TECHNICIAN

& Circuit Digests

1954

August • 1954

Growth of Service Test Equipment Over Past Three Decades

CALDWELL-CLEMENTS, INC.

1920's

Aerovox Wireless Corp.
Alden Mfg. Co.
Dubilier Condenser Corp.
General Instrument Corp.
Hoyt Electrical Inst. Works
International Resistance Co
Jefferson Elec. Mfg. Co.
Muter Co., Leslie F.
Radio Corp. of America
Raytheon Mfg. Co.
Sprague Specialties Co.
Sterling Mfg. Co.
Sylvania Products Co.
Thordarson Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.
Weston Electrical Instrument Corp.

Aerovox Corp.
American Electronic Mfg
Approved Electronic Instrument Corp
Barker and Williamson
Beam Instruments Corp
Browning Laboratories, Inc
Clarostat Mfg. Co
Cornell-Dubilier Elec. Corp
Crest Laboratories, Inc
DuMont Laboratories, Inc., Allen B.
Electronic Instrument Co
Electronic Measurements Corp
Epco Electronics, Inc
Feiler Engineering & Mfg Co
General Electric Co
General Test Equipment Co
Granco Products, Inc
Heath Co
Hewlett-Packard Co
Hickok Electrical Instrument Co
Hoyt Electrical Instrument Works
Hycon Mfg. Co
Industrial Instruments, Inc
Jackson Electrical Instrument Co
J-B-T Instruments
Jerrold Electronics Corp
Kay Electric Co
Lampkin Laboratories
Linear Equipment Labs
Magne-Pulse Corp
Mallory & Co Inc., P. R.
Marion Electrical Instrument Co
Millen Mfg. Co
Miller Instruments, Inc
National Union Electric Corp
Ohmite Mfg. Co
Philco Corp., Accessory Div.
Precise Development Corp
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Precision Apparatus Co.
Precision Electronics, Inc
Radio City Products Co
Radio Corp. of America, Tube Div.
Radio Kits, Inc
Radio Merchandise Sales, Inc.
Radion Corp.
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Simpson Electric Co.
Special Products Co
Sprague Products Co
Sterling Mfg. Co.
Superior Instrument Co.
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Sylvania Electric Products, Inc.
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Triplett Electrical Instrument Co.
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Weston Electrical Instrument Co.
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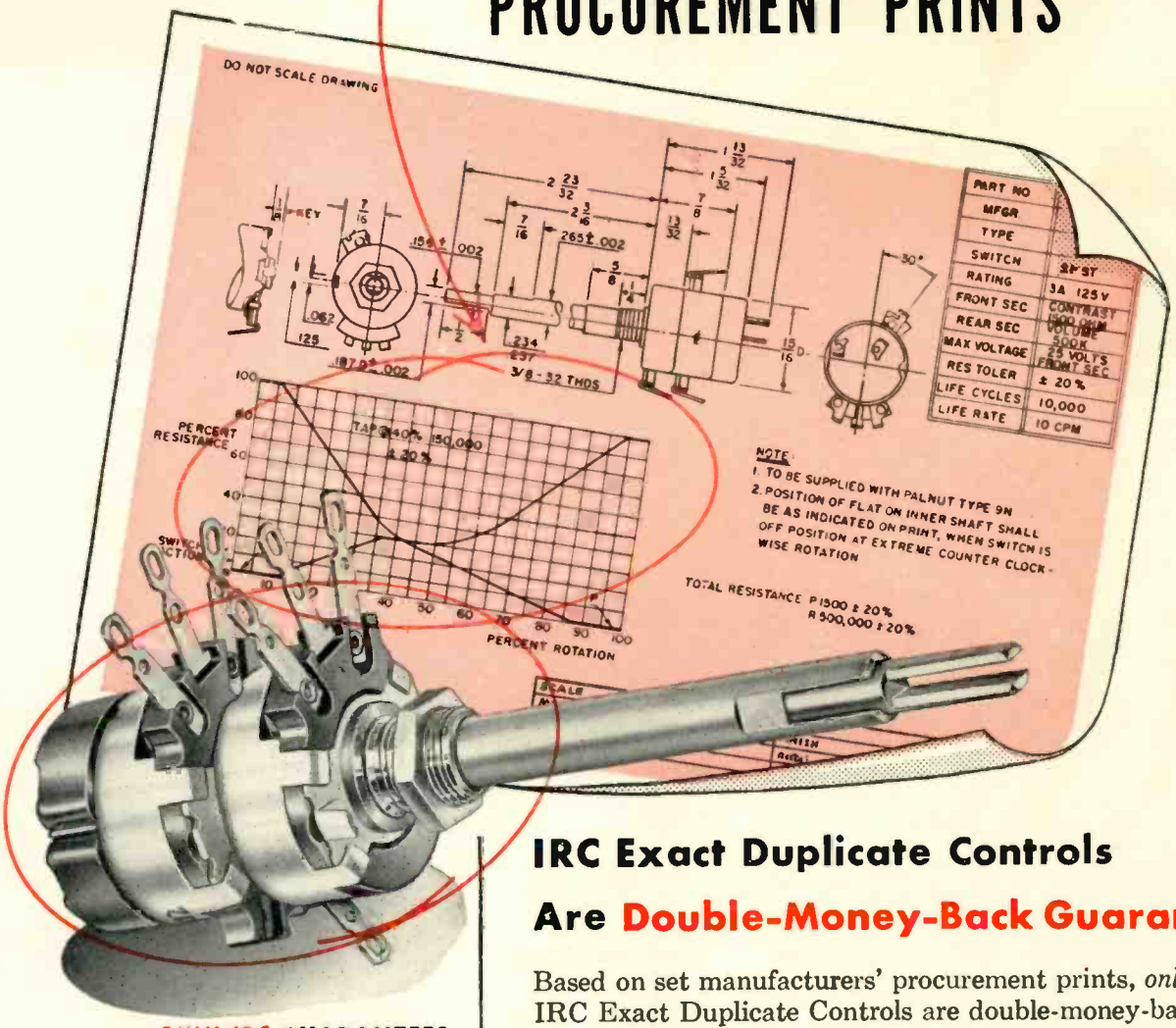
ASSURED ELECTRICAL ACCURACY

BASED ON MANUFACTURERS' PROCUREMENT PRINTS



IRC Exact Duplicate Controls Are Double-Money-Back Guaranteed

Based on set manufacturers' procurement prints, *only* IRC Exact Duplicate Controls are double-money-back guaranteed for accurate electrical operation. This firm guarantee applies to both IRC factory-assembled Exact Duplicates *and* universal CONCENTRIKIT equivalents.

Set manufacturers' electrical specifications are closely followed.

Resistance values are carefully selected to match.

Tapers are watched careful'y; IRC doesn't arbitrarily substitute tapers to obtain wide coverage.

For exact duplicate controls of guaranteed accuracy, specify IRC. Most Service Technicians do.

ONLY IRC GUARANTEES ACCURATE ELECTRICAL OPERATION AND SATISFACTORY MECHANICAL FIT OR DOUBLE-YOUR-MONEY-BACK

Electrical specifications of this typical manufacturer's procurement print are exactly duplicated by IRC's QJ-412 control (shown). CONCENTRIKIT assembly includes P1-206 and R1-223 shafts with B17-109 and B13-133X Base Elements and 76-1 Switch.

IRC

Wherever the Circuit Says ~~~

INTERNATIONAL RESISTANCE CO.

425 N. Broad Street, Philadelphia 8, Pa.

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TECHNICIAN
& Circuit Digests

TELEVISION • ELECTRONIC • RADIO • AUDIO • SERVICE

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AUGUST, 1954

TECHNICIAN'S *Test Equipment "Spec Charts"* provide some much-needed data on five types of service instruments. You'll find these charts very helpful as a "purchaser's guide."

DEPARTMENTS

CALDWELL-CLEMENTS, INC.
Publication Office, Bristol, Conn.
Editorial/Business Offices 480 Lexington Ave., New York 17, N. Y., Tel. Plaza 9-7880
Publishers also of MART and TELE-TECH & ELECTRONIC INDUSTRIES

*Reg. U. S. Patent Office

FIRST to give you the real high fidelity of a two-way speaker system in a small package—the Jensen "Duette" won your acclaim.

Now the Jensen Duette "Treasure Chest" model is an elegant compliment to your decor whether traditional or modern. The handsome versatile chest design is available in either selected mahogany or blonde oak veneer with genuine matching hardwood trim.

The "Treasure Chest" Duette fits on your book shelf or in a small table area. Measures only 11″ by 23¼″ by 10″. The "Treasure Chest" may be made into a graceful free-standing piece by the addition of modern wrought iron legs—available separately.

Duette "Treasure Chest" gives the full performance of the true two-way system with its special 8-inch woofer and compression driver tweeter in an unusually compact scientifically designed acoustic enclosure. Ideal for small space hi-fi system, excellent as an improvement addition for true hi-fi from existing radio, TV, phonograph or tape recorder. Capable of adequate bass reproduction even at low listening levels. Clean, smooth response with the unmistakable presence of the true two-way reproducer.

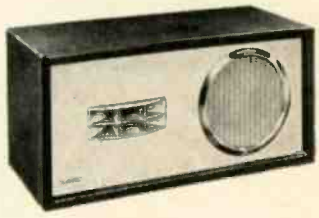
The Jensen "Treasure Chest" Duette in either blonde oak or mahogany is an extraordinary value at 76^{50} net.

ST-862 Wrought iron leg set, $4.25

Also see the "Duette DU-201" in Dupont Fabrikoid finish at a new low price 62^{50} net.

And the "Duette Portable" in black leatherette carrying case at only 77^{50} net.

Jensen has been the world's quality standard in loudspeakers for more than a quarter of a century.



DUETTE DU-201

DUETTE PORTABLE

Jensen MANUFACTURING COMPANY

Division of The Muter Company
6601 South Laramie Avenue • Chicago 38, Illinois
In Canada: COPPER WIRE PRODUCTS, LTD., Licensee

"Wish someone had thought of the vertical chassis before"

CHARLES W. RHODES

"Back-breaking chassis tugging belongs to the past"

L. B. HALLBERG

"Another wonderful feature—easier circuit tracing"

ROY R. THOMPSON

CROSLEY SUPER-V IS A SERVICE MAN'S DREAM

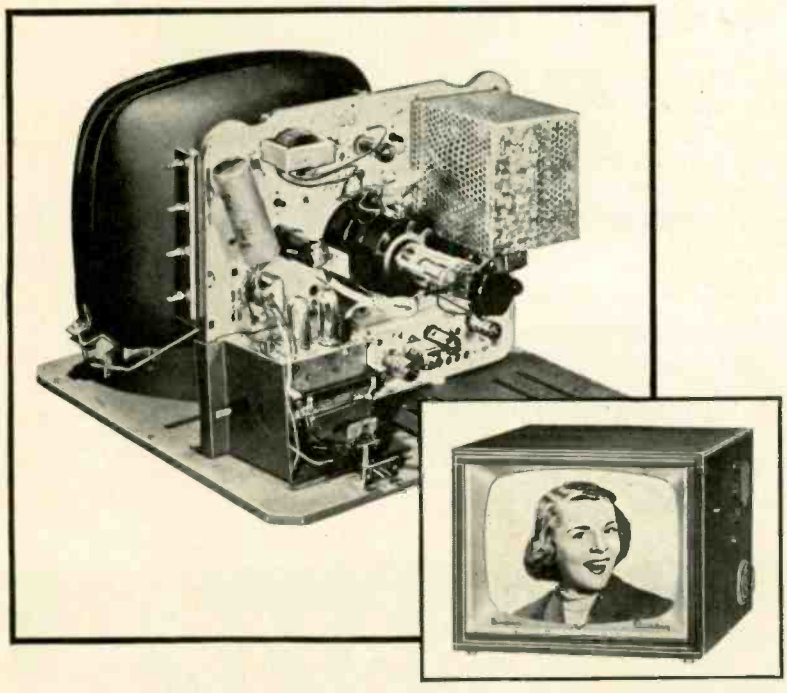
—read these letters

"The Super-V is not only a low-priced set, but a set that can be maintained at a low price, which is equally important. I only wish that someone had thought of the vertical-chassis arrangement for a TV set before. To me, there is nothing more annoying than fishing around blindly trying to get a miniature tube back into its socket on a conventional chassis."

Charles W. Rhodes, Electronic Service Mgr.
Robert L. Rice & Co., Portland, Oregon

"By removing the cabinet back, every tube is right in front of one's eyes. No more groping and twisting to relocate tube-socket pins. Back-breaking tugging of the chassis belongs to the past. If a repair or check of chassis components is necessary, a few screws are removed and the cabinet lifts off like a bonnet. The separate diagram showing the actual filament wiring makes the search for an open filament a matter of seconds."

L. B. Hallberg, Manager, Service Dept.
Hardware Products Co., Sterling, Ill.



"The Crosley Super-V is a service man's dream; the new vertical plane chassis allows the changing of any tubes in a very few minutes. When service of a more complicated nature is required, the entire cabinet can be removed by loosening 6 screws; this leaves the entire chassis accessible for service. Another wonderful feature is that the picture-tube chassis and bracket are incorporated in one common mounting board along with the points wired on terminal strips for easier circuit tracing."

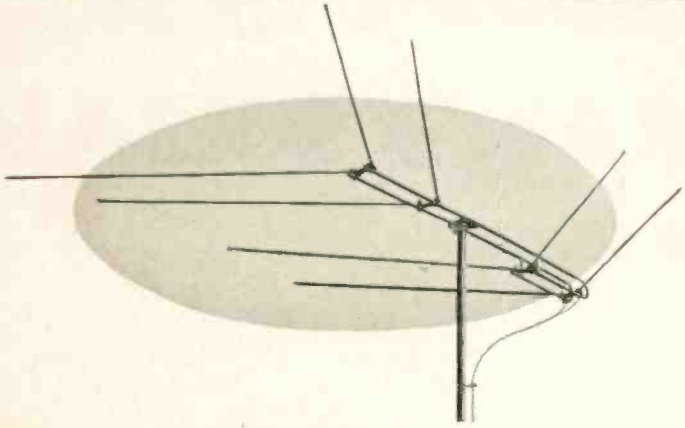
Roy R. Thompson, General Service Manager
Saginaw Distributors, Inc., Saginaw, Mich.

Crosley Division AVCO Cincinnati 25, Ohio

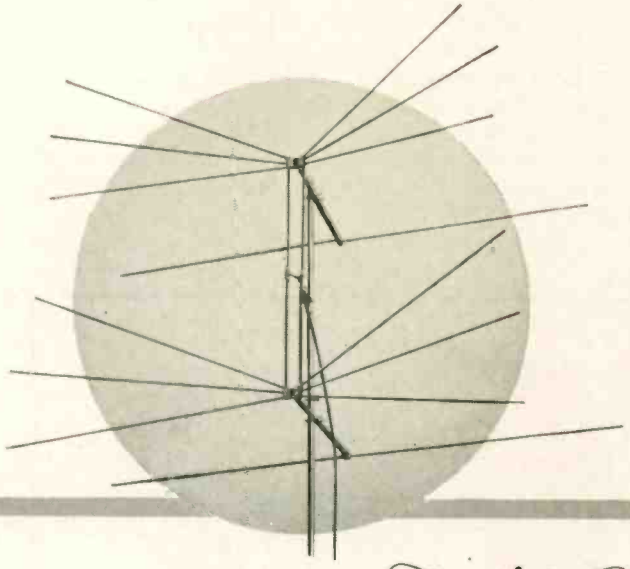
SCIENTIFICALLY DESIGNED...

FOR BETTER TV RECEPTION ...BETTER PICTURE QUALITY

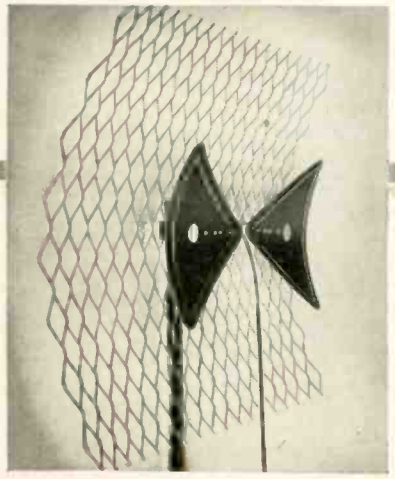
Scientifically designed to give top performance, Philco television antennas are products of extensive research into receiver requirements in all types of locations. Field tested electrical and mechanical designs provide proper gain, directivity, bandwidth and impedance . . . long life and ease of installation. Now a wide choice of Philco television antennas give you better picture quality . . . build complete customer satisfaction . . . more sales for you!



PHILCO ALL-CHANNEL UHF-VHF TROMBONE ANTENNA: The ideal antenna for areas having both UHF and VHF stations. The Philco Trombone can be stacked for VHF fringe area use. Completely pre-assembled at the factory . . . all-aluminum construction with dowelled elements: Part No. 45-1880.



PHILCO TWO-BAY SUPER CONICAL ALL-CHANNEL ANTENNA: Strong signal pickup on VHF channels 2 through 13, UHF channels 14 through 83 . . . ideal reception in fringe areas . . . all-aluminum: Part No. 45-3096-2. Fringe area single bay design: Part No. 45-3096.



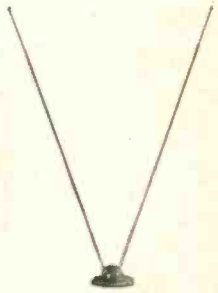
PHILCO PARAFLECTOR ALL-CHANNEL UHF ANTENNA: Pre-assembled, all-aluminum . . . 8 db to 10 db gain . . . outstanding fringe area performance . . . immediate mounting on existing masts: Part No. 45-3071. Bow Tie, Part No. 45-3069 and Bow Tie with reflector, Part No. 45-3070 provide top quality pictures in many UHF areas.

PHILCO TUBES
IMPROVE THE PERFORMANCE OF ANY TV OR RADIO RECEIVER

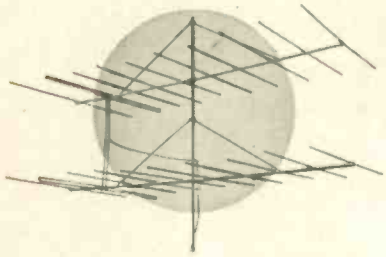
PHILCO CORPORATION

PHILCO

...SUPER PERFORMANCE TV ANTENNAS

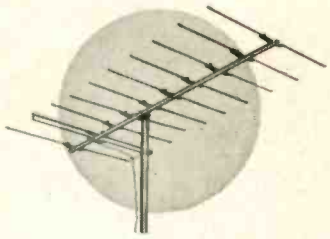


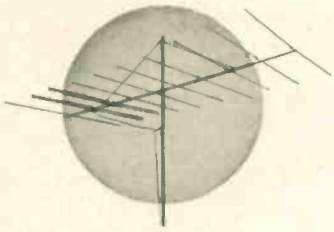
PHILCO VHF "V" ANTENNA: Adequate reception on all VHF channels in most localities . . . heavy chrome plated three-section brass tubing . . . weighted plastic base holds antenna fully extended in any direction: Part No. AD-2643. Also available with aluminum tubing "V": Part No. AD-2643-1.



PHILCO TWO-BAY VHF LOW BAND YAGI ANTENNA: 10 elements . . . all-aluminum . . . factory pre-assembled. Top performance on channels 2 through 6 . . . 13 db to 15 db gain on various channels. Single bay Part No. 45-3112-2 through 6. Stacked version uses stack-harness Part No. 45-3267.

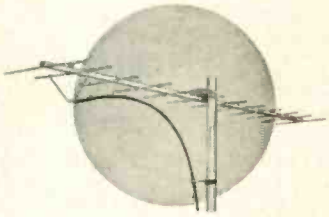
PHILCO HIGH BAND VHF YAGI ANTENNA: Pre-assembled, all-aluminum, 10 elements . . . high gain in fringe areas on channels 7, 8, 9, 10, 11, 12, or 13 . . . 10 db to 12 db gain on various channels . . . eliminates co-channel station interference: Part No. 45-3112-7 through 13.

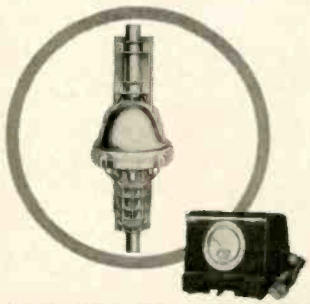




PHILCO BROAD BAND VHF YAGI ANTENNAS: All-aluminum, factory assembled for quick installation . . . high gain plus adequate band width. Three broad band models cover channels 2 to 6 . , . 4, 5, 6 . . . or 7 through 13: Basic Part No. 45-3112.

PHILCO GOLDEN YAGI UHF ANTENNA: Designed for 300 ohm operation . . . all steel construction . . . 11 db to 12 db gain on various channels . . . "Cronak" coated components resist salt air . . . humidity . . . six models cover entire UHF spectrum: Basic Part No. 45-1996.

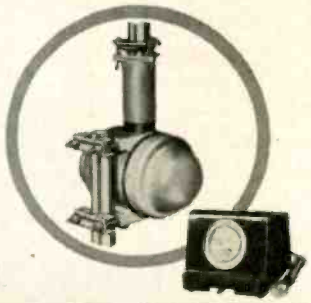




←PHILCO HEAVY DUTY ANTENNA ROTORS:→

PHILCO MODEL P-4: Supports antenna installations weighing up to 150 pounds . . . completely weather sealed . . . factory lubricated for life . . . uses 4-wire rotor cable . . . modern direction meter control cabinet: Part No. 45-1974.

PHILCO MODEL P-11: Easily handles two-bay arrays . . . mounts on masts up to 1⅝" in diameter . . . accurate direction control . . . heavy duty motor . . . streamlined design . . uses 4-wire rotor cable . . . modern direction meter control cabinet: Part No. 45-1994.

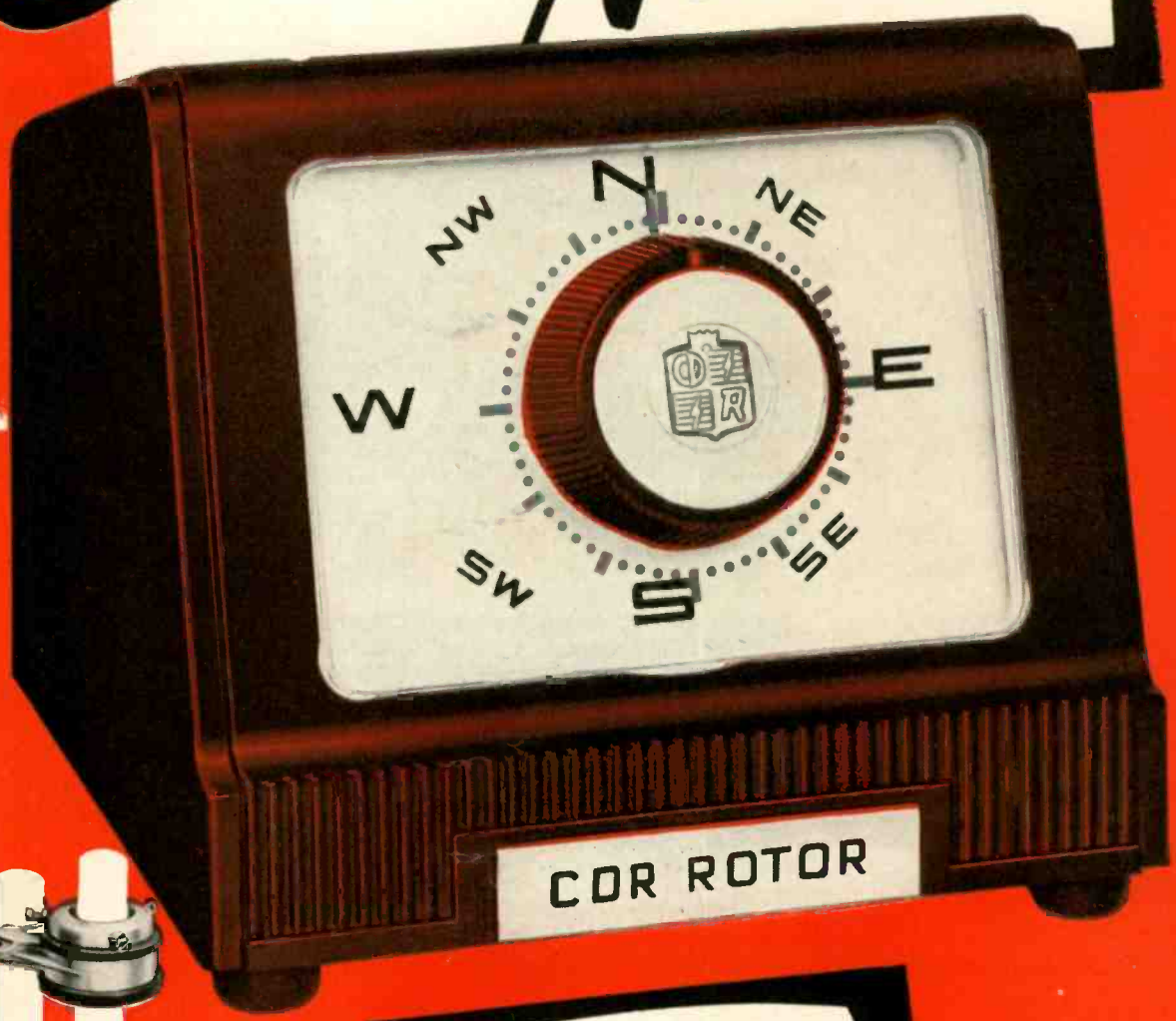


A complete line of powerful Philco TV antenna rotors as low as $39.95

ACCESSORY DIVISION

"A" AND ALLEGHENY AVE. • PHILADELPHIA 34, PA.

Sensationally New!



Pre-Sold *to consumers in every leading TV market area with saturation TV spot announcements as well as newspaper advertisements. These further helps — animated point-of-sale display... newspaper mats ... envelope enclosures... window streamers.*

Models AR-1 and AR-2

CDR AUTOMATIC ROTOR

40% sharper tuning than any other AUTOMATIC ROTOR

They said it couldn't be done – never thought it possible – but HERE IT IS! The AR-1 and AR-2 . . . the sharpest tuning AUTOMATIC ROTORS in the world. Superior construction and quality manufacture are featured in these as in the other CDR ROTORS, plus a handsome NEW MODERN DESIGN CABINET styled along lines for gracious, contemporary living. An added feature is a MECHANICAL BRAKE THAT IS RELEASED MAGNETICALLY! Here, truly, is the ultimate in rotors – handsome design, accurate, pinpoint, automatic performance easier to set and adjust – and CDR dependability!

Model AR-2

. . . complete, AUTOMATIC rotor with THRUST BEARING . . . and handsome modern design plastic cabinet, uses 4 wire cable **47.95**

Model AR-1

. . . . same as AR-2, without thrust bearing **44.95**

Model TR-2

The heavy-duty rotor with plastic cabinet featuring "Compass Control", illuminated "perfect pattern" dial, uses 8 wire cable **44.95**

Model TR-4

The heavy-duty rotor complete with handsome, modern design cabinet with meter control dial, uses 4 wire cable **48.95**

Model TR-11

The same as the TR-12 without thrust bearing, complete with meter control dial cabinet, uses 4 wire cable **39.95**

Model TR-12

A special combination value consisting of complete rotor including thrust bearing. Handsome modern cabinet with meter control dial, uses 4 wire cable **42.95**

CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

THE **RADIART** CORPORATION
CLEVELAND 13, OHIO

LETTERS
To the Editors

Stripped-Set Headache

EDITORS, TECHNICIAN:

Your editorial last month ("Stripped TV Sets Spell Trouble") was okay, but you overlooked some important angles. I know a lot of manufacturers have backed the independent servicer by keeping factory service to a minimum, running ad campaigns for the public that give us a pat on the back and even hold free training lectures for us—but doesn't this help them, too?

Take a look at the problem. You can buy one of these stripped sets for less than $150. Since it needs more servicing, you could shell out with $50 during the first year in repair bills. That's more than a third of the original cost. No wonder the public squawks. How would you like to pay $700 during the first year in repair bills on a new car that cost you $2000? The technician, trapped between the original cost and the fee he must charge if his family is to keep on eating, is on the spot.

Looking at it this way, the manufacturer is lucky to get out of the servicing end of the business. He's steering clear of a low-profit or no-profit operation. Free training and favorable ads don't take all the curse off the situation, either. Why can't the set makers take some of the dough they sink into these programs and put it back into their sets? It might do us *all* more good that way. Or else, why don't they underwrite some of the first-year servicing costs on these stripped chassis?

Most manufacturers are still on the ball as far as protecting their brand names with good quality is concerned. To the few who are creating the problem, I say this: "You need us as much as we need you. Let's get together on this problem for our mutual benefit."

E. BROWN

Detroit, Mich.

Suggestion

EDITORS, TECHNICIAN:

Just one suggestion. Would it be possible to run some articles on tape recorders, both servicing and fundamentals? With several . . . concerns readying pre-recorded tapes, I believe we will need any hints and information we can get.

DONALD RINGLER

Washington, D. C.

• *We won't let you down. Watch future issues.—Ed*

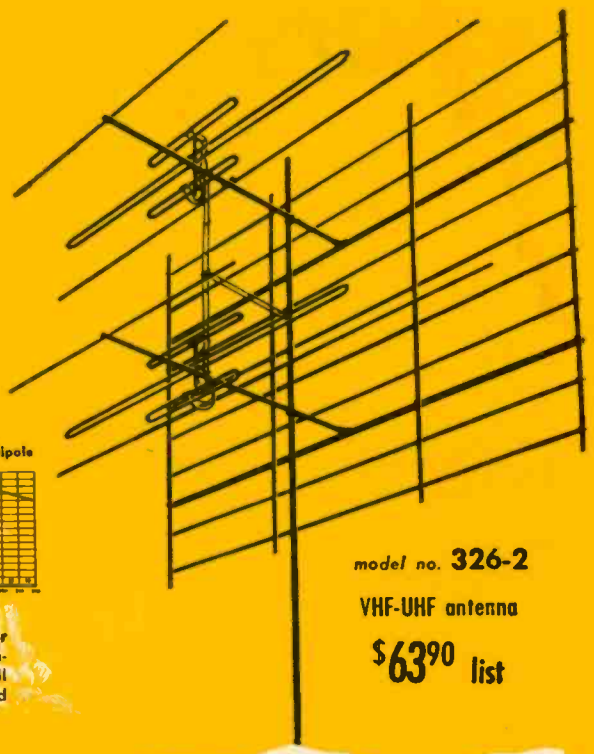
ATTENTION ANTENNA MANUFACTURERS

If you have not received your Antenna Specifications questionnaire, to be used in compiling an up-to-date Antenna TV "Spec" Chart in the September issue, please notify this office immediately.

The BACKSTOP

STOPS co-channel and adjacent-channel interference caused by rear signal pick-up!

- Highest front-to-back ratio ever built into an antenna!
- No rear pick-up; eliminates "venetian blinds"!
- Largest screen area: 70 square feet!
- Very high all-channel gain. Incorporates basic Champion design, including Tri-Pole, with additional elements!
- Completely preassembled!



model no. **326-2**

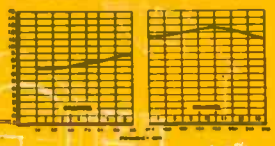
VHF-UHF antenna

$63.90 list

Table of Front-to-Back Ratios (Relative Voltage)

Channels	Front-to-Back Ratios
2	9:1
3	10:1
4	11:1
5	20:1
6	18:1

Only Low Band channels shown, since co-channel interference is not encountered on High Band channels.



IMPORTANT . . . don't be misled by polar patterns representing relative POWER. Remember, power is the square of voltage. All Channel Master polar patterns are presented in relative VOLTAGE.

2 radical new antennas by CHANNEL MASTER

The most beautiful antenna ever made! The only indoor antenna featuring powerful outdoor design principles — Bow-Tie and Screen.

Wonder Bow* VHF-UHF indoor antenna

DESIGNED FOR POWER!

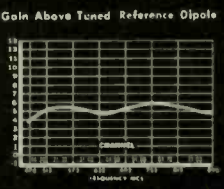
On **UHF:** For primary and secondary areas. In many cases, performance is equal to actual outdoor installations. Good directivity on all channels.

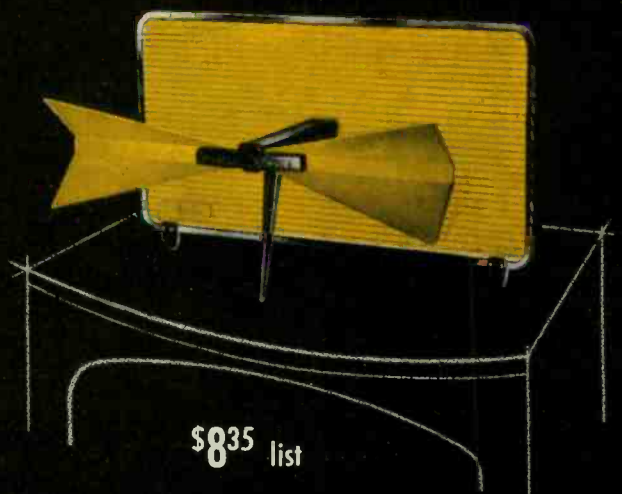
On **VHF:** Ideal in areas of strong VHF signals.

STYLED FOR BEAUTY!

Designed by a well-known industrial designer, the WONDER BOW is proof that indoor antennas can be beautiful as well as powerful. Wins customer approval on beauty alone!

The first gain figures ever to be published for an indoor antenna!





Gold and black
model no. 416

Silver and black
model no. 417

$8.35 list

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

Write for complete technical literature.

*Pat. No. D-171560

TECHNICIAN
& Circuit Digests

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

Open Letter to Test Equipment Mfrs.

Accurate, Complete "Specs" Should Be Made Available to Technicians

No serviceman will quarrel with the statement that properly designed test equipment is a must in the TV-radio repair shop. An instrument of good quality can, when properly used, greatly speed up service work and boost service revenue. An instrument with significant design faults, on the other hand, particularly faults (or limitations) poorly comprehended by the user, can make a difficult service job of a relatively simple one, and cause appreciable losses of time and money.

Let's get down to cases. The signal output of some sweep generators is quite non-linear. If the user isn't familiar with the non-linearity introduced by his instrument, some alignment jobs may prove quite troublesome. The non-linearity present may vary with the output setting of the generator, further complicating the job of interpreting response curves.

In quite a few oscilloscopes, the vertical attenuator control is not frequency-compensated. Measurement of horizontal sweep signals at one vertical amp. setting may not provide the same amplitude indication that it will at another setting. Furthermore, composite video signal waveshapes change considerably with vertical gain setting in these scopes. Confusion and delay may result if the technician is unfamiliar with the true source of these conditions.

Case in Point

A TECHNICIAN reader wrote us some time ago, telling about a service job that had taken him quite some time to perform. The waveforms of the horizontal sync pulses in some stages were considerably smaller than those cited by the set manufacturer. The technician accordingly assumed that trouble in one of these stages was present. It took him several hours before he deduced that the limited frequency response of his (newly-purchased) scope was responsible for the reduced amplitude of the waveforms, and not the set itself.

Other cases could be described, illustrating important design limitations in test equipment. Does this mean that the equipment is necessarily bad or useless? Not at all. *The technician's attention should, however, be called to the limitations of the instrument he is purchasing, or planning to purchase, if he is to employ it efficiently.* This is a point of ethics frequently overlooked by some test equipment manufacturers.

Improper "Specs" Listing

Linked with this "oversight" is the provision of inaccurate or misleading "specs", as well as the omission of "embarrassing" characteristics that reflect no credit on the instrument.

An example of an inaccurate specification is the statement that the output of a signal generator is continuously variable between, say, 0 and 500 millivolts, whereas in actuality, the output of the instrument cannot be reduced to zero volts at all.

An instance of the misleading "spec" is a statement that voltmeter accuracy is within, say, 3% of full-scale deflection at one specified range. The actual percentage of error at the low section of the range may be very much greater, but many technicians are apt to overlook this.

What is obviously needed is some system of 1—Standardizing specifications and 2—Insuring adherence to these "specs." *All* "specs" needed for correctly evaluating the merits of an instrument should be presented, not merely some of the more favorable ones. And these "specs" should be accurate, not "doctored up" to meet the more favorable "specs" of a competitor.

When the test equipment manufacturers fill this tall order, they will, we feel, go a long way toward picking up more business from the serviceman.

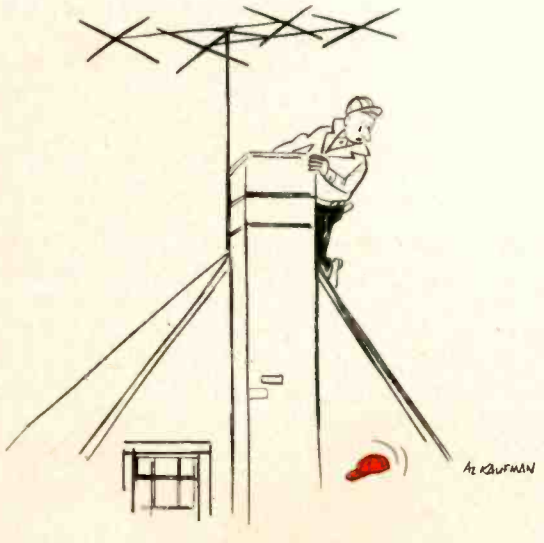
Tuning In the

NEW 19-IN. COLOR TUBE, CBS 205, is in mass production right now with output of about 40,000 expected this year. Capehart, CBS, Motorola, Westinghouse and others will use it in their sets. Motorola has already announced a color receiver using this crt for THIS FALL, *to sell at $895. "205" refers to number of square inches on the tube's viewing area.*

GROWING NUMBER OF WOULD-BE "experts" calling in technicians to work on Hi-Fi gear bought by the former with the notion that assembly and set-up is a cinch. At present the high-fidelity sales market is suffering a seasonal lull, with component volume lagging. Some high-class stores are moving fair quantities of complete instruments, and are doing fairly well with custom work.

TV SET SALES HAVE BEEN holding up well, with dealers fighting hard for a share of the business. As a matter of fact, the market is much better than most expected it to be, but most of the sales are in low-end new models or "distressed" larger units offered at fantastically low prices. Competition in TV is terrific in all markets. . . . Radios are slow in many localities, though portables and clocks are moving fairly well. . . . Recorders are steady and are expected to show a big increase over last year. . . . Phonos have been moving in the low and medium price brackets, with large deluxe units dragging.

THERE ARE STILL "SNOWY REGIONS" in many parts of the country, but one hears less and less about "fringe areas" these days because of the great improvements in antennas, towers and other reception accessories, plus increased skill and knowledge on the part of the nation's technicians. Some repairers we know of travel fifty miles and more to service one fringe set. What's your record distance? Let's hear from you for publication in TECHNICIAN.



"Gesundheit!"

STRANGER THAN FICTION. In a hard-boiled district of New York City, a technician was called in to service a receiver. The customer claimed (over the phone) that it had never worked since it was fixed, and refused to pay for the repair. As the technician placed his tool kit inside the front door hall, the woman kicked the box farther inside the house and slammed the door in the technician's face. The case was subsequently settled in court to the *woman's* satisfaction. Hm. . . . Easterner who used to run a small radio repair shop, is now a big-shot engineer for a national network, but he still has to personally repair the TV sets, Hi-Fi equipment and other electronic gear in his boss' home. Seems the latter is so sold on the guy's ability that he won't let anyone but the ex-servicer do the work.

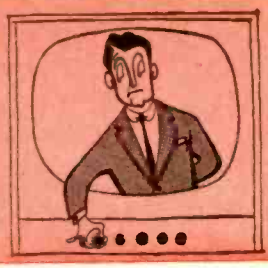
BUSINESS SO-SO AS SUMMER CONTINUES, though a sharp pickup is foreseen in September when the trek back from vacationland commences. Repair shops in many thickly-populated Summer resorts have been very busy, but conditions have been spotty in most of the big cities, with heavy competition in such cities as New York and Chicago, where some high-pressure outfits are spending up to $500 a week in advertising. Prices for service are holding up well in most independent shops. Trend noticed in some of the older TV cities: An increase in number of folk who are seeking "minimum" repairs, and who are unwilling to spend money for other needed work in cases where picture and sound are still present.

TRENDS OF THE TIMES: Numbers of discount-houses setting up service departments to counteract competitive claims that such outfits have no maintenance or installation facilities to offer. . . . Slight increase in number of firms advertising service on time-payment bases. . . . Large 24-hour, seven-days-a-week firm doing 60 percent of its volume on holidays and "after hours." . . . Most shop owners interviewed by TECHNICIAN editors say they do not plan to charge more for working on color-TV sets when the latter really hit the home market.

PORTABLE RADIO SALES are sharply up for the 1st quarter of this year as compared to a similar period last year. Though the trend is nationwide, heaviest demand is in northeast area of the country. New England technicians, please note! Don't overlook a good bet.

TV MEMORY MIRROR: Remember the pre-age split-sound sets, many still in use, that required at least half-a-dozen knob adjustments when switched from one channel to another? Contrast, fine tuning, horizontal hold, brightness and other controls had to be carefully adjusted each time. Not a hard job, if you happened to be an octopus. . . . And how about those clumsy magnifiers, oil-filled and others, that used to mar the appearance of 7- and 10-in. sets to produce a bigger picture? Remember the time, in the not-too-distant past, when conversions to a larger pix tube were a good source of income? Plummeting prices on large-screen sets have just about killed this sideline.

Picture .....



"Think it over—my repairs free or—kerplop!"

COLOR-TV IS CERTAINLY ON THE WAY, according to RCA Victor's former exec. VP, Jos. B. Elliott. He says the industry should be able to sell several hundred thousand sets in 1955; about one and three-quarter million in '56, and five million in '58.

INCREASE IN BOTCHED UP SETS repaired by would-be servicers in the home noted in several industrial centers. Although most technicians dislike working on these "worked-over" receivers, and many express their displeasure to the owners, one Chicago firm accepts such repairs with a smile. "If we're willing to take this kind of work we might as well be courteous about it," says the owner.

OPPORTUNITIES MANY OVERLOOK. Just about every customer needs phono needles, and just about every technician who visits the home can sell 'em—and make money, too. . . . "Are all your radios working satisfactorily? is the stock question the owner of a small shop and his two men ask each time a TV repair call is made. And it pays off handsomely. . . . A New York technician, servicing a television set in a doctor's office was asked by the latter if he could repair a piece of electronic medical equipment. He tackled the job, put the unit back into good working condition, and now has several other doctors on his customer list.

TV MANUFACTURERS' WARRANTIES are moving in two directions at the same time. Some mfrs are in favor of dropping 1-yr. warranties on pix tubes, claiming that present crt prices and quality are so favorable that these items no longer represent a big-cost replacement headache. On the other hand, GE has just extended its standard 90-day warranty on TV sets to cover labor charges, as well as parts replacement.

GARAGE-DOOR OPENER, recently introduced, will be marketed via TV-radio distribution channels. Even if you don't do selling, this kind of item can be a good "added line" for servicing.

THE JOB-SECURITY FACTOR should improve steadily. To judge by current population trends, the deck will be stacked in the worker's favor by 1963. In an anticipated (increased) population of 177 million, there will be a big percentage increase in the over- and under-age groups, leaving fewer workers in "acceptable" age brackets to furnish goods and services for more people.

TAPE DUPLICATING SYSTEM, announced by Ampex, will give still another shot in the arm to the growing field of pre-recorded tapes. By copying tapes at speeds several times normal playback speed, 2500 hours of tape playing time can be duplicated in a single 8-hr. working day. This includes simultaneous copying of both tracks on a dual-track recording. On modern stamping presses, disc recordings are usually produced at a rate of less than 1500 hours of music per 8-hr. day.

BIGGEST BOTTLENECK IN COLOR TV may not be the size of the crt so much as the non-interchangeability of pix tube types already developed. Most set makers are afraid to sink big dough into a circuit design that may become obsolete if the crt used in it is eventually abandoned. Sufficient standardization to allow interchangeability of tube types is one answer. Is this a problem for another "all-industry" committee? Technician-dealers and distributors also have a stake in this problem: Who has the warehouse space—or the money—to stock replacements for at least half a dozen varieties of crt?

LOOKING FOR WORK? Makers of master antenna systems, which are doing well, report a shortage of trained personnel for installing and maintaining these rigs. Also, Jerrold of Philadelphia announces a new licensing plan for people interested in selling or installing their master systems. The same mfr is setting up a school in Philadelphia, open to the entire industry, for training personnel in installation, maintenance and operation techniques.

THOUGH A FEW TV SET MAKERS have said off the record that they may revise a few receiver prices upward this Fall, most are looking forward to a knock-down-drag-out fight to the finish with leader models. "Price-wise, we haven't seen anything yet," a prominent sales executive told a TECHNICIAN editor.

CALENDAR OF COMING EVENTS

Aug. 25-27: Western Electronic Show & Convention, Pan-Pacific Auditorium, Los Angeles (show) Ambassador Hotel, Los Angeles (convention hq.)

Aug. 27-29: TV Service Clinic, Sponsored by the Texas Electronics Association, Adolphus Hotel, Dallas, Texas

Sept. 24-26: Fifth Annual TV-Radio Service Industry Convention and Exhibitions, Morrison Hotel, Chicago, Ill.

Sept. 30-Oct. 2: High Fidelity Show, Washington Athletic Club, International Sight and Sound Exposition, Palmer House, Chicago, Ill.

Oct. 4-6: Tenth Annual National Electronics Conference, Hotel Sherman, Chicago, Ill.

Oct. 8-20: Radio-Electronics-Television Mfrs. Assoc. Radio Fall Meeting, Hotel Syracuse, Syracuse, N.Y.

Oct. 13-16: The Audio Fair, Sponsored by Audio Engineering Society, Hotel New Yorker, New York.

Using the Oscilloscope

Scope Requirements; Eliminating Stray Pickup; Non-Linearity;

By James A. McRoberts

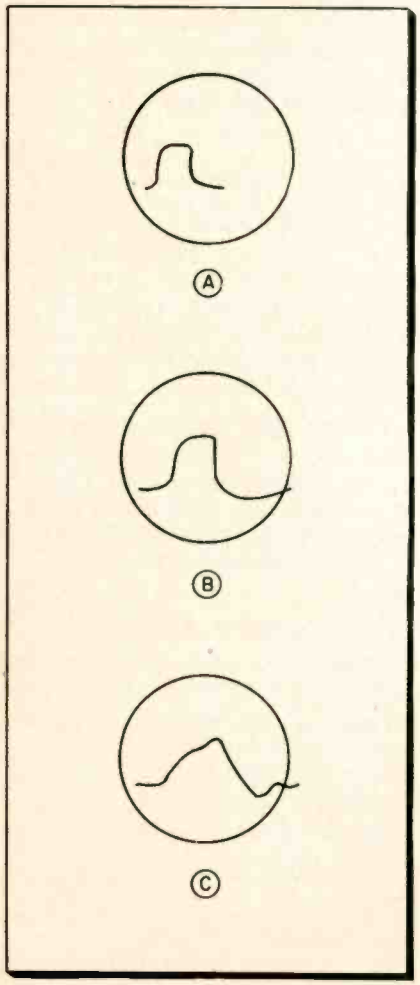
• In the performance of routine TV service operations, such as waveform inspection and alignment, a reasonably good oscilloscope is a "must" requirement. Economically, many readers cannot afford the best, so this article will discuss measures by means of which an inexpensive scope's usefulness may be extended (until a really good scope can be procured). Auxiliary equipment that may be used for this purpose will also be described.

Response Needed. Probably the most critical duty of a scope is the display of waveforms associated with the horizontal frequency of 15,750 cycles per second. Contrary to the general run of opinion, the vertical amplifier must be faithful far beyond the tenth harmonic of this frequency, if small portions of a single cycle—such as the retrace of a horizontal pulse—are to be accurately displayed. Ideally, the vertical amplifier should pass, without discrimination, frequencies 500 times as high as the horizontal sync pulse. Scopes of such a high-frequency response are, of course, prohibitive in price for the average technician, and not really needed for ordinary service work. A hundred times the horizontal frequency is a more practical requirement—i.e., a response extending to 1.5 or 2.0 megacycles.

Inexpensive scopes with a "usable" high-frequency response of only 150 kc may be employed. One very simple way to get the most out of such a scope is to note carefully how it reproduces horizontal waveforms on some TV receiver in good operating condition. Take particular note of—i.e., memorize—the distortion present, so you will know how much distortion is normal with a scope of this kind.

To illustrate: a horizontal sync pulse observed on an excellent scope is shown in Fig. 1A; its appearance on an inexpensive scope is illustrated in 1B. If a waveform seen on the inexpensive scope is excessively distorted (Fig. 1C), trouble in the receiver is indicated.

Fig. 1—Distortion of horizontal sync pulse on a laboratory scope (A); on an inexpensive scope (B); excessive distortion on inexpensive scope due to loss of high frequencies (C).



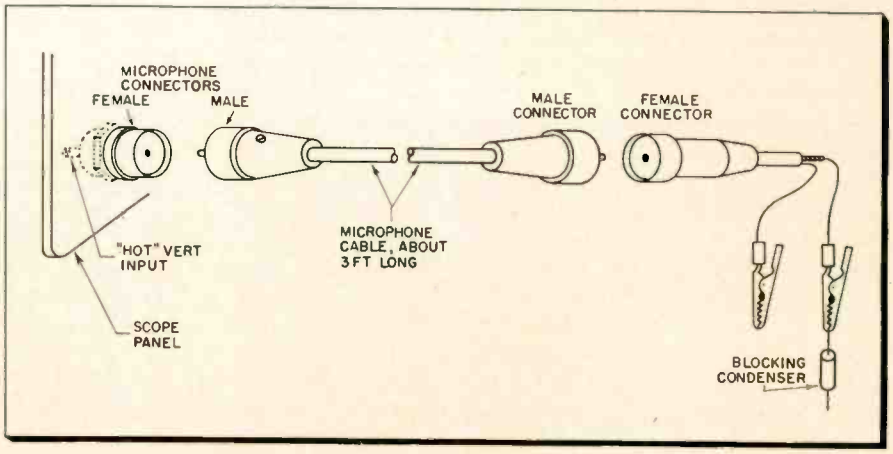
Eliminating Stray Pickup. Stray pickup by the vertical amplifier and its leads are perhaps the most annoying things that the serviceman encounters in a scope. He can readily do something about such pickup. The input circuit to the vertical amplifier should be shielded inside the scope. A microphine connector may be substituted for the customary binding post input. A microphone cable (Fig. 2) may be used as a shielded input lead; the input is thus shielded as far as the end of the microphone cable. Another length of microphone cable, complete with connectors, is handy as a spare or as an extension.

Probes—discussed later—may be terminated in a connector to match the cable, thus shielding the entire input system as far as possible.

Shielding of the vertical amplifier and the input cables not only prevents stray pickup (such as hum); it also prevents radiation of the signal on the cable to other parts of the receiver under test. Such radiation can cause regeneration and/or spurious modulation.

Scope Non-Linearity. The horizontal sweep may not be linear in inexpensive scopes. This non-linearity may be of the kind illustrated in Fig. 3A, which occurs towards the end of the sweep. The resultant dis-

Fig. 2—Single-contact microphone cable, with connector for coaxial (shielded) input, may be used for attaching scope vertical input to circuit under test. Set-up eliminates hum pickup.



for TV Receiver Servicing

Isolation & Filtering; Low-Capacitance and Detector Probes

tortion produced in a sine-wave signal is shown in Fig. 3B. Now, ordinarily, two or more waveform cycles are observed simultaneously. To remove the non-linear part of the display, simply expand the sweep by suitable rotation of the horizontal gain control; then move the right-hand cycle entirely off the screen by setting the horizontal positioning control so that only the one or two cycles at the left are visible. Fig. 4 shows such a display with the "unused" portion dotted.

In alignment operations, the non-linearity just described is not too important. The technician should look at alignment curves obtained on several sets in good working order, to familiarize himself with the response distortion introduced by his scope.

Filters and Isolation Resistors. Shielding the leads is not all that is required to make the input to the scope vertical amplifier satisfactory. Filter networks are also needed, to prevent upsetting the circuit under test, and to provide a more usable response curve in alignment. Intelligent use of filters is very important in oscilloscope work.

Alignment curves are frequently fuzzy and hazy, due to the presence of excessive high-frequency signal content, where only the relatively low frequencies are required. A high-pass filter can change a fuzzy curve (Fig. 5A) into a cleaner, far more usable one (Fig. 5B). The simple addition of a 0.001 to 0.01 mfd condenser across the scope vertical input terminals is enough for this magic transformation, although a more elaborate filter is preferable. (The more elaborate filter will do a better job of removing higher-frequency audio components as well as radio-frequency signals, from a sweep-generated response curve. Only 60 or 120 cycle components and their first ten harmonics are needed, for correct reproduction of the response curve.)

Fig. 5C shows the schematic of such a filter. R-1, a 10k resistor, isolates the scope from the circuit under test; 500 mmfd condenser C-1 serves as an r-f bypass. Further r-f filtration is provided by R-2, another 10k resistor. C-2's primary function is to bypass the higher audio (noise) frequencies, eliminating the fuzz that tends to develop in the alignment curve when the set is brought into alignment. C-2 has a value of 0.05 mfd in many such applications.

The entire filter should, preferably, be mounted in an i-f transformer can, with a female microphone connector (panel-mount) provided on the end of the can, to match the coaxial microphone input cable shown in Fig. 2. The lead length extending from isolation resistor R-1 beyond the shielding enclosure should be minimum.

Low-Capacitance Probes. An isolation resistor tends to prevent interaction of the scope vertical input with the circuit under test (i.e., loading or detuning). Interaction is further minimized by use of a low-capacitance probe. A typical low C probe is schematically illustrated in Fig. 6. Note that a series-connected low capacitance is capable of reducing the capacitative loading of a tuned circuit by the probe. The 47 mmfd capacitor in Fig. 6 is in series with the capacitance of the probe; the series combination represents the capacitative load shunting the circuit under test. The 47 mmfd series condenser also prevents or blocks the passage of direct current. (Although most scopes have a series blocking condenser, addition of another one prevents damage that may be caused by a short-circuit at the terminals of the scope binding post.)

Use low-capacitance probes for viewing the waveforms in horizontal oscillator and discriminator-ratio detector circuits, where the capacitance of the probe leads will upset the circuit if a larger-capacitance probe is employed. A resistor (1 or 2K) may be used in series with the end of the probe, if desired, to further isolate the circuits and reduce the shunting capacitance present.

Detector Probes. To view the modulation of radio or intermedi-

(*Continued on page* 58)

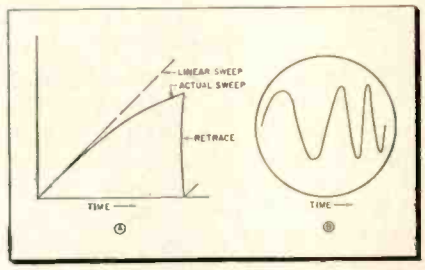


Fig. 3A—Non-linear sweep. B—Effect of non-linearity shown in (A) on a sine-wave signal.

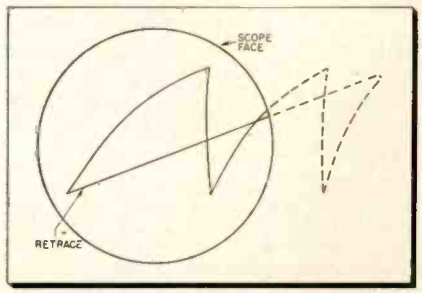
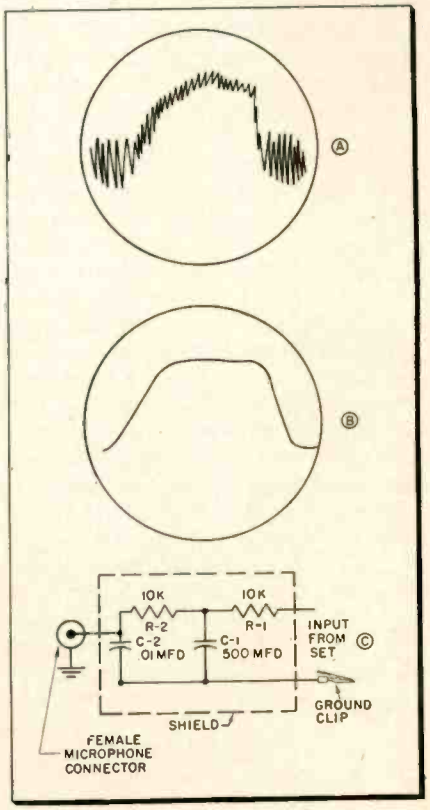


Fig. 4—Display adjusted so that only the left-hand or most linear part of the signal is left on the screen for inspection purposes.

Fig. 5A—Fuzzy response curve. C—Filter designed to remove the fuzz shown in (A). B—Response curve with fuzz content eliminated.



Setting Up A Successful

Factors Entering into an Indoor or Outdoor Installation.

By Arthur H. Smith

• The successful outcome of a well planned, properly installed public address system is gratifying to both the purchaser and the technician. Some installations, however, do not turn out successfully. Unusual conditions may arise—in some cases weeks after an installation is completed, in others as the system is in the process of being set up—that impair its operation.

A great deal of troubleshooting, replacement and re-arrangement can be avoided if certain basic installation fundamentals, about to be described, are observed.

Public address systems vary greatly in requirements, ranging as they do from small units, intended for audiences in quiet rooms or auditoriums, to large complex installations at stadiums, theaters or racetracks, where the public address system is required to have sufficient reserve power to override the noise levels that exist at these sites. Other installations include paging and music amplifiers at industrial plants, schools, hospitals, bus depots, restaurants and night clubs.

In some installations, *fixed* requirements must be met; i.e., the audience and activity are about the same at all times. Other installations may have varying requirements during the day or evening, due to fluctuations in the number of listeners, changes in surrounding noise levels, and other variables.

The success or failure of your system depends on satisfying these varying requirements adequately. The technician who fails the first time in an installation of this type may fail again, unless he is equipped with basic installation information.

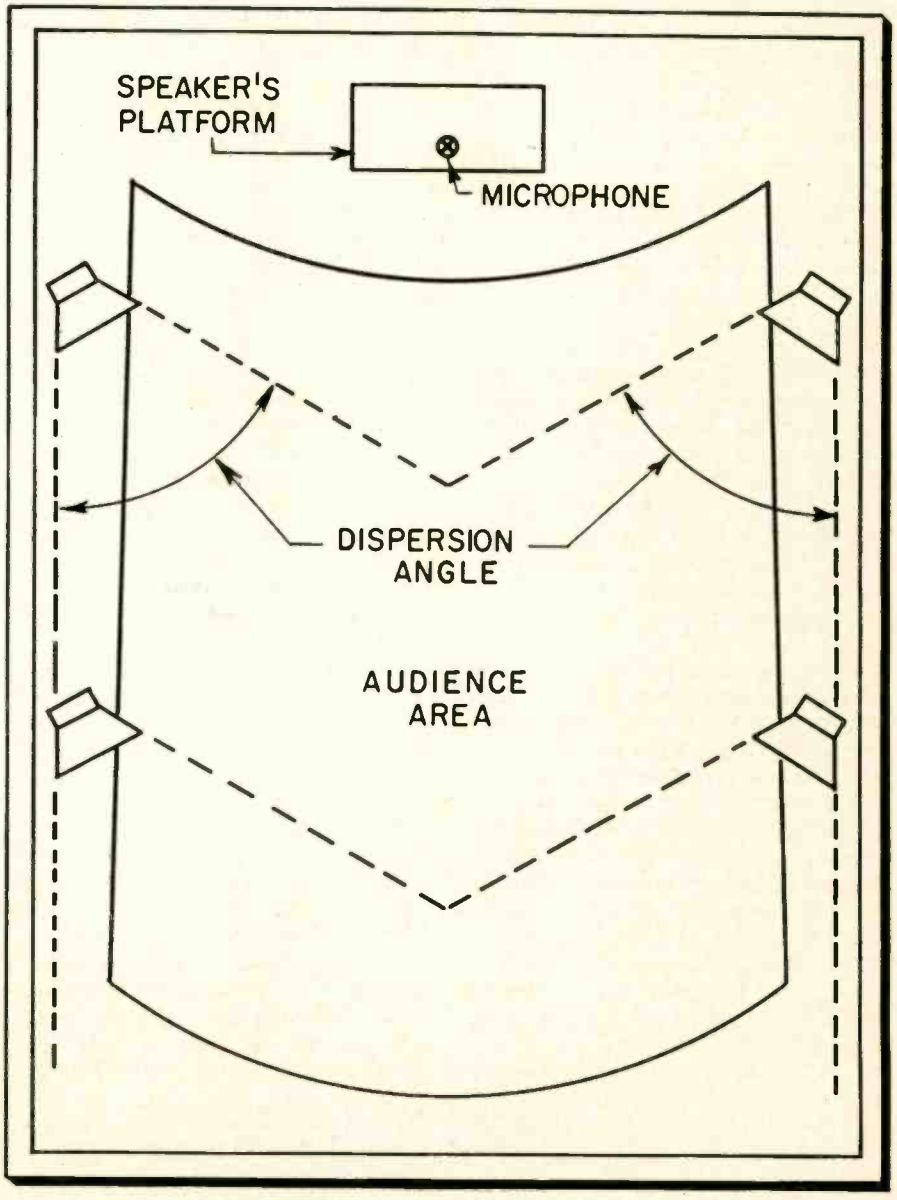
When called upon to install a public address system, your first logical step would be to go to the location where the installation is to be made. Look the place over yourself. Do not depend on descriptions of the place. Spend as much time as you can asking questions, the an-

Arthur Smith is a design engineer who operated a p.a. business for ten years.

Amplifier Power	Speakers Needed for Indoor Installation	Speakers Needed for Outdoor Installation
6 to 8 w	Two 8-in. speakers	One 12-in. speaker
15 to 18 w	Two 12-in. speakers	One trumpet
25 to 30 w	Four 12-in. speakers	Two trumpets
45 to 50 w	Six 12-in. speakers	Three trumpets
60 to 70 w	Eight 12-in. speakers	Four trumpets

Fig. 1—Number and size of speakers required with an amplifier of specified power output.

Fig. 2—Placement of four speakers in oblong room, for most effective use of the dispersion angle.



Public Address Sound System

Meeting Requirements. Speaker Considerations

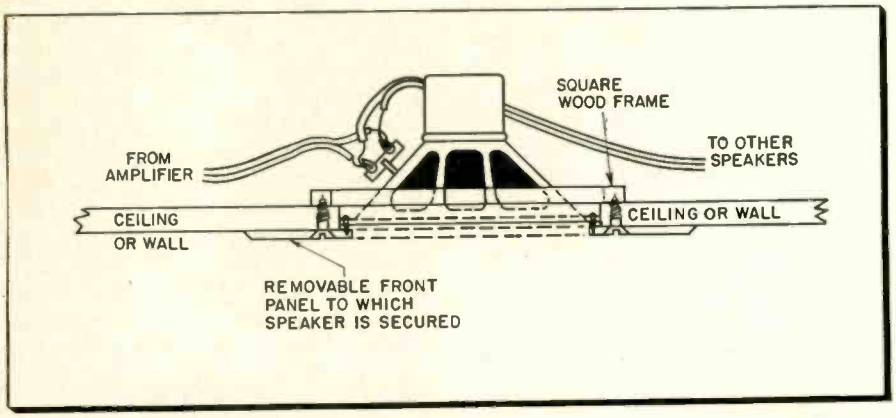


Fig. 3—Method of connecting ceiling or wall speakers to permit access to speakers and cables.

swers to which may be needed. Whatever the case may be, determine whether the requirements will be the same during the use of the system, or if they will vary.

Public address installations may be divided into indoor and outdoor systems. An indoor system, once established, can be relied upon to distribute sound faithfully under all conditions for which it was designed. The outdoor system, however, cannot be set up and forgotten about quite so easily.

Because of the usual absence of walls, ceilings and floors in an outdoor installation, sound distribution is dependent wholly upon the air mass that surrounds the audience. The lack of reflecting surfaces prevents re-distribution of the sound, which is literally lost to infinity due to the excessive damping effect of air in open space. Prevailing winds may carry the amplified sounds to or away from the audience, little or no control being possible. To cope with such conditions, at least in part, something of a brute-force technique, employing highly-directive trumpets, is used.

The following formula is based on indoor factory installations, which require adequate reserve power to override peak production noise. This formula is applicable to all other types of installation, since it provides for a good margin of reserve power. Multiply the number of people to be served by a constant index of .008, to obtain the amplifier power required.

Example: 4000 x .008 = 32 watts. In the case of a comparable outdoor installation, 10 watts should be added to the power requirement.

Now that the proper amount of power has been determined, the next consideration will be the number and types of speakers or trumpets to be employed. The table shown in Fig. 1 may be used in this connection. Good-quality twelve-inch speakers, with adequate handling capacities of fifteen to twenty-five watts, and trumpets using 25-watt driver units, are ideal for the installations referred to.

We have now determined the power required, and the number and types of speakers. The next consideration is speaker placement. You will want to achieve maximum sound coverage by utilizing efficiently the speakers available.

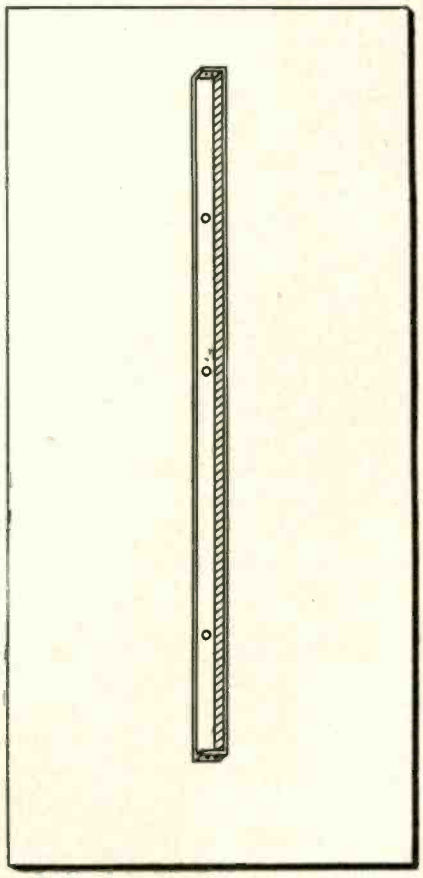
In a square or oblong room having straight walls, speakers should be mounted 10 to 12 feet from the floor. When a seated audience is anticipated, speakers should face the audience at a 45-degree angle from the wall. This will make the most effective use of the dispersion angle of the speakers (see Fig. 2).

Where the audience is expected to move about, two kinds of speaker placement can be used. The speakers can be placed flat against the wall, so that they radiate energy at an angle of 45 degrees from the wall. The speakers can also be placed in the corners of the room. The dispersion angle is more effectively used in the latter case. If the room is oblong, two or more speakers may be required to fill in possible dead spots along the long wall. The best type of placement is that in which the speakers are concealed in walls and ceilings. This will be discussed shortly.

Rooms of other than square or oblong construction may pose some problems. Alcoves, dividing walls, booths, balconies and side rooms should not generally be served by speakers in the main-room area. It may be advisable or necessary to use two eight-inch speakers in place of one twelve-inch unit, installing the two in obvious or possible dead spots. It is advisable to install suitable pads in such speakers, in order that a balanced level can be maintained, in relation to the sound level in the main room.

In permanent installations, when

Fig. 4—Ceiling support channel. The heavy-gauge steel unit shown comes in 24 and 48-in. spans. (Courtesy Lowell Mfg. Co.)



it is architecturally possible, or in new room construction, speakers may be installed recessed into the ceiling or wall. Access to the speakers and connecting cables should be provided by the use of mounting rings or plates, in the event future servicing is needed. Also provide accessible tie points for the cables between speakers, in order that continuity and resistance checks may readily be made. In the event of shorted or open cables, new cables can be pulled through by means of the old cable.

Removable ceiling or wall panels can be made up as shown in Fig. 3. Such panels will make speakers and cables in permanent installations accessible.

Steel support channels may be used for ceiling or wall installations (see Fig. 4). The channels used by the author come in either 24 or 48-in. lengths, and are made to conform to standard construction specifications (refer to Fig. 5).

In installations where requirements vary, and speakers may need to be moved to different positions from time to time, speakers mounted in wood cabinet baffles should prove satisfactory. The cables in this case may be laid in mouldings, or supported by means of slip rings spaced about the room, or securely strapped or stapled to the walls.

The outdoor installation usually uses trumpets which have a dispersion angle of 90 degrees. Position these trumpets as judiciously as possible, to make optimum use of the dispersion angle. Two trumpets are usually mounted near the speakers' or musicians' platform, while others are set up in trees, on poles or on suitable tripods, to cover the remaining area.

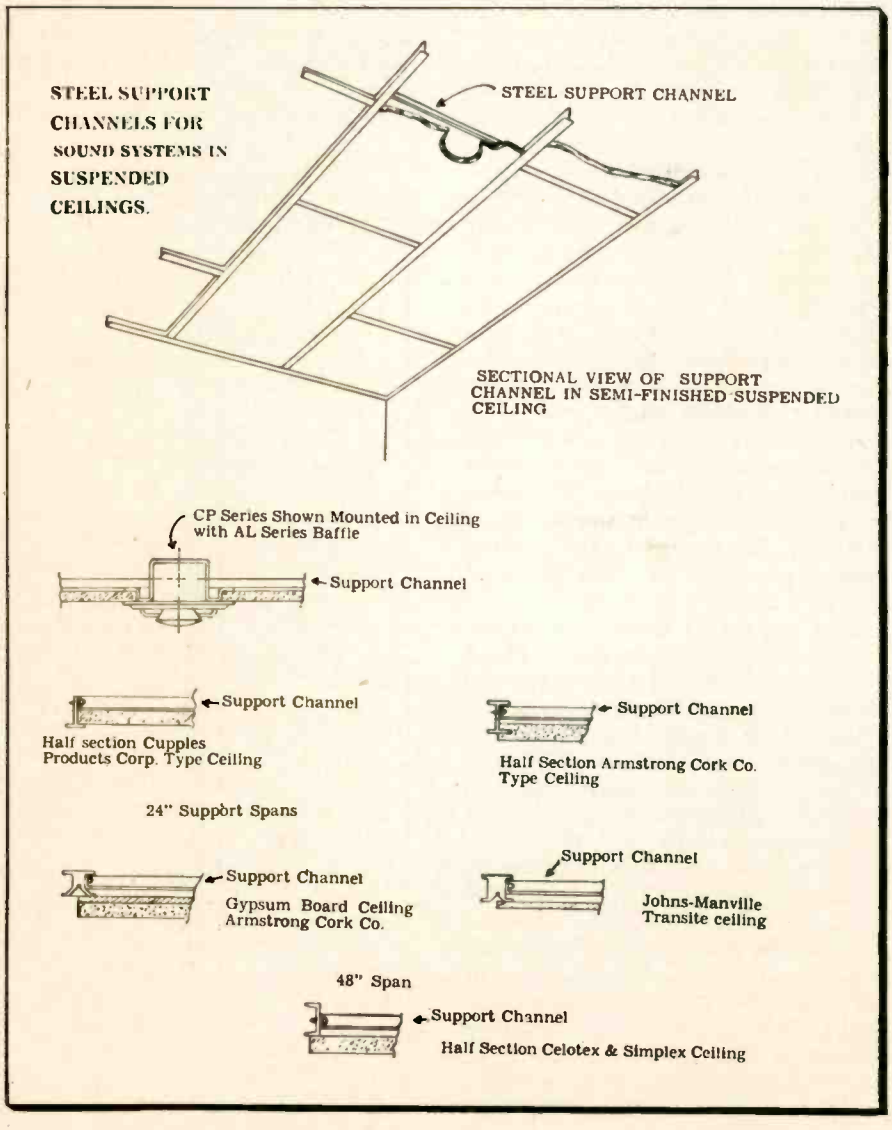
Up to this point, we have decided on the power requirement of the amplifier, and installed the speakers and cables. The next consideration will be the quality and input requirements of the system. For ordinary speech, ballyhoo and carnival service, an ordinary amplifier with no special features may be chosen. Where the system calls for music distribution or orchestral service, however, a good quality amplifier with several input channels should be selected. Good frequency response down to 15 cycles and up to and above 15,000 cycles, with low distortion, is mandatory.

Amplifiers with tone correctors and controlled feedback circuits will make it possible for you to make corrections in the acoustics, and counteract the effect of resonance points that may exist in the room in which the system is used. No matter what the installation, before you decide to purchase the amplifier, set up and review specifications and ratings. Make sure that the service for which you intend using the equipment is suited to it.

The amplifier should be equipped with good-quality, oversized components (preferably oil-filled condensers), and should have adequate ventilation. In many cases, public address systems are very much abused. They are put to long periods of operation at full power output. Failures have frequently been attributed to systems accidentally being left on overnight, or for the duration of a week-end. Ruggedness of the amplifier is therefore important.

Input requirements dictate the quality of the microphone and other accessories. These units should match amplifier "specs." Choose a mike cable that will be adequate for all possible needs. It is customary to provide several cables of 10, 25 and 50-foot lengths, with suitable connectors to join all cables if necessary.

Fig. 5—How steel support channels for sound systems are used in various types of ceiling. Units shown were designed for special kinds of speaker enclosures. (Courtesy Lowell Mfg. Co.)



Speaker Considerations

In connecting your speakers together, consideration must be given to impedance matching and phase relations. It is most advisable to install speakers in parallel or series-parallel. A large group of speakers should never be wired in series. Due to high transient voltages that may develop in a series wiring set-up, arc-over at the air gap of the voice coils may occur, possibly causing serious damage to the speakers. Furthermore, if a coil open-circuits, the entire system will be inoperative. If for some reason series operation *must* be used, the speaker

(*Continued on page* 48)

Making the Most of

Your Test Equipment

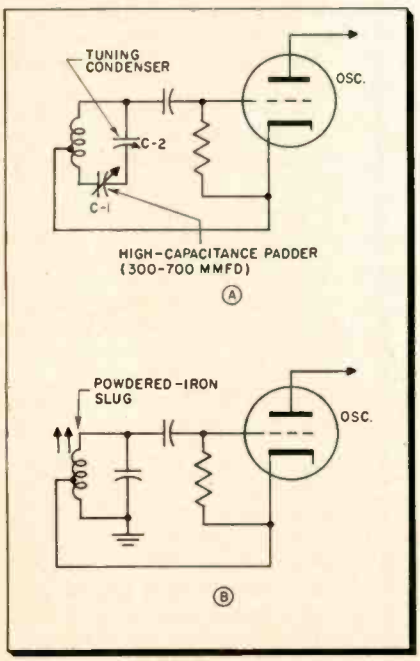
Adjusting Oscillator Padders with a Sweep Generator and Scope; Calibrating a Signal Generator; Enlarger for 3-in. Scope

By Maury Goldberg

Adjusting Oscillator Padders. Due to cost considerations, low-priced receivers seldom contain series oscillator padders for tracking at the low-frequency end of the dial. Because of the relative broadness of response of the single-tuned circuit between the antenna and the mixer grid (usually the loop itself), minor discrepancies in the tracking of the oscillator and mixer tuned circuits can usually be tolerated. Only a low-capacity shunt trimmer, ordinarily mounted on the tuning gang, is used to track the circuit at the high-frequency end of the dial.

In better-grade communication sets, home receivers and Hi-Fi tuners, some form of series padder is usually incorporated to give closer tracking at the low-frequency end of the band. Some receivers dispense with the capacitor padder shown in Fig. 1A and use a powdered iron slug instead, as shown in Fig. 1B.

Fig. 1—Oscillator tuned circuit using high-capacitance padder (A) or powdered-iron slug (B) for tracking at the low-frequency end of the AM band. In both cases, a small shunt capacitor (not shown) is also used across the main tuning capacitor (C-2) for h-f tracking.



In the usual adjustment of a padder or slug, a station—say around 600 kc on the broadcast band—is tuned in; the dial is then "rocked," while various settings of the slug, or padder capacitor, whichever is used, are made. The adjustment position providing maximum response is assumed to be the correct one; after it is obtained, the shunt trimmer is adjusted near the high-frequency end of the dial. The same procedure is then repeated as a re-check.

This is a relatively slow and somewhat unsatisfactory process, and can be speeded up and improved upon by using the following procedure: Clip the output lead from a sweep generator to the insulation on the "high" side of the antenna or loop wiring (see Fig. 2A). The input cable from a scope is then connected across the set's detector load resistor. With a center sweep frequency of about 600 kc, and a sweep width of .5 mc or less, a pattern such as the one shown in Fig. 2B will be observed. The receiver dial is set at a point near 600 kc, at which no station is received, for this test. It is immaterial whether the scope's internal horizontal sweep or the sweep from the generator is used, since the height indication alone is of interest, not the exact shape of the response curve.

The padder or slug is adjusted for maximum curve height. The response curve will slide to right or left along the baseline during the process, showing that the frequency of the tuned circuit is being varied. The small pip near the main response is the 455 kc i-f signal. Advantage can be taken of its presence by adjusting the i-f trimmers for maximum pip output at this time. If the main response curve is off to one side of the screen, adjust the phasing control on the generator, or reset the center frequency slightly, to bring the curve closer towards the center of the screen.

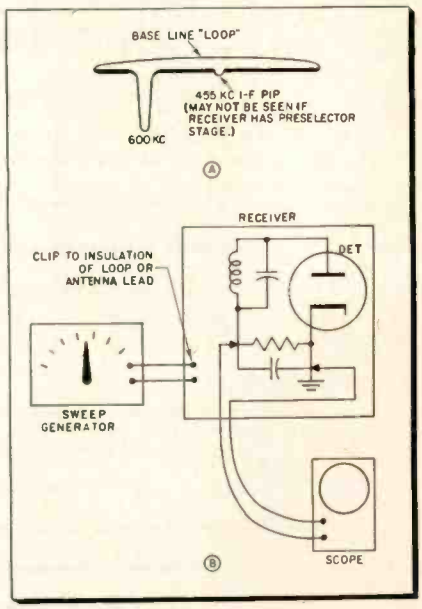


Fig. 2A—Connection of sweep generator and oscilloscope for oscillator alignment at the low-frequency end of the band. B—Response obtained on scope. To minimize "looping" of the base line, reverse line plug to the sweep generator, scope or the radio.

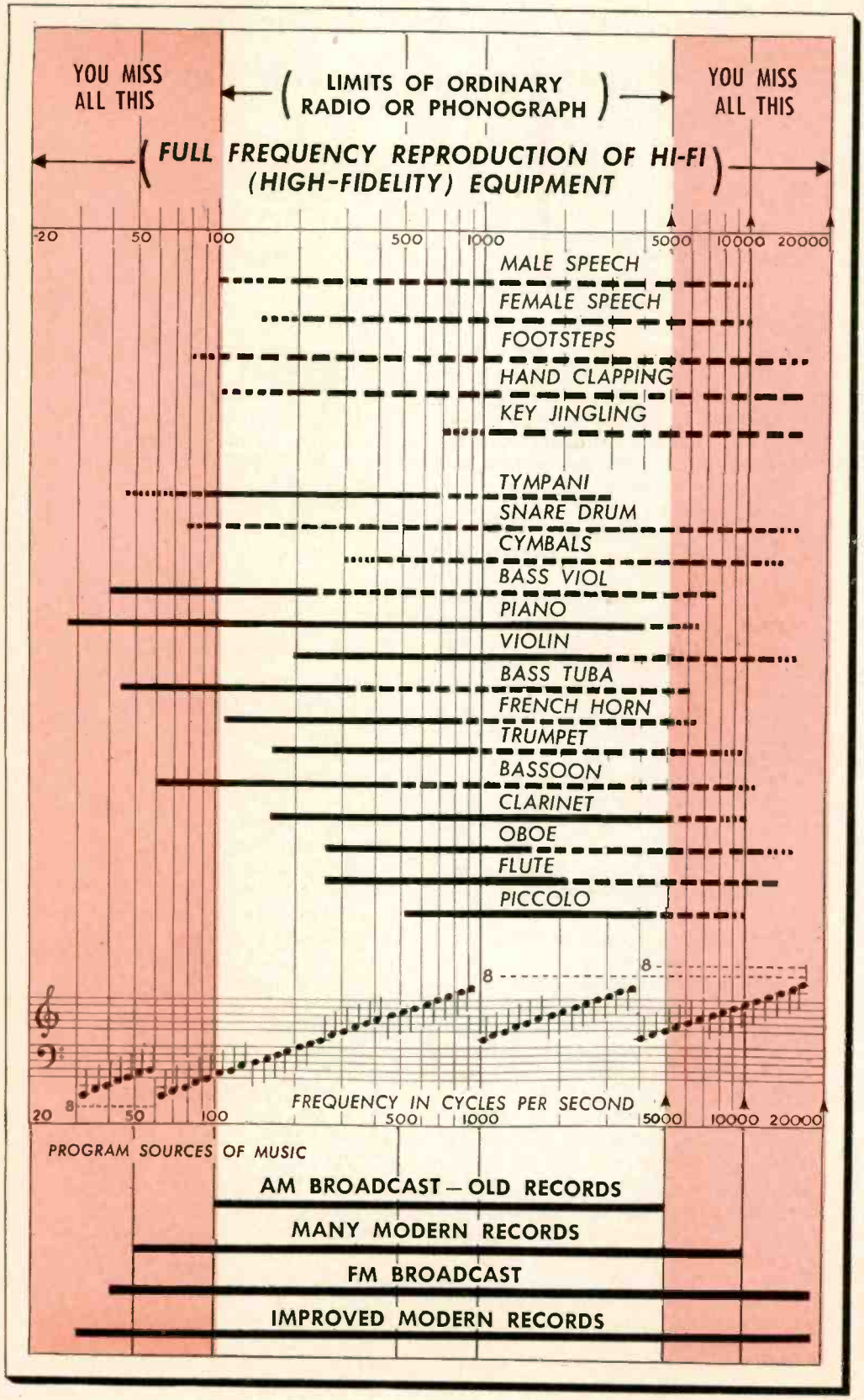
The method of adjustment just described is of value even when no series padder or slug adjustment is incorporated in the circuit. By pressing against one of the outer oscillator section rotor plates with an insulated rod, the height of the pattern will change. The same is true if one of the rotor plates of the mixer section is pressed inward slightly. If the output *decreases* in BOTH cases, the adjustment is correct as is. If the output *increases* when the oscillator rotor plate is pressed, bend the MIXER rotor plate *outward* slightly, until proper correction is obtained. If the output *increases* when the mixer plate is pressed, bend the OSCILLATOR plate *outward* to compensate.

This method is just the opposite

(*Continued on page* 56)

WHY You Need "HIGH FIDELITY"

To Enjoy the Full Value of Great Music and Fine Instruments



HIGH FIDELITY, in broad terms, refers to the re-creation of sound so that it resembles closely the original expression of that sound.

In the technical sense, many factors contribute to this life-like realism. One of the most important of these is the range of frequencies that is faithfully reproduced. The chart at the left shows that some musical instruments can produce tones lower than 30 CPS. The piano's lowest A vibrates to 27.5 CPS. Other instruments, like the organ, extend even lower than this.

At the high end of the frequency scale, the hearing varies from person to person. For many people, this limit goes beyond 15,000 CPS. We should note that, aside from harmonics, 5,000 CPS is about the highest *fundamental* tone an instrument can produce.

Now, no instrument produces a "pure" tone, which is uninteresting. Distinctive instrumental color lies in the *harmonics*, or overtones. These help make the piano sound like a piano, the trumpet sound like a trumpet. (Each instrument's range of fundamentals is shown as a solid line on the graph; the broken-line extensions indicate harmonics.)

As shown toward the bottom of the chart, old-type 78 RPM records and AM broadcasts rarely exceeded 5,000 CPS. When they did, accompanying background noise in the upper frequencies masked high-frequency musical sounds. Hi Fi reproducers, which faithfully recreated noise and distortion, did not find favor when they first appeared on the market. In fact, response was often limited deliberately to eliminate noise.

In the years after World War II, a rapid sequence of developments changed the listening climate. The advent of fine-groove plastic records. the opening of the present FM band and the refinement of magnetic recorders made possible source materials that were wide in range but low in noise and distortion. Some of these sources are indicated at the bottom of the chart.

Today, the limited range of the conventional radio or phonograph, shown at the top, is not acceptable to the Hi Fi lover. Room-filling deep tones cannot be "felt." The tinkle of the triangle, the in-the-room crash of the cymbals and the brilliance of the violins come through as a combination of muddy sounds. But a high-fidelity system brings all these living sounds into the home with their original clarity and color.

YOU Can Sell Hi-Fi

There's Room for the Small Dealer in this Growing Field

Interest in Hi-Fi is growing steadily. More and more people in all parts of the country are purchasing record-players, tape-recorders, FM tuners and related equipment that has the Hi-Fi ticket on it. There's gold in them thar hills, but you've got to know how to mine it.

The first job that should be performed if you're going to sell Hi-Fi to the public is to fan the latent interest of potential customers to sales temperature. Many people who have heard about Hi-Fi, and have developed some degree of interest in it, can have that interest stimulated to the point where it leads to a purchase. Here are some of the ways you can go about achieving this desirable result:

Get up an effective window display. For instance, obtain an old phono somewhere—the kind that is readily identified as old—and set it up beside a late-model record player. A small sign in front of each unit can give the frequency response of the machine, and list other characteristics that make for interesting comparisons. The language used should, of course, be as non-technical as possible.

You might, on another placard, state that records will be played on each machine at such-and-such an hour in the evening, giving listeners a chance to hear how much progress has been achieved in the field of record reproduction.

Demonstration and test records of various types might also be played on both machines, and the response in each case made visible to the audience on a scope. One of the better orators in the shop could handle whatever spiel is necessary.

Literature can be made available in the store, acquainting people with what Hi-Fi is all about. You don't have to write this stuff yourself. Plenty of Hi-Fi manufacturers have brochures available that are beamed at the layman. You can cut out portions of these booklets that you think do a good job, get permission to reproduce and distribute them under your store's imprint, adding a short sales message at the end, if you wish.

If you aren't shy, you might tell lodge secretaries and officials of similar organizations that you would be willing to deliver a talk on Hi-Fi to their membership. By delivering several such lectures, you can build up quite a reputation as a Hi-Fi expert, and profit from the business that results.

All of the preceding presupposes that you have acquired a good fundamental background on Hi-Fi, and have really made yourself an expert.

One of the fundamental problems the technician-dealer entering this field faces is the problem of how to meet the competition of cut-rate houses that sell at or near wholesale to both technicians and laymen. Meeting the prices of these houses is, of course, out of the question for the small independent. What he *can* do however, is offer customers something the cut-rate house cannot readily duplicate, i.e., a sincere interest in the customer's problems; simple, intelligible, accurate answers to questions posed by the customer; honesty about merchandise offered for sale; and last, but certainly not least, good service, within or outside the guaranty period.

Many customers don't know enough to buy intelligently from the cut-rate houses; they need guidance, and will pay your price if you can give it to them. Hi-Fi customers are basically more interested in quality than in price. If you can lead them by the hand through the claims and counter-claims that are currently befuddling the field, and steer them to a really good instrument or custom installation, your selling job will be made much simpler.

It will pay you to educate customers or potential customers with respect to acceptable hum level, distortion, frequency response, etc. Demonstrations to small groups of potential customers, audibly illustrating these characteristics, should prove very effective.

There's room for the independent technician-dealer on the Hi-Fi bandwagon . . . but he must "know his stuff" . . . and he'll have to educate his customers. . . .

◀ Sample of Hi-Fi promotional literature referred to in *YOU Can Sell Hi-Fi.* Material of this sort can either be displayed in your shop window, or distributed to customers. Chart shown and associated text was prepared by TECHNICIAN'S staff.

Webster INTERCOMS

The RF and WC Com-ette intercom systems are designed for low-cost installation. The RF Com-ette series is designed to work on ac or dc and requires no interconnecting wires between units. The WC series is a wired system, also operates on 115-volt ac or dc, and includes 50 feet of interstation wire. Sound Sales Div., Webster Electric Co., 1900 Clark St., Racine, Wisc.—TECHNICIAN

Pentron TAPE RECORDER

Featured in model TV-4 are dual-speed, dual-track operation at 7½ and 3¾ in. speeds; editing key for deletion of material while playing back tape. Four jacks include mike input, radio input, output to speaker and output to amplifier. Response (7½ in.): 50-9500 cps. List price including mike, reel of tape and extra reel, $189.50. Pentron Corp., 777 S. Tripp Ave., Chicago 24, Ill.—TECHNICIAN

Duotone SPEAKER SYSTEMS

The complete line of Ticonal magnet speakers, in new cabinets designed for Hi-Fi performance, feature improved cone design in the speaker for extended flat response. Duotone, Keyport, N. J.—TECHNICIAN

Masco INTERCOMS

The Econofone has been introduced to provide economical multiple-station intercom operation. The master is designed to handle up to 5 remotes which can originate or receive calls. An easy modification changes the Econofone into an all-master system; up to 6 masters may then be used with up to 3 separate pairs of conversations or a conference of any group of stations. Remotes have talk-listen switch. Master has volume control with off-on switch, talk-listen switch, pilot light and 5 station-selector switches. Mark Simpson Mfg. Co., L. I. City, N.Y.—TECHNICIAN

Louisiana Technicians

New Orleans Association Proposes Licensing

By Charles R. Maduell, Jr.

The new bill is intended to help laymen who feel lost when it comes to choosing a technician.

A few days ago, while the author was at the parts counter of a local distributor, he was approached by a casual acquaintance with the statement, "Aren't you a member of the Radio and Electronic Technician's Association?" When I stated that I was a member, he said that we RETA people were a very foolish bunch. Here we were charging at the rate of $5.00 for a service call, plus the legal or suggested list price for tubes; he was getting only $3.00 for a service call, but making all the gravy.

Upon further conversation, it was learned that he sometimes charged as much as $6.00 for a type 5U4 tube. We learned that this "gyp artist" does not have any test equipment, and would not know how to use it if he did. When he finds that the television set needs more extensive repairs than the simple replacing of one or more tubes, he simply takes the set to a local distributor for that make, has it repaired there, and charges the customer twice the price the distributor charged him. And so, with no investment, no equipment, and no knowledge, he makes money on TV repairs. He considers me and the other members of the RETA poor business men and rather stupid, because with all our knowledge, all our expensive instruments, and our large investment, we get only the hard jobs, which anyone knows do not pay for themselves, while the back-yard "tube-changer" makes all the money on the simple, paying jobs.

The honest technician-dealer is severely handicapped in competing against the "gyp" serviceman. Louisiana technicians feel that the licensing measure they are proposing will untie their hands.

Other Cases

On checking with the other members of RETA, I found they all had similar stories to tell. The records of the Better Business Bureau of New Orleans was full of the doings of the "gyps." Here are two picked from the lot:

A former customer (says the technician-dealer who is telling the story) called us on the phone to request service on her TV set. Our price of $5.00 for a service call was too high, according to her. She could get the job done for $3, she said. However, it was a Saturday, and the $3.00 man had gone fishing. She would gladly pay the extra $2 if we would come right out to repair her set.

Our serviceman returned from the customer's house with the story that all the set needed was a fuse and a 6AU5 tube. He charged her $0.30 for the fuse, $3.20 for the tube, and $5.00 for the service call, a total of $8.50.

The statement was made to him, "Gee, that tube has certainly dropped in price, hasn't it?" Our serviceman replied that tubes had gone *up*, not down. At this point, the customer brought out a ticket (the kind used to make out cash bills in small drug and grocery stores, with no name on the top); the bill showed that she had paid $7.80 for the same tube the last time it had gone bad, plus $3.00 for the service call. She thought she was getting by cheaply. The sharp tactics here are obvious to any serviceman—the profit on the "$3.00 call" is obtained by the simple expedient of overcharging on parts, or replacing unneeded parts.

Another case that comes from the files of RETA members: A set came to the XYZ shop for repairs, and it

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Charles R. Maduell, Jr. is a college graduate with a degree in physics who has been doing service work on radio, television, electro-medical and industrial electronic equipment since 1940. Maduell is one of the authors of the bill described in his article. He is also a member of the Board of Directors of the Radio and Electronic Technicians Association of New Orleans (RETA).

Fight "Gyp" Competitors

to Eliminate Some of the Evils in the Trade

was determined that it had a defective horizontal output transformer. When so informed, the customer stated that he believed this unit was replaced during a former repair job, but that he would check to make sure. About two days later, the bill for this former job was shown to the author. It read as follows:

Two condensers, at $0.50 each	$1.00
Replaced horizontal circuit	$9.50
Replaced vertical circuit	$9.50
Labor	$9.50
Total	$29.50

What is wrong with this bill is rather obvious.

We have seen several others of a similar nature. One bill listed "replacement of the modulated rectifier" (whatever that is), "repaired chassis front" (body and fender work?) "put picture back in picture tube," etc.

Legitimate Operators

In New Orleans there are approximately 250 television service shops operating legitimately. By the term "operating legitimately" is meant that there is a store facing on a street or alley, along with the presence of a small stock of parts, some test equipment, and the proper state and city Sales Tax registrations and licenses (business licenses, not technical ones). On a rough estimate, there are over 500 others who are in the "television repair business," operating from their "back-yard." This number includes those who are in legitimate jobs during the day, and become servicemen at night; some of these men are in the trade.

The situation is by no means found only in television. In the electro-medical field, for example, we ran into several instances where a crystal-controlled diathermy had the wrong crystal in it; or non-FCC-approved diathermy units were still being used, units which the salesmen had sold on the basis that the "FCC will not do anything unless they find out you have it."

About two years ago the Radio and Electronic Technician's Association was re-organized to combat these unethical practices. As an organization going about the matter without legal assistance, we met with one failure after another. Finally, the subject of licensing was brought up, and we had several meetings to see if we could develop a workable law. The plan was to find a law that would not "play politics" in the sense that a group of lawyers, or politicans who knew nothing of the technical side of the thing, would be the administrators of the law.

The Legislature of the State of Louisiana has been considering a Registration Law for Electronic Technicians that RETA formulated. While the law was designed with a number of purposes in mind, it was chiefly intended to improve customer-technician relations, and to lift the technician from the status of a "laborer" to that of a professional.

The licensing bill proposed by RETA was recently voted down 43 to 26 in the Louisiana House of Reps. RETA will not, however, let its proposal die. Re-introduction of the bill (after modification) is planned when the State Legislature meets again. RETA may alternatively try to get the bill passed as a New Orleans city law.

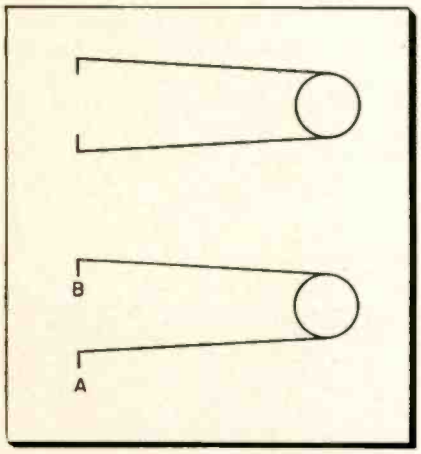
Will licensing solve some of the serviceman's problems? Louisiana technicians feel it will, if the technicians themselves, rather than politicians and bureaucrats, administer the bill.

Auto Radio Service Notes

Suggestions from Readers on Antenna Installation and Repairs, Interference and Static Elimination

Handy Tool for Trim Nuts

Many of the trim nuts on auto radio antennas have only two drilled holes providing for tightening. The use of pliers for this job invariably results in marring of the car's finish. To avoid such unpleasantness, we make up two instantly adjustable



wrenches from large steel safety pins, like those used by laundrymen. These tools will accommodate the trim nuts in general use.

Cut off both prongs of the snap end even with the catch. File them down enough to fit the holes in the nuts, and bend them as shown. By poking points *A* and *B* down into the two holes in the trim nut, then swinging the tool like an open end or spanner wrench, keeping the handle elevated, the surface finish surrounding the nut will not be scratched.—*Harry J. Miller, Sarasota, Fla.*

Auto Radio Power Supply

Repairing auto radios was a problem for me, until I licked it. I had no 6 v dc power supply and did not intend to purchase one, since I do not repair many auto radios. What I do now is remove the vibrator and rectifier tube from the auto radio being serviced. Then I feed 6.3 v ac to the input of the set, and apply a B+ voltage to the rectifier output. The two sets of voltages are obtained from a variable voltage supply I have built for experimental purposes (but they might as readily come from other sources available in the technician's shop).

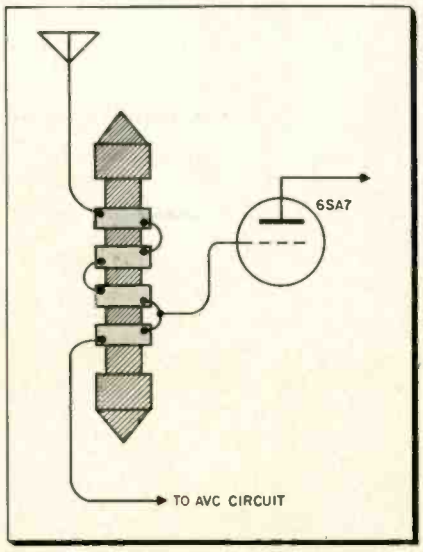
When the trouble lies in the power supply (as indicated by normal operation of the set when hooked up as just described), resistance checks will generally locate the defect.—*Richard D. Peressini, Fairview, N.J.*

(*A pm speaker will have to be substituted, if the set uses an em type.—Ed.*)

Substitute Antenna Coil

On numerous occasions, a bad antenna coil is discovered in an auto radio. The motorist wants the set fixed in a hurry. An exact replacement may not be on hand, nor easily available. On such occasions, I have found the conventional radio-frequency choke coil a highly efficient and satisfactory "universal" substitute.

To cite an example: a Chevrolet auto radio, model 985538, was found to have a defective antenna coil. A 2.5 mh radio-frequency choke with 4 pies on it was connected in its place, as shown in the sketch below.



The grid of the 6SA7 tube was connected between the first and second "pie," (counting from bottom). The lead at the top end of the uppermost "pie" went to the antenna. The remaining (bottom) lead was connected to the AVC circuit, as shown. After completion of the repair, the set was given a thorough test. It performed perfectly.

The rfc coil illustrated permits a measure of adjustment on the individual receiver, since the number of pies placed in the circuit may be varied. The unit thus becomes a good "universal" type antenna coil to keep on hand.—*Joseph Amorose, Richmond, Va.*

Simpler Antenna Installation

A short cut to the installation of radio antennas on 1952 and 1953 Ford cars (as well as Plymouths) may be described as follows: After drilling the hole for the erection of the aerial, lift the hood and poke the aerial down into the space between the V-shaped metal splash pan and the fender. Poke the aerial up through the hole, then drop the rubber grommet plastic cap, metal cap and holding nut down over the aerial. Now the aerial can be held with one hand, while a wrench is used to tighten the hold-down nut that locks the assembly.

Some technicians drill the hole, insert the aerial from the top, then spend a lot of time poking around the innards and splash pan under the hood, to get the locking assembly over the bottom of the aerial. They are thus forced many times to remove the splash pan, whereas my method avoids this time-wasting procedure.—*Harvey Muller, Danboro, Pa.*

Obscure Static Source

An elusive noise on a car radio was finally traced to static electricity in the car. Seems like the rear end collects the static charge because it is insulated, save through the universal joints, which do not make a good ground; static generated in this area is picked up by the antenna. The trouble was eliminated with the aid of a 20-inch web-type battery ground strap. The terminal end of the strap was attached to the front "U"-bolt of the left rear spring; the surface of the frame above the bolt was well cleaned, and the other end of the strap fastened in place with a sheet metal screw.—*Stanley Clark Service, East Bradenton, Fla.*

We Shut Our Order Book!

In spite of frequent increases in plant capacity, we have often had to refuse orders from set manufacturers for Mallory FP Capacitors. If we hadn't, we would not have had enough to meet demands from servicemen all over the country. That's . . .

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Shut your door—
on complaints and loss of time and money that call-backs cause you. Always use Mallory Capacitors on your service jobs.

The Mallory FP Capacitor Line is complete. There is a rating for every set. Mallory FP's are the only Fabricated Plate Capacitors on the replacement market. And they cost no more than ordinary capacitors.

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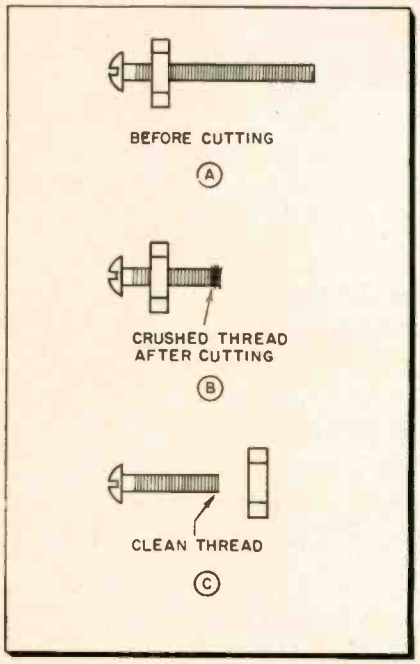
Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

Tip on Cutting Screws

When a hacksaw is used to reduce the length of a screw to the size desired for a particular job, the starting thread left after cutting is frequently so badly jammed that a nut cannot be threaded on. To pre-



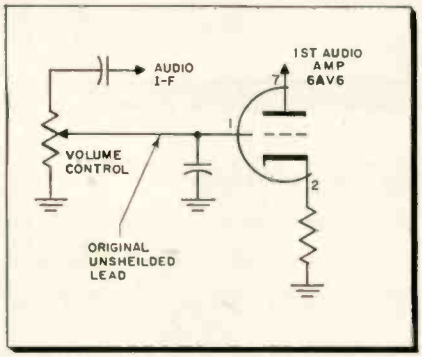
vent this, thread a nut of the right size on the screw *before* cutting, as shown in *A*. After cutting, when the starting thread has been crushed by the hacksaw blade (see *B*), the nut is simply threaded off the screw. In coming off, the nut will clean the thread, as shown in *C*.—*M. G. Goldberg, St. Paul, Minn.*

Battery Care For Self-Charging Portables

On G.E. self-charging portables, I have had complaints to the effect that the battery becomes prematurely discharged, and possibly ruined. I have found that customers have a habit of pulling the plug out to shut off the set, instead of first turning the switch to the "off" position. When the receiver is left "on" or in the "charge" position while it is not plugged in, the relatively small leakage current through the set's dry-disc rectifiers tends to discharge the battery. Turning the switch to the "off" position when the receiver is not in use will prevent this.—*S. Sandler, Providence, R. I.*

Buzz Elimination

We had a complaint of excessive buzz on an Admiral 19F1 chassis. Examination showed the buzz to be present on off-channel settings of the tuner, as well as when a signal was being received. The buzz, which was not sync clatter, became more marked with maximum settings of the volume control. Don't waste your



time checking the sync or other circuits; the trouble is in the audio. The trouble spot is an unshielded lead going from the tap on the volume control to the grid (pin 1) of the 1st audio amplifier, 6AV6. We replaced this lead with a length of coaxial cable, which was grounded at both ends of the shield; however, ordinary shielded audio wire can be used.—*Paul Leichter, Philadelphia, Penna.*

Horizontal Jitter

Sparton Chassis 27D213: A jelly-like jitter of the picture in a sidewise direction was evident on strong audio signals, following the replacement of condenser C-73 in the audio output stage. This symptom was particularly evident when the volume control was turned up. The two sections of C-73 are respectively the screen and cathode bypass condensers for the 6V6 sound output tube, V-15. The trouble arose because the ground terminal for this tube was too near the 6AL5 horizontal phase detector, V-25. Apparently the ground currents of the audio tube mingled with the ground currents of the phase detector.

A heavy piece of shielding braid was connected to each of the grounding lugs and returned to the chassis near the cathode resistor ground of V-15, the sound output tube. This extra grounding minimized the audio ground loop and eliminated the symptom.—*James A. McRoberts, Brooklyn, N. Y.*

SHOP HINTS WANTED

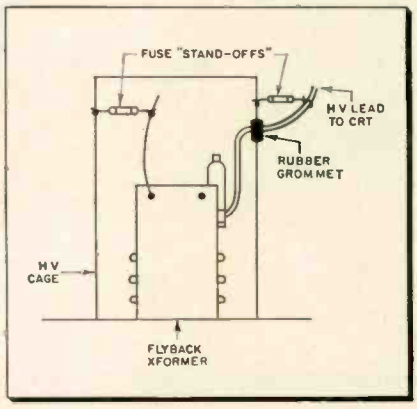
TECHNICIAN will pay $5 for acceptable shop hints. We are particularly interested in hints that tell how a technician located a hard-to-find trouble in a TV set, radio, record-changer or similar unit; or how he traced a conventional defect to its source more rapidly than usual by using a short-cut. Unacceptable items will be returned to the contributor. Send your ideas to "Shop Hints Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., New York 17, New York."

Screwdriver Improvement

Considerable burring of all types of Phillips-head screws often results from slippage of the Phillips-head screwdrivers. The slippage may be decreased considerably by filing down the tips of the no. 1 and no. 2 screwdrivers about 1/32 in. This measure will insure better traction in the screw heads.—*A. Ringel, Culver City, California.*

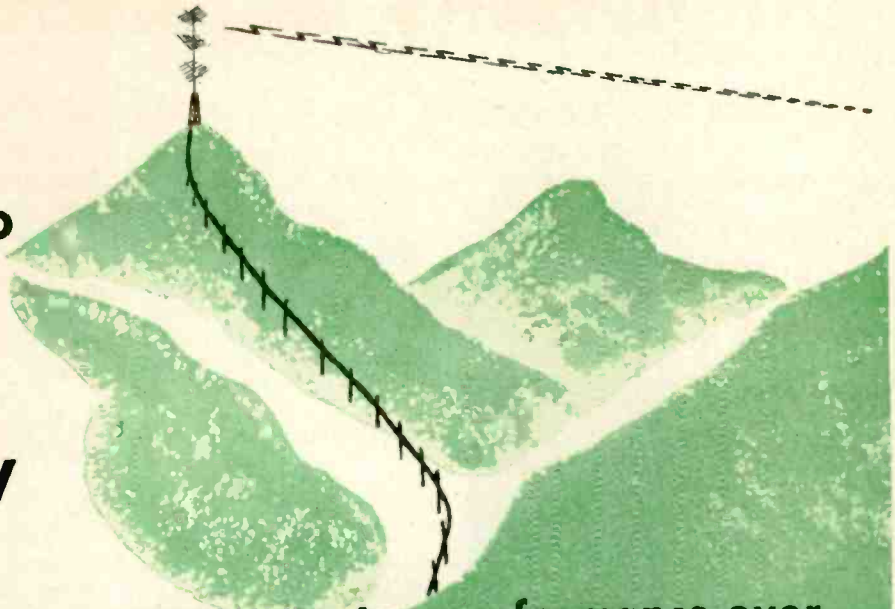
Unique HV Standoff

Don't throw those burned-out pigtail fuses away! When trying to dress leads inside high voltage cages, and in similar applications when it is desired to keep leads fixed in desired positions, the burned-out pigtail



fuses can be used as anchors. Since the fuse is blown, the glass envelope provides effective high voltage insulation. As with cellulose tape, the applications for these fuse "stand-offs" are only limited by the technician's ingenuity. The pigtails are used for tying purposes. Some possibilities are illustrated. *B. O. Riis, Little River, Miami, Fla.*

CONQUERORS of CANYONS!



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Engineered to give your customers top performance over the longest link . . . with fewer amplifiers needed!

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Federal's K-14—the primary lead-in famous for lowest line loss, long cable runs and fewer amplifiers—and Federal's RG-11/U and RG-59/U are the coaxials you can specify with utmost confidence . . . for Community TV Distribution Systems in any area . . . for any amplifier system.

When profit-eating signal leakage occurs the answer is Federal's K-125 and K-126 (non-radiating alternates for RG-11/U and RG-59/U).

All five are made to Federal's high standards of quality—and that means dependable, all-weather transmission . . . anywhere!

ORDER SWEEP TESTING—BE *DOUBLY* SURE!

Upon request, Federal will sweep test K-14, RG-11/U and K-125 . . . check attenuation from 50 mc up to 220 mc . . . for VHF channels 2 to 13. A notarized statement certifies that the test has been made . . . that attenuation does not vary over .5 db from the nominal values throughout the spectrum. There is a small additional charge for this valuable service.

Be *doubly* sure you're getting today's finest lead-ins for Community TV . . . specify Federal's "Big 5" . . . backed by sweep testing!

Principal Characteristics of Federal's "Big 5" of Community TV

TYPE	ZO Impedance Ohms	Capacitance per ft. micro-micro farads	DB per 100 Feet 50Mc	100Mc	200Mc	400Mc	Jacket OD Mils	Weight per 1000 Ft. (lbs.)
K-14	71	21	.57	.90	1.42	2.3	885	392
RG-11/U	75	20	1.5	2.15	3.2	4.7	415	89
RG-59/U	73	22	2.7	4.0	5.7	8.5	250	36
K-125 (5P-75)	75	20	1.5	2.15	3.2	4.7	470	127
K-126 (5P-76)	73	22	2.7	4.0	5.7	8.5	325	79

America's leading producer of solid dielectric cables

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Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

COMPONENTS DIVISION 100 KINGSLAND ROAD CLIFTON, N. J.

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.

Export Distributors: International Standard Electric Corp., 67 Broad St., N. Y.

WRITE DEPT. D-254 for complete data on Federal's "Big 5" of Community TV and Certified Sweep Testing

COLOR SHORTS

NEW DEFLECTION YOKE FOR 19-IN. TUBES provides improved convergence characteristics according to the manufacturer, General Instrument Corp. The product of research in an optical laboratory especially set up for such design, the yoke is suitable for use with the three current types of 3-gun tubes;

the planar mask type, the monoconvergence shadow-mask type, and the type in which the color phosphors are applied directly to the curved face. The complete yoke with plastic case removed is being held by Edgar Messing, General Instrument exec.

21-IN. SETS FOR ABOUT $500 IN '55: That's the prediction of Barney Balaban, prexy of Paramount Pictures. Paramount is 50-percent owner of Chromatic TV Labs, developers of the single-gun Lawrence color crt (Chromatron). The prediction is based on the use of the Chromatron . . . Chromatic has issued a full data-specification sheet on development type PDF 21-3, the rectangular glass-shell version of their single-gun tube. Diagonal of the viewing area is about 18 in.

INTEREST AMONG TECHNICIANS in color TV remains high in Kansas, Missouri and Southern Illinois, reports the Hoffman Sales Corp. of Missouri, as evidenced by the success of the six color schools in this area now being conducted by this outfit. As an example, David Doss, Hoffman gen. mgr., points to an attendance of 300 during the first week of the St. Louis training program, which corresponded with the opening of the vacation season. Second-week attendance was 400. Program will run for 10 weeks, each class is for a 3-hour period.

ANDREA'S 19-IN. COLOR SET will be ready for sale this fall, according to F. A. D. Andrea, the firm's prexy. Production on the 15-in. set, announced in April *Color Shorts*, has been dropped. "Developments in the television field," says Andrea, "have confirmed my early convictions to the effect that a small screen would not sell and is not a practical investment . . . I sincerely believe that this larger picture is the ideal size to start with."

CLOSED-CIRCUIT TV SYSTEMS for educational and industrial applications can now operate in full color. As a result of a recent patent license agreement with CBS, GE is now making such equipment. The color system used is not similar to the present commercial one approved by the FCC. Instead it is based on the old field-sequential system formerly given FCC approval. GE says this technique was chosen after comparative field tests because it provides superior color reproduction, makes possible better image detail and offers the user lower initial-equipment and operating costs . . . GE has also shipped complete color slide origination equipment to KING-TV, Channel 5, Seattle, Wash., will also ship color film origination equipment. KING-TV will begin regular color programming by early fall.

DU MONT NETWORK begins color telecasts this fall. Programs will originate from WABD, Channel 5, Du Mont's New York outlet. Dr. Du Mont feels that development of economical large-screen color pix tubes is breaking the log-jam in color TV. Receivers under this brand name, using the 19-in. Chroma-Sync Teletron, are expected to be available this fall.

TESTING REQUIREMENTS and test procedures for color-TV took up all of the June issue of the *Technician's Timesaver*, monthly test-equipment publication of Simpson Electric Co. Typical response curves and test set-ups are illustrated for color sets. Use of the Chromatic Probe and Chromatic Amplifier in adapting existing test instruments for color service is also illustrated.

CBS VERSION OF THE 3-GUN TUBE, designated 15HP22, is the subject of a 4-page data and application folder released by that manufacturer. As we go to press, CBS also announces a 19-in. version of their 3-gun design. This larger crt is being designated Colortron 205.

MOTOROLA MOBILE LAB is touring the country to check color TV performance and reception conditions under a wide variety of local conditions. These "on-location" checks are being conducted, says the manufacturer, because it is impossible to simulate interference,

snow and fringe problems, together with their effects on color reception, in the fixed-installation engineering department. The mobile lab truck, in addition to $20,000 worth of elaborate testing gear, carries a full staff of engineers and technicians.

BIGGER PIX, LOWER PRICE: More news from Motorola comes in the form of an announcement of 3 color receivers, all using the CBS 19-in. color tube and each selling below $1000—or below previously announced prices for sets using 15-in. pix tubes. Basic price for one of these sets is $895.

Paul L. Galvin, Motorola prexy, in making the announcement also predicted his company would sell 25,000 of these color sets this fall. However, he still expects his monochrome receivers to outsell the new color models by a ratio of about 25 to 1.

Decision to market color now, after a wait-and-see period, was prompted by availability of larger crt, increase in color TV programming, and ability to market at a reasonable price.

after you leave . . .

ASTRON capacitors build your reputation

Consumer satisfaction means repeat business. That's why smart servicemen install ASTRON BLUE POINT® capacitors and SAFETY MARGIN* electrolytics.

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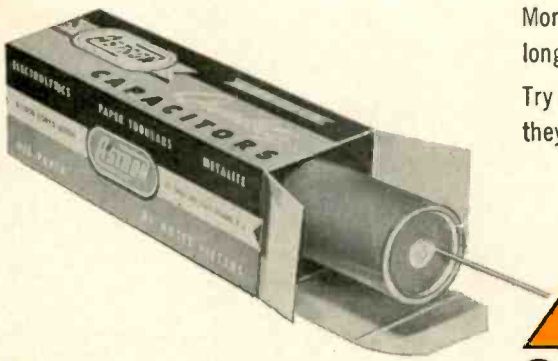
More and more manufacturers are using them because of their surprisingly long life and utmost dependability!

Try something new . . . start installing ASTRON CAPACITORS today . . . they work for you long after you leave the call.

*TRADEMARK



ASTRON CORPORATION

255 GRANT AVENUE, E. NEWARK, N. J.

Export Division: Rocke International Corp. 13 E. 40 St., New York, N. Y
In Canada: Charles W. Pointon 6 Alcina Ave., Toronto 10, Ontario

SERVICE ASSOCIATION REPORTS

LIETA Code of Ethics

New members of the Long Island Electronic Technicians Association, 88 Fourth Street, Oceanside, N.Y., subscribe to the group's Code of Ethics when they sign their applications. Some points covered in the code: employment of qualified personnel, with no students working as master technicians; avoidance of trick advertising; 90-day guarantee on repairs to customers, including *itemized* bill; use of replacement parts of suitable quality.

LIETA News, published monthly, now includes a page for the ladies. Contributions are by members of the Ladies' Auxiliary, made up of wives and daughters of regular members.

RTTG Uses TECH'N Piece

The Radio & Television Technician's Guild, 315 North 24th Street, Gadsden, Alabama, has been granted permission to reproduce TECHNICIAN's March editorial, *So Much for So Little*, as an ad in the local paper, *The Gadsden Times*. The organization feels such use of the editorial will help the local serviceman. The request came from Guy Brooks, RTTG Secy. President of the Guild is F. F. Hall.

NATESA Organizing Guide

Having trouble getting a service association rolling in your area? National Alliance of Television & Electronic Service Associations, 5908 S. Troy St., Chicago 29, Ill., will send you a copy of its booklet, *Here's How*, which lists a dozen steps to establishing a local association. A sample constitution and examples of promotional material and other forms actually used by some groups are included. The booklet stresses the need for local organizations, as well as nation-wide affiliation and representation in this nation-wide industry. NATESA, however, does not accept membership from individual technicians, as such, but only from operators of service businesses, whether they are one-man set-ups or larger.

Membership in NATESA, by a local group, is $25 per year. Associate membership for individual service companies operating in areas where a local association does not exist is permitted. Such individual membership has been reduced from $10 to $5 a year.

Welcome to ESA

The recently formed Electronic Service Association, 1763 E. Seven Mile Road, Detroit 3, Mich., is looking for members. The organization is open to "anyone engaged full time in the servicing of radio, television and electronic equipment," according to R. Aronson, Chairman of the Publicity Committee. Educational meetings and service clinics are being planned for the future. Prexy is Ralph L. Carew; corresponding secy. is T. T. Czarnecki.

TSDA Elections

Installed at the June dinner and meeting of the Television Service Dealers Association of Philadelphia, 6021 Ogontz Ave., Philadelphia, Penna., were the new officers elected to serve for 1954-55. They were Charles Kneell (president), Edward Strychowski (vice president), Harrison Neel (treasurer) and Martin Benoff (secretary).

TSDA has approved a bill to be proposed to the city council, for the purpose of controlling bait advertising. Drafted by the association's legal counsellors, the proposed ordinance would put the squeeze on phoney ads by unethical service operators.

RTSA Subscribes

The Radio & TV Service Association, 9302 Dartmouth Avenue, Tampa 4, Florida, has sent in a group of subscriptions to TECHNICIAN. The accompanying letter says, in part: "The object of our organization is to better acquaint the general public with TV and to inform all servicemen in this area with up-to-date service information. We feel assured that a subscription to TECHNICIAN is one of the better ways of acquainting our servicemen with the latest, up-to-date information." The letter is signed by Ray Murphy, secy.

Other RTSA officers are L. W. Van Slyck, pres.; Benny Diaz, vice pres.; and Charles Stump, treas. Meetings are held the 2nd and 4th Tuesday evenings of each month.

TSE Doings

According to *The Supreme Effort*, organ of Television Service Engineers, 307 Shukert Building, Kansas City, Mo., chronic absenteeism from meetings will be a cause for suspension of membership. This ruling was incorporated in the new by-laws. Such rules, which have been adopted by other associations, seem to be part of a trend to establish healthy active groups rather than paper organizations . . . TSE will run free want ads in its paper for qualified technicians who are seeking employment.

An item in *The Supreme Effort* lauds "Sol Heller, managing editor of Caldwell-Clements great magazine, TECHNICIAN," for the work "he and his staff are doing to better the position and lighten the load of the service man and shop owner . . . (TECHNICIAN) really fills the bill. For instance there is in the June copy several suggestions as to how to combat the summer slump . . . not hairbrain schemes or get-rich-quick ideas, but solid business-builders."

The business-builder material was prepared by J. L. Stoutenburgh, consulting editor.

RTGLI Ad Policy

The Guild, monthly organ of the Radio Television Guild of Long Island, Box 87, Bethpage, N.Y., accepts ads only from those wholesalers and jobbers who observe a code of fair practices that excludes cut-price sales direct to the public. One-third of a page in the June issue was left blank except for this brief notice inserted in the larger area of white paper: "But for his over-the-counter sales, this space could have been occupied by another distributor."

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 Association: .....

Address .....

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

Phone: .....

Your Name: .....

Your Address: .....

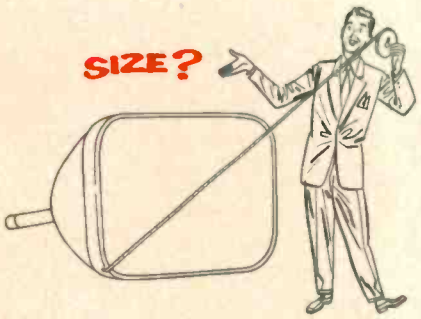
Mail to: Associations Editor, TECHNICIAN, 480 Lexington Avenue, N.Y.C. 17, N.Y.

SYLVANIA

Aluminized Picture Tubes

ARE PACKED WITH PROFITS!

Make old sets like new... have more satisfied customers!

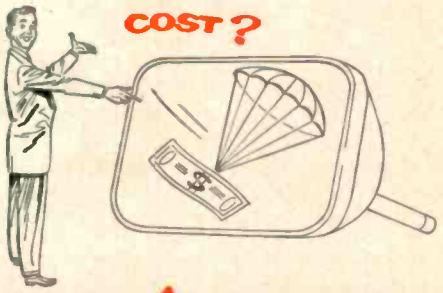


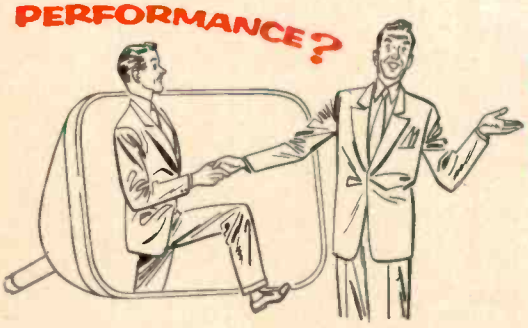
Interested in new sales records? You'll be heading in that direction when you replace old picture tubes with new Sylvania Aluminized Tubes.

Sylvania Aluminized Picture Tubes give terrific performance. They make old sets better and brighter than new by providing whiter whites—blacker blacks . . . a 6-times better picture contrast.

Sylvania Aluminized Picture Tubes are now available in most sizes for all popular TV sets. In other words, with Sylvania Aluminized Picture Tubes, you give your customers the best possible buy *and* the best possible service, including a full one-year warranty.

Remember, millions of set owners see and hear about Sylvania Picture Tubes on the nation-wide weekly television show "Beat The Clock." They know that they are famous for quality and dependability. For full details about aluminized tube replacement, write for Sylvania's "Aluminized Picture Tube Replacement Guide." Address: Dept. 4R-4208, Sylvania NOW!





SYLVANIA

Sylvania Electric Products Inc. 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

Test Equipment "Spec" Chart

Data on Scopes, VTVM's Generators & Tube Checkers

(Specifications on other types of test equipment will appear in forthcoming issues.)

OSCILLOSCOPES

MANUFACTURER	MODEL	FREQUENCY RESPONSE, VERT. AMPLIFIER	FREQUENCY RESPONSE, HORIZ. AMPLIFIER	DEFLECTION SENSITIVITY, VERT. AMP.	DEFLECTION SENSITIVITY, HOR. AMP.	SWEEP FREQUENCIES	INPUT IMPEDANCE, VERT. AMP.	INPUT IMPEDANCE, HORIZ. AMP.	CRT DIAMETER	PRICE
ALLEN B. DU MONT LABORATORIES, INC., 760 BLOOMFIELD AVE., CLIFTON, N.J.	274-A	UNIFORM WITHIN 10% FROM 20 CPS TO 50,000 CPS; DOWN NOT MORE THAN 50% AT 200 KC	UNIFORM WITHIN 10% FROM 20 CPS TO 50,000 CPS	.7 V/IN., PEAK-TO-PEAK. **(DIRECT:** 45 V PEAK-TO-PEAK PER IN., ± 18%)	.7 PEAK-TO-PEAK V/IN. **(DIRECT:** 51 P.P. V/IN., ±18%)	8 CPS TO 30,000 CPS	1 MEG, 40 MMFD. **(DIRECT:** 4.7 MEG, 50 MMFD	1 MEG PARALLELED BY 40 MMFD. **(DIRECT:** 4.7 MEG PARALLELED BY 50 MMFD.)	5 IN.	$150.00
	292 *	UNIFORM WITHIN 30% FROM 5 TO 100,000 CPS		.4 RMS V/IN. **(DIRECT:** 20 RMS V/IN.)	.56 RMS V/IN. **(DIRECT:** 31 RMS V/IN., ±15%	8 CPS TO 30,000 CPS	1 MEG, 70 MMFD **(DIRECT:** 4.7 MEG, 25 MMFD)	1 MEG PARALLELED BY 70 MMFD. **(DIRECT:** 4.7 MEG PARALLELED BY 25 MMFD)	3 IN.	$130.00
ELECTRONIC INSTRUMENT CO., INC., 84 WITHERS STREET, BROOKLYN 11, N.Y.	470-K	FLAT ± 2 DB, 10 CPS TO 1 MC	FLAT, ± 0 DB, 10 CPS TO 200 KC; −4 DB AT 500 KC	10 RMS MV/IN.	.3 RMS V/IN.	15 CPS TO 100,000 CPS	3 MEG SHUNTED BY 35 MMFD	1 MEG SHUNTED BY 40 MMFD	7 IN.	IN KIT FORM, $ 79.95; WIRED, $129.50
	425	5 CPS TO 500 KC, USABLE TO 2.5 MC	5 CPS TO 500 KC	.05 TO .1 RMS V/IN.	.05 TO .15 RMS V/IN.	15 CPS TO 75 KC	1 MEG	1 MEG	5 IN.	IN KIT FORM, $ 44.95; WIRED, $ 79.95
ELECTRONIC MEASUREMENTS CORP., 280 LAFAYETTE STREET, N. Y. 12, N.Y.	600	USEFUL TO 5 MC	USEFUL TO 1 MC	.02 RMS V/IN.	3 RMS V/IN.	15 CPS TO MORE THAN 75 KC	1 MEG, 35 MMFD ON 600 V POSITION	5 MEG, 40 MMFD	5 IN.	$ 99.50
FEILER ENGINEERING & MFG. CO., 8026 N. MONTICELLO AVE., SOKKIE, ILLINOIS	TS-7	USEFUL RESPONSE, 20 CPS TO .75 MC, UNIFORM WITHIN 20% TO 100 KC		.5 RMS V/IN. **(DIRECT:** 18 RMS V/IN.)	.5 V RMS/IN. **(DIRECT:** 18 V RMS/IN.	10 CPS TO 32,000 CPS	1 MEG, 50 MMFD **(DIRECT:** 5 MEG, 60 MMFD)	1 MEG, 50 MMFD **(DIRECT:** 5 MEG, 50 MMFD)	5 IN.	IN KIT FORM, $ 49.50; WIRED, $ 98.50
GENERAL ELECTRIC, ELECTRONICS DIVISION, SYRACUSE, N.Y.	ST-2A *	**PROBE AND AC:** + 0, − 20% FROM 20 CPS TO 500 KC. + 0, − 50% FROM 20 CPS TO 1 MC. **DC:** + 0, − 20% FROM 0 TO 500 KC	0 TO 100 KC AT FULL GAIN SETTING; − 20% FROM 20 CPS TO 100 KC AT ANY GAIN SETTING	**AC INPUT:** .015 RMS V/IN. **DC INPUT:** 2 RMS V/IN. **PROBE:** .2 RMS V/IN.	.4 RMS V/IN.	10 CPS TO 100 KC	**AC INPUT:** 1 MEG, 36 MMFD. **DC INPUT:** 1 MEG, 80 MMFD AT MAX. GAIN SETTING. **PROBE:** 1 MEG, 10 MMFD.	10 MEG, 35 MMFD	5 IN.	$327.50
HEATH COMPANY, BENTON HARBOR, MICH.	0–9	± 2 DB, 10 CPS TO 2 MC; ± 6 DB, 5 CPS TO 3 MC	± 6 DB, 10 CPS TO 500 KC	.025 V/IN. AT 1 KC	.6 V/IN./AT 1 KC	10 CPS TO 50,000 CPS	47 MMFD SHUNTING 2 MEG AT X1 POSITION. 35 MMFD SHUNTING 2 MEG, AT X10-100 POS.	25 MMFD SHUNTING 1 MEG	5 IN.	$ 59.50
HICKOK ELECTRICAL INSTRUMENT CO., 10514 DUPONT AVE. CLEVELAND 8, OHIO	665	.5 CPS TO 700 KC, WITHIN 3 DB		.02 RMS V/IN.	.03 RMS V/IN.	18 CS TO 50 KC	15 MMFD, 2.2 MEG.	52 MMFD, .1 MEG	5 IN.	$129.50
	670 *	DC TO 600 KC, WITHIN 3 DB. USEFUL BEYOND 5 MC	0—250 KC	.015 RMS V/IN. **(DIRECT:** 12 RMS V/IN.)	.07 RMS V/IN. **(DIRECT:** 13 RMS V/IN.)	3 CPS TO 50 KC	2.2 MEG, 30 MMFD. **(DIRECT:** 3.3 MEG)	1 MEG, 35 MMFD. **(DIRECT:** 3.3 MEG)	5 IN.	$244.00
HYCON MFG. CO., 2961 EAST COLORADO ST., PASADENA 8, CALIF.	613	**NARROW-BAND:** 20 CPS TO 500 KC; **WIDE-BAND:** FLAT WITHIN 2 DB FROM 20 CPS TO 4 MC		**NARROW-BAND:** .01V P.P PER INCH; **WIDE-BAND:** 0.1 V P.P. PER INCH		15 CPS TO 100 KC			3 IN.	$260.00
JACKSON ELECTRICAL INSTRUMENT CO., DAYTON 2, OHIO	CRO-2	FLAT WITHIN 1 DB FROM 20 CPS THROUGH 4.5 MC		AT 20 CPS TO 4.5 MC SETTING, SENSITIVITY RANGES ARE .15, 1.5, 15 RMS V/IN.	.4 RMS V/IN.	20 CPS THROUGH 50 KC	1.5 MEG SHUNTED BY 20 MMFD. **(DIRECT:** 6 MEG SHUNTED BY 1.1 MMFD)	1.1 MEG	5 IN.	$225.00
PHILCO CORP., ACCESSORY DIVISION, PHILADELPHIA, PA	S8202	10 CPS TO 1 MC WITHIN 6 DB	10 CPS TO 300 KC	.01 RMS V/IN.	.3 RMS V/IN.	TO 100 KC			5 IN.	$159.95
	S8200 *	0—750 KC WITHIN 2 DB; 0—1 MC, WITHIN 6 DB	20 CPS TO 80 KC WITHIN 2 DB; 10 CPS TO 125 KC WITHIN 6 DB	**WITH DIRECT CABLE:** .05 V RMS/IN. **WITH LOW-CAP. PROBE:** .5 RMS V/IN.	.5 RMS V/IN.	15 CPS TO 30,000 CPS	**WITHOUT CABLES:** 1 MEG SHUNTED BY 25 MMFD. **WITH LOW-CAP. PROBE:** 1 MEG SHUNTED BY 10 MMFD	.5 MEG SHUNTED BY 35 MMFD	3 IN.	$149.50

PRECISE DEVELOPMENT CORP., OCEANSIDE, N.Y.	308 *	DC TO 5 MC, WITHIN 1½ DB		10 MV/IN., ± 6 DB		1 CPS TO 80,000 CPS			8½ IN.	IN KIT FORM, $129.50, WIRED, $229.50
PRECISION APPARATUS CO., INC., 92-27 HORACE HARDING BLVD., ELMHURST, N.Y.	ES-500A	10 CPS TO 1 MC	10 CPS TO 1 MC AT FULL GAIN	.02 V/IN.	.15 V/IN.	10 CPS TO 30 KC	22 MMFD INPUT CAPACITANCE; 2 MEG, INPUT RESISTANCE	APP. 20 MMFD INPUT CAPACITANCE; ½ MEG, INPUT RESISTANCE	5 IN.	$173.70
RADIO CITY PRODUCTS CO., CENTER & GLENDALE STREETS, EASTON, PA.	533M (MIDGET SCOPE)	FLAT TO 2 DB FROM 20 TO 150,000 CPS		.02 V/IN.	.6 V/IN.	5 CPS TO 50,000 CPS	.5 MEG SHUNTED BY 50 MMFD	.5 MEG SHUNTED BY 70 MMFD	3 IN.	$ 99.50
RADIO CORP. OF AMERICA, HARRISON, N.J.	WO-88A	0 TO 100 KC, FLAT; AT 500 KC, WITHIN—3DB; AT 1 MC, WITHIN—10 DB	AT 10 CPS, WITHIN —1 DB; AT 200 KC, WITHIN—6 DB	**WITH WG-218 DIRECT PROBE & CABLE:** .025 RMS V/IN. **WITH WG-216B LOW-CAP. PROBE:** .25 RMS V/IN.	.6 RMS V/IN.	15 CPS TO 30 KC	**WITH WG-218 DIRECT PROBE AND CABLE:** 1 MEG SHUNTED BY 75 MMFD. **WITH WG-216B LOW-CAP. PROBE:** 10 MEG SHUNTED BY 9.5 MMFD.	2.2 MEG SHUNTED BY 55 MMFD	5 IN.	$149.50
	WO-56A *	FLAT FROM 0 TO 500 KC WITHIN—2 DB; FLAT FROM 0 TO 1 MC WITHIN—6 DB		**WITH DIRECT PROBE AND CABLE WG-218:** 10.6 RMS MV/IN. **LOW-CAP. PROBE WG-216B:** 106 RMS MV/IN.	21.2 RMS MV/IN.	3 CPS TO 30,000 CPS	**WITH DIRECT PROBE AND CABLE WG-218:** 1 MEG SHUNTED BY 75 MMFD; **WITH LOW-CAP. PROBE WG-216B:** 10 MEG SHUNTED BY 35 MMFD.	1 MEG SHUNTED BY 35 MMFD	7 IN.	$274.50
SUPREME, INC., GREENWOOD, MISS.	655 *	20 CPS TO APP. 100 KC	20 CPS TO 75 KC	.3 RMS V/IN.	.3 RMS V/IN.	20 CPS—30,000 CPS			5 IN.	$126.50
	650		20 CPS TO 75 KC	.5 RMS V/IN.	.5 RMS V/IN.	20 CPS—30,000 CPS			3 IN.	$ 99.95
SYLVANIA ELECTRIC PRODUCTS, INC., 254 RANO STREET, BUFFALO, N.Y.	400	FLAT WITHIN 3 DB FROM 10 CPS TO 2 MC; USEFUL TO 4 MC	FLAT WITHIN 3 DB FROM 10 CPS TO 600 KC	.01 RMS V/IN. **(DIRECT:** 24 RMS V/IN.	.5 RMS V/IN. **(DIRECT:** 26 RMS V/IN.	15 CPS TO 50 KC	26 MMFD, 5 MEG. **(DIRECT:** 16 MMFD AND 4.7 MEG, EITHER PLATE TO GROUND)	31 MMFD, 5 MEG. **(DIRECT:** 16 MMFD, 4.7 MEG, EITHER PLATE TO GROUND)	7 IN.	$249.50
	132Z *	FLAT WITHIN 3 DB FROM 7 CPS TO 70 KC, USEFUL TO 250 KC	FLAT WITHIN 3 DB FROM 7 CPS TO 120 KC	34 MMFD, .5 MEG. **(DIRECT:** 16 MMFD, 3.9 MEG, EITHER PLATE TO GROUND)	.25 V/IN. P.P. **(DIRECT:** 18 RMS V/IN.	10 CPS TO 30 KC	34 MMFD, .5 MEG. **(DIRECT:** 3.9 MEG, 16 MMFD, EITHER PLATE TO GROUND)	34 MMFD, .5 MEG. **(DIRECT:** 3.9 MEG, 16 MMFD, EITHER PLATE TO GROUND)	7 IN.	$169.50
TRIPLETT ELECTRICAL INSTRUMENT CO., BLUFFTON, OHIO	3441	20 CPS TO 4 MC, FLAT TO 3 DB; RESPONSE USABLE BEYOND 9 MC	FLAT WITHIN 2 DB FROM 20 CPS TO 150 KC	.01 RMS V/IN. WITH SWITCH IN 2 MC POSITION; .02 RMS V/IN. WITH SWITCH IN 4 MC POSITION	.15 RMS V/IN.	10 CPS TO 60 KC	**WITH LOW-CAP. PROBE:** 2 MEG, 20 MMFD. **AT INPUT TERMINALS:** 2 MEG, 45 MMFD		5 IN.	$199.50 —
WATERMAN PRODUCTS CO., INC., 2445-63 EMERALD ST., PHILA. 25, PA.	S-14-B POCKET-SCOPE *	WITHIN — 2 DB FROM DC TO 700 KC	WITHIN—2 DB, FROM DC TO 200 KC	.05 RMS V/IN.	.15 RMS V/IN.	.5 CPS TO 50 KC	1 MEG, 25 MMFD. **DIRECT:** 10 MEG, 8 MMFD	1 MEG, 35 MMFD. **DIRECT:** 10 MEG, 10 MMFD	3 IN.	$219.00
WESTON ELECTRICAL INSTRUMENT CORP., 614 FRELINGHUYSEN AVE., NEWARK, N.J.	983	FLAT FROM 0—3.58 MC; WITHIN—3 DB FROM 3.58 TO 4 MC	1 MEG SHUNTED BY 35 MMFD	.017 RMS V/IN.	.017 RMS V/IN.	10 CPS TO 100,000 CPS	**WITH DIRECT PROBE AND CABLE:** 1 MEG SHUNTED BY 75 MMFD. **WITH LOW-CAPACITANCE PROBE ONLY:** 10 MEG SHUNTED BY 9 MMFD	1 MEG SHUNTED BY 35 MMFD	5 IN.	NOT ANNOUNCED YET

* OTHER MODELS AVAILABLE

VACUUM TUBE VOLTMETERS

MANUFACTURER	MODEL	METER SIZE	VOLTAGE RANGES (HV, P-P, SEE FOOTNOTE)	RESISTANCE RANGES	FREQUENCY RESPONSE (HF, SEE FOOTNOTE)	DB RANGES	INPUT IMPEDANCE (MEGOHMS)	NOTES	PRICE
CHICAGO INDUSTRIAL INSTRUMENT CO., 536 W. ELM ST., CHICAGO 10, ILL.	504	5.5 IN.	**AC/DC:** #0-5, 10, 50, 100, 500, 1000, 5000 V. **HV:** 30 KV	6 RANGES TO 1000 MEGS	**HF(X):** 100 MC	−20 TO +16	**AC:** 1 **DC:** 20 AT 5000 V 100	4 CURRENT RANGES, DC: 0-500 MA. 6 CAPACITANCE RANGES: 50 MMFD TO 5000 MFD	$ 42.00
	541	4.5 IN.	**AC/DC:** #0-3, 30, 300, 1200 V. **HV:** 30 KV. P-P	4 RANGES TO 1000 MEGS	**HF(X):** 100 MC	−10 TO +56			$ 30.00
ELECTRONIC INSTRUMENT CO., INC., 84 WITHERS ST., BROOKLYN 11, N.Y. (EICO)	221 *	4.5 IN.	**AC/DC:** #0-5, 10, 100, 500, 1000 V. **HV:** 30 KV	5 RANGES 0.2 OHMS TO 1000 MEGS	20 CPS TO 200 KC. **HF(X):** 250 MC	5 RANGES −24 TO +55	**AC:** 3 **DC:** 25	MODEL 214 SAME WITH 7.5 IN. METER	$ 39.95
	232 *	4.5 IN.	**AC/DC:** #0-1.5, 5, 15, 50, 150, 500, 1500 V. **HV:** 30 KV. P-P	7 RANGES 0.2 OHMS TO 1000 MEGS	30 CPS—3 MC. **HF(X):** 250 MC			MODEL 249 SAME WITH 7.5 IN. METER	$ 49.95
ELECTRONIC MEASUREMENTS CORP., 280 LAFAYETTE ST., NEW YORK 12, N.Y. (EMC)	106 *		**AC/DC:** #0-1.5, 10, 100, 300, 1000 V. **HV:** 30 KV	5 RANGES 0.2 OHMS TO 1000 MEGS	25 CPS TO 100 KC. **HF(X):** 200 MC	5 RANGES −24 TO +55	**AC:** 2 **DC:** 16.5		$ 35.90
FEILER ENGINEERING & MFG. CO., 8026 N. MONTICELLO AVE., SKOKIE, ILL.	TS-9 *	4.5 IN.	**AC/DC:** #0-5, 10, 100, 500, 1000 V	5 RANGES 0.2 OHMS TO 1000 MEGS		−20 TO +16	**AC:** 3C **DC:** 26	MEASURES DC 0-1 MA	$ 52.50
HEATH CO., BENTON HARBOR, MICH.	V-6 §	4.5 IN.	**AC/DC:** #0-1.5, 5, 15, 50, 150, 500, 1500 V. **HV:** 30 KV (1000 V LIMIT ON AC)	7 RANGES 0.1 OHM TO 1000 MEGS	**HF(X):** 250 MC	−70 TO +65	11		$ 24.50
	AV-2 §		**AC:** #0.01, 0.03, 0.1, 0.3, 1, 3, 10, 30, 100, 300 V		10 CPS TO 50 KC	−52 TO +52	1		$ 29.50
HEWLETT-PACKARD CO., 395 PAGE MILL RD., PALO ALTO, CALIF.	400 D		12 RANGES 0.0001 TO 300 V		10 CPS TO 4 MC		10	4 OTHER MODELS AVAILABLE	$225.00

VTVM'S (CONT'D)

MANUFACTURER	MODEL	METER SIZE	VOLTAGE RANGES (HV, P-P, SEE FOOTNOTE)	RESISTANCE RANGES	FREQUENCY RESPONSE (HF, SEE FOOTNOTE)	DB RANGES	INPUT IMPEDANCE (MEGOHMS)	NOTES	PRICE
HICKOK ELECTRICAL INSTRUMENT CO., 10514 DUPONT AVE., CLEVELAND 8, OHIO	209A	9 IN.	**AC/DC:** #0-3, 12, 30, 120, 300, 1200 V. P-P	7 RANGES 0.1 OHM TO 10,000 MEGS	**HF(N):** 200 MC		**AC:** 12 **DC:** 15	MEASURES CAPACITANCE, 0-1000 MFD IN 7 RANGES; INDUCTANCE, 50 MH-100HY	$132.50
	225	9 IN.	**AC/DC:** #0-1.5, 3, 12, 30, 120, 300, 1200 V. P-P	0.2 OHMS TO 100 MEGS	40 CPS TO 3.5 MC		10	AUDIO TONE FOR CONTINUITY CHECKS	$ 89.50
	215	5 IN.	SAME AS MODEL 225	7 RANGES 0.2 OHMS TO 1000 MEGS	40 CPS TO 3.5 MC. **HF(N):** 250 MC		10. WITH PROBE, 30		$ 67.50
HYCON MANUFACTURING CO., 2961 E. COLORADO ST.,	612	4.5 IN.	**AC/DC:** #0-3, 10, 100, 300, 1000 V. **HV:** 30 KV	5 RANGES TO 10 MEGS	**HF(X):** 50 MC		10	BUILT-IN TUBE CHECKER	$135.00
PASADENA 8, CALIF.	614	5.5 IN.	SAME AS MODEL 612	SAME AS MODEL 612	**HF(X):** 50 MC		10		$ 85.00
JACKSON ELECTRICAL INSTRUMENT CO., DAYTON 2, OHIO	709	7 IN.	**AC/DC:** #0-1, 5, 10, 50, 100, 500, 1000 V. **HV:** 30 KV, P-P	7 RANGES TO 1000 MEGS	TO 4.5 MC. **HF(X):** 200 MC		11		$ 95.00
MEASUREMENTS CORP., BOONTON, N.J.	67		5 RANGES, AC P-P ONLY 0.0005 TO 300 V		5 CPS TO 100 KC		1		
PHILCO CORP., ACCESSORY DIV., "A" & ALLEGHENY AVE., PHILA. 24, PA.	M-8100		**AC/DC:** #0-1.5, 15, 150, 450, 1500 V. **HV:** 22.5 KV. P-P	5 RANGES TO 1000 MEGS	HF(X):	−20 TO +65	**AC:** 5 **DC:** 10		$ 64.95
PRECISE DEVELOPMENT CORP., OCEANSIDE, N.Y.	9071W*	7.5 IN.	**AC/DC:** #0-5, 25, 250, 500, 1000 V. **HV:** 30 KV	5 RANGES 0.2 OHMS TO 1000 MEGS	**HF(X):** 250 MC	−20 TO +55	**DC:** 25	VOLTAGE REGULATED	$ 49.95
	909W*	4.5 IN.	SAME AS MODEL 9071W	SAME AS MODEL 9071W	**HF(X):** 250 MC	−20 TO +55	**DC:** 25	MODEL 907 SAME WITH 7.5 IN. METER	$ 37.50
PRECISION APPARATUS CO., INC., 92-27 HORACE HARDING BLVD., ELMHURST 6, N.Y.	EV-10A	7 IN.	**AC/DC:** #0-3, 12, 60, 120, 300, 600, 1200, 6000 V. **HV:** 60 KV	8 RANGES TO 2000 MEGS	HF(X):	8 RANGES −20 TO +77	13⅓ TO 600 V; 26⅔ AT 1200 V; 133⅓ AT 6000 V	8 CURRENT RANGES, DC: 0-300 MA; 0-1.2, 6, 30, 120, 600, 1200 MA; 0-12 AMPS	$ 99.75
	EV-20	4⅛ IN.	**AC/DC:** #0-3, 12, 30, 120, 300, 1200 V. **HV:** 60 KV	6 RANGES TO 2000 MEGS	HF(X):	6 RANGES −20 TO +63		SAME CURRENT RANGES AS MODEL EV-10A	$ 69.95
RADIO CITY PRODUCTS CO., INC. 152 W. 25 ST., NEW YORK 1, N.Y.	657	8.5 IN.	**AC/DC:** #0-1.5, 3, 6, 30, 150, 600, 1500, 6000 V. **HV:** 30 KV. P-P	8 RANGES TO 10,000 MEGS				MEASURES CAPACITANCE, 1 MMFD TO 1000 MFD, IN 6 RANGES	$ 99.95
	655		**AC/DC:** #0-1.5, 5, 15, 50, 150, 500, 1500 V. **HV:** 30 KV. P-P	7 RANGES TO 1000 MEGS	30 CPS TO 3 MC		**DC:** 11		$ 59.50
	345		**AC/DC:** #0-5, 25, 100, 250, 1000 V. **HV:** 30 KV	5 RANGES TO 1000 MEGS		−20 TO +62	25		$ 47.50
RADIO CORP. OF AMERICA, TEST EQUIP., HARRISON, N.J. (RCA)	WV-87A	8.5 IN.	**AC/DC:** #0-1.5, 5, 15, 50, 150, 500, 1500 V. P-P	7 RANGES TO 1000 MEGS	30 CPS TO 3 MC **HF(X):** 250 MC		**AC:** 1.5 **DC:** 11	9 CURRENT RANGES, DC: 0-0.5, 1.5, 5, 15, 50, 150, 500 MA; 0-1.5, 15 AMPS	$112.50
	WV-97A		SAME AS MODEL WV-87A	SAME AS MODEL WV-87A	SAME AS WV-87A		SAME AS WV-87A		$ 67.50
	WV-77A		**AC/DC:** #0-3, 12, 60, 300, 1200 V	5 RANGES, TO 1000 MEGS	SAME AS MODEL WV-87A		**AC:** 2 **DC:** 11		$ 47.50
SIMPSON ELECTRIC CO., 5200 W. KINZIE ST., CHICAGO 44, ILL.	303		**AC/DC:** #0-1.2, 12, 60, 300, 1200 V	5 RANGES TO 1000 MEGS	25 CPS TO 100 KC **HF(X):** 100 MC	5 RANGES −20 TO +63	**AC:** 0.275 **DC:** 10		$ 68.00
SYLVANIA ELECTRIC PRODUCTS, INC., 254 RANO ST., BUFFALO, N.Y.	301	7 IN.	**AC/DC:** #6 RANGES, 0-1000 V. **HV:** 30 KV. P-P	6 RANGES TO 1000 MEGS		6 RANGES −20 TO +61.4	**AC:** 2.7 **DC:** 17	6 CURRENT RANGES, DC: 0-10 AMPS. MODEL 302 SIMILAR, WITH RF PROBE	$109.50
	221Z	4.5 IN.	**AC/DC:** #0-3, 10, 30, 100, 300, 1000 V. **HV:** 30 KV	SAME AS MODEL 301.	**HF(N):** 300 MC		SAME AS MODEL 301	7 CURRENT RANGES, DC; 0-10 AMPS	$ 99.50
TRIPLETT ELECTRICAL INSTRUMENT CO., BLUFFTON, OHIO	631	5.5 IN.	**DC:** #0-1.2, 6, 30, 120 V					VTVM IS COMBINED WITH VOLT-OHM-MILLIAMMETER WHICH MEASURES **AC/DC:** #0-1200 V; **DC:** 0-12 AMPS; **DB:** −30 TO +56; **OHMS:** 0-150 MEGS	$ 59.50
	650	5.5 IN.	**AC/DC:** #0-1, 5, 10, 50, 100, 500 V. DC TO 1000 V. **HV:** 50 KV. P-P	6 RANGES TO 1000 MEGS	**HF(N):** 110 MC		**AC:** 1.4 **DC:** 11		$ 69.50
WESTON ELECTRICAL INSTRUMENT CORP., 614 FRELINGHUYSEN, NEWARK 5, N.J.	982		**AC/DC:** #0-1.6, 8, 40, 160, 400, 800, 1600 V. P-P	7 RANGES TO 1000 MEGS	HF(X)		**AC:** 2.8 **DC:** 10		$ 69.50

*ALSO AVAILABLE IN KIT FORM AT LOWER PRICE.
§KIT FORM.

HV: HIGH VOLTAGE THAT CAN BE MEASURED WITH PROBE. (PROBE AVAILABLE AT EXTRA COST. P-P PEAK-TO-PEAK (AS WELL AS RMS) VOLTAGES MAY BE MEASURED.

HF: HIGH FREQUENCY RANGE EXTENDED WITH PROBE. **(N):** PROBE INCLUDED IN PRICE; **(X):** PROBE AVAILABLE AT EXTRA COST.
#AC VOLTAGES ARE ROOT-MEAN-SQUARE

SIGNAL GENERATORS

MANUFACTURER	MODEL	FREQUENCY RANGE	INTERNAL MODULATION	EXTERNAL MODULATION	OTHER FEATURES	PRICE
APPROVED ELECTRONIC INSTRUMENT CORP., 142 LIBERTY ST., NEW YORK 6, N.Y.	A-200K	100 KC–25 MC (FUNDAMENTALS); 18–75 MC (HARMONICS)	440 CPS	40–30,000 CPS	CATHODE FOLLOWER OUTPUT. MODULATION % VARIABLE, 0–100%. KIT FORM.	
CLOUGH-BRENGLE CO., 6014 BROADWAY, CHICAGO 40, ILL.	*299-A	100 KC–32 MC	400 CPS	50–10,000 CPS	ACCURACY 1% ON HIGH BAND (10 MC–32 MC), ½% ON OTHERS. BUILT-IN VTVM. MODULATION % VARIABLE, 0–80%. OUTPUT VARIABLE FROM 0.1 TO MORE THAN 1V.	$250.00
ELECTRONIC INSTRUMENT CO., INC., 84 WITHERS ST., BROOKLYN 11, N.Y.	*315	75 KC–50 MC (FUNDAMENTALS); 30–150 MC (HARMONICS)	400 CPS	YES	ACCURACY WITHIN 1%. OUTPUT OVER 0.1 V. KIT FORM (315K) OR FACTORY WIRED (315W).	(315K) $39.95 (315W) $59.95
	*320	150 KC–34 MC (FUNDAMENTALS); 22 MC–102 MC (HARMONICS)	400 CPS		R-F OUTPUT OVER 0.1 V. AUDIO OUTPUT 1½–2 V. KIT FORM (320K) OR FACTORY WIRED (320W)	(320K) $19.95 (320W) $23.95
ELECTRONIC MEASUREMENTS CORP., 280 LAFAYETTE ST., NEW YORK 12, N.Y.	500	150 KC–36 MC (FUNDAMENTALS); OVER 100 MC ON HARMONICS	400 CPS	YES	KIT OR WIRED FORM.	(KIT) $19.75 (WIRED) $29.75
	700	18 CPS–108 MC (FUNDAMENTALS); UP TO 216 MC ON HARMONICS	18 CPS–300 KC		MODULATION % VARIABLE. SQUARE-WAVE OUTPUT TO 20 KC. R-F ACCURACY 1½%. CRYSTAL MARKER AND AMPLITUDE CONTROL.	$ 55.95
GENERAL ELECTRIC, ELECTRONICS DIV., ELECTRONICS PARK, SYRACUSE, N.Y.	ST-5A	TV PICTURE CARRIERS, CHANNELS 2–13; VARIABLE I-F CARRIER: 20–50 MC			CRYSTAL CONTROLLED R-F CARRIERS, SWITCH SELECTED. CRYSTAL ACCURACY 0.02%. I-F ACCURACY 0.5%. DIAL READABILITY TO 0.1 MC.	$439.50

HEATH CO., BENTON HARBOR, MICH.	SG-8	160 KC–110 MC (FUNDAMENTALS); 110 MC–220 MC (CALIBRATED HARMONICS)	400 CPS	YES	CATHODE FOLLOWER OUTPUT. R-F OUTOUT OVER 0.1 V. A-F OUTPUT 2–3 V. KIT FORM.	$ 19.50
	LG-1	100 KC–30 MC (FUNDAMENTALS)	400 CPS	60–10,000 CPS	BUILT-IN METER CALIBRATED IN OUTPUT VOLTAGE AND % MODULATION. OUTPUT FROM 1 MICROVOLT TO 0.1 V. EXTERNAL MODULATING SOURCE MAY BE METERED.	$ 39.50 KIT FORM.
HICKOK ELECTRICAL INSTRUMENT CO., 10514 DUPONT AVE., CLEVELAND 8, OHIO	*288X	110 KC–110 MC (AM), 110 KC–160 MC FM), ALL FUNDAMENTALS	60 CPS OR 400 CPS (FM), 400 CPS (AM)		CRYSTAL CONTROLLED. VARIABLE A-F OUTPUT 0–15,000 CPS. VARIABLE FM SIGNALS.	$195.00
	*680	53–89 MC, 174–217 MC, ALL FUNDAMENTALS; TO 868 MC ON HARMONICS			CRYSTAL ACCURACY. SELECTOR FOR 3 CRYSTALS (2.5 MC CRYSTAL SUPPLIED). CALIBRATED CHANNEL MARKERS FOR PIX AND SOUND, 0.05% ACCURACY. BUILT-IN INDICATOR TUBE FOR ZERO-BEAT CALIBRATION.	$129.50
INDUSTRIAL TELEVISION, INC., 369 LEXINGTON AVE.' CLIFTON, N.J.	IT-130R	OUTPUT (CONTINUOUS) 470-890 MC (CHANNELS 14–83). INPUT (SWITCH-SELECTED) 50–90 MC, 170–220 MC (CHANNELS 2–13)		FROM VHF SOURCE	CONVERTS INPUT SIGNAL (ANY VHF SOURCE) TO OUTPUT ON ANY UHF CHANNEL. CONVERTS VHF TEST EQUIPMENT FOR UHF USE.	$149.50
KAY ELECTRIC CO., 14 MAPLE AVE., PINE BROOK, N.J.	*DUAL MEGA-MARKER, SR.	R-F SOUND AND PIX TV FREQUENCIES, CHANNELS 2–13	400 CPS (ON SOUND CARRIERS)		SOUND CARRIER ACCURACY TO 0.01%. SEPARATION BET. PIX AND SOUND CARRIER, 4.5 MC WITHIN ±500 CPS. MAXIMUM OUTPUT: SOUND CARRIER, 0.1 V; PIX CARRIER, 0.045 V. 4.5 MC OUTPUT, 0.1 V OR LESS (VARIABLE).	$350.00
PHILCO CORP., ACCESSORY DIV., "A" & ALLEGHANY AVES., PHILA. 34, PENNA.	G8000	OUTPUT (CONTINUOUS) 470–890 MC (CHANNELS 14-83). INPUT (FIXED) 60 MC		FROM VHF SOURCE	CONVERTS VHF SIGNAL SOURCE (60 MC) TO OUTPUT ON ANY UHF CHANNEL. DIAL CALIBRATION ±3% WITH 60 MC INPUT. APPROX. BANDWIDTH, 15 MC.	$169.50
PRECISE DEVELOPMENT CORP., OCEANSIDE N.Y	610	300 KC–110 MC (FUNDAMENTALS); 60 MC–330 MC (HARMONICS)	60 CPS OR 400 CPS	YES	CATHODE FOLLOWER OUTPUT. KIT FORM (610K); KIT WITH ASSEMBLED R-F HEAD (610KA); OR WIRED (610W).	(610K) $23.95 (610KA) $28.95 (610W) $39.95
	630	SAME AS 610; ALSO, SEPARATE A-F OUTPUT, 20–20,000 CPS	20–20,000 CPS	YES	CRYSTAL MARKER WITH SEPARATE AMPLITUDE CONTROL. MODULATION % VARIABLE. CATHODE FOLLOWER OUTPUT. KIT FORM (630K); KIT WITH ASSEMBLED R-F HEAD (630KA); OR WIRED (630W).	(630K) $33.95 (630KA) $38.95 (630W) $53.95
PRECISION APPARATUS CO., INC., 92-27 HORACE HARDING BLVD., ELMHURST, N.Y.	E-200C	88 KC–60 MC (FUNDAMENTALS); TO 240 MC ON HARMONICS	400 CPS	YES	MODULATION VARIABLE 0–100%. SEPARATE AUDIO OUTPUT. INDIVIDUALLY CALIBRATED. BUILT-IN AVC-AGC SUBSTITUTION VOLTAGE.	$ 78.50
RADIO CITY PRODS., 152 W. 25 ST., NEW YORK 1, N.Y.	*706A	150 KC–55 MC (FUNDAMENTALS); TO 220 MC ON HARMONICS	400 CPS	YES	ACCURACY WITHIN 1% OF CALIBRATION ADJUSTMENT. MODULATION VARIABLE 0–80%.	$ 67.50
	*750	9–220 MC (FUNDAMENTALS); TO 900 MC ON HARMONICS	360 CPS AND 141.75 KC	YES	ACCURACY WITHIN 0.5%. MAY BE USED AS BAR OR CROSS-HATCH GENERATOR.	$ 79.50
RADIO CORP. OF AMERICA, HARRISON, N.J.	WR-89A	19–260 MC (FUNDAMENTALS)	4.5 MC, 600 CPS, 100–150 KC	UP TO 10 MC	OUTPUT 0.1 V OR MORE. CRYSTAL CALIBRATED. ONE, TWO OR THREE SIMULTANEOUS MARKERS. 96 CHECK POINTS, 2.5 MC APART, FOR CRYSTAL CALIBRATION.	$242.50
SUPERIOR INSTR. CO., 227 FULTON ST., N.Y.	660-A	100 KC–60 MC (FUNDAMENTALS); 60 MC–220 MC (HARMONICS)	400 CPS	YES	SEPARATE AUDIO OUTPUT, MORE THAN 1 V.	$ 42.95
SYLVANIA ELECTRIC PRODUCTS, INC., 254 RANO ST., BUFFALO, N.Y.	501	15–120 MC (FUNDAMENTALS); 120 MC–240 MC (HARMONICS)			DIAL CALIBRATION WITHIN 1% ACCURACY. CRYSTAL CONTROLLED. MAXIMUM FUNDAMENTAL OUTPUT, 0.1 V. SEPARATE CRYSTAL OUTPUT.	$129.50
TELONIC INDUSTRIES, 444 S. RURAL ST., INDIANAPOLIS, IND.	MO-1	420–930 MC			MAXIMUM OUTPUT, 1 V. BETTER THAN ± 0.25% ACCURACY	$100.00
TRIPLETT ELECTRICAL INSTR. CO., BLUFFTON, OHIO	*3432	165 KC–40 MC (FUNDAMENTALS); 36–120 MC (HARMONICS)	400 CPS	40–15,000 CPS	MODULATION % VARIABLE, INTERNAL OR EXTERNAL. SEPARATE VARIABLE AUDIO OUTPUT, 400 CPS, 0–10 V.	$ 79.50
	*3436	470–900 MC (FUNDAMENTALS)	1000 CPS		MAXIMUM R-F OUTPUT, 0.5 V. ACCURACY WITHIN 1% (HAND-DRAWN SCALE). SEPARATE AUDIO OUTPUT, 1000 CPS, 0–20 V.	$169.50
WESTON ELECTRICAL INSTR., 614 FRELINGHUYSEN AVE., NEWARK 5, N.J.	985	4–110 MC, 170–260 MC (FUNDAMENTALS); 340–520 MC (HARMONICS)	400 CPS, 300 KC, 4.5 MC		CRYSTAL CALIBRATED (1.5 MC AND 4.5 MC CRYSTALS). DUAL VIDEO AND SOUND MARKERS AVAILABLE. MARKER OUTPUT: CONVENTIONAL PIP, OR FOR INTENSITY MODULATION OF SCOPE. BAR PATTERN OUTPUT FOR TV LINEARITY CHECKS.	$199.50

*OTHER MODELS AVAILABLE.

SWEEP GENERATORS

MANUFACTURER	MODEL	FREQUENCY RANGE	SWEEP WIDTH RANGE	MARKER FACILITIES	OTHER FEATURES	PRICE
APPROVED ELECTRICAL INSTR. CORP., 142 LIBERTY ST., NEW YORK 6, N.Y.	A-400	0–227 MC	0–12 MC	2–40 MC (FUNDAMENTALS), 40–80 MC (HARMONICS).	CRYSTAL CONTROLLED. UNSWEPT R-F OUTPUT AVAILABLE. PHASING CONTROL. MARKER ACCURACY TO 0.5% OR BETTER.	
ELECTRONIC INSTRUMENT CO., INC., 84 WITHERS ST., BROOKLYN 11, N.Y.	360	500 KC–228 MC	0–30 MC	BUILT-IN OSCILLATOR REQUIRES EXTERNAL CRYSTAL.	MARKER AMPLITUDE CONTROL. PHASING CONTROL. KIT (360K) OR WIRED (360) FORM.	(360K) $34.95 (360) $49.95
GENERAL ELECTRIC CO., ELECTRONICS DIV., ELECTRONICS PARK, SYRACUSE 1, N.Y.	ST-4A	4–110 MC, 170–220 MC	500 KC–15 MC		LINEAR SWEEP; PHASING CONTROL, RANGE GREATER THAN 360 DEGREES. SWITCH FOR RETURN SWEEP BLANKING. OUTPUT VOLTAGE: 0.1 V, 4-110 MC; 0.5 V, 170-220 MC	$395.00
HEATH CO., BENTON HARBOR, MICH.	TS-3	4–220 MC	0–15 MC MINIMUM, 0–50 MC MAXIMUM, DEPENDING ON FREQUENCY.	19–60 MC (FUNDAMENTALS), 57–180 MC (HARMONICS). ALSO EXTERNAL.	LINEAR SWEEP. PHASING CONTROL. MARKER AMPLITUDE CONTROL. OUTPUT OVER 0.1 V. CRYSTAL INPUT (4.5 MC CRYSTAL INCLUDED). TRIPLE MARKERS AVAILABLE. RETURN RETRACE BLANKING. KIT FORM ONLY.	$ 44.50
HICKOK ELECTRICAL INSTRUMENT CO., 10514 DUPONT AVE., CLEVELAND 8, OHIO	695	0–50 MC (HETERODYNED OUTPUT), 50–90 MC (FUNDAMENTALS), 170–220 MC (FUNDAMENTALS).	0–15 MC, ±3 MC	EXTERNAL	LINEAR SWEEP. PHASING CONTROL, RANGE APPROX. 170 DEGREES. VARIABLE BIAS VOLTAGE OUTPUT. OUTPUT UP TO 0.3 V.	$265.00
HYCON MFG. CO., 2961 E. COLORADO ST., PASADENA 8, CALIF.	610	19 MC–900 MC	±20% OF CENTER FREQUENCY UP TO 250 MC; ±10% ABOVE 250 MC.	19–50 MC, 60–90 MC, 160–220 MC, 450–900 MC	OUTPUT UP TO 2 V. ACCURACY OF MARKER DIAL CALIBRATION, 0.1%.	$330.00
JACKSON ELECTRICAL INSTR. CO., DAYTON 2, OHIO	TVG-2	2–108 MC, 174–216 MC	0–18 MC	FUNDAMENTALS: 4–8 MC, 16–29 MC, 27–54 MC. HARMONICS: 8–16 MC, 54–216	PHASING CONTROL. RETURN TRACE BLANKING CONTROL. 400 CPS MODULATION. MODULATION OF R-F OUTPUT BY EXTERNAL VIDEO SIGNAL. OUTPUT UP TO 0.25 V. TRIPLE MARKERS AVAILABLE.	$245.00
KAY ELECTRIC CO., PINE BROOK, N.J.	*MEGA-SWEEP (CAT. #100-A)	50 KC–1000 MC	0–30 MC	MC. ALSO EXTERNAL.	LINEAR SWEEP. SWEEP RATE ADJUSTABLE 50–100 CPS. SAW TOOTH SWEEP OUTPUT FOR SYNCHRONIZING OSCILLOSCOPE. OUTPUT, 0.1 V.	$465.00

SWEEP GENERATORS (CONT'D)

MANUFACTURER	MODEL	FREQUENCY RANGE	SWEEP WIDTH RANGE	MARKER FACILITIES	OTHER FEATURES	PRICE
PHILCO CORP., ACCESSARY DIV., "A" & ALLEGHANY AVES., PHILA. 34, PENNA.	7008	4–120 MC, 145–260 MC	0–15 MC	3.2–250 MC	LINEAR SWEEP. COMBINATION UNIT INCLUDES OSCILLOSCOPE. OUTPUT, 0.5 V.	$466.00
	G8002	470–890 MC	TO 25 MC AT LOW END; TO 50 MC AT HIGH END.		LINEAR SWEEP. PHASING CONTROL RANGE, 140 DEGREES. RETURN RETRACE BLANKING SWITCH. MINIMUM OUTPUT, 1 V (PEAK-TO-PEAK).	$289.50
PRECISION APPARATUS CO., INC., 92-27 HORACE HARDING BLVD., ELMHURST, N.Y.	E-400	2–240 MC (FUNDAMENTALS), 240–480 MC ON HARMONICS.	0-1 MC (NARROW BAND), 0-15 MC (WIDE BAND).	ACCOMMODATES 4 SWITCH-SELECTED EXT. CRYSTALS.	PHASING CONTROL. RETURN RETRACE BLANKING. 2-MC & 4.5-MC CRYSTALS INCLUDED. CRYSTAL CALIBRATED.	$139.75
RADIO CORP. OF AMERICA, HARRISON, N.J.	WR-59C	300 KC–50 MC; SWITCH SELECTION OF VHF CHANNELS: 54-88 MC, 174-216 MC.	0–12 MC OR BETTER		LINEAR OUTPUT. PHASING CONTROL RANGE, 160 DEGREES. RETURN TRACE BLANKING CONTROL.	$274.50
SIMPSON ELECTRIC CO., 5200 W. KINZIE ST., CHICAGO 44, ILL.	479	2–120 MC, 140–260 MC	0–15 MC	3.3–250 MC; INPUT FOR CRYSTAL.	PHASING CONTROL. RETURN TRACE BLANKING CONTROL. 400 CPS MODULATION OF R-F GENERATOR AVAILABLE AT 30%. ACCURACY 0.1% WHEN CALIBRATED WITH 5-MC CRYSTAL. DIAL ALSO MARKED IN HARMONICS FOR UHF USE.	$325.00
SYLVANIA ELECTRIC PRODUCTS, INC. 254 RANO ST., BUFFALO, N.Y.	500	2–230 MC	0–600 KC (FM) 0–15 MC (TV)		LINEAR SWEEP. PHASING CONTROL. MAXIMUM OUTPUT 0.1 V. SWEEP OUTPUT FOR SYNCHRONIZING OSCILLOSCOPE.	$139.50
TELONIC INDUSTRIES, 444 S. RURAL ST., INDIANAPOLIS, IND.	*SM-2	375–950 MC	0–75 MC	400–930 MC	LINEAR SWEEP. RETURN TRACE BLANKING. SWEEP OUTPUT FOR SYNCHRONIZING OSCILLOSCOPE. MARKER ACCURACY CALIBRATED TO ±0.25% OR BETTER. SEPARATE MARKER AMPLITUDE CONTROL.	$450.00
TRIPLETT ELECTRICAL INSTR. CO., BLUFFTON, OHIO	3434-A	0–240 MC	0–12 MC	FUNDAMENTALS: 3.5–4.9 MC 19.5–48.6 MC; HARMONICS: UP TO 241 MC. ALSO EXTERNAL	PHASING CONTROL. MARKER AMPLITUDE CONTROL. 600 CPS MODULATION AVAILABLE FOR R-F GENERATOR SECTION, OR AS SEPARATE AUDIO. SWEEP OUTPUT FOR SYNCHRONIZING OSCILLOSCOPE. OUTPUT OVER 1 V. CHOICE OF ABSORPTION OR PIP-TYPE MARKERS. DUAL MARKERS AVAILABLE.	$199.50
	3435	0–240 MC	0–12 MC	EXTERNAL	PHASING CONTROL. SWEEP OUTPUT FOR SYNCHRONIZING OSCILLOSCOPE.	$114.50
WESTON ELECTRICAL INSTR., 614 FRELINGHUYSEN AVE., NEWARK 5, N.J.	984	15-POSITIONS, PRE-SET. ONE POSITION (VARIABLE TO 50 MC) FOR I-F; OTHER POSITIONS FOR 12 VHF CHANNELS & 2 FOR FM.	0–10 MC		LINEAR SWEEP. PHASING CONTROL RANGE, 165 DEGREES. OUTPUT TO 0.1 V. RETURN TRACE BLANKING SWITCH.	$199.50

*OTHER MODELS AVAILABLE.

TUBE CHECKERS

MANUFACTURER	MODEL	COUNTER OR PORTABLE MODEL	DOES TESTER CHECK DYNAMIC MUTUAL CONDUCTANCE	SPECIAL FEATURES	NOTES	PRICE
AMERICAN SCIENTIFIC DEVELOPMENT CO., 334-336 S. MAIN ST., FT. ATKINSON, WIS.	TV-20	PORTABLE	YES	GAS DETECTION CIRCUIT		$124.50
ELECTRONIC INSTRUMENT CO., INC., 84 WITHERS ST., BROOKLYN 11, N.Y.	625	PORTABLE	NO	SPARE BLANK SOCKET PROVIDED FOR FUTURE TUBE TYPES	KIT WITH COUNTER DISPLAY CASE, $44.95; FACTORY-WIRED, $59.95	KIT, $34.95; FACTORY-WIRED, $19.95
ELECTRONIC MEASUREMENTS CORP., 280 LAFAYETTE ST., N. Y. 12, N.Y.	208	PORTABLE	NO	MATCHES AND CHECKS H1–F1 TUBES SUCH AS 1614, KT66 AND 5881		$ 24.90
	206*	PORTABLE	YES	TESTS TUBES FOR GAS, NOISE	AVAILABLE WITH SLOPING COUNTER CASE AT $79.50	$ 83.50
HEATH COMPANY, BENTON HARBOR, MICHIGAN	TC-2*	COUNTER	NO	SPARE BLANK SOCKET PROVIDED FOR FUTURE TUBE TYPES	PORTABLE MODEL, $34.50	$ 29.50
HICKOK ELECTRICAL INSTRUMENT CO., 10514 DUPONT AVE., CLEVELAND 8, OHIO	600A	PORTABLE	YES	CONTAINS BIAS POTENTIOMETER	MODEL 605A OFFERS SAME FEATURES, BUT CONTAINS MULTIMETER IN ADDITION. UNIT MEASURES CAPACITANCE-INDUCTANCE. PRICE, $189.50	$164.00
	533AC*	COUNTER	YES	TESTS TUBES FOR NOISE, GAS, LIFE EXPECTANCY	AVAILABLE IN PORTABLE MODEL, SAME PRICE	$185.80
JACKSON ELECTRICAL INSTRUMENT CO., DAYTON, OHIO	715	PORTABLE	YES	PROVIDES C-R TUBE TEST; SPARE SOCKETS, CIRCUITS FOR FUTURE USE		$ 79.50
	468	PORTABLE	YES	TESTS TUBES FOR LIFE EXPECTANCY; PROVIDES SIMPLIFIED OPERATION VIA "SEQUENCE SWITCH"		$104.50
PHILCO CORP., ACCESSORY DIV., PHILA, PA.	7052	COUNTER	YES	TESTS TUBES FOR LIFE EXPECTANCY		$187.50
	9100	PORTABLE	YES	TESTS TUBES FOR LIFE EXPECTANCY		$189.50
PRECISION APPARATUS CO., INC., 92-27 HORACE HARDING BLVD., ELMHURST, N.Y.	SERIES 10-12P	PORTABLE	YES	HIGH SPEED ROLLER CHART, EXTRACTOR FUSE POST	WITH MULTIMETER, $139.50	$107.50
	SERIES 612*	PORTABLE	NO	PROVIDES NOISE AND CONDENSER TESTS	WITH MULTIMETER, $107.00	$ 76.75
RADIO CITY PRODUCTS CO., INC., 152 WEST 25TH ST., N. Y. 1, N.Y.	324	PORTABLE	NO	PROVIDES C-R TUBE REACTIVATOR	COMBINATION PORTABLE-COUNTER MODEL, $79.50	$ 67.95
	808A*	PORTABLE	NO	PROVIDES OHMMETER, C-R TUBE REACTIVATOR, VTVM. TESTS CRT FOR SHORTS, LEAKS		$ 99.95
SIMPSON ELECTRIC CO., 5200 W. KINZIE ST., CHICAGO 44, ILL.	1000	PORTABLE	TESTS DYNAMIC PLATE CONDUCTANCE, WHICH IS RELATED TO MUTUAL CONDUCTANCE	NEW ROLL CHART AVAILABLE EACH YEAR; COMPLIMENTARY ROLL CHART SUPPLEMENTS PROVIDED AT REGULAR INTERVALS		$ 135.00
SUPERIOR INSTRUMENTS CO., 2435-41 WHITE PLAINS RD., N. Y. 67, N.Y.	TV-11	PORTABLE	NO	CHECKS CONDENSER LEAKAGE		$ 47.50
SYLVANIA ELECTRIC PRODUCTS, INC., 254 RANO ST., BUFFALO, N.Y.	220	PORTABLE	YES	NEW SETTINGS REGULARLY PUBLISHED IN "SYLVANIA NEWS" CAN BE READILY RECORDED ON ROLLER CHART	COUNTER-TYPE TESTER 219 HAS SAME CHARACTERISTICS AND PRICE AS THE 220	$114.50
TRIPLETT ELECTRICAL INSTRUMENT CO., BLUFFTON, OHIO	3413-A	PORTABLE	NO	PROVIDES ADAPTER FOR TESTING C-R TUBES		$ 79.50
	3423	PORTABLE	TESTS PROPORTIONAL MUTUAL CONDUCTANCE	H-F SIGNAL IS APPLIED TO GRID OF TUBE, OUTPUT SIGNAL IS MEASURED	TESTS TUBES USED IN RADIO-TV, INDUSTRIAL PRODUCTION, THEATER, P.A. SYSTEMS & COMMUNICATIONS	$199.50
WESTON ELECTRICAL INSTR. CORP., 614 FRELINGHUYSEN AVE., NEWARK, N.J.	981	PORTABLE	TESTS PROPORTIONAL MUTUAL CONDUCTANCE	PROVIDES METER MEASUREMENT OF HIGH LEAKAGE RESISTANCE BETWEEN TUBE ELEMENTS	TESTS VOLTAGE REGULATOR AND SUBMINIATURE TYPE TUBES	$199.50

*OTHER MODELS AVAILABLE.

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WALSCO Scotty

3.77 LIST

GUARANTEED FOR 1 YEAR

Greatest Antenna Value in America

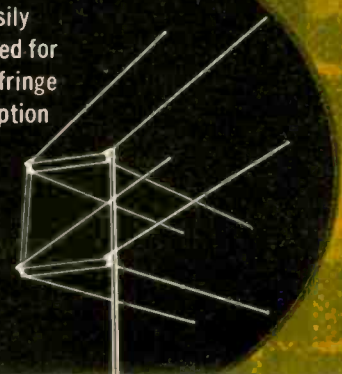
The new "Scotty" has every quality feature necessary for crystal-clear reception in metropolitan and surburban areas. Good gain and directivity on all VHF channels. Used effectively for UHF, or as a combination antenna. Tested and approved for color reception.

COMPARE

WALSCO "Scotty"	3.77
Antenna B	7.50
Antenna C	4.86
Antenna D	5.40
Antenna E	4.60

Place your order today

Easily stacked for semi-fringe reception



Walsco ELECTRONICS CORPORATION

3602 Crenshaw Boulevard, Los Angeles 36, California

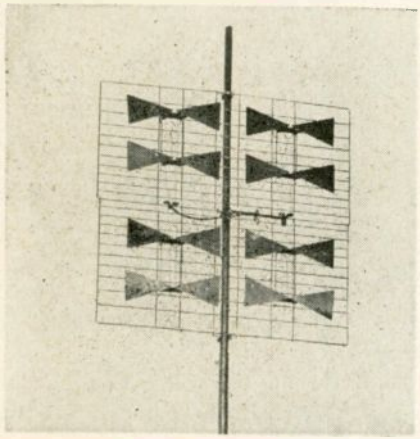
Export Distributor:
AD AURIEMA, Inc., 89 Broad St., New York 4, N.Y.

New Antennas

TV Types & Installation Items; Converters & Connectors

Channel Master UHF ANTENNA

The Twin Multi-Bow, model 410-8, is an 8-bay bow tie with screen. The large screen contributes to the



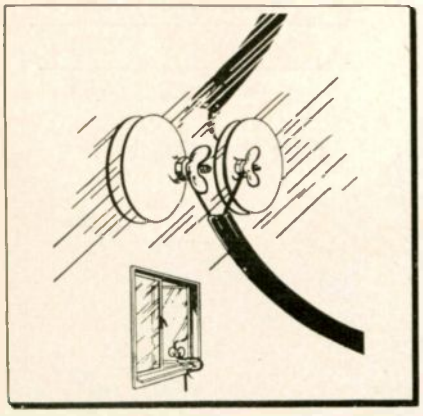
antenna's gain, said to range from 12½ to 16½ db. It also provides high front-to-back ratio. List price, $20.83. Channel Master Corp., Ellenville, N. Y.—TECHNICIAN

Danforth VHF ANTENNA

The Mountie, model 38, is a yagi-type 5-element antenna made with rugged boom and elements for durability. Field tests 110 miles from transmitters are said to show good performance on all 12 VHF channels. Danforth Mfg. Co., Monmouth, Ill.—TECHNICIAN

Walsco WINDOW CONNECTOR

Window-Thru bushing allows servicemen to bring antenna wires into a home without drilling holes. The durable bushing attaches to

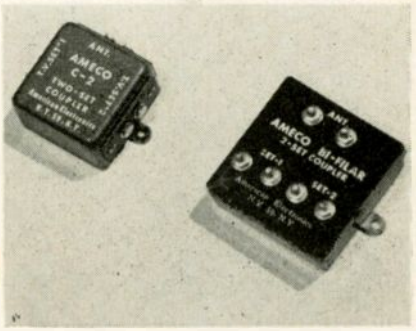


any window in a few minutes, is effective for VHF and UHF. Weatherproof capacitor discs attach to the window pane; windows can be opened and closed without breaking wires. Packaged with window-pane cement and instructions. List price, 99 cents. Walsco Electronics Corp., 3602 Crenshaw Blvd., Los Angeles 36, Calif.—TECHNICIAN

Ameco ANTENNA COUPLERS

Two 2-set couplers operate 2 receivers from 1 antenna while retaining impedance match and avoiding mutual interference. Model C-2, $1.84 list; model C-2B (bi-filar wound for low insertion loss), $3.30 list.

Two antenna crossover networks permit joining UHF and VHF antennas to a single transmission line. One model is for 2 antennas (1 UHF, 1 VHF); another model is for



3 antennas (1 UHF, 1 VHF low-band, 1 VHF high-band). Model UV-2 (double-tie), $3.25 list; model UV-3 (triple-tie), $3.85 list.

Also available: "Thru-Window" coupler for passing antenna signal into house without drilling holes. List price, $1.48. American Electronics Co., 1203 Bryant Ave., New York 59, N. Y.—TECHNICIAN

GI HIDDEN UHF CONVERTER

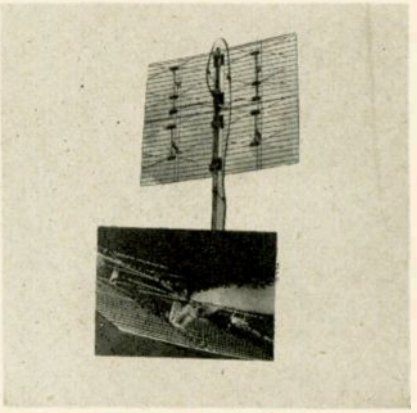
The Tuck-A-Way, a low-cost all-channel UHF converter, can be installed behind, on either side or on top of the TV set. Dial and switch are positioned on top, making them accessible in any position. Continuous tuning covers channels 14-83. General Instrument Corp., 829 Newark Ave., Elizabeth 3, N.J.—TECHNICIAN

Granco UHF CONVERTER

Model LCU-A features high-ratio finger-tip tuning, slide-rule tuning dial, two-cavity coaxial tuner to cover the UHF band continuously with a low noise figure, stability and signal amplification. Offered at $29.95 list (mahogany) and $32.95 (blond). Granco Products Inc., 36-17 20 Avenue, L. I. City 5, N.Y.—TECHNICIAN

JFD UHF ANTENNA

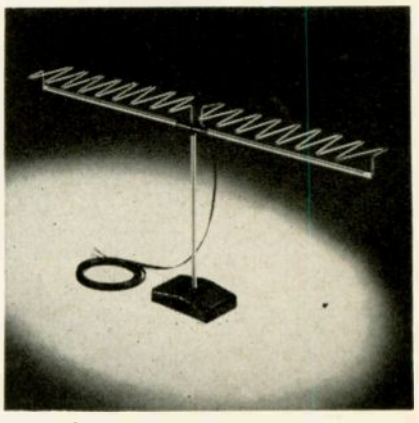
This new high-gain 8-bow antenna with screen features an ad-



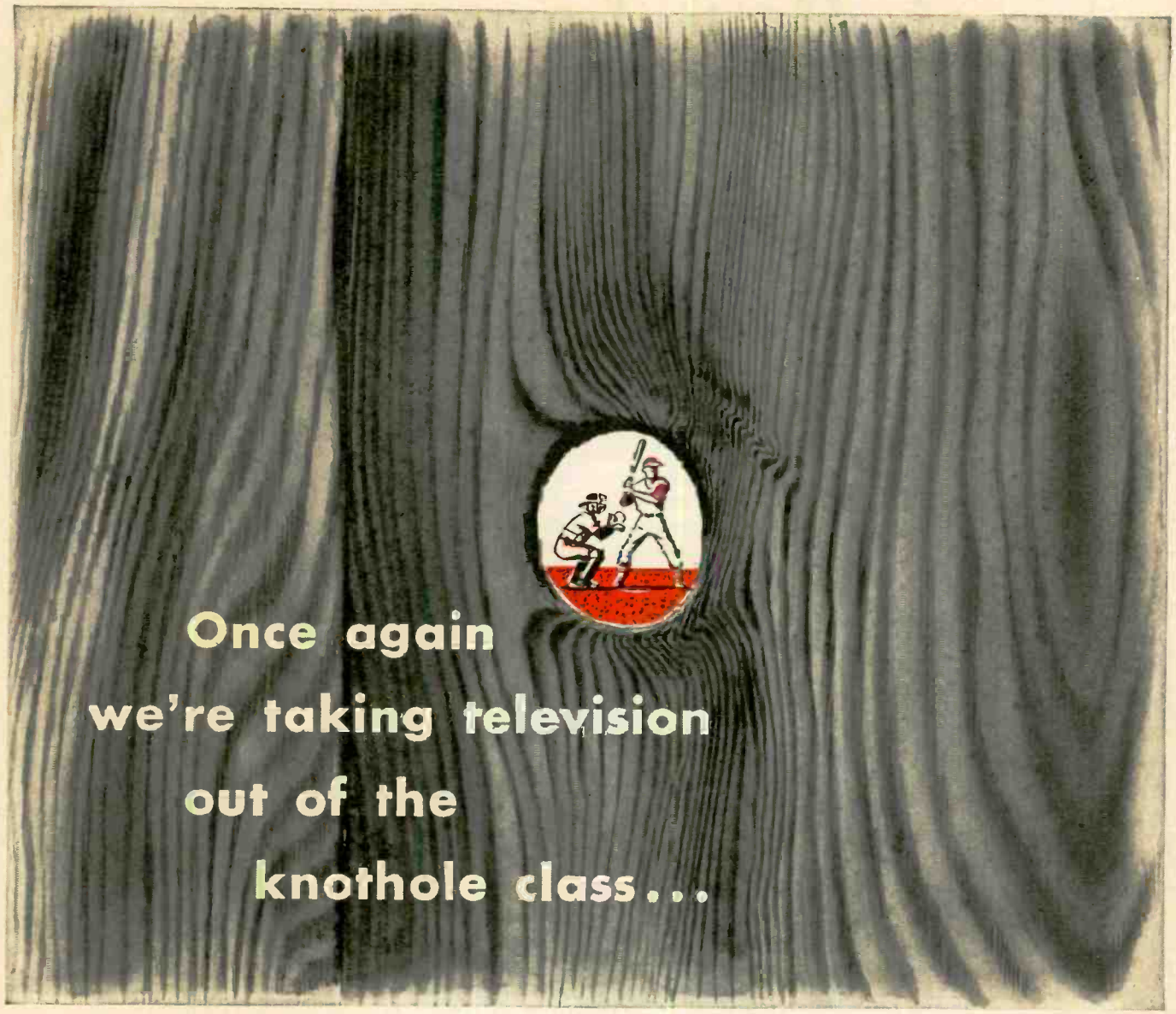
justable calibrated slide for peaking of any one or any group of UHF channels. The pre-assembled unit is said to have a sharp directivity pattern with 18 db of back rejection. Model UHF-308 lists for $25.95. JFD Mfg. Co., 6101 16th Ave., Brooklyn 4, N. Y.—TECHNICIAN

Peerless INDOOR ANTENNA

The Diron Golden Wand is designed for operation on all VHF and FM channels without individual adjustment for different frequencies, includes 12 ft. of 300-ohm twin lead.



Available in gold finish, model DV11G, or black, model DV11B. List price, $9.95. Peerless Products Industries, 812 Pulaski Rd., Chicago 51, Ill.—TECHNICIAN



From a knothole—to a box seat . . . That was Du Mont's big contribution to black and white television . . . Now, again, Du Mont leads the way in practical, big-screen color television.

Out of Du Mont cathode-ray tube research comes the dramatic Chroma-sync Teletron . . . a **bigger-screen, shorter-length, lower-cost** color picture tube featuring electrostatic "Mono-Convergence".

DU MONT®

CHROMA-SYNC

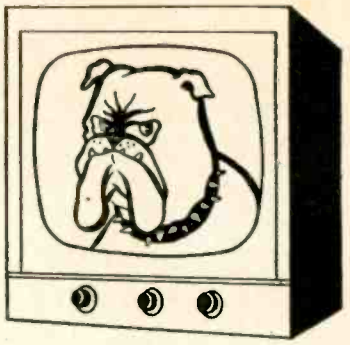
Teletrons*

FEATURING "MONO-CONVERGENCE"

ALLEN B. DU MONT LABORATORIES, INC. *T.M.

Cathode-ray Tube Division • 750 Bloomfield Avenue • Clifton, N.J.

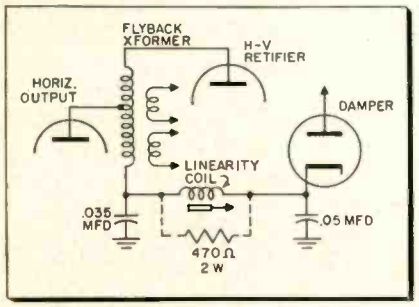
"Tough Dog" Corner



Difficult Service Jobs Described by Readers

Double Trouble

This set came into our shop with the customer's complaint that it would break out every so often into a double picture horizontally. When the set broke down in the shop after a half hour wait, I noticed an effect similar to that of a ghost. However, with no video present, the same effect could be seen on the raster. There appeared to be two rasters present, one displaced from the other by about one inch. With video present, the horizontal hold control showed normal action. What made matters tough was that, when an effort was made to troubleshoot, the



set snapped back to normal. Introduction of a probe apparently disturbed the fault. There was then another long wait for the set to break down again.

The next time the set broke down, I used hand capacity near the horizontal oscillator circuit. The set again returned to normal. After considerable probing, it was found that the most sensitive area was in the vicinity of the horizontal linearity coil. The two capacitors connected to this coil (0.035 mfd and 0.05 mfd) were checked on a condenser bridge and found to be good. This left the coil itself, which we felt must be setting up some kind of parasitic oscillation. A 470-ohm, 2-watt resistor was shunted across the coil to load it down. The set then operated normally for a long test period; then was delivered to the customer. There have been no call-backs.—*Joseph F. Valenti, Bronx, N. Y.*

B & W Pix OK, No Color

Here is an early Tough-Dog case on a color TV receiver. After we received our first RCA CT100 color set, we enjoyed beautiful color reception for about a month. Then one day we turned the set on (during a color program) to get a beautiful monochrome picture, but no color. Frantically we began to change tubes in the color section of the receiver, but to no avail. Before we could progress any further, the 15-minute color broadcast was over. During subsequent color programs, we checked voltages and undertook other troubleshooting, but could find no defect.

When we finally got in our color bar generator, we hooked it up to the set and, to our surprise, got excellent results. We saw the full range of color bars, as specified in the instruction manual. The set's hue control had normal range. After a few days of thinking it over, the right idea finally popped up. The day before the defect was first noted, there had been some moving around of sets and antenna wires in the showroom where the color receiver was located. The belief that the difficulty was due to trouble in the antenna system was supported by the presence of colored snow off channel.

The next time a color program was on, the trouble was located. It turned out to be a trap in our master antenna system which was tuned to eliminate Channel-5 interference from Channel 4, a problem which is common in our area. In the process of moving around, someone had nailed the trap to the wall. This apparently detuned the trap enough to kill the color subcarrier for Channel 4 without noticeably affecting monochrome video signal. When the trap was removed, color came back perfectly.—*Donald E. Tucker, Washington, D.C.*

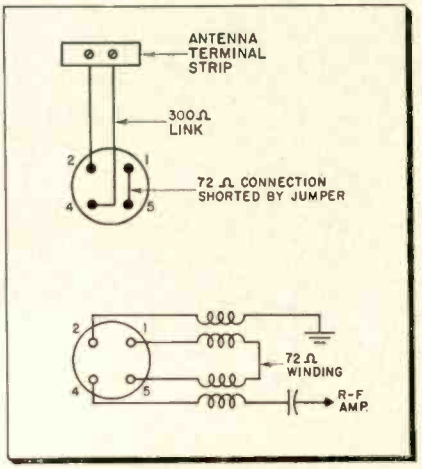
$ For Your "Tough Dog Story"

Have you tangled with a difficult or obscure service problem recently? Write it up, telling us how you licked it, and send it to "Tough Dog" Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., New York 17, N.Y. $10 will be paid for usable material. Unacceptable items will be returned to the contributor.

Open Winding, Weak RF

The favorite expression customers use is, "There must just be a wire loose in the set." How right they were on this one!

An RCA 6-T-53 came in with a very snowy and indistinct picture. Used with rabbit ears, it was unusually sensitive as to position of the aerial. A complete check of tubes and voltages showed nothing abnormal. On our outside antenna in the shop, Syracuse (some 50 miles away) came in very poorly; the local station showed an excellent picture. The trouble seemed to be in the front end, but where?



The antenna matching unit shows provision for both 72-ohm and 300-ohm lines. You will note on the diagram that the winding for a 72-ohm input, connected between points 1 and 5, is shorted out when the 300-ohm input is used. However—and here is the sticker—both coils are wound together to make up the bifilar matching transformer. With one side of the 72-ohm coil open, even though this side was shorted out by the jumper on the connector, the wrong impedance was reflected back into the 300-ohm winding. Hence, a mismatch was created.

When this one little open wire was connected—bango—normal reception returned.—*Stanley T. Curtis, Utica, New York*

NOW AT LAST...

A Reliable, General-Purpose 5" OSCILLOSCOPE

Priced at Only $127.50

The NEW PRECISION MODEL ES-520

The new ES-520 is ***PRECISION***-engineered in response to long and growing demand for a reliable, factory-made, general purpose 'scope at a price within reach of all to whom initial investment is of extreme importance.

The ES-520 conforms to every ***PRECISION*** standard of quality, workmanship and performance. It is a completely factory-engineered, factory-wired and factory-calibrated instrument . . . ready to go to work for you the moment you take it out of its carton!

SPECIFICATIONS

- ★ Push-Pull vertical drive. 20 millivolts per inch sensitivity.
- ★ 3-Step, frequency-compensated, vertical input attenuator.
- ★ Vertical frequency response 20 cycles to 500 KC within 2 DB
- ★ 1 volt, peak-to-peak, built-in vertical voltage calibrator.
- ★ Excellent vertical square wave response from 20 cycles to 50 KC.
- ★ Push-pull horizontal drive. 50 millivolts per inch sensitivity.
- ★ 'H' frequency response 20 cps to 200 KC within 3 DB (at full gain).
- ★ Internal linear sweep 10 cycles to 30 KC. Neg. and pos. sweep synch.
- ★ Tube Complement: 12AU7 'V' cathode follower and amplifier, 6C4 phase-splitter, 12AZ7 push-pull 'V' drive. 6AB4 'H' amplifier, 12AZ7 push-pull 'H' drive. 12AU7 sweep oscillator. 6X4 rectifier, 1V2 high potential rectifier, NE-51 calibration regulator, 5UP1 CR tube.
- ★ Built-in 60 cycle sine-sweep phasing control.
- ★ Beam modulation input terminal at front of panel.
- ★ All 4 deflection plates directly accessible at rear.
- ★ Filter-type, removable, calibrated graph-screen.
- ★ Etched, anodized, heavy gauge aluminum panel.

SERIES ES-520: In black ripple finished, rugged steel cabinet, 8¼ x 14½ x 16½". Complete with all tubes, including 5UP1 CR tube. Comprehensive instruction manual. Code: Quest. Shipping weight: 30 lbs. **Net Price: $127.50.**

...and STILL THE LEADER IN ITS FIELD

for performance, versatility and value—

the popular ***PRECISION*** **ES-500A**

HIGH SENSITIVITY WIDE-RANGE 5" OSCILLOSCOPE

The famous ES-500A incorporates advanced engineering features and refinements so necessary to meet the more critical needs of modern electronic circuit analysis, AM, FM and TV.

SERIES ES-500A: in louvered, black ripple-finished, heavy gauge steel case, 8¼ x 14½ x 18". Complete with removable light shield, calibrating mask and detailed instruction manual. **Net Price: $173.70**

PRE ISIO TEST EQUIPMENT

PRECISION **Apparatus Company, Inc.**

92-27 HORACE HARDING BLVD., ELMHURST 6, N. Y.

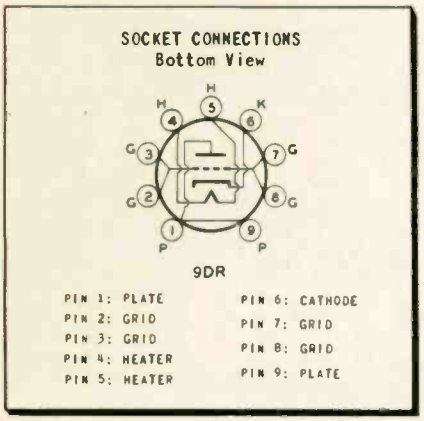
Export Division: 458 Broadway, New York 13, U.S.A. Cables: Morhanex
Canada: Atlas Radio Corp., Ltd., 560 King Street W., Toronto 2B

New Tubes & Accessories

CRTs, TV Types, Tester, Carton & Ventilated Shield

RCA UHF TRIODE

Medium-mu triode of the 9-pin, short-bulb miniature type, the 6BC4, is designed for use as r-f amplifier in cathode-drive circuits



of UHF tuners. Features high gain, low noise and good isolation within the tube between input and load circuits. Tube Department, Radio Corp. of America, Harrison, N. J.—TECHNICIAN

GE TUBE CARTON

Newly designed container completely suspends the tube within its carton. An inner cardboard sleeve, built into the box, improves cushioning and protection. Container

now being used for all GE tubes. General Electric, Electronics Park, Syracuse, N. Y.—TECHNICIAN

Sheldon ALUMINIZED CRTs

New 10-, 12- and 20-in. aluminized pix tubes complete the manufacturer's line of aluminum crt's from 10-in. to 27-in. sizes. Added types include 10BP4C, 10BP4D, 12ZP4, 12ZP4A, 20CP4B and 20CP4D. The last 2 are said to be only ones in that size available in aluminized versions. Sheldon Electric Co., Irvington 11, N. J.—TECHNICIAN

CBS HEAVY-DUTY TUBES

Three ruggedized horizontal-output tubes, 6CU6, 12CU6, and 25CU6, are high-rated equivalents of the 6BQ6-GT, 12BQ6-GT, and 25BQ6-GT. Electrical characteristics and socket-pin arrangements follow those of the prototypes, but the new tubes are said to provide longer life, withstand higher pulse voltages and momentary overloads. CBS-Hytron, Danvers, Mass.—TECHNICIAN

Sylvania 21ATP4

New 21-in. rectangular glass-shell crt features filter glass spherical faceplate, aluminized screen, electrostatic focus, magnetic deflection and external conductive coating. Shorter neck length (20⅜ in.) is due to use of 90-degree deflection angle. Picture area: 263 sq. in. Typical voltages: 2nd-anode—16 kv; grid no. 2—300 v. Picture Tube Div., Sylvania Electric Products, Inc., Seneca Falls, N. Y.—TECHNICIAN

Precise TRANSISTOR KIT

Kit model T1 includes equipment (transistors, transformers, coils, etc.) necessary for the purchaser to acquire basic transistor knowledge through experimental and practical use. Audio one-stage amplifiers, transformer-coupled amplifiers and other circuits are covered in the instruction book, along with the physics of transistors and applications. Price, $17.95. Precise Development Corp., Oceanside, L. I., N. Y.—TECHNICIAN

Raytheon 17AVP4

Four lbs. lighter than conventional 17-in. monochrome crt's and 3⅝ in. shorter due to use of 90-degree deflection angle, type 17AVP4 is designed for use in new-type compact TV designs. Uses electrostatic focus, magnetic deflection. Typical 2nd-anode voltage, 12 kv. Receiving Tube Div., Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass.—TECHNICIAN

Methode VENTED TUBE SHIELD

Ventilator shields improve "hot" tube performance by dissipating heat; are easily handled and com-

pression fitted to ground terminals on laminated or printed circuit sockets. Available in lengths of 1 11/16 in. or 2 1/16 in. with one standard diameter to fit either 7- or 9-pin tubes; tin or black oxide finish. Methode Mfg. Corp., 2021 W. Churchill St., Chicago Ill.—TECHNICIAN

AMS CRT TESTER

Portable cathode-ray tube tester, model 101, is said to provide positive indication within 90 seconds for continuity and emission. Three neon indicators and a meter provide facilities for testing of open connections, shorted elements, leakage, cathode

emission and indication of gaseous tubes. Tests can be made with crt in carton, TV set, cabinet or on the bench. Weight: 5½ lbs. Authorized Manufacturers Service Co., 919 Wyckoff Avenue, Brooklyn, New York—TECHNICIAN

New Test Instruments

Meters & Other Circuit Testers; Instrument Accessories

IDL RESISTANCE CHECKER

Meterless operation is featured in model R-10 Signa-Glow, which uses null-indicating pilot bulbs incorporated in a Wheatstone bridge circuit to measure resistances from 5 ohms to 50 meg. Requiring no calibration or re-calibration, the instrument operates from normal ac line current. A 3-position multiplier switch provides following ranges: Scale reading x.01, x1 and x100. Manufacturer states the tester is more durable, more accurate and

faster to use, because it requires no adjustments, than conventional meters. Industrial Development Laboratories, 17 Pollock Ave., Jersey City 5, N.J.—TECHNICIAN

Sylvania VTVM

The 302 Polymeter offers a subminiature vacuum tube r-f probe, peak-to-peak scale, 7-in. meter movement, lighted scale, a patented linearity circuit, input impedance of 17 megohms, shielded ac and r-f leads, and screw-on connectors. Changes in control arrangement speed switching. These changes include a new selector switch sequence and range switches. Reads peak-to-peak or dc from 200 millivolts to 2,800 volts, ac from 50 mv to 1,000 v, r-f from 100 mv to 300 v (10kc to 300 mc), resistance from .5 ohms to 1,000 megohms and db from —20 to +61.4. The dc range may be extended to 30 kv by using the Type 225 multiplier probe. List price, $129.50. Sylvania Electric Products, Inc., 1221 West Third Street, Williamsport, Penna.—TECHNICIAN

Precision V-O-M

20,000 ohms per volt on dc, 5,000 ohms per volt on ac are features of model 120. 44 self-contained ranges include an extra-low resistance range (2-ohm center scale); an extra-low voltage range (1.2 v full scale) on both ac and dc; and an extended low dc current range (0-60 microamperes). Direct ac or dc voltage readings to 6,000 v; dc current to 12 amp; resistance to 20 meg. Price, including batteries, test leads and manual: $39.95 net. Precision Apparatus Co., 92-27 Horace Harding Blvd.. Elmhurst, Long Island, N. Y.—TECHNICIAN

RCP V-O-M

Model 480 AC-DC Multitester has 1000 ohms-per-volt sensitivity for all dc measurements. Operating features include circuit and range selection by means of both selector switch and jacks, providing protection against burnout and misuse. Meter movement is built to withstand overloads. Radio City Products Co., Inc., Easton, Penna.—TECHNICIAN

Simpson COLOR ADAPTERS

New color adapter cable (Chromatic Probe) and booster amplifier are available for alignment and adjustment of color TV sets. They are externally used accessories for either the model 480 Genescope or model 479 AM-FM signal generator. These accessories quickly convert monochrome sweep marker systems to chromatic systems. Price of chromatic probe is $9.95; booster amplifier is $24.95. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.—TECHNICIAN

EICO PEAK-TO-PEAK VTVM

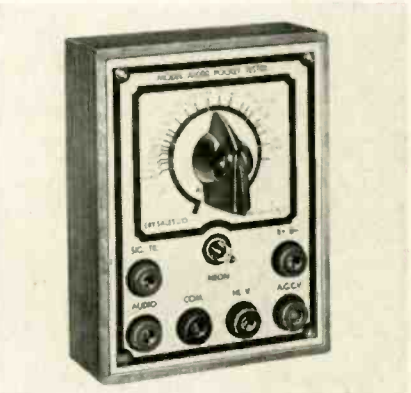
Model 232 peak-to-peak vtvm includes the new dual-purpose ac-dc Uni-Probe. A half-turn of probe tip selects dc or ac-ohms. Features: stable push-pull bridge circuit, unaffected by voltage variation; reads peak-to-peak voltage of complex and sine waveforms, reads rms voltage of sine waves, dc voltage and resistance; center-scale zero adjustment for alignment. Specifications: dc or ac, to 1500 v in 7 ranges (±3% accuracy); peak-to-peak, to 4200 v in 7 ranges. Response from 30 cps to 3 mc (to 250 mc with r-f probe), ±5%. Resistance to 1000 meg in 7 ranges, accuracy ±3%. Model 232-K, kit, sells for $29.95; factory wired, $49.95. EICO, 84 Withers St., Brooklyn, N. Y.—TECHNICIAN

Crest SCOPE CRT BOOSTER

Designed to improve the emission of weak cathode-ray tubes used in test oscilloscopes, this rejuvenator is of open frame construction, and may be mounted to the scope either internally or externally. Crest Laboratories, Inc., 84-11 Rockaway Beach Blvd., Rockaway Beach 93, N.Y.—TECHNICIAN

Eby MULTIPLE TESTER

Pocket-size tester, model A1000, is said to combine functions of several instruments. Some uses: low or high ac or dc voltage measurements, signal tracer, audio oscillator, condenser checker, agc substitution



voltage supply, continuity checker. Complete with instructions, $5.95. Eby Sales Co., 130 Lafayette St., New York 13, N. Y.—TECHNICIAN

Scala 2-WAY PROBE

As a direct probe, the Scala BZ-5 is designed for general trouble-shooting. A flip of the switch converts it into a resistive isolating probe for visual alignment. The latter arrangement (low-pass filter) sharpens up alignment markers and cleans up noisy response curves. Scala Radio Co., 2814 19th St., San Francisco, Calif.—TECHNICIAN

Industry Keyhole

RADIO RECEPTER CO. has changed the name of one of its divisions. The Seletron & Germanium Div. is now being called the Semi-Conductor Div. . . . **GRANCO PRODUCTS,** of Long Island City, N. Y., mfrs of UHF converters, have opened a new plant annex right beside the original building. Production facilities are now more than doubled. Move was made necessary by brisk sale in converters and recent entry into the test-equipment field with announcement of a UHF signal-gain generator . . . **RIDER BOOK-DISPLAY RACK** is part of a stepped-up sales campaign in paperbacks for technical readers. The rotating floor-stand merchandiser holds up to 500 books (66 titles), keeps all titles in full view for easy selection.

TWO HEADS: Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio, announces 2 new magnetic heads, one for record and one for reproduce, designed to meet specs of Cinemascope applications. Details from Dept. RT-3 . . . **CORNELL-DUBILIER ELECTRIC CORP.** has new vice prexy. Recent board of directors meeting elected Leslie A. Johnson to that post, also apptd. him as mgr. of new plant in Sanford, N. C. . . . **BENDIX AVIATION CORP.** will make all radios used in 1955 models of Lincoln and Mercury autos. Shipment of the 8-tube sets begins in early fall.

HAZARD E. REEVES, prexy of Reeves Soundcraft and Cinerama, is in Europe studying latest continental developments in audio and choosing new sites for Cinerama theatres. Reeves Soundcraft got an Academy Award this spring for developing a magnetic recording system for motion pix use . . . **CBS-COLUMBIA** has a new publications mgr. for its Service Dept. Joseph Roche, who holds the post, held a similar position with Du Mont, is co-author of the Video Handbook and the Radio Data Book . . . **GENERAL CEMENT MFG. CO.,** 919 Taylor Ave., Rockford, Ill., has a new serve-yourself counter display for its tools. Display holds a dozen of each of 49 most popular alignment tools.

A VARIABLE AUDIO TIME DELAY, introduced by Kay Electric Co., Pine Brook, N. J., has a variety of applications. The Echo-Vox, as it is called, can be used to time speakers in auditoriums and other large areas so that objectionable echoes are eliminated. On the other hand, the unit can be used to introduce or enhance a desired echo effect . . . **AEROVOX CORP.** of New Bedford, Mass., has put Stanley W. Horrocks in charge of its new Special Products Div. Initial products of the division will be printed wiring and a line of ceramic power and transmitting capacitors.

Setting Up Public Address Sound System

(*Continued from page 20*)

frames should be electrically insulated from those of adjoining speakers; that is to say, no metallic mounting brackets which are common to all speakers should be employed.

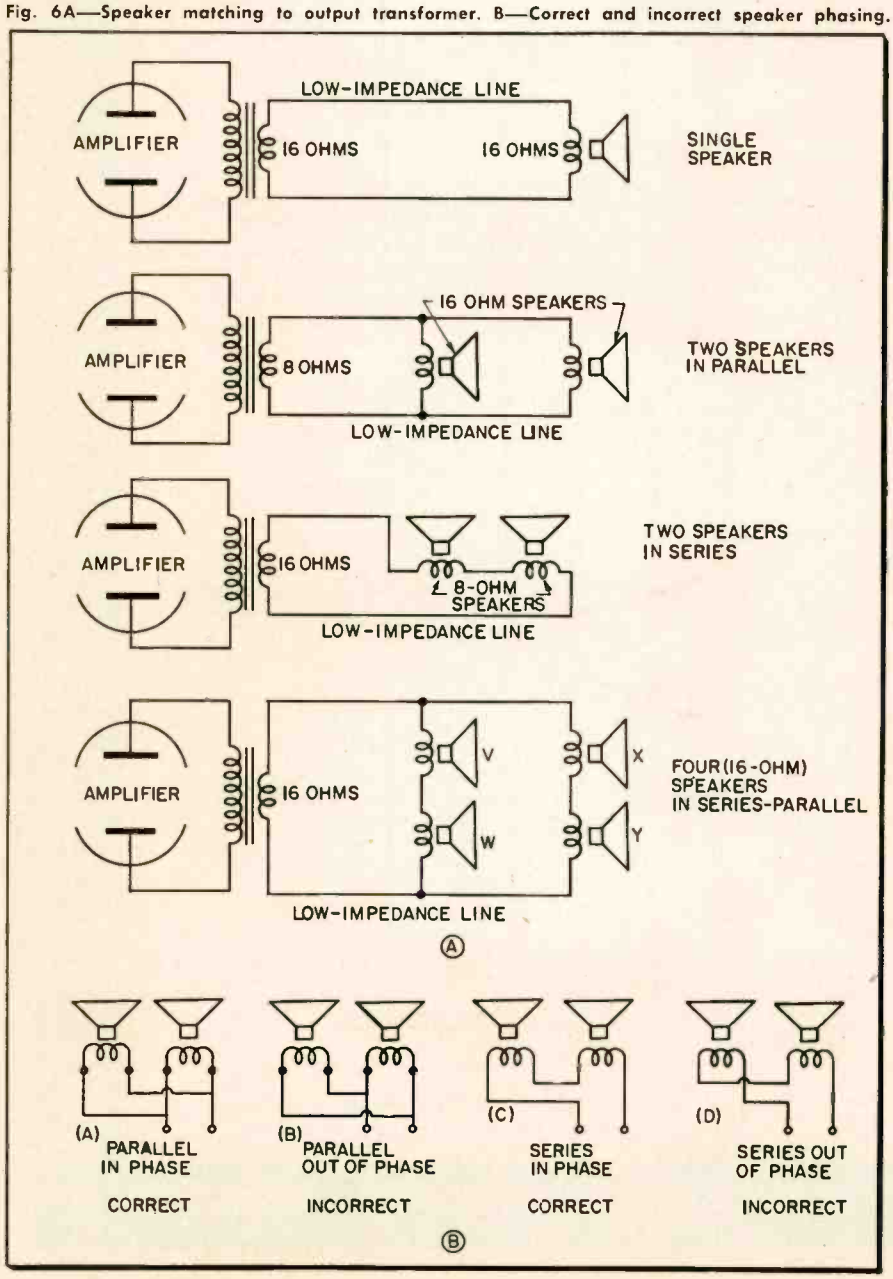
Shown in Fig. 6A are typical speaker connections used when matching to a low-impedance tap of the amplifier output transformer. The top circuit represents a simple paging system. The 16-ohm source impedance is properly matched by the 16 ohm load impedance presented by the speaker.

The second-from-the-top circuit is for two (or more) loudspeakers in parallel. When the individual impedances of each speaker connected in parallel is the same, the total impedance is equal to the impedance of any one speaker, divided by the number of speakers. In *B*, this total

$$\text{or load impedance} = \frac{16}{2} = 8 \text{ ohms.}$$

The next sketch shows two or more speakers in series. The total impedance presented by several speakers in series is obtained by simply adding the individual impedances. In this case, the net or load impedance = 8 ohms + 8 ohms = 16 ohms.

Fig. 6A—Speaker matching to output transformer. B—Correct and incorrect speaker phasing.



The last sketch shows four speakers in series-parallel. The 32 ohm impedance produced by the series connection of speakers V and *W*, is in parallel with the 32-ohm impedance of speakers *X* and Y in series. The overall load therefore equals 16 ohms, and properly matches the 16-ohm secondary of the output transformer.

When two parallel-connected speakers are *not* of equal impedance, divide the produce of their impedances by the sum of their impedances, to determine the net impedance they will offer. The impedance of a 4 and 16-ohm speaker in parallel would be:

$$\frac{4 \times 16}{4 + 16} = 3.2 \text{ ohms}$$

Where more than two speakers of differing impedance are connected in parallel, add the *reciprocals* of the individual impedances, and then take the *reciprocal* of their sum, to obtain the net impedance. The impedance of a 4, 8 and 16-ohm speaker connected in parallel would be worked out as follows:

The sum of the reciprocals of the individual impedances equals $\frac{1}{4} + \frac{1}{8} + \frac{1}{16} = \frac{7}{16}$. The reciprocal of this equals $\frac{16}{7}$, which equals 2.2 ohms.

Speaker Phasing

Phasing is concerned with the utilization of two or more loudspeakers in such a way that the sound from any one speaker does not cancel the sound of any other speakers (and create a dead area between both). This is an important consideration where speakers face the same direction. The connection to the voice coil, whether in series or parallel, must be so made that at any one instant, all diaphragms move in or out *in unison*. For parallel operation, the *like* terminals of each unit must be connected together; if the speakers are wired in series, two *unlike* terminals must be used as a junction. Fig. 6B illustrates these connections.

When the time to test out your system arrives, place all necessary microphones where needed and connect them to the amplifier. Determine the control settings and mike placement at which feed-back occurs with each microphone, making a note of this as a reference for you and other operators of the system. Make whatever corrections are required in output and tone control settings and microphone placement. Get comments from various people to help you in determining the success of your installa-

(*Continued on page 59*)

New Shop Equipment

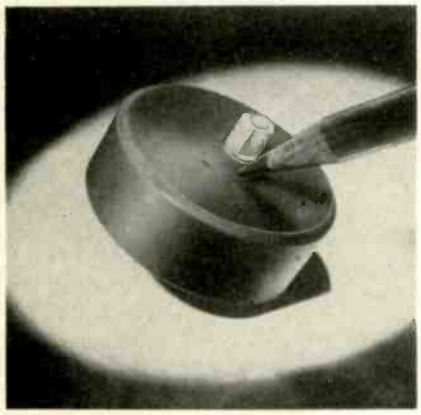
Replacement Components; Units for Sales and Service

Wen SOLDERING GUN

Model 199 features light weight, (1½ lbs.), speed (working-hot in 2½ seconds), long reach and long-life tips. Fully guaranteed. Price, $7.95. Wen Products, Inc., 5808 Northwest Hwy., Chicago 31, Ill.—TECHNICIAN

Aerovox CAPACITORS

Permanently sealed Cartwheel capacitors were developed to meet the requirements of color-TV, are available in ratings up to 30 kv, and



can operate under high humidity or high temperatures. Available in a choice of sizes, voltages and capacitances, as well as several terminal styles. Hi-Q Div., Aerovox Corp., Olean, N. Y.—TECHNICIAN

Mueller SERVICE MIRROR

Mounted on floor stand and using a 3-section telescoping mast, this TV mirror can be adjusted to any height from 13 to 32 in. The mirror (7 in. by 7 in.) swivels on a ball-and-socket joint, can be adjusted to any angle. When collapsed, the light-weight assembly can be carried in tool kit. Complete unit priced at $7.95. Mueller Mfg. Co., 230 Tuscan Rd., Maplewood, N. J.—TECHNICIAN

Astron CAPACITORS

Blue Point molded plastic paper capacitors are designed for continuous high-temperature operation without derating. For use where combination of small size, stability and moisture resistance are prime factors. Astron Corporation, 255 Grant Ave., East Newark, N. J.—TECHNICIAN

Phalo POWER-SUPPLY PLUG

Molded directly to the cable, this power-supply plug is ready for connection with any standard octal radio socket. The need for mechanical fitting of plug to cable is eliminated. Units available to meet any application where from 1 to 11 pins are required, with or without the phasing pin keyed for easy seating in the socket. Phalo Plastics Corp., 25 Foster St., Worcester 8, Mass.—TECHNICIAN

Teflon SPAGHETTI

High-temperature spaghetti tubing of high dielectric strength is available in a wide range of sizes in white, black, brown, red, blue and yellow. The tubing maintains full electrical insulating characteristics even when flexed or bent during assembly and installation, will not melt, burn or decompose while soldering a joint next to it. This tubing offers resistance to water absorption, tending to repel water. Supplied on reels in lengths of 100, 200, 500 and 1,000 feet. Polymer Corp. of Penna., Reading, Penna.—TECHNICIAN

CBS TUBE CADDY

The DeLuxe Caddy incorporates several improvements over the earlier version. These include: scuff-proof vinyl plastic covering; metal corner reinforcements; more space for GT tubes (caddy holds 68 GT tubes, 210 tubes in all); 1-in. deeper tool compartments; roomier door pocket for flashlight, manuals, etc.; a 10 x 12-in. test mirror mounted inside cover; finger-notched carrying handle and non-marring rubber feet. Available from CBS-Hytron distributors. CBS-Hytron, Danvers, Mass.—TECHNICIAN

Ersin SOLDER

Five-core solder in tin-lead mixtures of 60-40, 50-50 and 40-60 are available in Service Paks, mounted on wooden spools. Activated rosin core wets metals rapidly, results in easy tinning. Packs are 50 cents each. British Industries Corp. (Multicore Sales Corp.), 164 Duane St., New York 13, N. Y.—TECHNICIAN

Hunter SLUG RETRIEVERS

Retrieving tools for tuner slugs are now available in 3 lengths—12, 16 and 20 in. The longer shafts, for use in sets on which the tuning units are mounted toward the back, incorporate the same non-magnetized holding mechanism as that of the standard TV-12. To operate, the technician slips the blade of the retriever into the tuning slot and engages the head of the slug, then gives slight forward press on the handle, which causes the tip of the retriever to grip the slug. The serviceman then rotates the slug back into place. The retriever is disengaged by a backward pull on the handle. Hunter Tool Co., 6608 So. Gretna Ave., Whittier, Calif.—TECHNICIAN

Vidaire TEST SOCKET

The Adap-Test has dual sockets with 20 in. of lead extensions to bring socket voltages into the open on inaccessible tubes. Test points are numbered for identification.

Available in 3 models: AT-1 for octal tubes, AT-2 for 7-pin miniatures, AT-3 for 9-pin miniatures. Vidaire Electronics Mfg. Co., 576 W. Merrick Rd., Lynbrook, N. Y.—TECHNICIAN

Stancor FLYBACKS

Said to be exact duplicates, physically and electrically, that do not require chassis or circuit alterations are flyback A-8239, replacement for Motorola part nos. 24K79-2753 and 24K701099, having application in over 100 Motorola models and chassis; and A-8240 replacement for Muntz part no. TO-0036. Stancor Div. of Chicago Standard Transformer Corp., Addison and Elston, Chicago 18, Ill.—TECHNICIAN

Technician's Lighter Side

with Sol Heller

HANDS ACROSS THE SEA. An elderly technician who was visiting London went window shopping with a young English TV serviceman with whom he had made friends. During the course of their stroll, the Englishman pointed to a 7-inch TV set that had been reduced for clearance.

"Blimey, they're only asking 8 pounds for that set," marveled the Britisher. "Why, it's worth 12 pounds easy."

"Twelve pounds?" cried the American incredulously. "Son. I don't know much about your money system, but I wouldn't give you three ounces for that piece of junk."

QUARREL THAT LAUNDRY AWAY. Experiments at Pennsylvania State College indicate that intense inaudible sound waves can be used to wash clothes. If they could only make intense *audible* sound waves do the job, our laundry problems would be over. We'd just get the dirty linen out every time a quarrel with our better half was incubating, then let nature take its course.

THIS OFFER EXPIRES IN SIXTY DAYS. A portable power megaphone has been named "Little Bull." We offer the manufacturer, for free, a fine slogan for his product: "A Little Bull Goes A Long Way."

NIGHTMARE OF THE FUTURE. Whatever happened to that $2 pocket radio that was rumored to be just around the corner early last year? Sounded like a wonderful idea—for everybody except the serviceman, that is. Can't you just hear the customer's howl of anguish when shown his repair bill: "10¢ for a new tube? That's robbery, man!"

BIG BUSINESS. A man who had bought a 21-inch TV set for $2.95, in one of those crazy sales that department stores run from time to time to stimulate traffic, came back to the TV-radio department the next day.

"You having a special sale on antennas soon?" he demanded. "My wife and I will go as high as $1.50 for a good outdoor unit.

GETTING MORE MILES TO THE DOLLAR. "How many miles would 2,836,173 one-dollar bills reach if they were placed end to end?" Motorola recently asked its employees, in a guessing contest. Winning guess was 279.65 miles. Which brings me to my point: If two million-odd dollars can cover 279 miles, why can't one dollar extend to a good meal at my favorite restaurant, seeing that it's only six blocks from my house?

MFRS' Catalogs & Bulletins

CLEAR BEAM ANTENNAS & ACCESSORIES: Full listing of Clear Beam and Tempo antennas, telescoping masts and other accessories. Clear Beam Antenna Corp., 100 Prospect Ave., Burbank, Calif.

INT'L RECTIFIER DIODES: Ratings and specifications on germanium diodes are listed in *Bulletin GD-1A*, 4 pp. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.

SNYDER AUTO ANTENNAS: Full-color catalog describes the complete line of cowl, fender, rear and deck mount auto radio aerials including the Snyder-Matic, whose 3 sections can be raised or lowered by a finger-tip dash control. Free antenna display materials are also listed. Dick Morris, Snyder Mfg. Co., Philadelphia 40, Penna.

WARD ANTENNAS: Separate removable catalog sheets in a folio-type cover keep this catalog, the *Ward Antenna Rama*, up to date by the later insertion of new sheets. Full information on more than 25 models. Free on request. Ward Products Corp., Div. of the Gabriel Co., 1148 Euclid Ave., Cleveland, Ohio.

COMMERCIAL PRODUCTS ANTENNA HARDWARE: 14 types of stand-offs (in 60 sizes), in addition to guy-wire clamps, turnbuckles, U bolts, eyebolts, rings and guy hooks are described in the mfr's latest catalog. Commercial Products, 417 Main St., Toledo 5, Ohio.

AEROVOX CAPACITORS: Hi-Q ceramic condensers, including new Cartwheel types, are described with full electrical and physical specifications in *Hi-Q Ceramic Capacitor Catalog;* 24 pp; illustrated. Hi-Q Div., Aerovox Corp., New Bedford, Mass.

EICO INSTRUMENT KITS: Useful as a condensed catalog or mailing piece, a new 6-page brochure, *Form DMC-554*, gives highlight specs and descriptions of the 38 kits and 42 wired instruments in the EICO line. Electronic Instr. Co., Inc., 84 Withers St., Brooklyn 11, N. Y.

RHEIN SOUND SYSTEMS: An amplifier selection chart, designed to aid in the choice of equipment for specific requirements and listing the manufacturer's 27 amplifiers, is featured in this 4-page folder. Notes on applications are included. Available from distributors or write to Rhein Sound Systems, Inc., 2 Coburn Ave., Orlando, Fla.

HALLDORSON TRANSFORMERS: Expanded line of transformers, with emphasis on TV components, is described and illustrated in *Catalog No. 22*. Chart of audio amplifier tubes vs. output transformers is included. Halldorson Transformer Co., 4500 Ravenswood Ave., Chicago 40, Ill.

JAVEX ELECTRONIC ACCESSORIES: Installation accessories, wall outlets, connectors, feed-through bushings, h-v indicators and display materials are listed in *Catalog 254*, 8 pp. Javex, P. O. Box 646, Redlands, Calif.

GEN'L CEMENT TOOLS: Thirty-six TV tools and five tool kits are included in a listing of special-purpose alignment tools, bench kits and display materials. *Brochure no. 3545*, 4 pp., is available from General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.

BOGEN SOUND SYSTEMS: Indoor and outdoor PA systems, fixed and mobile, as well as complete sound systems and accessories such as mikes and baffles are listed in *Catalog PA554*, 20 pp. Includes a section on selection of systems for specific rquirements. Write to David Bogen Co., Inc., 29 Ninth Ave., New York 14, N. Y.

CORRECTION

ALPHA SOLDERS: Seven solder fluxes and 6 types of bar solder, described on p. 42 (New Products), July TECHNICIAN, are made by Alpha Metals, Inc. For information on these products, address inquiries to that manufacturer at the following corrected address: 56 Water St., Jersey City, N. J.

NEW BOOKS

ELECTRONICS. *By George Corcoran and Henry Price. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 459 pages; $7.00, hard cover.*

All types of vacuum tubes and such equivalents as germanium diodes and transistors are considered, together with the various classes of linear and non-linear operation and circuit applications. Although treatment is basic, a substantial math background is necessary. The text will be most useful to the lab man and the advanced technician who wishes to expand his background.

TECHNICIAN'S GUIDE TO TV PICTURE TUBES. *By Ira Remer. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. 154 pages; $2.40, paperbound.*

Care, handling, replacement, maintenance and repair of crt's are covered in this service technician's guide. Basic parts of the tube, associated accessories and adjustments, and physical and electrical characteristics are presented without complex technical data or formulas. Tube data are in the form of several pages of charts. An appendix describes the 3-gun color tube.

FUNDAMENTALS OF TRANSISTORS. *By Leonard Krugman. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. 144 pages; $2.70, paperbound.*

With the growing use of transistors in electronic equipment, this book's explanation of how these semiconductors operate should be of timely interest to technicians. From basic semiconductor physics, the text goes through the mechanism of operation, and into an analysis of the unit with grounded base, emitter, and collector, respectively. The book also covers transistor amplifier, oscillator and high frequency applications. Common transistor symbols are presented in the appendix.

HOW TO LOCATE AND ELIMINATE RADIO & TV INTERFERENCE. *By Fred D. Rowe. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. 128 pages; $1.80, paperbound.*

The various sources of radio and TV interference are discussed, along with a number of methods for locating and eliminating such interference. Subjects included are antennas, locating equipment, appliances, power lines, TVI suppression in transmitters, and TV receivers.

TELEVISION SIMPLIFIED, 4TH EDITION. *By Milton S. Kiver. Published by D. Van Nostrand Company, Inc., 250 4th Avenue, New York 3, N. Y. 544 pages; $6.75, hard cover.*

This enlarged revised edition contains many new illustrations and schematic diagrams, plus two additional chapters on UHF and color TV. Up-to-date material has also been added on cascode and other TV tuners, keyed agc systems and d-c video amplifiers.

HIGHLIGHTS OF COLOR TELEVISION. *By John R. Locke, Jr. Published by John F. Rider Publisher, Inc., 480 Canal Street, New York 13, N. Y. 48 pages; $0.99, paperbound.*

General review, covering colorimetry, NTSC color signal, color transmitters and receivers, the 3-gun shadow-mask tube, and some details of the associated receiver. Basic principles and processes are described with the aid of block diagrams and other drawings.

TeleTest FLYBACK CHECKER

Yokes, width coils and linearity coils, as well as flybacks, may be tested for shorted turns or continuity without the use of a duplicate reference unit on the TeleTest Flyback Checker. The use of normal receiver operating voltages, rather than 100-120 volts, is said to show up faults that might be obscured by a reduced-voltage test. Positive check of condition on good units as well as bad ones is said to be possible. Priced at $44.95. TeleTest Instruments Corp., 31-01 Linden Pl., Flushing, N.Y.—TECHNICIAN

Transmission

By Edward Abbo

Saxton Products, Inc.

The choice of a proper feed or transmission line is important, if optimum reception is to be achieved. This is particularly true in special-purpose antenna setups (such as community installations) and in fringe installations, where choice of the proper transmission line very often spells the difference between poor, adequate or good reception.

Several types of transmission lines are in popular use. Most widely-used is 300-ohm twin-lead transmission wire. In strong signal areas, twin-lead is normally satisfactory, primarily because of its relatively low cost, and because it is easy to handle. In noisier, weak-signal areas, however, and where the feed-line is quite long, twin-lead becomes inadequate for the following reasons:

TRANSMISSION LINE LOSSES (IN DB PER 100 FEET)

Type of Line	Loss at 100 MC		Loss at 500 MC		Loss at 1000 MC	
	Wet	Dry	Wet	Dry	Wet	Dry
300-Ohm Open Wire	1.20	0.40	2.30	.80	1.9	1.8
300-Ohm Tubular	2.8	1.1	6.8	3.1	10.2	4.8
300-Ohm Flat	7.6	1.5	20.0	3.2	30.0	5.0
RG-59U	—	3.8	—	9.4	—	14.2
RG-11U	—	1.8	—	5.0	—	7.6

1. The dielectric loss (loss across the polyethylene insulation compound) increases greatly as the frequency goes up.
2. The loss becomes even greater in wet weather, or in sea-coast areas which are normally damp.
3. The line material dries out, tends to break or crack, and changes its characteristics after a period of time, thereby requiring fairly frequent replacement.
4. The signal loss becomes prohibitive as the feed-line is lengthened.
5. Because of its flexibility, the line tends to whip about in windy weather, with consequent loss of picture stability, unless adequately anchored.

Coaxial cable is also used quite extensively. There are many different types of coaxial cable. Two types have become more or less standard with the average serviceman. These are identified by the type numbers RG59U and RG11U.

RG59U is most frequently used because it is thinner and easier to handle, and also because it sells for a lot less than the sturdier and more efficient RG11U. RG11U is more commonly used in community installations, and in urban areas for multiple apartment house master antenna installations.

Coaxial cable has an impedance of 72 ohms, and generally speaking, has its largest field of application in areas where noise impulses are prevalent. Its life span is considerably longer than that of twin-lead; in addition, its tough outer jacket is much more resistant to the weather and the elements. Coaxial cable also shields out and rejects noise impulses, and has a much better loss characteristic.

Briefly, coaxial cable (particularly RG11U) is much more expensive than twin lead; it is more difficult to handle, and its impedance (72 ohms) requires special matching equipment in almost all cases, since 300 ohms is the standard input impedance for most television receivers.

In the last two years, two other types of feed line have

Line Review

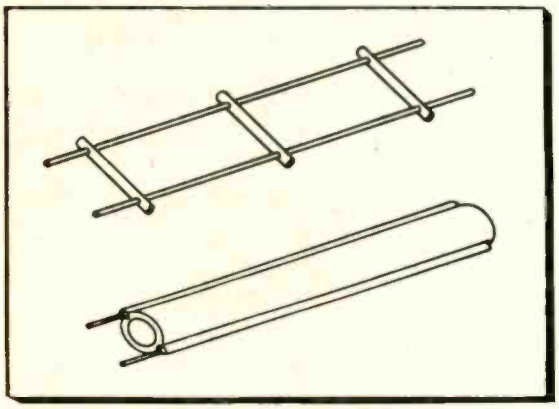
become fairly popular: 300-ohm tubular wire, and more recently both 450-ohm and 300-ohm open-line wire.

300-ohm tubular wire is now being used extensively because it is more weather resistant than the flat 300-ohm lead; its loss characteristics are considerably better, it is less affected by the elements, and it is sufficiently inflexible so that it does not tend to whip around or be affected by high winds.

It has most of the advantages of coaxial cable, besides being much less expensive; it does not, however, have the shielding effect of coaxial cable.

Open-line transmission wire has only recently started coming into its own. Its basic disadvantages are now in great measure being overcome. It was only made in 450-ohm types until recently, thereby negating many of its inherent advantages. Matching stubs were required to change its characteristic impedance to 300-ohms. In its 450-ohm form, it was very unwieldly to handle, due to the large spacing between the wires. These drawbacks, coupled with the fact that there was very little hardware available to extend its application, made its use rather limited. And since its use was limited, and volume sales low, the comparative cost of the line was quite high. Recently, however, improvements in fabricating machinery have made volume production of 300-ohm open-line transmission wire feasible.

(Two disadvantages of open-wire line, when it is used for UHF reception, are: 1—There is appreciable increase



450-ohm open-wire vs 300-ohm tubular line. courtesy Du Mont

in signal loss when the line becomes wet. 2—If the line is run close to a wall or similar object unit, signal losses through absorption are significantly increased. A third disadvantage of the line on both UHF and VHF lies in the fact that its relative inflexibility presents the serviceman with mechanical installation problems—Ed.)

300-ohm transmission wire has some important advantages. For instance, it requires no special matching. It is easy to handle and manipulate (*note our preceding comment—Ed*). In common with all open-line wire, it has the best loss characteristic of any type of commercial transmission wire. It is least affected by changes in weather. Its price also has rapidly approached that of ordinary flat twin lead, the least expensive of all the transmission lines.

The basic difficulty at the moment is a lack of adequate hardware to facilitate its use. With the increasing popularity and obvious advantages of open-wire line, however, this handicap may be overcome soon. The line is now available in copper-coated steel, pure copper, and (for salt-sea areas) in a variation of these, with a covering of Formvar.

Making the Most of Your Test Equipment

(*Continued from page 21*)

of the one usually recommended, but is preferred for this reason: there is no possibility of plates shorting, as exists when the plates are bent inward; furthermore, there is always more room for outward bending than for inward compression.

Calibrating Signal Generator. To properly align sound-stages tuned to 4.5 mc, an accurately calibrated signal generator is necessary. If a 4.5 mc crystal calibrator is available, accurate setting of the i-f presents no problem; if an AM signal generator is being used for marking purposes, however, it should initially be calibrated at this frequency, and re-checked every month or so.

The simplest method of doing this is to clip the output lead from the generator to the insulation on the grid wire of the last sound i-f stage of a TV receiver; a TV station is then tuned in. With the signal generator output turned up fairly high, and the modulation OFF, move the generator dial slowly back and forth from the 4.5 mc point on the scale, and set it at the zero-beat point. The generator signal will now be beating against the 4.5 mc sound signal developed in the video detector and fed to the sound i-f stages. Mark this setting on the signal generator dial as the 4.5 mc point, regardless of the actual scale reading at this point.

The zero-beating is best done during a station break, when no sound modulation is present; if the process is performed at other times, the beat frequency will vary with the modulation, causing it to sound "hashy." With a little practice, however, the zero-beating can be performed fairly accurately even under modulation conditions, since the general over-all sound does vary as the dial is moved.

If a scope is used for observing the zero beat setting, connect it across the volume control, or the discriminator output.

By *zero beat* we mean, of course, the generator setting at which no audible or visible output occurs; output will, of course, be visible or

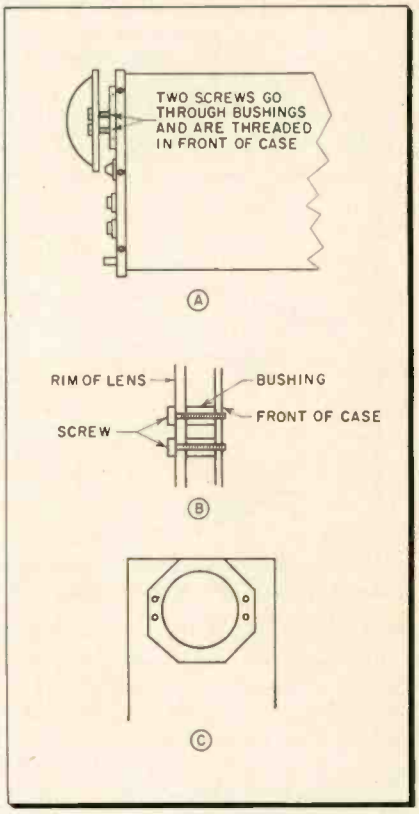


Fig. 3A—Side view of enlarger mounting. B—Mounting detail. C—Front view of unit.

audible at settings directly above or below this one, if it is the true zero beat point.

Enlarger for 3-in. Scope. Technicians who have only an older type 3-in. scope, and who wish to enlarge the viewed pattern on the face of the tube until such time as they can afford a larger and more modern instrument, may be interested in a simple method of bridging the gap between the two. This method consists of securing an enlarging lens (like the one used on the 3-in. Pilot TV receivers a number of years ago) and mounting it in front of the present tube. Fig. 3 shows how one of these lenses was mounted on a 3-in. RCA scope to provide a screen of approximately 4 in. If light reflections from overhead are bothersome, a piece of cardboard shield may be used to form a hood over the lens.

Walsco Markets Low-Cost Antenna

In ordinary metropolitan and suburban areas, an elaborate array or expensively designed antenna is not necessary to get a good TV picture. With this fact in mind, Walsco Electronics has announced the "Scotty" antenna, designed to produce good results on VHF at distances of 20 or 30 miles from the transmitter, and selling at $3.77.

"Scotchman" shows Scotty to Walsco prexy Walter C. Schott and sales mgr. Bob Mueller.

Since its angle may be adjusted, the antenna can also be used for UHF or UHF-VHF applications. Made of reinforced aluminum, the receptor carries a 1-year unconditional guarantee. It may also be stacked for semi-fringe use. Further information from Walsco Electronics Corp., 3602 Crenshaw Blvd., Los Angeles, Calif.

See Test Equipment "Spec" Charts beginning on pg. 34

Using the Oscilloscope for TV Servicing

(*Continued from page 17*)

ate-frequency signals on the scope, a detector must be employed to rectify the modulated signal and remove the radio-frequency carrier. Tubes can be used, but the overwhelming preference is for the simple diode crystal, such as a type 1N64 germanium diode. The entire device can be housed in a commercial-type crystal probe; or else a

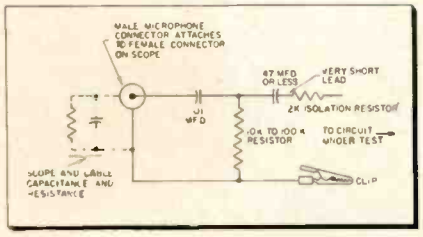


Fig. 6—Schematic of low-capacitance probe.

brass cylinder may be used as the outer casing (the small tube in electric light fixtures makes an excellent casing). A connector may be mounted at one end of this cylinder, to match the microphone coaxial cable arrangement previously mentioned.

A typical shunt diode detector circuit with its filter is shown as Fig. 7A; in 7B, another arrangement which uses a series diode for detection is shown. Either of these setups is entirely satisfactory. The isolating condenser should never be omitted, and may be used in conjunction with an isolating resistor of about 4.7k, if desired.

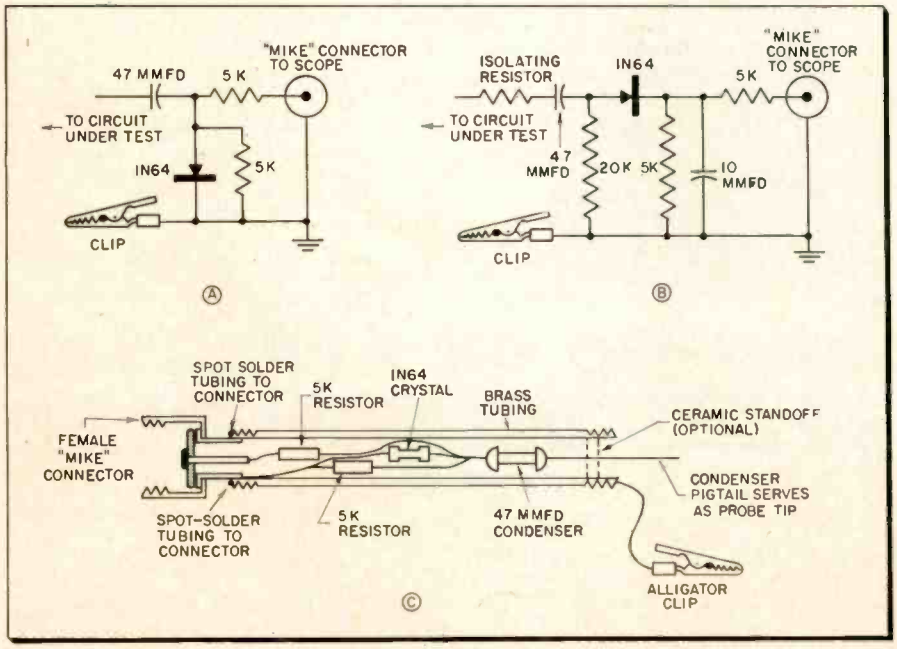
The ends of any isolating resistor or condenser attached to the circuit should be extremely short, since r-f circuits are invariably tuned, and even the shortest possible lead will detune the circuit to which it is applied considerably. The detuning results in a loss of amplitude, which must be taken into account in interpreting the waveshapes obtained with the crystal probe across a tuned r-f or i-f circuit.

Using Tuned Circuit with Detector Probe. A tuned circuit may be employed in conjunction with a detector probe. The tuned circuit comprises a coil (which may be slug-tuned) and a condenser across it (which may be the self-capacitance of the coil). The parallel combination is connected between the probe point and the ground connection of the detector probe. The coil is placed near the tuned (or even untuned) circuit whose waveform is to be observed on the scope. The probe resonant circuit is tuned to the frequency of the circuit under test.

The advantage of the arrangement just described lies in the fact that the coupling can be made relatively weak, with the result that the circuit under test will not be appreciably upset. The coil can be an i-f coil of the same frequency as the one in the circuit under test. No shunting capacitance will be needed in most instances, since the capacitance of the probe and the coil will generally be large enough to provide proper resonance.

Too close coupling between the probe circuit and the circuit under test is to be avoided, since the tuned probe will act as a trap under such conditions.

Fig. 7A—Shunt crystal detector probe. B—Series-type crystal detector probe. Both are used for detecting i-f or r-f modulated signals. C—Pictorial sketch of shunt xtal probe.



"In the first place, the programs are lousy."

Scope Calibration. In the absence of a scope grid, calibration may be achieved as follows:

The vertical deflection produced by some known peak-to-peak voltage is marked on the tube face. Since a 5-inch tube is the most common type employed, obtain about 4 inches of vertical test signal deflection. Divide this height into 10 equal parts, and mark each division on the scope face with a grease pencil, or else use a Crayola wax crayon.

Use the shop's tube tester as the source of the calibrating voltage. Do *not* use the test signal from the scope heater supply, since you do not know exactly what its voltage is at any instant. With a tube tester, you can set the line voltage to deliver a metered amount of filament or heater voltage to the filament terminals of some tube socket on the tube-tester face; these terminals may then be connected to the scope's vertical input for calibration purposes.

Technical new products on pgs. 40, 44, 46, 50, 60

P. A. Sound System

(*Continued from page* 48)

tion. Have the purchaser of your system appoint someone (if he won't do it himself) to operate the unit. Explain the various applications and limitations of the system.

A p.a. system in most cases becomes an important instrument in conducting your client's business. In case of failure or trouble, your client may be out of business, with possible loss of customer prestige. Providing spare fuses and tubes for your customer is a thoughtful act that will, in the end, bring in more revenue than the service income possibly lost by such a procedure.

Show the customer (or his representative) the location of the power plug and the fuse-holder, and describe how he can gain access to and replace the tubes. Discuss the proper manner to handle and store microphones. Every possible bit of consideration and help you can give your client in maintaining his public address system will promote reliable and consistent functioning of his setup. This will enhance your reputation, and stimulate new p.a. business for you via word-of-mouth recommendations.

New Product Briefs

SUPERIOR SUPER METER: New twist in this v-o-m is a built-in isolation transformer to insure automatic protection when used for servicing transformerless receivers. Net price is $28.40. Superior Instruments Co., 2435 White Plains Rd., New York 67, N. Y.—TECHNICIAN

JACKSON WIDE-BAND SCOPE: Flat within 1 db from 20 cps through 4.5 mc, this scope is useful for general TV servicing, and particularly for color. Increased sensitivity may be obtained by reducing bandwidth to 100 kc for low-frequency work. Incorporates retrace blanking, intensity modulation input, calibrating voltage. Jackson Electrical Instr. Co., 18 S. Patterson Blvd., Dayton, Ohio.—TECHNICIAN

DALTON PORTABLE JIG SAW: Model D-500, useful for rough-in work, is a portable electric jig saw that can cut straight lines, curves or designs in wood, plastics, metal and rubber. Pistol grip. Built-in compressor acts as cooling unit, blows sawdust away from guide lines. Kapner Hardware, Inc., 2248 2nd Ave., New York 29, N. Y.—TECHNICIAN

E-V HI-FI MIKE: Cardioid microphone 666, with high front-back ratio, has response from 30 to 15,000 cps. Light, slim design. Electro-Voice, Inc., Buchanan, Mich.—TECHNICIAN

ALLIANCE first with AUTOMATIC GARAGE DOOR OPERATOR

THAT'S PRICED LOW FOR THE MASS MARKET

$179.95

OFF-SEASON PROFITS FOR TV DEALERS

THE ELECTRONIC

LIFT-A-DOR

Alliance

OPENS • CLOSES • LOCKS GARAGE DOORS

Automatically. A RADIO-CONTROLLED "NATURAL" FOR RADIO AND TV SERVICE DEALERS AND INSTALLERS!

More than 15,000,000 homes are prospects!

Fast—Easy Installation—Alliance Lift-A-Dor Is a Packaged, Quality, Low Priced Unit. Fits Nearly All Overhead Doors —Takes Only Ordinary Tools and 'Know How' To Install.

AVOID SEASONAL SLUMPS WITH THE ELECTRONIC ALLIANCE LIFT-A-DOR!

AMAZING LOW PRICE!

The first dependable fool proof garage door operator, fully guaranteed at a price all can afford! A real convenience —a protective necessity that saves work—simply push a button!

TV DEMONSTRATIONS!

Alliance TV spots like those making Alliance Tenna-Rotor famous, will show and demonstrate Lift-A-Dor to millions of TV viewers.

Newspapers—magazines—point-of-sale displays pre-sell!

WRITE THE FACTORY FOR FACTS!

A radio impulse transmitter in car, operated by push-button on dash is pre-tuned to receiver in garage which raises or lowers door automatically—locks, unlocks and turns on light. Installation takes no digging—no outdoor wiring, no special tools. Write for catalog and complete information.

THE ALLIANCE MANUFACTURING CO. • ALLIANCE, OHIO

Makers of the Famous Alliance Tenna-Rotor

CBS, RCA Color CRT's

CBS Colortron 205

The CBS-Hytron Colortron 205 (RETMA type 19VP22) offers viewers 205 sq. in. of picture area on a 19-in. round tube with a glass envelope. This new 3-gun shadow-mask design is electrostatically focused; instead of using an electrostatic convergence system, it incorporates an electromagnetic one.

The deflection angle is 62 degrees; typical 2nd-anode voltage is 25 kv. As in the earlier CBS color tube, phosphor dots are deposited directly on the spherical glass faceplate.

Magnetic convergence is accomplished as follows: 3 pairs of pole pieces are mounted in the tube above the anode and spaced 120 degrees apart. 3 external electromagnets, mounted on the tube neck, create magnetic fields which are induced into the pole pieces to provide dynamic convergence control of each of the 3 electron beams. To compensate for slight variations in manufacturing, small dc fields may also be induced in these pole pieces.

The electromagnets provide adjustment for each of the 3 beams. In case additional adjustment is needed to achieve convergence, an external positioning magnet is provided for one beam, the blue one.

Introductory price of the tube to set makers is $175.

RCA 21-in. Tube

A new and improved 21-in. tricolor kinescope with a picture area of 250 sq. in. has been developed by RCA, and will be demonstrated on Sept. 15. The tube has a round metal envelope, is relatively shorter than those produced previously, and is 25% lighter than 19-in. glass color tubes. A filter glass face-plate and new gun provide improved picture contrast.

The most significant improvement is the new RCA curved shadow mask and mounting system, which make possible simplified mechanical mounting in the tube, and greater beam power input during operation without objectionable mask distortion. The phosphor dots are on the face-plate. The manufacturer reports accurate and stable registration, and absence of color impurity around the picture edges.

Introductory price of the tube to equipment manufacturers is $175.

News of the Industry

Low-Priced Tape Playback

Owners of record players can convert these devices to handle prerecorded tapes with a new nonrecording playback-only unit announced by Bell Sound Systems, 555 Marion Rd., Columbus 7, Ohio. The tape player, which is attached to the turntable of any 78-rpm manual record player and may also be mounted on many automatic changers, is available in 2 models. Frequency response for model 375 (3¾ in. per sec.) goes from 50 to 6500 cps; response for model 750 (7½ ips) ranges from 50 to 10,000 cps. Either unit accommodates 5-in. reels with dual-track tapes and feeds its output directly into equipment designed for standard magnetic phono cartridges. Where a magnetic input is not part of the equipment, the model 2246 pre-amp may be used. The units are only 10 in. square, sell for $29.95 each.

Muzak Switches to Tape

Pioneer in the field of functional background music, the Muzak Corp. is converting its operation from one using discs to one relying on tapes. The change-over should be completed this summer. Heart of the new system is a new tape player that accommodates 4800-ft. reels. Subsonic signals recorded on the tape automatically key the following functions: starting, stopping, pre-selection of specialized music, rewinding and changing of tracks. Two such machines used in tandem can go on playing indefinitely. Muzak is now engaged in transcribing its complete disc library of 7,000 pieces to tape.

RETMA Activities

At a meeting of the RETMA Service Committee, chairman Harold Schulman noted that the cost of servicing will become more important as selling prices of sets are reduced. Technical training, he noted, is important in the development of an overall improvement in servicing. In addition to making widely available the complete RETMA course for training advanced service technicians, the organization has conducted its first teacher training course at the New York Trade School in July. Thirty teachers in trade and vocational schools attended. Also being considered is a program of community cooperation which will serve to identify technically competent technicians.

JFD Opens New Lab

Atop the building occupied by JFD Mfg. Co., 6101 16th Ave., Brooklyn, N.Y., is a new penthouse-laboratory built to test antennas under actual use conditions. Headed by chief engineer Doug Carpenter the lab houses a polar recorder, generators, field-strength meters, a transmitter and other equipment for testing antennas. Lining the edges of the roof are experimental antenna designs undergoing try-outs.

Du Mont Hits Big Networks

Two networks enjoy a virtual stranglehold on TV broadcasting, said Dr. Allen B. Du Mont in a statement filed with the Senate subcommittee holding hearings on UHF problems. FCC stoppage of new-station construction in 1948 left the nation with a large number of operating stations affiliated with either of the two big chains. The freeze, which lasted more than 3 years, gave these networks a head start that has put smaller competing companies at a disadvantage, Du Mont stated.

NEDA Activities

The 1954 Battery Index, published by the National Electronic Distributors Association, 228 N. La Salle St., Chicago 1, Ill., is available free in single copies, at $5.75 per hundred in larger quantities. The index uses a single code for identifying batteries of all makes regardless of the manufacturer's numbering system. NEDA is now organizing a meeting with representatives of all manufacturers to check the index. The overall plan is to make certain that batteries now listed as being electrically interchangeable are also physically interchangeable.

Parts and equipment distributors attended a NEDA seminar held in Seattle, Wash., on July 24, 1954. Topics discussed were the impact of color TV on distributors, cost of operation in today's economy and proper selection and training of sales personnel.

News of the Reps

"THE REPRESENTATIVES" have a new slate of national officers, elected at the annual delegates meeting in New York. New execs, together with chapter affiliations, are: Wally B. Swank, prexy (Empire State); Dean A. Lewis, 1st vice-prexy (California); Ross C. Merchant, 2nd v-p (Wolverine); John J. Kopple, 3rd v-p (New York); David M. Lee, secy. (Pacific Northwest); and Harry Halinton, treas. (Chicagoland) . . . The organization now has 649 members, including 12 in foreign countries . . . **CHICAGOLAND CHAPTER** has also installed new officers: Roy J. Magnuson, prexy; Karl D. Engle, v-p; Helen K. Beebe, secy; and Joe K. Rose, treas.

GEORGE PETTIT CO., 349 N. Ashland Ave., River Forest, Ill., was appointed jobber sales rep for United Catalog Publishers in Illinois, Indiana and Wisconsin.

EDWIN DURHAM SCHANE, JR., Atlanta, Ga., has been added to the staff of the Morris F. Taylor Co., Inc., mfrs' representatives, as a dealer contact man in the southeast.

GENE PIETY, 2030 Home Rule St., Honolulu, Hawaii, now represents the Halldorson Transformer Co. in Hawaii.

M. F. KLICPERA CO. will represent the Thordarson-Meissner Co. in Oklahoma, Arkansas, Louisiana and Texas . . . The same manufacturer will be represented by the **HYDE SALES CO.** in Montana, Idaho, Wyoming, Utah, Western Nebraska, Colorado and New Mexico.

FLOYD FAUCETT & SON, 2380 Sewell Rd., S. W., Atlanta, Ga., will represent Tricraft Products Co. in Virginia, N. & S. Carolina, Georgia, Florida, Alabama, Mississippi and Tennessee.

BURTON F. HOMSHER, 2018 Jessie Ave., Fort Wayne, Ind., will cover Indiana and Kentucky for Commercial Products of Toledo, Ohio . . . **WILLIAM B. MOOZA**, National Sales Development Co., 7 E. 42nd St., N. Y. C., will represent the same manufacturer in New England . . . **BARSTOW & DORAN**, 1406 S. Grand Ave., Los Angeles, Calif., will represent C-P in S. California, Arizona and Hawaii.

PAUL KURTZ CO., Detroit, Mich., will contact distributor and industrial accounts in Michigan for the Insuline Corp. of America, Manchester, N. H.

MARSHANK SALES CO., 672 S. Lafayette Pk. Place, Los Angeles, has added 2 sales engineers to its staff. They are **WILLIAM HOOPER** and **E. R. CHAMPION.** Marshank covers southern California, Arizona and southern Nevada.

ADVERTISERS INDEX
AUGUST, 1954

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.

PAUL H. WENDELL

EDITOR AND PUBLISHER OF

SERVICE MANAGEMENT

WRITES ABOUT

THE MARK of the PROFESSIONAL

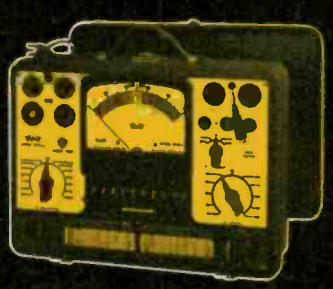
"... In the television service shop of today an observer can quickly spot the expert professional technician by observing his modus operandi or manner of working. The tools of his profession are scopes, signal generators, tube testers and vacuum tube voltmeters. They are there at his fingertips—not for use on occasional jobs, but for consistent use on all jobs."

Reprints of Mr. Wendell's complete article "The Mark of the Professional" are available at no cost from your parts jobber or from Triplett Electrical Instrument Co., Bluffton, Ohio.

TEST EQUIPMENT STANDARDS ARE SET BY

TRIPLETT

Model 650. Vacuum Tube Voltmeter $69.50 net. One probe ACV and RF peak to peak measurements. One selector switch all ranges.



Model 3413-A. Tube Tester $79.50 net. The only tester in its price range to get at each tube pin and make an open and short check.

Model 3436 UHF Marker-Signal Generator $169.50 net. For calibrating front ends and converters—all that is needed in *one* instrument.

Mocel 3441 Oscilloscope $199.50. Peak-to-Peak Voltmeter. Exclusive reversible polarity simplifies wave form reading.

capacitor replacements

FOR SETS OF THE MONTH

DUMONT CHASSIS RA-312, 313

Symbol No.	Rating MF @ WVDC	DuMont Part No.	Sprague Replacement
C286	80+40+10+4 @ 350	03151425	TVL-3792 / TVA-1601
C287	10 @ 450/80+10 @ 350/ 10 @ 50	03151426	TVL-4675 / TVA-1705
C288	5 @ 100	03138362	TVA-1402
N201	Integrator Plate	88000631	V-1

RCA CHASSIS KCS88J, KCS88K, KCS88L, KCS88M, KCS88VA

Symbol No.	Rating MF @ WVDC	RCA Part No.	Sprague Replacement
C114	100 @ 250	79314	TVL-1535
C132	80 @ 400/80 @ 200	79147	[1]TVL-3764
C134	100 @ 400/30 @ 50	79146	[2]TVL-3672

NOTES

[1] Parallel 40 MF sections
[2] Parallel 10 MF and 20 MF sections

RAYTHEON CHASSIS 17T18, 21T19

Symbol No.	Rating MF @ WVDC	Raytheon Part No.	Sprague Replacement
C219	25 @ 450/100+10 @ 300/ 60 @ 50	8C-23689	TVL-3574 / TVA-1711
C504	150 @ 150	8C-22463	TVL-1430
C505	150 @ 150	8C-22464	TVL-1430
C305	Integrator Plate	17A-22376	V-1

ADMIRAL CHASSIS 21A3Z

Symbol No.	Rating MF @ WVDC	Admiral Part No.	Sprague Replacement
C204	4 @ 50	67A4-9	TVA-1303
C411	20 @ 300	67A4-18	TVA-1608
C501	100+60 @ 350/20 @ 200	67D15-105	[1] TVL-3640 / TVA-1613
C503	40 @ 300	67A4-19	TVA-1611
C504	80+10 @ 200/20 @ 50	67D15-106	[2]TVL-4579
M401	Integrator Plate	63C6-9	V-1

NOTES

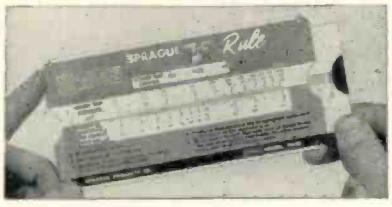
[1] Parallel 60 MF and 40 MF sections
[2] Parallel 40 MF sections

Sprague makes more capacitors . . . in more types . . . in more ratings . . . than any other capacitor manufacturer. Send 10c for 48-page TV Replacement Capacitor Manual to Sprague Products Co., 65 Marshall St., North Adams, Mass., or get it FREE from your Sprague distributor.

MAJESTIC CHASSIS 115, 116

Symbol No.	Rating MF @ WVDC	Majestic Part No.	Sprague Replacement
C36A, C58A, C92A, C141A	40+40+4+4 @ 450	C-5.435-3	TVL-3785 / TVA-1702
C70C, C73C, C89C, C95C	40+40+4+4 @ 450	C-5.435-3	TVL-3785 / TVA-1702
C72G, C139G	100+25 @ 50	C-5.429-2	TVA-1310 / TVA-1306
C93B, C94B, C106B	40+40+8 @ 450	C-5.435-4	TVL-3785
C63, C64, C65, R65, R66, R67	Integrator Plate	B10.101	V-1
C138, R129, R130	Triode Coupling	B10.103	T-1

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, Massachussets. They're only 15¢ each.

DON'T BE VAGUE...INSIST ON

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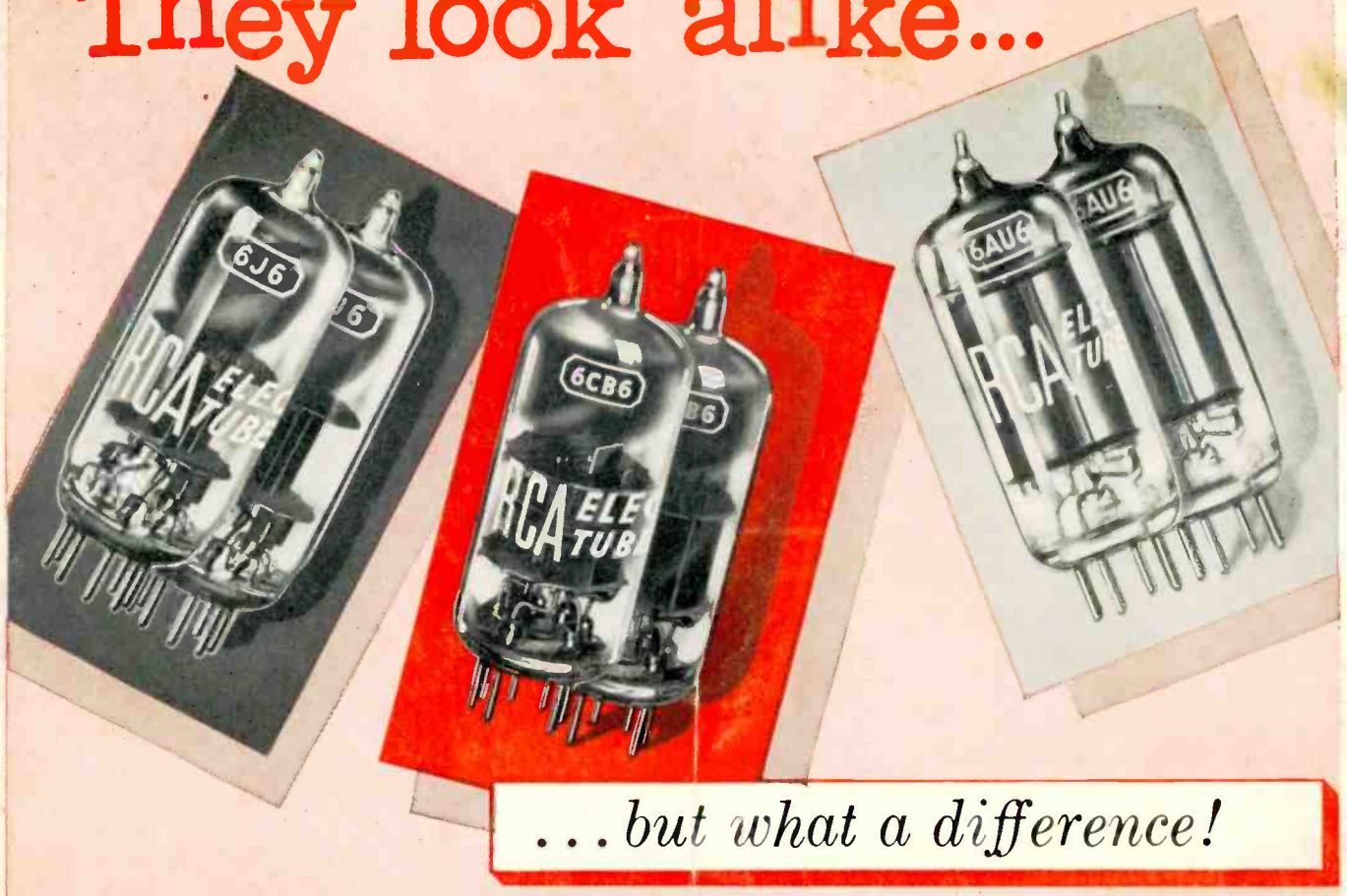
(Distributors' Div. of the Sprague Electric Co.)

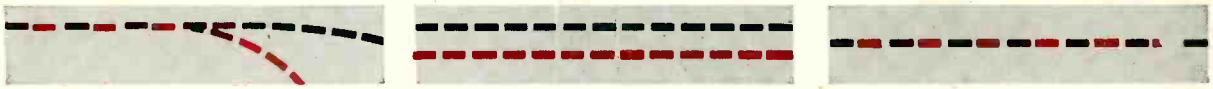
They look alike...



...but what a difference!

These RCA types today give you...

LONGER LIFE | **SUPERIOR PERFORMANCE** | **AT NO EXTRA COST**



Here are 3 more examples of how regular RCA receiving tubes are constantly being improved to meet the changing requirements of radio and television applications. These RCA types provide you with the superior performance usually claimed for higher priced specialty designed types.

RCA-6J6 features pure tungsten heaters for improved life . . . uses a special cathode material to help maintain characteristics throughout the life of the tube. Each tube mount is adjusted to provide increased uniformity of characteristics of each triode unit.

RCA-6CB6 uses a No. 2 grid of improved design, resulting in lower grid operating temperature and longer tube life. Special controls on materials and processing improve uniformity of plate cutoff and reduce variations in characteristics when heater voltage fluctuates.

RCA-6AU6 uses a double helical heater, resulting in an extremely low hum level. Inverted pinched cathode reduces possible motion of tube elements thus minimizing microphonics.

The superior performance of *regular* RCA receiving tubes—at *regular* prices—eliminates unnecessary callbacks, assures you of greater customer satisfaction, results in increased profits for you.

When you sell a receiving tube, your reputation and profit depend on its *performance* and *reliability*. So, you can't afford to buy anything less than the best in receiving tubes . . . and the best are RCA.

RADIO CORPORATION of AMERICA

ELECTRON TUBES — **HARRISON, N.J.**