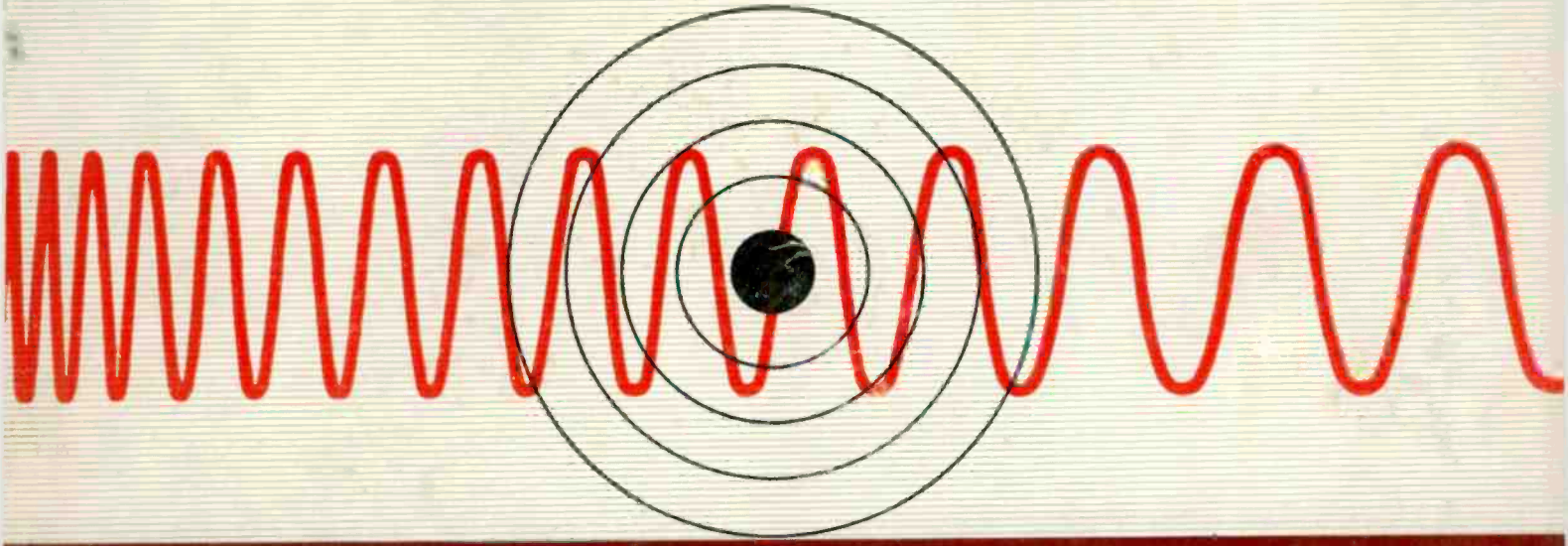
TECHNICIAN

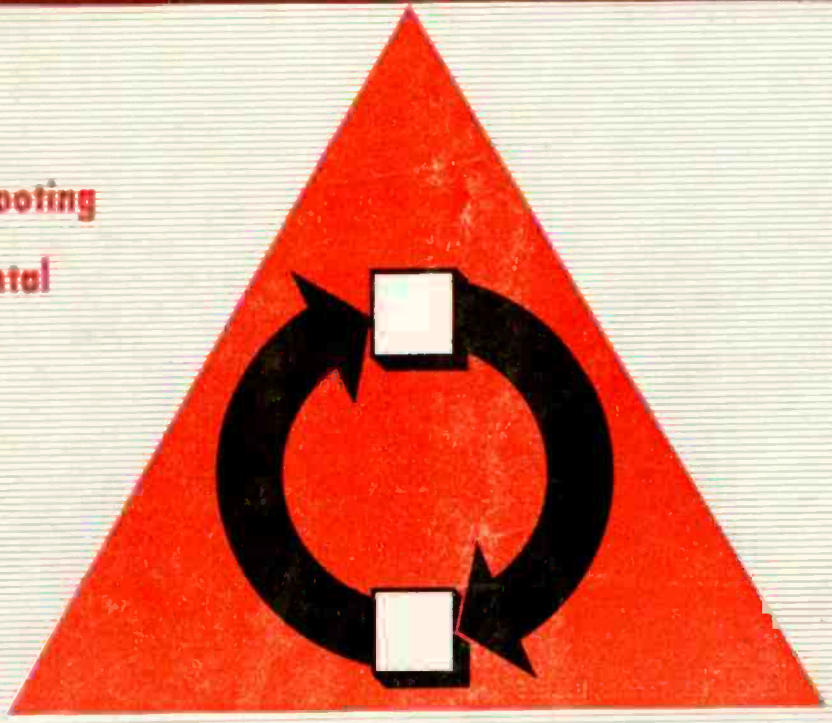
& Circuit Digests



Troubleshooting

Horizontal

AFC



"DO IT YOURSELF"
TUBE SALES
Friend or Foe?

See page 32

November • 1955

Caldwell-Clements, Inc.

Preferred for modern set servicing

KNOBMASTER FIXED SHAFT
Q Control standard shaft is knurled, flatted and slotted —fits most knobs without alteration.

INTERCHANGEABLE FIXED SHAFTS
Exclusive IRC convenience feature—provides fast conversion to "specials", with FIXED shaft security. 15 types available.

1/4" LONG BUSHING
Accommodates all small sets, yet handles large set needs perfectly.

7 STANDARD TAPERS
Full coverage of all taper requirements is provided in the Q Control.

94 RESISTANCE VALUES
For TV, AM and FM coverage, 94 values of plain and tapped controls are furnished.

QUALITY APPEARANCE
The handsome professional appearance of IRC Q Controls lets you point to your work with pride.

CUSHIONED TURN
The smooth, quality of "feel" of a Q Control contributes to customer confidence.

TYPE 76 SWITCHES
Either of two type IRC switches attached as quickly and easily as a control cover—meets all your requirements.

Service technicians get greater coverage with less investment; more practical service features; and easier, faster installation with the IRC Type Q Control. Here's a dependable, basic control that is directly designed for modern set servicing. For appearance, performance and price . . . there's none better. So why settle for less? Tell your Distributor you want Q Controls . . . most servicemen do.

This 8 page catalog gives you all the facts . . . Send for your free copy now—

INTERNATIONAL RESISTANCE CO.

Dept. 401 N. Broad St., Phila. 8, Pa.

In Canada: International Resistance Co., Ltd., Toronto, Licensee

Send me Q Control Catalog DC1D.

Name_____

Company_____

Address_____

City_____ **State**_____

IRC

Wherever the Circuit Says

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& Circuit Digests

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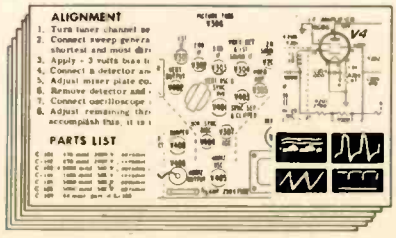
NOVEMBER, 1955

FRONT COVER The purpose of any horizontal AFC system and the general means used to achieve it are shown symbolically. Tendencies to change above or below a desired fixed frequency are corrected to keep the oscillator on the bull's-eye of the "target" frequency. Changes are counteracted by a corrective voltage, in whichever of two directions (the arrows) is needed. For data on circuits and servicing, see page 28.

FEATURES and ARTICLES

DEPARTMENTS

CIRCUIT DIGESTS



IN THIS ISSUE:

CAPEHART: Hi-Fi Phono, Chassis CA-239
EMERSON: Table AM radio, Chassis 120266-B
GE: Transistorized portable radio, Model 675
(including service techniques for transistor circuits)
MAGNAVOX: TV Chassis 650 series
MOTOROLA: TV Chassis TS-533
SYLVANIA: TV Chassis 1-533-1,2
WELLS-GARDNER: TV Series 324A59C-A-576, etc.

NEW G-E PICTURE-TUBE TV SERVICE DEALERS

1. How to get television service business where your customers cannot pay at once, in full.

2. How to move repaired TV sets now in your store, left there by owners unable to pay immediately.

3. How to keep down your book receivables, in order to free working capital for business growth.

YOUR G-E TUBE DISTRIBUTOR HAS FULL INFORMATION. ACT TODAY!

FINANCE PLAN HELPS SOLVE 3 MAJOR PROBLEMS

Widespread TV ownership has meant a steady uptrend in servicing volume. At the same time, demands on you have increased—demands on your time, facilities, and capital.

General Electric's consumer finance plan for complete picture tube installations, opens up to you, as a service dealer, credit resources which help you tap new and valuable markets. Markets where customers can't pay large television service bills immediately and in full—but can, and will, pay their bills out of income.

Up to now, your local credit facilities may have been inadequate to handle instalment buying. So . . . G.E. makes available financing aid in order to help you get all the TV service business you can profitably undertake.

Local regulations and instalment-buying requirements will determine the operation of this plan in your area. Credit when judiciously employed helps you in this way: it permits you to offer your customers with good credit standing the opportunity to buy over a period of months, when cash isn't readily available.

Ask your G-E tube distributor to tell you how you may qualify for the plan! *Tube Department, General Electric Co., Schenectady 5, N. Y.*

CHECK THESE PLUS BENEFITS FROM G.E.'s FINANCE PLAN:

✔ **Your TV service customers now can afford to replace worn-out picture tubes immediately. They no longer feel obliged to wait.**

✔ **You can do a Grade-A servicing job, complete with new receiving tubes and any needed parts . . . because your customers need only make part payment at once, the rest in easy instalments.**

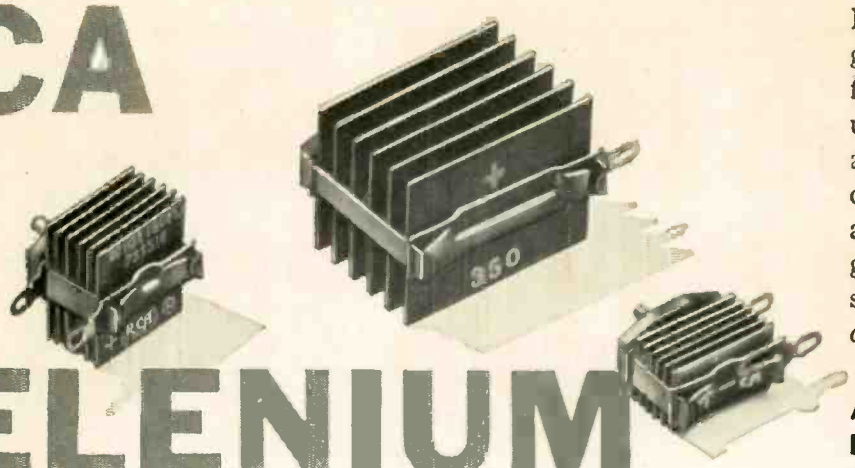
✔ **TV owners now can afford to buy the best from you. That means G-E Aluminized Tubes—G-E Service-Designed Tubes—other high-quality components.**

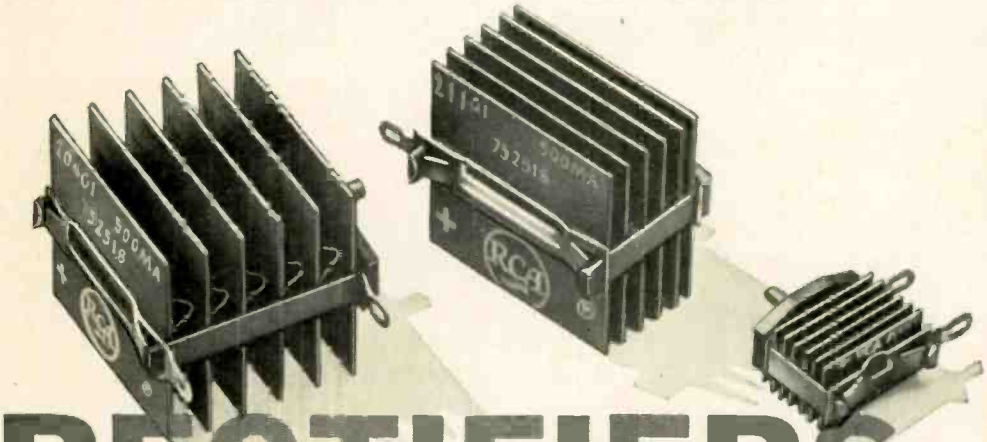
✔ **You can successfully compete for the local consumer's retail dollar. You are offering the same up-to-the-minute credit-purchase terms as other progressive merchants in your neighborhood.**

GENERAL ELECTRIC

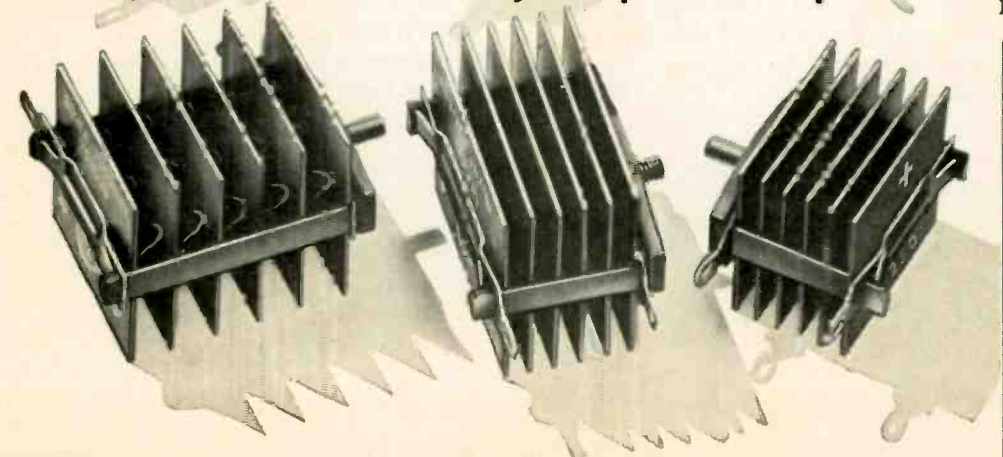
161-1A5

RCA SELENIUM RECTIFIERS





-one comprehensive line for virtually all replacement requirements!



Now, RCA offers you a top-grade line of selenium rectifiers for general replacement use in TV, radio receivers, and phonographs. Advanced design, select raw materials, and superior workmanship give you a *dependable line* of selenium rectifiers *for virtually all* service jobs.

Advanced Design for Dependable Performance and Long Life

Note the wide-open plate spacing for elimination of solid center "hot spot." Design utilizes corrugated spacers for *excellent heat dissipation and rigid construction for rugged service.*

NEW—smaller size . . . for any given current, they are smaller than other types.

NEW—quicker installation . . . integral mounting stud.

NEW—wide-open design . . . insures maximum heat dissipation, cooler operation . . . no center "hot spots."

NEW—rigid construction . . . for rugged service.

RCA SELENIUM RECTIFIERS—*a comprehensive line*—for consistently good performance, easier installation, longer life and customer satisfaction. ORDER FROM YOUR RCA DISTRIBUTOR TODAY!

WIDE SELECTION OF 12 TYPES

Max. Output ma	Max. Input volts	RCA Type
65	130	205G1
75	130	200G1
100	130	206G1
150	130	201G1
200	130	207G1
250	130	208G1
300	130	202G1
350	130	209G1
400	130	203G1
500	130	204G1
400*	130	210G1
500*	130	211G1

*Special thin types for use where available space will not permit the use of type 203G1 or 204G1.

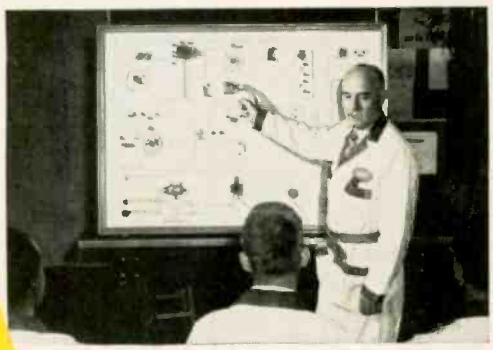
RCA **RADIO CORPORATION of AMERICA**
ELECTRONIC COMPONENTS HARRISON, N. J.

GUIDE

AUTRONIC-EYE®

TRAINING COURSES MEAN MORE BUSINESS FOR YOU!

Courses for experienced service technicians provide latest repair information—enable you to do the job faster and more efficiently.



Jumbo-size operational panel of Guide's Autronic-Eye Circuit puts all parts out front for better, more efficient instruction.

Quick, accurate circuit diagnosis and repair to factory specifications boosts your profits. That's why so many qualified auto technicians attend these Guide training courses at no cost other than transportation and living expenses.

The Guide Lamp diploma, awarded only to those who successfully complete the course, is proof that you're equipped to give more and better service to more people—and that means business.

If you're an auto radio service dealer, come yourself, or send your technicians. There's one of 30 GM Training Centers near you. Apply through your local United Motors Service Division Distributor or write

GUIDE LAMP DIVISION • GENERAL MOTORS CORP. • ANDERSON, INDIANA

Thirty modern GM Training Centers offer newest equipment and latest service techniques. There's one nearby . . . no matter where you live.

Superior's New Model TV-12

TRANS-CONDUCTANCE TUBE TESTER

ALSO TESTS TRANSISTORS!

A RADICAL CHANGE IN DESIGN PROCEDURE. Customarily, a *new* model Tube Tester means a *revised* model. For usually when a manufacturer designs a "new" model, he actually re-designs the last model made, including new improvements to meet changing requirements, and circuit improvements resulting from experience in producing the last model made. That is the usual practice, but doesn't apply to the new Model TV-12.

Superior Instruments Co. has been designing and producing Tube Testers since 1935. About two years ago, they asked their engineers to select a circuit which would meet the requirements of those technicians who want a *top quality* Tube Tester. The engineers selected the basic TRANS-CONDUCTANCE circuit employed in the Model TV-12. And then, thanks to the cooperation of a leading switch manufacturer, who designed a special *five* position lever switch, they were able to improve that basic circuit.

The Model TV-12, therefore, is not a "rehashed" model — it is not a tester which simply tests good tubes "good" and bad tubes "bad." This radically new tester will check tubes under dynamic conditions very closely simulating the manner in which they would function in a receiver or amplifier. It is a tube tester we are proud of. It is a tube tester which we claim will compare favorably with laboratory instruments selling for double the price.

And about Transistors. We doubt that the Transistor will ever wholly replace the Vacuum tube. Unquestionably, however, the present already substantial rate of production and use of Transistors will be very greatly increased in the near future.

The Model TV-12 will test *all* Transistors produced to date and provision has been made for testing the new Transistor types known to be designed but not yet in production.

SPECIFICATIONS

TESTING TUBES

- TESTS ALL TUBES including 4, 5, 6, 7, Octal, Lock-In, Hearing-Aid, Thyratrons, Miniatures, Sub-Miniatures, Noval, Sub-Minar and Proximity Fuse types.
- Employs improved TRANS-CONDUCTANCE circuit. An in-phase signal is impressed on the input section of a tube and the resultant plate current change is measured. This provides the most suitable method of simulating the manner in which tubes actually operate in Radio & TV receivers, amplifiers and other circuits. Amplification factor, plate resistance and cathode emission are all correlated in one meter reading. Although the Model TV-12 is not calibrated to provide mutual-conductance reading (MHO'S), the Engineer or Technician who needs that information may easily compute it with calibrations we supply.
- NEW IMPROVED ROLL CHART MECHANISM uses a combination of fibre and brass gears to eliminate back-lash and slippage.
- NEW LINE VOLTAGE ADJUSTING SYSTEM. A tapped transformer makes it possible to compensate for line voltage variations to a tolerance of better than 2%.
- SAFETY BUTTON — protects both the tube under test and the instrument meter against damage due to overload or other form of improper switching.
- This model retains the INDIVIDUAL ELEMENT IDENTIFYING SYSTEM developed by Superior in 1945. All elemental switches are numbered according to RMA pin number designations. This procedure enables the operator to instantly identify the particular element being tested.
- NEWLY DESIGNED FIVE POSITION LEVER SWITCH ASSEMBLY. Previously because of switch limitations, the same voltage was applied to the plate and grid. Extra position and unique design of new switch permits application of *separate* voltages as required for both plate and grid of tube under test, resulting in improved Trans-Conductance circuit.

TESTING TRANSISTORS

Although Transistors may be tested for forward and inverse action with an Ohmmeter, such procedure will not identify an *inefficient* transistor. Also, if the ohmmeter uses a high-internal battery voltage, the transistor will likely be damaged. A transistor can be safely and adequately tested only under dynamic conditions. The Model TV-12 will test all transistors in that approved manner, and quality is read directly on a special "transistor only" meter scale.

The Model TV-12 will accommodate *all* transistors including NPN's, PNP's, Photo and Tetrodes, whether made of Germanium or Silicon, either point contact or junction contact types.

Model TV-12 housed in handsome rugged portable cabinet sells for only **$72.50**

SHIPPED ON APPROVAL

NO MONEY WITH ORDER — NO C.O.D.

Try it for 10 days before you buy. If completely satisfied *then* send $22.50 and pay balance at rate of $10 per month for 5 months. **No Interest or Finance Charges Added!** If not completely satisfied return unit to us, no explanation necessary.

MOSS ELECTRONIC DISTRIBUTING CO., INC.
Dept. D-184, 3849 Tenth Ave., New York 34, N.Y.

Please rush one Model TV-12. I agree to pay $22.50 within 10 days and to pay $10 per month for 5 months. It is understood there will be no finance, interest or any other charges, provided I send my monthly payments when due. It is further understood that should I fail to make payment when due, the full unpaid balance shall become immediately due and payable.

Name .....

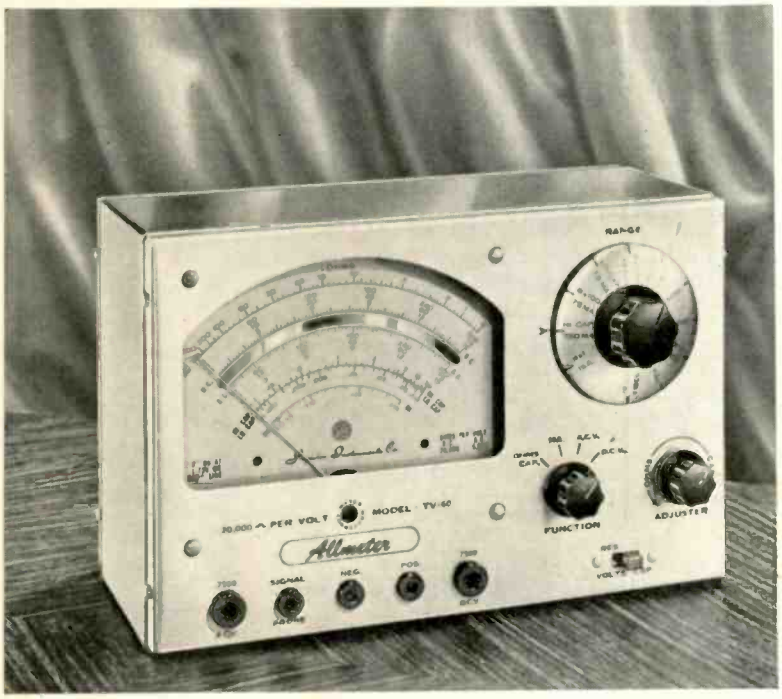
Address .....

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

Superior's New Model TV-60

ALLMETER

The most complete all-purpose 20,000 Ohms per Volt Multimeter ever designed!



FEATURES

- Giant *recessed* 6½ inch 40 Microampere meter with *mirrored* scale assures accuracy and easy-reading. All calibrations are printed in large easy-to-read type. Fractional divisions are easily read with the aid of the mirrored scale.
- The line cord, used only when making Capacity measurements, need be plugged in only when using that service. It is out of the way, stored in its pliofilm compartment at all other times.
- A built-in Isolation Transformer automatically isolates the Model TV-60 from the power line when the capacity service is in use.
- Selected, 1% zero temperature coefficient metalized resistors are used as multipliers assuring *unchanging* accurate readings on all ranges.
- Use of the latest type of *printed circuit* guarantees maintenance of top quality standard in the production runs of this precise instrument.
- A new *improved* type of high-voltage probe is used for the measurement of high voltages up to 30,000 Volts. This service will be required when servicing color TV receivers.
- Simply plug-in the R.F probe and convert the Model TV-60 into an efficient R.F. SIGNAL TRACER permitting the measurement of stage-gain and cause of trouble in the R.F. and I.F. circuits of A.M., F.M., and TV receivers.
- Plug in the Audio probe and convert the Model TV-60 into an efficient AUDIO SIGNAL TRACER. Measure the signal levels and comparative efficiency of hearing-aids, public-address systems, the amplifier sections of Radio & TV receivers etc.
- A sensitive, accurate Volt-Ohm-Milliammeter with *giant* meter and *mirrored* scale.
- An accurate direct-reading Capacity meter.
- A Kilovoltmeter.
- An R. F. Signal Tracer.
- An Audio Signal Tracer.

SPECIFICATIONS

8 D.C. VOLTAGE RANGES: (At a sensitivity of 20,000 Ohms per Volt) 0 to 15/75/150/300/750/1500/7500/30,000 Volts.

7 A.C. VOLTAGE RANGES: (At a sensitivity of 5,000 Ohms per Volt) 0 to 15/75/150/300/750/1500/7500 Volts.

3 RESISTANCE RANGES:
0 to 2,000/200,000 Ohms, 0-20 Megohms

2 CAPACITY RANGES:
.00025 Mfd. to .3 Mfd., .05 Mfd. to 30 Mfd.

5 D.C. CURRENT RANGES:
0-75 Microamperes, 0 to 7.5/75/750 Milliamperes, 0 to 15 Amperes

3 DECIBEL RANGES:
— 6 db to + 18 db
+ 14 db to + 38 db
+ 34 db to + 58 db

R. F. SIGNAL TRACER SERVICE:
Enables following the R.F. signal from the antenna to speaker of any radio or TV receiver and using that signal as a basis of measurement to first isolate the faulty stage and finally the component or circuit condition causing the trouble.

AUDIO SIGNAL TRACER SERVICE:
Functions in the same manner as the R.F. Signal Tracing service specified above except that it is used for the location of cause of trouble in all audio and amplifier systems.

Model TV-60 comes complete with book of instructions; pair of standard test leads; high-voltage probe; detachable line cord; R.F. Signal Tracer Probe and Audio Signal Tracer Probe. Pliafilm bag for all above accessories is also included. Price complete. Nothing else to buy. Only **$52.50**

SHIPPED ON APPROVAL
NO MONEY WITH ORDER — NO C.O.D.

Try it for 10 days before you buy. If completely satisfied *then* send $12.50 and pay balance at rate of $8.00 per month for 5 months. **No Interest or Finance Charges Added!** If not completely satisfied return unit to us, no explanation necessary.

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Name _____

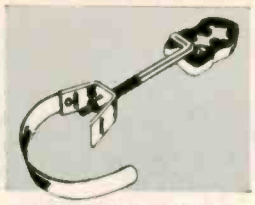
Address _____

City _____ Zone _____ State _____

TELCO E-Z "SWING IN" STAND-OFF

Wood screw type, 3½"; UHF-VHF

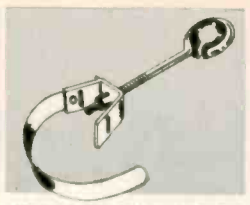
No. EZ-8027 $4.80 / C



TELCO E-Z "KANT-STRIP" STAND-OFF

"Swing In" type; 3½", 9" strap

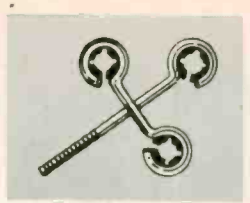
No. EZ-8253 $0.13



TELCO "KANT-STRIP" STAND-OFF

Round insulator, 3½" 9" strap

No. 8253 NET $0.11



TELCO 3-WAY STAND-OFF

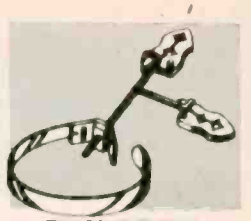
For 3-line use; 7½" wood screw

No. 8397 NET $0.21

TELCO NUT-TYPE STAND-OFF

Welded 10-23 nut, 3½", 9" strap.

No. 8253-N $0.12



TELCO E-Z NUT-TYPE STAND-OFF

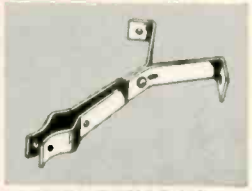
Tougher, inline duplex, 7½", 9" strap.

No. EZ-8258-N $0.24

TELCO CHIMNEY QUICK MOUNT

Easy to install; complete

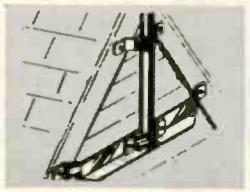
No. 8005 NET $1.35



TELCO SNAP-IN CHIMNEY MOUNT

Fits masts to 1¾", complete.

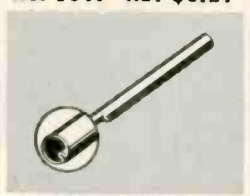
No. 8610 NET $1.71



TELCO PEAK MOUNT

Masts to 1¾", 30" lower support

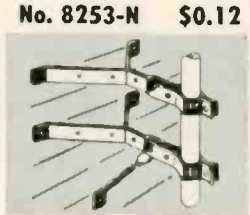
No. 8625 NET $2.37



TELCO GALVANIZED ANTENNA MASTS

1¼" OD x 5' crimped end

No. 9013 NET $0.78



TELCO DELUXE SNAP-IN WALL MOUNT

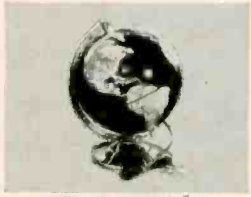
Extra sturdy, 12" clearance

No. 8312 NET $2.10

TELCO UNIVERSAL LIGHTNING ARRESTOR

Easy to install; UL approved

No. 8642 NET $0.75



TELCO UHF-VHF GLOBE-TENNA

Handsome 12" globe plus built-in antenna

No. A-9265 $12.95

Ask For These

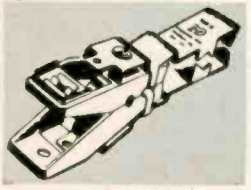
TELCO SERVICE AIDS

...at Your Jobber

TELCO UHF-VHF LIGHTNING ARRESTOR

Universal type, UL approved

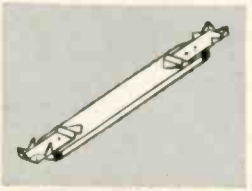
No. 9242 NET $0.42



TELCO 3-WAY TV LINE KLIP

For straight side or plug-in

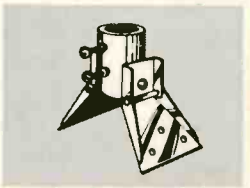
No. 9015 NET $0.12



TELCO LOW-LOSS LINE KLIP

All one piece, plastic, metal ends

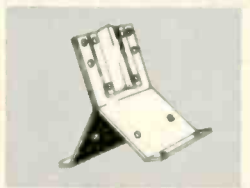
No. 9055 NET $0.15



TELCO HINGED TYPE RIDGE MOUNT

Fits masts to 1½" assembled

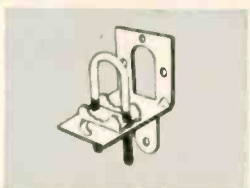
No. 9021 NET $1.17



TELCO ALL-PURPOSE MAST BRACKET

Fits masts to 1¾" use every where

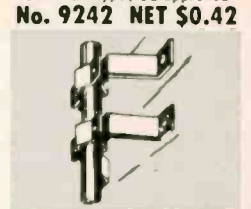
No. 8575 NET $1.65



TELCO MAST HANDY MOUNT

For masts to 1½", extra support

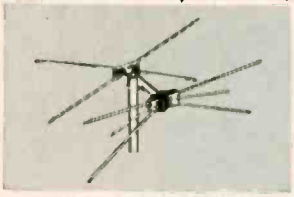
No. 8800-U $0.33



TELCO SPECIAL WALL MOUNT

For close-in (4") mounting.

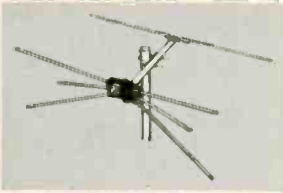
No. 9241 NET $0.45



TELCO MASTER-LINE VHF CONICAL ANTENNA

Single bay, 10 element; all-channel

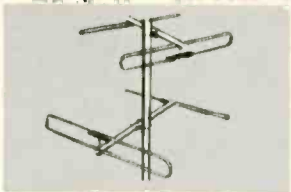
No. A-8700 $4.20



TELCO RANGER COLOR CONICAL ANTENNA

Single bay, 8 element, VHF-UHF

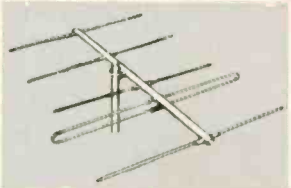
No. A-110 NET $3.45



TELCO HI-LOW DIPOLE ANTENNA

VHF, covers channels 2 to 13.

No. A-250 NET $4.41

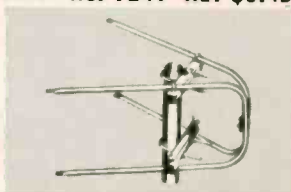


TELCO 5 ELEMENT VHF YAGI ANTENNA

12 models, custom cut to each.

No. A-302 Ch. 2 **$7.35**

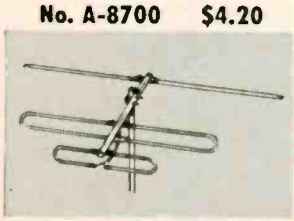
No. A-313 Ch. 13 **4.35**



TELCO UHF-VHF DOUBLE V ANTENNA

Covers channels 2 through 83.

No. A-9017 $3.15



TELCO VHF INLINE ANTENNA

Channels 2-13, ½" seamless elements.

No. A-9046 NET $5.97

TELCO INDOOR UHF-VHF ANTENNA

DeLuxe brass, nickel-plated elements.

No. A-8160-TP $2.97

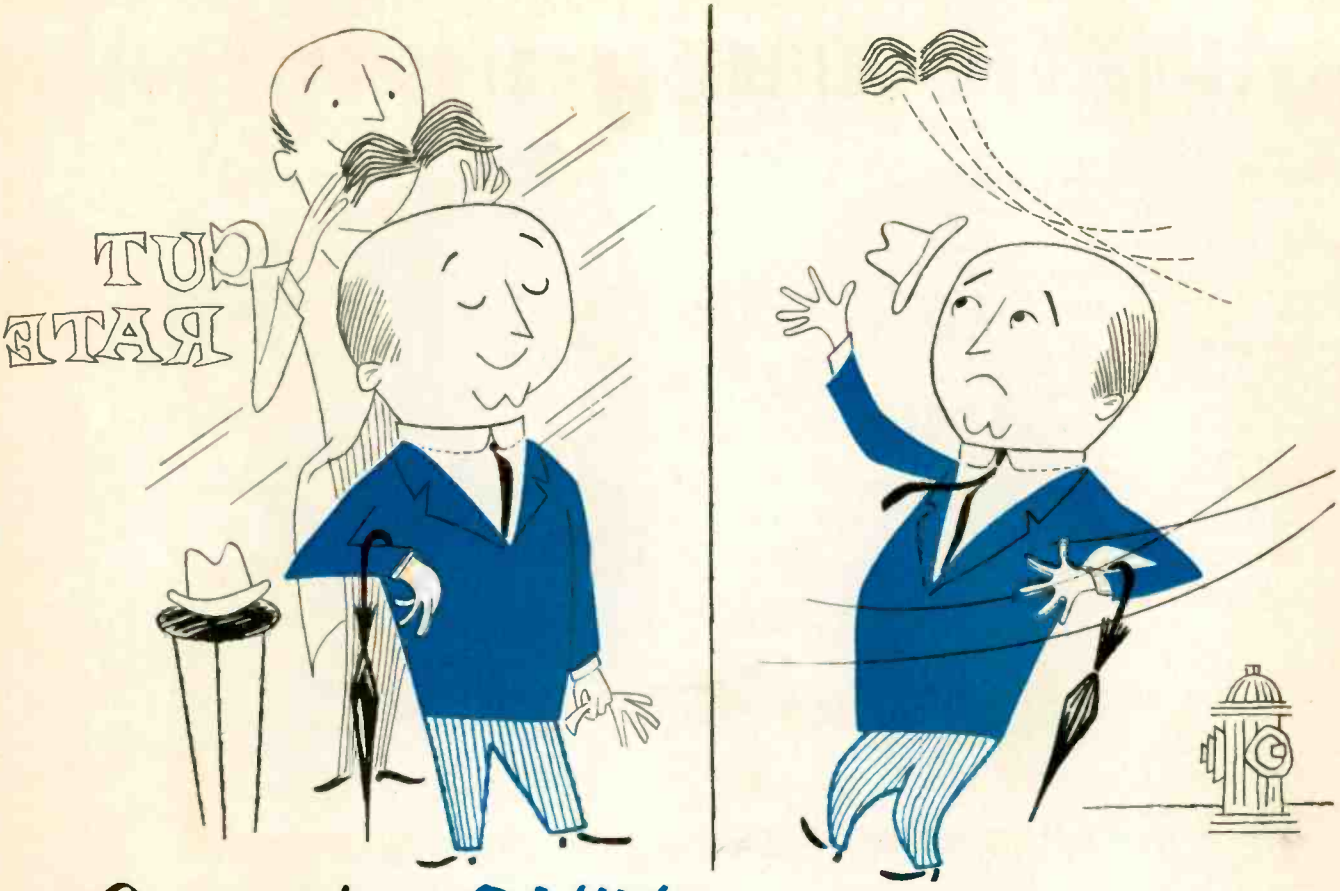
FREE!

Your copy of the complete, illustrated TELCO Catalog. Send postcard today.

TELCO

TELEVISION HARDWARE MFG. CO.

Division of General Cement Mfg. Co. 902 TAYLOR AVENUE • ROCKFORD, ILLINOIS



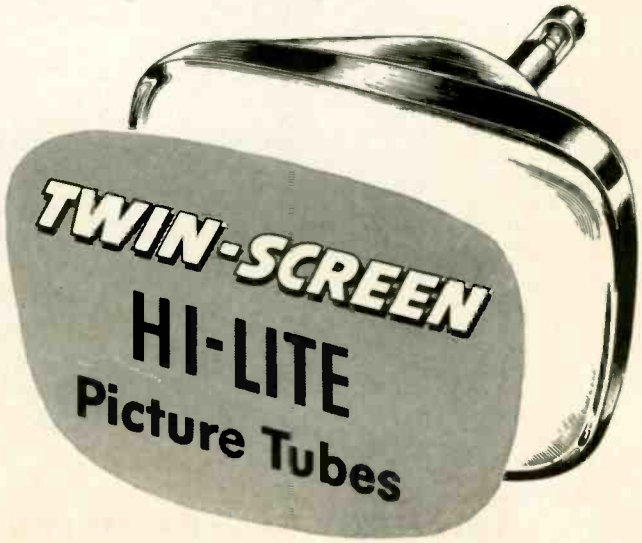
Consider ONLY a

PERFECT REPLACEMENT

when original quality disappears

When the *original* goes, the substitute should be a *Perfect Replacement*. Ordinarily there is only one perfect replacement—something that looks and works as good as the original when new—*or better*. When the original picture tube goes, the *perfect* replacement is a Du Mont Twin-Screen Hi-Lite* The set will sparkle with new picture life . . . you'll have "new set" quality—*or better*. A Du Mont Twin-Screen Hi-Lite picture tube *replaces* age with "like new" performance.

**the ultimate in aluminized picture tubes.*



DU MONT®

CATHODE-RAY TUBE DIVISION, ALLEN B. DU MONT LABORATORIES, INC., CLIFTON, N. J.

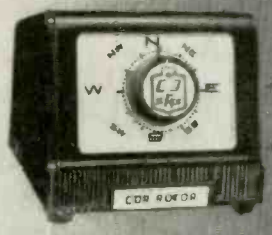
setting new selling records everywhere

C·D·R TV antenna ROTORS

the COMPLETE line
A Model for Every Need

AR-1

The completely AUTOMATIC rotor, powerful and dependable, with a modern design cabinet. Uses 4 wire cable.



AR-2

Completely AUTOMATIC rotor with thrust bearing. Handsome cabinet, uses 4 wire cable.

AR-22

Here is the completely AUTOMATIC version of the famous TR-2 with all the powerful features that made it so famous.

TR-2

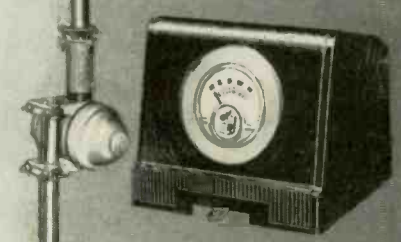
The heavy-duty rotor with plastic cabinet featuring "compass control" illuminated perfect pattern dial. Uses 8 wire cable.

TR-4

The heavy-duty rotor complete with modern cabinet with METER control dial. Uses 4 wire cable.

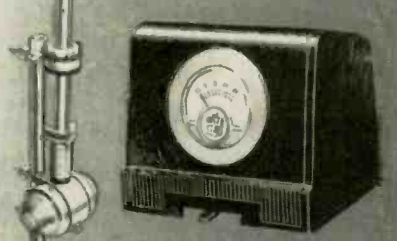
TR-11

The ideal budget all-purpose rotor with new, modern cabinet featuring meter control dial. Uses 4 wire cable.



TR-12

A special combination value consisting of complete rotor with thrust bearing Handsome modern cabinet with meter control dial uses 4 wire cable.

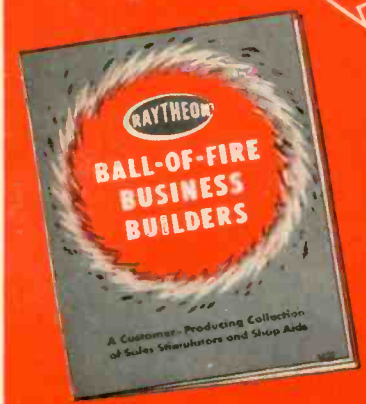


CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

THE RADIART CORP.
CLEVELAND 13, OHIO

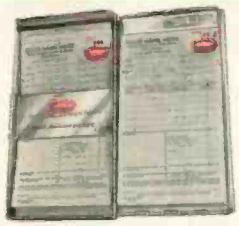
SERVICE DEALERS:

ask your RAYTHEON Tube Distributor for these wonderful sales helps...



Tube and Tool Carrying Cases
Two sizes — hold both tubes and repair tools

Cardboard Cutout Trucks
With your name — give them to the children



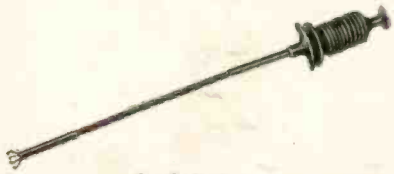
Aluminum Snap-Out-Form Pocket Case
Protects forms, looks businesslike

Triplicate Invoice Sets
Provides 3 copies of each bill

14-Point Check-Up Card
Hang on set to show adjustments made

Drop Cloth
To show customers you care

Illuminated Outdoor Sign
A real traffic stopper



Go-Getter
Picks up small parts where hands can't reach

Window Streamer
Sells check-up service

Window Displays
To sell your service to passersby

You ain't seen nuthin', until you see the sensational collection of sales and shop aids in the new Raytheon BALL-OF-FIRE BUSINESS BUILDERS booklet. Pictured are a few of the new additions to Raytheon's already famous collection of tried and tested promotion items. For years, Service Dealers from coast-to-coast have been relying on Raytheon sales aids to help them get more than their share of business, using Raytheon Shop Aids to help them work more efficiently, and effectively.

Many items are free, the rest are 'way below normal cost. Ask your Raytheon Tube Distributor for a free copy of the new Raytheon Booklet or write to Department C, Raytheon Manufacturing Company, Receiving and Cathode Ray Tube Operations, Newton 58, Mass.

RAYTHEON MANUFACTURING COMPANY
Receiving and Cathode Ray Tube Operations
Newton, Mass. • Chicago • 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

LETTERS
To the Editors

"Old Sol"

EDITORS, TECHNICIAN:

With reference to your article on sun spots (Sept. 1955), this is a very important item to the servicemen of this area. We have channel 2 here, and already have experienced the effects of "Old Sol." Thank you for giving me information on this subject.

Have you ever tried to explain to the lady of the house, who knows nothing about TV, how the sun is causing the interference on her set? Or the fellow who thinks all technicians are crooks? This really poses a problem.

C. L. MASSA
Capital Television Service
Houston, Texas

• *Some techs carry around the issue with the sun spot article, and show it to the lady of the house. She can't understand it, but may be satisfied with the authoritative treatment of the subject in the trade magazine . . . at least satisfied enough to get out of your hair.—Ed.*

Business Practices

EDITORS, TECHNICIAN:

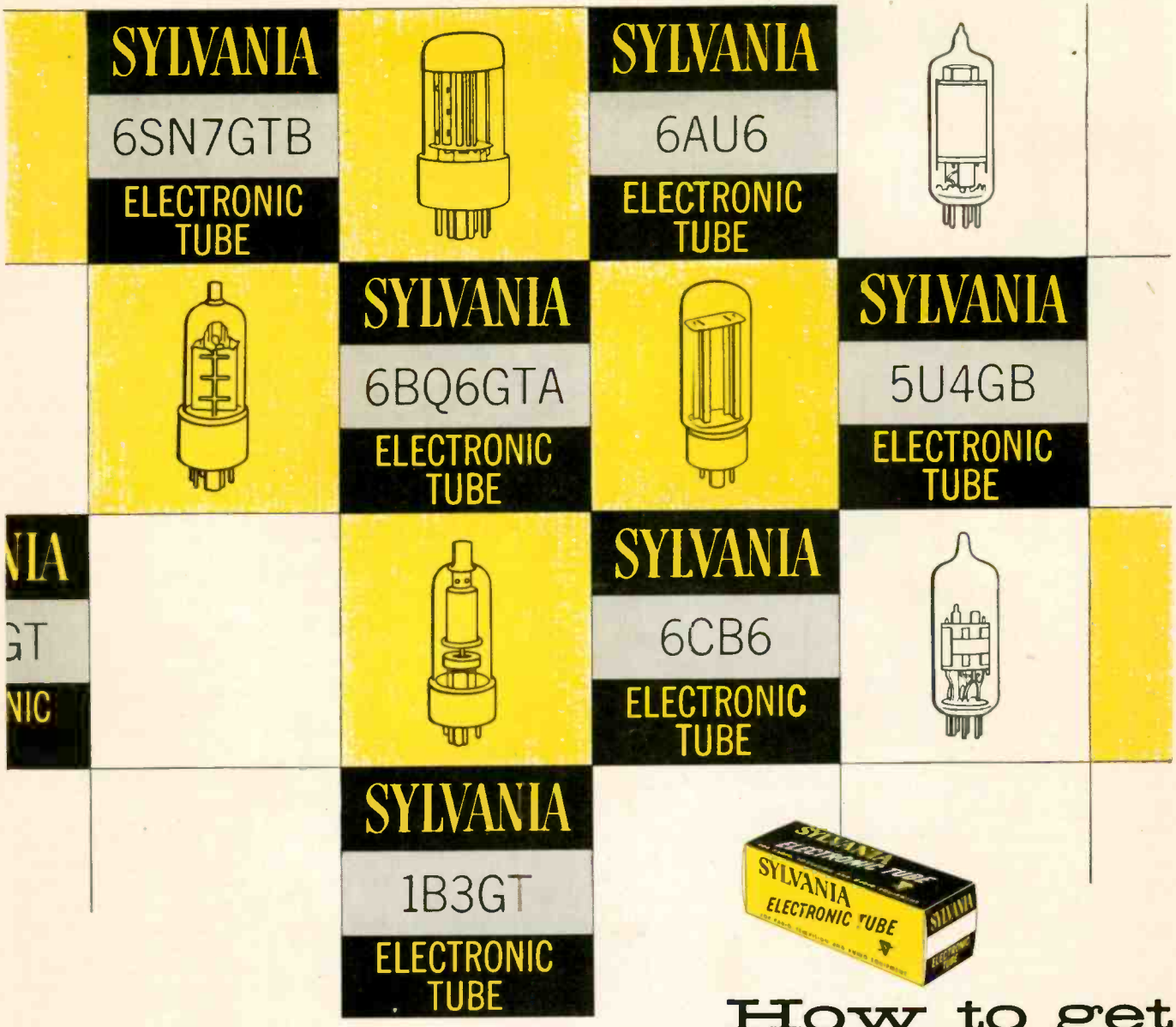
"How much local TV servicing is being done by part-time technicians, students and amateurs?" The problem doesn't concern itself primarily with competition, but rather with the business practices involved. It is difficult for the layman to comprehend the difference in the charges for a simple repair job performed by the part-timer and the full-time shop.

For example, a chassis pulled to the part-timer's home which requires a 0.05 μf condenser represents a total expenditure of 20¢ for material and possibly an hour of his spare time. What should he charge? Occasionally the customer is a friend, and accommodating him is sufficient reward. Since electronics is often his hobby, the part-timer is prone to discount the value of his knowledge. And overhead practically doesn't exist. So uppermost is the thought that everything above 20¢ is clear profit.

Now take the full-time shop with its crew of well paid employees, trucks, rent, insurance, etc. Now that the condenser has been replaced, can the set be returned? You're darned right it can't! Every one of those *little* defects must be corrected. Hasn't the set been to the shop? These little jobs are being performed almost every day in every shop. To legitimately cover costs and to show a profit, it is necessary to charge from $12 to $18 plus parts.

The part-timer doesn't have to contend with this problem because the customer is usually satisfied that operation of the set has been restored, and the fee was pleasantly low.

(*Continued on page 14*)



How to get the jump on call-backs in 6 easy moves

Here are six tube types called for most in your daily service work. Eliminate the call-backs from these types and your biggest share of headaches is over. It's easy to do just that, too, simply by getting into the habit of using only Sylvania tubes . . . in the familiar yellow and black carton.

These 6 types alone incorporate over 14 design and production improvements to eliminate the most common causes for "quick failures" and costly call-backs. It's no wonder more and more servicemen consider the yellow and black carton their "calling card of top quality service."

SYLVANIA®

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

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

(*Continued from page 12*)

Also, part-timers often get the quick repairs, and the "dogs" go to the full-time shop, increasing the average cost of repairs in the regular shop. Unfortunately, this has been the basis for many charges of unethical practices against full-time shops.

MURRAY BARLOW
PRESIDENT
Radio & TV Guild of Long Island
Bethpage, N.Y.

• *See this month's editorial for amount of servicing business done by part-timers and full-time shops.—Ed.*

Color Schedule

EDITORS, TECHNICIAN:

It's nice of you to publish a list of the coming color TV programs (Tuning in the Picture). Trouble is the magazine gets here well after the first of the month. Can you publish it two months ahead?

HOWARD RABE
Rabe Electric Shop
Fremont, Nebraska

• *Not yet. The TV networks tell us they can't firm down their plans too far in advance now. As color programming becomes more firmly established, we hope they will.—Ed.*

UnHappy Frequencies

EDITORS, TECHNICIAN:

The adversity of both manufacturers and TV networks against UHF television is a pet peeve. As one who has been in the service business since TV started, I can state that there are no better pictures than on UHF. Antennas are simple, ghosts are rare.

As an example, the local UHF station carries certain sporting events. The network will pull a special sporting program off this station and place it on the VHF station for no good reason, indicating that UHF is just a secondary medium.

I propose that the networks should keep their programs on UHF stations, and in no city where UHF can be authorized should anyone be able to purchase a VHF-only set.

CHARLES R. MADUELL, JR.
PRESIDENT
Delta Electronics
New Orleans, La.

Payment Plans

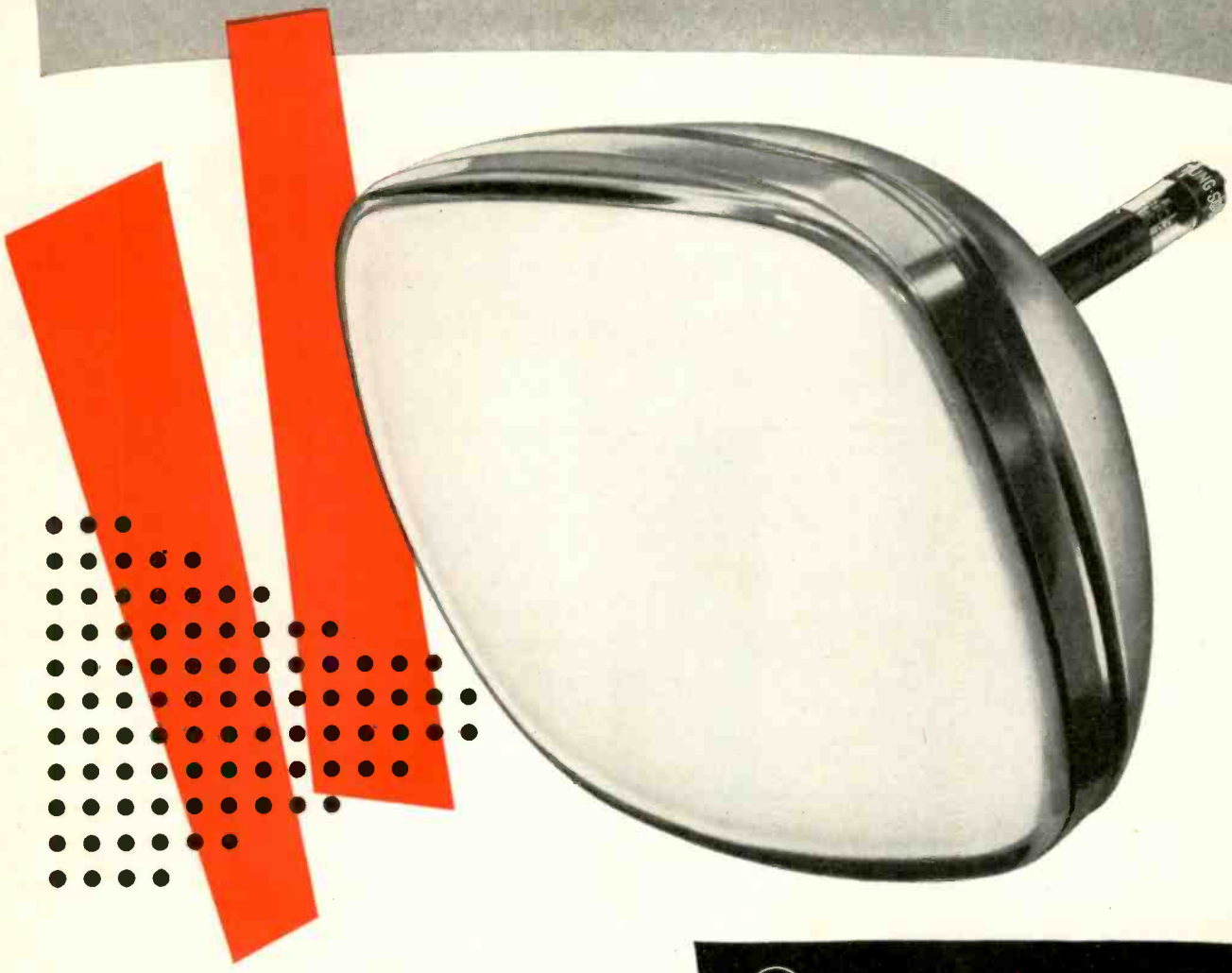
EDITORS, TECHNICIAN:

In your Sept. 1955 issue (Tuning in the Picture), you write about a payment plan on test equipment being tried out by Sylvania as though this were something new. Precision Apparatus Co. has had a similar payment plan for so many years that I can't check back to see when it started.

MORRIS F. TAYLOR
Silver Spring, Md.

• *Precision's time-payment plan started around 1935, and is still in effect, allowing up to 12 monthly payments on an instrument.—Ed.*

Captures *all* the Picture . . . every tone . . . every detail . . . brilliantly!



A picture of unsurpassed realism—every tone, every detail brilliantly portrayed . . . that's what you see when you view television created by the Tung-Sol Magic Mirror Aluminized Picture Tube.

Because the Magic Mirror brings into play a much wider range of intermediate tones, every detail is caught. The new depth, sharper contrast and lively, life-like sparkle you see make ordinary pictures seem faded and flat.

Hundreds of exacting tests from raw materials to finished tubes—plus a constant vigil of quality control during the entire manufacture—guarantee the uniformly superior performance of the Magic Mirror Aluminized Picture Tube.

When you're replacing picture tubes, make sure you install this finer Magic Mirror Aluminized Picture Tube. Ask your Tung-Sol supplier for details about the big new promotion program that will make Magic Mirror one of your biggest selling items.

TUNG-SOL®

MAGIC MIRROR ALUMINIZED PICTURE TUBES

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

Sales Offices: Atlanta, Chicago, Columbus, Culver City, Dallas, Denver, Detroit, Newark, Seattle.

Miniature Lamps

Sealed Beam Headlamps

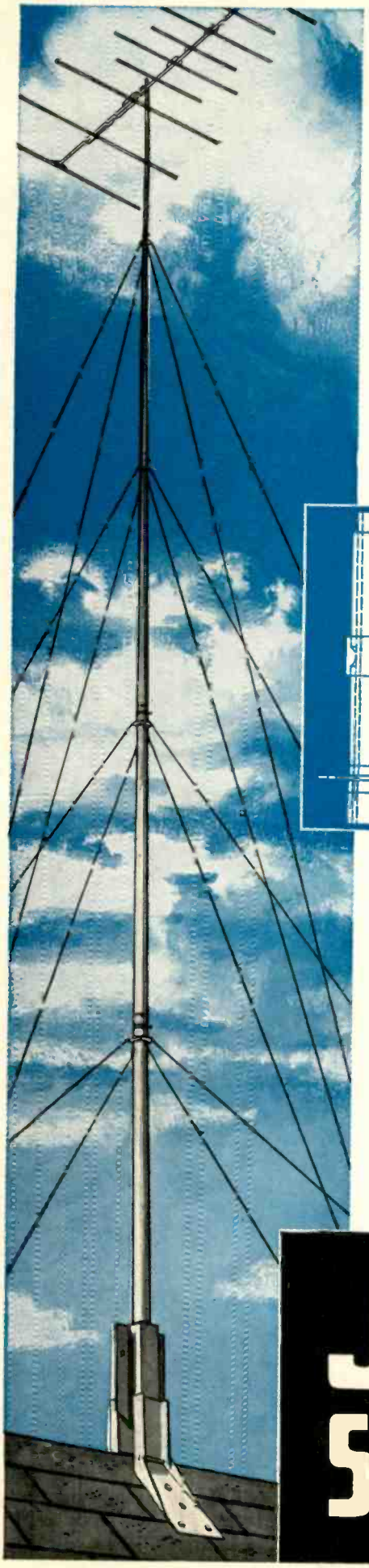
Signal Flashers

Radio And TV Tubes

Aluminized Picture Tubes

Special Purpose Tubes

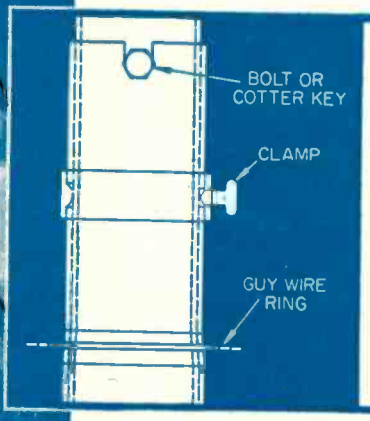
Semiconductors



New concept in telescoping TV masting ... utilizes J & L Perma-Tube

REDUCE YOUR TV MAST COST OVER 20%

Use high-strength, corrosion-proof J & L Perma-Tube 10-foot telescoping sections to easily construct 30 to 50-foot masts



Only J&L Telescoping Perma-Tube offers:

- **Joint design which provides instant field assembly**
- **Machine-fitted joints that insure close tolerance for high strength and rigidity**
- **Guy wire ring position that eliminates all binding and guy wire interference**

No longer is it necessary to buy expensive, ready-made masts. Now you can "tailor-make" your own with standard 10-foot lengths of 16-gage J&L Perma-Tube—and save money.

It's available in cartons from your local distributor in five diameters. The largest base section OD is 2¼ inches and each telescoping section is ¼-inch smaller, the smallest section having an OD of 1¼ inches.

J&L Perma-Tube in the 1¼-inch size can be used interchangeably as a fitted-joint section for smaller masts or as the smallest and topmost piece of longer telescoping masts.

Corrosion-proof J&L Perma-Tube is treated with Vinsynite—then coated both inside and outside with a metallic vinyl resin base. It successfully passes ASTM's 500-hour-minimum salt spray test—which guarantees Perma-Tube's longer life on the job.

Sturdy J&L Perma-Tube is made of a special, high-strength, J&L-produced steel. A 10-foot section of 1¼-inch diameter by 16 gage can support a weight at its center point of 200 pounds with a minimum of deflection and permanent set.

Order these new telescoping sections along with your regular 1¼-inch J&L Perma-Tube. Hardware—cotter keys or bolts, clamps and guy rings—may also be secured from your local distributor. For more information write J&L direct.

J&L STEEL

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

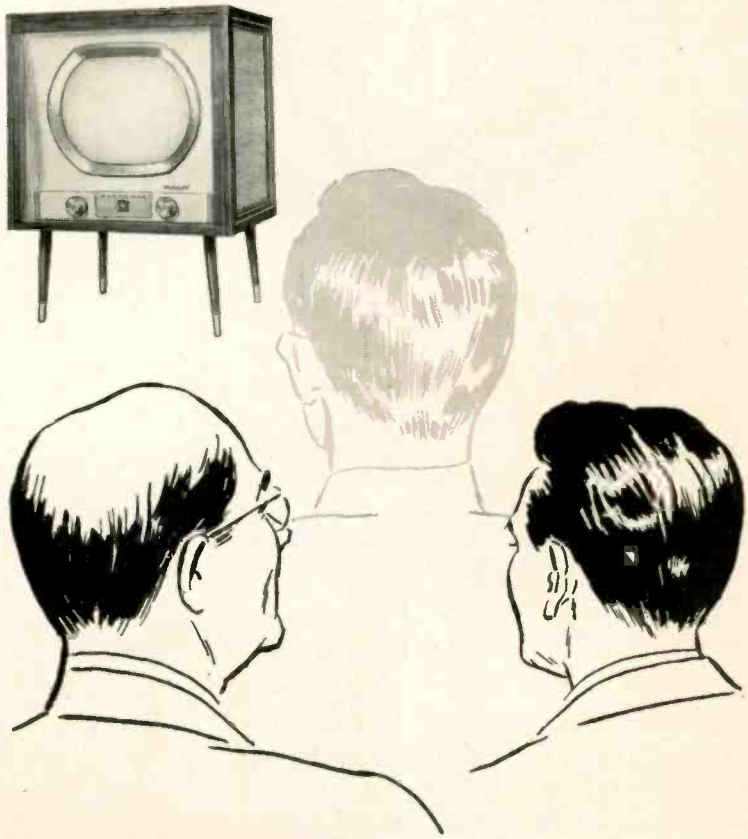
You're backed by the most experienced color technicians in your area when you handle

Motorola® Color TV

Since Motorola pioneered the first Big Screen Color TV, over a year ago, our engineers have made many new important color improvements. These have been built into our sets—and Motorola distributor technicians have been brought up to date on them immediately.

So, your Motorola distributor's technicians not only have longer practical experience with Big Screen Color TV than any other such group in your area—they are factory trained in the most up-to-the-second Color TV improvements and techniques besides. And all that know-how is available to you, any time you need help!

This is another example of how Motorola works with you. Why not get together with your Motorola distributor and the brand that's a leader in Big Screen Color TV.



MOTOROLA

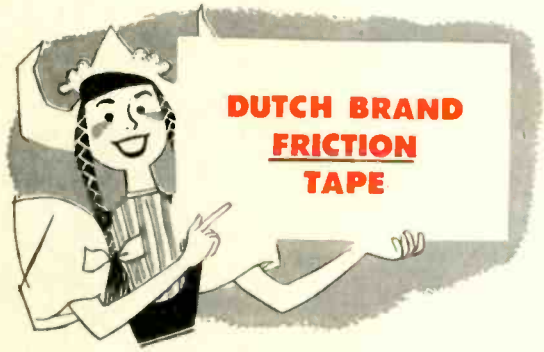
World's Largest Exclusive Electronics Manufacturer

DUTCH BRAND TAPE

3 sure ways to perfect insulation...

Outstanding quality! Dielectric strength exceeds 1000 volts per mil of thickness. Conforms to irregular surfaces; wraps neat and smooth for applications where space is limited. Available in widths, lengths and assortments of packaging to fit every need.

The perfect splicing compound. Stretches readily, fuses perfectly, resists up to 18,000 volts through a single thickness and contains no corrosive chemicals. The favorite of master electricians.



Resists up to 2000 volts through a single thickness. Strong, tears straight, free of pin-holes, always uniform. Also available in a variety of widths and in packaging assortments that assure real convenience and savings. The favorite for many years ... Dutch Brand "sticks and stays stuck."

Whatever your insulation requirements, there is a Dutch Brand Tape that will do the job best.

Order from your electrical wholesaler

Johns-Manville
DUTCH BRAND
PRODUCTS
7800 WOODLAWN AVENUE • CHICAGO 19, ILL.

Editor's Memo

The Lord High Executioner in Gilbert and Sullivan's amusing satire *The Mikado* sings a number called, "I've Got a Little List." It starts off something like this:

"As someday it may happen that a victim must be found, I've got a little list of society offenders who might well be underground, and who never would be missed."

The executioner then proceeds to name the people on his list. They include:

". . . people who eat peppermint and puff it in your face . . ."

". . . funny fellows, comic men and clowns in private life . . ."

Yep, they'd none of them be missed. I must confess that I too "have a little list." I wouldn't be at all surprised to find that a lot of people have.

Here are some of the people on my list:

—Jobbers who sell parts wholesale to the public.

—Techs who cut the price for servicing below reasonable levels.

—Customers who think every tech is out to gyp them.

—Receiving tube reprocessors.

—Publishers who neglect to police questionable tube ads.

—Techs who belittle the efforts of hard working service association officers.

—Manufacturers who cut equipment designs below reasonable standards.

—Non-professionals and would-be techs who butcher sets.

—Judges who always give the consumer the benefit of the doubt in a suit over a bill.

—Manufacturers who don't carry out their warranties efficiently.

—Newspapermen who sensationalize every small news item putting the tech in a bad light.

—Techs who dress sloppily, keep their shops sloppy, and act similarly to decent customers.

I could go on and on with this list of of characters "who never would be missed." In all fairness, however, it should be mentioned that I have another list—a list of people who are a pleasure to know, personally as well as in business. To mention just a few:

—Hard-working techs doing a good job at a fair price, supporting worthwhile industry activities, and keeping alert for new technical developments and business opportunities.

—Manufacturers who help the small shop owner promote his business, boost the servicing industry's prestige in the public eye, and design and market products with the technician in mind.

—Jobbers who really cater to the service tech, and carry him along in time of financial stress.

These are the backbone of our industry, and they well deserve our gratitude and support.

Al Forman

. . . world's most beautiful, most advanced antenna rotator

Thompson Products

Automatic Superotor.

The only completely *silent* automatic antenna rotator on the market today! New electronic VP* Tuning permits peak performance for Fringe, UHF and Color!

*Vernier Precision

Consistent National Advertising and Factory-Planned Local Promotion, plus the use of the Dealer Aids Listed Below, will Guarantee Volume Superotor Sales in Your Area.

FULL-COLOR MOVIES

Be the first in your area with these 1-minute movie spots. Take advantage of full-size theater screens, captive audiences! Biggest bargain in advertising today! Learn how you can qualify.

POWERFUL RADIO SPOTS

Recorded radio spots to cover your entire area. We'll help you to make all the arrangements!

HARD-HITTING DIRECT MAIL

Colorful new consumer folders which tell the entire Superotor story. Tops for pre-selling your potential customers. Available in quantity.

EYE-CATCHING TELEVISION SPOTS

Now you can pre-sell prospects *right in their homes!* 20-second demonstrations that will reach all the TV owners in your area!

DYNAMIC NEWSPAPER ADS

Big ads — small ads — any size that you need! Establish your store as Superotor headquarters! Real eye-catching ads that keep the Superotor name in the public's mind!

POINT-OF-SALE DISPLAYS

Create consumer interest at the point of purchase right where he can ask questions and buy! Bright, attention-getting window and wall banners, demonstrator displays.

Call or Write Today for Complete Information

OTHER THOMPSON PRODUCTS ELECTRONIC AFFILIATES
• *Bell Sound Systems* • *Dage Television* • *Ramo-Waaldridge Corp.* • *Pacific Semi-Conductars, Inc.*

ELECTRONICS DIVISION
Thompson Products, Inc.

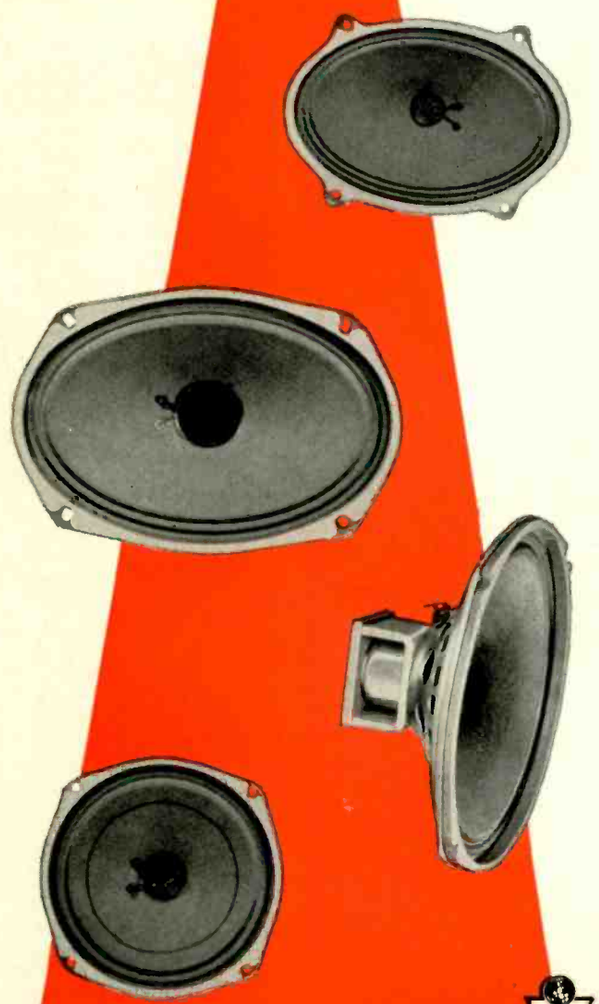
2196 CLARKWOOD ROAD • CLEVELAND 3, OHIO

Available in Canada thru Atlas Radio Corp., Ltd., 50 Wingold Avenue, Toronto

from DELCO RADIO...

One of the Largest Makers of High Quality

SPEAKERS



for Home and Auto Radios, Phonographs and Television

Product of combined Delco Radio and General Motors engineering skills, manufactured in plants devoted exclusively to electronic parts, the Delco speaker line embraces 14 standard models for home and auto radios, phonographs, and television—plus the model 8007, a superior Hi-Fi dual-purpose speaker for replacement in AM, FM, TV and phonograph sets, and for use with custom-built high-fidelity audio systems. It's plain to see that here's the speaker line to fill your needs...products of uniformly fine design and construction, *all* of them competitively priced!

Standard Speaker Features: Designed and built to R.E.T.M.A. standards; cones uniform in response over operating frequency range; fully dustproofed with drawn brass magnet covers and felted cones; Alnico-V magnets; heavily plated metal parts.

Model 8007 Hi-Fi Speaker Features: Size 8"; 50 to 12,500 CPS frequency range; Alnico-V magnet; 10-watt power rating; 4.1 input impedance; 1 3/16" voice coil.

DELCO RADIO

DIVISION OF GENERAL MOTORS, KOKOMO, INDIANA

A GENERAL MOTORS PRODUCT — A UNITED MOTORS LINE

DISTRIBUTED BY ELECTRONICS DISTRIBUTORS EVERYWHERE

Order these quality products of a volume electronics manufacturer through your UMS Electronic Parts Distributor today.

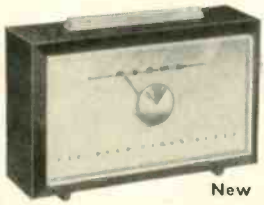
a ALLIANCE TENNA-ROTOR a beats the biggest drum!

30,000,000 TV VIEWERS

week after week

New

MODEL U-98 — fully automatic — incorporates 32 distinct improvements—eliminates all arcing and consequent picture distortion—points directly, positively, instantly to target station—"*just set it and forget it*"! . . . . . List Price, **$39.95**



New

MODEL T-12—fingertip electrical operation. Rocker switch on top controls turning. Has direction indicator dial. Compact and smartly styled. Highly accurate! . . . . . List Price, **$29.95**

You can't miss with the "leader"!

Seven years of continuous TV advertising pays off!

Millions *know* about Alliance . . . more *users* have Alliance Tenna-Rotor.

Millions of sales impressions in hundreds of TV markets week after week—year after year—give you the solid backing that no other TV accessory has even approached!

Nearly two million Alliance Tenna-Rotors are in use!

The

ALLIANCE MANUFACTURING COMPANY, INC.

Alliance, Ohio

Never before—an antenna with such utterly . . .

Fantastic front-to-back ratios

Low Band: from **20:1** to **50:1** relative VOLTAGE
(2500:1 relative *power*)

High Band: up to **13:1** relative VOLTAGE
(169:1 relative *power*)

"Super-sembled" — with Channel Master's trigger-fast Snap-Lock Action.

CHANNEL MASTER'S new "K.O." all-channel antenna

Knocks out venetian blinds and co-channel interference!

Channel Master's new "K.O." has the highest front-to-back ratios ever recorded for any TV antenna! The sensational "K.O." actually sets up an INVISIBLE BARRIER to signals coming in from the rear. Working with supreme efficiency on both VHF bands, it totally REJECTS rear signals, preventing venetian blinds and other picture problems caused by co-channel interference.

Spectacular High Gain!

Low Band, 7 to 9 DB, single bay; High Band, 8.5 to 10.5 DB, single bay. True Yagi performance, combined with completely independent High and Low Band operation for maximum efficiency.

Available 3 ways!

Broad Band model—model no.1023
(includes HI-LO Matching Harness)
Low Band only—model no.1026
High Band only—model no.1073

Full descriptive literature available from your Channel Master distributor.

LICENSED BY KAY-TOWNES ANTENNA CO., ROME, GA.

CHANNEL MASTER CORP. ELLENVILLE, N. Y.
The World's Largest Manufacturer of TV Antennas and Accessories

TV-ELECTRONIC

TECHNICIAN

& Circuit Digests

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

Full-Timers Dominate Servicing

Technicians, distributors, manufacturers and publishers have long (and often angrily) debated the question of whether the bulk of the TV-electronic servicing business is done by full-time shops or part-timers.

There are several reasons for differences of opinion on this question. First, while it is not too difficult to find the names and addresses of regular shops from the classified pages of the telephone book, it is almost impossible to determine who the part-time technicians are, and how many of them service sets regularly.

Second, local conditions vary greatly. For example, in small communities where large electronic manufacturing and government installations are located, part-timers account for much of the servicing work. In other areas, only a few amateurs and experimenters are available, so practically all servicing goes to full-time shops. The result is that a biased picture of the situation is given to any observer in a particular region who tries to extend his own local experience to the national scene.

A third reason for disagreement is the simple fact that people pick up unsubstantiated comments and assume them to be correct, or else purposely believe those reports which suit their own designs.

In an attempt to clear away the confusion, TECHNICIAN editors undertook a project to determine the actual division of servicing business between full-timers and part-timers. It was decided to question those men across the country who are most familiar with the servicing business in their respective areas—the heads of service associations. Each reply would then be combined with all others to provide the national picture.

Here is what we asked:

What is your estimate of the percent of local TV servicing business in your area done by:

1. Service companies, full-time technicians and retailer service departments listed in the classified pages of the phone book?

2. Part-time technicians, students and amateurs?

Replies from the leaders of 40 service associations across the country—a more than adequate cross-section—have been received and statistically analyzed. This is what they say: In answer to question 1, the median percentage of all 40 association replies is that full-time shops listed in the classified phone book do 75% of the business. For question 2, part-time technicians do 25%.

With the combined authority and experience of 40 associations behind this finding, we hope this will settle the argument. Full-time shops do dominate the TV servicing business.

It's time for manufacturers, distributors—as a matter of fact, everyone in the TV-electronic industry—to recognize this fact. In merchandising products, working out cooperative efforts or any other project encompassing the entire servicing market, it's the full-time technician who must be catered to. That's the only road to understanding and success.

More Opportunities Coming Your Way

When the number of TV sets in use continues to climb, and more TV broadcasts reach more people, it means a greater number of servicing opportunities for you. That's exactly what's happening now.

By Jan. 1, 1956, an estimated 6,400,000 more sets will be in use than a year ago.

New FCC rules permit maximum station powers for 1250-foot antennas, instead of the previous 1000 feet. This means a larger broadcast service radius for more people to receive TV. It may also mean more co-channel interference for some existing sets, requiring wavetrap installations.

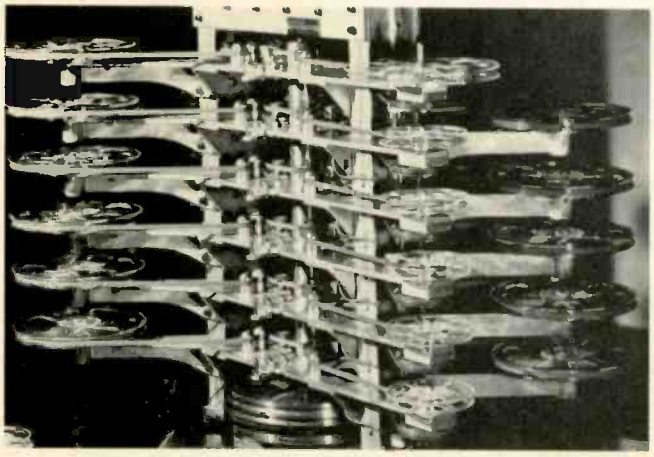
With 450 TV stations operating, and some 175 more with construction permits, the technician's outlook for more business appears to be brightening up considerably.

Tuning In the

FABULOUS NEW DEVELOPMENTS are expected to take place before long. Two TV set makers are putting the finishing touches on solar energized portable TV receivers. Two giant set manufacturers, one in the East and one in the Midwest, are planning to bring out tape recorder lines. One West Coast company is fooling around with transistor radios powered by the r-f energy from local broadcast stations. One of the biggest electronic firms in the country is getting ready to sell consumer products for the first time.

EUROPEAN TV: Though most receivers on the continent are 17-in., with the 21-in. size beginning to enter the market, foreign television lags behind the American counterpart in most other respects, says Tore Lundahl, VP of Technical Appliance Corp., Sherburne, N.Y., after a recent trip abroad. Typical example: Snowy pix with lots of ghosts are common in Switzerland, due to uneven Alpine terrain, yet most Swiss antennas are of the folded-dipole type, vintage of the late forties in this country, instead of being modeled after some of our more recent superpowered designs. TV sets ranging from $250 to $400, are definitely in the luxury class.

ATOMIC RESEARCH, according to Westinghouse scientists, is aiding the American housewife in the fundamental problem of washing away dirt. Experiments now under way employ a special mixture comprising millions of exploding atoms to determine why dirt clings to objects and how best to remove it. . . . Sale of geiger counters and related devices to amateur and professional prospectors, still on the upswing, is about 10 times what it was 2 years ago. Instruments are available for less than $20.



"Whirling Dervish," "Dub-Dupe" and "The Monster" are some of the unofficial names affectionately tagged to this compact and highly efficient machine for duplicating tape recordings in large quantities. This duplicator, developed by Dubbings Sales Corp., 41-10 45th St., Long Island City 4, New York, produces 10 simultaneous tape copies at high speed. Common 2-inch capstan and heavy flywheel insure flawless reproduction. Master tape is at the top; feed reels at the left and right.

HAVING TROUBLE with sets that play fine when you call, but customer swears pictures flickered and shrunk all previous evening? There's a good chance that overloaded power lines at night, dropping voltage to about 97 v., is trouble source. Excellent way of duplicating trouble condition during afternoon call is to insert voltage adjuster between line and set. Units cost only $11 to $12.

SERIES OF CLEVER CARTOON ads by Mallory running in *TV Guide* tells public to call the TV technician when set trouble occurs. One ad, warning of 20 kv jolt, shows a TV set with teeth. Headline says, "It bites!"

EMPLOYMENT will continue to rise in the United States, despite automation, predicts Dr. W. R. G. Baker of GE. "History should have taught us by now that the machine has brought man only a higher standard of living, less muscular effort and more leisure time," he told an audience at the University of Pennsylvania.

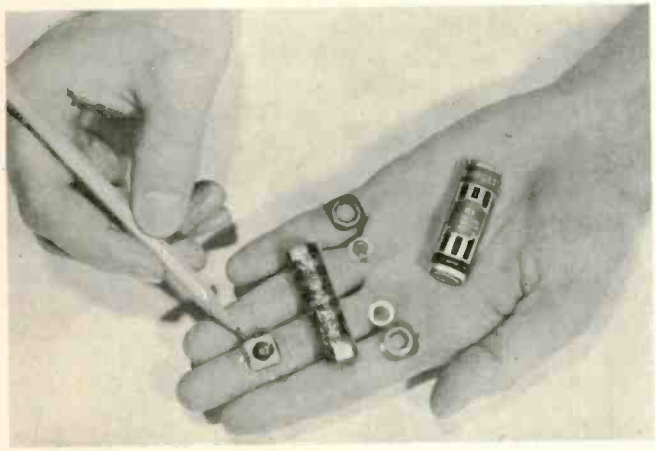
NOVEMBER 1955 NETWORK COLOR TV SCHEDULE

WEEKDAYS, November 1-4, 10, 11, 14-18, 21-25			
3:00—4:00 PM (EST)	NBC	"Matinee Theatre"	(Live)
MONDAYS through FRIDAYS November 1-4, 7-11, 14-18, 21-25, 28-30			
5:30—6:00 PM (EST)	NBC	"Howdy Doody"	(Live)
THURSDAY, November 3			
11:00—12:00 AM (EST)	NBC	"Home Show" (Color Insert)	(Live)
SATURDAY, November 5			
9:00—10:30 PM (EST)	NBC	"The Great Waltz" (Max Liebman Presents)	(Live)
SUNDAY, November 6			
7:30—9:00 PM (EST)	NBC	"The Constant Husband" (The Sunday Spectacular)	(Film)
TUESDAY, November 8			
8:00—9:00 PM (EST)	NBC	"Milton Berle"	(Live)
WEDNESDAY, November 9			
7:00—9:00 AM (EST)	NBC	"Today" (Color Insert)	(Live)
11:00—12:00 AM (EST)	NBC	"Home Show" (Color Insert)	(Live)
MONDAY, November 14			
8:00—9:30 PM (EDT)	NBC	"Overseas Press Club" (Producers' Showcase)	(Live)
SATURDAY, November 19			
9:30—11:00 PM (EST)	CBS	"Caine Mutiny Court-Martial" (Ford Star Jubilee)	(Live)
SUNDAY, November 20			
4:00—5:30 PM (EST)	NBC	"The Devil's Disciple" (Maurice Evans Presents)	(Live)
WEDNESDAY, November 23			
7:00—9:00 AM (EST)	NBC	"Today" (Color Insert)	(Live)
SATURDAY, November 26			
1:15—3:45 PM (EST)	NBC	"Army vs. Navy" (NCAA Football Game)	(Live)
9:00—10:30 PM (EST)	NBC	"Dearest Enemy" (Max Liebman Presents)	(Live)
TUESDAY, November 29			
8:00—9:00 PM (EST)	NBC	"Milton Berle"	(Live)
WEDNESDAY, November 30			
9:00—10:00 PM (EST)	NBC	"Kraft TV Theatre"	(Live)

The CBS November color schedule is not available at press time.

Picture .....

$1000 REWARD is being offered by Sylvania Electric Products Inc. for information leading to the arrest and conviction of any individual or company fraudulently branding small radio and television receiving tubes with the Sylvania name.



13 midget wafer cells (1) go into new 22½-v. Burgess battery (r). Cell consists of manganese dioxide mix between discs of zinc and carbon. Old carbon rod has been replaced by small piece of conductive carbon. These smaller, improved units are a result of automation

HIGHWAY HI-FI will be available in 1956 Chrysler cars thanks to radically new CBS development—a 16-2/3 rpm record player whose arm doesn't skip grooves when the car goes over bumps. Three-quarters to one hour of music on each side of the record. Watch for other companies planning to announce 16 or 16-2/3 rpm records and players.

CALENDAR OF COMING EVENTS

Nov. 3-4: The 8th Annual Electronics Conference, sponsored by the Kansas City section of the Institute of Radio Engineers, the Town House, Kansas City, Kan.

Nov. 4-6: Philadelphia High Fidelity Music Show, Benjamin Franklin Hotel, Philadelphia, Penna.

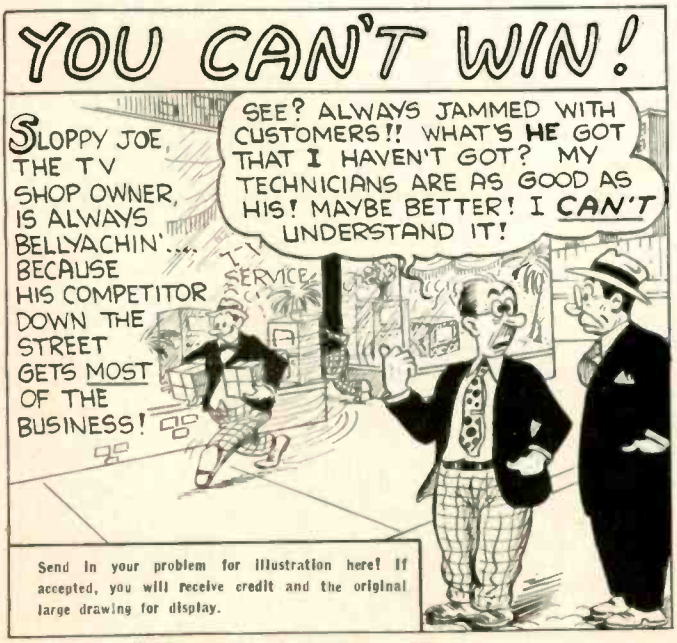
Nov. 14-18: 29th Annual Meeting, National Electrical Manufacturers Assoc., Traymore Hotel, Atlantic City, N. J.

Jan. 9-20: Furniture Mart, Chicago, Ill.

Jan. 15-17: National Appliance Radio & TV Dealers Assoc., 1956 Convention, Conrad Hilton Hotel, Chicago, Ill.

Feb. 8-11: 1956 Los Angeles High Fidelity Music Show, Hotel Alexandria, Los Angeles, Calif.

QUOTABLE QUOTES. Industry predictions for the year 1975 include: "Color . . . will be standard, with pictures projected from a central receiving instrument on flat tubes in picture frames that can be switched on . . . in each room . . . Engineers will develop a means of 'bending' television waves to follow the shape of the earth, to give the signals greater range."—Ross D. Siragusa, pres. of Admiral Corp. . . . "We have the potentiality of producing more goods and services in the next 20 to 25 years than were produced in the entire history of the republic from 1776 to 1955 . . . (The electronic industry) by 1975, may account for . . . something in the neighborhood of $35 billion."—Frank Stanton, pres. of CBS . . . "By 1975 there will be at least 92,000,000 television sets in the United States, 90% of which will feature color . . . electronic refrigerators, electronic air conditioners and possibly even washers; electronic heating; television tape recorders."—Frank M. Folsom, pres. of RCA.



Horizontal AFC Circuits:

Common Analysis for All Systems; Overall Checking Procedure

A. R. Clawson

• Existing literature on horizontal AFC reminds one of the forest that cannot be seen for the trees. So much has appeared on the adjustment of each of the several individual systems in use, but so little has been written on the overall trouble-shooting procedure for HAFC problems, applicable to all systems. In attempting such an approach, the writer will describe a procedure employing a pocket type voltmeter or portable vtvm and flashlight cells, for convenient use in the field. Obviously, this field set-up may be supplemented by the oscilloscope in the shop.

All HAFC systems break down into functional subsections, as Fig. 1 suggests. Some or all of these subdivisions may be combined into a single tube or circuit element, depending on the system. However, regardless of such combinations, all functions will be present in any system. The comparator compares the frequency and phase of the local horizontal oscillator with that of the transmitted sync pulse, and yields an "error" signal if a discrepancy exists. The filter smooths out this error signal. There is also a device for controlling or altering local oscillator speed in accordance with the smoothed error signal to bring the oscillator into frequency with the sync pulses. Do not lose sight of these important functional subdivisions.

Reference to Fig. 1 shows the comparator with its two signal inputs, and one signal output as a result of comparison. This section compares a set-generated signal (either single-ended or push-pull) with a standard signal (either single-ended or push-pull) to yield a signal output which is proportional to the error between the frequencies of the two input signals. If these two signals are equal in frequency and phase there is no error signal. When it exists, the error signal carries information as to the *sense* of the frequency difference, viz., whether the comparison signal is above or below the standard signal as to frequency.

Nature of Error Signal

This sense of the error signal (a voltage or a current) means that it has some zero or neutral value. A greater frequency of comparison signal places the error signal above that zero value, while a lower frequency places error signal below that zero; or vice versa. The standard signal is that supplied by the sync pulses after appropriate treatment by the sync circuits. Note that the comparison signal is equal to the frequency of the local oscillator whether the former is supplied directly by the oscillator itself or some other (ensuing) portion of the horizontal circuit. The comparator may accept more than one comparison signal in some designs.

To sum up, then, the error signal is the result of comparison. It not only contains information as to the sense of the difference between the compared signals, but also as to the *quantity* of the difference. This quantity will be the amount of voltage, positive or negative, by which the comparator output varies from its zero or neutral value.

In this connection, it must be pointed out that the normal or neutral value need not be zero. When there is no frequency difference to be sensed, for example, the normal output may be 20 volts positive to ground. When a frequency difference of a given amount in one direction is sensed, this voltage might go to 25 volts positive (5 volts more positive than normal). When a difference of the same amount in the other direction is noted, the output may go to 15 volts positive (an error signal of 5 volts negative).

The filter accepts the error signal, if any, and smooths it out to a slowly varying dc voltage or current, as required by the corrector unit. It thus provides a slowly varying output as the frequency of the local (comparison) signal drifts from the standard (sync) signal rather than providing sharp jumps, such as occur at each pulse of the sync signal. A further purpose is to provide a form of flywheel action, in the absence of several sync pulses, which it per-

Fig. 1—Functional HAFC block diagram for troubleshooting.

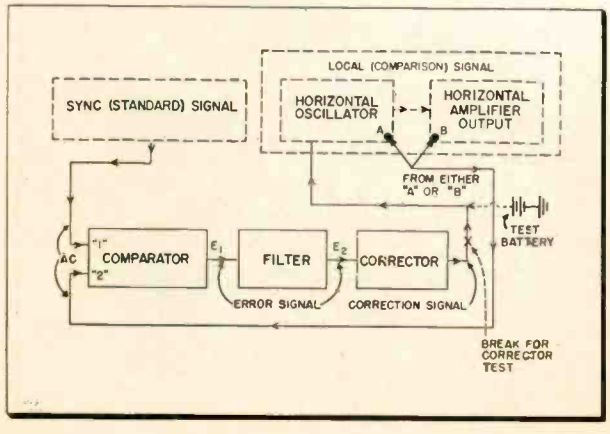
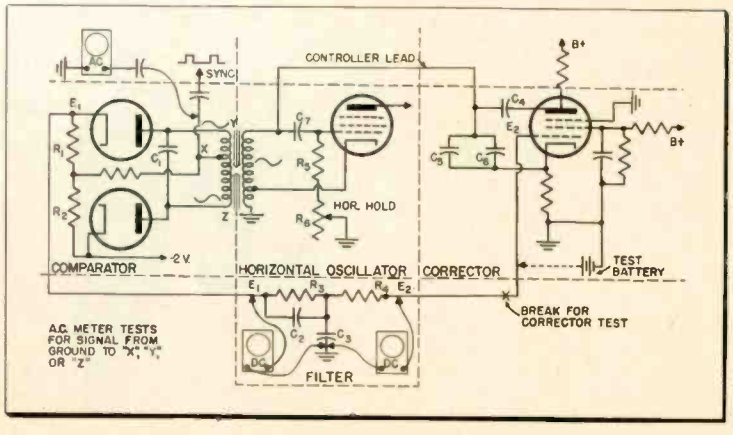


Fig. 2—The synchrolock system analyzed into units for troubleshooting.



Troubleshooting Methods

for Localizing Defects in All Types of Control Circuits

forms by virtue of the slowness of its response compared to the time of the sync pulse. We have an unfiltered error signal as the filter unit input and an error signal, filtered and smoothed, as the output.

The function of the corrector unit is to take the smoothed error signal and to correct the frequency of the local oscillator, making the latter run at the same speed or frequency as the incoming sync (standard) pulses. Action might be likened to that of the valve on a steam engine controlled by a governor (our comparator).

Sample Circuit

Prior to considering tests, we look at a system in which all the functions are clearly defined, such as the RCA 'synchrolock' system shown in Fig. 2, in part. The local oscillator inductance is part of the transformer and induces in the secondary the local 'comparison' signal fed in push-pull to the diode discriminator (comparator) plates from its terminals "Y" and "Z." The standard or sync signal is fed to the center tap of the same winding, reaching the diode plates in parallel. The discriminator 'compares' the standard sync signal with the local oscillator signal and yields an output at E_1 which is also the input to the filter unit. The E_1 output is "zeroed" at about -2 volts, which is the bias for the corrector (reactance) tube.

The filter smooths the error signal E_1, providing a smoother error signal E_2, which is applied to the grid of the reactance corrector tube. A rise or fall of the grid voltage of the corrector tube will result in a change of the local oscillator frequency, bringing the local frequency into near coincidence with the incoming signals. This action requires a steady voltage to be applied as E_1 and E_2 (different from -2 volts) as long as the free running frequency of the local oscillator is not the same as the incoming sync signals.

A field or shop test for the proper action of the comparator is to connect a voltmeter to the E_2 line (20,000 ohms-per-volt sensitivity or better on dc), and to change the local oscillator frequency. The E_2 voltage will vary with this frequency change. The frequency may be changed by variation of either the hold control or the frequency control (slug) on the transformer, or by touching a screwdriver to the grid or cathode of the oscillator tube. Lack of voltage variation definitely indicates trouble in the comparator circuit. Naturally you try a new tube and repeat the test. If the tube replacement does not help, then you see if you have the sync signal present by checking with your voltmeter on ac with a blocking condenser in series, and make a similar test for the local oscillator signal or the 'comparison' signal. In the synchrolock case, the local signal is in push-pull and you must test at both push-pull inputs. In some other cases, the sync is in push-pull and the local signal is single-ended, so you make the appropriate tests at *all* points, using your meter on ac *with a series condenser to stop dc*. The two signals may be both single-ended, and then you test at the two points only.

Your ohmmeter will answer questions as to the resistance values in the filter section, and as to shorted condensers. Replacement or bridging will answer the questions of open-circuited condensers. Generally speaking, the presence of an error signal at the output of the filter (E_2) indicates correct operation of the filter. You perform the frequency variation test with the meter connected to monitor point E_2 after ascertaining that E_1 varies with frequency shift.

Tests on Corrector

The frequency shift test on the comparator and the check to see that the error signal gets through the filter should precede the testing of the corrector.

We test the corrector by the application of a voltage shift at its input (E_2 of Fig. 2) and observe the comparator output error signal E_1. In the case of the synchrolock of Fig. 2 we can simply short the grid of the corrector (reactance) tube to ground

Fig. 3—Phase-detector type of HAFC, with functional units shown.

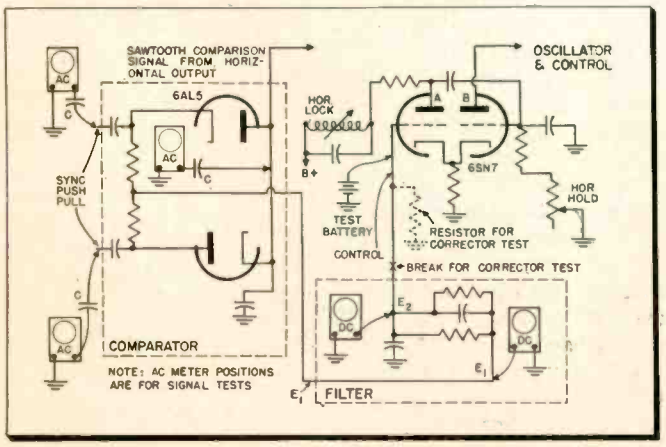
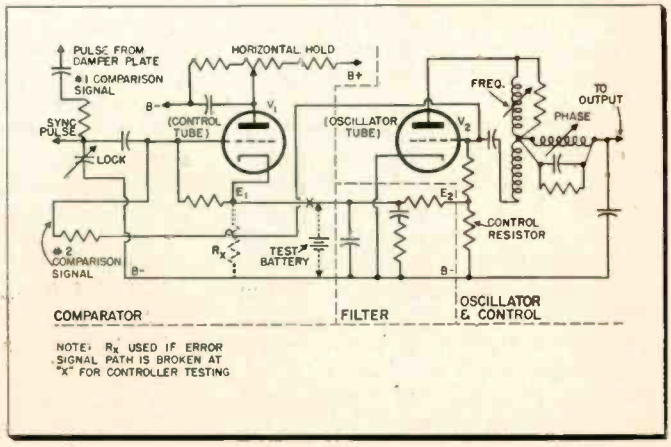


Fig. 4—Functional units of the synchroguide or pulse-width system.



and note if a change has taken place in the meter connected to the discriminator output. Preferably, however, we break the feedback line carrying E_2 to the corrector grid, connect it with a resistance to ground (or any bias required) as in Fig. 2, apply a voltage (say from a flashlight cell) to this grid and observe our meter (on dc, of course) monitoring E_1. The point for the break and the connections for the test battery are shown in Fig. 2 and in Fig. 1 in dotted lines.

We have proven the ability of the comparator to yield a change in E_1 by a frequency shift test previously made. Now we apply a voltage to test our corrector unit employing the comparator as a frequency change indicator in conjunction with our voltmeter. In the shop, the bias boxes (used for agc voltage supply during alignment) make useful sources of voltage for this test. If the application of voltage to the corrector input does not cause a frequency change as indicated by a change of E_1, then we try a new tube and make the customary voltage and resistance measurements in the corrector vicinity plus condenser bridging for possible open-circuited condensers.

Phase-Detector AFC

Fig. 3 illustrates a different type of HAFC circuit: however, we still have the three functional units of comparator, filter, and controller. A phase detector serves as the comparator. The sync is fed to the phase detector in push-pull for the standard signal, and the local comparison signal is derived from the horizontal output flyback—it has the same frequency as the local oscillator and is equally suitable for comparison duty.

If a frequency difference exists between the sync and the local signal, an error signal E_1 is generated and filtered to form the error signal E_2. Correction takes place in the "A" section of the local oscillator (a multivibrator) by variation of its grid bias. This is accomplished by the application of E_2 error signal voltage to the control grid of the "A" tube section.

Testing of this system is similar to the synchrolock system previously described. Variation of the horizontal hold control will cause a variation of E_1 and E_2, which variation may be observed with a dc meter as indicated; this tests the comparator and filter. To test for control action, break the line to the grid of the "A" tube section from the filter E_2 point, insert a resistance of about 250k, apply a voltage from a battery (a flashlight cell will do) to the control grid of the "A" tube while monitoring the error signal at either E_1 or E_2. The voltage applied by the flashlight battery should change the frequency and, as a consequence thereof, should change the error voltage in one direction or the other, depending on the polarity of the test battery. If, in the test procedure, you have found an inoperative comparator, you make the tests with the ac voltmeter for the presence of an ac signal—use a series condenser (larger than 0.005 mfd) to block out any dc which may cause a reading. Ohmmeter tests with condenser bridging or substitution will eliminate filter troubles.

The synchroguide (or pulse-width) circuit employs a control tube which combines the functions of comparator and controller. The comparison signals from the damper plate (or other connection to the horizontal output) and the local oscillator are mixed in the grid circuit of this control tube with the standard or sync signals—see Fig. 4. Variation of the grid bias (caused by the variation of the time of the sync pulse compared to the comparison signals) results in a variation of the cathode current of the control tube (note that the control tube is also the comparator). This cathode current variation causes a variation in the voltage developed across the control resistor (Fig. 4) through which cathode current flows. The voltage variation so developed controls the oscillator grid bias and hence its frequency.

Synchroguide Tests

The cathode circuit contains a rudimentary filter shown in Fig. 4 enclosed in dashed lines. We note that the hold control is in the plate circuit of the control tube, and we cannot use it to vary the frequency of the local oscillator to test the comparator. We test the comparator in this system by moving the frequency control adjustment slug on the synchroguide transformer, while observing a voltmeter monitoring the error signal E_1 or E_2. An alternative means of frequency variation is to touch the grid of the oscillator tube (V_2) with a small insulated screwdriver. The capacity thus added will cause a frequency shift and an error signal voltage variation if the comparator is functioning properly.

Lack of functioning of the comparator calls for local tests to determine the presence of the signals at its input. You can use your rms-reading ac voltmeter with a series blocking condenser to read about one fifth of the peak-to-peak values of the signals present for a 1000 ohms-per-volt instrument, while about one fourth of the peak-to-peak values will be indicated by a high-impedance vtvm. Testing the control action simply requires that the error voltage previously mentioned be present at the grid of the oscillator tube. If it is not present, then you must check the oscillator circuit with the ohmmeter and make voltage tests.

As we have seen, we may break down any complicated HAFC system into the three functional units of comparator, filter, and controller functions, even though these functions may exist in combination, as in the synchroguide system.

We test the comparator function by variation of the local horizontal oscillator while we observe a meter monitoring the error signal developed by the comparator for a corresponding variation.

We test the filter by ascertaining if the same error signal passes through it.

Controller Tests

We test the controller by the application of a voltage to its input (after breaking the error signal path to the controller input) while monitoring the output of the comparator, which we have previously tested. This is equivalent to furnishing a local voltage in the place of the error signal to work the controller, while observing the error signal output of the comparison device for variation. This procedure obviously requires breaking the error signal path from the comparator to the controller, or inserting a high resistance in that path to prevent interaction. Breaking the path is the safe method.

Input signals may be tested with an ac voltmeter and a series dc blocking condenser with reading as indicated for such tests in the synchroguide discussion. •

Meter Calibration Methods

Adapt Old Meters and Movements to Extended Applications

BEN CRISSES AND DAVID GNESSIN

• Available today are many meter movements and whole meters, surplus and otherwise, in excellent condition, whose calibration is relatively useless for radio and TV service. Certain meter scales may be marked UP and DOWN, or in degrees of FULL, or ANGLE OF AZIMUTH, or degrees of arc, etc. Old meters taken from equipment containing external multipliers may be incorrectly graduated for direct use out of the equipment. All these, as well as ordinary service meters whose scale faces have been obliterated or otherwise rendered unreadable, can be easily calibrated in the following manner:

To begin with, you must know the current capacity of the meter movement. Since meters in series each show exactly the same current reading, you should obtain an accurate ammeter or milliameter and hook it up, together with your doubtful meter as shown in Fig. 1. (Most ordinary multimeters have a current scale in milliamperes.) The dc source is a readily available 1.5-volt flashlight cell. The potentiometer shown has a maximum resistance of 1 megohm. Anything higher can be used as well.

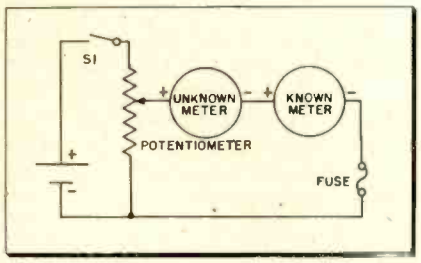
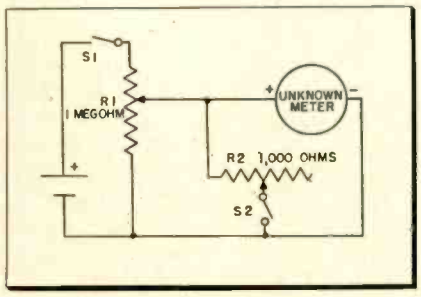


Fig. 1—Set-up for finding maximum current capacity and calibrating current readings.

Fig. 2—Finding resistance of meter movement.



When you connect the two meters in series, observe the proper polarity. In the event the polarity of the unknown meter is not clear, hook it up *momentarily* to see if the needle wants to go the wrong way. If so, reverse the connection. When the needle goes in the proper direction, mark the positive terminal of the unknown meter accordingly.

Safety Precautions

The fuse, if used, should be equal to the full-scale current rating of the known meter. Thus, if you're using the 250-ma scale of the known meter, use a ¼ ampere fuse (any voltage rating at all). This will protect both meters in the event you accidentally set the potentiometer at too high a value. The safe thing, of course, is to set the potentiometer at minimum when starting, gradually working the rotation up until a satisfactory reading is achieved. If the rotation is very slow, it is unlikely that you will get a high enough surge of current as to damage the meter.

To start the calibration, leave the potentiometer at zero and close switch S1. Then turn the pot up to the point where either meter shows a deflection. If either meter needle starts to move counter-clockwise (wrong direction), reverse the leads to that meter. If the known meter reaches full-scale before the unknown one, then change to a higher scale on the known meter.

When the unknown meter reads full-scale deflection, regardless of what it shows on its face, the correct full-scale current may then be read on the known meter.

Simply mark the unknown meter with the full scale reading, then rotate the pot in the opposite direction until the unknown meter reads half-scale or some other subdivision, marking it with the reading from the known meter, continuing the process until you have as many graduations as you wish. Now you will have only a current meter. To make it more useful, continue as follows:

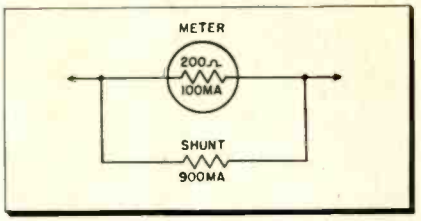


Fig. 3—Determining value of shunt resistor needed to increase meter's current capacity.

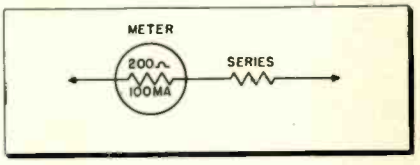


Fig. 4—Series resistor for voltmeter use.

Determine the resistance of the meter movement. To do this (Fig. 2), hook up the unknown meter (whose full scale current you have already determined). By this time you have marked the positive terminal, so observe meter polarity. Make sure that potentiometer R1 (the same as that used in Fig. 1) is set for zero output and both switches are open.

Close switch S1 and carefully adjust R1 for full-scale meter deflection. You know this current reading. Now, close switch S2 and adjust potentiometer R2 (resistance 1000 ohms) until the meter reads half-scale. Now, open S1 and S2. Connect an ohmmeter from the center-tap of R2 to the positive terminal of the meter. Whatever you now read on the ohmmeter is exactly the resistance of the unknown meter's movement.

If you care for the theory involved in the resistance measurement, it's as follows: When switch S2 was closed, potentiometer R2 was wired in parallel with the meter. When the meter read half-scale, then, exactly half the battery current was flowing through the meter and half through pot R2, since the original current through both was established as exactly full scale by R1. Since half the current through R2 equalled half-scale of the meter, it must be reasoned that all the current through R2 alone would equal full-scale of

(*Continued on page 57*)

"Do It Yourself" Tube Sales—

Housewife presses test button of "U-Test-M" machine being promoted to drug, food, auto, hardware stores. Distributors stock cabinet; store owner gets percentage cut without investment.

INDUSTRY REPORT

ALBERT J. FORMAN, EDITOR

• The TV-electronic servicing industry is being confronted with a new means for selling replacement electron tubes. It is a merchandising system where the consumer tests his own receiving tubes on an easy-to-use tube checker set up in the store, and if the tube is bad buys a new one. Since close to 175,000,000 replacement tubes will be sold in the coming year, it is evident that if the test-it-yourself method accounts for only a small part of the market it can still become a sizable business.

The problem facing each technician is whether he should oppose such a sales method, or adopt it in his own business. To help you evaluate the opportunities and hazards possible in do-it-yourself tube sales, the viewpoints of technicians, jobbers and manufacturers favoring the idea are summarized, followed by a similar summary of those in opposition.

With the exception of a few participating companies, hardly anyone in the industry appears to favor the location of self-service testers in drug stores, supermarkets or other non-electronic outlets. However, a more significant industry segment believes that it is strongly to the advantage of TV technicians to install such equipment in their shops. Their reasons are as follows:

Favorable Viewpoints

1. As indicated by events in the home decorating, carpentry and allied fields, the consumer trend is toward do-it-yourself, and growing stronger daily. The dollar-conscious set owner is aware that tubes are the major source of receiver failures, and is looking for a convenient means of replacing tubes himself to save the labor charge. Supermarkets, drug and hardware stores recognize these opportunities, and are setting up self-service tube installations, thereby pulling business away from regular TV dealers. If you can't lick 'em, join 'em . . . using the same sales technique to keep the tube business in the service shop where it belongs.

2. A sharp increase in profits can be realized from the large number of tubes sold to self-service customers at list price. Also, many tubes may be brought in from old and nearly discarded radio and TV sets for which the customer is reluctant to pay the cost of a technician's repair job.

3. A larger volume of servicing business could be anticipated from the increased store traffic of people coming in to test tubes. If the tube doesn't make the set play, the owner would be inclined to return and order the complete work done. More store traffic also means more opportunities for radio, TV and audio sales.

4. Saving in time should be expected. Instead of the technician spending valuable time away from the bench, the customer would spend the time. The only time the technician spends with the customer is to ring up the sale.

5. Better public confidence in the service technician is expected to result. The fact that the customer makes his own test, and then tests the new tube he bought, is aimed at reinforcing the belief that the service shop does not want to fool the customer.

6. The novelty of the idea would be a strong selling attraction.

Friend or Foe?

Pro and con viewpoints highlight controversial issue facing servicing industry. Report reveals current activities

The cogent reasons advanced in favor of self-service tube sales are balanced by equally compelling beliefs expressed by industry leaders opposed to test-it-yourself. Officials of six major tube manufacturers were interviewed, and all stated that they were opposed to self-service sales, while three voiced an additional "wait and see" attitude until their own investigations are completed. However, all six tube makers were quick to point out that once tubes are sold to the distributor, the manufacturer can not legally tell the distributor how to sell them. Here are the reasons presented by technicians, jobbers and manufacturers opposed to do-it-yourself tube sales:

Unfavorable Viewpoints

1. The great majority of consumers are not qualified to tinker with the innards of a TV set; often more harm than good is done. Encouraging people to attempt to fix TV is to mislead them and make them have less confidence in the professional technician.

2. The ready availability of electronic fix-it-yourself and hobby publications would be strongly supplemented by self-service testers, and have two harmful effects tending to cut down technician income. First, where the tube replacement repairs the set, the technician has lost the profit from a call. Second, the technicians would be weighed down with a greater proportion of "tough dog" sets . . . the ones where tube replacement did not put them in working order.

3. Promotion of test-it-yourself would encourage chain drug stores and supermarkets, with their high power merchandising techniques, to install testers and draw servicing business away from radio-TV shops.

4. Self-service may actually demand more sales time in handling customer returns and demands for refunds when the new tube purchased does not make the set work.

5. It appears questionable whether a tube tester simplified sufficiently for the non-technical customer to use would give the tube a completely effective and accurate test.

6. Self-service would open the door to sales of inferior and rebranded tubes.

7. There is a serious electrical hazard to digging into a TV set, even when the line cord is disconnected. The safest practice is to discourage set owners from doing so.

8. Test-it-yourself is a novelty which will wear off, and when it does the shop owner will be stuck with excessive inventory and a costly tester.

Activities to Date

Three companies are known to be manufacturing self-service tube testers. They are: American Scientific Development Co., Ft. Atkinson, Wis.;

Reproduction of electronic distributor's advertisement aimed at selling test-it-yourself idea and the "Quik-Chek" installation exclusively to TV dealers and service shops in Philadelphia area.

Reliable Electronics Corp., Collingswood, N. J.; and U-Test-M Manufacturing Co., Milwaukee, Wis.

Representative of what the machines themselves are like is the "Quik-Chek" made by Reliable Electronics. The tester, set into the slanted top of a locked storage cabinet holding up to 300 tubes, has some 20 sockets with the designations of the tubes to be inserted printed beside the socket. The customer inserts the tube in the proper socket, makes one voltage adjustment, and presses a single button. The meter then reads good or bad. Atop the tester is a bold sign reading: "Do it yourself! TV tubes. Automatic tester. Replace your worn tubes and save many dollars. Guaranteed for one year."

The testers made by the two other companies noted are similar in design, none of them having roll charts. The U-Test-M unit has considerably more tube sockets, and the chart information is placed on a separate large card instead of next to the sockets.

Testers in Use

To date there are in use an estimated 1000 self-service testers made by the various manufacturers. By mid-1956 the number is expected to rise to 3000, and be supported by advertisements in leading consumer magazines.

In some areas it is reported that technician-dealers are setting up a route of installations in non-electronic stores. The TV dealer keeps the machine stocked, and the store owner gets a percentage of sales. A sign on these machines notifies the customer that if the set needs further servicing, he should contact the dealer at a given address.

Several electronic distributors around the country are selling and/or renting these testers, and they report that many of their jobber friends have called them, expressing positive interest in selling the testers. Distributors are reported to be selling self-service testers in Florida, Indiana, Michigan, Missouri, New York, Ohio, Pennsylvania and other states.

Distributor Activity

A leading distributor exponent of test-it-yourself is Resco (Radio Electric Service Co. of Penna.), with jobber headquarters in Philadelphia. They have sold over 100 "Quik-Chek" installations—exclusively to radio-TV dealers—and still going strong. Resco officials state that they got into the business in an attempt to keep tube sales within the TV industry, and that most technicians appreciate this aim after it has been fully explained to them.

Radio Distributing Co. of Indianapolis is another jobber who reports improved tube sales due to the self-service testers.

Depending on the distributor, there are several plans for obtaining a tester. One is outright purchase, where the TV dealer pays about $150 to $190 for the machine. Another plan is a $2/month rental charge and an initial dealer order for 250 tubes, plus minimum succeeding monthly orders of 50 tubes. Still another plan consists of $10/month rental, 250 tubes initial purchase and 100 tubes/month minimum; at the end of 15 months the dealer owns the tester. There are, of course, other combinations of rental fees, minimum orders and rebates.

Close-up of Reliable Electronics' newest "Quik-Chek" model shows simplified 20-socket tester mounted on cabinet holding tube supply

Opposition to do-it-yourself is quite strong, however. Representative of manufacturer's activities is the aggressive "don't-do-it-yourself" campaign being conducted by Westinghouse. It is carrying this message to 20,000,000 people via the "Studio One" TV show it sponsors.

Service associations have been playing an important role in combating self-service tube sales, particularly in chain stores. Typical is a letter sent to technicians by Radio-Television Technicians Association of Orange County, Calif. It reads in part: "The sales of tubes by supermarkets continues unabated, on an increased scale it appears. We are informed that the practice is now to spread to chain drug stores, liquor stores and gas stations. It's happening in many areas of the East now. The fact that we can do something about it is evidenced by the response we have received since we started our campaign. If you value your business, it's time to take an active part. Thousands of dollars worth of tube sales and service will be diverted if you let it. Tell the salesmen who offer you tubes how you feel about a manufacturer who allows his brand to be associated with the slipshod type of service that do-it-yourself tube checking will produce."

Significance of Do-It-Yourself

It is estimated that 80 to 85% of replacement tube sales are channeled from distributor-to-technician-to-consumer, and the remaining 15 to 20% are purchased by the consumer directly from the distributor. Of the tubes sold by technicians, an estimated 10 to 15% are over-the-counter. Should test-it-yourself become established, what portion of its share of the market would come from the technician's 80-85% and what portion from the jobber's 15-20%? Would it come from over-the-counter or service call sales? And what would happen to the technician's income? It is impossible to make even a semblance of an accurate guess at the present stage of the game.

The entire TV-electronic industry is carefully observing the progress—or failure—of self-service tube sales for two reasons. First, replacement receiving tubes are really big business, amounting to one-third of a billion dollars at the consumer level. Only a small percentage is needed to put someone into a multi-million dollar enterprise. Second, several manufacturers of other electronic items, including antennas, components and audio products have been seriously evaluating the do-it-yourself market for their own products. Surely, the success or failure of self-service tube sales will play a major role in setting the precedent for other products requiring minimum know-how to replace or repair.

Taking the overall view, is tube self-service a friend or foe of the professional TV technician? It is apparent to this writer that such sales in drug and food stores are definitely the technician's enemy. But what about self-service in the TV shop? Here the answer is not an obvious black or white, yes or no. Rather it must be a considered judgment of many shades of grey in the form of the pro and con arguments summarized earlier. Mr. Technician—you decide! •

TV Linearity Adjustments

No Test Pattern or Generator Needed in Simplified Method

CHARLES GARRETT

A simple and satisfactory method of adjusting picture linearity and size in T.V. sets in both the horizontal and vertical circuits without need for a test pattern, or special equipment in its absence, is as follows:

To set vertical height (or size) and linearity first remember that the vertical linearity adjustment usually affects the top half of the screen mostly, while the height control varies the bottom half. This holds true in almost all TV sets. In some (Motorola for instance), the reverse is true.

Step 1 is to tune in a picture and slowly roll it down by manipulating the vertical hold control. Notice if the blanking bar changes in height (thickness) as it moves from the top of the screen to the bottom. See Fig. 1.

Any change in thickness indicates misadjustment.

Step 2: If the bar increases in size as it moves towards the bottom, return the vertical hold control to its normal setting and reduce the height somewhat. The top of the picture may now be down a little. If so, advance the linearity control a little. Now roll the picture down again; add linearity if the bar is still too narrow at the top or reduce height if the bar is still too wide at the bottom (or if the picture has advanced too far below the bottom of the screen).

The screen may need centering during these adjustments. When centering, move the picture towards that portion of the screen that *expands* the blanking bar as it moves on the screen; that is, towards the bottom if the bar increases in height there or towards the top if the bar is larger there. Repeat the procedure until no further improvement can be made. For speed and accuracy stop the picture from rolling while making adjustments.

Often a linear picture is obtained but it is expanded above and below the top and bottom of the screen. In this case reduce height and linearity equally until the top and bottom edges of the picture are just out of sight. Repeat Step 1 and touch up if necessary. Slight imperfections are not noticeable to most people, but with a little practice near perfect results can be obtained in about the same time it takes to hook up and warm up a bar generator.

(*Continued on page* 56)

Fig. 1—Change in thickness of the blanking bar as picture is rolled downward discloses extent and direction of vertical nonlinearity.

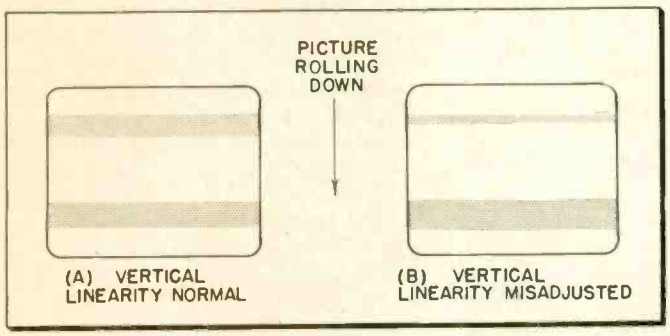
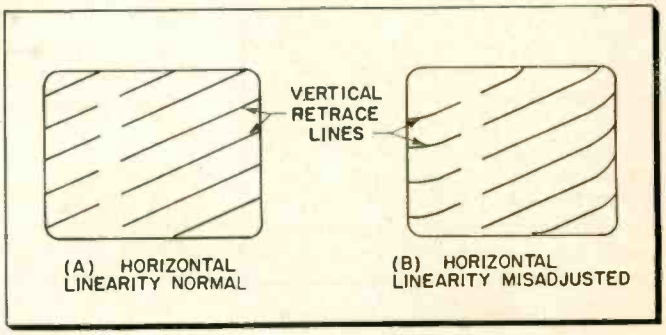


Fig. 2—When retrace lines are made visible, departure from their straight-line trueness will expose errors in horizontal linearity.



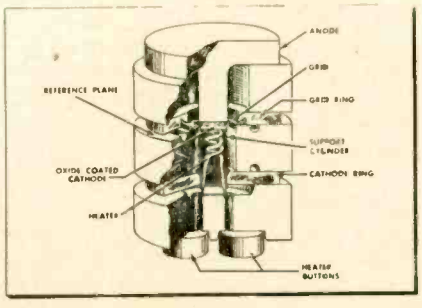
New Button-Size Ceramic Triode

A new type of micro-miniature receiving tube has been demonstrated by GE for use in UHF television sets. The 6BY4 is an all metal-and-ceramic triode about ⅜ in. long and 5/16 in. in diameter.

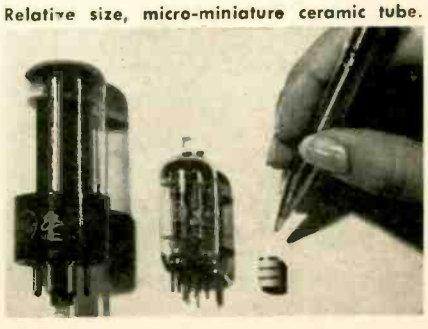
Production models will soon be available with the following characteristics measured at 900 mc: Noise factor, about 8 db; power gain, about 15 db with 10 mc band-width. Reported to be highly rugged, the tube is the culmination of years of research in ceramic materials and titanium.

Though the design features micro-spacing of elements, including a grid of about 1000 turns per in. of practically invisible wire, it permits simplified production techniques that should result in a relatively low price.

Internal construction of 6BY4 ceramic triode.



Relative size, micro-miniature ceramic tube.



Servicing Hi-Fi Record

How Equalization Is Achieved; Switching Methods; Where

By Norman H. Crowhurst

• Although the basic equalizer circuit in an audio preamplifier is essentially a simple one, modern preamplifiers provide switching so that any of the standard record equalization curves in current use may be selected by turning a switch. This has made the circuit somewhat more complicated to service in the event of trouble.

In all standard equalization curves, there are two basic components: a low-frequency boost and a high-frequency roll-off. Fig. 1 illustrates the basic network used to provide low-frequency boost. The components which are ordinarily selected by switches to vary the equalization characteristic are indicated, for the sake of simplicity, by arrows. Adjusting the value of capacitor C_1 (or selecting another value with the switch) varies the *frequency* at which bass-boost action begins, known as the turnover point. Three different values of capacitance, for example, will produce the three different curves of Fig. 2B.

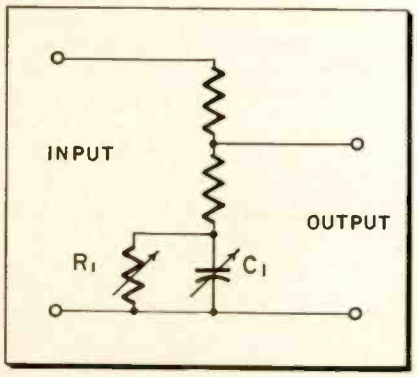
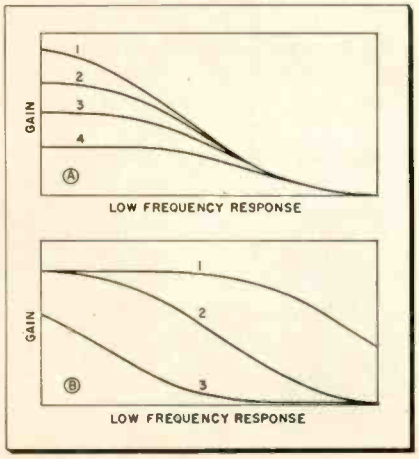


Fig. 1—Typical bass-boost equalizer network.

Fig. 2A—Curves produced by different values of bass-boost resistor. B—Changes in turnover point produced by changes in capacitor.



Boost action occurs as follows: At lower frequencies, the reactance of C_1 increases. The voltage drop across C_1 is then greater as frequency goes down. Since output of the network is taken across C_1 (and a fixed resistor in series with it), output will be greater as frequency is lower, and boost action is thus achieved. Above a certain relatively high frequency, the reactance of C_1 is negligible. Above this point, therefore, output is unboosted and relatively flat.

As the value of capacitance is increased, reactance is reduced. This means that the frequency beyond which there is little or no effect is also reduced. Curves 1, 2 and 3 of Fig. 2B show the effect of successively increasing the capacitor.

Slope Sharpness

Resistor R_2, since it is shunted across the condenser but does not discriminate frequency-wise, has a moderating effect on the boost action. Low ohmic value will produce curve 1 of Fig. 2A. Increasing R_1 will progressively result in curves 2, 3 and 4. Note that the turnover frequency does not change; only the slope of the curve does.

Fig. 3 shows the components in the high-frequency roll-off network. Again, the capacitor, C_2, is switched to vary the point (frequency) at which treble begins to roll off, while changes in the value of resistor R_2 limits the amount or degree of roll-off. These effects are demonstrated in Fig. 4, where different capacitor values produce the curves shown in part A and changes in resistance account for the degrees of slope sharpness in part B.

Figs. 1 and 3 represent the basic schematic for practically all equalizer arrangements used in modern record preamplifier-equalizers, wherever these networks may be located in the circuit. Sometimes these networks occur with one feeding directly into the other, as with the output points of Fig. 1 connecting directly to the input points of Fig. 2. Sometimes the networks are broken up, as with the bass-boost circuit in the grid of an amplifier and the treble roll-off in the plate circuit of the same stage. (For other variations, see the editor's comments at the end of this article.) What complicates equalizers is the method of switching used.

Economical Switching

The resistors and capacitors whose values are changed are made up of as few individual components as possible. The manufacturer, in other words, will avoid using a completely different set of components for each switch position. These components may be connected in series or in parallel, with some of the same ones selected in different arrangements so as to keep the number of individual components to a minimum. The switches used are not just simple, single-contact, rotary selectors, but often have complicated rotors, so as to enable combined changes in value to be incorporated with a minimum amount of external wiring.

All this is done by the manufacturer to reduce production costs. More complicated switches cost very little more, in quantity, than simpler ones; but extra components and wiring operations add much more to the cost. The fact that the switching is a little more complicated does not alter the basic circuitry, or materially affect the kind of things that can happen to make servicing necessary —but it *looks* more difficult.

The variable resistor (R_1) for the low-frequency boost is usually provided by one or more switch contacts which put different combinations of resistors in this position. It is not usual for this component to become short-circuited, but it is quite possible for a contact to become open in this part of the cir-

Preamplifier Equalizers

to Look and How to Listen for Troubles in These Networks

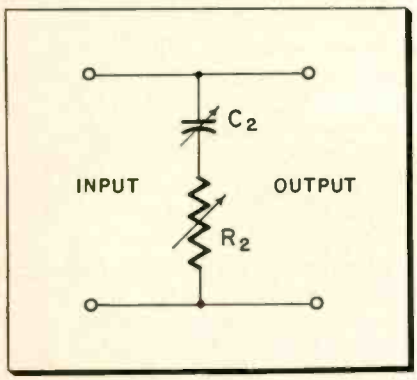
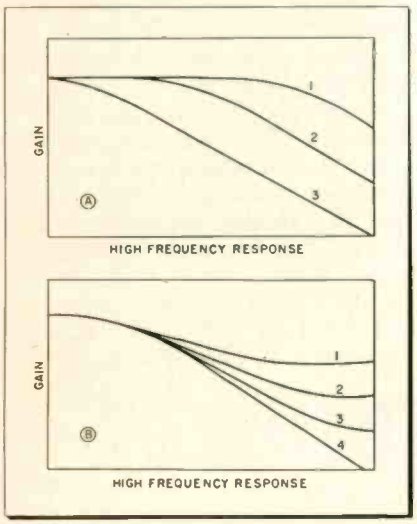


Fig. 3—Typical treble roll-off equalization.

Fig. 4A—Effect of changing treble roll-off capacitor. B—Effect of roll-off resistor.



cuit. The result is a low-frequency boost that *continues* to rise *below* the lowest frequency desired. This usually causes increased hum, due to the fact that 60 cycles get over-emphasized. In most designs, the boost has leveled off somewhere above 60 cycles, so as to avoid unnecessary emphasis of hum.

If this resistor R_1 should be the only return path to provide the correct bias voltage on the grid of the following tube, an open circuit here may also result in spurious effects which could cause unstable circuit operation.

The next possibility to consider is what happens if C_1 in the low frequency boost goes either open or short-circuited. In this case, either is a reasonable possibility. The effect of losing the low frequency boost will be to make the reproduction sound bass-deficient. If the boost condenser goes short, the low-frequency boost just disappears, providing an obvious clue.

If the capacitor goes open, the gain will rise by somewhere between 10 and 20 db. This may well make the preamplifier almost unmanageable and will probably result in distortion, particularly if the gain control occupies a position in the circuit *after* the stage where the equalization is inserted. In any event, the response will lose its low frequency boost as well as having too much gain.

If either element of the high frequency roll-off goes open then the reproduction will sound unduly harsh or shrill, because the equalization intended to be used to compensate for recording preemphasis is then missing. If the capacitor element becomes short-circuited, which is rather a remote possibility with these small-value capacitors, then the gain over the band will be reduced considerably, and the high frequency roll-off will go missing.

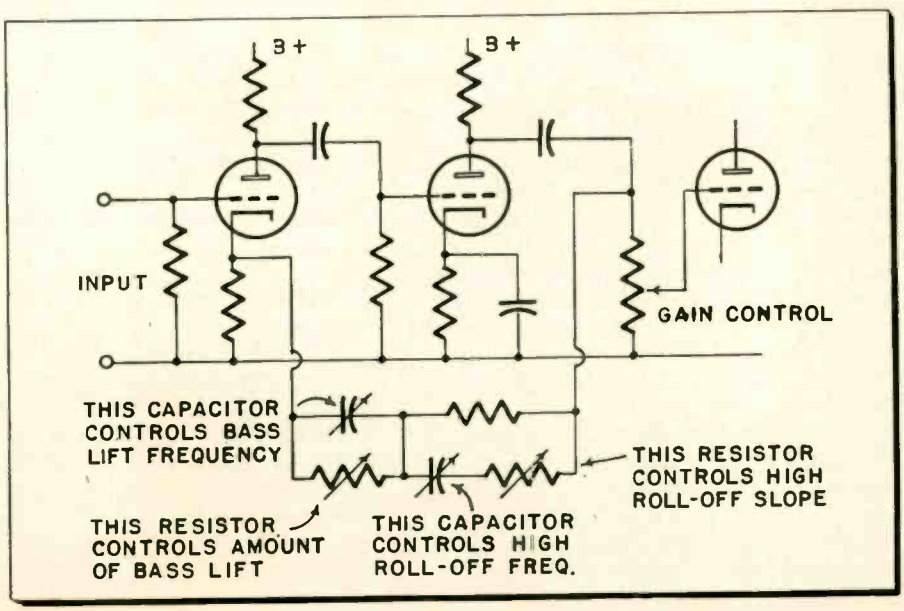
Having covered the possibilities of this kind of circuit it should be a relatively simple matter to identify which type of fault is being experienced in any individual case. In addition, it will often help to sit down and redraw the schematic for each *position* of the equalizer switch, so the exact contacts and components in use at any position can easily be identified. Then the circuit can be carefully traced through these components until the fault is found. Probable troubles include a bad switch contact, a dry soldered joint, or a faulty component.

Tracing Switched Circuits

It is impossible in a general article of this kind to go into details as to the manner of switching because every circuit, as well as every fault, will be different, but careful tracing of the circuit will enable the more complicated arrangement to be reduced to an equivalent like the fundamental circuits of Figs. 1 & 3. From this the actual contacts used in the switch and components can be identified, and each one checked in turn until the offending part of the circuit is located.

Some equalizers use a feedback network, or a combination of part

Fig. 5—Representative feedback-type equalizer, with functions of components identified.



feedback and part direct equalization. Fig. 5 shows the components of an all-feedback circuit for equalizer, with the functions of the components identified. It may seem a little more complicated to think out, because, to give low frequency boost, the low frequencies have to be rolled off in the feedback loop, and vice versa for the highs. But the inversion is once more reversed by the negative nature of the circuit arrangement, so final effects are as desired. A short circuit in the bass-boost capacitor loses bass-boost in either circuit, and an open circuit results in excessive gain.

As with many other service problems, it is important not to let apparent complexity disturb you at first sight. Just sit down and take things in order to get the quickest solution of your problem.

• *Equalizing networks considered by the author assume that the output of the pickup cartridge is fed "flat" or without alteration into a stage of preamplification, and that equalization is performed after this point of introduction. While this arrangement does appear to typify the present trend, many currently available popular preamp-equalizer units, as well as very many still in use that have been put into service over the years, show an important variation from this system.*

The variation involves the treble roll-off network. In the case of Hi-Fi magnetic-type cartridges, such as the variable reluctance pickup, a single resistor, inserted between the output of the cartridge itself and the input to the preamp, accomplishes roll-off. This element, designated as the load resistor in Fig. 6A, is physically mounted on the preamp chassis or subchassis. However, it works electrically with the inductance of the coil in the magnetic cartridge (L) to provide an R-L frequency-shaping network instead of the R-C network described in the article.

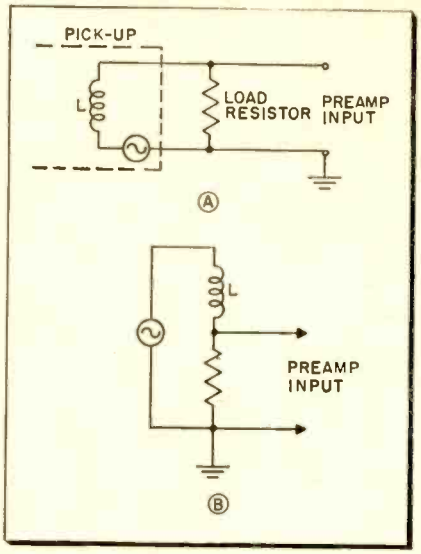


Fig. 6—Load resistor plus cartridge inductance provide roll-off in magnetic pickups.

Audio signals generated in the pickup coil, as shown in Fig. 6, are in series with the coil and load resistor. Action of the network may be followed more easily in Fig. 6B. At low frequencies, the (inductive) reactance of L is negligible, and nearly all of the signal present is dropped across the load resistor. Above a certain higher frequency, however, the increasing reactance of L drops some of the available signal, with less available across the load resistor. Since output to the preamplifier is taken off across the resistor, there is a roll-off at high frequencies.

Since the inductance of the coil in the cartridge differs from one type of magnetic pickup to another, the value of load resistance must be changed correspondingly to provide the correct equalization curve. Preamp-equalizers that use this method may provide a choice of fixed resistors to match the popular cartridges or else incorporate a calibrated potentiometer to achieve the same flexibility. Open-circuiting of the load resistor, or an increase in value, will result in harsh shrillness (excessive treble). In the unlikely event that the resistor is shorted or reduced in value, cartridge output will not enter the preamplifier at all, or will be reduced with missing treble.

Equalizers that use the load resistor in conjunction with cartridge inductance to shape treble response generally adhere to conventional methods, already described, for producing bass boost elsewhere in the circuit.—Ed.

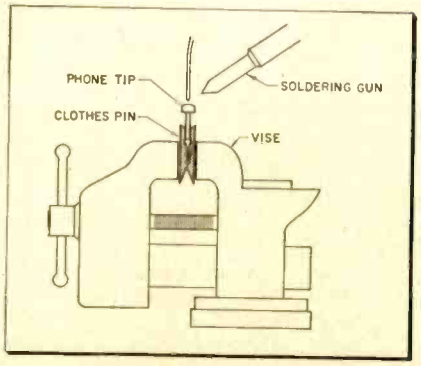
"Clothespin" Servicing

By Joseph Amorose

• An item that seemingly bears no relation to servicing, the ordinary spring-type clothespin, can be a very handy aid around the technician's shop, particularly when used with a little imagination. Especially in a one-man shop, where an extra hand is so often required to perform an otherwise simple job, clothespins of this type can simplify work and cut down on time to a considerable extent.

One application that has been used by the writer is shown in Fig. 1. When a very small radio or TV part is placed in a vise to facilitate soldering operations, the work is made difficult because the large mass of metal in the vice quickly draws off heat applied by the iron. An easy way to eliminate this difficulty is to grip the small part in the jaws of a spring-type clothespin. The clothespin is then placed in the vise, as shown in the drawing. This idea is particularly useful when soldering the wire from a test prod or headphone into a phone tip—a job that is often necessary.

Fig. 1—Small-part soldering is made easier.



The spring-type pins are also handy in making speaker cone repairs. These cones, particularly on midget sets, loosen often and easily, producing annoying rattles and other symptoms. To glue the cone back properly, continuous pressure must be applied until the cement dries. This usually entails removal of the speaker from the chassis, a time-consuming procedure not often justified by the scope of the job. However, the repair can be made without removing the speaker from the chassis if the spring-type

(Continued on page 58)

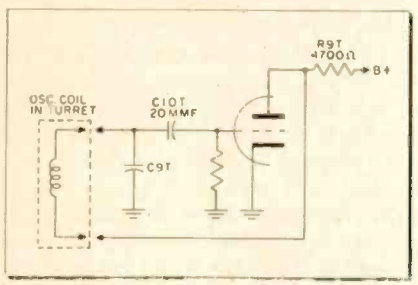
"Tough Dog" Corner

Difficult Service Jobs Described by Readers

Oscillator Woes

Temperature-sensitive intermittent operation of the local oscillator was the trouble on this Philco 51T1-601, with the stage quitting after one or two hours of normal operation. With the back cover of the set removed, the stage would remain in oscillation for longer periods. With the chassis removed from the cabinet, the set would not fail at all, thus adding to the difficulty of troubleshooting. To produce in-cabinet temperatures, a heat lamp was pressed into use.

The oscillator plate voltage was metered during application of the



Erratic condenser stopped local oscillator.

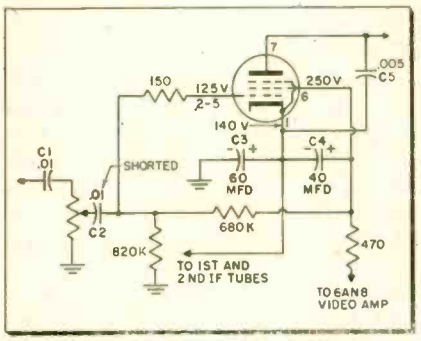
heat. After about 15 minutes, this voltage dropped sharply, almost to zero. Rotation of the tuning turret so that it was between channels, and between contact positions, returned plate voltage to normal. Since this action took C9T and C10T out of the circuit, breakdown of one of these components was indicated.

The grid end of C10T was lifted and metered during a second application of the heat lamp. After another 15-min. wait, the voltmeter read nearly the full plate voltage. Replacement of C10T and also of R9T (which had changed in value to only 3000 ohms as a result of the defect) cured this tough one.—*H. C. Hill, Sr., Absecon, New Jersey.*

Volume Controls Pix

This problem was encountered while servicing an Admiral chassis of the 18 series, using printed circuits. With the volume control at maximum setting, everything seemed normal. However, as soon as volume was reduced to half the normal setting, or less, both picture and sound disappeared, leaving only a raster.

I hardly knew where to start until I took a careful look at the schematic. The 6AS5 sound output tube (see illustration) was hooked up so that it had about 150 volts on its grid. With the output tube thus operated, 150 volts was being developed at the



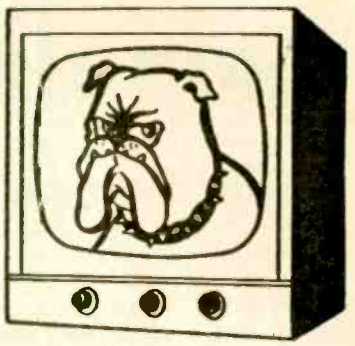
This vol. control acted as a contrast control.

cathode, which was being used as a supply source for various points in the i-f stages. From here it was a matter of checking voltages and resistance around the sound output stage, which led to the discovery that some 150 volts was being fed to the volume control. The 0.01-mfd coupling condenser, of course, was shorted.

At maximum setting of the volume control, the full 1-meg of resistance between this 150-volt point and ground was enough to prevent loading of the supply. As the control was reduced in setting, the increased load tended to short out the B-plus, thus cutting off the tube and preventing it from developing voltage at its cathode. With no voltage at the cathode, there was no supply for critical points in the i-f strip. This caused the volume control to act indirectly as a contrast control.—*B. C. Hutson, No. Little Rock, Arkansas.*

Mysterious R-F

Two large black horizontal bars appeared on the raster of this Zenith 19L26 when the set was turned on, and they got worse as the set played. By the end of 5 minutes, these interfering bars were so pronounced that the raster was almost completely blacked out by two wide strips with tapering gray edges.



$10 For Your "Tough Dog Story"

Have you tangled with a difficult or obscure service problem recently? Write it up, telling us how you liked it. Use drawings to illustrate your explanations wherever necessary. A rough sketch will do as long as it can be followed. Send it to "Tough Dog" Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., N. Y. 17, N. Y.

The symptom was tunable. That is, the intensity of the bars varied from channel to channel, being virtually absent on Channel 2 and most pronounced on UHF; in addition, the bars were locked in sync on programs of local origin, but would move up or down on programs of distant origin. The interference also seemed to have a directional characteristic. The latter symptom had me requesting the surrounding neighbors to turn off their house current. After about a half hour of this, to no avail, the set was brought into the shop.

The interference pattern was again apparent in the shop. A search for an oscillating stage in the r-f and i-f sections was made—no soap. All tubes except the rectifier were replaced, but still no results. A shielded probe was connected to a field strength meter to hunt for the source of oscillation, and the meter was set up on UHF. Naturally, the source of radiation had to be the 5U4 rectifier—when the probe was moved toward this tube, the high level of oscillation nearly bent the pin on the field strength meter.

The tube checked out perfectly. The only conclusion appears to be that some high r-f was being generated in one of the elements or at a point of weld, and that it was being modulated by the 120-cps ripple from the power transformer. Physical placement of the 5U4 near the antenna terminals inside the set permitted the signal to get into the tuner by brute force. The same offending 5U4, when suitably coupled to a rabbit-ear antenna, was able to modulate every receiver in our shop. —*Louis A. Conner, New Orleans, Louisiana.*

Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

Line Cord Protection

The line cords on electric drills and other equipment used in the shop often become frayed and damaged from constant use, requiring replacement from time to time. Premature damage and replacement can be avoided by using the twisted plastic cord wrappers of the kind universally sold to be used on telephone cords. Use of these protective wrappers prevents line cords on drills, soldering guns and other equipment from becoming twisted and fouled, thus prolonging their life.—*Henry Josephs, Gardenville, Penna.*

Pilot Bulb Remover

Two rubber crutch (or cane) tips attached to a dowel stick make a handy tool for removing pilot light bulbs in close, narrow, and otherwise hard-to-reach places. The prepared stick will remove both good bulbs and broken ones. Although the rubber tips come in different sizes, there is no difficulty, when a bulb is brought along, in matching up a pair of tips that will fit snugly enough over the bulb to grip it. The diameter of the dowel stick is chosen so that one of the crutch tips—the one shown at the right in the figure—will just fit on it as it would on a crutch or cane. At the other end of the dowel stick, instead of being slipped over the end of the stick, the tip is turned around and screwed on as shown.

In use, the left end of the tool will fit snugly over pilot bulbs to make removal easy. The other end of the tool is just right for removing broken pilot bulbs. The bottom of the crutch tip is shaped just about right for fitting into the broken socket. If the rubber is a little too large, a sharp razor blade can be used to taper it to fit. A slight inward and twisting pressure will soon remove even the most obstinate broken bulb or base. The tool works equally well on bayonet and screw-type pilot lights. I keep such a stick on my bench at all times.

The rubber tips are available in all novelty or dime stores at about a nickel each. The dowel stick can be purchased at a hardware store.—*Joseph Amorose, Richmond, Virginia.*

Nut Driver Extension

I ran into a situation in which I had trouble removing a high-voltage cage. Because of the location of the cage in a tight spot, I would have needed a nut driver with a shaft at least 6 in. long to get to the ¼-in. hex-head screws that were securing the cage to the chassis. My ¼-in. nut driver has a shaft only 3 in. long. I procured a length of separate shaft 4 in. long, which I was able to fit snugly into the head of the nut driver. At the outer end of the shaft extension, I connected another ¼-in. socket head. This made the nut driver more than long enough to do the job. Incidentally, any size socket head can be secured to this type of shaft for different types and sizes of nuts. Sets of these heads and shafts are available in hardware stores.—*George Mancini, Methuen, Massachusetts.*

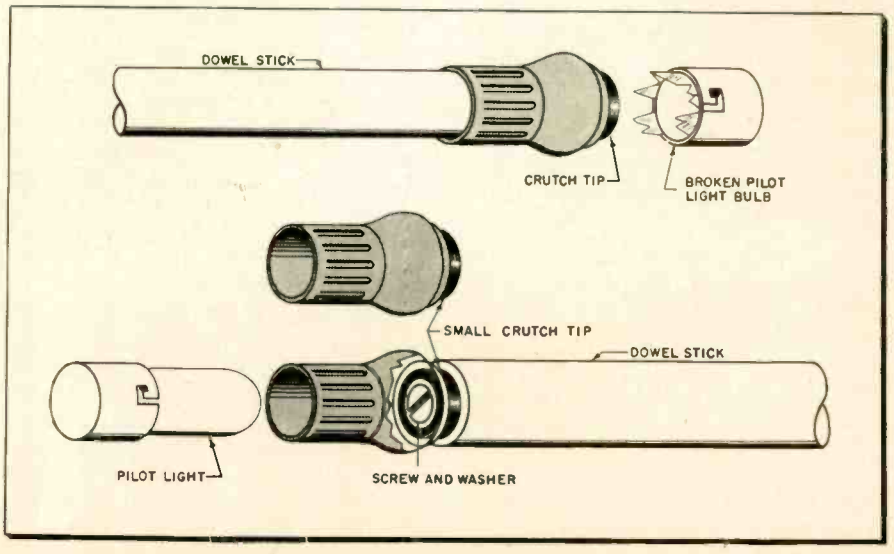
Weak H-V Rectifier

This fault occurs on some Stewart-Warner 9202 models (17 in.) in particular, and on other similar models. Turning up the brightness control causes the picture to bloom excessively, with focus and brightness being incorrect. Changing the low-voltage rectifier, the horizontal output tube, the damper, and the horizontal oscillator has little effect. Changing the 1B3-GT high-voltage rectifier has considerable effect, but it is not always favorable. The new tube is quite likely to be even worse than the old one.

The difficulty lies in the fact that insufficient heater voltage is being supplied to the 1B3-GT by the single-turn filament winding on the high-voltage transformer. Only tubes that take slightly less heater current drain than normal will work satisfactorily, if at all. To check on the level of filament voltage, solder two short leads to a single-cell pen-light bulb, connect the other ends of these leads to the heater contacts in the 1B3 socket, and turn the set on. If the bulb lights with a pronounced glow, similar to that in normal flashlight use, then filament voltage should be okay. If filament voltage supplied by the transformer is too low, the bulb will have a dim or barely discernible glow.

To remedy the situation, add enough wire to the filament winding to make a 2-turn loop around the leg of the transformer, and insulate this wire well. The transformer has plenty of open space, so the addition of this extra turn of wire is not difficult. The difference is little less than startling. Focus, brightness and picture stability are all very much improved.—*M. G. Goldberg, St. Paul, Minnesota.*

Removal of stuck pilot bulbs, even broken ones, is easy with this stick and 2 crutch tips.



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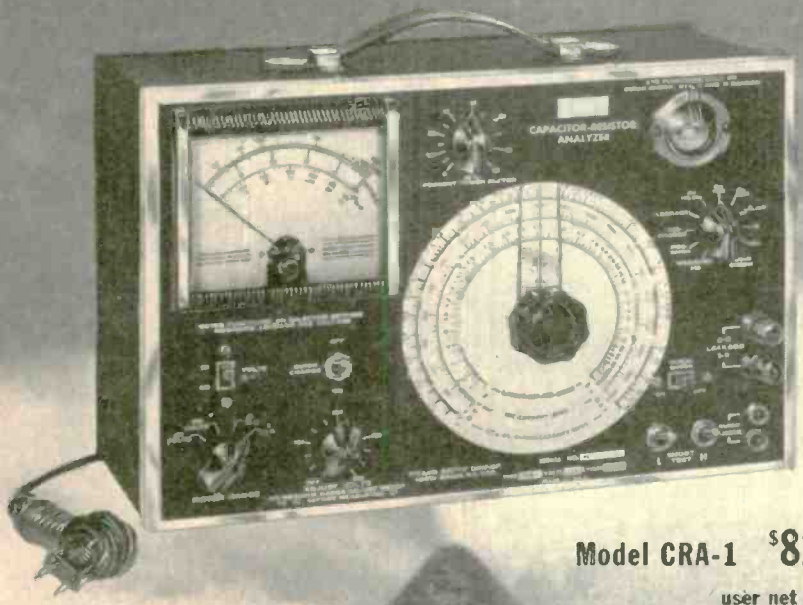

Model CRA-1 **$82.95**

user net price

This fine double duty instrument provides you not only with the complete setup for checking and analyzing all types of capacitors and resistors, but also the "Quick Check" feature enables you to test capacitors while they are wired in a set.

With the Pyramid analyzer there is no need to remove capacitors from the circuit to determine if they are open, shorted or intermittent.

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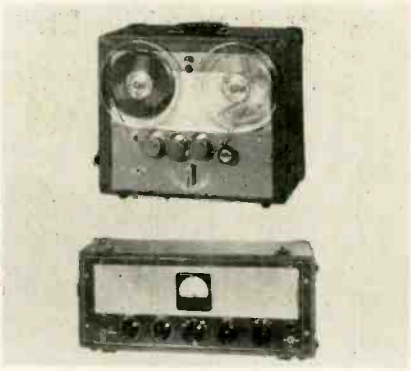


University SPEAKERS

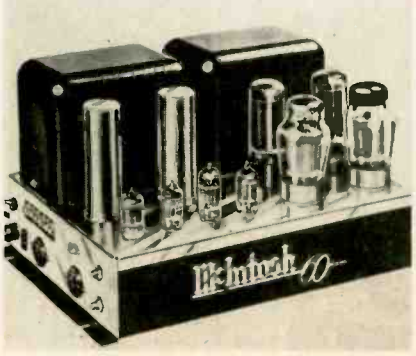
Two hi-fi speaker systems in "Decor-Coustic" designs are the "Senior" (illustrated) and "Master" models. The Senior is powered by a 3-way speaker system using woofer, midrange horn and tweeter, and handles up to 30 watts. Enclosure is of the horn-loaded phase inverter type, with projected sound strongly coupled to room. Master model is similar, with larger speakers and enclosure. Finishes are cherry and blond mahogany. University Loudspeakers, Inc., 80 S. Kensico, White Plains, N. Y. —TECHNICIAN (Ask for No. 11-40).

EV ENCLOSURES

Complete line of "Do-it-Yourself" K-D Kits make it easy to build high-fidelity speaker enclosures. Seven models to choose from; corner types, wall types, for full-range loud-speaker, for separate two, three, and four-way speaker systems. Includes the Patrician and Georgian interior "K" horn units and complete E-V Baronet, Aristocrat, Regency, Empire and Centurion enclosures. Every kit includes glue, screws and nails. Electro-Voice, Inc., Buchanan, Mich.—TECHNICIAN (Ask for No. 11-42).

McIntosh AMPLIFIER

Model MC 60 high fidelity amplifier delivers 60 watts with less than 0.5% distortion from 20 to 20,000 cps. Noise and hum level is 90 db or more below rated output. Damping factor is 15 or more for 4, 8 and 16 ohm output; 20 for 600 ohms. Phase shift is 8° from 20—20,000 cps. Size is 14½" x 10" x 8" high, chassis type construction. Eight-tube unit weighs 42 lbs., finish is chrome and black, sells for $198.50. McIntosh Laboratory, 320 Water St., Binghamton, N. Y. —TECHNICIAN (Ask for No. 11-43).



Audak ADAPTER

New instant "Plug-In" adapter instantly connects any of the manufacturer's cartridges to any Garrard player. It is designed specifically for the RC-80M and RC-90 record changers and Model "T" turntable. No soldering, no wire handling. Price $2.70 net. The Audak Co., 500 Fifth Ave., New York 36, N. Y. — TECHNICIAN (Ask for No. 11-46).

Ampex TAPE PLAYER

For stereophonic reproduction, Model 612 "tape phonograph" plays each of two separately recorded sound tracks from a single tape through two separate amplifier-loudspeaker systems. In addition, the new phonograph also can reproduce standard monaural tape recordings. Accommodation is provided for both full and half track tapes. Prices for the Model 612 tape phonograph begin at $395. Ampex Corp., 934 Charter St., Redwood City, Calif. — TECHNICIAN (Ask for No. 11-45).

Quam SPEAKER

A two and one-half inch loudspeaker, Model 25A07, is designed as a replacement-improvement speaker for personal portable radios, intercom equipment and similar applications. It is only 1¼ inches deep. Its maximum input is 2 watts; 0.65 ounce alnico V magnet; four mounting holes on the rim; voice coil impedance is 3.2 ohms. Quam-Nichols Co., 234 E. Marquette Blvd., Chicago 37, Ill. — TECHNICIAN (Ask for No. 11-44).

Utah SPEAKERS

A new line of single cone and coaxial speakers named the "Fabulous 'G' Series" is available in 8", 12" and 15" sizes in the coaxial models. They all have heavy Alnico V magnets, spring clip, solderless terminals, and seamless cones. The series includes extended range, mid-range, woofer, tweeter and coaxial. Utah Radio Products Co., Inc., 1123 E. Franklin St., Huntington, Ind. — TECHNICIAN (Ask for No. 11-47).

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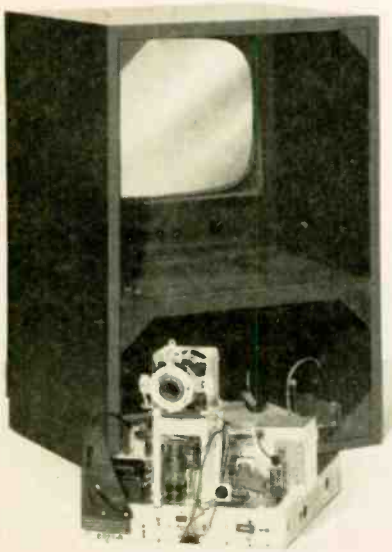

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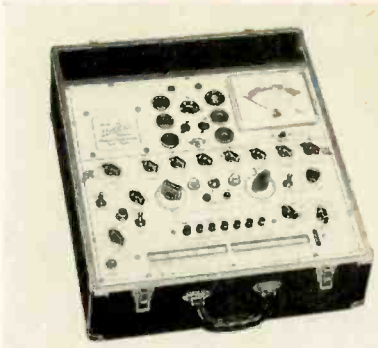
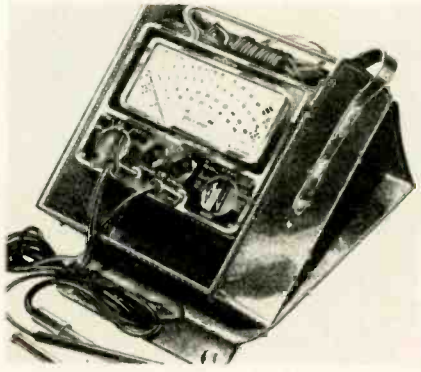


Dynamic mutual conductance type tube checker in portable case, Model 750, permits quick and accurate evaluation of any tube normally encountered in electronic work including ruggedized, TV, hearing aid and series heater-string types. Features include micromho ranges to 30,000 in 5 ranges; two "Replace-Good" ranges on 5" meter; dc Voltmeter readings up to 200 volts; dc milliammeter measurements up to 100 ma. Hickok Electrical Instrument Co., 10523 Dupont Ave., Cleveland 8, Ohio—TECHNICIAN (Ask for No. 11-1)

Eico OSCILLOSCOPE

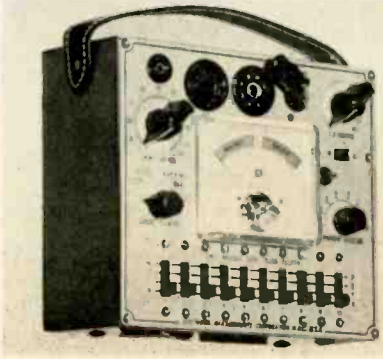
Model 460 5-mc oscilloscope for monochrome and color TV servicing offers reproduction of the 3.58 mc sync burst. It features dc to 4.5 mc response, automatic sync circuit, pre-set TV vertical and horizontal sweep positions, built-in voltage calibrator, vertical amplifier push-pull throughout for reduced distortion and choice of direct (DC) or capacitive (AC) coupling, sensitivity is 25 mv/in. Has 4-step frequency-compensated attenuator. EICO, 84 Withers St., Brooklyn 11, N.Y.—TECHNICIAN (Ask for No. 11-2)

Phaostron VTVM



The "777" VTVM is a self-contained instrument with all accessories fitting into its leather carrying case. Accessories include: high-frequency coaxial cable, dc probe and line cord. Features include: illuminated scales; double shielded 200 microamp movement; 42 unduplicated ranges; scales 4⅞" long; and 3% dc and 5% ac accuracy. Unbreakable, ultra-compact metal case. Complete with all equipment and accessories, it sells for $69.95. Phaostron Co., 151 Pasadena Ave., South Pasadena, Calif.—TECHNICIAN (Ask for No. 11-3)

EMC TESTER & REJUVENATOR



New tube tester and rejuvenator, Model 209, is available wired in hammertone case at $35.90, in oak at $28.50, and kit form at $25.90. It uses standard, total emission method. Checks for tube quality, shorts, leakages, continuity and opens. Instrument features 3½" meter. Additional equipment required to rejuvenate and repair picture tubes is the Model CRA, picture tube adaptor, selling for $4.50. Electronic Measurements Corp., 280 Lafayette St., New York 12, N.Y.—TECHNICIAN (Ask for No. 11-6)

Simpson PANEL METERS

Two new lines of rectangular panel instruments, 4½" and 5½", are available in three types: dc meters, rf meters, and ac rectifier meters. Instruments can be supplied with sensitivities as low as 10 microamperes. All practical ranges can be supplied. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.—TECHNICIAN (Ask for No. 11-8)

GEE OSCILLOSCOPE

Model 555K wide range, 5" oscilloscope has a 3-stage vertical push-pull amplifier with plate follower circuit that is useful to 3.6 mc. Vertical sensivity is 25 mv/in. Vertical input is 500,000 ohms across 35 mmf. Horizontal frequency response is useful up to 700 kc. Sweep range is 15 to 150,000 cps. Also features Z axis modulation. Price in kit form is $59.50 General Electronic Equipment Co., Easton, Pa.—TECHNICIAN (Ask for No. 11-5)

Du Mont VTVM

Compact and highly sensitive vacuum-tube voltmeter which can make precise ac measurements from 100 microvolts to 300 volts at frequencies from 10 cycles to 2 mc is designated as Type 346. It also has an output permitting use as a broadband amplifier. The 4¼" meter scale is illuminated, and decibel readings are from −72 to +52 db. Meter ranges are 0.001, 0.003, 0.01, 0.03, 0.1, 0.3, 1.0, 3.0, 10, 30, 100 and 300 volts full scale. Accuracy is ±3%. Allen B. DuMont Labs., 760 Bloomfield Ave., Clifton, N.J.—TECHNICIAN (Ask for No. 11-4)

Senco CHECKER

Improved filament checker for quickly finding the open filament in series filament TV sets is pocket sized and automatically checks all octals, loctals, 7 and 9 pin miniature tubes and picture tubes. It can also be used as a continuity checker and neon voltage indicator by inserting standard test leads. Dealer net is $2.75 without test leads, $2.95 with leads. Service Instruments Co., 171 Official Road, Addison Industrial District, Addison, Ill.—TECHNICIAN (Ask for No. 11-7)

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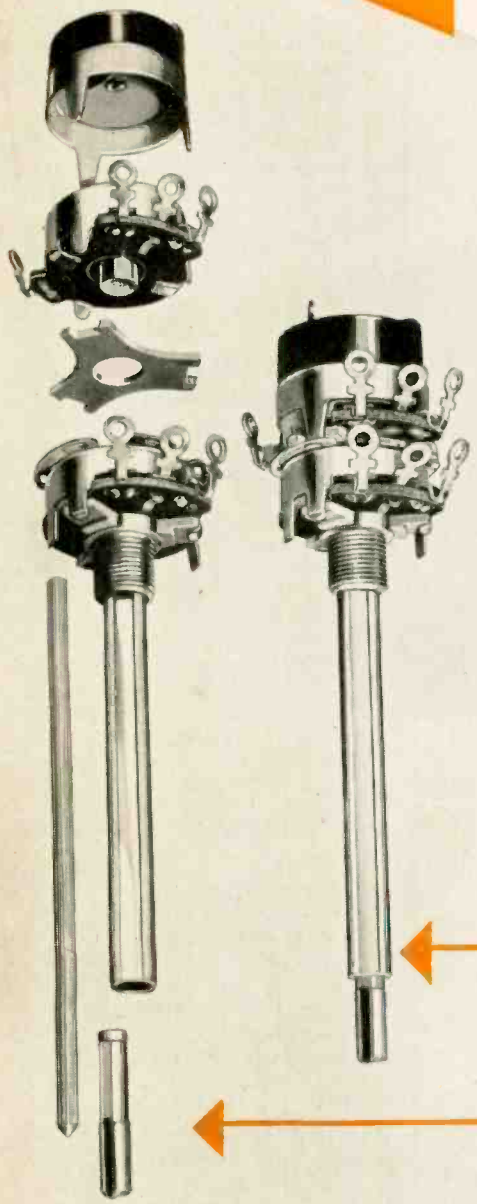

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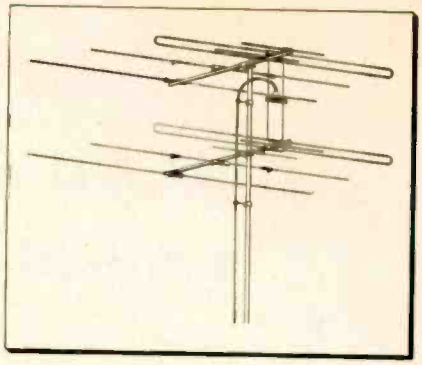
New Antenna Products

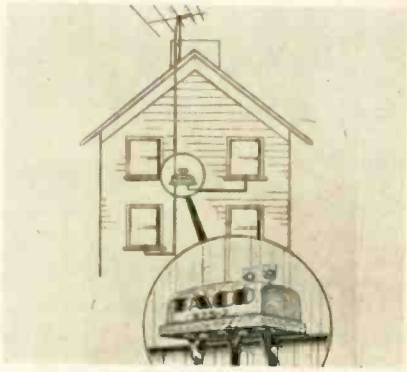
Amphenol TV ANTENNA

A VHF fringe area antenna, named "Poweray," utilizes a new sleeve dipole principle. The high gain and broadband characteristic is achieved by the use of short antenna elements in series with a section of simulated three wire transmission line in conjunction with a novel reflector system. The sleeve dipole principle assures close centering of the impedance characteristic for optimum match. American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill.—TECHNICIAN (Ask for No. 11-65)



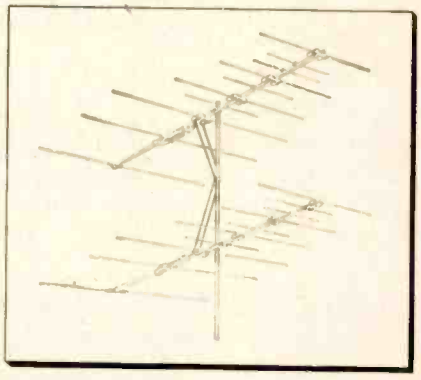
Taco COUPLER

Multi-set couplers are finding use in private homes, apartments and motels. Model 825 coupler is available as two-way or three-way splitting devices. Housed in weatherproof cases, they are designed for installation on the exterior of the building, reducing long indoor runs of transmission line. These couplers are of the voltage-splitting type and do not require power line connections. In high signal strength areas, the units may be used in tandem. Technical Appliance Corp., Sherburne, N. Y. — TECHNICIAN (Ask for No. 11-32).



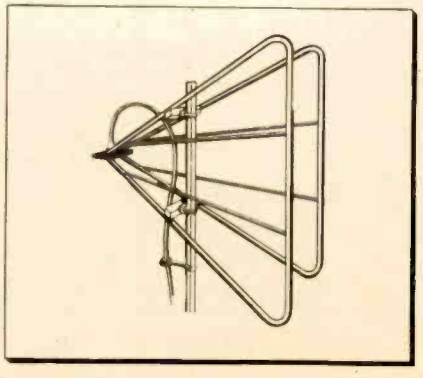
Telrex ANTENNAS

Basic single bay Super Thunder Bird, Model T-120, supplied in a 2-bay array, ¼-wave stacked, model T-122 increases gain 3db on all channels. A ½-wave stacked two-bay array, Model T-122-S (illustrated), is offered for low channel emphasis. Model T-122-S provides gain increases over a single bay up to 4.5db on channels 2-6. They provide exceptional sensitivity and directivity for fringe and deep fringe reception areas. Models T-110 and T-130 are also available. Telrex, Inc., Asbury Park, N. J. — TECHNICIAN (Ask for No. 11-30).



Telco ANTENNA

A clever, new UHF-VHF antenna design that opens up like a book is the "Sky-Wing" antenna. Claimed to have unusually high gain, this television antenna is, in addition, of all aluminum construction. It comes fully preassembled, and is ready for immediate installation. The "Sky-Wing" (Catalog No. A-300) lists for $7.95, complete. It is presently available through parts distributors throughout the country. Television Hardware Mfg. Co., 400 South Wyman St., Rockford, Ill. — TECHNICIAN (Ask for No. 11-33).



Kay-Townes TV ANTENNA

The Little Jim, an inline type giving high gain on Channels 2 through 13, is available in models LJ-1 and LJ-2. A new type director is said to increase gain and directivity on both high and low bands and permit close coupling of directors. Because of this, the complete antenna can be mounted on a crossarm of only 96 in. The Little Jim incorporates new snap-lock construction, all element holders being riveted. Kay-Townes Antenna Co., Rome, Ga., — TECHNICIAN (Ask for No. 11-34).

Wayco VHF ANTENNA

"Master" model antenna offers uniform high gain of all channels from 2 through 13. The antenna functions as a phased colinear array on channels 7 through 13 and has an end-loaded, broad band dipole with reflector for low band operation. The antenna is produced in two models—Standard and Deluxe. The Master Deluxe antenna carries a full 5-year guarantee of durability. Heavy duty seamless aluminum tubing and stainless steel hardware are used. Wayco, Inc., Waynesboro, Tenn. — TECHNICIAN (Ask for No. 11-35).

BT WAVETRAP

Precision tunable trap to eliminate FM interference in master TV systems and individual TV sets is called Model MWT-1. List price is $23.00. Any FM channel from 88 to 108 mc may be attenuated more than 20 db. Rejection ranges from 35 db at channel center to less than 3 db 1.5 mc on either side. Feed-thru circuit insures 75 ohm impedance match on all VHF TV channels. UHF cable connectors are used. Blonder Tongue Labs., Inc., 526 No. Ave., Westfield, N. J. — TECHNICIAN (Ask for No. 11-31).

Capcon TV FILTER

The new "Printed-Circuit High-Pass Filter" eliminates or suppresses TV picture interference from ignition, diathermy, amateurs, industrial equipment, neon signs, electrical appliances and other extraneous signals. It has a three-section high-pass filter. The printed circuit contains six precision coils and four condensers. This filter will cut out all interfering signals below 54 mc with an attenuation above 45 db. It retails at $1. Capcon, Inc., 25 Willett St., New York 2, N. Y. — TECHNICIAN (Ask for No. 11-36).

For more technical information on new products, use inquiry coupon on page 50.

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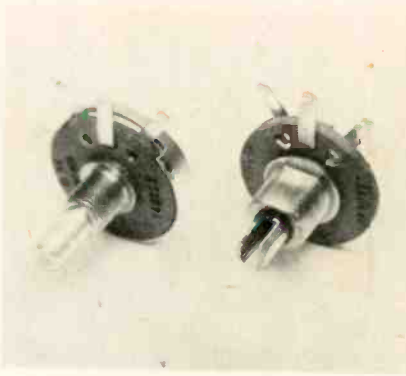
New Components in Review

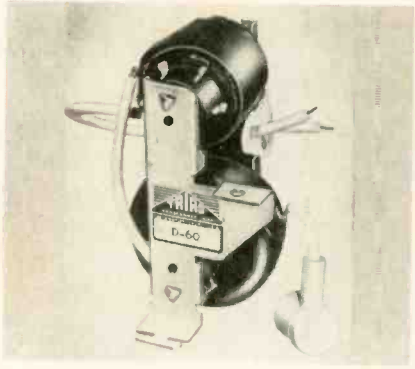
Clarostat CONTROLS

The "Humdinger" or Series MH control, a low-cost potentiometer, has been redesigned to provide an increased range of resistance values from 2 ohms to 15,000 ohms—a gain of 14,000 ohms over earlier models. Wiper arm is insulated from shaft mounting and bushing. A special feature is the hollow-shaft construction which allows the mounting of a switch at the rear, with the switch shaft passing through the center of the control. Clarostat Mfg. Co., Dover, N. H.—TECHNICIAN (Ask for No. 11-10)



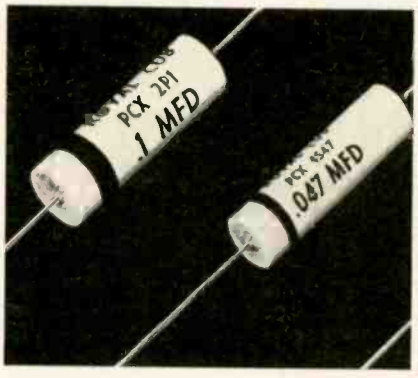
Triad FLYBACKS

Five new replacement flyback transformers, designed for use in RCA, Travler and Zenith television receivers, are electrically and mechanically interchangeable with the manufacturer's original equipment. Wherever possible they are composite replacement to fill a number of requirements where mechanical and electrical specifications are identical. Complete line of TV replacement transformers is listed in Catalog TV-155. Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif.—TECHNICIAN (Ask for No. 11-11)



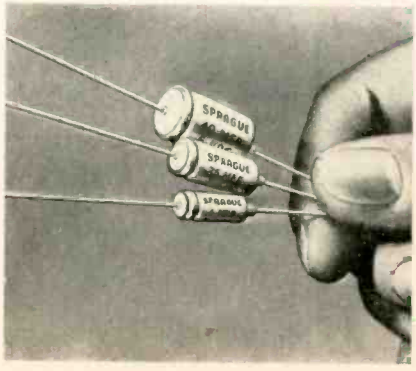
CD TUBULARS

"Royal Cub" paper-dielectric capacitors are designed for high temperature and high stability operation with long-life characteristics. It operates over a temperature range of —55° C. to +100° C. at full-rated voltage. Average capacitance-temperature variation is only 5% from the 25° C. value. "Royal Cub" is available in 100, 200, 400, 600, and 1,000 volts dc working, and capacitances from 0.001 to 1.0 mf depending on voltage. Cornell-Dubilier Electric Corp., South Plainfield, N.J.—TECHNICIAN (Ask for No. 11-12)



Sprague ELECTROLYTICS

Tiny hermetically-sealed aluminum electrolytic capacitors, "Lyttl-Lytics," answer a need for moderately priced, reliable miniature capacitors with low leakage current for transistorized radios, wireless microphones, personal recorders, etc. Low leakage assures minimum battery drain. The new miniatures are available in ratings from 1 to 110 mf, and in standard working dc voltages of 1, 3, 6, 10, 12, and 15. Sizes range from 3/16" D x 1/2" L to 3/8" D x 3/4" L. Sprague Electric Co., North Adams, Mass.—TECHNICIAN (Ask for No. 11-9)



JFD CAPACITOR KIT

New piston capacitor kit, PK85, offering a comprehensive selection of precision piston capacitors for electronic experimental purposes, houses an assortment of 85 quartz and glass piston capacitors of the 10 basic types now in use. JFD Electronics Div., 6101 16th Ave., Brooklyn 4, N.Y.—TECHNICIAN (Ask for No. 11-14)

Alden SOCKET KIT

Socket selector kit 908W-K facilitates voltage, current and resistance readings in electronic circuits, extending usefulness of various test instruments. In addition to the socket selector block and cable, there is an assortment of some 17 socket selectors, jumpers and chassis adapters for measuring values at tube pins from above chassis. Alden Products Co., 117 No. Main St., Brockton, Mass.—TECHNICIAN (Ask for No. 11-17)

Erie CAPACITORS

Type "H-A" Hi-K Disc Ceramicons employ a dielectric which reportedly exhibits flat temperature characteristics. Maximum capacity change is only 3% over temperatures ranging from +10° to +85°C. Capacities values range from 150 to 4,250 mmf, with tolerances of ±10% and ±20%. Diameters range from 5/16" to 3/4". Maximum thickness on all units is 5/32". Complete information is available in Bulletin 449, Erie Electronics Div., Erie Resistor Corp., Erie, Pa.—TECHNICIAN (Ask for No. 11-16)

G-C Stackpole RESISTORS

The "G-C 60 Line" makes it easy for the service technician to select his carbon resistor needs quickly. Each box of resistors carries a uniform dealers net price of 60c ($1.00 list price). The resistors are packed six, four and three to a box, in 1/2 watt, 1-watt and 2-watt types respectively. G-C Electronics Mfg. Co., 919 Taylor Ave., Rockford, Ill.—TECHNICIAN (Ask for No. 11-13)

Shallite RESISTORS

New wire lead precision wirewound resistor uses transparent encapsulation. The visibility feature reportedly assists in precluding service failures caused either by bubbles or strains. Included is the electric welding of wire to the phosphor bronze leads. Shallite, Inc., 10 Mill St., Paterson 1, N.J.—TECHNICIAN (Ask for No. 11-15)

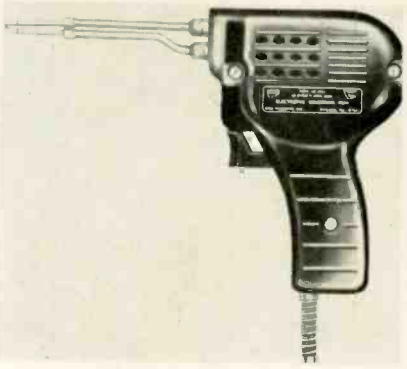
For more technical information on new products, use inquiry coupon on page 50.

New Products for Technicians

Delco PLASTIC KITS

Handy, clear plastic, pocket-sized kits are designed to keep replacement hardware at the technician's finger tips for quick and easy servicing. The clear plastic kits (there are four different ones to cover the whole range of hardware needs) are divided into eight small compartments. A chart on the cover names the part and part number for convenience when ordering compartment refills. United Motors Service, Div. of General Motors Corp., General Motors Building, Detroit 2, Mich. — TECHNICIAN (Ask for No. 11-50).

Wen SOLDERING GUN



Model 288 soldering gun is a 200-watt, heavy-duty unit that comes up to working heat in less than 5 seconds. List price is $9.95. Features include silver-plated tip and connectors, rigid, removable tip, and spotlight angled to throw shadowless light on work area. Weight is 2¼ lbs. Requirements are 110/120 volt, 60 cycle source, 2 amps maximum. Height is 6¼ in., length without tip is 4½ in., 9 in. with tip. Wen Products, Inc., 5804 Northwest Highway, Chicago 31, Ill. — TECHNICIAN (Ask for No. 11-49).

Esico SOLDERING GUN

"Luger" soldering gun uses any of seven quick-change, residue-proof tips of assorted sizes and shapes, including a V-shaped type only 1/16 in. thick for tight spots. Heating speed is 6 seconds, and wattage range is 100 min, to 150 max. Single-heat model requiring 1.2 amps, 120 volts, 60 cycles, lists at $9.95. Dual-heat unit at $11.95. Both have 10-watt pre-focused spotlights which illuminate areas without shadows. Electric Soldering Iron Co., Deep River, Conn. — TECHNICIAN (Ask for No. 11-51).

Sentinel REMOTE CONTROL

New remote control unit and personalized speaker for TV receivers offers technicians opportunity to sell installations in home and hospital. Device changes to any of 12 channels, switches from speaker in set to personal speaker, controls fine tuning, volume, on-off and brightness. Sentinel Radio Corp., 2100 Dempster St., Evanston, Ill. — TECHNICIAN (Ask for No. 11-52).

Sonotone CARTRIDGES

Series 3 ceramic cartridges offer flat response from 20 to 15,000 cycles per second. High compliance of 2.5 keeps distortion below "negligible" point. High output of 0.5 volt cuts preamplifier requirement. Cartridge is self-equalizing because ceramic responds to amount of needle movement, rather than velocity. Single needle model with diamond needle, $30 list. Turnover model with sapphire-diamond needles, $32.50. Sonotone Corp., Elmsford, N. Y. — TECHNICIAN (Ask for No. 11-48).

GC SERVICE AIDS

An all-plastic, shockproof inspection mirror (catalog #5090-P) for observing hard-to-get-at locations has 36¢ net price. Another aid, a set of four test socket adapters (catalog #9250) facilitates top-of-chassis measurements. It nets for $6.75. General Cement Mfg. Co., 400 S. Wyman St., Rockford, Ill. — TECHNICIAN (Ask for No. 11-53).

Louis PLASTIC

New plastic comes as thick liquid and sets cold to bond practically all materials. It comes with a powder which makes it into a handmoldable putty for forming parts, replacing insulators, fitting knob to shaft, repairing cabinets, etc. Louis Labs., 175 W. 97 St., New York 25, N. Y. — TECHNICIAN (Ask for No. 11-55).

Vidaire DIAL LIGHT

Easy-to-install dial accessory that lights up TV channel tuning in the dark is Model DL-10 ChanneLite. Only simple lead clip to filament pin of any octal tube is needed. Vidaire Electronics Mfg. Co., 576 W. Merrick Rd., Lynbrook, N. Y. — TECHNICIAN (Ask for No. 11-54).

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New Tubes

GE TUBES

A new twin triode, the 6CH7, developed for TV cascode r-f amplifier circuits is reported to give more gain and better noise factor on the higher VHF channels than previous cascode tubes. A duplex-diode triode, the 6CN7, is intended for service as a combined horizontal phase detector and reactance tube in TV sets. Tube Dept., General Electric Co., Schenectady 5, N. Y. — TECHNICIAN (Ask for No. 11-39).

Raytheon TUBES

Two new picture tubes are the 21AMP4A, listing for $44.25, and the 21WP4 at $39. Both are magnetic focus and deflection types using external ion traps. The 21AMP4A offers an aluminized screen. Five new additions to the company's line of receiving tubes include the miniature 6AU8 and 6BH8 sharp-cutoff pentodes and medium-mu triodes listing for $2.85; 6CD6GA beam-power pentode at $4.70; 12AU7A nonmicrophonic version of the 12AU7 at $2.20 list; and the 12BV7 high transconductance miniature pentode at $2.50. Raytheon Mfg. Co., Receiving and Cathode Ray Tube Operations, 55 Chapel St., Newton 58, Mass. — TECHNICIAN (Ask for No. 11-37).

RCA TUBES

Total of 25 different picture tube types are included in the "Silverama" line of aluminized TV tubes. Sizes are 10, 12, 16, 17, 20, 21, 24 and 27 inches. It is claimed they will perform the function of 114 types now on the market. Warranty protection is given for one year from date of purchase. Two new additions to the receiving tube line are the 12AB5 beam power 9-pin miniature for auto radios, and the 6AU4GTA halt-wave rectifier for use as a damper diode. RCA Tube Div., Radio Corp., of America, Harrison, N. J. — TECHNICIAN (Ask for No. 11-38).

"I get a full 35 to 15,000 cycle response . . ."

New Color Picture Tubes

Accelerated growth of color TV is foreshadowed by developments in color pix tubes announced by GE and Westinghouse.

In a progress report and demonstration at Electronics Park, Syracuse, N. Y., GE unveiled a 22-in. rectangular tube that departs from conventional 3-gun types. The 3 guns used are mounted in the same horizontal plane, rather than in triad. Replacing the passive aperture mask is an active grille of parallel vertical wires, used as a post-acceleration electrode, to focus the 3 beams on their corresponding phosphors. The phosphors are also deposited in vertical stripes, rather than in groups of 3 dots.

Disposition of the 3 guns and wire grille are shown in Fig. 1. This artist's conception shows electrons striking phosphors inside the tube's faceplate. Though this final refinement is still under development, the demonstration model actually used an internal flat phosphor plate, mounted behind the envelope's faceplate.

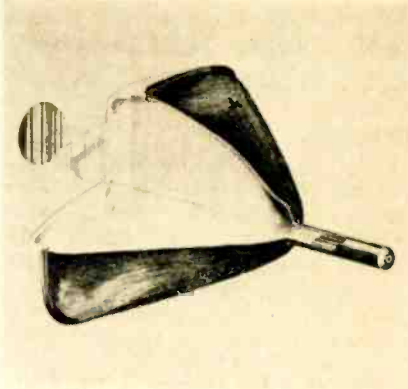


Fig. 1—Cutaway of GE color crt shows vertical grille wires and 3 in-line guns in neck.

Post acceleration permits more brightness, or light output, than is possible from shadow-mask tubes using the same value of 2nd-anode voltage. While the fine apertures in a shadow mask pass only about 15 percent of the electrons originating from the 3 guns, the wire grille is reported to permit about 90 percent of the electrons to strike and activate color phosphors. Fig. 2 shows, with some exaggeration for the sake of clarity, how the grille wires deflect and focus the beams sharply on the various phosphor stripes.

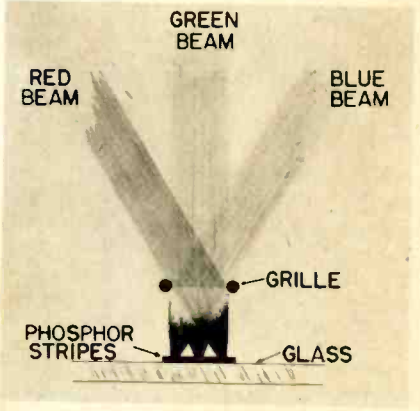


Fig. 2—How grille wires act to spot-focus color beams on appropriate phosphor stripes.

Inherent advantages include the fact that receiver design, while expected to follow the pattern of present color sets, is considerably less critical. Broader tolerances are possible in circuits and components concerned with deflection and convergence, paving the way to reduced costs, improved convergence, simpler adjustment and better long-term stability. Also, less deflection power is needed.

Stepped-up light output enables better contrast and color saturation in a lighted room than that obtained with a shadow-mask tube, although,

in a darkened room, contrast is cut down in the present state of development. This is due to the presence of a white haze, the result of secondary emission, in areas that should be dark.

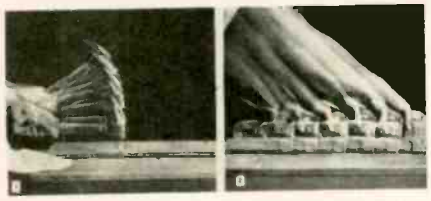
Normally, the final gun electrode is held to 6.5 kv, the grille is operated about 200 volts lower, and the phosphor screen is run at about 25 kv. While absolute values are not critical, the ratio between important voltages must be maintained.

The model shown used a metal flange, but development of an all-glass rectangular shell is under way. Final production version is not expected to be ready for use in next year's receivers. However GE states that, when the tube is ready, it can be incorporated in receivers designed around present aperture-mask tubes with only minor changes.

From Westinghouse comes news of a 22-in. rectangular all-glass version of the shadow-mask tube. Beside its reduced cost, this bulb is similar to conventional monochrome crt bulbs, and does away with the heavy insulation needed for metal-flange versions. These factors open the way to practical production and incorporation in conventional color receivers.

Stapler vs. Hammer

The 2 motion-sequence photos shown here, representing the same time period, compare the efficiency of a hammer and a new stapling gun for fastening non-metallic sheathed cable. As can be seen, the man with the gun was able to imbed 6 staples for every one set by his opposite number wielding the hammer. While hammering required an average of 5 strokes per staple, one was par with the gun. The stapler used, the Arrow T-75, represented an increase in efficiency of at least 70 percent.



Stapler is 6-to-1 favorite over hammer.

In addition to greater speed, the T-75 prevents damage to cable insulation and short circuits by automatically stopping staples at a predetermined depth; it also spreads and locks staples in wood. The ability to operate the stapler with one hand also contributes to safety of users who must balance on ladders. The T-75 and guns for other cable types are made by Arrow Fastener Co., Inc., 1 Junius St., Brooklyn 12, N. Y. (Ask for No. 11-70)

TV Linearity

(*Continued from page 35*)

To check horizontal linearity and width, adjust the brightness and contrast controls until vertical retrace lines are clearly visible on the screen. Reduce the width until the edges of the picture can be seen; then expand width so that they are just barely out of sight. If the picture is linear, the retrace lines will be perfectly straight from one side of the screen to the other. If they bend up a little at the right of the screen or down at the left, it means that the picture is cramped. See Fig. 2. If they tend to straighten out at the ends, the picture is expanded at those points. Adjust the horizontal linearity for the straightest slanting lines. The width and linearity may have to be juggled a little for best picture linearity and for a full screen. Very good results can easily be obtained but an extra effort is not usually necessary as it can't be noticed on a program.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF TECHNICIAN published monthly at Bristol, Conn., for October 1, 1955.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, M. Clements, 480 Lexington Ave., New York, N. Y. Editor, Albert J. Forman, 165 E. 179th St., New York 53, N. Y. Editorial Consultant, Orestes H. Caldwell, Catrock Road and Bible St., Cos Cob, Conn. Managing Editor, S. C. Silver, 259-36 148 Drive, Rosedale, N. Y. Business Manager, M. H. Newton, 583 W. 215th St., New York, N. Y.

2. The owner is (if owned by a corporation its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given.) Caldwell-Clements, Inc., 480 Lexington Avenue, New York 17, N. Y.; M. Clements, 480 Lexington Ave., New York, N. Y.

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(Signed) M. CLEMENTS

Sworn to and subscribed before me this 22nd day of September, 1955.

ALICE H. POND
Notary Public, State of New York
No. 03-8406175
Qualified in Bronx County
Cert. filed with N. Y. Co. Clerk
Commission expires March 30, 1956

Horizontal Oscillator-AFC Troubles? Where does troubleshooting start? See article beginning on page 28.

Meter Calibration

(*Continued from page 31*)

the meter. Therefore the resistance of R2 at this time was exactly equal to the resistance of the meter.

Now, knowing its current and resistance rating, the meter can be calibrated for any type of use desired. Note the examples below. For simplicity, values of 100 ma current rating and 200 ohms resistance rating of the unknown meter are assumed:

Suppose the meter is to be used as a simple ammeter whose full-scale reading is to be 1 ampere. Using the information previously determined, it can be seen that 900 ma must be shunted in parallel with the meter to limit the current through the meter to the 100 ma it is designed to carry. Using Ohm's Law, $R = E/I$, we know that $I = .9$ ampere. Better look at Fig. 3 to get the full picture. We can see that whatever voltage exists across the meter must exist across the shunt resistor. We can find the voltage across the meter, since we know the full-scale meter current and meter resistance.

$E = I \times R = .1 \times 200 = 20$ volts.

Now that we know the 20 volts exists across the shunt resistor, while .9 ampere flows through it, we can compute its resistance: $R = E/I = 20/.9 = 22.22$ ohms. This is the resistance that must be placed across the meter movement for a 1 ampere reading at full-scale deflection. Try winding your own resistor with an old wire-wound resistor from an old radio set. You might use a stock resistor if it's close enough.

If the meter is meant to be used as a voltmeter, with a full-scale reading of 100 volts, the following problem is worked out: Since 100 ma gives full-scale deflection, a resistor must be inserted in series with the meter so that 100 ma goes through the meter when 100 volts is applied. See Fig. 4. Again we fall back on Ohm's Law. We found out before that 20 volts drops across the meter at full scale deflection.

Since the meter drops 20 volts, and we want to read 100 volts full scale, the series resistor will have to drop 80 volts. The latter value (80 volts) is the one we use in the computation: $R = E/I = 80/.1 = 800$ ohms. Thus, with 800 ohms in series with the meter, the meter face can be calibrated to a full-scale reading of 100 volts without any additional equipment. •

Clothespin Servicing

(*Continued from page 38*)

clothespins are used.

Raise the loosened cone with a thin knife blade and apply cement to the edges; then clip the clothespins around the rim to exert pressure until the glue is dry. Allow about 24 hours for thorough drying.

As can be seen in Fig. 2, small pieces of folded cardboard are placed under the pins so that oozing cement will not cause the clothespins to stick to the cone. If such sticking is permitted to occur, a torn cone may be the result upon removal of the pins. Use as many pins as room will allow around the rim of the glued cone. Done this way, the whole job takes only a few minutes. The author has used this method on many loose cones with never a "comeback."

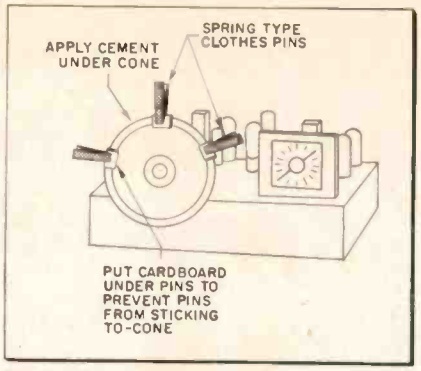


Fig. 2—Cementing loose speaker cones quickly.

Only two applications have been described. However, once the handy clothespins have entered the shop and come into use, many other applications, limited only by the technician's ingenuity, will be found. •

Customers & Intermittents

Are you haunted by intermittent faults you *think* you have fixed? There's always the chance that the set will act up in the same way after return to the owner. When it does, there's always the danger that the owner will lose confidence in you—unless he has been oriented properly on what to expect.

Technician August F. Kietzman, of Gilman, Ill., prepares set owners with a printed form he gives them while returning any set he has serviced for an intermittent. Some excerpts from the form: "Often an intermittent that has been chronic in the home, works perfectly here at the shop, possibly due to jar in transit, temperature or humidity changes, etc. Repairing a set of this type often necessitates a certain amount of 'hide-and-go-seek' labor, coupled with considerable patience on our part as well as that of the customer.

"We usually replace certain parts that we are suspicious of under special tests and, after another test run, if no trouble has shown itself, we return the set to the customer. Of course, in this procedure we are not *sure* we have corrected the trouble, and must enlist your aid in detecting any further trouble, as it would be practically impossible for us to operate and monitor each intermittent case more than a few hours.

"Your set has operated without showing any trouble here at the shop for ....hours. If it gives any trouble after being returned, please call us immediately and aid us by answering the following questions as fully as possible . . . "

Some of the questions then appearing on the sheet, designed to help Kietzman in narrowing down the source of the complaint, include: "Does the set cut off periodically?" "Does reception gradually fade out, or snap off?" Does turning another appliance in the house on or off affect it?" Other questions can be drawn up by individual technicians who wish to adapt the form, based on their own techniques in handling intermittent receivers.

In preparing his own questions, Kietzman has tried to keep them in a form that can be answered with "yes" or "no." He leaves space after each question for the answers.

Has the form helped? The best answer is the fact that Kietzman has been using it since 1938. It has since been revised for use with TV as well as radio.

Tube Racket Smash Plan Passes Million Mark

More than a million old radio and TV receiving tubes had been smashed before Philco's racket-smashing campaign was a month old. During the program, service technicians and dealers are being given 5 cents credit for each old tube turned in. Tubes are destroyed in the presence of technicians who bring them in to distributors.

The campaign was launched to keep discarded tubes out of the

Philco distrib D. Lerner, of E. Orange, N. J., destroys worn-out tubes brought in for credit.

hands of racketeers who have been cleaning them up to look like new, and reselling them. (See *Inside story: The "Reprocessed" Tube Racket,* TECHNICIAN, July, 1955) James J. Shallow, gen. mgr. of Philco's Accessory Div., estimates the nation-wide racket has cost TV and radio users $100 million annually. The Philco campaign was launched with the distribution of reprints of the exclusive TECHNICIAN exposé, which appeared in July.

High Fidelity Notes

The Hi-Fi Home: A builder on Long Island, N. Y., is successfully selling a home in the $18,000 price range that includes an integral hi-fi system as standard equipment. Built into a cabinet storage wall, the flexible system, using GE equipment, includes a preamp-control unit, a 10-watt amplifier, 2 12-in. speakers and a record player. Speakers are directed to both the recreation and living areas of the split-level houses. Another speaker connection may be used to service the living-dining-kitchen portion of the house. The homes are in the Brookville Farms development in East Northport. Builders report that public response has been favorable, with the hi-fi installation often acting as a sales clincher.

Tape News: Developments in extra-play tape are proceeding so rapidly that the 50-percent longer playing Mylar-backed tape, announced only a few months ago, has been surpassed. A new Mylar backing, half a mil thick, now makes it possible to put twice as much tape on a given reel than is possible with conventional acetate-backed tapes. A 7-in. reel can now play for a full hour, single-track, at 7½ ips, or 2 hrs. dual-track. Several manufacturers are marketing the new reels.

Hi-Fi Demonstration: G. A. Briggs, British authority on sound reproduction, conducted a lecture-demonstration at Carnegie Hall on October 9 in which live performances, given by the well known artists present, were compared with their recorded performances. Equipment used was of the type available to the public for hi-fi home use.

Hi-Fi Institute: Latest companies to join the Institute of High Fidelity Manufacturers include Audak Company and Presto Recording Corp. Audak makes pickups, arms and cutting heads. Presto manufactures discs, turntables, and other tape and disc recording and playback equipment.

News of the Industry

INTERNATIONAL RESISTANCE CO., Phila., announces the election of A. H. HARDWICK as vice-pres., and the appointments of GEORGE STEVENSON as sales co-ordinator and ERNEST W. YONICK to Eastern sales mgr. of its wholly-owned subsidiary, CIRCUIT INSTRUMENTS, INC., St. Petersburg, Fla.

CENTRALAB DIV., GLOBE-UNION INC., Milwaukee, reports the election of ROBERT L. WOLFF as vice-pres. in charge of engineering.

Robert L. Wolff

Harry Kalker

SPRAGUE ELECTRIC CO., North Adams, announced that HARRY KALKER, sales mgr., has returned from a 3-week tour of the electronic industry on the West Coast.

BRACH MFG. CORP., DIV. GEN'L. BRONZE CORP., Newark, N. J., advises that DANIEL ROSEMAN has been named to the post of Eastern sales mgr. of television products.

CHANNEL MASTER CORP., Ellenville, N. Y., announces the appointments of two new district sales mgrs. to service its distributors—EUGENE DUFFNER has been assigned the state of Fla. and EARL PRUITT will handle the states of Ind. and Ill.

PRECISION ELECTRONICS, INC., Franklin Park, Ill., announces the appointment of IRVING ROBINS as jobber sales mgr.

RAYTHEON MFG. CO's. PERCY L. SPENCER of Newton, Mass. has been elected director of its Microwave and Power Tube Operations.

ELECTRONIC INSTRUMENT CO., INC., Brooklyn, reports that PHILIP A. PORTNOY has been appointed vice-pres.

ASTRON CORP., East Newark, N. J., announces the appointment of PETER MALER as its new sales promotion mgr.

FEDERAL TELEPHONE & RADIO CO., Clifton, N. J., announces the appointment of JOSEPH SOLARI as general sales mgr. of the Components Div.

(News continued on page 62)

CBS-HYTRON DIV. COLUMBIA BROADCASTING, Danvers, Mass., reports the appointment of WILLIAM W. POSEY as East Central district sales mgr.

ALLEN B. DUMONT LABS., Clifton, N. J., advises that BENJAMIN C. BOWKER has been named public relations mgr.

RADIO MERCHANDISE SALES, New York, N. Y., reports the appointment of EDWARD E. WINEBLATT as general mgr.

ASTATIC CORP., Cleveland, announces a brand new 3-point merchandising program for its line of phono cartridges. The new and the old stock numbers will appear on the end of the individual cartridge box, printed in a color which will be changed periodically, so that the jobber can tell at a glance the fresh from the older stock; the under side of the cartridge box will have complete replacement data for both ASTATIC and other brands; and on the bottom of the box will be shown the list price of the cartridge and the dealer net price.

SYLVANIA ELECTRIC PRODUCTS INC. announces the production of its 10 millionth television picture tube.

ADMIRAL CORP. has held 109 television training schools since printed circuit wiring was introduced in the company's television receivers in June, 1954 according to a recent release.

TECHNICAL APPLIANCE, Sherburne, N. Y., presented GLORIA LOCKERMAN, spelling queen of the $64,000 question program, with a complete antenna installation.

GENERAL CEMENT MFG. CO. and its five subsidiaries have moved into a recently acquired five-story building located in downtown Rockford, Ill.

RCA SERVICE CO. announces the opening of a repair shop in New York for commercial and industrial electronic equipment.

BEN SNYDER, president of SNYDER MFG. CO., reports that Charles Schlegel, executive sales rep, has won the sales competition on their 3-D Directronic indoor TV antenna. Mr. Snyder and sales manager Dick Morris have announced Christmas gift promotion of K-80 do-it-yourself and rear-deck auto radio antenna kits.

TODD-TRAN CORP., Mt. Vernon, N.Y., announces that Messrs. RICHARD SCANLON and RICHARD CORN have joined their organization in the capacities of production mgr. and chief engineer, respectively.

CAPEHART-CANADIAN WESTINGHOUSE make Canadian agreement. A licensing agreement, whereby CANADIAN WESTINGHOUSE CO., LTD, will manufacture and distribute CAPEHART-FARNSWORTH consumer products in Canada was jointly announced by the two companies.

Reps and Distributors

QUAM NICHOLS CO. has named THE JAMES M. PICKETT CO., New York, as rep in the New York area.

JAMES P. HERMANS, rep for OXFORD ELECTRIC CORP., has retired from his company. He will be succeeded by F. W. MOULTHROP who will occupy the same offices in San Francisco and cover the same territory.

THOMPSON PRODUCTS, INC., has announced the appointments of THE F. W. MOULTHROP CO., to cover the northern California and Nevada territory and R. W. FARRIS CO., INC., Kansas City, Mo., for the Midwest.

CLEAR BEAM ANTENNA CORP. has named N. J. FAYMOVILL factory rep in the Midwest.

HEART OF AMERICA CHAPTER, REPS OF ELECTRONIC PRODUCTS MFRS., INC., awarded a Plymouth Suburban Plaza as attendance prize at its Ninth Manufacturer-Distributor Conference. JOHN DEVEREUX of EBINGER ELECTRONICS, INC., St. Louis, Mo., was the fortunate winner out of 227 attending.

JONTZ MFG. CO., Mishawaka, Ind., has appointed the following reps: EVERETT BEAN in the South, WILSON LEEPER ASSOC. in the West, MIDWEST SALES CO. in the Midwest, and HANK LIEBERMAN CO. in the Southwest.

JENSEN MFG. CO. has announced the appointment of QUINN CUNNINGHAM & ASSOC., Indianapolis, Ind., as industrial rep in the Indiana and Kentucky territory.

PERFECTION MICA CO., MAGNETIC SHIELD DIV., has named THOMAS J. GRIFFIN and PETER N. HANSEL as reps in New England and metropolitan New York, TRONIC ENGINEERING ASSOC. in Chicago, and REX ELECTRONICS of Indianapolis.

SNYDER MFG. CO. has appointed JIM OCH executive sales rep in the deep South.

TED FISCHER announces the opening of a wholesale electronic parts house in Bedford, Ind. Ray Dougherty will be resident manager.

ALLEN B. DU MONT LABORATORIES, INC., has announced the formation of DU MONT NATIONAL DISTRIBUTORS, INC., to control distribution in areas not presently covered.

WEST COAST ELECTRONIC MFRS., ASSN. DISTRIBUTOR SALES GROUP, has elected W. J. MORELAND chairman for the coming year.

BENDIX AVIATION CORP., TELEVISION & BROADCAST RECEIVER DIV., has announced the appointment of four new distributors: McGOWIN-LYONS HARDWARE & SUPPLY CO., Mobile, Ala., PAIGE E. MULHOLLAN CO., Tulsa, Okla., SILKWORTH DISTRIBUTING CO., Flint, Mich. and HAYES AND HOPSON, INC., Ashville, N.C.

REGENCY DIV., I.D.E.A., INC., announces the appointments of 5 new distributors: BRIGHTMAN DISTRIBUTING CO., St. Louis, Mo., DAVE EDELMUTH CO., Cleveland, Ohio, MORLEY BROS., DISTRIBUTORS, Saginaw, Mich., KENTUCKY ELECTRONIC DISTRIBUTORS, Louisville, Ky. and JOYCE APPLIANCE, INC., Indianapolis, Ind.

SYLVANIA ELECTRIC PRODUCTS INC., RADIO & TELEVISION DIV., has announced the appointments of the following new distributors: APPLIANCE MERCHANDISERS, INC., Fort Wayne, Ind., PAUL-JEFFREY CO., INC., Syracuse, N.Y., V. J. STANLEY CO., Rochester, N.Y., and AIR PRODUCTS, INC., Oklahoma City, Okla.

JFD MFG. CO. has announced the appointments of the ELECTRONIC SUPPLY CORP., Pasadena, Calif., as distributor in Southern Calif., and SWAN DISTRIBUTING CO., Jackson, Miss., in the Miss. area.

Arrow STAPLE GUN

T-25 staple gun for fastening low voltage wires without danger of short circuits is operated with one hand. Tapered striking edge allows wires to be fastened in tight corners. Arrow Fastener Co., 1 Junius St., Brooklyn 12, N. Y. — TECHNICIAN (Ask for No. 11-56).

GC CHEMICALS

To protect printed circuits after repairs, Print-Kote, silicone resin, is available in a pressure spray can. A 6-ounce can (Cat. No. 14-6) lists for $3.25, with a net of $2.17.

Electro-Tet is a non-toxic cleaner and solvent intended to replace carbon-tetrachloride; is non-flammable and fast drying, and can be used safely for cleaning chassis, controls, switches, etc. "G-C Electro-Tet" Cat. No. 10-G. List price, $6.00 for a one-gallon can. General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—TECHNICIAN (Ask for No. 11-80)

ACA TAPE RECORDER

The Magneloop Jr., a multi-purpose, magnetic tape, continuous-loop, record-playback device, is available in two models. Messages up to 12 minutes may be recorded on Model A which operates at 3¾ ips. Model B with a tape speed of 7½ ips is able to record for 6 minutes. Housed in a sturdy cabinet 15⅝ in. high x 7⅜ in. deep x 9 in. wide, it weighs 13 lbs. Furnished with enclosure-mounted 5-inch loudspeaker, crystal microphone, 6 ft. speaker cable and tape cartridge. Amplifier Corp. of America, 398 Broadway, New York 13, N.Y.—TECHNICIAN (Ask for No. 11-81)

Anchor "REACTO-TESTER"

Combination picture tube reactivator-tester tests for open connections, open elements, shorted elements, cathode emission and gaseous tube. The "Reacto-tester" Model T-400 also repairs certain open elements and shorts, and reactivates low emission. Price is $39.95. Anchor Products Co., 2712 W. Montrose Ave., Chicago 18, Ill.—TECHNICIAN (Ask for No. 11-82)

Ameco VHF BALUN

The VHF balun Model VB-1 was designed to operate in the frequency range of 50 to 220 mc. It is actually a matching device that couples a signal from a 300 ohm balanced line to a 72 ohm unbalanced line, or vice versa. While it was primarily designed for 72 ohm co-axial cable, it can be used for 52 ohm co-axial cable (there will be a slight loss of signal when used with 52 ohm co-axial cable as compared to 72 ohm cable. It is useful in community TV systems and ordinary TV installations. American Electronics Co., 1203 Bryant Ave., New York 59, N.Y.—TECHNICIAN (Ask for No. 11-83)

Association News

TRA Considers Insurance
Alameda, California

The Television-Radio Association of Alameda County, 4223 E. 14th St., Oakland, Calif., joins the ranks of those associations seeking to expand service to members to include a form of group insurance. Members are considering a plan that would cover shop owners, their employes, and the families of both.

A cooperative campaign involving TRA and local UHF-TV station KSAN is yielding benefits to both groups. One phase of the campaign has the broadcaster distributing free UHF conversion strips to association members, the only condition being that members charge no more than $8.00 to consumers for installing these strips. In addition, KSAN has set aside a half hour of air time each week, known as "TV Service Workshop," to acquaint the public with what goes on inside the service industry. The shows are handled on a rotating basis by the five associations active within the area of the station's coverage.

ARTS Lecture Series
Chicago, Illinois

A current series of talks sponsored by the Associated Radio & Television Servicemen of Chicago, 433 South Wabash Avenue, Chicago, Illinois, avoids emphasis on technical matters to the exclusion of everything else. Considerable attention is being given to business matters. The first in the series was an introduction to installment financing for the small shop, presented by a bank official. The second lecture, scheduled for November 29, will cover service problems with printed circuits. The third lecture, scheduled for December 14, returns to business problems: A Dun & Bradstreet official will discuss credit and credit ratings. A fourth lecture swings back to technical matters, dealing with transistors.

RTSA Evaluates Insurance
Pittsburgh, Pennsylvania

A recent series in the *Video Scope*, official publication of the Radio Television Servicemen's Association, P. O. Box 6844, Pittsburgh 12, Penna., presents an analysis of the types of insurance needed in a service operation for protection against possible damages. Different issues of the publication are carrying studies of various types of insurance in installments, such as fire insurance, liability, etc.

National Unity Meet

Representatives of the electronic service industry from coast to coast met at the Lincoln Sheraton in Indianapolis on Oct. 9th. This meeting was the second of the electronic service council which represented national, state and local service associations seeking a unified servicing organization. The following resolution was adopted:

"That the delegates present, return 'to their respective associations and at their general meetings, request their membership to join NATESA, the National Alliance of Television Electronic Service Associations, and that at the next national NATESA meeting, to be held not later than April 1956, they make any changes felt necessary, and that any qualified TV service association will be immediately accepted without normal investigation, if application is received by Feb. 7, 1956."

It should be noted that significant discord still exists. According to Murray Barlowe, President of Radio & TV Guild of Long Island, who was vice-chairman of the meeting, the unity conference was "loaded" by NATESA delegates. He charges that motions were either railroaded through, failed to come to a vote, or were not allowed to be discussed fully and democratically by delegates with opposing viewpoints.

WILL YOU HELP US?

. . . By giving us the name of the technical association to which you belong? We'd like this information as part of an editorial survey which we're conducting.

Service Associations: .....

Address .....

Manager or Recording Secretary's Name: .....

Phone: .....

Your Name: .....

Your Address: .....

Mail to: Associations Editor, TECHNICIAN, 480 Lexington Avenue, N.Y.C. 17, N.Y.

Catalogs & Bulletins

ANTENNAS: Folder gives description and prices for "Pixie" antennas with special "Dicon" element. Winegard Co., Burlington, Iowa. (Ask for No. B11-1)

MASTER TV: Spec sheet on new closed-circuit TV camera Model TVC-1 for commercial or master TV system use is presented in 12-page manual on master TV installation. Booklet describes troubleshooting, products and system analysis. Blonder-Tongue Labs., Inc., 526 North Ave., Westfield, N.J. (Ask for No. B11-2)

RESISTORS: 1955-56 Resistor Engineering Guide, and Bulletins P-1a and P-2a describe company's complete line of resistors and special products, 4-watt and 10-watt axial lead resistors. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. (Ask for No. B11-3)

TUBE TESTER: Bulletin 500 describes Dyna-Quik dynamic mutual conductance tube tester. B & K Mfg. Co., 3726 N. Southport Ave., Chicago 13, Ill. (Ask for No. B11-4)

ENCLOSURES: Bulletin 211 illustrates line of do-it-yourself hi-fi speaker enclosure kits. Electro-Voice, Inc., Buchanan, Mich. (Ask for No. B11-5)

COILS: 1956 edition of TV Replacement Guide, Form No. 408, contains 80 pages of coils and related products. 12,000 models and chassis are listed, and over 155 brand names in the cross-reference guide. Merit Coil & Transformer Corp., 4427 N. Clark St., Chicago 40, Ill. (Ask for No. B11-6)

TEST EQUIPMENT: Catalog R36A describes complete line of instruments for servicing TV, communications and industrial electronic gear. Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N.J. (Ask for No. B11-7)

KITS: 1955 fall flyer shows test and audio equipment kits, including new FM tuner. Heath Co., Benton Harbor, Mich. (Ask for No. B11-8)

PARTS & EQUIPMENT: 324-page 1956 general supply catalog No. 150 lists over 26,000 electronic products. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (Ask for No. B11-9)

TUBES: Loose-leaf Base Diagram Book of more than 350 base blueprints for over 1300 electron tubes. Cost is 75¢ each. Tung-Sol Electric Inc., 95 Eighth Ave., Newark 4, N.J. (Ask for No. B11-10)

PRINTED CIRCUITS: 17 new printed electronic circuit plates for radio-TV replacement, plus parts cross-reference is given in Guide No. 3 Supplement. Centralab, Div. of Globe-Union, 900 E. Keefe Ave., Milwaukee 1, Wis. (Ask for No. B11-12)

CAPACITORS: Three pamphlets are: "Capacitors for the Electronics Industry" (GED-2620; "Electronic Capacitor Selection Guide" (GET-2417); and "Capacitors for Air Conditioning Equipment" (GEA-5895C). General Electric Co., 1 River Rd., Schenectady 5, N.Y. (Ask for No. B11-13)

CONTEST: Entry forms and promotion material for "Beat the Clock Contest" available to all dealers who sell firm's products. Sylvania Electric Products, Inc., 1100 Main St., Buffalo 9, N.Y. (Ask for No. B11-14)

CAPACITORS: Revised catalog sheets of fixed glass capacitors and LP-4 glass resistor are available. Erie Electronics Distributor Div., Erie Resistor Corp., Erie, Pa. (Ask for No. B11-11)

TV SERVICE HANDBOOK: A new simplified service handbook designed to help the dealer and salesmen save valuable time at $.25 from General Electric Co., Radio & Television Dept., Electronics Park, Syracuse, New York. (Ask for No. B11-14)

COILS: "TV Technician's Coil Replacement Guide, No. 156," 64 pp., cross references more than 2,000 TV chassis numbers, and nearly 11,000 TV model numbers, with the Miller replacement part information for all coils, i-f transformers and special windings. Also available is General Catalog No. 56 which lists nearly 1,000 different replacement items. Free upon request from J. W. Miller Co., 5917 S. Main St., Los Angeles 3 Calif. (Ask for B11-15)

OBTAIN THE BULLETINS

described here by writing on company letterhead to Bulletins Editor, TECHNICIAN, 480 Lexington Ave., New York 17, N. Y., listing numbers given at end of each item of interest. Please mention title of position held. Use coupon on page 50.

New Books

SWEEP AND MARKER GENERATORS FOR TELEVISION AND RADIO. *By Robert G. Middleton. Published by Gernsback Publications, Inc., 25 West Broadway, New York 7, N. Y. 224 pp. Paper cover. $2.50.*

While the writer presents information on the practical application of the subject instruments, this is by no means his exclusive preoccupation. Considerable space is devoted to the nature of the signals produced, the means of producing them, differences from one instrument to another in getting results, desirable and undesirable characteristics to be looked for, means of checking the instruments, allowing for various types of error, calibration techniques, and other important points. Reference tables, profuse use of illustrations and a glossary of generator terminology add value to the book.

COLOR TV SERVICING. *By Walter H. Buchsbaum. Published by Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N. Y. 258 pp. Hard cover. $6.35.*

Assuming familiarity with monochrome circuits, or anticipating use of a supplementary text on monochrome, this volume begins with an evaluation of differences between black-and-white receivers and those designed for color reproduction. A discussion of the physical principles of color precedes a description of color TV signals. Transmission, picture tubes and receiver circuits are then studied. There is considerable information on installation and troubleshooting techniques, with ten pages of full-color illustrations covering specific defects. Four chapters are devoted to such specific receiver defects and related troubleshooting techniques.

TV REPAIR QUESTIONS AND ANSWERS: VIDEO CIRCUITS. *By Sidney Platt. Published by John F. Rider Publisher, Inc., 480 Canal Street, New York 13, N. Y. 128 pp. Paper cover. $2.10.*

The second in a series intended to cover the entire TV receiver, section by section, in question and answer form, this tome further subdivides its subject into questions and answers on video i-f amplifiers, detectors, video amplifiers, d-c restorers and age circuits. Alignment problems are handled as a separate topic.

THE MOBILE MANUAL FOR RADIO AMATEURS. *Compiled and published by the American Radio Relay League, Inc., West Hartford 7, Connecticut. 352 pp. Paper cover. $2.50.*

Selected reprints of articles on mobile receivers, transmitters, antennas and power supplies provide much valuable information for the interested technician. While the book has been directed to the ham, a good deal of the contents, though less than half, would be of direct interest to the service technician who handles auto radios or other related mobile equipment. There is worthwhile material on vibrator power supplies, revision of 6-volt equipment for 12-volt operation, noise elimination, improvements in selectivity and sensitivity in automotive operation.

REPAIRING RECORD CHANGERS. *By Eugene Ecklund. Published by McGraw-Hill Book Co., 330 W. 42 St., New York 36, N. Y. 271 pages. $5.95.*

This well illustrated manual presents a full explanation of how changers operate, and describes common problems and methods for their solution. One section is devoted to fault location and tests, and another one to pickups, needles and records.

ELEMENTS OF TELEVISION SERVICING. *By Abraham Marcus & Samuel E. Gendler. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. 606 pages. Hard cover. $6.95.*

On a practical technical level, this volume presents just about everything

(Continued on page 69)

Cumulative Article Index

All feature articles appearing in TECHNICIAN from September 1953 through October 1955

(Continued on page 70)

(Continued from page 67)

a TV technician should know if he expects to perform a competent job. It's quite impressive to see how much information this includes. The text is clearly written, properly illustrated, and is rather easy to read. Just about the only material not covered are a few of the more advanced servicing techniques.

The first four chapters cover the TV signal, basic receiver operation, antenna selection, and set installation. The section on field troubleshooting is comprehensive, offering over 65 photos of symptoms as seen on the screen, together with analyses and suggestions for correction. The section on bench servicing examines the various receiver stages in greater detail, shows the test instruments needed, and describes alignment procedure. The final section on color TV servicing spans about 100 data-packed pages, and is one of the best works on the subject published in a book to date.

TRANSISTOR ELECTRONICS. *By Lo, Endres, Zawels, Waldhauer & Cheng. Published by Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N. Y. 521 pp. Cloth binding. $12.00.*

Though the design engineer is the primary target of this book, its thorough treatment of basic transistor operation and circuit analysis can clear up many questions in the minds of non-engineering technicians who are looking for a clear understanding of the subject. Considerable attention is devoted, at the outset, to essential physical concepts, including the properties of germanium and the behavior of electrons therein. Fundamental transistor networks and circuits are analyzed, often by analogy, and a number of representative circuits are given.

TELEVISION RECEIVER SERVICING, VOL. 2. *By E. A. W. Spreadbury. Published by Trader Publishing Co., Ltd., Dorset House, Stamford St., London, S.E.1, Great Britain. 308 pp. Cloth binding. 21 shillings.*

Written by one of the examiners of the Radio Trades Examination Board responsible for granting Television Servicing Certificates in London, and intended as a study instrument for applicants for the license, this volume may be of special interest to prospective examiners and examinees in areas where licensing regulations are imminent or in force. For a diverting insight into the differences in TV operation, practice and service as they exist in the U. S. and Great Britain, a better source could not be found. These considerations aside, since there are many more similarities than differences, the text provides as much practical information on the subject as many good ones that have appeared on this side of the Atlantic. The first volume of this 2-vol. set covered what the British call time-base circuits. The volume under discussion covers the rest of the receiver. Also included are antenna considerations and an extensive treatment of circuit alignment.

(*Continued from page 68*)

INTERFERENCE

INTERMITTENTS

MISCELLANEOUS

POWER SUPPLIES, BATTERIES & RECTIFIERS

PHONOGRAPHS

PRINTED CIRCUITS

RADIOS, AM-FM, AUTO, PORTABLE

TEST EQUIPMENT

TRANSISTORS

TUNERS

UHF

VIDEO & SOUND CIRCUITS

ADVERTISERS INDEX
NOVEMBER 1955

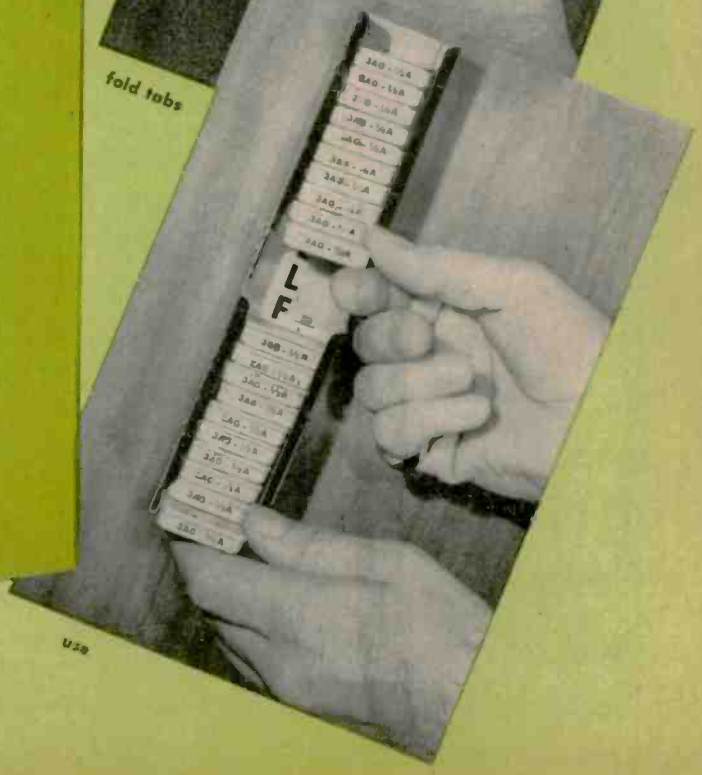
While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

position

mark

hang

fold tabs



use

Easy does it...

when you can work the easy way, you work more in the same time—profit more.

The new Littelfuse single channel fuse-stocker is the easy way to have the right fuse right at hand by your work bench.

Ten channels (each can dispense two types of fuses)—50¼ Amp 3AG fuses and 50½ Amp 3AG fuses for the price of the fuses alone.

Ask your distributor or his salesman.

LITTELFUSE *Still leading in its 29th year.*

DES PLAINES, ILLINOIS

capacitor replacements

FOR SETS OF THE MONTH

MOTOROLA CHASSIS TS-533

Symbol No.	Rating µF@WVDC	Motorola Part No.	Sprague Replacement
C127	30@200/10@50	23B737468	R-2150
C213	3@50	23A690543	TVA-1303
C405	20@500	23K737706	TVA-1906
C407	40@400/200+60@200	23B737469	R-2151
C510	200+5@150	23B737470	TVL-2444

SYLVANIA CHASSIS 1-533-1, -2

Symbol No.	Rating µF@WVDC	Sylvania Part No.	Sprague Replacement
C108	2@50	161-1001	TVA-1301
C316	10@500	161-1022	TVA-1902
C319	2@50	161-1001	TVA-1301
C500	80@150	161-1023	TVL-1421
C501	200+10@350/50@25	161-3023	R-2152
C502	60+20@350/80@150/100@50	161-4019	R-2153

MAGNAVOX CHASSIS 650 SERIES

Symbol No.	Rating µF@WVDC	Magnavox Part No.	Sprague Replacement
*C116	20@350	270027-20	TVA-1608
C212	2@50	270027-22	TVA-1301
C413	10@350(NP)	270027-26	R-1468
C501	70+40+10@350/50@50	270021-52	R-2154
C502	30+10+10@350/100@200	270021-57	R-2155
PC301	Integrator Plate	250186-1	V-1

* Not Used In All Models

WELLS-GARDNER MODEL 324A59C (or V) -A-576 SERIES

Symbol No.	Rating µF@WVDC	Wells-Gardner Part No.	Sprague Replacement
C401	140@150	45X421	TVL-1428
C402	125+20@300/100@50	45X419	R-2142
C403	60@300/40@50	45X420	R-2143
C305, R308	Integrator Plate	76X7	V-1

EMERSON CHASSIS 120266-B

Symbol No.	Rating µF@WVDC	Emerson Part No.	Sprague Replacement
C11	30+30+20@150	925328	TVA-3444
C6, 7, 8, 9; R6, 7, 8	Coupling Plate	923028	DT-1

GENERAL ELECTRIC MODEL 675

Symbol No.	Rating µF@WVDC	General Electric Part No.	Sprague Replacement
C10	20@8	—	TE-1118
C13	8@15	—	TE-1204

CAPEHART CHASSIS CA-239

Symbol No.	Rating µF@WVDC	Capehart Part No.	Sprague Replacement
C108	80+50+20+20@150	7500908-51	R-2156
C109	4@50	650663A-3	TVA-1303

SPRAGUE "T-C" RULE

Use this handy pocket-size Sprague Temperature Coefficient Rule to find quickly the values of stock N750 and NPO type ceramic capacitors to connect in parallel to equal a capacitor of desired intermediate temperature coefficient of the required capacitance.

COLOR CODE CHARTS

Complete charts for color codes on all types of ceramic capacitors are on the back face of this rule.

Get your Sprague "T-C" Rules now from your Sprague distributor, or directly from Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts. Only 15c each.

Sprague makes more capacitors . . . in more types . . . in more ratings . . . than any other capacitor manufacturer. Send 10¢ for the 65-page giant seventh edition TV Replacement Manual to Sprague Products Co., 65 Marshall St., North Adams, Mass., or get it FREE from your Sprague distributor.

DON'T BE VAGUE. . . INSIST ON

SPRAGUE

(Distributors' Div. of the Sprague Electric Co.)

HOW YOU CAN BUILD NEW BUSINESS AND BIGGER PROFITS WITH RCA

Silverama

SUPER-ALUMINIZED PICTURE TUBES!

Take an active part in RCA's powerful sales promotion and advertising campaigns in your neighborhood now!

RCA's campaigns to introduce "SILVERAMA" are the most dynamic sales stimulators in picture tube history. Make your store "sales headquarters" for RCA "SILVERAMA" *in your own neighborhood.* Join successful hands with RCA and your RCA Tube Distributor. Use these *sell-powered* advertising and sales promotion materials to increase your business, prestige, and profits . . . now!

Window Display Kit, Streamers, and Hanger . . . dramatic, eye-catching traffic stoppers! These tell your neighbors *your store* is "Hq" for the great new "SILVERAMA" Picture Tube! See your RCA Distributor for full details on the "SILVERAMA" Window Display Contest!

SALES PROMOTION

Merchandising Booklet . . . the top secrets of "putting on a good front" window display are revealed to you. Shows you how to "stop them . . . so you can sell them!"

Direct Mail Piece . . . handy self-mailer or envelope stuffer. Ties your name and shop in with RCA "SILVERAMA" national advertising campaigns!

ADVERTISING

National Magazines . . . "Advertised in Life" . . . and in TV Guide! Important, consistent, big ads in these top magazines tell your customers about the wonders of RCA "SILVERAMA." Be ready for the demand. Contact your RCA distributor!

Local Newspapers . . . ad mats available to your distributor will feature names and addresses of service-dealers handling RCA "SILVERAMA". Be sure *your name* is on the list. Contact your RCA Tube Distributor!

Radio and TV . . . "Milton Berle" and "Martha Raye" coast-to-coast TV Shows, and network radio programs such as "Monitor", and "Fibber McGee and Molly" will bring the RCA "SILVERAMA" story right into your customers' homes . . . send them to your shop. Be ready. Contact your RCA Tube Distributor!

There's more, too! And your RCA TUBE DISTRIBUTOR has the complete story. Cash in on the new, dynamic RCA "SILVERAMA" campaign. SEE YOUR RCA TUBE DISTRIBUTOR *NOW!*

RADIO CORPORATION of AMERICA
TUBE DIVISION HARRISON, N. J.