT6, 8CN7 and 12AV5GA. The 6BG6GA is identical to the 6BG6G except that it employs a straight-sided T-12 envelope. The 2CY5 is a heater-cathode type sharp-cutoff tetrode of miniature construction designed especially for use in VHF tuners of TV sets. The 5CL8 is a heater-cathode type triode-tetrode designed for use as a VHF oscillator-mixer. The 6BU8 is a heater-cathode type twin pentode of miniature construction having separate plates and number 3 grids but a common screen, number 1 grid, and cathode. One section may be used as a sync separator and sync clipper while the other section is used to generate AGC voltage. The common number 1 grid may be used for suppression of wire pulses from both sync and AGC circuits. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 2-3)

New Products for Technicians

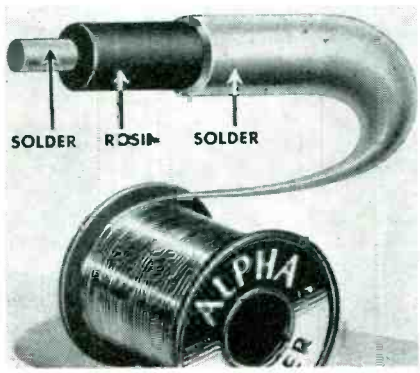
Winegard ANTENNA →

A new type of all-channel outdoor TV antenna, the Color Beam Deluxe incorporates the famous patented Electro Lens. It picks up even the weakest station signals within a range of 100 miles or more. Guaranteed to improve the picture quality of any B&W set, it is specifically designed to meet all the rigid requirements for reception of color. Completely factory assembled and equipped with the new universal Jigger Mount. Lists for $33.95. Winegard Co., Burlington, Iowa. (ELECTRONIC TECHNICIAN 2-18)



Alpha SOLDER →

Cen-Tri-Core energized rosin-filled solder is now available in a series of new low-temperature alloys for intermediate and special soldering applications. A typical new alloy is Alpha 238 which has a melting range of 242° to 320° F., which is lower than 63 tin/37 lead and it is therefore extremely effective where excessive heat may cause damage to the metals being joined. Flux skip spots are virtually eliminated. Alpha Metals, Inc., 56 Water St., Jersey City, N.J. (ELECTRONIC TECHNICIAN 2-17)

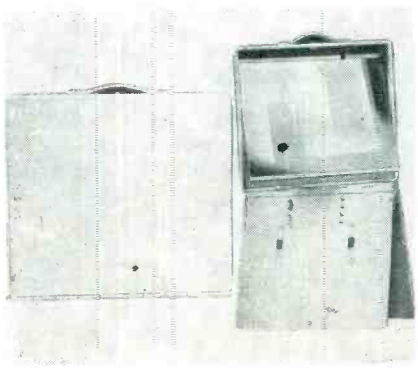


Knight-Kit FLYBACKER →

The new flyback-checker kit permits instant and highly accurate checking of all types of standard horizontal-output transformers and deflection yokes as well as linearity controls. It is capable of checking a wide range of inductances and positively indicates shorted turns on coils between .003 and 2 henries. The instrument will determine the continuity of any circuit with a resistance between 0 and 0.5 megohm. Kit complete sells for $19.95. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (ELECTRONIC TECHNICIAN 2-19)

Advance MIRROR →

Adjustavue portable mirror is fully adjustable, in a self-contained carrying case. When in use the two covers unfold to form a base and stand for the mirror. It may then be swiveled or tilted to any position. Spring clips on the inside of the cover are used to hold alignment tools, circuit diagrams, notes, etc. The covers are all aluminum with a satin-silver finish. The overall size is approximately 13" x 14". $14.95. Advance Electronics Co., 8510 North End Ave., Oak Park 37, Mich. (ELECTRONIC TECHNICIAN 2-16)



IRC TERMINALS

Miniature terminals, Type LT, are designed to meet military and commercial requirements. A body of molded Fluorocarbon Plastic (Polymonochlorotrifluoroethylene) insulates the solder seal ring from the feed-thru lead. It has superior insulation resistance, zero moisture absorption, high arc-over resistance and wide temperature range. International Resistance Co., 401 N. Broad St., Philadelphia 8, Penn. (ELECTRONIC TECHNICIAN 2-21)

Baird TRANSISTOR TESTER

A new portable transistorized instrument for measurement of transistor parameters in quality-control testing, circuit design, incoming inspection and general trouble shooting has just been designed and is completely self-contained with its own 1 kc oscillator and mercury-cell power supply. Battery life of cell is about 1000-hours. Measures 5-11/16" x 5-1/2" x 10" Baird Atomic Inc., 33 University Road, Cambridge 38, Mass. (ELECTRONIC TECHNICIAN 2-22)

Rolas SAFETY LEG

Any straight or extension ladder can be used with complete safety on any uneven ground or surface by means of the new ladder-leveling safety leg. Easily installed in a few minutes, this safety leg extension adjusts automatically from its normal position to 6" on uneven ground. Tightening the wing nut by hand locks the saw-tooth inner mechanism. Lists for $3.98. Rolas Products Corp., 156 Avon Ave., Newark 8, N.J. (ELECTRONIC TECHNICIAN 2-20)

National HIGH-Q CHOKES

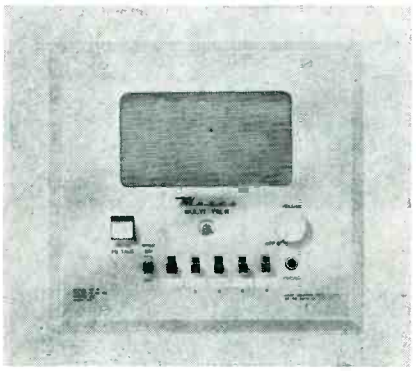
Newest addition to the "Blue Chip" line of components is a complete set of high-Q ferrite-core choke coils offering 14 inductances from 150 μh to 1 mh. These compact chokes are intended for use in networks and filters at frequencies from 50 to 1500 kc and may also be used as resonant elements in IF and RF circuits. Coil form length is ⅝", with 1½" pigtail leads. Overall diameters range from 7/32" to 9/16". National Co., 61 Sherman St., Malden 48, Mass. (ELECTRONIC TECHNICIAN 2-15)

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

New Products

Masco INTERCOM

New home intercom provides communication between rooms as well as between master and remote stations. The homemaker can hear one or all other room stations and the master station in any other room of the house. Through



the door-remote station, she can hear the children at play or safely screen callers. Music can be distributed to selected points in the system by plugging in any radio, phonograph, or recorder. Mark Simpson Mfg. Co., 32-28 49th St., Long Island City 3, N.Y. (ELECTRONIC TECHNICIAN 2-9)

Seco MONITRON

TV sets and other electronic equipment can be monitored for signal breaks without the attention of the operator. Two different circuits can be monitored simultaneously; also traces signal paths and makes point to point gain measurements. A dual magic eye tube monitors signal level independently of the alarm and an indicator lamp lights when a failure occurs. $119.50 assembled. $74.50 in kit form. Seco Mfg. Co., Minneapolis, Minn. (ELECTRONIC TECHNICIAN No. 2-60)

Vidaire EQUALIZER

The Hi-Fi Bass & Treble Equalizer Model EQ-6 is a network type; designed for use with 8 or 16 ohm speaker systems to compensate for deficiencies, such as poor response of the speaker or enclosure and acoustical properties of the room. It is installed between the output transformer of the amplifier and the speaker system. No additional wires are added nor power needed for its operation. Individual control of Bass & Treble is provided over a range of −6DB to +3DB for Bass and −3DB and +3DB for Treble. Vidaire Electronics Mfg. Corp., 576 Merrick Rd., Lynbrook, N. Y. (ELECTRONIC TECHNICIAN 2-61)

OPEN LETTER TO THE SERVICING INDUSTRY

Statement of RCA Policy

January 2, 1957

The radio-television-electronics industry has just completed its greatest year in history.

In 1956, the industry contributed more than $11 billion to the national economy and now, after only ten short years, it has achieved fifth place in American manufacturing.

Servicing, a primary factor in customer satisfaction, has been one of the major elements in this phenomenal growth. In fact, the electronics industry has reached its present high level largely because of the outstanding performance of the servicing profession. Reflecting the importance of its contribution, the servicing profession last year achieved a $2.8 billion volume—one quarter of the entire electronics industry's gross income.

The rapid expansion of the electronics industry has been characterized, like other fast-growing industries, by many new developments and changing conditions. Some of these activities have created a feeling of uncertainty and confusion in some segments of the servicing profession.

As a timely contribution toward clearing up this uncertainty and confusion, RCA's fundamental policies with regard to servicing are herewith reaffirmed and amplified:

1. RCA believes that full customer satisfaction depends on a vigorous and healthy independent service industry and, therefore, RCA will continue to make available to the servicing profession the information and knowledge it acquires in its own operations.

2. RCA believes in the free competitive system in the operation of its factory service business. In this, independent service organizations must have equal opportunity to compete with RCA factory service for consumer service arrangements on RCA Victor television sets. It is our further belief that in any plan under which the original price of the television receiver includes service through the warranty period, dealers must have full freedom to provide their own service or provide the service through independent service organizations or RCA factory service. In the exercise of this choice the dealer must not be restricted to "captive service."

3. RCA believes in, and plans to continue, its service organization's program for procuring replacement parts and other material on a basis that is fair and competitive with the independent service dealers.

4. RCA believes that good customer service requires broad distribution of replacement parts. It will continue its long established policy of making all repair and replacement parts available to the service industry through all of its distributors.

5. RCA believes in supporting every forward-looking industry-wide program aimed at increasing the respect of the consuming public for this vital arm of the American distribution system. RCA will continue to recognize the independent service industry in its advertising program and printed literature.

Historically, RCA has operated on a basis of cooperation with the independent service profession. When we pioneered television immediately after World War II, we not only developed our own servicing facilities, but also encouraged the growth of the entire servicing profession by inaugurating a program of education and training for independents.

Virtually everything that we learned, and our technical "know how," were made available to servicemen throughout the country. This information was given without charge to 175,000 servicemen through 3,500 seminars and training sessions in 247 cities. Since the introduction of color television, RCA has conducted 2,000 color clinics in more than 150 cities for more than 100,000 service technicians. In addition, our knowledge and experience on color television servicing have been made available to thousands of other servicemen through seminars, lectures, demonstrations and printed material.

This program of cooperation has contributed immeasurably to the tremendous growth of the entire servicing profession.

Today, independent servicemen handle the great bulk of the electronics industry's servicing requirements. For example, more than 90 per cent of all RCA Victor television sets are maintained by independent service technicians, with less than 10 per cent being handled by the RCA Service Company.

We believe that the importance of the RCA Service policy lies in the contributions it makes to the entire servicing industry. It has helped sell the public on the need to buy good service. It has helped raise standards throughout the industry to their present high level.

Cooperation and mutual understanding of the problems common to the manufacturer, distributor, dealer and serviceman are essential. This is the basis upon which we all can continue to win and merit the public acceptance that is so vital to our success.

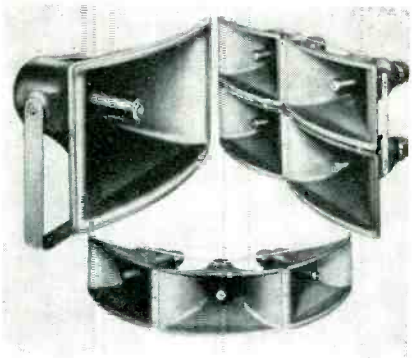
Frank M. Folsom, *President*

RADIO CORPORATION OF AMERICA

New Audio Products

Jensen HORNS

The RT-20 is an axial-projector horn with a rectangular mouth, moulded from glass-fibre reinforced polyester resin. The horns have high versatility and are so designed that they can be mounted horizontally or vertically on car tops, in wall corners, etc., depending upon acoustical situations. The selection of almost any desired directional pattern, from a highly concentrated beam to full 360° coverage, is a simple matter. Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago, Ill. (ELECTRONIC TECHNICIAN 2-7)



Shure MICROPHONES

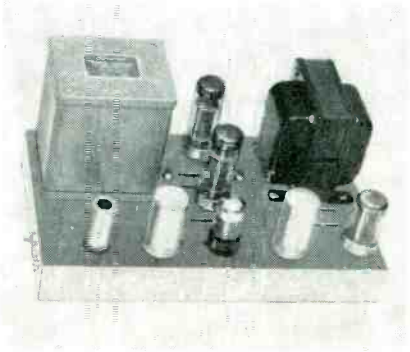
The new improved Unidynes provide 41% higher output. They are highly recommended for use with low-gain amplifiers and tape recorders, in addition to their use in fine quality public-address systems. The unidirectional dynamic Unidynes are an excellent choice for use in installations where feed-back is a problem. The Unidynes are especially suited for theatre-stage sound systems, magnetic recording and remote broadcasting. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. (ELECTRONIC TECHNICIAN 2-8)

Utah TWEETER

A completely new 25-watt high-frequency 5" speaker with a built-in cross-over network is fully enclosed. Features: solid brass binding posts assures contact without soldering; alnico V magnets; all frontal areas are "Shadow Black"; dust-proof construction and seamless-type cone permanently bonded to the voice coil. ¾" voice coil weighs 3.16 oz., and has an impedance of 12 ohms. Overall depth is $2\frac{11}{16}$". Utah Radio Products Corp., 1124 E. Franklin St., Huntington Ind. (ELECTRONIC TECHNICIAN 2-25)

Eico HI FI AMPLIFIER

New 60-watt high fidelity power amplifier in both kit and wired form features the ACRO TO-330 output transformer. The circuit comprises an EF86 low-noise voltage amplifier direct-coupled to a 6SN7GTB cathode-coupled phase inverter which drives a pair of ultralinear connected push-pull EL34 output tubes operated with fixed bias, and a GZ34 extra-rugged rectifier with indirectly-heated cathode. $72.95 kit, $99.95 wired. Electronic Instrument Co., Inc., Brooklyn 11, N.Y. (ELECTRONIC TECHNICIAN 2-10)



Audio SERVICING

Fairchild HI FI AMPLIFIER

The Model 255 now incorporates a number of engineering changes and is rated at 30-watts output. This has been accomplished through circuit revisions and by the use of EL34 output tubes and a GZ34 rectifier. The circuit changes have also improved stability and overall transient response. $99.50. Fairchild Recording Co., Long Island City, N.Y. (ELECTRONIC TECHNICIAN 2-11)

Duotone RECORD BRUSH

A new static-resistant record brush made of the finest sable hair available fastens on the arm of any type machine. It cleans the dust from record grooves in advance of the needle and thus not only keeps the dust from being ground into the record grooves as the needle passes over it, but it also saves wear on the needle itself. LP $1.00. The Duotone Co., Inc., Keyport, N.J. (ELECTRONIC TECHNICIAN 2-14)

Harman-Kardon HI FI LINE

The high fidelity line for 1957 offers amplifiers, tuners and combination receivers in 3 price groups; namely Custom Group, Deluxe Group and Economy Line; having power ratings of 40-watts, 20-watts, and 10-watts respectively. The 40-watt amplifier-preamplifier features new controlled "H" circuit, which enables the unit to deliver full output with less heat, dynamic-loudness-contour selector, variable damping, 3 position rumble filter, 3 tape equalization positions, and a built-in 3 position speaker selector switch. Harman-Kardon, 520 Main St., Westbury, N.Y. (ELECTRONIC TECHNICIAN 2-12)

Connoisseur TURNTABLE

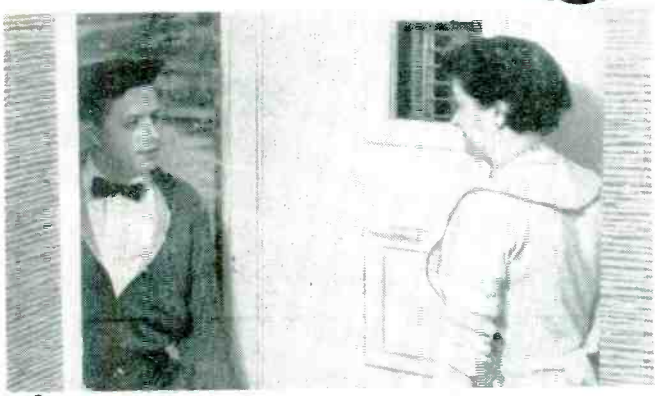
The new, 1957 model of the British-made connoisseur turntable offers studio-quality performance. The 12" non-magnetic turntable is a lathe-turned sand casting, custom-fitted to its individual spindle. The design calls for clearance between the spindle shaft and its bearings sufficient to allow a thin film of oil to be maintained between them, preventing metal-to-metal contact. A synchronous hysteresis motor provides 3 speeds with minimum noise level and hum induction. Supplied with a light-weight tone arm which provides virtually flat response up to 20,000 cps. Distributed by Ercona Corp., 551 Fifth Ave., New York 17, N.Y. (ELECTRONIC TECHNICIAN 2-13)

MR. SERVICE-DEALER:

YOU CAN MAKE $6.40 EXTRA on 7 OUT of 10 TV SERVICE CALLS in INDOOR ANTENNA AREAS

with the JFD Electronics **Magic Genie**®

Here's How:

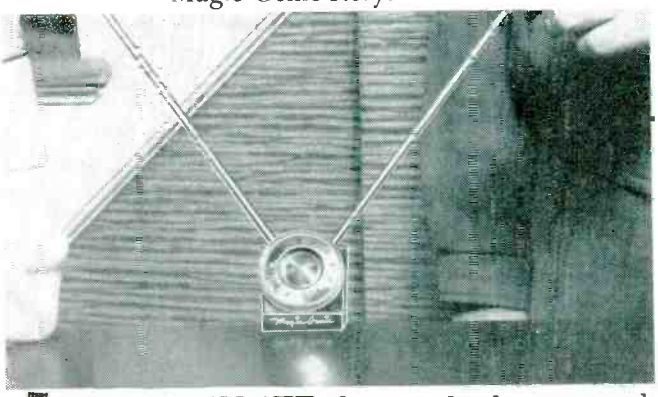


1 TAKE the JFD Magic Genie with you in your tube caddy on your next service call. It's conveniently small and compact.

2 USE the Magic Genie to check the picture after you have serviced the set.

3 YOUR customer is sure to ask about it. This is your invitation to tell the fabulous Magic Genie story.

4 SHOW your customer how much more beautiful the Magic Genie looks than the old ugly indoor antenna sitting on top of her TV set.



5 DEMONSTRATE the way dipoles rotate and adjust in any direction for powerful black and white and color reception.

6 CLINCH the sale by pointing out the Magic Genie unconditional money-back guarantee backed by JFD's 28 years of electronic know-how.

JFD **ELECTRONICS, INC.**

PIONEERS IN ELECTRONICS SINCE 1929

NATIONALLY ADVERTISED AT $17.95 promotionally priced at **$14.95**

Call your JFD distributor for your Magic Genies and start earning that extra money now. It's so easy.

News of the Industry

The **IRE** Board of Directors, at its January meeting, appointed six members to the Board for 1957. W. R. G. BAKER, Vice Pres. of GE was reappointed Treasurer; Haraden Pratt was appointed again as Secretary; DONALD G. FINK was reappointed Editor of IRE. Appointed as Directors were ALFRED N. GOLDSMITH, A. W. GRAF and WILLIAM R. HEWLETT.

MOTOROLA announces that PAUL V. GALVIN was elected Chairman of the Board and was succeeded as Pres. by ROBERT W. GALVIN, formerly Executive Vice Pres.

ASTRON CORP., for the second year, has awarded to its employees gold pins denoting five years' service to the company.

AMPHENOL ELECTRONICS CORP. celebrates its 25th anniversary in 1957 and will mark the occasion by special issues of the firm's magazine "The Amphenol Engineering News," and by advertising the trade show exhibits keyed to the occasion.

SIMPSON ELECTRIC CO. announces that its new plant in Mercer, Wisconsin is near completion. SIMPSON also has plants in Chicago and Aurora, Ill., and Lac du Flambeau, Wisconsin.

BURTON BROWNE ADVTG. announces that four new clients have been named. They are The NATIONAL CO., FILTORS, INC., INLAND ELECTRONICS CORP., and WELCO MFG. CO.

"Capacity Unlimited" is the name of a new 25 minute color sound-film story of the growth over the past 46 years of the CORNELL-DUBILIER ELECTRIC CORP. The film is narrated by WESTBROOK VAN VOORHIS and CHRIS SCHENKEL and is available for loan, without cost, to TV stations, schools, clubs, civic groups and sales meetings upon request.

WINEGARD CO. is aiming its 1957 technical and promotional efforts toward selling antennas like appliances; as a consumer sales item.

New offices and facilities for the **P. R. MALLORY & CO. INC.**, Distributor Div., are now located at 1302 E. Washington St., Indianapolis, Ind.

EDWARD A. ALTSHUIER has been appointed manager of merchandising and market research for AMERICAN ELECTRONICS, INC.

WESTINGHOUSE ELECTRIC announces the appointments of FRANKLIN P. HINMAN as operations manager of the cathode ray and power tube departments and GEORGE C. SZIKLAI as technical assistant to R. T. ORTH, Vice Pres. and General Mgr. of the tube divisions.

THOMPSON PRODUCTS names G. R. MOORE as staff Vice Pres. in charge of sales and advertising.

GAIL S. CARTER has been elected to the Board of Directors and appointed assistant to the Pres. of MERIT COIL & TRANSFORMER CORP.

Electronic distributors attending the **1957 ELECTRONIC PARTS DISTRIBUTORS SHOW** will have a chance to share management experiences and problems in down-to-earth round table discussions led by top management in small, private non-competitive groups. Four management round table forums will be conducted May 22 and 23 from 8:30 to 11:00 AM.

HERB CORNELIUS, general Sales Manager, and **RUSSELL JORND,** Chief Engineer, were among the 21 employees of LITTLEFUSE, INC. to be honored recently at the firm's fifth annual service award banquet.

900 CHANNEL MASTER employees divided $504,106.64 in December through their participation in the company's annual profit-sharing plan. $1,800,000 has been distributed through profit-sharing since the company began this policy in 1952. . . . CHANNEL MASTER also announces the installation of a new steel tubing mill to manufacture electric-weld steel TV masting.

SNYDER MFG. CO. has moved its West Coast executive offices and warehouse to larger quarters at 152 W. Pico Blvd., Los Angeles, Calif. . . . The annual SNYDER International Sales Conference was held in Las Vegas late in January.

FRANK D. LINTERN and **C. E. SEAMAN** have been appointed to managerial posts in the sales department of ELECTRO-VOICE, INC.

TODD PRODUCTS CO., INC. announces the appointment of STAN LEVY as Works Manager.

GENERAL INDUSTRIES CO. announces the appointments of W. E. FOSTER and CARL RUSSERT as Vice Presidents of the Plastic Div. and MORRIS BARCHARD as Manager of the Div. with C. M. NORRIS as Assistant Manager.

BETTY R. PARDO has been named assistant to Henry Berlin, Vice Pres. of MARK SIMPSON MFG. CO., INC.

UTAH RADIO PRODUCTS CORP. announces the appointment of WILLIAM L. ALLEN as Industrial Sales Manager.

PERMO, INC. announces the promotion of WILLIAM R. ANTON and GEORGE AVALON to the positions of Vice-Pres. in charge of Sales, and Vice Pres. in charge of manufacturing respectively.

PHILO CORP. announces the following appointments: JOSEPH H. GILLIES was named Executive Vice Pres. in charge of operations, LARRY F. HARDY has been promoted to Executive Vice Pres. in charge of Consumer Products and DR. LESLIE J. WOODS was named Executive Vice Pres. in charge of Research and Engineering. . . . The appointment of **HENRY F. ARGENTO** as Vice President and General Manager of the Government and Industrial Div. of PHILCO has also been announced. He succeeds JAMES D. McLEAN, who resigned to become Pres. of HOFFMAN.

MAJOR GENERAL FRANCIS H. LANAHAN, U.S.A. (Ret.), has been elected Pres. of FEDERAL ELECTRIC CORP. of Lodi, N. J.

RCA TV Service Tips

Excerpts from manufacturers literature.

8-PT-7030 Series

Late production receivers use a KRK55B instead of a KRK55A.

Vertical Bounce—Vertical breathing or bounce of the raster may be due to the vertical output transformer. In some cases this may be corrected by changing R157 from 15,000 ohms to 8,200 ohms.

Vertical Linearity—If poor linearity of the upper part of the raster is traced to the vertical output transformer it may be possible to obtain good linearity by connecting a 120,000 ohm resistor across the primary winding. C156, in the plate circuit of the vertical output tube can also cause poor linearity as well as vertical foldover, unstable vertical hold on a bunching of the raster lines. The particular condition observed will depend on the amount of leakage of the capacitor. The replacement for C156 is .022 mfd at 600 volts.

Intermittent Picture Flashing—Intermittent flashing of the picture may be due to insufficient spring pressure of the contact springs between the built-in antenna and connector board or between the connector board and chassis. To correct this condition, the spring contacts should be cleaned and the spring tension increased sufficiently to make good contact.

Horizontal Ringing—Excessive ringing (vertical lines on left side of raster) may be corrected by changing the value of C175 from .033 mfd to .027 mfd. C175 is connected from the width coil to the horizontal coils of the deflection yoke.

Cabinet Antenna—It is important for proper operation when using the cabinet antenna to make sure that the bottom rod section is fully extended. The cabinet antenna is connected to the input of the receiver by the action of the bottom rod section when it is pulled out. The terminals for an external antenna are always connected to the receiver input. The lead-in should therefore be disconnected when using the cabinet antenna. The rods of the cabinet antenna should be fully retracted when using an external antenna.

KCS96 Chassis

H.V. Fuse Failure—Failure of the high voltage fuse usually is caused by a condition in the horizontal circuit that results in abnormal current through the fuse. In the KCS96 chassis, however, the vertical output circuit should also be checked if the cause of fuse failure cannot be readily determined. The plate and screen currents of the vertical output tube flow through the H.V. fuse and can cause fuse failure if the vertical output tube or associated circuit cause abnormally high current through the fuse. When the H.V. fuse fails for no apparent reason the possibility of an intermittent condition in the vertical output tube or circuit should not be overlooked.

KCS97 Chassis

Buzz In Sound—Buzz in the sound due to the vertical sweep oscillator is usually corrected by dressing the volume control leads away from the

(*Continued on page 52*)

Representatives

JENSEN MFG. CO. announces the appointment of JACK E. WILLSON of Marblehead, Mass. as sales rep for the company in the New England states.

EDWARD G. OROS, Cleveland, O., is now representing the ASTRON SALES CORP. for distributor sales of their capacitors in the states of Ohio, W. Va., and western Penna.

RYE SOUND CORP. has just announced the appointment of three reps to handle distributor sales of their RYE SOUND EARSETS and other products in the Mid-West. RAY HUTMACHER ASSOC. will cover Ill. and Wisc., E. G. CROS & ASSOC. will handle W. Va., W. Penna.; and EARLE GOETZE CO. will represent them in Kan., Iowa., Mo., Neb., and Okla.

RADIO ELECTRIC SERVICE CO. OF PENNA. has opened another branch at 29 York Rd., Willow Grove, Penna. with MARTIN GROSSMAN as manager.

PYRAMID ELECTRIC CO. has appointed HENRY D. SARKIS to represent them in N. Ill. and S. Wisc. and GASSNER & CLARK CO. will handle the government and industry sales for the same area.

NATIONAL CO., INC. announces the appointment of R. L. GENTRY SALES CO. as sales reps for all of New England, Metropolitan New York and Northern N. J.

WINEGARD CO. has appointed 8 new sales reps for the Southern states. They are: HANK LIEBERMAN, JOSEPH LAWRENCE, and CARY ISENBERG to handle Dallas, Texas; B. C. KENNEDY and HOWARD MARTIN will cover Memphis; and BUD HILKER and GEORGE ROBERTSON will be reps in Winston-Salem, N. C.; and GEORGE JESSE SALES CO. will cover Birmingham, Ala.

SNYDER MFG. CO. has named AL ENGELMAN CO. to represent them in Tenn., Ala., Northwest Fla., Ark. and La.; and W. R. HAYS CO. will handle the Okla. and Texas territory.

J. Y. SCHOONMAKER CO. has now moved to larger quarters at 5328 Redfield, Dallas, Texas.

NATIONAL CO. has announced four new sales reps. JACK GEARTNER will handle Fla.; HARRY DOULL will cover counties in Dela., Md., N. J. and Penna.; R. MARK MARKMAN will handle Southern Calif.; and JACK CRAWFORD will handle Oregon, Wash., parts of Idaho, Mont. and Alaska.

UNIVERSITY LOUDSPEAKERS has expanded its representation in the rocky mountain area. BUSH & WHARFIELD CO. will operate out of Salt Lake City and Denver and will service accounts in Wyo., Colo., Utah, New Mexico, Western Texas, S. Idaho, E. Mont. and West. Neb.

FISTELL'S ELECTRONICS SUPPLY CO. has moved to larger quarters at 1001 Bannock St., Denver 4, Colo.

RCA Service Tips

(*Continued from page 50*)

vertical sweep circuits. In some cases, however, it may be necessary to correct this condition by repositioning the vertical output transformer 45 to 90 degrees counterclockwise from the original position.

700 Series

Horizontal Hold Operation—A change in the horizontal hold control was made in late production of all current receivers. This change provides faster action of the control. The picture remains in sync for 2/3 of a full turn instead of 2 full turns. This change does not affect the stability or holding range of the hold control circuit because the change was accomplished by decreasing the number of threads per inch of the control. In addition, it should be noted that 8 diagonal bars instead of 12 are obtained with the control in the extreme clockwise position.

KCS102B & D

Production Changes—In some receivers, differences exist from the schematic diagram due to production changes in early and late model chassis.

In Early Production Receivers

C120, is 470μμfd.
C139, .022μfd.
C155, at V109-2, is omitted.
R115, is 18 ohms.
R152, 22K ohms is added from C to D of T104.

In Late Production Receivers

C139, is .022μfd.
C167, .001 μfd, is added from V106-8 to ground.
L103, .22 μh, is added between V105-3 and T105-A.
R114, is 470 ohms.
R115, is 27 ohms.
R123, is a 1-watt resistor.
R126, is a 2-watt resistor.
R149, vertical lin. control is 1.2 meg. ohms.
R173, is 22 ohms.
R174, is 15K ohms.
R181, is 220K ohms.
R182, 470 ohms is added between R114 and junction of C126 and R119.

Catalogs & Bulletins

(*Continued from page 20*)

Available to you free, unless noted otherwise. Fill in code number on coupon page and mail to Reader Service Dept., ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

POSTER: Large poster boosting the independent service dealer available from Sprague Products Co., North Adams, Mass. (ELECTRONIC TECHNICIAN No. B2-9)

QUICK SELECTION CHART: Indicates the data and other information on GE 450-milliampere and 600-milliampere receiving tubes with controlled heater warm-up time for TV sets. ETD-1163-C General Electric Co., Schenectady 5, N. Y. (ELECTRONIC TECHNICIAN No. B2-10)

SELENIUM RECTIFIER REPLACEMENT GUIDE: Pocket-size manual lists specifications and replacement requirements for all sets using rectifiers. Dept. E, Semiconductor Div., Radio Receptor Co., Inc., 251 W 19 St., New York 11, N. Y. (Ask for B2-21)

FUSE RESISTOR: Comprehensive data on applications, advantages, design, construction, ranges, tolerances, stamping, etc. detailed charts and graphs. Bulletin P-3, International Resistance Co., Philadelphia, Penn. (ELECTRONIC TECHNICIAN No. B2-22)

IMPORTANT NOTICE TO SUBSCRIBERS

Changes of address require four weeks' notice. Notify your Postmaster and ELECTRONIC TECHNICIAN Circulation Department at the earliest possible moment.

When ordering change, please INCLUDE IMPRINTED STRIP showing exactly how magazine is now addressed. This will enable us to put the change into effect with a minimum of delay.

Association News

L.I. Guild Elects

The Radio and Television Guild of Long Island after polling its membership, elected Rockville Center merchants Christopher Stratigos and Ralph Milne as president and vice-president for the year 1957. The new president has set several challenging objectives for 1957 which are specifically designed to benefit paid-up members. They are a study of the possibility of group advertising, group insurance and investigation of a placement-bureau arrangement with technical schools to help ease the trained-technician shortage within the service industry. In addition the highly successful Electronics Fair held at the Farmingdale Agricultural and Technical Institute in December under the sponsorship of the Guild will be continued as an annual affair. Stratigos, who succeeds Murray Barlowe of Bethpage, congratulated his predecessor for his accomplishments of the past year.

RTTA Pasadena Elects

The annual election of officers of the Radio Television Technicians Association, Pasadena was held. New officers were installed at a dinner dance at the Altedena Country Club. Those elected for the new term are President Frank Fisher, 1st and 2nd Vice President Bill Yatty and Ben Leff, Secretary Ron Kealy and Treasurer Ray Doyle. The outgoing President Harry Coolidge made a report on activities of the California State Electronics Assoc. (CSEA). He stressed efforts being made toward a state-licensing bill that would be fair to both the public and to the independent servicer.

TESA Mineral Area Organized

A group of servicemen from St. Francis, Jefferson, Washington, Reynolds and Iron Counties met at Flat River, Missouri and organized another Television Electronics Service Association. Starting with 5 enthusiastic members the group expects to increase their membership rapidly. Meetings will be held on the first Monday night of each month and will be on a rotation schedule; meeting in the cities of servicemen represented in the area.

Vince Lutz, NATESA Membership Coordinator was on hand as usual to lend a helping hand. He did a very fine job in explaining the benefits of an association and getting the group started. The group voted to affiliate with NATESA. All servicemen in the area are invited to attend meetings.

TSA Color Service Clinic

The Television Service Association of Michigan presented the Midwest's first all-color service clinic in the Fort Shelby Hotel in Detroit, on January 27th and 28th. TSA, leading manufacturers, representatives and distributors participated in this colorama. One step in combatting captive service is to become better business men and give better service. The program was designed to give the serviceman and tools to do a better job, new ideas, new techniques, new instruments and better methods in both management and service.

Something new in
EMPLOYMENT OPPORTUNITIES!
See pages 14 and 18

Circuit Digests Index

Index addenda of all Circuit Digests published since complete cumulative index in November 1956 issue.

December, 1956

Circuit Digest No.

CROSLEY 310
Chassis 489: Models BT-12M, BT-12MZ, BT-12BZ, BC-12M, BC-12MZ, BC-12BZ, BC-14M, Chassis 490: Models BT-13M, BT-13B, BC-13M, BC-13B, BC-15M

GENERAL ELECTRIC 311
Chassis "ST" line: Models 21C133, 21C134, 21C135, 21C136, 21C140, 21C-141, 21C142

MAGNAVOX 314
Chassis 73 series: Models V/U73-01-AA, V/U73-02AA

MOTOROLA 312
Auto radio Model 79MS, Ford FEJ-18806-C

RCA-VICTOR 313
Transistorized portable Chassis RC-1156A: Model 8-BT-10K

WESTINGHOUSE 315
Chassis V-2311, V-2321, V-2370, V-2380: Models 14T170, 14T171, 14T172, 14TU170, 14TU171, 14TU172

January, 1957

Circuit Digest No.

ADMIRAL 316
COLOR TV Chassis 29Z1, 29Z1B, 29SZ1, 29SZ1B2: Models C322C2, CS-322C2, C32C3, CS322C3, C322C16, CS322C16, C322C17, CS322C17, C322-C26, CS322C26, C322C27, CS322C27, LC322C36, LCS322C36, LC322C37, LCS322C37, LC322C39, LCS322C39

BOGEN 317
High Fidelity AM-FM Tuner, Model R660

GENERAL ELECTRIC 321
Portable TV Chassis "MM" series: Models 17T025, 17T026

MOTOROLA 320
Chassis 539, 539Y series (TTS, TS, WTS, VTS, prefix): Models 21C5, 21F6, 21K54, 56-63, 21T33, 35, 36; 24K14, 15; 24T6 (A, YA prefix)

OLYMPIC 318
Chassis CT, CU, CW, CX

PILOT 319
Audio Amplifier & Preamplifier Model AA-903B

February, 1957

Circuit Digest No.

ADMIRAL 322
Chassis 17Z3D: Models T23A1, 2, 3; Chassis 17Z3DC: Models C23A26, 7; Chassis 17Z3DT: Models T23A6, 7, 11, 12, 13

AMERICAN TV & RADIO 323
Chassis 2600: Models 26001, 2, 3, 4, 5

DUMONT 325
Chassis RA-392/393: Model Sportsman Portable TV

HOTPOINT 324
Chassis "U" series: Models 21S401, 21S451, 21S452, 23S501, 21S502, 21S-551, 21S552, 24S801, 24S802 and UHF

WESTINGHOUSE 326
Transistor Radio: Chassis V-2278-2; Models H 610P5, H 611P5, H 612P5

Outdoor Hi-Fi

(Continued from page 29)

stick close to the speaker axis and travel in a narrow beam. To accomplish wide-angle dispersion either special tweeters designed for this work, or more speakers, would have to be used. Care must also be exercised in the selection of trumpets to assure the desired low-frequency response.

In the Music Grove installation Fig. 4, the seats nearest the orchestra do not require any reinforced sound. The general rule that the distance ratio from the nearest to the farthest person should be under four can be applied by considering D_1 to be the distance to the middle row of seats. By reinforcing the middle to rear area the sound is more evenly distributed and the problem of feedback is minimized. In order to compensate for the attenuation caused by the longer distance to the rear seats, the horns are aimed at the last row.

Frequency response is important in high quality orchestra reinforcement work. Unless the ratio of D_2 to D_1 is kept under four, as in this instance, separate high-frequency tweeters may be needed to fill in. If required, one would be placed between the two trumpets and one on each side. An alternative is to use more trumpets. In this case, twin-reflex trumpets were mounted on sycamore trees 20-feet above the ground. The vertical speaker axis is aimed at the farthest row of seats. The horizontal sound-distribution pattern is similar to the paging system previously described.

The trick of a unidirectional mike to avoid feedback will not work too well in an orchestral-program pick-up. The mike should be omnidirectional. As a matter of fact good microphoning technique calls for the installation and use of many strategically-placed pickups. A microphone-mixer-preamplifier arrangement can do much to improve the overall effects of reproduction and compensate for various accoustical deficiencies that may be present in and around the orchestra pit.

Power Requirements

Power for Hi-Fi reproduction of a full orchestra requires an ample reserve for low frequencies and wide dynamic range. The application-guide chart may be used. The indi-

cated power multiplied by a factor of 3 will suffice in most cases. It is well not to economize on the speakers. As the efficiency and power handling capabilities go up the power necessary for a given volume level goes down. This condition is further demonstrated on the bottom of the guide chart. Cone-type speakers require 4 times as much power as a large high-efficiency horn. •

The TV Antenna

(Continued from page 30)

picture was obtained by disconnecting one side of the antenna?

Orientation is another important item, I'm on the alert for. Do-it-yourself activities, and wind will create conditions, from a fixed 180° reversal to continually varying. Antenna complaints that date back to the original installation may call for a different type of antenna and installation.

Life expectancy of an antenna varies from area-to-area depending upon climatic conditions, quality of materials and how good an installation was made. In many cases it does not exceed two years. Yet there are rusty, ghost-radiating-signal attenuators posing as antennas that are more than five years old. The customer is not aware of the bad effects these old installations are creating in their TV sets. Deterioration is gradual and is bound to be unnoticed. How many vertical-sync amplifier tubes have been prematurely replaced because the combined weakness of the antenna and the normally slight depreciation of tube was enough to register a complaint?

By explaining to the customer that a new antenna will result in better reception, fewer service calls and in the long run will save money (besides which sooner or later it will have to be done anyway) I have found the chances are good that the cash register will ring. •

Dynamic Testing

(Continued from page 31)

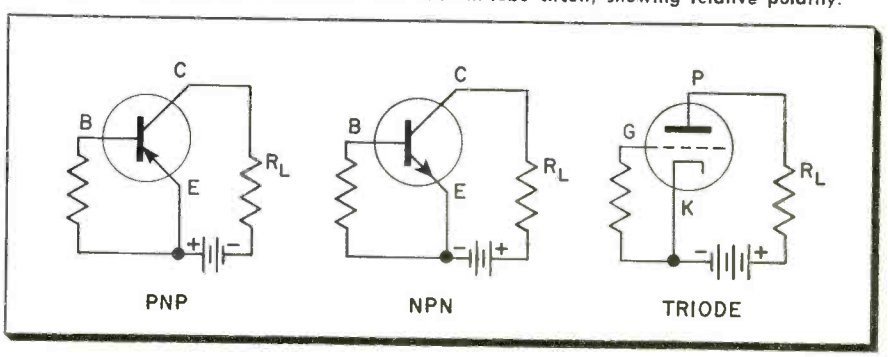
strength. The polarity of relative terminal voltages, with respect to each other in the NPN transistor is much the same as in a vacuum tube, as in Fig. 2. Under stronger signal conditions, the base is driven more negative, and the gain is thereby reduced. However, in the PNP type, the relative terminal polarities are reversed and the AVC voltage is also reversed. On a stronger signal the base, which acts like the grid of a tube in this case, would become more positively biased. Regardless of polarity, a voltmeter inserted to read upscale will show variations as the tuning condenser is rotated. This provides another quick dynamic test, which will indicate whether or not everything is functioning up to the 2nd detector. The audio stages do not present any unusual or difficult problems and the repair procedure is standard.

Front End

Should there be a break in the signal path, as indicated by either the signal tracing method or the lack of AVC action, then the IF's should be checked as outlined above. If it is possible to feed an IF signal from the antenna stage, then the probable cause of trouble lies in the oscillator circuit. If after checking voltages, resistances and continuity, the circuit seems to be OK, then try a new transistor. Trouble-shooting the RF stage is performed in the conventional manner. Broken loopsticks, and leads cause many of the difficulties in this section.

Oscillation due to lead dress, alignment, and overall gain of the receiver, are just a few of the characteristics to be on the alert for in these sets. Different transistors will function more efficiently with different values of load resistance and bias. For best results the manufacturer's specifications should be referred to whenever possible. •

Fig. 2—Comparison of transistor and vacuum-tube circuit, showing relative polarity.



Business Decisions

(Continued from page 33)

"speeds up" or increases depreciation rates. This starts the chain reaction to your objective of retaining cash in the business, because when you increase depreciation rates you also increase allowable depreciation deductions on your tax return. The amount you may write-off the first year is twice what it would be if you used the straight-line method; so by applying a $1000 instead of $500 depreciation deduction against your regular income, you are going to reduce your taxes, and cash that does not have to be paid out in federal taxes can be retained in the business for expansion purposes.

It seems all good things eventually come to an end, however, and while in the first year the declining balance depreciation rate may be double that of the straight-line, this differential diminishes in succeeding years until declining balance deductions are even less than they would be under the straight-line method. This is why it is important that you consider current and future earnings before you select a depreciation method.

For example, if your current earnings are low, or if you are putting in a new line of merchandise and the results of this expansion will take a few years to show in your earnings, it might be more advantageous taxwise for you to use the straight-line method of computating depreciation.

The straight-line method does not "speed up" depreciation deductions. It spreads them out equally over the

estimated useful life of the asset; so when you use a straight-line method you are saving, in a sense, for a rainy day. When your earnings improve or increase, you will have more substantial depreciation deductions to apply against those earnings. There usually is no point in increasing a loss or reducing low earnings by claiming additional depreciation deductions when you do not need them.

A point to remember when you are trying to decide whether to buy new or used equipment is that second-hand equipment *must* be depreciated by the straight-line method. This tax factor should be considered, because loss of the opportunity to use the declining balance method with its rapid write-off feature may cancel any immediate savings effected by the purchase of used equipment.

Business Structure

The matter may have been decided and forgotten many years ago, but a basic question businessmen should consider from time to time—and one which has many tax implications—is whether to do business as a proprietorship, partnership or corporation. There may be personal or professional factors that force the selection and maintenance of a non-corporate form of organization, but depending on the earnings of the business and the amount of those earnings you may need to withdraw, there are certain tax advantages to be gained by incorporating a new or expanding company.

Since proprietorship and partnership income is taxed at individual rates, which range anywhere from 20 to 91%, and corporation earnings are taxed at corporate rates of 30% on the first $25,000 earned during the year, and 52% on the excess, it might appear that if you have relatively low income the proprietorship-partnership rates are lower. However, you must also consider that the corporate tax carries with it the privilege of deducting a reasonable salary paid to an employee-owner. The employee-owner has to pay a personal tax on his salary, of course, but if he were not incorporated, he would have to pay a personal tax on all the money earned by the business.

If the retained earnings of the company are taxed at a corporate rate which is lower than what the personal tax rate would be, the employee-owner would benefit by having additional funds available in the corporation for expansion purposes.

(*Continued on page 60*)

Business Decisions

(*Continued from page 59*)

These funds may be accumulated in a corporation up to $60,000 without further tax penalties, and even higher if the corporation can prove a need for them.

These advantages—while they may cut your current tax bill and increase working capital for expansion needs—can be lost if you have jumped into a corporation without first reviewing your own long-range cash requirements. If you are continually forced to withdraw money from the corporate earnings to pay personal expenses, you will have to withdraw these funds in the form of dividends. That means the corporation will have to pay tax on the earnings you are withdrawing as dividends, and you will have to pay tax on the dividends received. The "double tax" on earnings and dividends can nullify any tax advantage from incorporation when earnings must be withdrawn immediately as dividends.

Many businessmen seek professional advice about tax matters as they do professional assistance with their golf game—when the slice has become almost unbearable. You can save tax dollars by realizing that business decisions made in the fall affect the amount of tax you must pay in the spring. Practice year-around tax thinking, and consult a certified public accountant when you are in doubt as to the tax effect of even the most routine business decision. •

Miller Effect

(*Continued from page 35*)

vided by Miller Effect, may provide less impedance to the upper audio frequencies than does the resistor. It would thus provide a treble roll-off network.

The interesting phenomenon considered in this article is not always a menace, by any means. It is actually put to use in some circuits. It has been used, in various forms, to put together automatic noise-control circuits in some receivers, also automatic tone-control and phono scratch filter circuits, in which the noise-elimination or tone-adjustment circuits are varied by the nature or strength of the incoming signal. •

New Books

(Continued from page 6)

TELEVISION FOR RADIOMEN. *By Edward M. Noll. Published by The Macmillan Co., 60 Fifth Ave., New York 11, N.Y. 778 pages. Hard cover. $10.00.*

This revised edition, one of the most exhaustive works on the how-what-why of TV receivers, has been expanded with a 93-page section on color TV. While there are some limited treatments or omissions (printed circuits and recently-developed wideband yagis, for example), the vast amount of well-written information contained so far outweigh any shortcomings, that this volume must be classed among the most valuable in the field.

HANDBOOK OF SEMICONDUCTOR ELECTRONICS. *Edited by Lloyd P. Hunter. Published by McGraw-Hill Book Co., 330 W. 42 St., New York 36, N.Y. 832 pages. Hard cover. $12.00.*

Thirteen specialist representing leading manufacturers have set down the physics, technology and circuit applications of transistors, diodes and photocells. Much advanced design data is included in this large work.

INVERSE FEEDBACK. *By Alexander Shure. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. 56 pages. Paper cover. $.90.*

This is No. 15 in the Electronic Technology Series, and it capably explains the theory and application of feedback in various electronic devices. A full understanding of feedback is important for electronic technicians, and this handy volume provides the needed information. Topics include effects on input impedance, frequency response, stability, as well as multi-stage circuits.

TV TUBE LOCATION & TROUBLE GUIDE—RCA. *Edited by the Laboratories Staff and published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N.Y. 46 pages. Paper cover. $1.25.*

This handy volume of chassis layouts, tube functions and trouble charts for hundreds of RCA TV sets made from 1947 to 1956 is extremely helpful in locating the most common failures—tubes—quickly and easily. Since the book is not intended as a complete troubleshooting reference, circuits are not included. But as a rapid trouble location aid, it is quite successful.

Something new in EMPLOYMENT OPPORTUNITIES!
See pages 14 and 18

Your Tubechecker

(Continued from page 36)

consists of a variable plate supply and a high-pass filter, L_1, C_1. The grid circuit normally consists of the variable bias supply and a signal oscillator.

The filter network blocks the AC plate current from the power supply. The AC plate current resulting from the AC input signal, is passed on to the meter circuit. When a signal voltage from the signal oscillator is impressed on the grid of the tube, a signal current is produced in the plate circuit. The resulting meter reading is calibrated to represent the value of the Gm of the tube. Calibration to read Gm is accomplished by applying the following formula:

$$Ip = Eg \times Gm: \text{ or, } Gm = \frac{\triangle Ip}{\triangle Eg}.$$

For example: if the grid voltage (Eg) is 1-volt AC, and the change in AC plate current (Ip) is 4 ma, then Mutual conductance, transconductance, or

$$Gm = \frac{0.004\text{-amps}}{1\text{-volt}} = 4000$$

micromhos.

Since top performance of a TV set is dependent on the working characteristics of all the vacuum tubes it employs, it makes good sense to check all the tubes. Most customers will appreciate having their set working at its best. Besides customer good will, the number of call backs is reduced. These extra tubes are legitimate sales and results in extra dollars in the serviceman's pocket. So use an appropriate tubechecker. •

INDEX TO ADVERTISERS

February 1957

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.

PROFESSIONAL HI-FI SPEAKERS FOR PROFESSIONAL PA SYSTEMS

ONLY JENSEN HAS THIS COMPLETE LINE OF SPECIALLY DESIGNED 2 AND 3-WAY SPEAKERS FOR PROFESSIONAL HI-FI SOUND SYSTEMS

The "chips are down" when it comes to hi-fi sound coverage in industrial, commercial and institutional systems. Many a speaker that might "get by" in a music lovers living room just won't do the job in professional installations. Here you've just got to have full efficiency, ample power handling capacity and wide-angle distribution over the frequency range.

Jensen has five 2-way coaxial and 3-way TRIAXIAL* speakers to do this job for you. All are honest multi-way units with independently-driven horn-loaded compression-driver mid and high channels with full cross-over networks. They are *minus* frills like fancy covers and pretty nameplates but are *plus* on dependability features like corrosion and moisture resistant treatments. For realistic sound quality, we know of nothing the equal of these fine high performance hi-fi speakers. They work excellently in very small enclosures on ceiling or wall or suspended overhead. And of course they may be used in larger cabinetry when ultimate reproduction of "lows" is needed.

Higher quality interior sound distribution systems are the trend of the future. Jensen Professional Series High Fidelity Loudspeakers insure highest quality results.

***The Jensen Professional Series also includes:* Lifetime Driver Units; Hypex Projector Horns; Hypex Complete Projectors; Extended Range High Fidelity Loudspeakers; Weather Master Speakers; Transformers; Controls; Cabinets and accessories.**

Write now for your copy of Catalog 1070.

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If it's worth Engineers' time . . .

. . . It's worth Engineered Cable

Belden

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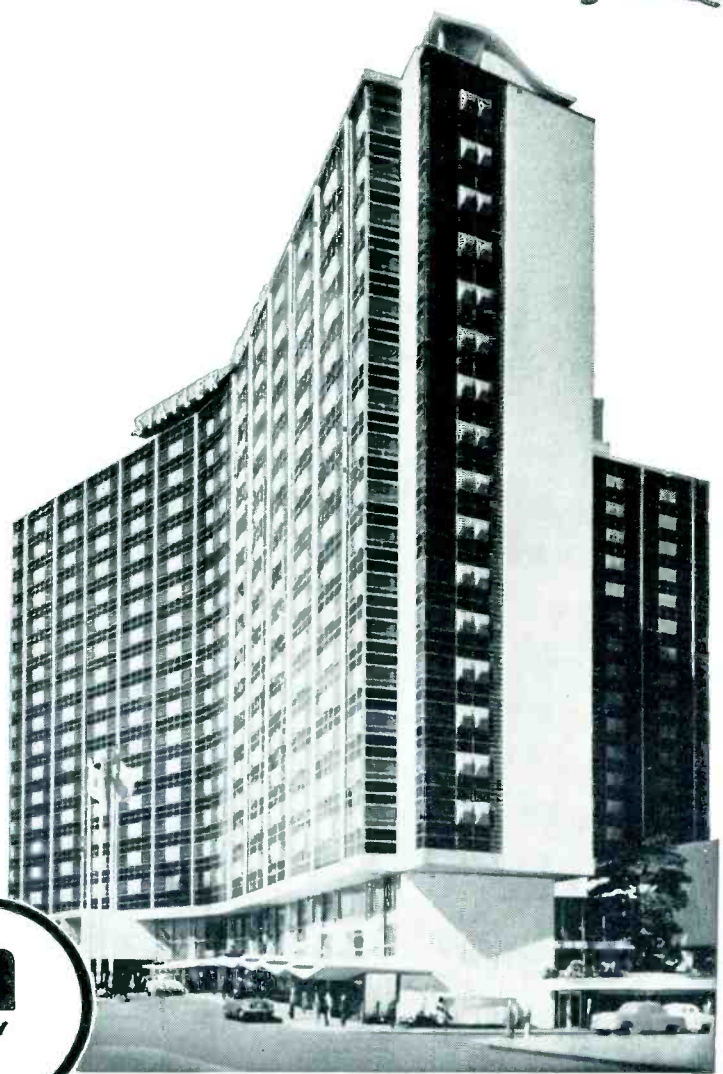
Indoor-outdoor, phones or speakers—there is a Belden engineered cable to meet your needs for a permanent, trouble-free installation.

"Items from the Complete Belden Line"



Intercommunications systems in the Statler Hilton in Dallas, and other leading hotels with intercommunications systems, are wired by Belden.

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SINCE 1902
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Magnet Wire • Lead and Fixture Wire • Power Supply Cords, Cord Sets and Portable Cord • Aircraft Wires
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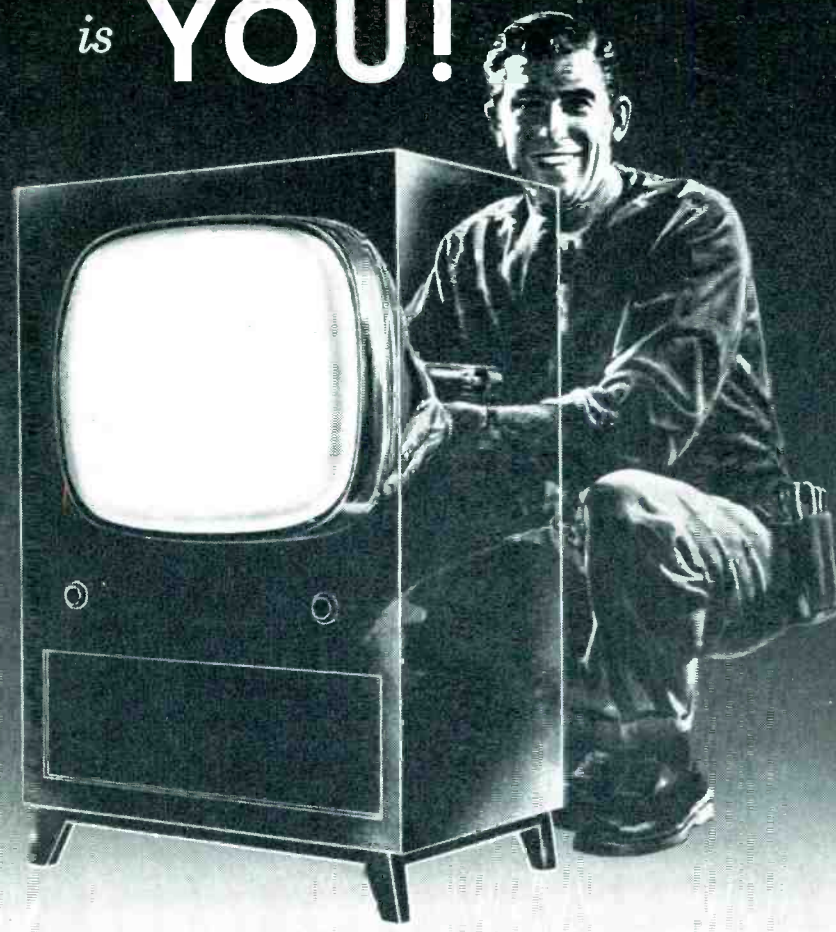
The Keynote of the 3rd Annual

NATIONAL TELEVISION SERVICEMEN'S WEEK*

is YOU!



Once again, RCA salutes its partners in the great electronic industry—*you*, the TV servicemen—whose neighborhood is America, whose business is America's entertainment. This year, RCA's salute to you is carried over network radio and TV, including March 16th TV Emmy Awards program and March 23rd Perry Como show; in the March 25th issue of Life, and the March 23rd issues of the Saturday Evening Post and TV Guide; in local newspapers; via displays, streamers and mailings, in every town and city from coast to coast. All America joins with us in a tribute to you—the men who help keep the nation's TV "rollin'"!

*REGISTERED WITH U.S. CHAMBER OF COMMERCE, MARCH 25 TO 30

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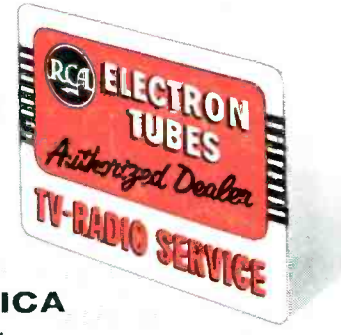

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