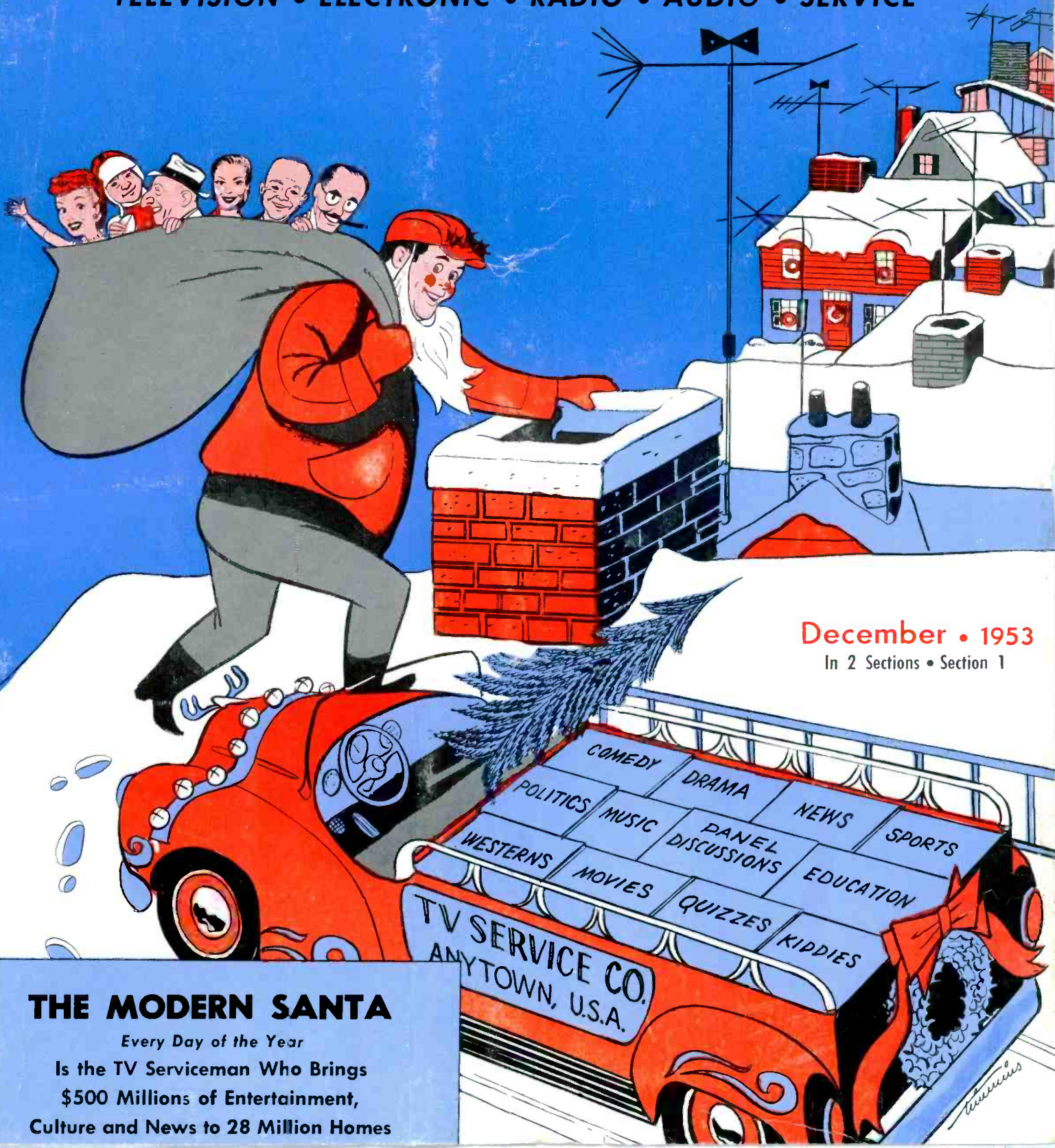


Formerly
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TECHNICIAN

TELEVISION • ELECTRONIC • RADIO • AUDIO • SERVICE



December • 1953

In 2 Sections • Section 1

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NO. 1

CHOICE

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*Not Claims! Not Predictions!
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Technicians prefer IRC TV Controls
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Wherever the Circuit Says 

With Complete
Color-TV
Schematic

TECHNICIAN

(Formerly the TECHNICIAN SECTION of "TELEVISION RETAILING")

For Color-TV Set
To Operate on
NTSC Standard

Color TV is Coming Fast

"GET READY FOR COLOR TV!" is advice given TV servicemen by industry leaders. They see early approval of NTSC standards by FCC, leading to marketing of first color receivers in 1954. Probably 1% to 3% of TV production will be color sets this coming year (50,000 to 100,000 color receivers). In '55, 20% to 25%, (1 million color sets). In '56, 35% of total production (2 million color sets). By the close of '58, we estimate 28% of total TV sets in use will receive in full color.



TUNING IN THE COLOR PICTURE at New York demonstration last month—most impressive color-TV show-

ing to date on NTSC standards, presented by RCA. Traveling over a 4,000-mile relay, the program was also viewed in Burbank, California. Color quality was excellent. Subtle hues and textures reproduced very well. Color film, making its bow on transcontinental TV, compared well with the live portion of the show. Due to enhancing effect of color, smaller-size picture tubes seem to be acceptable from normal viewing distance. Parts of program were shown in black-and-white for comparison. Defects still evident: slight "crawling" noted at close range, but not disturbing; some pin-cushioning of pix and raster, possibly due to tube design; smearing of pix content in fast-motion sequences. The latter, also evident on black-and-white portion of show, may not be a peculiarity of color-TV. Tube "bugs" may be at fault.

COLOR-TV, FAMILY ROWS!—Color television seems certain to precipitate some lively family discussions. The wife, who has deferred to the head of the house in black-and-white TV matters, may be coming into her own. The hoots and howls that are set up when the husband insists he has properly tuned in magenta can be very disturbing to masculine dignity. The severest critics of color TV are apt to be the girls; they are going to love to tinker with the chrome control.

Look Inside for Technician's

COLOR-TV RECEIVER SCHEMATIC NO. 2

Last September, TECHNICIAN scooped its competitors by publishing the first complete schematic of a TV color receiver built to receive the NTSC standard signal. We now present an improved schematic of a color set. This receiver, while still in the experimental stage, will probably be the prototype of the first commercial color sets to reach the market.

A number of stages closely resemble those present in black-and-white sets. These include the front end, keyed AGC, automatic frequency control, and sync separator stages. The video IF amplifier is similar to the corresponding section in a black-and-white set, but has characteristics necessitated by the nature of the color signals it must pass. A regulated kickback high-voltage power supply is present.

The sound section differs from the conventional intercarrier set-up in black-and-white sets in only two basic respects: 1—The sound signal is taken off in the plate circuit of the 5th video IF stage, instead of in the video detector or video amplifier. 2—Step-down of the high-frequency sound IF signal to 4.5 MC takes place in a quartz crystal detector circuit, instead of in the video detector.

In a coming article, stages devoted exclusively to the processing of color signals (lower right-hand section of schematic) will be discussed. Further color schematics will be presented as manufacturers complete new designs.

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

COLOR

SHORTS

NBC COLOR SHOWS to be put on the network during December and January, include the following:

Dec. 5 Your Show of Shows

Dec. 16 Kraft Theatre

Dec. 20 Amahl and the Night Visitors.

Jan. 1 Tournament of Roses

Jan. 11 Kate Smith

Jan. 21 Dinah Shore

Employing NTSC standards, these shows will be produced in full color, and with FCC permission will be transmitted on the NBC network in color. Observers with experimental color TV receivers will see them in color; the 27,300,000 present ordinary receivers will be able to pick them up in regular black-and-white.

COLOR TV IN HOME—In Old Greenwich, Conn., 30 miles from the Empire State Tower, Jack Gould, radio editor N. Y. Times, viewed the Oct. 30 "Carmen" color broadcast on an Emerson experimental color receiver. He reports: "Tuning a color receiver, about which there has been considerable discussion, proved surprisingly easy. The familiar controls on the black-and-white receiver—station selection, fine tuning, brightness and contrast controls—are first adjusted in the conventional way. Then the one major new control—the chrome control—is used. When this control is in the counter-clockwise position, the picture is black-and-white. Turn the chrome control to the right and the color springs onto the screen in all its brilliance. Depending upon how far the control is turned, one can have a choice between barely discernible tints to

deep hues. A half-way adjustment, producing delicate and restful shadings, seems best."

CONVERGENCE CONTROL—"There is also another control that may need occasional adjustment," continues Gould. "It is called the convergence control and determines whether the primary TV colors—red



Emerson color-TV demonstration receiver, with 14-inch picture, tentatively priced at \$700. Cabinet 36 in. wide; 28 in. deep.

blue and green—are each in their correct place on the center of the picture tube. By and large, the adjustments on a color set are more critical than on a black-and-white receiver but there is one advantage over a monochrome set. The contrasting hues act much like a "tuning-eye" and for the layman it is easier to tell whether the adjustments are right or wrong."

DARKENED ROOM—"Pending the development of color tubes of greater brilliance, on which substantial progress already has been made, the room lighting must be turned down or even off to watch color. But with the images in different hues there is not the sense of glare that comes from watching monochrome video in a darkened room. The size of the color picture seen was roughly twelve inches," explained Editor Gould.

COLORS VIVID, WARM—"The most effective colors were produced when the stage background was not too dark," concluded Mr. Gould. "Then the colors had vividness, warmth and variety. During some of the darker scenes there was a trace of green overcast, apparently introduced for special effect, that at home

proved somewhat disconcerting. On the whole, however, the electronic reproduction of delicate shadings seemed pure magic. Color TV in the home now is much better than the earliest black-and-white."

LAWRENCE COLOR-TUBE has Crosley as its first manufacturer licensee. This tube, invented by the famous creator of the cyclotron and Nobel Prize winner, Dr. E. O. Lawrence of the University of California, employs alternate strips of red, green and blue phosphors onto which the beam of electrons is directed by a grid of parallel wires which when charged exert a lens action on the beam. In the Lawrence tube only a single electron-gun is employed. That absence of masking makes effective a much larger proportion of the swinging electron beam, is one of the principal claims for the new tube. Its construction makes readily available picture sizes as large as 21 and 24 inches, comparable to present black-white popular sizes. Use of a single gun is declared to improve reception quality of the Lawrence color-tube when receiving standard black-white pictures.

RICHARD HODGSON, president of Chromatic TV Laboratories, affiliate of Paramount Pictures, and developer of the new Lawrence tube, completed the color-tube licensing arrangements with Len Cramer, now Crosley general manager, formerly with DuMont Laboratories. Crosley will produce the Chromatron in its Batavia, Ill., tube plant where production facilities will be converted as rapidly as demand requires, following FCC color approval, and when network color television begins. Mr. Cramer said that a pilot line for color tubes at Batavia has been in operation for some time and that the granting of the license by Chromatic is expected to accelerate this program.



Dr. W. R. G. Baker, Chairman NTSC, presents FCC Chairman Rosel Hyde with 60 lb. of technical data supporting new color-TV standards.



Lawrence color-TV tube demonstrated to Crosley's Len Cramer (left) by Chromatic Labs' president, Richard Hodgson.

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CIRCULATION

This issue: 44,000. Guaranteed circulation
 by January 1954:

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TECHNICIAN, December 1953, Vol. 58, No. 6.
 50 cents a copy. Published monthly by Caldwell-
 Clements, Inc., Publication Office, Emmett St.,
 Bristol, Conn. Editorial, Advertising and Ex-
 ecutive Offices, 480 Lexington Ave., New York
 17, N. Y. Entered as second class matter at the
 Post Office at Bristol, Conn., Nov. 4, 1953,
 under the act of March 3, 1879. M. Clements,
 President; Orestes H. Caldwell, Treasurer. Sub-
 scription rates: United States and Canada, \$4.00
 for one year; \$6.00 for two years; \$8.00 for
 three years. Pan-American and Foreign countries:
 \$7.00 for one year; \$10.00 for two years;
 \$14.00 for three years. Printed in U.S.A.

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DECEMBER, 1953

TECHNICIAN'S SECOND COLOR SCHEMATIC—Complete circuit of an experimental TV color
 receiver that will probably be the prototype of the first commercial color sets. Section 2 of
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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

THIS ANTENNA 

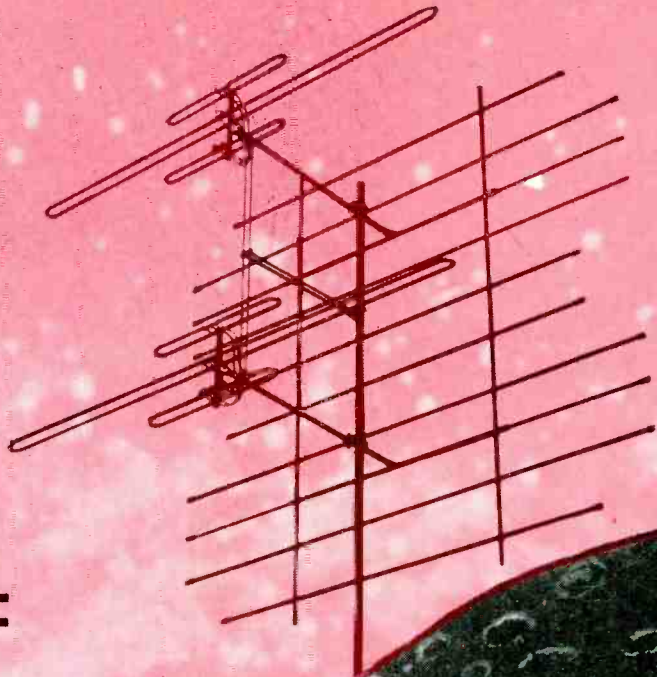
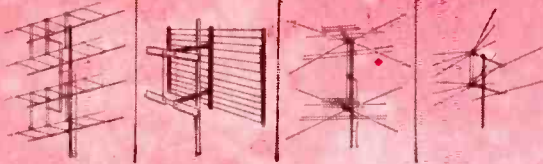
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this ...

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or this



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and many Yagis, too!

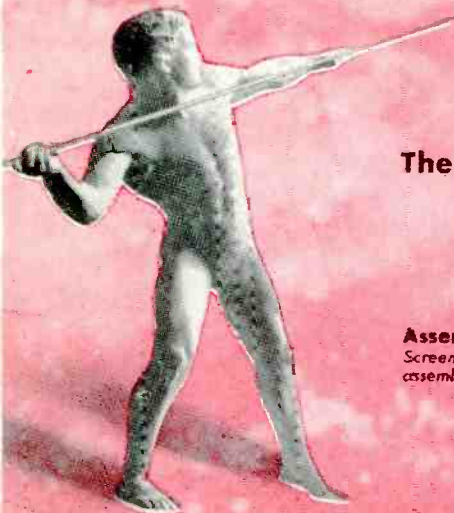
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Folded dipoles throughout give close to 300 ohms impedance across entire band. Lightweight, all-aluminum construction. Available in one, two, or four-bays.



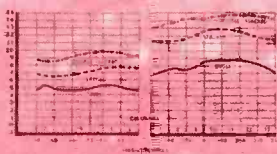
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The stacked CHAMPION provides:

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Assembles faster than a five-element Yagi.
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horizontal
polar pattern
(relative
voltage)



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model no.		Net price
325	single bay	\$20.83
325-2	two bay	42.36
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325-3	2 bay harnesses	\$2.00
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*Pat. Pend.

3 great, new UHF antennas

by **CHANNEL MASTER**

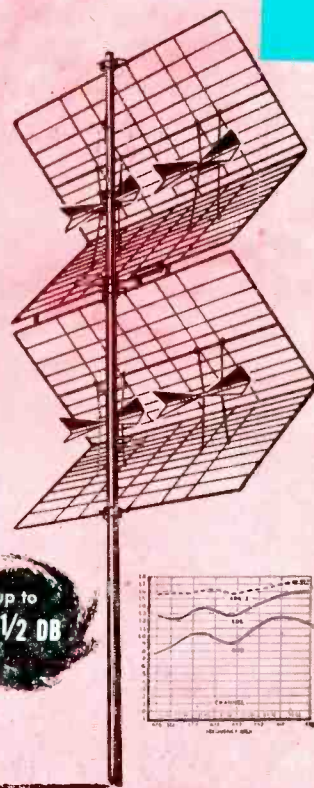
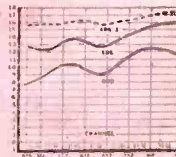
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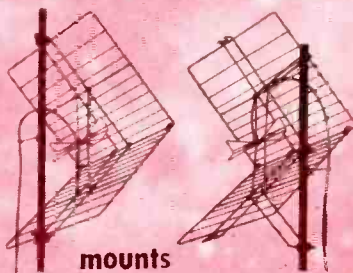
Model No.	Description	List Price
405	Twin Corner Reflector	\$18.06
406-2	2-Bay Twin Corner Reflector. Stacking harness furnished free.	36.10
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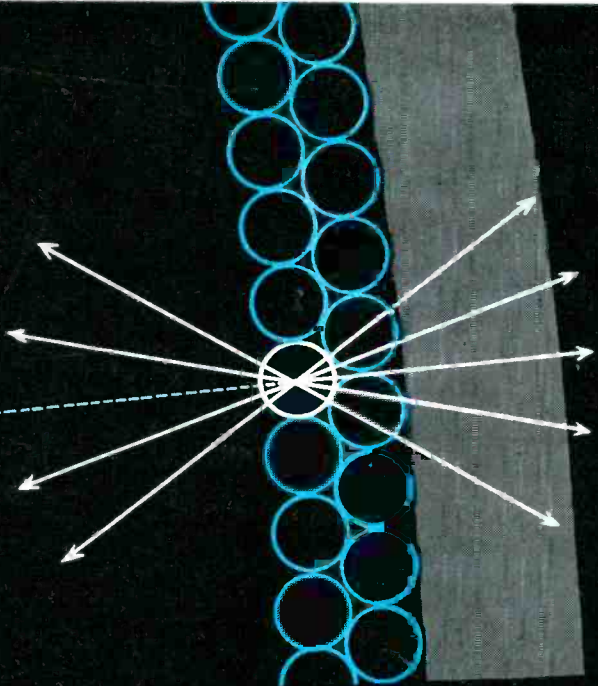
model no. 420

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Send for complete technical literature.





what
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means

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Aluminizing means a brighter TV picture, greater contrast, lower beam current, smaller spot size, sharper focus, reduced screen scorch—all from the efficient use of light.

On the inside of any TV tube face is a coating of phosphor crystals—the picture screen. As the electron beam—tracing the picture—strikes these crystals, they glow, giving off light in all directions. And there's the problem! Half the light thus generated is *inside* the tube, either lost to usefulness or lighting areas that should be dark. Both brightness and contrast suffer.

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To aluminize a picture tube, deposit a nitrocellulose film evenly over the phosphor. Over that, deposit a film of aluminum only millionths of an inch thick—*just thick enough to reflect the light and just thin enough to let the electrons pass through.* Under heat, evaporate the nitrocellulose film to leave a thin smooth coating of aluminum. Result—an efficient light reflecting mirror to specifications.

Simple as it sounds, Rauland research engineers worked for three years to solve the problem and were among the first to do so.



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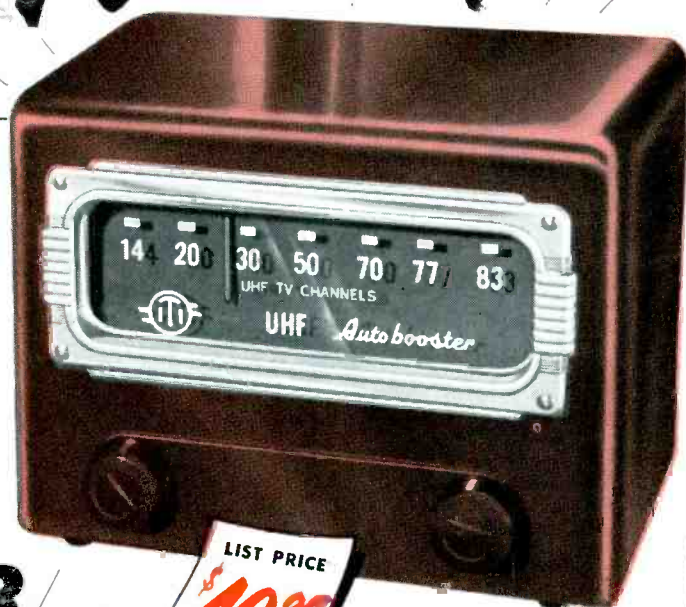
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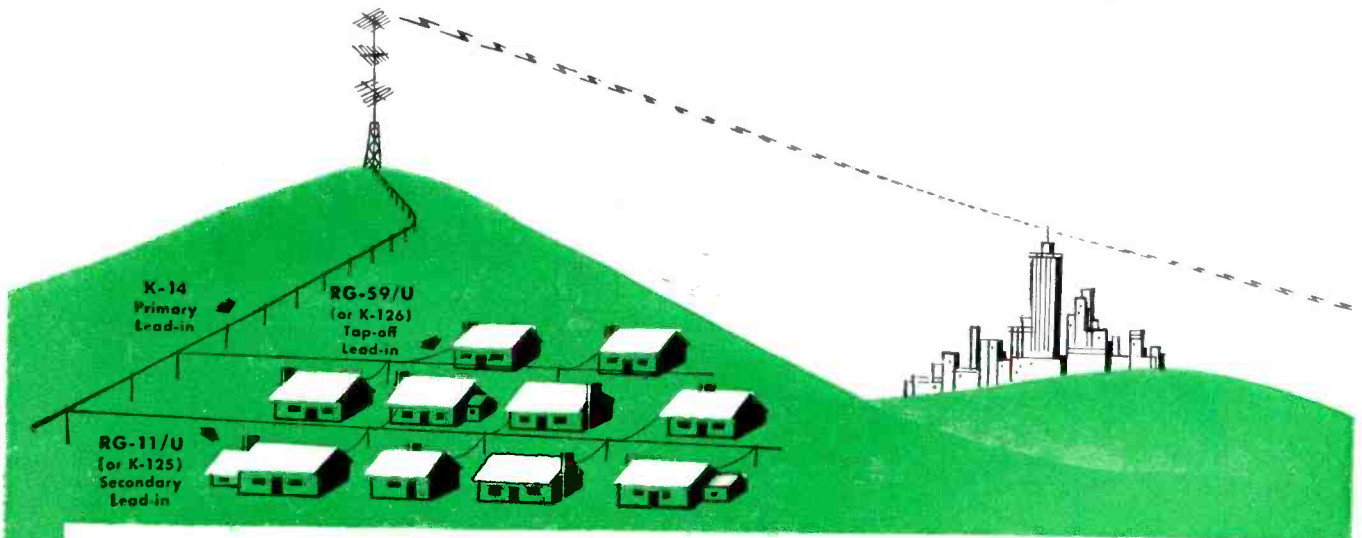
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RG-59/U—73-ohm coaxial TV lead-in cable. Highly efficient as a community system pole-to-house tap-off. Meets all needs wherever a high-grade installation is a must. Capacitance: 21 mmf/ft. Attenuation DB 100/ft: 2.7–50 Mc; 4.0–100 Mc; 5.7–200 Mc; 8.5–400 Mc.

Use these 2 for Community TV radiation:

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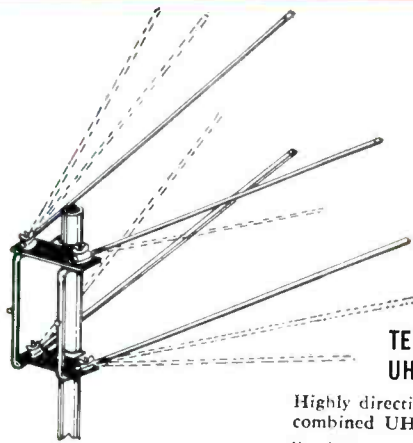
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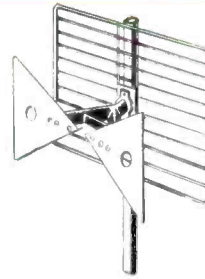
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... exclusive with TELCO, is a free air insulator that prevents shorting out under any condition ... found only on TELCO UHF Antennas.

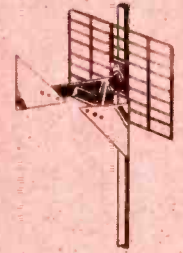
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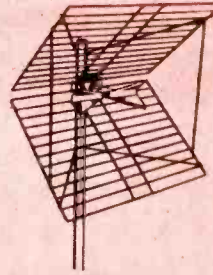
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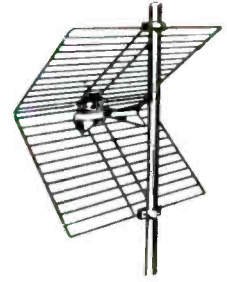
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No. 8965 List \$5.95



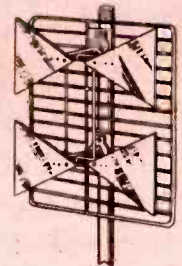
TELCO UHF "GOLDEN GRID" STANDARD BUTTERFLY ANTENNA
No. 9001 List \$3.95



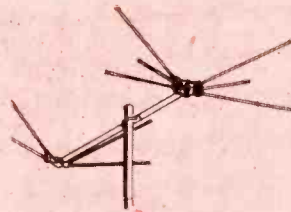
TELCO UHF "GOLDEN GRID" DELUXE CORNER REFLECTOR ANTENNA
No. 8984 List \$11.25



TELCO UHF "GOLDEN GRID" STANDARD CORNER REFLECTOR ANTENNA
No. 9002 List \$11.25



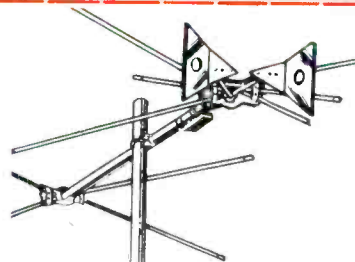
TELCO UHF "GOLDEN GRID" 2-STACK DOUBLE TIE ANTENNA
No. 9004 List \$7.50 less mast



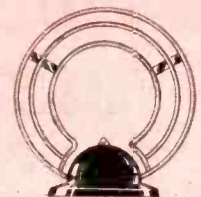
TELCO VHF CONICAL ANTENNA
No. 8700 List \$9.25



TELCO VHF SUPER CONICAL ANTENNA
No. 8902 List \$19.85

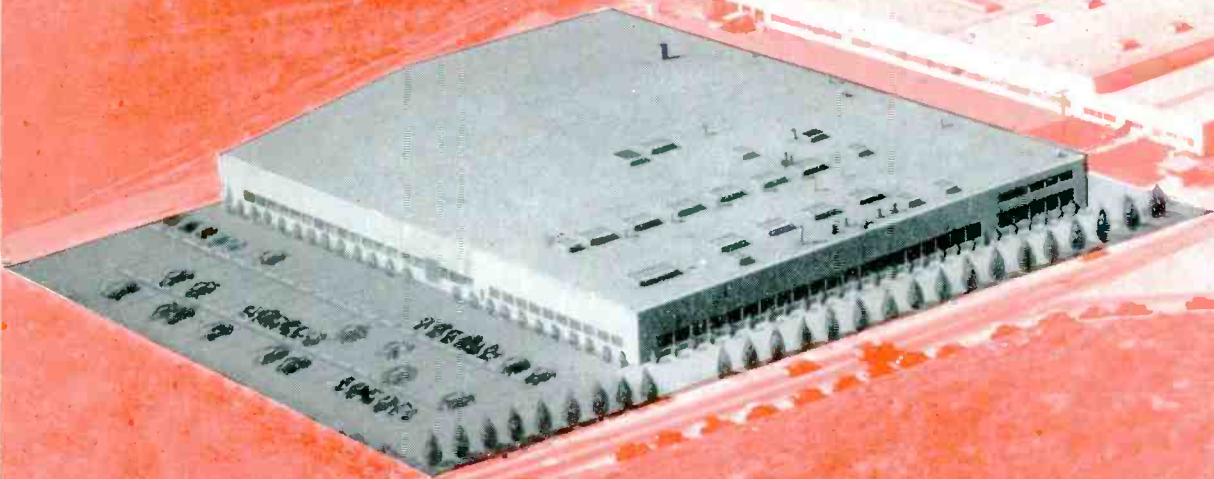


TELCO UHF-VHF UNIVERSAL CONICAL ANTENNA
No. 8981 List \$16.25



TELCO UHF-VHF "GOLDEN HALO" INDOOR ANTENNA
No. 9000 List \$4.95

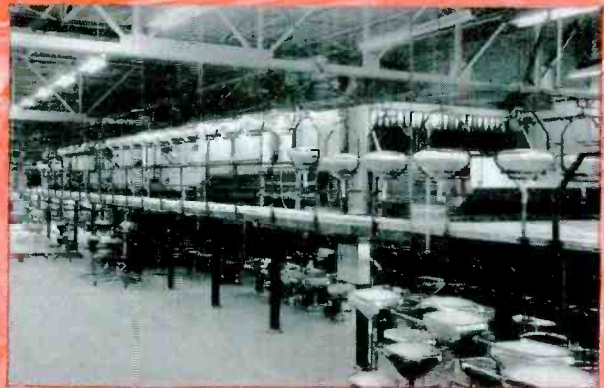
It takes the **WORLD'S** Newest **PICTURE TUBE PLANT**...



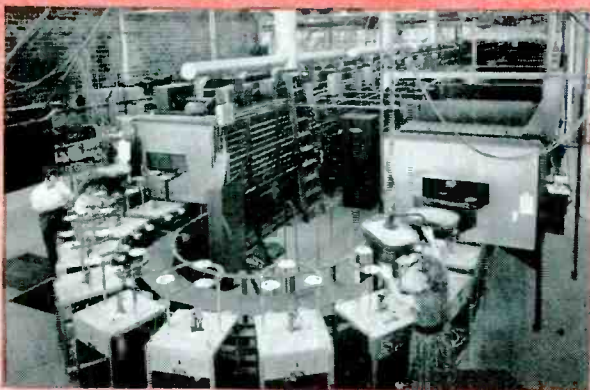
Equipped with the **WORLD'S**
LARGEST SETTling MACHINE...



A **BAKE OVEN**
as Big as They Come...



And the **WORLD'S** LARGEST
EXHAUST MACHINE...



to make the **WORLD'S** Finest
TELEVISION PICTURE TUBES...

RAYTHEON PICTURE TUBES



The only way to make large screen (21", 24" and 27") TV Picture Tubes of unsurpassed quality is to make them with equipment especially designed to handle and produce them. That's why Raytheon built and has in operation this miracle of a picture tube plant, which houses the world's finest, largest and most advanced equipment and methods for making large size Picture Tubes. This magnificent new plant is one more indication of Raytheon's dedication to a single ideal — to continue to supply you with the finest quality Television and Radio Tubes the world has ever known.



RAYTHEON MANUFACTURING COMPANY

Excellence in Electronics

Receiving Tube Division
Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Cal.

RAYTHEON MAKES ALL THESE:

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NEUTRONIC TUBES • MICROWAVE TUBES



the CDR Rotor

sells faster...sells easier

because.....

The best line of TV Rotors money can buy

It is the complete line of quality rotors, with a model and type to best serve 'most every type application.

TV Spot Campaign

To reach the buying public, an intensive campaign on Television in key markets pre-selling CDR ROTORS for you.

Newspaper Advertisements

Also directed at the consumer, a supporting campaign in key city newspapers exploiting the advantages of the CDR ROTOR.

Moving Displays

It's causing excitement everywhere, this display that is an eye and traffic stopper, a silent salesman for the CDR ROTOR.

Envelope Stuffers

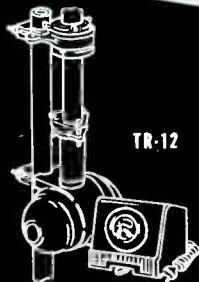
Here's another selling tool that may be mailed directly to your customers, selling them the CDR ROTOR in their home.

Newspaper Mats

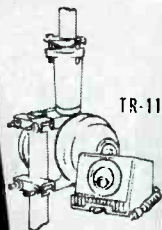
A full set of completely prepared advertisements for dealers and distributors to capture extra CDR ROTOR business.

Window Streamers

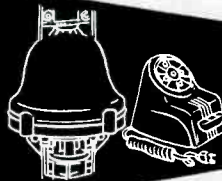
They let everybody going into and by your store know that you have the CDR ROTORS, a colorful and eye-catching streamer.



TR-12



TR-11



TR-2



THE *RADIART* CORPORATION
CLEVELAND 13, OHIO



CORNELL-DUBILIER ELEC. CORP.
SOUTH PLAINFIELD, NEW JERSEY

Decide on DuMont

on the basis of...



Microscopic look at the cathode surface reveals soft, even texture, necessary for efficient tube performance

Product Superiority

*not too wet, not too dry—
not too light or heavy...*

THE CATHODE plays an important role as source of electron energy in the picture tube. Moisture content and texture of the cathode coating must meet rigid standards to insure maximum picture tube life.

At Du Mont, exclusive processes are used for applying the cathode substance. The soft even texture achieved (see illustration) packs the effective emitting area (in circle) with extra electron power.

The resulting brighter performance over maximum tube life tells you why Du Mont is the right replacement for any set.



*Trade-mark

REPLACEMENT SALES, CATHODE-RAY TUBE DIVISION • ALLEN B. DUMONT LABORATORIES, INC., CLIFTON, N.J.

Depend on Mallory
for
Approved Precision Quality

The sales leader—
proved in every UHF area



Now...

The MALLORY CONVERTER Packs *ALL* Features in Half the Size!

*The new Model 88 has these important Sales Advantages
originated by Mallory:*

Less than half as large . . . measuring only $7\frac{5}{8}$ " wide x $5\frac{1}{16}$ " high x $4\frac{5}{8}$ " deep . . . yet full Mallory quality.

It has linear tracking. Tuning is easier, more exact than ever. No bunching of channels.

The Preselector in the new 88 protects against image interference, oscillator radiation and interference at the IF frequency. It insures better selectivity.

The Mallory 88 Converter adds *all* UHF channels to *any* TV set without sacrificing a single VHF channel.

Design refinements and precision quality of the 88 assure high quality picture definition and easy tuning.

The customer has nothing more to buy, no adjustments to make for additional new channels . . . even if he moves to another area.

Installation is easy. It only takes a few minutes to connect the antenna and power leads from the Converter to the set. It can be done right in the customer's home.

ASK YOUR MALLORY DISTRIBUTOR for complete details of the new, handsome, compact Model 88 Converter. It can be your answer to bigger profits . . . just as all Mallory Converters have been for dealers in areas where UHF is already on the air.

P. R. MALLORY & CO. Inc.
MALLORY

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS
RECTIFIERS • POWER SUPPLIES • FILTERS • MERCURY BATTERIES

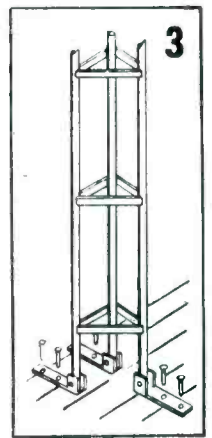
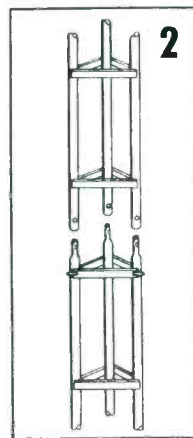
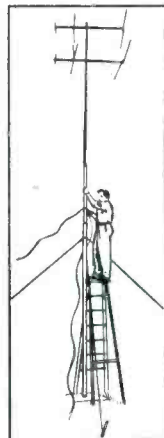
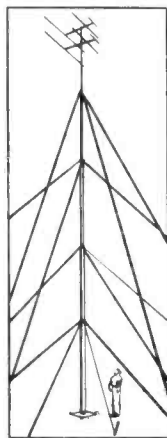
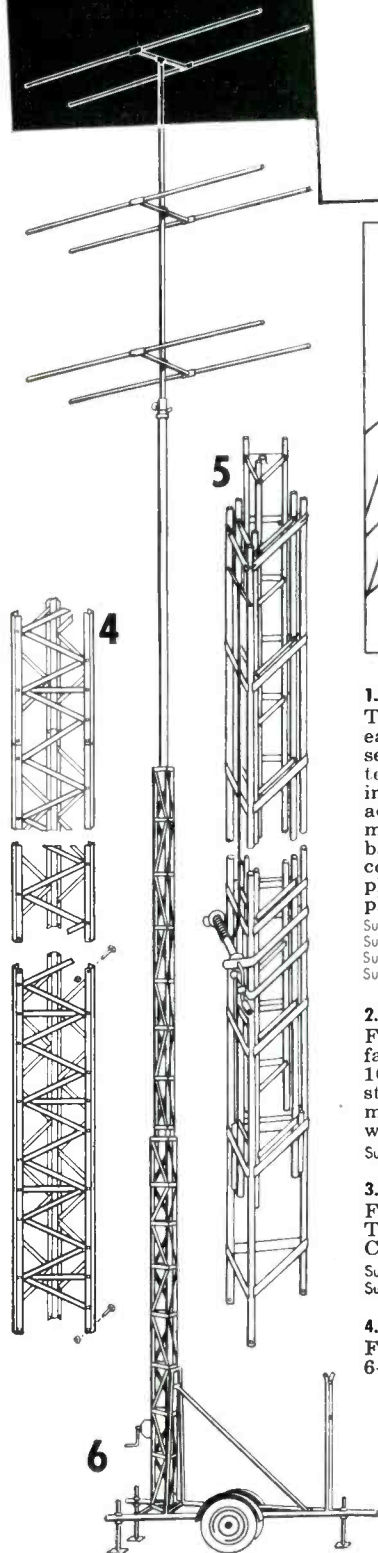
APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

TV MASTS and TOWERS

What do you want to buy? What do you want to pay?

YOUR **Admiral** DISTRIBUTOR
has it!



1. TELESCOPING MASTS up to 50 ft. high

These masts are available in 2, 3, 4 or 5 sections, each 10-foot section telescoped within the next section. Up to fifty feet in height just by extending sections and tightening bolts. Lowering mast one section at a time provides easy access to antenna or line for servicing. Mast may be completely rotated by hand from the base section. Finest quality throughout... cold rolled seamless steel tubing, bright zinc plated for weather resistance. Furnished complete with all necessary accessories.

Suggested retail price, 20 foot mast, No. M-1..... \$12.50
Suggested retail price, 30 foot mast, No. M-4..... 20.00
Suggested retail price, 40 foot mast, No. M-6..... 29.00
Suggested retail price, 50 foot mast, No. M-30..... 37.75
Above masts include mounting stirrups

2. SECTIONAL STEEL TOWERS up to 100 ft. high

Furnished in 10-foot sections which are easily fastened together for any desired height up to 100 feet. Quality built of heavy duty tubular steel, electrically welded throughout. Can be mounted on any peaked, pitched or flat surface with accessory angle base plate.

Suggested retail price, standard 10 ft. section, No. M-13, \$17.95

3. SINGLE SECTION STEEL TOWERS 10 ft. or 20 ft. high

For low cost guyed or unguyed installations. Tubular steel, electrically welded throughout. Complete with self-aligning mounting brackets.

Suggested retail price, 10 ft. tower, No. M-15..... \$21.50
Suggested retail price, 20 ft. tower, No. M-16..... 35.75

4. SECTIONAL ALUMINUM TOWERS up to 120 ft. high

Furnished in knocked down or preassembled 6-foot sections. This tower may be easily erected

in one piece to 42 feet in height. Six-foot sections may be added to maximum height of 120 feet. Made of spring-tempered aircraft aluminum alloys. Combines highest strength with amazingly light weight of only one lb. per foot for safe, easy installation, low shipping cost. Unexcelled corrosion resistance. Available accessories include mast kit, rotator adaptor kit, hinged aluminum base plate and rotating universal base for manual rotation of tower.

Suggested retail price, 6 ft. section, No. M-21..... \$16.50

5. CRANK-UP STEEL TOWERS 28-38-55 ft. lengths

Made in two or three telescoping sections, raised and lowered with hand crank. Ideal for experimental work and deluxe installations, especially in hurricane areas. Also suitable for mounting on panel trucks. Heavy duty tubular steel, electrically welded throughout. Angle base plate included for mounting on any peaked, pitched or flat surface.

Suggested retail price, 28 ft. tower, No. M-9..... \$ 79.50
Suggested retail price, 38 ft. tower, No. M-10..... 99.50
Suggested retail price, 55 ft. tower, No. M-11..... 164.50

6. TRAILER-MOUNTED TOWER for fringe area demonstration

Designed for fast, easy, one-man operation. Maximum extended height 75½ ft. Minimum length 21 ft. Overall trailer length 16 ft. 6 in. Worm type winches for raising and extending mast provide important safety factor... prevent mast from collapsing if winch handle is accidentally released. Full 360 degree antenna rotation. Includes standard trailer coupler and ball. See your Admiral Distributor now about special offer for limited time only.

Call your **Admiral** Distributor for
ADMIRAL TV ANTENNAS • TUBULAR STEEL TV TABLES
MOUNTING HARDWARE and ACCESSORIES

Admiral Corporation, Accessories and Equipment Division, Chicago 47, Ill.



and only **\$12⁹⁵**
Which Soldering Gun?

You be the judge! Three competitive soldering guns were to be plugged in each morning . . . kept connected, operative, HOT all day. But Soldering Gun "A" lasted only 1 1/4 hours, burned out its transformer and started smoking! Gun "B" burned out in 21 minutes! The WEN Soldering Gun with Feraloy tip scored 567 HOURS! Or compare this way — the WEN Gun with 50c Feraloy tip averages 25,000 soldering connections. Gun "A" (replacement tip 25c) 800 connections. Gun "B" (new tip \$5.00) 1,627 connections. That means your soldering connections need cost you but 1/500 of 1c — using the WEN Gun. Practically lasts forever under ordinary conditions.

THEN THERE'S THE NEW
Electric
WEN SANDER-POLISHER

Only **\$13⁹⁵**

Ideal for home use and many shop operations. It's light (2 1/2 lbs.) quiet like an electric razor and handy to work with. Operates 240 strokes per second. Sands wood, metal, polishes furniture, your car — anything. Even gives a good massage.



 GUN "A" 1 1/4 HR.	 GUN "B" 21 MIN.	 WEN GUN
--------------------------	------------------------	----------------

RADIO SUPPLY STORES SELLING THOUSANDS

Get the Facts! — See Your Jobber or Write —
WEN PRODUCTS, INC., 5808 Northwest Highway, Chicago 31, Ill.
 (Export sales — Scheel International, Inc., Chicago)

LETTERS

To the Editors

Slow Service Info

EDITORS, TECHNICIAN:

Why do most TV manufacturers drag their feet so in providing complete servicing information on their new models? Sometimes many months go by before any service dope finally comes through to us fellows who have to do the work. Don't those factory people know that new sets break down, too? New York K. L.

Professionals

EDITORS, TECHNICIAN:

I think we can learn something from the way the radio-TV technician in South America operates. Down there he is rated as a professional, much as a doctor or lawyer. People look up to him and nobody would dare call him a "gyp artist." Let's find out how they do it down there. Ohio L.T.J.

Likes "Circuit Digests"

EDITORS, TECHNICIAN:

You have a fine service magazine and I personally look for the CIRCUIT DIGEST each month because I find it so helpful. Please accept my thanks and keep it going. Connecticut M.H.G.

In-Warranty Replacements

EDITORS, TECHNICIAN:

Sometimes I think the manufacturers stay up nights thinking of ways to hurt the technician-serviceman. They set up factory service branches to provide cut-price competition in cities already well covered by established service organizations. Then, they make in-warranty replacement parts available only from the factory service company or from exclusive dealers in the community; neither of these are helpful. What is the poor independent servicer to do? Washington R.F.

Filing Technical Articles

EDITORS, TECHNICIAN:

May I take this chance to compliment you on the new magazine layout. Either intentionally or by accident, all technical articles, with one exception, in the latest issue were backed by ads or nontechnical editorial features, enabling the technician to file the technical articles for future reference.

JULES ELKISH

Jules Elkish Radio & Television Service
 257 S. 13th St.
 Philadelphia 7, Penna.

**From Chairman Service
Committee, RETMA**

EDITORS, TECHNICIAN:

... "May I take this opportunity to wish you the best of luck on your new venture. I have already seen your Technician CIRCUIT DIGEST greeted with great interest wherever it has appeared.

HAROLD J. SCHULMAN
Director of Service

Telest Service Dept.
Allen B. Du Mont Laboratories

Fills Real Need

EDITORS, TECHNICIAN:

We would like to compliment you and your staff on the format of your new magazine, TECHNICIAN. We believe it fulfills a real need in the TV periodical field.

YVON JOHNSON
CLIFF LEVY

1943 - 33rd Avenue
San Francisco, Calif.

We Blush!

EDITORS, TECHNICIAN:

Your magazine "Technician" is in my opinion perfection in journalism. Your technical articles are of the best calibre and your non-technical features present the facts exactly as does the *New York Times*, which lets the reader interpret the conclusion for himself, and also to bias himself one way or the other if he so desires.

L. J. CALIFANO

Achilles Radio Co.
119 N. Lake Ave.
Albany, N. Y.

Says "Technician" Is Tops

EDITORS, TECHNICIAN:

Congratulations are due to those responsible for the new TECHNICIAN magazine. I have read the latest issue and predict that this publication will quickly be recognized as the best in its field. My own subscription order is in the mail.

HARRY TELLIS

895 Pearl Harbor St.,
Bridgeport 10, Conn.

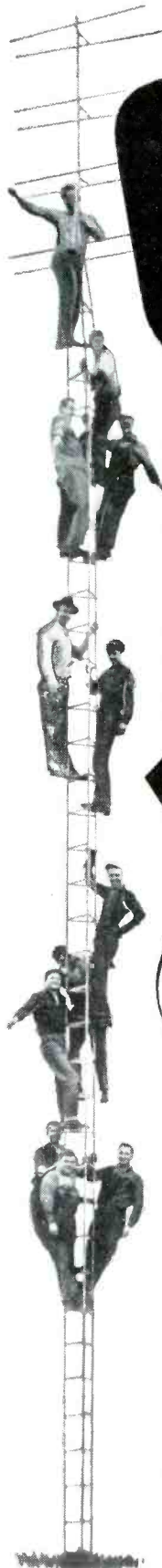
Distressing Attacks

EDITORS, TECHNICIAN:

I find the radio and TV business a very distressing business at times. I believe it is the fault of the service operators. Any serviceman will, I think, admit that he is insulted every day in this way. We go out to check a customer's set. He wants to know what is wrong, and when you tell him he has a bad condenser, a bad tube, and possibly bad blocking oscillator transformer and the job will cost \$25, he will usually say, "How do I know that what you say is right? I read in Reader's Digest or the Daily News or some other publication about how most radio and TV men are gyps."

J. K. W.

Louisiana



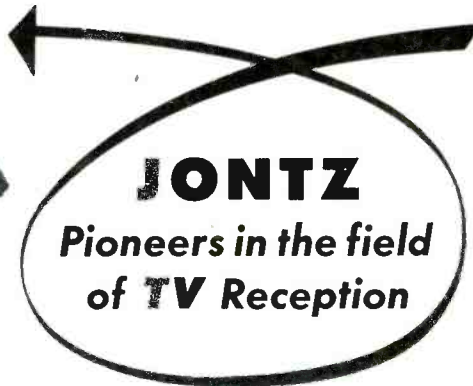
JONTZ

TV INSTALLATION ACCESSORIES

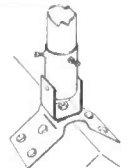
**SAFE... LONG LASTING
... EASY TO INSTALL**

Jontz TV Installation Accessories give you extra quality, greater economy.

All Jontz products are heavily zinc-plated with an additional chromate coating... six times more weather protection than ordinary zinc-plating.

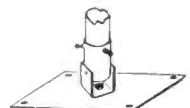


QUALITY CONSTRUCTION
Jontz masts are made of highest quality electric weld steel tubing, with heavy zinc galvanized coating... your assurance of tubular strength and durability.



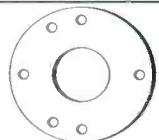
**APEX MOUNT,
MODEL A-5**

4-way swivel mount for any type of installation. Fully adaptable to flat surface, peak roof, or corner mounting.



**ROTARY MOUNT,
MODEL S**

4-way rotary base mount. Fits along roof peak for safe, easy installation.



**GUY RINGS
BY JONTZ**

The answer to your guy ring needs. Handy Jontz guy rings may be used with either 3 or 4 guy wires... your choice of 5 I. D.'s.

**MODEL 200
"SUPER" KWICK CLIMB TOWER***

Finest self-supporting 50-ft. tower available. Withstands wind loads up to 100 m.p.h. ... assures maximum safety with no guy wires. Approved by one of the world's leading liability insurance companies, when properly installed according to specifications. Constructed of highest quality rust-resistant 1-in., 14 gauge tubular steel... easy to erect, easy to climb. Available in 10-ft. sections... shipped complete with foundation mounting. Additional height up to 150 feet if required.

*Twelve men in photograph represent 2018 pounds!

Your inquiries will receive prompt attention.
Don't delay... write us today!

QUALITY



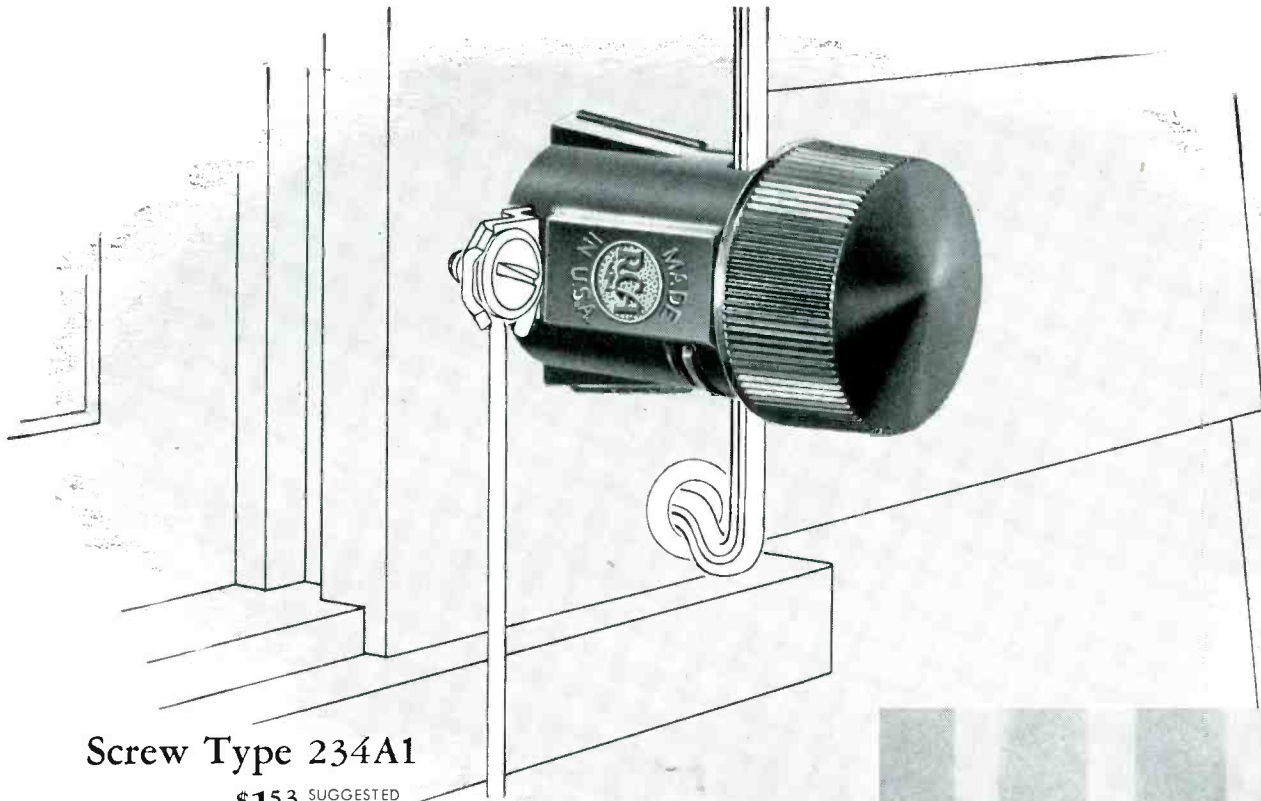
ECONOMY



MANUFACTURED BY

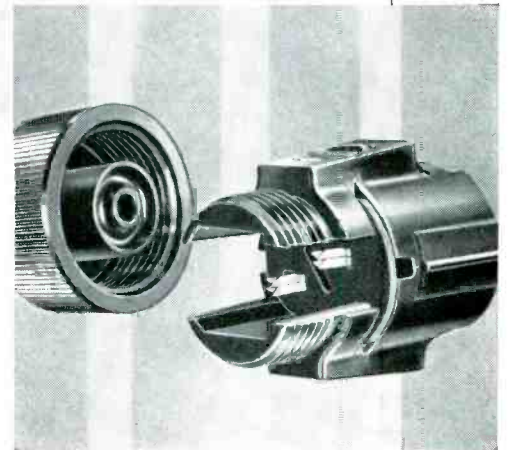
JONTZ MANUFACTURING CO.

1101 East McKinley, Mishawaka, Indiana, Mishawaka 5-5178



Screw Type 234A1

\$1.53 SUGGESTED LIST PRICE



Strap Type 235A1

\$1.40 SUGGESTED LIST PRICE

A new low-loss arrester for the new UHF lines!

- ✓ Standing-wave ratio less than 2-1 at 800 Mc.
- ✓ Low-capacitance design.
- ✓ Low loss . . . approximately 1 db at 800 Mc.

INSTALL an RCA UHF Lightning Arrester and forget about signal losses. Losses are negligible in both types . . . even under extremely tough weather conditions.





Install an RCA UHF Lightning Arrester and forget it . . . because the resistance elements are made of a remarkable *conductive rubber* that is *non-corrosive and impervious to moisture*.

Install an RCA UHF Lightning Arrester in less time, and with less

effort, than any other make . . . because all you need do in most applications is mount, unscrew cap, insert transmission line in slot, and replace cap. It's as easy as that!

And remember . . . RCA UHF Lightning Arresters will accommodate most of the tubular round and oval transmission lines without the need of splicing or baring conductors. Both types are listed by Underwriters Laboratories, Inc.

Will take all of these basic types of UHF lines

- TUBULAR 
- OVAL 
- FOAM 
- JACKETED 

See your RCA Distributor for "the best UHF and VHF Lightning Arresters to come down the line."

For the best in VHF Lightning Arresters use . . .



Screw Type 215X1
\$1.25

Suggested List Price



Strap Type 214X1
\$1.10

Suggested List Price



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



Why didn't someone do this before?



Only Superotor®

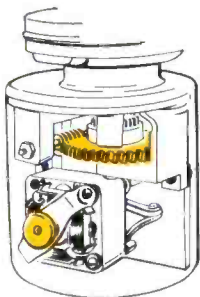
has the Quick Detachable Drive Unit™



A **Leader** FIRST!

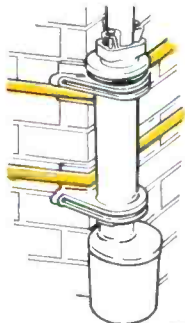


"TERRIFIC!" say TV servicemen — and you'll echo their words when you see the amazing new Superotor. Imagine — a drive unit as easy to replace as a light bulb! Strictly a one-man job! No fussin', no cussin', — no need to dismount the antenna — no need to interrupt TV viewing while the drive unit is being serviced. Great? Yes! — and this is just one of FIVE major advances that put Superotor years ahead of anything on the market. No wonder the big switch is to Superotor!



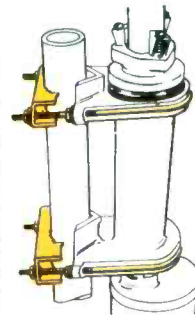
- Double Lock Stop Prevents Drift & Coast

A **Leader** FIRST!



- Built-in Chimney Mount Design

A **Leader** FIRST!



- Steel Reinforced Construction

A **Leader** FIRST!

VP* Tuning

*Vernier Precision

A **Leader** FIRST!



Patent Applied for Copyright



2925 EAST 55th ST., CLEVELAND 27, OHIO

... LEADING THE WAY TO BETTER PRODUCTS

Sparkling Beauty

for the housetops



WARD'S
DYMON-VANE
CONICAL

another in the Tele-vane Series



The Circle-vane . . .
first of Tele-vane
series for Channels
2-6 VHF.



Dave Chapman, S. I. D.
Famous designer of
the Ward Tele-vane
series of TV Antennas.

Ward flashes again with the handsome Dymon-vane, the second model in its new series of Tele-vane TV antennas. Reflecting the modern trend and decor the beautiful new Dymon-vane enhances any home and becomes a valuable prized addition. Clean cut in design, a flawless performer, the Dymon-vane stands out as a glittering solitaire among all other TV antennas. A conical antenna with aluminum elements and black permatube cross arm with wrought adornments, the Dymon-vane is designed for complete coverage of VHF Channels 2-13 in metropolitan, suburban and fringe areas.

The New Dymon-vane comes in single bay or two bay stacked models . . . folded and pre-assembled ready for easy installation.

THE WARD PRODUCTS CORP.

DIVISION OF THE GABRIEL COMPANY

1148 Euclid Avenue, Cleveland 15, Ohio

In Canada: Atlas Radio Co., Ltd., Toronto, Ont.



TECHNICIAN

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

Don't Be Afraid to Charge a Good Price!

Explain Clearly to Your Customer What You Have Done For Him. Make Him Understand; Then Your Callbacks Will Cease to Be Headaches.

Here's a great editorial which came in our mail from a service reader in a Southern state. We think it carries a message which every TV technician and service organization should read—and heed! The man who can really diagnose and repair a television set has to have a background of knowledge and skill that can be compared to a physician's professional qualifications. The trained technician renders a valuable service, and, we insist, he should be well paid for it.

—Editors

You Sell Time and Knowledge

Don't be afraid to charge for your labor. If you explain to the customer that time and knowledge are all you have to sell and that you have to charge for your service, the customer *always*—and I do mean *always*—will understand!

The habit of charging for parts that are not installed, adopted by a few ignorant men in this business, has created a feeling of suspicion for the whole service industry and can only be cured by showing such erring operators the fallacy of their thinking.

“Charge for what you do and do what you charge for.” This has been my policy in the TV business, and I defy anyone to prove otherwise.

Take time to explain to every customer, when you repair the set—“*Only* what I put in is guaranteed, nothing else. You *can* have more trouble from other parts in your set—and you probably will. But when you do, call me and I promise I will treat you right. Remember almost everything today has to be economically built and will go bad in time.”

Sets Are Bound to Go Bad—and Will!

“Our whole American economy is based on a system of replacement. If your TV was built as good as the manufacturer could build it, it would cost him four times as much, few sets would be sold, and we would all be out of business in a few short years. Your set is bound to go bad and will, so call me when it does.”

Try this approach. It is true, and, when you explain this fact to your customer, make him understand, and your callbacks cease to be headaches. They become profitable, and you are no longer a gyp but a serviceman looked up to and respected by your community.

Believe me, the man who says you cannot charge a customer a fair price—yes, and I say a very good price—for a job, if the customer sees and understands what you do, is either a poor salesman or a fool.

Tuning In the

\$20 PER TV, PER YEAR is the average revenue to be expected from TV sets in your area, say servicers we have questioned. Estimates run all the way from \$15 to \$25 for TV sets in use, counting those requiring all degrees of servicing. On same basis, each radio set should bring in an average of \$3 to \$5 a year, say experienced technicians.

LEARN ABOUT COLOR-TV IN THIS ISSUE—Besides the second complete color-TV schematic to be presented to *TECHNICIAN* readers in Section 2 of this issue, an important review of "Color Tubes and How They Work" appears on page 32 and following pages. Also current developments in color TV are reported on "Color Shorts" and other news pages. (Remember, *TECHNICIAN*'s first complete color-TV schematic was given to our service readers in our September issue, four months before any other service magazine.)

WATCH COLLECTIONS—Check your slow-pay accounts every month, and keep after any money due. A busy servicer we know rolled up \$50,000 service billings in '52, but still unpaid are \$3,000 of those accounts—most of the net profit on the whole year's work! Of course he is turning the delinquents' names over to a collection agency which will probably collect half, but will charge him 33½% on such amounts, which means less than \$1,000 recovery of bills due, also the loss of goodwill and a lot of former customers forever.



"We'll have your set back in two weeks, but from now on, I'd leave those 'fix-it-yourself' books alone!"

COLOR TV-RECEIVER CIRCUIT, No. 2

See Section 2, This Issue

For your study and information—

Another complete schematic of a representative compatible color-TV receiver designed to operate on the NTSC standard signal (expected shortly to be adopted officially by FCC). Our first color-TV schematic appeared in *TECHNICIAN*'s September issue. Other color-TV schematics will follow in future issues, as manufacturers complete their plans for color-TV production.

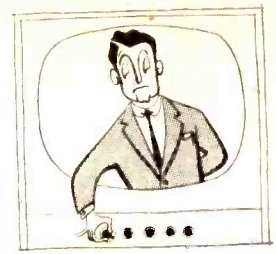
HERE'S TVI DOPE from Harry Tellis of Zenith: If you live in a town that is getting new police or paging-service transmitters in the 40-50 MC portion of the spectrum, prepare for TVI trouble. Output from these transmitters is producing video and/or audio interference in modern TV receivers with 40-50 MC IF's. Best thing to do is to lay in a stock of high-pass filters to insert in antenna transmission lines at the receiver antenna terminals when customers start complaining.

CHECK-UP ADVERTISING—For some tips on how to sell the "check-tune-up idea" to customers in your advertising, take a look at some auto dealer and auto-maker ads on this topic in local newspapers. Notice how they plug the pleasures of fall motoring, the descriptions of a sluggish engine, tired because it is full of thick, heavy, dirty oil and grease, and the troubles that could befall the unwary car owner who doesn't speed right down to the garage to demand that conditioning job on his vehicle. Similar points such as new and better TV programs, tired tubes and components which produce sluggish receiver performance, or the possibility of a dead set, can be made in your own advertising with telling effect.

CHECK-UP TIME IS HERE—People are settling to serious TV watching again. For alert servicers, this means real opportunities to make that green stuff by reminding customers that antennas and receiver controls need attention if the set is to perform satisfactorily during the long evenings ahead. It should be pointed out that older antennas, masts and transmission lines are likely to be victim to the ravages of high winds, sleet and ice just when the family wants TV the most—on those cold, blustery nights when even a dog wouldn't go out. In the sets, tubes act weak and can stand renewal; size and linearity controls, AFC, AGC and other circuits need adjustment to bring the receiver back to its former peak performance.

REMARKABLE HOW FEW CLOCKS in clock-radios go haywire these days. Chief complaint is noise, and more often than not this is caused by placement of receiver, touching wall or some other object, which magnifies any inherent hum. Sometimes noise can be eliminated for a time by permitting clock to operate with receiver lying on its back for a half-hour or so. Or, better yet, a drop of oil on bearings of faster gears.

Picture



AVERAGE TECHNICIAN can handle 35 to 50 TV service jobs per week, and works 44 to 48 hours per week, according to survey of 40,000 shops just completed by GE investigators. Average TV servicing call is billed at \$8.75 to \$11.50, while take for a radio job runs \$7 or less. Two-thirds to four-fifths of TV servicing work is done in the home, whereas 80 to 90% of typical radio servicers' jobs are handled in shop. Majority of servicers reported an increase of business in '52 over '51, and all expect 1953 to outrun last year. Detailed analysis of this survey broken down by types of service shops appears on a following page.

SHRINKAGE IN FM stations (1948, 1020; 1953, 543) has lately attracted attention of FCC, as FM broadcasters continue to surrender their licenses. Commissioner Webster, veteran radio man, states he would consider allotting part of recent FM band to other services, if a good case of need can be put up by non-FM applicants.

ARE YOU "IMMUNE" TO PROGRAMMING? Interesting thing how many technicians look at TV pictures day in and day out, yet don't know a single program or a single star in the video set-up. Used to be the same thing with radio, too. We know a guy who's been in the game since 1921, and the only performers he could recall were "The Happiness Boys."

TV TREASURE HUNT—The wife of a well-known Hollywood and New York director of movies, plays and TV shows is a rabid collector of antiques. Recently, at an auction, she was the successful bidder for a beautiful Chinese lacquered cabinet. When it arrived at her home, she found it contained a TV set. She called her TV serviceman, explained her plight and asked him to come over. "I'll be right over," he said, "but can you give me some idea of what the trouble is?" "Trouble?" she snorted, "That's what I want you for. I'm afraid to plug the darn thing in!"

"FREE ESTIMATES, NO CHARGE FOR HOME CALLS" is the newest old wrinkle being used in TV servicing ads to get the serviceman into consumers' homes in many communities. Belief is, of course, that once the serviceman is in the home, the customer feels obligated to give the job to the estimator. The trend is knocking the props out from under the two-and-three-dollar-per-visit service-call groups. Looks as though the serviceman will have to "sell himself" to the consumer, if he wants to get the job, instead of relying on the "fee" just to visit the home.

HANDLING "OFF-TIME JOB" EVIL. A Maryland service operator with four technicians got a phone complaint from Mrs. Jones: "I paid your man Bill \$16 for fixing my TV on his own time, but it still doesn't work right! I'd like to know what you can do about it." "Of course, lady, we're not responsible for unauthorized work, as you must understand—but I'll look into it,"

replied the Boss, his temper rising. Now Bill was a particularly good man and the shop would miss his expert know-how. So next morning Mr. Boss called all his other men together (omitting Bill), and repeated to them Mrs. Jones' story. "Now you fellows know that what Bill did is strictly against our rules. Shall I fire Bill?" All the men looked sheepish, but then chorused: "No, no, please don't fire him. Bill's a good fellow. We want him to stay. We'll see that nothing like this happens again." That closed the incident, and no off-time jobs of any importance have been discovered since.

CRT IMPLOSIONS ARE RARE, is gist of RETMA service committee study of this occasional hazard. In fact, with 27,000,000 picture tubes now in use, only 100 implosions (or .0004%) were reported by all member companies during the last six months. Tubes involved were 21-inch rectangular cylindricals in most cases; also a few 27-inch cylindricals and a few 17-inch rectangular sphericals. In nearly 70% of the accidents, the protective glass also shattered. Half of these were laminated safety glass, half were tempered glass.

IMPLOSION CAUSES were reported as follows: Structure of cylindrical tube; temperature change; bruises, bump checks, poor annealing; glass strain in bulb at weak points; rough handling in production; unknown.

TAXES are indeed heavy. But—we are taxed twice as much by our idleness, three times as much by our pride, and four times as much by our folly.—Benjamin Franklin, 1782.



"It's a good thing I got the TV antenna up before I fell. Now we can use the \$25 I saved toward my hospital bill."

Troubleshooting Parasitic

Basic Theory of How "Parasites" Tend to Arise;

By JAMES A. McROBERTS

• The serviceman is frequently called on to eliminate internal TVI (interference originating in the TV set itself). As a prerequisite, he should be able to recognize an oscillating circuit, whenever localization tests indicate the existence of such a circuit in some section of the receiver. (TVI localization tests were discussed in *Tracking Down TVI to its Source*, in the November issue of *TECHNICIAN*.)

We are going to discuss in this article undesired oscillation of the parasitic type. Such oscillation is invariably produced by some form of shock-excited ringing circuit.

The broad definition of a parasitic element is either an inductance, a capacitance, or a resistance which is not present on the schematic diagram as a separate component, but is effectively in the circuit nevertheless. A parasitic element can best be explained, perhaps, by considering several examples.

Inductance. A straight round wire, such as the lead from an ordinary paper bypass condenser, or the or-

dinary bus wire employed in circuit wiring, may have a (parasitic) inductance of about .02 microhenry per inch. If this wire is bent, then the inductance increases. All metallic parts possess some inductance; even the foil of a condenser or the plate of a vacuum tube has a small although sometimes significant inductance.

The lead to a tube element is a common parasitic inductance. While the technician may not be concerned with exact values, a couple of illustrative examples will be given:

1. The base pins of a 12AT7 are approximately .04 in. in diameter and about .65 in. long. Each pin has an inductance of about .095 microhenry.

2. The element leads, excepting the plate lead, of a 6BG6-G are about 2.25 in. long, to which is added a base pin approximately a half inch in length. The inductance present is about .065 microhenry minimum; some of this inductance is due to bending. The socket pin and terminal add more inductance.

Even the metallic chassis has some inductance, although we need not ordinarily consider it in service applications.

Capacitance. The most common parasitic capacitance element is the interelectrode capacitance of a tube or tube section. These interelectrode capacitances are not regarded as parasitic when used as all or part of the tuning capacitance for a stage. Nevertheless, these capacitances are, in the strictest sense, parasitic in nature, and enter into the problem of oscillation.

Interelectrode Capacitances

By way of statistics, the output capacitance of a 6BG6 is 6.5 mmfd; its input or grid-to-cathode capacitance is 11 mmfd; and its screen-to-cathode capacitance is about 8 mmfd. The 12AU7 and the 12AT7 have a grid-to-cathode capacitance of about 1.6 mmfd, while the plate-to-cathode capacitance is in the order of .3 to .5 mmfd.

All coils possess self-capacitance, which may be visualized as a shunting or parallel parasitic capacitance across the coil. This shunt capaci-

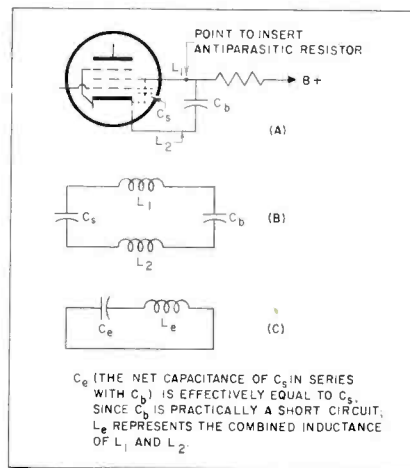


Fig. 2A—Partial schematic of a stage, showing location of bypass (C_b) and interelectrode (C_s) capacitances; also stray inductances (L_1 and L_2). B—Parasitic elements of circuit shown in (A). C—Simplification of circuit shown in (B). C_e and L_e are the effective net capacitance and inductance, respectively.

tance forms the tuning capacitance of the horizontal deflection coils, which oscillate for a half cycle during retrace at a frequency of app. 100 kc.

Circuit wiring generally introduces an extremely small capacitance which may nevertheless not be neglected when the cause of spurious oscillation in UHF tuners is being sought.

Resistance. While resistance tends to damp out parasitic or other oscillation, the presence of resistance in parasitic form in all wires—particularly coils or inductances—should be noted.

Resonant Circuits. The elements just described may constitute portions of a resonant circuit. Such a circuit may oscillate if suitably excited. The principal forms such circuits can take will be described, so that the technician can learn to recognize them. More complex forms of such resonant circuits are often difficult to analyze; case histories involving such complex circuits will therefore follow the consideration of the more simple cases.

Parallel Condensers. The danger of spurious oscillation always lurks in instances where one condenser shunts another (see Fig. 1). The capacitances of the two condensers

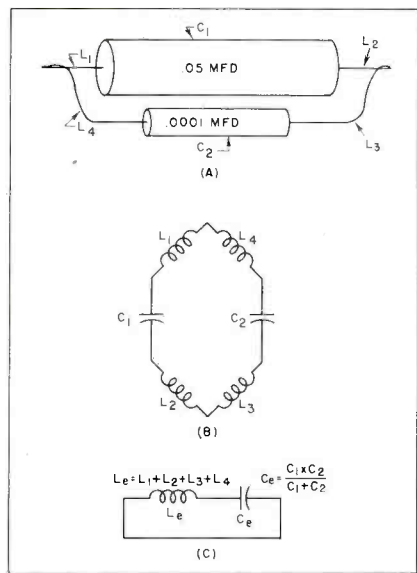


Fig. 1A—Capacitors in parallel, together with their lead inductance, may make up a parasitic resonant circuit. B—Elements of the parasitic circuit, schematically shown. C—Simplified, equivalent L-C series resonant circuit. Effective inductance is represented by L_e ; effective capacitance is represented by C_e .

Oscillation in TV Receivers

Common Sources of Trouble; Remedies

constitute a single effective capacitance; the series combination of the two provides a net capacitance smaller than that of either condenser. The leads form a set of parasitic inductances in series.

Inter-electrode and Bypass Capacitances; Parasitic Inductance. Fig. 2 illustrates a very common case of a parasitic resonant circuit. Here we have two capacitances in series, as before. The bypass condenser (C_b) is, however, much larger in value than the interelectrode capacitance (C_s), and is practically a short-circuit; the effective series capacitance in the parasitic circuit (C_e) is,

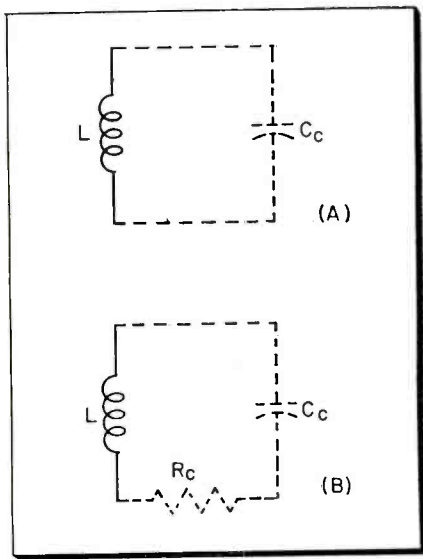


Fig. 3A—Capacitance (C_c) present between the turns of a coil forms a resonant circuit with the coil's inductance. B—Circuit of (A) with parasitic resistance of coil (R_c) added.

therefore, only a trifle less than the smaller interelectrode capacitance. The inductance is provided by the circuit leads, including leads to the tube elements, and some slight inductance in the condenser and tube elements themselves. Since these inductances are in series, they add up to form a single larger or effective inductance (L_e). The effective inductance and the effective capacitance determine the resonant frequency of the parasitic oscillatory circuit.

Inductance and Self Capacitance. Fig. 3 shows the typical case of a

coil (inductance) resonating with its own self-capacitance. (We might note that there is a parasitic resistance effectively in series with the coil's inductance, due to the resistance of the wire with which the coil is wound.) In shunt with the self-capacitance is the circuit capacitance.

Inductance of One Coil in Series with Self-Capacitance of Another. Fig. 4 shows a case less common than those previously discussed; this case and its variations are well worth remembering. The parasitic capacitance of a second coil, L_2 , is in series with the inductance of the first coil, L_1 . The circuit may be completed through direct connection or through capacitances which may themselves be parasitic. An example of such parasitic capacitances, as they may exist between the contacts of a switch, is illustrated in Fig. 4B.

Paralleled Tubes. A frequent offender is the paralleled tube. Fig. 5 shows such a circuit for a parasite involving only two elements of each tube. In addition to the cathode-grid parasite shown in Fig. 5B, other parasites may be formed between the plate and cathode or between plate and grid of each tube section. Note that interelectrode capacitances and connecting leads (including tube element leads) form the parasitic elements.

Remedies. Once the technician is able to recognize potential parasitic circuits, similar to those illustrated up to this point, he can proceed to the next consideration: the cure of TVI resulting from parasites, either by elimination of the unwanted oscillation, or by its effective suppression.

If we can eliminate the parasitic circuit altogether, we can cure the complaint. The two condensers of Fig. 1, for example, may be replaced by a single unit of the appropriate value. This measure eliminates or greatly reduces the lead inductance and thus eliminates the parasitic circuit.

Another remedy derives from the fact that a resonant circuit may be damped by increasing its series resistance, or decreasing its parallel resistance. Addition of such a resistance, especially by the insertion of

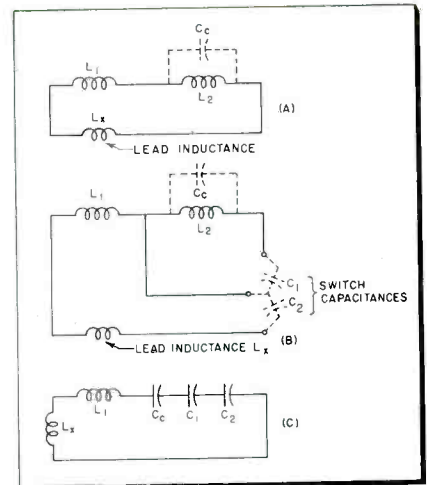


Fig. 4A—Coil inductance (L_1) in series with parasitic capacitance (C_c) of a 2nd coil (L_2) and the lead inductance (L_x). B—Basic circuit of (A), in series with, and completed by, capacitance introduced by switch contacts. C—Equivalent of one of the parasitic circuits in (B). Several others are possible.

a resistor in series with the parasitic circuit, is a common means of eliminating parasitic oscillation. In Fig. 2, for example, an 'antiparasitic' resistor is inserted between the screen grid terminal and the bypass capacitor. The value of the inserted resistance is usually about a hundred ohms or less—often 47 ohms. Such a value kills the parasite without introducing other significant effects on circuit operation. Inspection of circuit diagrams will show that these antiparasitic resistors are generally used between similar elements of paralleled tubes—that is, between paralleled grids, plates, screens, etc.

Frequency-Shifting TVI

There is a third way of dealing with parasitic TVI. The frequency of the oscillation causing the offending symptoms may be shifted by increasing or decreasing the capacitance or inductance of the parasitic circuit, producing a new frequency of oscillation which does not cause interference. This method is employed in cases where the interference is relatively weak. We may cite, as an example, the case where a parasite becomes objectionable only

Parasitic Oscillations (Continued)

after the set has been moved from one area to another in which the signal level is lower. The increase in receiver sensitivity due to reduced ACC biasing now permits the TVI to become noticeable.

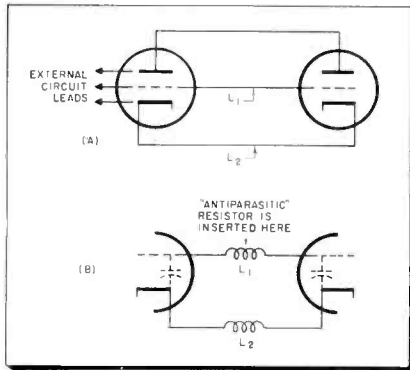


Fig. 5A—Partial schematic of two tubes, or tube sections, in parallel. B—Circuit of (A) showing parasites in grid-cathode circuit.

When attempting to effect a shift in the TVI frequency, care must be exercised that the new frequency doesn't also result in noticeable TVI. (A parasitic circuit may be "re-tuned" by changing the lead dress, or by replacing tubes and other components, to change interelectrode and other capacitances present.—Ed.)

Reduction of the transmission or radiation of the offending oscillation may also be attempted. The remainder of the circuit wiring connected to a parasitic oscillatory circuit may transmit or radiate the oscillation. Weak parasitics may frequently be "cured" by reduction of such radiation. Altering lead dress has helped in some instances. A long lead which acts as a radiator may often be

shortened. A screen dropping resistor, to cite an example, may be a foot or so away from the tube terminal to which it connects, with a long length of wire in between. Physically transferring the resistor to the tube socket terminal may eliminate noticeable TVI symptoms.

Addition of shielding may reduce pickup by the grid wiring of a first video IF stage; shielding a radiating lead may not only reduce its radiation, but also cause some attenuation of the oscillatory energy due to the bypassing effect of the shield wire. (This bypassing effect will introduce losses in the desired signal; detuning of the circuit may also have to be corrected—Ed.) This method is often employed in conjunction with frequency shifting, already described.

Reduction of excitation is still another method that is often successful. If the shock which excites the oscillation is reduced (or eliminated), then a cure may be effectively made. Reduction of drive to a horizontal amplifier tube may reduce the excitation of a parasitic present at its screen grid (refer to Fig. 2) to a negligible level; it should, however, be noted that an antiparasitic resistor is a more certain, as well as more lasting cure.

A combination remedy involving more than one of the techniques described here is often necessary. To make full use of this information, the technician should memorize the typical parasitic circuits illustrated. He should also memorize the cures. Only when the various possibilities are mentally "on tap" can he learn to "see" parasitic resonances that are not shown on the schematic diagram.

Educating the Service Customer

"Because of the intricacies of television," says J. R. Widisky of Bonded TV Service Co., Boston, Mass., "we cannot agree to continue to service sets without additional charges, simply because we have done one particular repair job. We allow the customer a two-day trial period after repairs are made, to determine whether or not the original job is satisfactory. After two days, service will again be rendered at the customer's request at a new charge. Our prices are reasonable in view of the fact that they are figured at the rate of \$3.50 per hour."

Important among Bonded's efforts in behalf of ethical servicing and representation, is the plan suggested by the company to aid consumers and television servicing in general.

Entitled "Education of the Consumer," outline of the plan follows:

Let the Public Know

- a. Many parts and tubes combine to make up the picture and sound.
- b. Anyone of many parts in a particular circuit can cause the loss of picture and sound.
- c. In most cases, breakdowns, although they appear to be alike, are caused by some other part not replaced by the service man.
- d. Give an opportunity for the service man to prove to the consumer that the above is true before accusing him of poor workmanship.
- e. The consumer cannot expect continuous service, without additional payment for labor and parts, for work done previously, that has no bearing on the new breakdown.
- f. Unreasonable requests for quick return of sets requiring shop work should not be made.
- g. The responsibility of honoring a parts warranty is entirely on the shoulders of the manufacturer who has been paid for it and not the service company.

Service Industry Cooperation

Inside the industry, Mr. Widisky asks:

1. Request the manufacturer not to overrate his product and stop leading the public to believe that his set will perform without external interference, such as airplanes, diathermy, X-ray machines, etc.
2. Set up a code of ethics with regards to advertising by television service companies to clarify just what the customer is getting, and what the customer is paying for.
3. Appoint a technical board of advisors which could be composed of volunteers without pay, from service companies, to review complaints.



Servicing AC-DC Radios

Part 1 of a Series on Hard-To-Find Troubles.

BY M. G. GOLDBERG

• With the advent of television, many technicians have treated radio as though it belonged in a museum along with the hand-wound phonograph. Millions of radios, however, still find their way each year to service shops.

Most radios sold and serviced today are of the AC-DC type, using 4, 5, or even 6 tubes. Probably 75% or more of all troubles on AC-DC receivers are caused by either shorted or burned-out tubes, with other less frequent complaints due to dried-out

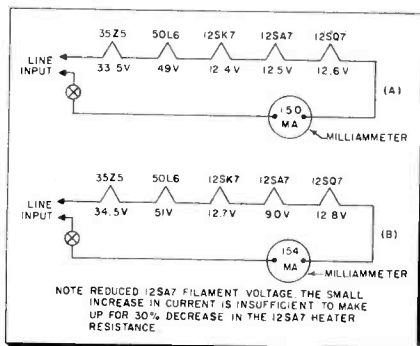
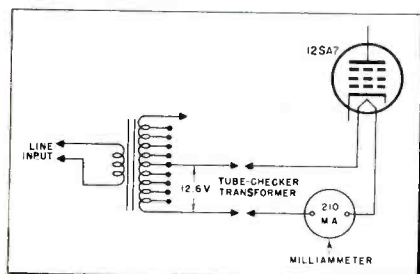


Fig. 1A—Normal heater voltage readings. B—Readings with defective 12SA7 in set.

filter capacitors, rubbing speaker cones and torn or slipping dial drive cords. All of these troubles have quite obvious symptoms and their cures are almost all self-evident. A small percentage of sets, however, turn out to be brain teasers and gray-hair inducers; these are the sets to which we shall direct our attention in this article, as well as in the ones to follow.

Let us consider, for a start, the case of a standard-brand 5-tube AC-DC set which comes into the shop for repair,

Fig. 2—Above-normal current flows in defective 12SA7 heater, due to its connection across the 12.6v supply of the tube-checker.



with the complaint that the set either cuts out after playing a while, or doesn't start working at all. When the set quits working, the pilot light remains on, ruling out the possibility of an open tube heater. All tubes check good on the tester. Although the set sounds "alive", no station is received.

Test Results

A quick pass with the signal generator output lead (generator set at 455 kc, 400-cycle modulated signal used) shows plenty of output in the speaker; the IF trimmers peak normally, indicating that the trouble originates in the oscillator-mixer circuit. Oscillator and mixer plate voltages are near normal, but no negative voltage is present at the oscillator grid.

The signal generator is next tuned to 1955 kc and its output lead clipped to the oscillator grid terminal. A strong local station comes in fine at 1500 kc, proving that something in the oscillator circuit is wrong. The 12SA7 is rechecked, and still tests good; we try another tube in the set anyway, and everything works fine and stays that way. To find out why the old tube didn't work, we put it back in the set and check all heater voltages. Nine volts appear across the 12SA7 filament terminals, and normal or slightly above normal voltages are measured on the other heaters.

Wattage Too Low

A resistance check on the 12SA7 filament shows it to be below normal, with the heater partially shorted out. Since the current thru the tube is limited to slightly more than 150 ma by the presence of the other tube filaments in the series-string, the wattage ($E \times I$) consumed by the heater is only $9 \times .15$ or 1.35 watts, compared with the $12.6 \times .15$ or 1.89 watts that is normally present.

When the defective tube is placed in the tube checker, the transformer winding of the latter is in parallel with the heater, and delivers 12.6 volts to its terminals. Since the resistance of the tube has dropped to approx. 60 ohms from 84 ohms normal, the current it draws in the tester

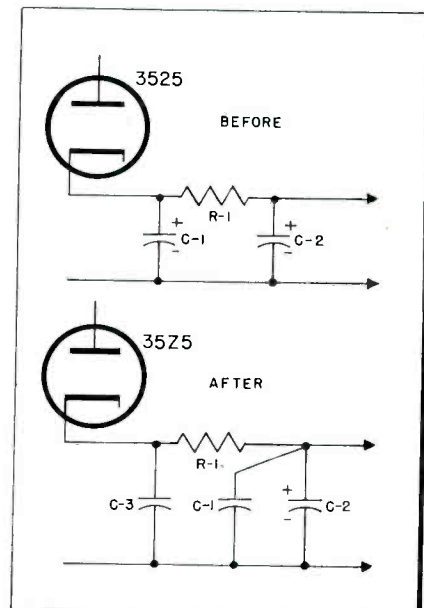
is 210 ma, producing a power consumption of 2.6 watts—more than enough for proper cathode emission (see Figs. 1, 2). A "fooler," eh?

When a hard-to-find trouble is present in an old midget set that needs a new tube, electrolytic, etc., the profit margin moves toward the vanishing point. One of the ways to economize on such an old "dog" set, when a filter replacement is required, is indicated in fig. 3.

If the hum level of the receiver is unusually high, and shunting a new filter of, say, 30 mfd across C-1 and C-2 in turn has little effect in reducing the hum, turn off the set and resistance-check the filter resistor R-1 (see Fig. 3). Often this resistor has been overheated and its resistance is below normal, reducing its filtering effect. Or the "hot" leads of the capacitor may have shorted together internally, effectively reducing the pi-section filter to a single capacitor.

Both troubles can be checked for by measuring the voltage drop across R-1 when the set is operating. If the drop is very low, it indicates that either one or the other fault mentioned is present, and must be corrected. Resistance and condenser substitution checks (with the original filter capacitor disconnected) will readily localize the trouble.

Fig. 3—Tying "hot" leads of reduced-value dual filter together makes it possible to add only a single capacitor (C-3) as replacement.



VHF Antenna

Oscillating Lines, Using Stub for Increased Pickup,

By PHILIP THIER

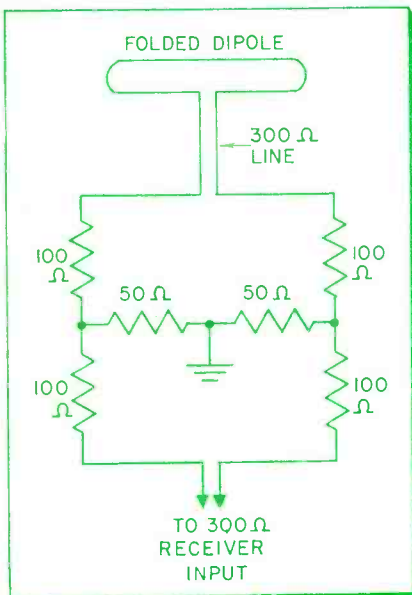
VHF antenna problems still haunt many technicians. Here are some solutions offered by one serviceman.

Oscillating Lines

Oscillation may be set up in a transmission line when a mismatch is present. If the line is unshielded, the radiated energy of these oscillations is apt to affect neighboring receivers. The oscillations may also be picked up by the video IF section of the receiver to which the line connects. Because of the instability of the oscillations, their pickup by video IF stages will be indicated by multiple undulating images or reflections. Similar reflections may be caused by the physical placement of the transmission line, its length, or a combination of the two.

In some installations, there are many bends in a line with long horizontal runs. The inductance present in combination with the effective capacitance to ground and/or the capacitance between lead-in wires, becomes a resonant circuit which may oscillate at one or more of the channel frequencies. Extra-long lead-in lengths, even without curves, may become tuned circuits at some TV frequency.

Fig. 1—This pad may help when incoming stations are strong, and ghosts are present.



Check for all the conditions cited when line oscillation is suspected.

Using Stub to Increase Antenna Pickup

Quite often, open-ended stubs are employed as broadly-tuned circuits to increase the sensitivity of a particular antenna element. For example, a 12.5 in. open stub connected to the high-frequency dipole of a "hi-lo" array will aid reception of Channels 9 thru 13. When the pickup of any one channel is to be increased by a quarter-wave open-ended stub acting as a tuned circuit, the physical length of the stub may be obtained from the formula: $L = 234/F$, where L is the length of the stub in feet, and F is the geometric center of the frequency band in which the channel lies. (This center is determined by the formula, $F_C = \sqrt{F_H \times F_L}$, where F_C is the geometric center frequency (in mc), F_H the highest, and F_L the lowest frequency of the band in question.

The geometric center frequency for Channels 2 to 5 is 66.5 mc; for Channels 7 to 13, it is 193.8 megacycles. Substitute these values in the formula $L = 234/F$, and stub lengths of 3.5 ft. and 1.2 ft., respectively, are obtained. This particular type of matching stub is connected to the transmission line *at the antenna end only*. Here again it may be necessary to trim down the stub length in a specific practical application. Start with a greater-than-formula length and trim down, while in telephone contact with an assistant watching changes in the received picture. As always, a test pattern displayed on the receiver serves as the best indication of overall performance.

Eliminating Ghosts

Multipath reception is almost unavoidable in congested localities. The big-city apartment-house roof, on which antennas sprout like weeds, often introduces difficult problems. Each new installation increases the possibility of ghosts being caused by reflections from antenna to antenna. An antenna system in an oscillatory state due to a mismatch would, on such a roof, be like the proverbial bull in a china shop; every set in the

building would probably be affected. (A scientific-minded gentleman once led a bull into a New York china shop, just to see what would happen. The bull walked among the costly chinaware as gingerly and carefully as though he owned the shop.—Ed.)

The technician must rely on his own ingenuity to find a spot on the roof where his installation will not be

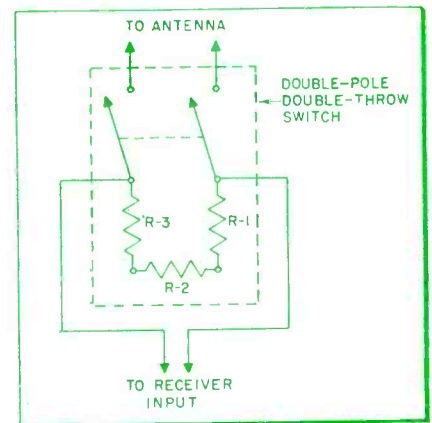


Fig. 2—Pad with switch added, to permit antenna to be connected directly to receiver.

affected by the others. The desired positioning may often be obtained by setting the antenna higher—in some cases, lower—than all the others. The use of a directional array with a high front-to-back and front-to-side ratio will help to prevent interference from nearby antennas. Keeping the transmission line length as short as possible will also help minimize interaction. A shielded line is recommended for city use, to eliminate antenna interaction due to line pickup, as well as to minimize local interference.

In most cases, the reflected signal is weaker than the direct one. Should this be so, it may be possible to attenuate the incoming signal enough to eliminate the ghost, and still have sufficient strength remaining in the direct signal to permit good reception. The pad shown in Fig. 1 may be used for this purpose. If a ghost on a strong station is to be eliminated, and one or more stations are being received whose strength is not great enough to suffer attenuation by a pad, the type of pad and switching arrangement shown in Fig. 2 may be made up. The resistors are small-

Installation Problems

Ghost Elimination, Choosing Booster. Human Problem

sized carbon units between 100 and 1,000 ohms in value (their exact value is determined by trial-and-error).

When two images of similar intensity are seen, with the entire picture jittery, a reflected signal almost as strong as the direct one is indicated. The jitters result from the receiver sweep circuits trying to synchronize on both sets of sync signals. Under certain conditions, the reflected signal may be out of time phase with the direct signal just enough to cause partial or complete cancellation of the synchronizing pulses. This condition is probably present when receiver loses sync (and has a ghost) on one channel only.

It may be of aid, in eliminating a ghost by antenna reorientation, to know the approximate straight line distance between the receiving antenna and the reflecting surface causing the ghost. This distance is equal to: $d/w \times 10$ miles, where d is the distance in inches between the desired image and its ghost, as seen on the picture tube, and w is the width in inches of the picture on the screen.

Master Antenna Installation

On small multiple dwellings or private homes, it may be inconvenient or undesirable to mount more than one antenna. There may, however, be more than one receiver in the house for which an antenna installation is desired. In such a case, a single high-gain multi-array antenna may be used.

With suitable compensating circuits, a number of receivers can be supplied from one antenna. The number of sets is limited only by the signal strength available from the antenna system. In Fig. 3, multi-connection arrangements are shown for 72- and 300-ohm systems. If for any reason, one of the receivers is disconnected from the system, the double pole-double-throw knife switch must be reversed, to connect the dummy load resistor into the circuit, and thereby maintain the system's matching.

In large apartment houses, where five or six apartments are stacked one upon the other, it might be possible to get the tenants to agree on a

single high-gain antenna. The landlord may prove quite willing to permit such an arrangement. There are advantages to be gained by all three parties. The individual set owner pays less in the long run for his antenna installation and its maintenance; the landlord gains in having fewer antennas on his roof, and the installation becomes more profitable.

Using Booster to Improve Pickup

If a high-gain antenna and adequate antenna height do not provide a suitable signal input to the receiver, a booster may be tried. Since the booster becomes the first RF stage of the receiver, it is necessary to take certain important considerations into account. First, the input and output impedances of the booster must match the transmission line and the receiver input impedances, respectively. Second, the booster must have a high signal-noise ratio, since this ratio is effectively established in the first receiver stage. Third, the booster

must be able to provide gain on all channels being received. (Some commercial units incorporate band-switching arrangements to permit efficient operation at all channels.) Finally, the booster should be completely shielded, permitting it to be placed inside the receiver cabinet if the set owner so desires.

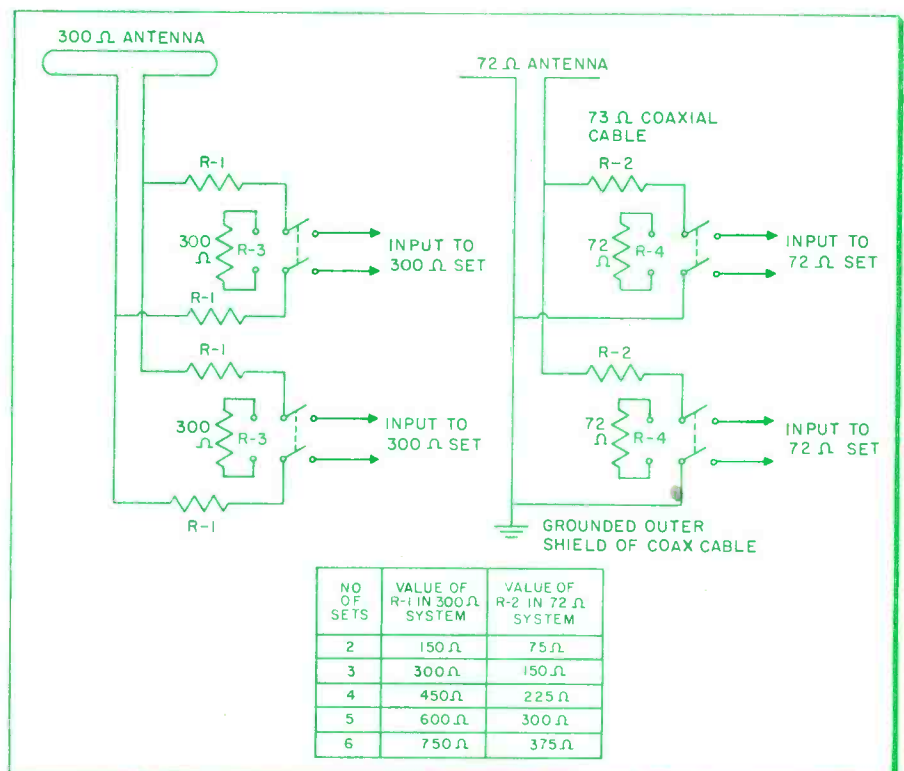
The Human Problem

No discussion of antennas is complete without considering the human problem. How can a technician convince a customer that one or two particular channels are simply not receivable in his locality? After all, his buddy on the other side of town gets Channel "X" perfectly.

If the technician has satisfied himself that no possibility has been neglected, that every trick he knows about has been tried to bring in reception, then he has but one course of action left. A letter or a telephone call to the station in question, telling them in detail of the problem will,

(Continued on page 56)

Fig. 3—Method for connecting more than one receiver to an antenna. The dummy load (R-3, R-4) must be switched in, if any receiver is taken out of the system, to prevent mismatching.



Servicing Printed

Advantages of P-C Networks. Testing for Trouble.

By JOHN ROGERS

• Like every development, with which the man on the bench is not yet fully familiar, the printed circuit gets its share of hostile scrutiny. It seems like just one more gimmick designed to add to the serviceman's problems. Nevertheless, the use of these units does provide a number of advantages.

For one, the problem of stocking replacements is minimized. Consider, for example, the fact that two widely-used vertical-integrator assemblies account for millions of TV receivers produced by close to a hundred manufacturers. For another thing, once a successful test procedure is worked out for a given network, this same technique may be applied to the same and similar units every time they come up for servicing.

These advantages will be even more tangible with the newer units involving inductors. IF systems are a conspicuous case of circuit variation from one receiver to another. The advent of printed IF transformers and traps can conventionalize design around these units to a far

greater extent than has been true in the past. In addition, these new IF components permit the kind of chassis mounting that makes alignment mechanically convenient.

Recently developed IF units are a good case in point. In Fig. 1, a printed IF transformer and its shield can are shown. (A conventional IF transformer and can are shown below this sketch for comparison purposes.) The rectangular-spiral tracings on the plate are the printed IF coils; the screws mounted on the metallic discs are adjustable for alignment purposes. The holes punched in the side of the can provide access to the adjustments when the assembly is mounted on a chassis.

Two advantages accrue from this arrangement: 1—All adjustments are available from the top of the chassis, making a touch-up alignment possible without removal of the receiver from its cabinet. 2—Since many manufacturers find it convenient to place IF cans under the bell of the picture tube, manipulating the top adjustment of the conventional transformer is made difficult. Side mounting of the ad-

justments on the printed transformer simplifies the adjustment problem.

Notwithstanding their real advantages, printed networks present a challenge when something goes wrong in a circuit where one is used. Checking them involves a little forethought. Some key questions have to be considered in advance: Should you replace the complete printed unit, or is it practical to replace a single defective component within the network? If so, how closely can you isolate defects in part of the network only? Is there some special technique for checking the entire assembly?

Troubleshooting Procedure

Inspection of the network schematic will provide some of the answers. Consider the rather simple ones shown in Fig. 2. In A or B, either of the two components can be checked directly between the tap connection and either of the two end leads. In C, a little more ingenuity is involved. If an ohmmeter placed across the combination yields a reading equal to R-1's value, the resistor is (unless an intermittent is present) normal, and the possibility of a short in the condenser is eliminated.

The capacitor may, however, be open. This possibility can be

Fig. 1—A printed-circuit IF transformer compared with a conventional one (courtesy RCA).

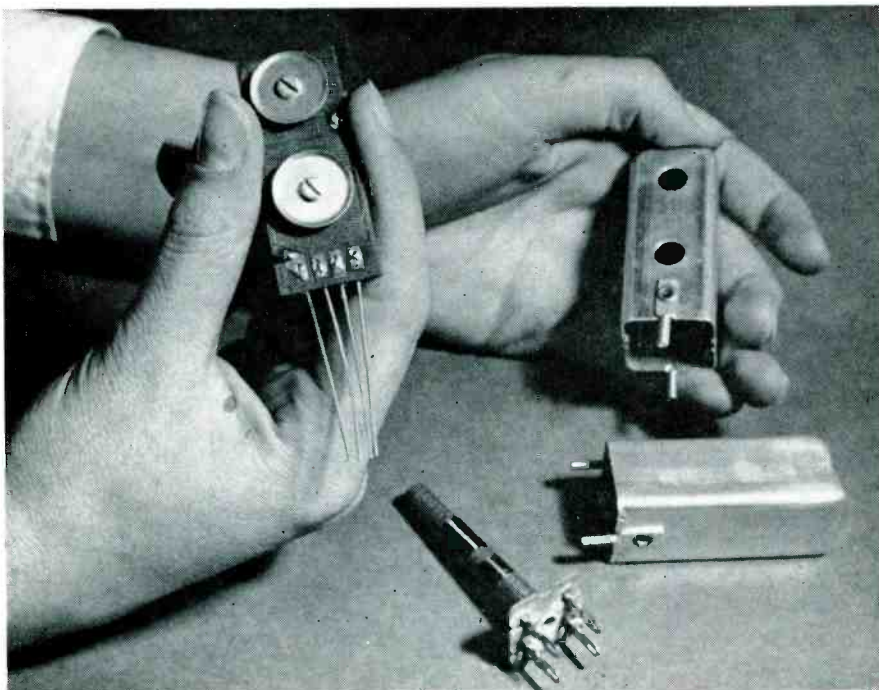
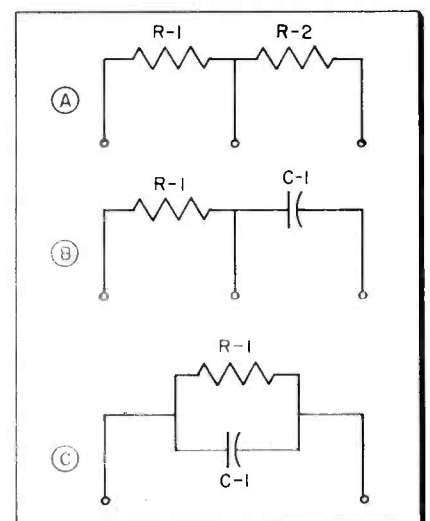
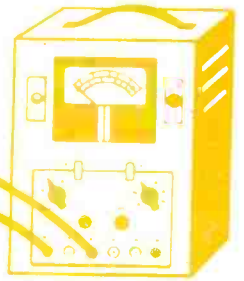


Fig. 2—Schematics of several printed circuits.



Circuits and Chassis

Replacing Individual Components. Soldering Cautions.



checked by temporarily shunting a substitute capacitor across the terminals of the printed unit. When either the resistor or condenser is open, a repair may be accomplished by permanently installing a substitute for whichever component is defective, across the terminals of the printed combination.

When an ohmmeter across the network's terminals indicates a reading lower than the rated value of R-1, the entire unit will require replacement.

The problem is somewhat more difficult when a rather complex network, like the audio couplate shown in Fig. 3, is present. There are six leads on this unit. There are also, as Fig. 4 indicates, six components. These facts do not automatically establish the checking procedure; a little analysis, however, will promote the working out of a suitable test procedure.

The resistors can be handled rather easily. Leads 3 and 4 go across R-1; R-2 connects to leads 3 and 5; leads 2 and 6 come from R-3's terminals. Two of the three capacitors can readily be tested for open circuits, shorts, or leakage; C-1 and C-3 are, respectively, accessible through leads 1 and 4, and leads 5 and 6. A short in C-2 will show up in a resistance check between leads 1 and 5, but be careful about drawing conclusions concerning the presence of such a short, in making the check cited. There is a shunt path between leads 1 and 5,

consisting of C-1, R-1 and R-2, which must be considered. In fact, whenever the necessity of testing C-2 arises, the three elements in this parallel leg should be tested *first*. In the latter case, each of the three components is checked individually.

Other networks are tackled differently, of course, but the example shows how the printed circuit can be broken down for troubleshooting purposes. You can work out similar test procedures of your own.

Replacement Techniques

When replacement of a printed network becomes necessary, reference to the schematic and service data of the receiver involved yields helpful information. In addition to a listing of component values in the circuit, a numbered identification of the leads is generally given. A replacement obtained from some source other than the manufacturer of the original unit may use a different lead numbering system, but this is a minor matter. The replacement unit will generally come with an instruction sheet; if it doesn't, the manufacturer's catalog will provide the desired information.

The mechanics of removing or connecting the printed network, while they differ somewhat from techniques applied to conventional individual components, are equally simple. Excessive heating should be avoided; a low-heat soldering iron is recommended on such jobs. Little heat should be necessary, since these units have mechanical connections that are easily made and severed. The solder originally used for connecting printed assemblies is often of a type that has a low melting point. For this reason, application of excessive heat, when it is desired to disconnect only one of two leads for testing, may melt all connections. A mild withdrawing force applied to the lead with the long-nose pliers while heat is being applied, will promote a more rapid withdrawal. If the lead to be severed is gripped with the pliers close to the point of contact, the pliers will aid in dissipating heat.

Often the printed circuit, instead of being a separate, removable unit, is an integral part of the chassis. This is the case with miniaturized equipment, such as hearing aids or midget portable receivers. In a printed-circuit chassis, considerations concerning the choice of chas-

Fig. 3—Typical printed-circuit audio couplate.

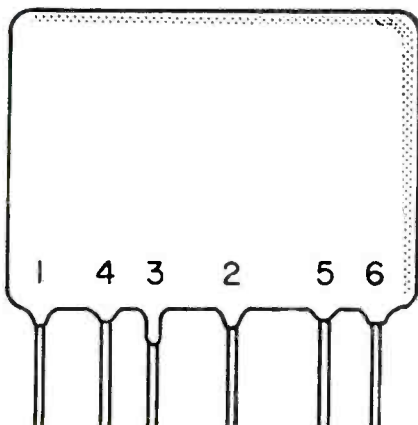
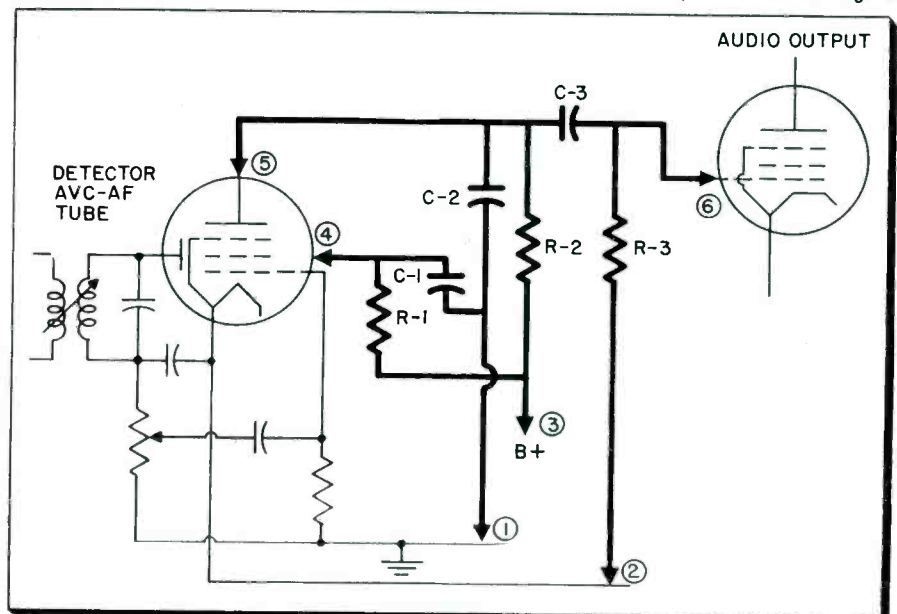


Fig. 4—Schematic diagram (heavy lines) of printed-circuit audio couplate shown in Fig. 3.



sis base material are usually very different from those determining the choice in the case of a conventional receiver design. Instead of a sheet of good conducting material, like aluminum, a non-conductive plate is used. The plate is often of bakelite or some other plastic. On this plate are sprayed, stamped or engraved all connecting leads and some components. Good leads are obtained by spraying one or more layers of conducting material on the insulating plate.

Printed Chassis

The underside of a chassis made up in this way is shown in Fig. 5. In this portable Admiral receiver, printing techniques are used, in the main, to eliminate the use of hook-up wire. Resistors, condensers, tubes and other components, most of which are of the conventional type, are mounted above the chassis board (see Fig. 6). Connections are made to the printed leads through eyelets cut through the chassis.

When a section of printed lead is damaged, a jumper of ordinary hook-up wire, soldered across the connecting terminals of the original lead material, results in a quick and satisfactory repair. When a resistor or condenser requires replacement, it is most convenient to clip the defective component out of the circuit and to solder the new part to the connecting wires remaining from the original part.

In many pieces of equipment, resistors and capacitors are printed directly on the chassis insulating board, as well as leads. Resistors are made by spraying an appropriate resistive material over one area, instead of a good conductor. When such a resistor open-circuits, and it is desired to shunt a conventional replacement across its terminals, it is advisable to scrape away some of the material of which the resistor is made. This is done to make certain

that the defective part remains open-circuited.

Condensers are printed on a chassis in a simple fashion. Areas representing the conducting plates are sprayed on either side of an insulating strip or the chassis board itself. When these capacitors give trouble, the cause is usually the formation of dirt or moisture around the plates, which results either in leakage between the plates, or between one of the plates and one of the leads, or between one of the plates and other circuit components. Cleaning away the accumulated foreign matter with a soft brush will eliminate the defect. Coating the affected part with an insulating spray will prevent a recurrence.

After a little familiarity, the compact printed circuit becomes a friendly and appreciated arrangement, with some distinct advantages over a sprawling, 3-D array of hard-to-find individual components. There is no chance of mis-wiring during assembly, nor can wiring layout vary among individual examples of the same model. In this connection, refer again to Fig. 5. Notice how the clear-cut layout simplifies the problem of circuit tracing.

Admiral offers the following helpful hints on the servicing of its printed chassis, which can no doubt

be applied to many other printed chassis as well:

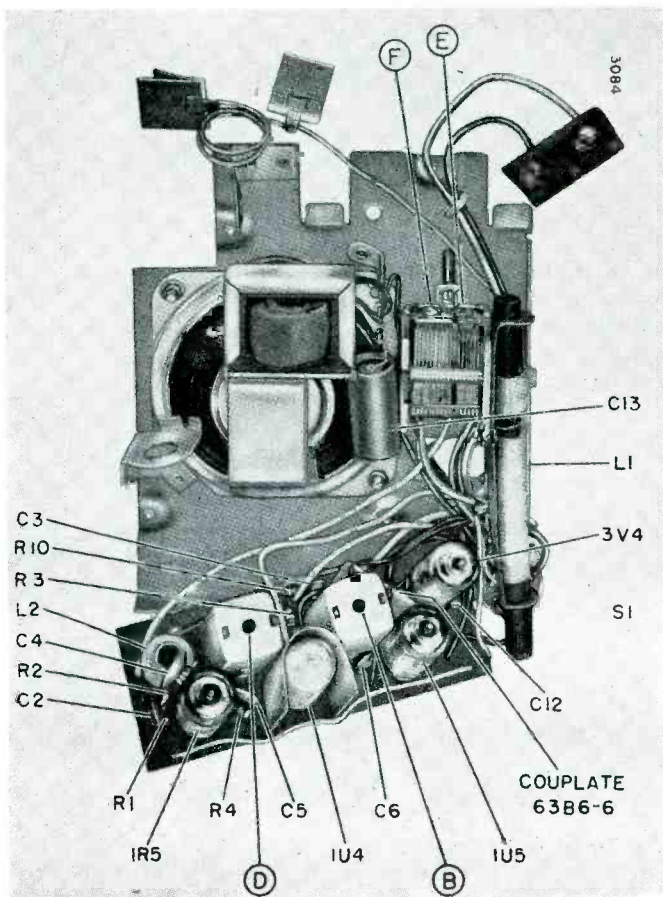
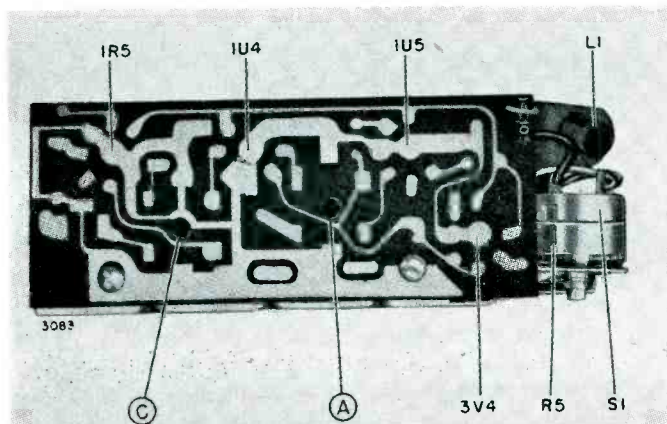
To avoid damaging printed circuits with excessive heat, use a soldering iron (60 watts maximum) with a small tip when replacing parts.

To remove defective parts, apply the tip of the soldering iron to the connection at the underside of the chassis. Keep soldering iron on connection just long enough to melt the solder, then quickly tap the chassis against the service bench to shake the solder away from the connection. After the solder is removed, untwist or separate connections. A pick will be helpful for untwisting or separating connections. After disconnecting wires or lugs, carefully remove parts from the top of the chassis. Before installing replacement parts, clean the solder from the connection, so the wires or lugs may pass through the holes in the chassis panel. To avoid running solder into adjoining circuits, use as little solder as necessary.

To avoid need for complete tube socket replacement, defective tube socket terminals may be replaced individually.

Note: The tubular shield (center connection) at the bottom of each tube socket must be securely soldered to the printed circuit, otherwise hum or oscillation will result.

Fig. 5 (left, below)—Underside view of a printed chassis (Admiral 4X1 battery portable), showing routing of printed leads. Fig. 6 (right)—Top view of the printed chassis shown in Fig. 5, illustrating the arrangement of components (Figs. 5 and 6, courtesy Admiral).



Tube Hints from Manufacturers

Tube-Caused Horizontal Drift; Premature 6BQ6 Burn-Outs; New HV Tubes

Horizontal Drift

The manufacturer offers some advice concerning the Capehart CX-36 chassis that may apply to other receivers using a Synchrolock-type horizontal AFC circuit (twin-diode AFC tube associated with a reactance tube). In the Capehart chassis, a 6AL5 is used as the AFC control tube, and one section of a 12AT7 serves as the reactance tube. In some cases, a gradual change in horizontal phase or frequency may result after the set-up adjustments have been properly made. Such horizontal instability may be caused by either a defective AFC control tube or reactance tube. Some 12AT7 tubes have been reported as developing secondary emission; this would be evidenced by the grid going positive. Check this grid (to ground) voltage with a VTVM. It should read zero with the 6AL5 removed. It should also read zero with the 6AL5 in place when horizontal frequency and phasing are properly set. If the reading is positive, replace the 12AT7 with a new one, and check results. Other defects may, of course, produce a positive reading here.

Premature 6BQ6 Burn-Outs

DuMont calls attention to the general problem of premature failure of horizontal output tubes, with specific reference to the RA-166/171 chassis series:

The 6BQ6 horizontal deflection amplifier tube should not require replacement more than once a year. Occasionally a receiver will be encountered which requires replacement of the 6BQ6 every few months. Common causes of this condition are misadjusted linearity or horizontal drive controls. The drive control should be advanced just far enough to eliminate drive bars from the picture. If the control is advanced further than this, the tube will be driven harder than required, shortening its life.

Satisfactory linearity can usually be obtained at two points in the range of the linearity control; with the slug turned almost all the way in, and with the slug turned almost all the way out. The correct setting is the one near the outer end of the

linearity control range.

If the coupling capacitor to the horizontal output tube grid is leaky, grid bias on the tube will be reduced, or the grid may become positive. This will also shorten the life of the tube drastically.

New Design HV Tubes

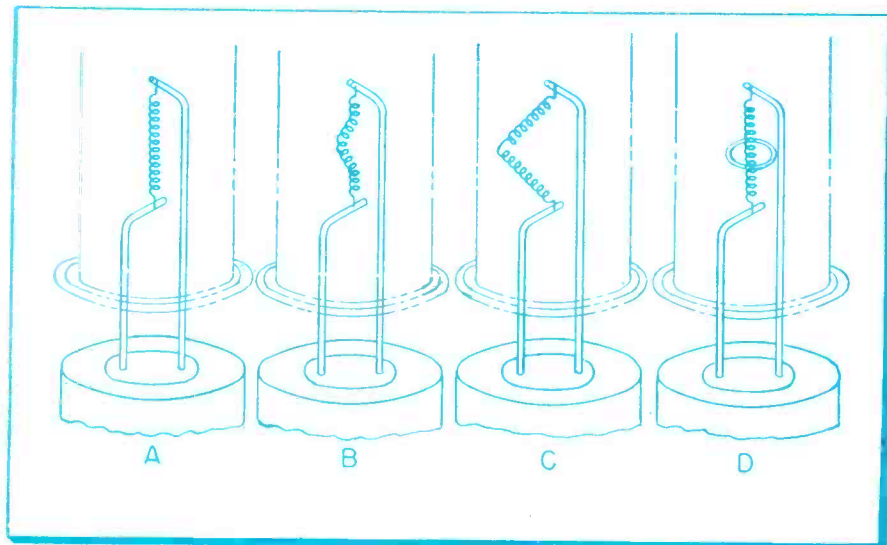
Two types of high-voltage rectifiers are used extensively in TV receivers: the 1B3-GT and the 1X2-A. The life of these two rectifier tubes has in some cases been considerably shorter than was expected. Numerous tests indicated that the shortened tube life was caused by the filament "bowing" and shorting to the anode structure. This "bowing" is shown in drawing B and C. The normal filament structure previously used in these tube types is shown in drawing A; B illustrates the "bow" which may develop in this type filament after a few hundred hours of operation and C shows an extreme bow which results in tube failure due to a "short" between the filament and anode structure.

Tube failure due to this "bowing" has become more serious in newer type receivers which produce 15-18 KV for the hv supply. It was found that the high amplitude wave form applied to the anode produced an electrostatic "pull" on the filament. This was due to the difference in

voltage potential during the negative-going portion of the wave form. Since the "bow" always occurred on the side opposite the filament support rod, it was found that a small ring attached to this rod would neutralize most of the electrostatic field. The position of this ring is shown in drawing "D."

This type of construction developed by GE engineers for 1B3-GT and 1X2-A tubes has resulted in a much longer tube life—an important advantage. However, the placement of the ring around a portion of the filament causes a voltage difference to exist between this ring and different portions of the filament, since the ring acts as a grid. In actual operation in a TV receiver, this causes approximately a 50-volt reduction in the output voltage, which is relatively unimportant since it represents such a small percentage of normal anode voltages. It does, however, affect the readings obtained on various tube testers due to the comparatively low voltage applied to the elements. Some types of tube testers may show a low reading on brand-new, perfectly good tubes. A test check has been made on a number of tube testers now on the market and these tests indicate that General Electric 1B3-GT and 1X2-A tubes are not "bad" unless they check in the lower half of "replace" scale.

A—Normal filament condition in HV rectifier. B, C—Filament "bowing" takes place due to electrostatic pull of high second-anode potentials. D—New ring neutralizes pull effect.



Picture Tubes for

Aperture-Mask Form, with Color-Phosphor Triads, Is Most

• At the recent Waldorf demonstration of color TV, presented by the National Television System Committee for the benefit of the Federal Communications Commission, thirteen different color TV sets were displayed in operation. These sets had been designed and built in 13 different competing factories, and involved various special circuits developed by their individual designers.

All of the 13 color sets thus shown, however, employed the "aperture-mask" type of color tube which has been under development in the RCA laboratories for more than a decade. The basic principle of the aperture-masking tube (described and illustrated in *TECHNICIAN* for October, page 41) was invented by Dr. Alfred N. Goldsmith, consulting engineer, back in 1940. Dr. A. B. DuMont has patents on the triad grouping of color phosphors. In both its 3-gun and single-gun forms, the RCA masking tube has been shown in many color-TV demonstrations during the last four years, and several hundred such tubes have been furnished to TV manufacturers for experimental use.

Recently, striking structural improvements have been made in the

aperture-mask type tube by the engineers of CBS-Hytron. Their new CBS color tube has color-screen parts weighing only $\frac{1}{2}$ pound, as contrasted with the 6-lb. weight of the earlier model color screen.

In view of the resulting cost reduction for mass output, some former skeptics of color TV have declared that the new CBS construction may result in savings that will bring a future 21-inch color set down to \$400, instead of the \$800 to \$1,000 price range often cited.

Principle of Operation

In principle, the basic aperture-mask type of color tube (see Fig. 1) contains three identical electron guns arranged in a triangular configuration. The resultant beams are also in the same triangular arrangement relative to the tube axis.

Each of the three electron beams is individually modulated by a composite voltage that consists of color and brightness signals. This voltage is applied between the control grid and cathode. The proper color signal is applied between the control grid and ground; the common brightness signal is applied between all cath-

odes and ground. By utilizing this method, the individual beams are modulated in accordance with the transmitted signal, and are of the proper intensities for their respective colors.

The modulated beams are also focused by their respective guns. This focusing, similar to that in conventional black-and-white tubes, is accomplished by the electrostatic lens formed grids 2 and 3 (Fig. 2, p. 34). Since the focusing electrodes (grid No. 3 of each of the three guns) are internally connected together, a common focusing voltage may be used. This feature simplifies the associated circuitry.

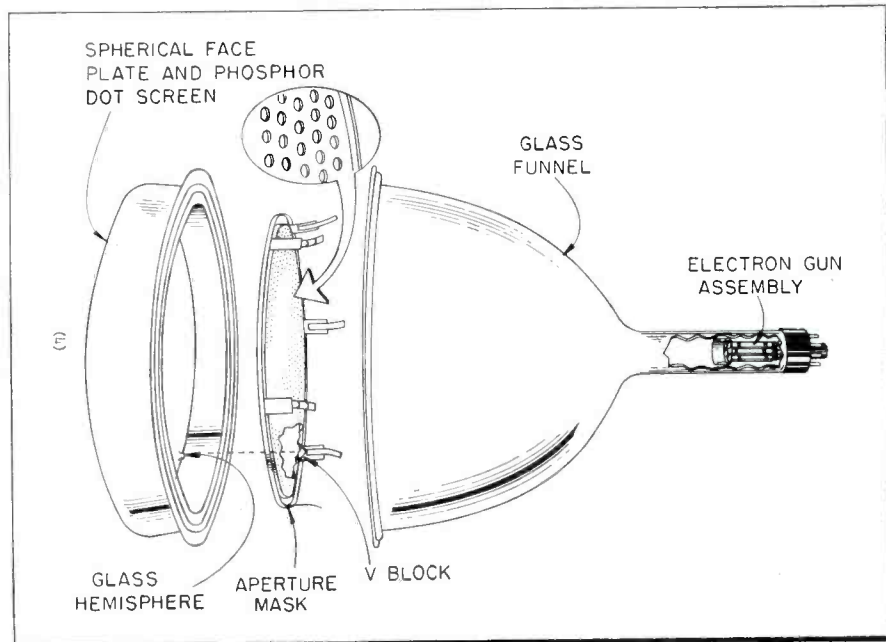
Convergence of Beams

As the three electron beams emerge from the convergence electrode (grid No. 4), they are acted upon by the electrostatic convergence lens. This lens is formed by the potential gradient that exists between the convergence electrode and the inner conductive coating in the neck of the tube. This conductive coating is electrically part of the accelerating anode. It is the function of this lens to converge the three beams at the aperture mask. Convergence is necessary to insure that the three color images will be superimposed.

Adjustment of convergence is accomplished by varying the voltage applied to the convergence electrode. This voltage is a combination of a static voltage and a dynamic voltage derived from the horizontal and vertical deflection circuits. It varies the focal length of the convergence lens in accordance with the positions of the beams as they scan the phosphor screen. In the new CBS tube, the spherical shape of the mask and screen reduces the dynamic-convergence voltage needed, and facilitates easy convergence adjustment in the receiver. (Adjustment of the focus and convergence potentials will probably be achieved by using potentiometers in the HV divider network.)

In the ideal case, the three beams leave the convergence lens so aligned that, when deflected, they

Fig. 1—"Exploded" view of the CBS-Colortron. Aperture mask is curved, unlike the flat mask in the RCA tube. Colortron is very much lighter than the RCA tube; it weighs approximately $\frac{1}{2}$ lb.



Color-Television

Widely Used in Experimental Color-Sets Built So Far.

approach the aperture mask at the correct angles properly converged. In the practical case, however, this is not always true. For this reason, it is necessary to employ external components to align the beams.

External Alignment

The first of these external components is a combination of three small, moveable permanent magnets, one for each beam (see Fig. 3). These magnets provide for adjustment of each of the beams, so that they will be properly acted upon by the convergence lens. The three magnets are mounted nominally 120° apart on the circumference of a non-ferrous ring. The ring is located approximately $1\frac{1}{2}$ inches from the tube axis in the grid No. 2 region.

The other external component necessary for proper beam alignment is the color-purifying coil. The magnetic field produced by this coil is perpendicular to the tube axis. This field acts upon the three beams simultaneously and, by proper adjustment of its strength, as well as its axial and rotational position, the common axis of three beams can be positioned to achieve optimum color purity. The coil is located on the neck of the tube in the region of grids 2 and 3. The construction of the coil will, when it has been correctly designed, allow it to be rotated and moved along the CRT neck.

After the beams have been acted upon by the alignment components and the convergence lens, they enter the deflection area. Here, the deflection yoke provides the required uniform magnetic fields that simultaneously deflect the three beams.

As in black-and-white tubes, the deflection yoke consists of four electro-magnetic coils. These coils function in pairs, each coil of a pair located diametrically opposite the other. Since this deflection yoke acts simultaneously on three beams, the electromagnetic field requirements are more stringent than those in black-and-white tubes. In particular, a more uniform field is required for deflection in the tri-color tube.

The electron beams travel in straight line paths from the deflec-

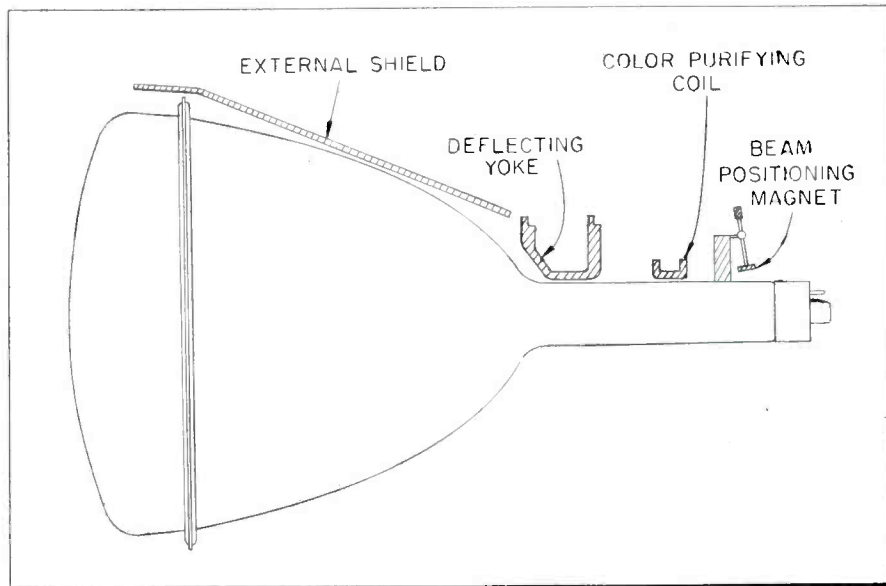


Fig. 3—Cross-sectional view of external components used with the tri-color tube. Note component arrangement. Only one of the three beam-positioning magnets present is shown in sketch.

tion area to the screen. Between the phosphor screen and the deflection area is the aperture mask. This mask is positioned so that, when viewed from the deflection point of any of the beams, only the dots of a single color can be seen through the perforations in the mask (see Fig. 4).

With the mask in the position described above, one beam will strike only the red dots, another beam will strike only the blue dots, and the third beam will strike only green dots. The mask, consequently, allows each beam to reproduce the exact hue of one of the primary colors present in each portion of the televised scene. The combination of the three primary colors recreates the televised scene in full color.

Color-purifying Coil; Positioning Magnets

The approximate position of this coil on the neck of the CBS tube is shown in Fig. 3. By rotating the coil around the neck of the tube, the transverse magnetic field will move the beams in different directions. Conversely, the current through the coil determines the magnitude of the movement.

Fig. 3 indicates the location of the

beam-positioning magnets on the neck of the tube. The field strength of each magnet is approximately 8 gauss.

Grid No. 1 Drive

The three electron guns of the Colortron have similar transfer characteristics. Due to the differences in phosphor luminescence efficiencies, however, the cutoff voltage of each gun must be adjusted to produce equal phosphor brightness or color balance. If color balance is not maintained when the tube is reproducing black-and-white pictures, for instance, color tinting of the gray scale will result. Individual grid-No. 2 voltage controls and grid-No. 1 drive controls will probably be provided in sets using the CBS tube, with grid-No. 2 controls allowing a voltage adjustment of from 100 to 450v.

Installation and Adjustment Procedure

After mounting, the color-purity coil, convergence magnets, and deflection yoke are placed on the neck of the tube. Once these components are positioned on the neck of the tube, the socket and high-voltage

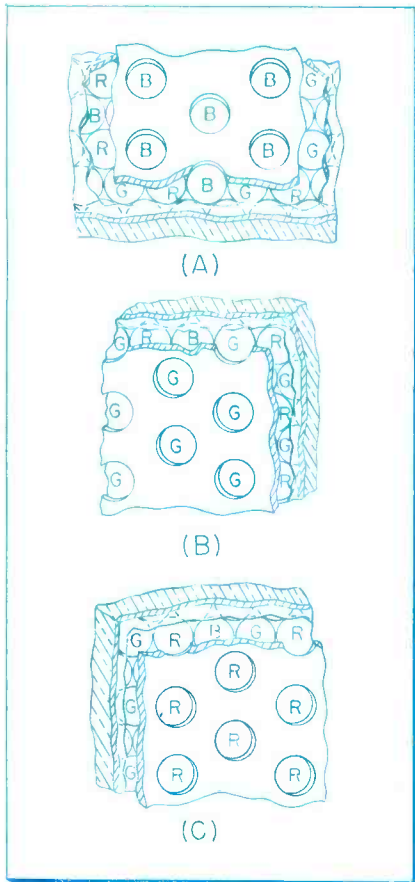


Fig. 4—Views of mask-and-screen assembly as seen from the deflection points of the three beams. View from deflection point of (A) blue gun, (B) green gun, (C) red gun.

connections may be made.

Before applying voltages to the tube, the grid-No. 2 controls are turned to zero and the grid-No. 1 controls to their maximum negative positions. Then, the proper potentials are applied to the electrodes of the tube, and sweep power is permitted to reach the deflection yoke. Initially, some arcing or sputtering may be observed. This is a normal reaction.

After allowing sufficient time for the various supplies to stabilize, the grid-No. 2 voltage of the red gun is slowly increased, and the grid-No. 1 bias simultaneously reduced until the screen is illuminated.

The next step is the adjustment of the purity coil. The servicer will probably be told to make this adjustment as follows:

1. Pull the deflection yoke back from the funnel of the tube approximately $\frac{1}{2}$ inch.
2. Energize the color-purity coil.
3. Move the purity coil along the neck of the tube, while simultaneously rotating it, until the purest red field is obtained in the center of the screen. It will be noted that the pattern on the screen also contains alternate blue and green fields extending radially out

from this red center. 4. Slide the deflection yoke in the direction of the face plate until the most uniform red field is obtained over the entire screen.

Once the most uniform red field is obtained, slight readjustment of the color purity coil may be required to achieve optimum color purity. The adjustment may be made by varying the current through the purity coil or by additional movement of the coil.

After obtaining optimum purity of the red field, the blue and green fields should be separately checked. No further adjustment of the color-purity coil should be necessary.

Convergence Adjustment

Convergence is the next characteristic to be adjusted. This adjustment procedure must be made in two separate parts. Convergence adjustment is facilitated by use of a spot generator. This spot generator should be capable of producing equally-spaced horizontal and vertical rows of spots on the phosphor screen. Each of these spots contains individual red, blue, and green components. Proper convergence is attained when the three color components are superimposed.

Initially, the static convergence voltage is adjusted so that spots near the center portion of the screen are converged. If this condition is not obtained, the beam-positioning magnets should be adjusted until the spots within a small central area of the screen are converged.

Dynamic convergence can be optimized after the static convergence is attained. Horizontal dynamic convergence is obtained by adjustment of the waveform and amplitude of the horizontal-dynamic-convergence voltage. This voltage should be varied until each spot of a horizontal row near the center of the screen is converged. Vertical convergence is attained by varying the vertical-dynamic-convergence voltage until each spot of a vertical row near the center of the screen is converged. Because of the interaction between the horizontal-and-vertical-convergence adjustments, it is recommended that these adjustments be performed alternately until optimum convergence is obtained.

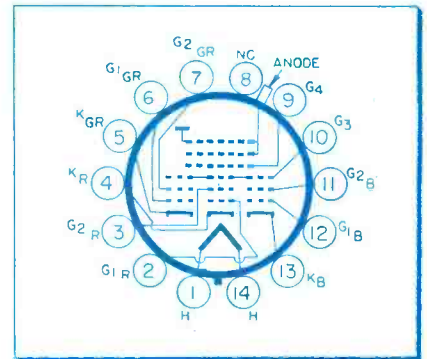
The final adjustment of the Colortron is the setting of the color balance. As was previously stated, the transfer characteristics and bias voltages of the three guns must be adjusted to produce a grey scale with no color tinting.

The following steps should be

taken to achieve color balance:

1. Set each grid-No. 2 voltage at the same value.
2. Set each grid-No. 1 voltage so that a low-level grey field is obtained on the screen.
3. Increase the brightness level of the composite field on the screen. This may be done by varying a master brightness control, or by varying a signal voltage simultaneously applied to all No. 1 grids.
4. As the brightness is increased during Step 3, observe which color becomes dominant.
5. Reduce the brightness of the field to the level in Step 2.
6. Reduce the Grid-No. 2 voltage of the gun controlling the dominant color.
7. Repeat steps 3 through 6 until no color tinting is observed over the required brightness level.

The foregoing adjustment procedure represents the method that achieves the fastest alignment consistent with optimum operational quality. After these steps have been completed, further adjustment should not be required. But further adjustment of the various components can be made to overcome any undesirable characteristics that may result from improper initial adjustment.



- Pin 1: Heater
- Pin 2: Grid No. 1 of red gun
- Pin 3: Grid No. 2 of red gun
- Pin 4: Cathode of red gun
- Pin 5: Cathode of green gun
- Pin 6: Grid No. 1 of green gun
- Pin 7: Grid No. 2 of green gun
- Pin 8: No connection
- Pin 9: Grid No. 4
- Pin 10: Grids No. 3
- Pin 11: Grid No. 2 of blue gun
- Pin 12: Grid No. 1 of blue gun
- Pin 13: Cathode of blue gun
- Pin 14: Heater
- Metal Flange: Anode

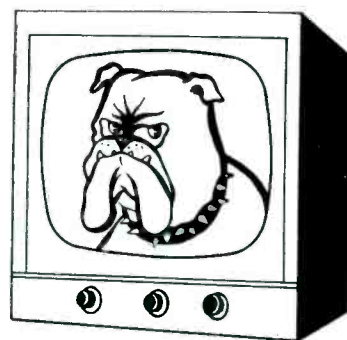
MAXIMUM RATINGS—Design-Center Values

Anode voltage	20,000 volts DC
Grid-No. 4 [convergence] voltage	11,000 volts
Grid-No. 3 [focus] voltage	5,000 volts
Grid-No. 2 [accelerating] voltage, each gun	500 volts DC
Grid-No. 1 [control] voltage, each gun:	
Negative-bias value	200 volts DC
Positive-bias value	0 volts DC
Positive-peak value	2 volts
Peak heater-cathode voltage, each gun:	
Heater negative with respect to cathode:	
During warm-up period not to exceed	
15 seconds	410 volts
After warm-up	180 volts
Heater positive with respect to cathode	15 volts

Fig. 2—Basing diagram of Colortron. Maximum voltage ratings of the tube are also shown.

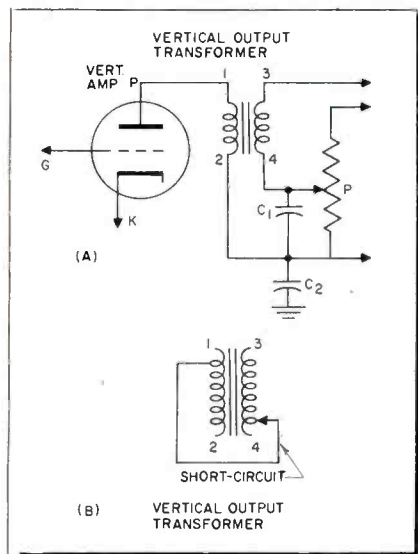
"Tough Dog" Corner

Difficult Service Jobs Described by Readers



Odd Vertical Trouble

Here is an unusual case where a fault clearly existed in spite of voltage and resistance readings that were well within normal range at the point of the defect. The lack of vertical deflection indicated a fault in the vertical deflection system.



Substitution of tubes did not cure the trouble and volt-ohmmeter checks failed to indicate the fault (until leads were disconnected). To add to the benchman's difficulties, the fault was intermittent.

A simplified version of the circuit is shown in sketch A. With the set in operation, an AC signal of about 15 volts RMS was present at the input of the vertical amplifier (between G and K). Somewhat less than this (about 4 volts RMS) was present between point P and terminal 2 of the output transformer. After an attempt to find out what prevented the tube from yielding an amplified output, the possibility of an AC short-circuit from plate to B+ was considered. Disconnecting the two output leads from the secondary (terminals 3 and 4) and subsequent testing for AC signal gave a signal of about 95 volts RMS at the plate. This was pretty close to the normal amount of sweep signal that should have been present at this point.

Ohmmeter tests with the second-

ary leads still disconnected revealed the defect: a short-circuit between primary and secondary (see sketch B). Note that the resistance readings across both windings were approximately normal when the transformer was connected in the circuit. Replacement of the transformer restored set operation to normal.—*James A. McRoberts, Brooklyn, N.Y.*

Delayed Vertical Sweep

During six years of TV servicing, I've come up against three of these models (Zenith 24G26, 16 in.) with the same trouble. All were cured by the same remedy. The symptom: vertical sweep takes about two minutes longer to come in than is normal. If this situation is not corrected, the bright horizontal line occurring while there is no vertical deflection could damage the CRT in due time.

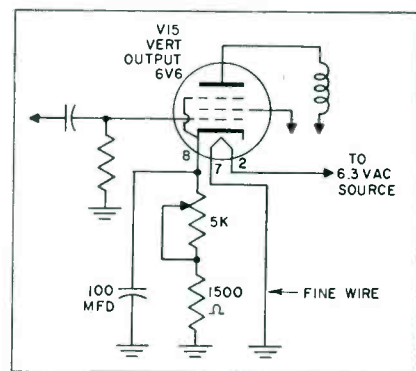
I started, as usual, by checking tubes, voltages and components, without success. Finally I monitored the plate current of the vertical output tube, V-15 (see sketch). When the set was turned on, the meter needle rose very slowly. It did not reach maximum value for about two minutes, at which time vertical sweep was normal in the picture tube.

It occurred to me that a slowly-heating vertical output tube filament might be responsible for the symptoms. Since the tube had already been checked, only the socket and wiring remained to be tested.

\$ 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.

After letting the set cool off for about ten minutes (to bring it back to the condition in which the trouble was apparent) I shorted pin 7 to ground (even though it was already



grounded). When the set was turned on again, vertical sweep came in quickly, about the same time as audio. A check showed that pin 7 was connected to chassis by a very fine wire. During warm-up, this wire apparently acted like a resistance in the filament buss. When this lead was replaced with a heavier wire, the trouble disappeared.—*John L. Mancini, Winthrop, Mass.*

Noise In AC-DC Receivers

An annoying noise present in quite a number of 5-tube AC-DC receivers shows up when the set is jarred. Removing the back loop plate to check the chassis causes the noise to disappear. Replacing the loop plate brings the noise back in. I have found the trouble in every case due to a noisy rectifier tube, worst offenders being 35Z5's and 35W4's, although the tubes test perfect in a tube checker. To cure the trouble, place a metal shield over the tube, and ground the shield to chassis with a flexible lead; or else wrap 6 or 8 turns of copper wire around the tube, spaced about 1/8 in. apart, and ground this wire to the chassis. A new tube, of course, will eliminate the trouble but will increase the cost of the repair. The cause of the trouble is a loose tube element, which creates RF interference that is transferred to the loop.—*M. G. Goldberg, St. Paul, Minn.*

Training School

Industry-Sponsored Courses Now Operating at New York.

• The pilot training course for television technicians, sponsored by the Radio-Electronics-Television Manufacturers Association at the New York Trade School, is now underway. At its opening, purposes of the course were outlined in brief talks by several well-known figures in the TV service industry.

Harold J. Schulman, chairman of the RETMA Service Committee and service manager of the Allen B. Dumont Laboratories, Inc., explained that the RETMA program is based on a need by the nation's technical schools for an industry-approved syllabus for TV technician training. He said the aim of the pilot course is to use the combined experience and thinking of all set and parts manufacturers in a course of instruction that will be distilled to represent the best of service instruction. The in-

structional material now prepared will be proven in the pilot classes and then distributed to all interested schools which wish to duplicate this training program, he said.

John F. Rider, of John F. Rider Publisher, Inc., chairman of the Local Industry Advisory Committee to the New York Trade School, told the students that the RETMA pilot course will be a virile one that will constantly change with new electronic product designs and service techniques. He said that the student's participation in bringing their service problems to the class is an important factor in tailoring the course to the needs of the nation's TV technicians.

G. E. McLaughlin, superintendent of the New York Trade School, told the members of the first pilot course they were making history and that

within a year or less they will look back and feel proud that they have pioneered in helping develop instructional material for TV service technicians that will be used in many trade and vocational schools.

Tuition Fee Nominal

While a tuition fee of \$60 is charged, the pilot training course is being supported with both money and equipment donated by RETMA member-companies. A preliminary course of instruction already has been drawn by the Association's Service Committee but is open to revision on the basis of experience gained during this pilot class. Following this phase, an industry-recommended course of training will be drawn up for use in vocational schools throughout the country.

The participating students all are practicing TV technicians from the New York area with three or more years experience. They receive both classroom and laboratory instruction in the most advanced servicing techniques. Fifteen benches of test equipment, along with TV receivers, instructional material, extra components and antennas, have been donated by RETMA member-companies for use in the course. Paul Zbar is the chief instructor.

Equipment Available

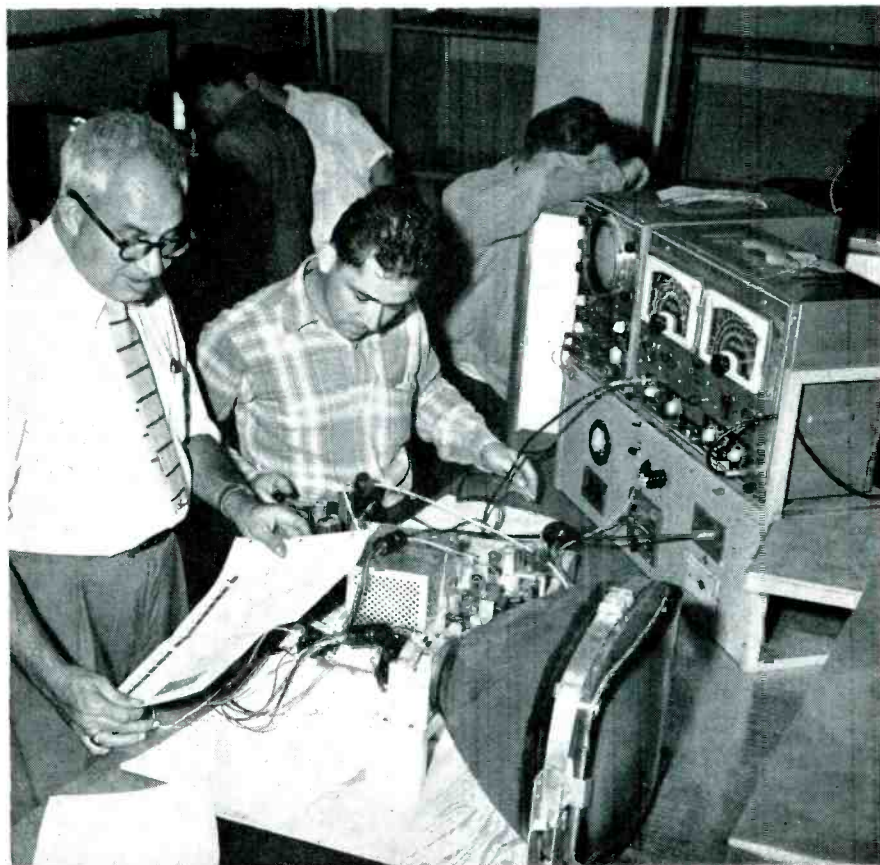
Test Bench Set Up—Fifteen test benches have been set up in the lab. Each bench is equipped as follows:

1. Cathode-ray oscilloscope
2. Sweep-frequency generator
3. Marker generator
4. Electronic VTVM
5. Low-capacitance, demodulation, and hi-voltage probes
6. Isolation transformer
7. Solder gun and hand tools
8. Master antenna outlet
9. Universal test speaker
10. Current model TV receiver

Each TV manufacturer has provided a TV chassis of his make to be worked on, chassis being rotated to all students.

Every RETMA TV servicing test-equipment manufacturer is also re-

Students participating in the RETMA course for TV technician training at the N. Y. Trade School. The course occupies two evenings a week, Mondays and Wednesdays, 6:30 p.m. to 9:30 p.m. and runs for 16 weeks. With a 10-day Xmas recess, present course will end January 19.



for TV Technicians

RETMA Members Gave Chassis and Instruments

presented with a complete set of his equipment, mounted on a specific bench. The student will be rotated among the test benches so that he will personally use all these major pieces of test equipment.

Course Organization—The course has been organized to give the student a logical, scientific approach to servicing.

The TV receiver is presented as a composite of seven related functional sections. The function of each section is analyzed and its effect on picture, sound and raster demonstrated. The equipment used in troubleshooting and/or aligning each section is discussed and demonstrated. Home servicing techniques are discussed and demonstrated.

Picture at right shows Paul B. Zbar, chief instructor, addressing class of technicians.



Outline of Pilot Course Offered TV Technicians in New York

Lecture Demonstration

- A. Prospectus of Course
- B. Rules & Regulations
- C. Lab Layout

II. TROUBLE SHOOTING TV RECEIVER

- A. Review of Basic TV receiver
- B. General Troubleshooting Procedure
 - 1. Isolating Defective Section
 - 2. Isolating Defective Stage
 - 3. Isolating Defective Part
 - 4. Correcting Defect
 - 5. Additional Preventive Maintenance

III. SWEEP SECTION - SERVICING

- A. Sweep Circuits - Latest model TV receivers
- B. Visual Indications of Sweep Defects
- C. Instruments Required and How They are used to Service Sweep Circuits
 - 1. Oscilloscope & Auxiliaries
 - 2. VTVM
 - 3. VOM - Home Servicing Techniques
 - 4. Cross Hatch Generator - Dot & Bar Generator
 - 5. Tube Tester
 - 6. Capacity Tester
 - 7. Isolation Transformer
- D. Correcting Defect
 - 1. Selecting proper replacement components
 - 2. Replacement techniques
- E. Additional Preventive Maintenance

Laboratory

- A. Laboratory Set Up
- B. Class Organization

I. INTRODUCTION

- A. Overall Circuit
- B. Section Functions - as evidenced by removing selected tubes
- C. Troubleshooting - For Defective Tubes
- D. Test Bench & Receiver Rotation

- A. Circuit Familiarization
- B. Test Instruments Familiarization and Use
 - 1. Oscilloscope Operation
 - 2. VTVM Operation
 - 3. VOM
 - 4. Cross Hatch Generator
 - 5. Isolation Transformer
 - 6. Capacity Tester
- C. Troubleshooting Defective Sweep Circuits
 - 1. Visual indications - Symptoms
 - 2. Isolating Defective Sweep circuit stage
 - 3. Isolating Defective Part
 - 4. Replacing Defective Components
 - 5. Checking Receiver after trouble has been corrected
- D. Test Bench & Receiver Rotation

The same procedure as for Unit III, will be followed for the following Units IV through Unit IX.

IV. SYNC SECTION SERVICING

V. VIDEO SECTION SERVICING

(Includes Video I. F. Amplifiers, Detector, Video Amplifier, D. C. Restorer, CRT and Associated Circuitry, A. G. C.)

VI. SOUND SECTION SERVICING

(Includes F. M., I. F. Amplifiers, Detector, and A. F. Amplifiers.)

VII. FRONT END SERVICING

(Including UHF techniques)

VIII. HIGH VOLTAGE SECTION SERVICING

IX. LOW VOLTAGE SUPPLY SERVICING

The following topics will be presented in addition:

X. ANTENNAS & TRANSMISSION LINES

- A. Antenna types and characteristics
- B. Transmission Lines
- C. Installation Techniques

XI. REQUIREMENTS FOR EFFICIENT SERVICE SHOPS

- A. Physical layout, test bench, etc.
- B. Equipment Requirements
- C. Manuals, Books Periodicals
- D. Business Practice and Procedure
- E. Business Ethics

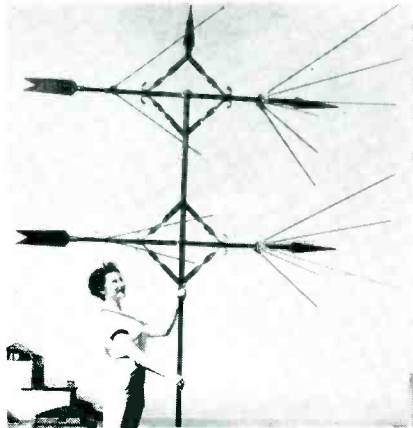
XII. CUSTOMER RELATIONS

Antennas and Installation

UHF, VHF and Combination Models; Indoor and Outdoor

Ward ANTENNAS

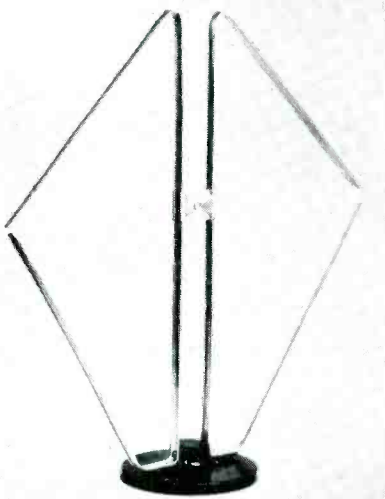
The Circle-vane and the Dymon-vane are VHF antennas designed for use in rural or suburban fringe areas where high sensitivity is required. Decorative features have been added.



The conical type Dymon-vane, which may be used stacked, is recommended for broadband use in metropolitan areas. The Circle-vane, a ten-element antenna based on the yagi principle, is for fringe use. Ward Products Corp., Div. of Gabriel Co., 1523 E. 45th St., Cleveland 3, Ohio.—TECHNICIAN.

Ultrasonic INDOOR RHOMBIC

The Ultra-Tenna, an indoor antenna of rhombic design, has a tuning slide to adjust it for optimum



results on UHF or VHF. It may also be rotated 90 degrees on its base for orientation. Matches 300-ohm line. Ultrasonic Corp., Cambridge, Mass.—TECHNICIAN.

Amphenol UHF-VHF ANTENNA

This all-purpose antenna, model 114-059 Stacked V, may be adjusted easily to any one of three angle spacings between elements. These alternate spacings provide a choice of good gain on both VHF and UHF bands, improved gain on VHF alone, or improved gain on UHF alone. A single down-lead is used in combined VHF-UHF operation. Shipped in two sub-assemblies for rapid installation. American Phenolic Corporation, 1830 South 54th Avenue, Chicago 50, Ill.—TECHNICIAN.

RMS VHF ANTENNA

The Mugwump is a combined conical-yagi type antenna for all-channel use. It is said to offer the characteristic gain of a yagi, together with the broad-band response of a conical. The yagi portion is preassembled for quick-rigging. Impedance match to 300 ohms; only a single down lead required. Model CY-1 is a single-bay unit; model CY-11 is a 2-bay array, stacking bars included. Radio Merchandise Sales, 2016 Bronxdale Ave., New York 62, N. Y.—TECHNICIAN

Fretco UHF-VHF ANTENNA

The Super Fretaray is a broad-band colinear array featuring four 104-in. reflector bars. It is said to provide high gain on UHF and VHF. A single transmission line is used. Fretco, Inc., 1041 Forbes Street, Pittsburgh 19, Penna.—TECHNICIAN.

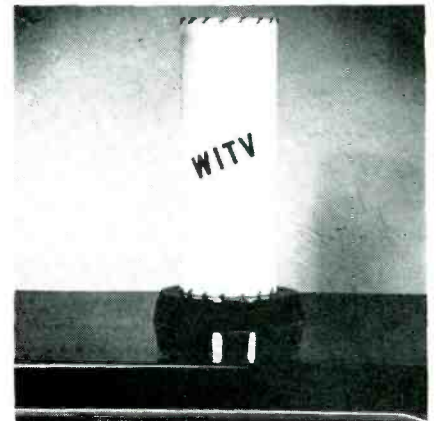
Tescon UHF ANTENNA

A single-bay corner-reflector antenna, model 706, is said to provide up to 14.8 db gain in UHF fringe areas. Factory pre-assembly facilitates quick installation. TV Products Co., Springfield Gardens, N. Y.—TECHNICIAN.

Metal Products ANTENNAS

Three antennas include two outdoor UHF-VHF and one indoor UHF type. Model TW-30 is a traveling wave antenna said to have gain across the UHF band equivalent to single-channel yagis, with medium gain at

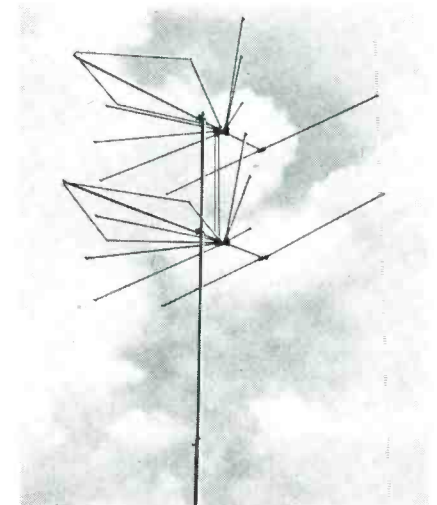
VHF. Model TW-15 is a smaller version of this type for use in primary UHF areas. Model CP-12 is an indoor UHF antenna, built around a lamp.



When placed on top of the TV receiver, it provides diffused lighting suitable for TV viewing. Metal Products Corp., 807 N.W. 20th Street, Miami 37, Florida.—TECHNICIAN.

JFD UHF-VHF ANTENNA

A rhombic section for UHF pickup, mounted in front of a conical section for VHF channels, is combined to provide all-channel coverage with a single antenna. Jetomic models JeT454 (single-bay) and JeT454S (two-bay array) are factory pre-assembled, and use simple quarter-wave copper jumpers for UHF-VHF matching in place of couplers or cross-over networks.



List prices: JeT454, \$16.50; JeT454S, \$34.50. JFD Manufacturing Co., 6101 16th Ave., Brooklyn 4, N.Y.—TECHNICIAN

**Be Sure to See Page 65
CIRCUIT DIGESTS**

Accessories; New Tubes

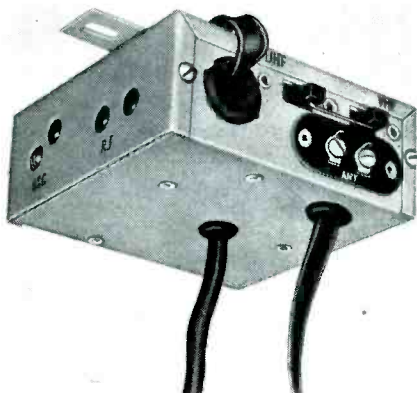
Boosters, Converters, Rotors, Lead-in; Three Tubes

Tech-Master 630 UHF ADAPTER

Designed to fit into the front well of 630-type chassis, model TV101-U UHF converter provides one-knob continuous tuning over the UHF spectrum. The unit mounts inside the receiver cabinet quickly and requires only two electrical connections to the existing chassis. Other features: shielding to minimize radiation and interference, cascode IF stage, low noise, high gain and selectivity. Tech-Master Products Co., 443 Broadway, New York 13, N. Y.—TECHNICIAN.

Crest ONE-CHANNEL CONVERTER

This high-gain UHF converter may be peaked without instruments for any channel within a 20-channel range. Other features: oscillator sta-



bility, low interference susceptibility, 300-ohm match. List price \$22.50. Crest Laboratories, Rockaway Beach N. Y.—TECHNICIAN

Mallory UHF CONVERTER

Fifty percent smaller than the manufacturer's previous units, model 88 retains the principles incorporated in its predecessors. This UHF converter features continuous tuning, Channels 14-83; 300-ohm input and output impedance; high stability; 82 mc IF for operation on either Channel 5 or 6. P. R. Mallory and Co., Indianapolis 6, Indiana.—TECHNICIAN.

Alliance UHF CONVERTER

When connected to the VHF receiver, model AC-80 permits switch selection of UHF or VHF reception and continuous tuning across the UHF band. It features good stability and 300-ohm input and output impedances. Alliance Mfg. Co., Alliance, Ohio.—TECHNICIAN

Sylvania SHORT-NECK CRT

Type ST-1501 (pending assignment of a RETMA number) is a magnetic focus, 90-degree magnetic deflection, 21-in. glass TV picture tube, which increases the range of the picture size, yet lessens the overall length of the tube to approx. 20 in. A gray filter-glass, spherical face plate and a single field ion trap magnet are used. Aluminized and non-aluminized versions will be available. Sylvania Electric Products Inc., Seneca Falls, N. Y.—TECHNICIAN

RCA 12AQ5

The 12AQ5 is a beam power amplifier of the 7-pin miniature type intended primarily for use in automobile radio receivers operating from a 12-volt storage battery. Within its maximum ratings, the 12AQ5 is the performance equivalent of the larger glass octal type 12V6-GT. It features high power output with relatively low plate current drain. Tube Department, RCA, Harrison, N. J.—TECHNICIAN

GE CASCODE AMPLIFIER

A miniature receiving tube has been designed for use in remote-cutoff cascode applications. The tube, type GL-6386, minimizes cross modulation, and provides dependable life, high gain, low noise figure, and low third order harmonic distortion. It may be used as an RF amplifier, IF amplifier or mixer in circuits to which it is desired to apply AGC. General Electric, Electronics Park, Syracuse, N. Y.—TECHNICIAN

Cardwell UHF CONVERTER

Continuous single-knob tuning over the full UHF band is provided by converter model ES-1. Using a printed-circuit tuner, the unit is said to have high sensitivity with low noise level, and no appreciable drift. The compact converter, which mounts in any position, converts incoming signals to either Channel 5 or 6 frequencies without affecting the tuning or reception of VHF stations. Allen D. Cardwell Mfg. Corp., 96 Whiting Street, Plainville, Conn.—TECHNICIAN.

Anaconda TWIN LEAD

Encased in foamed polyethylene, this low-loss, all-weather line is intended for UHF-VHF use. It has a characteristic impedance of 270 ohms and handles easily during installation. Columbia Wire and Supply Co., 2850 W. Irving Park Road, Chicago 18, Ill.—TECHNICIAN

Leader ANTENNA ROTOR

The Superrotor rotor and control unit offer several features: antenna position readable on control box at all times; operation possible more



than 350 feet from control point; high-torque motor; drive unit quickly detachable and replaceable without dismounting antenna; no-drift design; and built-in chimney mount. Leader Electronics, Inc., 2925 E. 55th St., Cleveland, 27, Ohio.—TECHNICIAN

Masco VHF BOOSTER

The Mascode VHF television booster features a low-noise cascode-type tuning circuit and fully automatic tuning. Easily installed behind a TV set, the booster is said to increase station strength by a factor of 13 on all VHF channels. It is automatically turned on and off by the TV receiver. Mfr. claims low noise factor (approx. 6) and balanced input and output, for further noise reduction. Mark Simpson Mfg. Co., 32-28 49th St., Long Island City 3, N.Y.—TECHNICIAN

NEW SERVICE GEAR

Test Equipment, Shop Aids and Parts

GC ALIGNMENT TOOL

Long Slim, model X-57, is a high-dielectric TV alignment tool, 3/8-in. in diameter, available in blade lengths of 7 in., 12 in., or 16 in. Made



of strong but flexible plastic, it permits access to hard-to-reach portions of a TV chassis. General Cement Mfg. Co., 904 Taylor St., Rockford, Ill.—TECHNICIAN

Sprague CAPACITOR CHECKER

The Kwik-Test checks capacitors that are still connected in the circuit for shorts or open-circuits and intermittent operation. By flipping two switches, a technician can check any capacitor in the range between 30 mmfd and 2000 mfd, even when the capacitor is shunted by a resistance as low as 60 ohms. Available in two models: KT-1, for 115v/60 cycle operation, \$34.50 net price; KT-1x, for 115-230v/25-60 cycle operation, \$39.50 net. Sprague Products Co., Marshall Street, North Adams, Mass.—TECHNICIAN

Miller CRT RESTORER

Re-Katho, a picture tube restorer, also checks CRT's dynamically. Tests for shorted or open elements without tube removal from the set or carton. Unit is said to restore up to 90% of low-emission picture tubes to useful condition. The restorer



uses suitable dc potentials to reform the barium coating on the tube cathode. Net price, \$129.50. Miller Television Co., 2840 Naomi, Burbank, Calif.—TECHNICIAN

Speedex WIRE STRIPPER

The 766 series of wire strippers, consisting of several models to accommodate different wire sizes, are said to be fully automatic with delayed return action to prevent crushing of fine stranded wires. Interchangeable steel blades can be purchased separately to meet various wire stripping requirements. List price: \$8.25. General Cement Mfg. Co., Rockford, Ill.—TECHNICIAN.

Tele-Matic RETRACE ERASER

This plug-in electronic network, model CR-59, permits the set owner to turn up brightness and contrast controls without bringing in annoying retrace lines. The retrace eraser



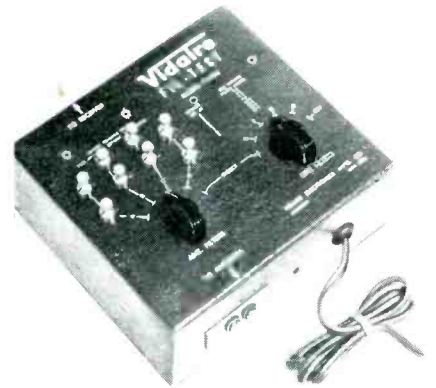
is easily installed by plugging it into the back of the cathode-ray tube and connecting one lead to the yoke. Installation can be done in less than two minutes, it is stated. For use only in sets lacking blanking circuits, where the video signal is grid-fed. List price, \$3.50. Tele-Matic Industries, Inc., 1 Joralemon St., Brooklyn 2, N. Y.—TECHNICIAN.

C-D METAL-CASE CAPACITORS

Capacitors impregnated with Fixfil are said not to soften, crack or leak even at maximum operating temperatures. The capacitors may be operated at full-rated voltage over the entire temperature range of minus 55° C to plus 130° C without derating. In addition, capacitance change from nominal will not exceed plus/minus 10% over this same temperature span. Available in both metal container and tubular metal-cased styles, in ratings up to 1 mfd, 400v dc. Tubulars available in C-D's

Demicon series. Cornell-Dubilier Electric Corp., South Plainfield, New Jersey.—TECHNICIAN.

Vidaire TVI TRACER



The Fil-Test, model FT-100, is a wave-trap meter that determines the type of antenna and/or line filters needed to suppress TVI in a given installation by the adjustment of two selector switches. The switches may be adjusted simply for maximum rejection by the set owner when the interference occurs. When the serviceman checks the settings later, he knows which filters and traps to install. Vidaire Electronics Mfg. Co., Lynbrook, N. Y.—TECHNICIAN.

SIC BIAS SUPPLY

The Align-O-Pak, model BE-2, is designed to replace bias batteries when aligning TV receivers. Output is variable from 0 to 10 volts dc. The output leads are isolated from the metal case and power line. Handy for diagnosing AGC troubles: Connect the



bias leads to the AGC buss, disable receiver AGC, and vary the output. If a stable picture appears, the AGC is faulty. Service Instruments Company, Chicago, Ill.—TECHNICIAN

AUDIO EQUIPMENT

Amplifiers, Speakers, Pickups, Mikes

Newcomb STEREO AMPLIFIER

A pair of matched 12-watt audio channels, complete with pre-amps, are the heart of the 3D-12 stereophonic amplifier. Operation of controls is no more complex than on single-channel amplifiers, due to ganging of adjustments. In addition to conventional adjustments, the unit incorporates a selector that permits reversing the feeds to the separate speakers, switching to use as a straight monaural amplifier, or use as a monaural amplifier with output to two speakers for stereophonic effect. Newcomb Audio Products, Hollywood, Calif.—TECHNICIAN.

Duotone SPEAKERS and MIKES



Manufactured by Philips of Holland, the Duotone line of single speakers are intended to give wide-range results normally provided by two-way systems. Ticonal, a magnet steel developed by Philips, is used to give high flux density. The Master series includes four models: an 8½ in., a 10 in., and two 12 in. speakers. Response from 40 to 20,000 CPS is listed for one of the 12 in. speakers. Also listed is the Variant line, which includes 25 smaller budget-priced speakers. The microphones include types suited to broadcast, recording, PA, desk, and hand use. Available models feature high sensitivity, shock-proofing, and freedom from precautions as to positioning. Duotone, Keyport, N.J.—TECHNICIAN.

E-V 4-WAY SPEAKER SYSTEM

The Georgian, a folded corner horn four-way reproducer, uses a Klipsch "K" horn with a 15-in. woofer for bass reproduction; a horn-loaded compression type driver from 300 to 1,000 cps; a diffraction horn from 1,000 to 3,500 cps; and the Super Sonax very high-frequency driver extending beyond the limits of audibility. In addition to appropriate crossover networks, presence and brilliance controls are incorporated. Electro-Voice, Inc., Buchanan, Mich.—TECHNICIAN

Bogen ALL-SPEED PLAYERS

Record players featuring continuously variable turntable speed from 29 to 86 RPM are available. Turntable locks into position at the three popular speeds: 33, 45, and 78 RPM. Constant-velocity 4-pole motor maintains set speed with minimum wow over wide range of line-voltage variation (95-125 volts). Tracking pressure: 4-6 grams on microgroove; adjustable from 12 to 39 grams for normal use. Automatic velocity-trip start and shutoff mechanism. Available as record player alone, model B50-3, with GE or crystal cartridge. Also available with 10-watt amplifier and 12-in. speaker as model VP-17 (with crystal cartridge) and model VP-17X (with GE cartridge). David Bogen Co., 29 Ninth Ave., New York 14, N. Y.—TECHNICIAN

Shure MIDGET MIKES

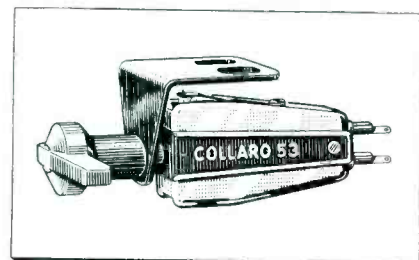
The MC series of magnetic microphones, diameter only 1 in., are immune to heat and humidity variations, according to the manufacturer. These controlled reluctance microphones, designed for transistor circuits, are applicable to compact amplifiers and transmitters, dictating equipment, etc. Models MC10 and MC11 are similar, but MC11 has a shield ring for reducing hum pickup. Shure Brothers, Inc., 225 W. Huron St., Chicago 10, Ill.—TECHNICIAN

Astatic CERAMIC PICKUP

Model GCD is a turnover-needle three-play cartridge that remains stationary in the pickup arm while the needle is switched back and forth. It employs a ceramic element.

Output is listed at one volt. Frequency range is 50 to 10,000 cps. The Astatic Corp., Conneaut, Ohio.—TECHNICIAN

Collaro CRYSTAL PICKUPS



Two cartridges employ metal-sealed crystals impervious to normal humidity and temperature changes. They are designed to operate into a 1-meg impedance and require no low frequency equalization. Type "O" has a frequency response from 50 to 10,000 cycles ± 4 db, and a .5 volt output; type "P" has a response from 50 to 12,000 cycles ± 4 db and a .1 volt output. Both types are of the "turnover" variety and are supplied with two interchangeable sapphire styli. List price: \$11.00 either type. Rockbar Corp., 215 E. 37th St., New York, New York.—TECHNICIAN

Atlas MIKE BOOM STANDS

A safety air-lock cushion is built into the vertical section of boom stand model BS-36 to prevent sudden or accidental slippage. Boom

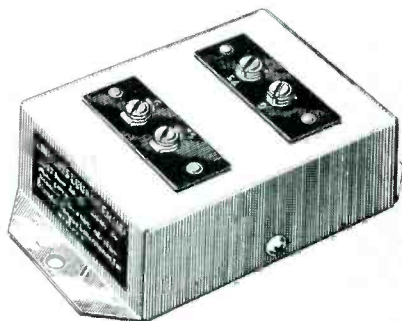


length, 72 in. Also available as model BS-36W with swivel casters in base for wheeling through studio. Atlas Sound Corp., 1451 39th St., Brooklyn 18, N. Y.—TECHNICIAN

Recent New Products

B-T LINE-LOSS EQUALIZER

The Model LLE-1 Line Loss Equalizer maintains balanced signal levels through the following lengths of transmission line: 500 ft. of



RG, 59U, 1,000 ft. of RG/11U, 1,400 ft. of 300-ohm line or 5,000 ft. of open wire. Prevents overloading and cross-modulation. Unit requires no AC power and may be inserted at any point in the transmission line. Lists at \$9.50. Blonder-Tongue Laboratories, Inc., 526-536 North Ave., Westfield, N.J.—TECHNICIAN.

Genelex AUDIO PENTODE

This low-hum, low-noise, low-microphonic, voltage-amplifying audio pentode, which will fit a standard 9-pin miniature socket, is known as the GENELEX 2729. Tube is manufactured by the General Electric Company, Ltd., of England. The 2729 has been designed for use in high-quality, high-gain, audio preamplifier and equalizer stages. The total hum voltage referred to the input grid is claimed not to exceed 1.5 microvolts. An internal shield com-



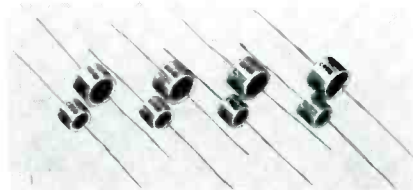
pletely surrounds the tube elements. British Industries Corp., 164 Duane Street, New York 13, N.Y.—

RCA TV YOKE

High inductance RCA deflecting yoke, designed for replacement use in TV sets employing direct-drive horizontal-deflection systems. This component (RCA-214D1) can be used with picture tubes up to 20 inches in size which require 66 to 70-degree deflection. It is specifically intended for direct-drive TV sets in which the horizontal coils are in series with the low-voltage terminal of the high-voltage transformer to form part of the direct load for the horizontal-output tube. A modified cosine design maintains full-screen focus. The yoke comes with 12-in. leads and damping and neutralizing elements. Horizontal coils, app. 29 mh; vertical coils, 3.3 ohms DC resistance. Tube Dept., RCA, Camden, N. J.—TECHNICIAN

Internat'l MIDGET SELENIUMS

These miniaturized selenium rectifiers were designed to serve as replacements in the servicing of boosters, converters, and other



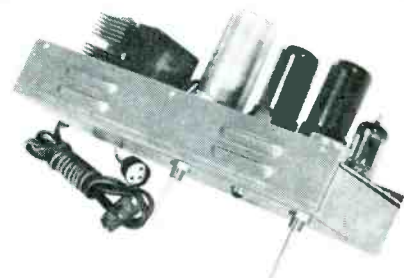
equipment requiring relatively low current drain. The CR series selenium rectifiers consist of a number of cells assembled within a cylindrical tubing, and provided with pigtail leads for easy wiring into crowded spaces. These rectifiers are rated for maximum RMS input voltages of 130 and 160, for working into a capacitive load. International Rectifier Corp., 1521 E. Grand, El Segundo, Calif.—TECHNICIAN

Mallory VOLTAGE ADJUSTER

A line voltage adjuster and isolation transformer, type LVA2, provides continuously-variable AC-line adjustment from 90 to 130 volts at 1200 watts. Also available is variable low voltage from 0 to 40 volts at 4 amps in the isolation position, or 0 to 40 volts at 8 amps in the common line position, and an isolated variable 90 to 130 volt output at 350 watts. The transformer is designed to operate from a line voltage of 115 volts, plus or minus 10 volts, 60 cycles. P. R. Mallory & Co. Inc., Box 1558, Indianapolis, Ind.—TECHNICIAN.

VCA HI-FI AMPLIFIER

Intended to assist the serviceman in high fidelity conversions or new custom installations, the VC-6 is a compact amplifier that can be installed with a minimum of set alteration. Provides 6 watts of push-pull output and has a frequency



response of 50 to 30,000 CPS. Output impedance is 8 ohms. A single tone control provides up to 6 db of bass or treble boost. List price, \$26.95. Video Corp. of America, 229 W. 28th St., New York 1, N.Y.—TECHNICIAN.

Rayburne SIGNAL BOOSTER

The model TSB-1 is an IF signal booster to provide an extra stage of IF amplification without switching. The booster, which is supplied in adapter form, is installed in an existing tube socket and requires only one connection to ground. Rayburne Mfg. Co., Inc., 4-6 Radford Pl., Yonkers, N. Y.—TECHNICIAN.

Beam SPEAKER SYSTEM

The Quadruplex, developed in Great Britain, is a multiple speaker system employing four independent driving mechanisms in a single integrated speaker design. The manufacturer states this is the first commercial speaker to incorporate such a design. Beam Instruments Corporation, 350 Fifth Avenue, New York, N.Y.—TECHNICIAN.

Suprex CRT ADAPTER

The Suprex picture tube adapter can be used with any make tube tester and all picture tubes, according to the manufacturer. One end plugs into the tube tester and the other end plugs into the picture tube. The CRT need not be removed from the TV cabinet. Any tube, electrostatic or magnetic, 10 in. to 30 in., can be checked. Overall length is 49½ in. Retail for \$3.95. Suprex Electronics Corp., 23 Atherton St., Yonkers, N. Y.—TECHNICIAN.

for Technicians Reviewed

C-B-C EXTENSION CORD

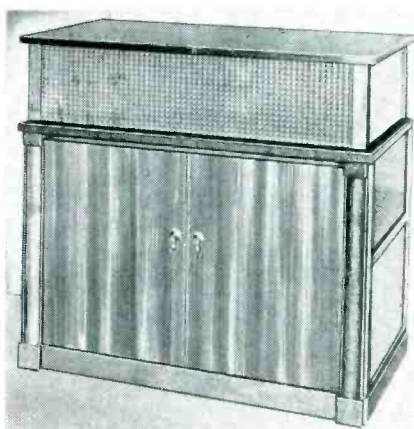
The Picboost television picture tube extension cord permits the testing of picture tubes or chassis when either is outside the television cabinet. It also may be used for television conversion work and for high-fidelity installations incorporating a television receiver. The cord is equipped with a heavy-duty duodecal socket and base. The list price is \$2.25. C-B-C Electronics Co., Inc., 1310 Callowhill St., Philadelphia 23, Pa.—TECHNICIAN.

Alliance ANTENNA ROTATORS

Alliance Tenna-Rotor models T-10 and U-83 are control units for motor-rotated antennas. Model T-10 is operated by a single control bar, which is top-mounted. Depressing one end of the bar causes rotation in one direction; opposite rotation is produced by pressing the other end. A dial and pointer indicate position of the antenna. Model U-83 is automatic. The control knob is set to the desired position; rotation ceases when the antenna reaches this point. Alliance Manufacturing Co., Alliance, Ohio.—TECHNICIAN

Brociner WALL SPEAKER

Because use of a corner horn is not practical in many homes, model 4W wall horn has been designed



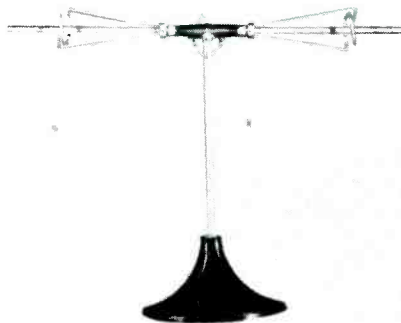
with a built-in corner. Without requiring corner placement, it duplicates performance of the earlier model four-corner horn. It is powered by a twin-cone driver unit designed for horn loading over the entire audible range. Brociner Electronics Laboratory, 344 E. 32nd St., New York 16, N.Y.—TECHNICIAN.

Sylvania RF AMPLIFIER

Tube type 6BQ7A, suited to grounded-grid balanced amplifier service for frequencies up to 300 m.c., is another of the VHF cascode amplifier tube series with higher gain than its prototype, the 6BQ7. The 6BQ7A has a gm of 6400 umhos and an amplification factor of 38, with 150 volts applied to the plate. It can be used as a replacement for the 6BQ7, with slight realignment of the tuned circuits. Sylvania Electric Products, Inc., Sales Dept., 1740 Broadway, New York, N.Y.—TECHNICIAN

Hi-Lo UHF ANTENNA

The Hi-Lo model 303 "Twin Arrow" indoor antenna provides complete UHF-band coverage, and a



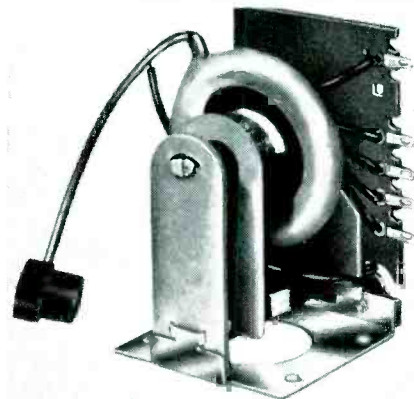
high signal gain, according to the manufacturer. Twin arrows may be adjusted for local areas. Model 303's list price is \$5.95. Hi-Lo TV Antenna Corp., 3540 N. Ravenswood Ave., Chicago 13, Ill.—TECHNICIAN.

Delco UHF-VHF ANTENNAS

Nine UHF and VHF TV antennas are being distributed by the United Motors Service Division of General Motors Corporation. These antennas are "area engineered" to solve the varied reception problems found in different TV areas of the country. To insure proper installation, UMS issues a catalog illustrating each antenna, along with an area map showing the preferred application for which the antenna was designed. Also included in the UMS TV line are two new couplers, for use when two and four-set installations are made on one aerial. The nine antenna types include a dual-V antenna, bow-tie, bow-tie with reflector, conical, two-bay conical, four-bay conical, UHF corner reflector, UHF 8-ft. rhombic, and an indoor antenna.

Stancor HV TRANSFORMER

The A-8137 flyback transformer is an exact replacement for the Hoffman No. 5035 unit, used in 17 models and five chassis built by this manu-



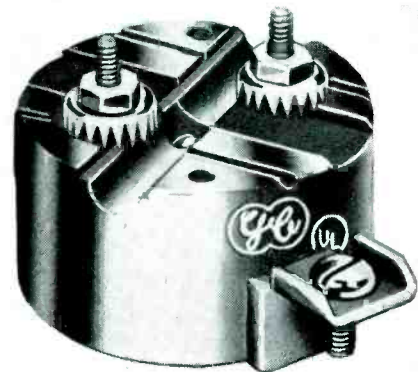
facturer. The transformer has a high-voltage output of 13-15 KV and maximum scan angle of 70 degrees. Chicago Standard Transformer Corp., Addison & Elston, Chicago 18, Ill.—TECHNICIAN.

RCA B-BATTERY

The VS 086 is a midget 45-volt alkaline-type B-battery for use in portable radios. It weighs approximately three oz. and is 3 1/16-in. long, 1 1/16-in. wide and 1 1/16-in. deep. Suggested list price is \$2.65. RCA Victor Div., R.C.A., Camden, N. J.—TECHNICIAN.

Telco LIGHTNING ARRESTOR

Carrying full Underwriters' approval for both indoor and outdoor use, the Telco Universal Lightning Arrestor mounts anywhere and will accommodate all the new UHF and VHF antenna lead-in lines. \$1.25, complete with all hardware. Televi-



sion Hardware Mfg. Co. (Division of General Cement Mfg. Co.), 919 Taylor Ave., Rockford, Ill.—TECHNICIAN.

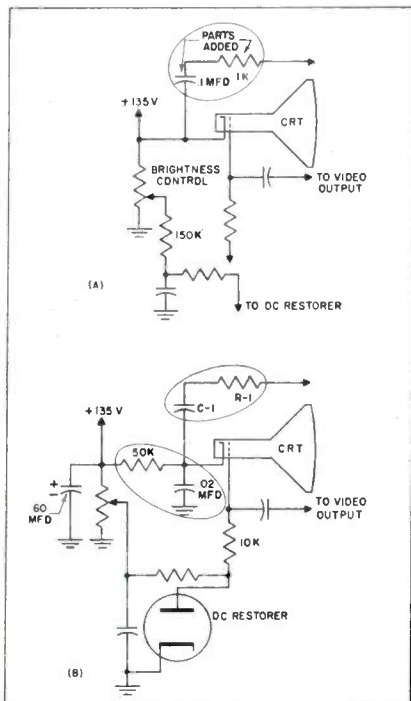
Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

Retrace Blanking

A reader writes that he tried to install a retrace blanking circuit in a Mattison TV chassis in accordance with the techniques outlined by M. G. Goldberg in his article *Eliminating Vertical Retrace Lines in Television Receivers* (Sept. TECHNICIAN). Parts were added as shown in sketch (A) below, but the retrace lines failed to disappear. Goldberg's answer should interest other technicians:

"Your difficulty in the matter is that in this circuit the cathode of the CRT goes directly to the 135v source in the power supply, across which there is a 60 mfd capacitor, a direct short for any sort of pulse, as you can appreciate. In making any changes for retrace blanking, keep in mind that there must be some resistance in the circuit (cathode or grid) in which you are applying the pulse, in order to build up a pulse voltage.



"In (B) you will see the sketch as I copied it from the set schematic. The four components to be added for retrace blanking are circled. I have added the rest of the dc restorer circuit to make matters clearer, although the latter actually has no effect on the operation of the blanking

SHOP HINTS WANTED

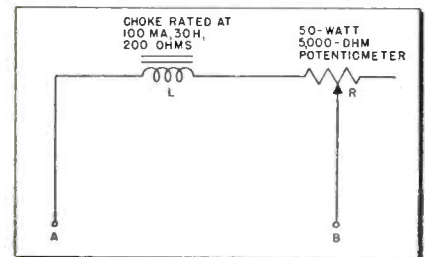
TECHNICIAN will pay \$5 for acceptable shop hints. We are particularly interested in hints that tell how a technician located a hard-to-find trouble in a TV set, radio, record-changer or similar unit; or how he traced a conventional defect to its source more rapidly than usual by using a short-cut. Unacceptable 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."

circuit. Note that I have included a 50k resistor in series with the CRT cathode, to isolate it from the 60 mfd capacitor, and have also added a .02 mfd capacitor from cathode to ground to bypass video signals which might appear at this point. Now we can apply the pulse to the cathode for blanking. This pulse must be positive in polarity, so check your pulse polarity with a scope. If no scope is available, you can work things out by watching the screen; if the retrace lines are brighter than before, then you have picked off a signal of the wrong polarity. The retrace blanking pulse must be obtained from another part of the circuit, in such a case.

"You are using a 1k resistor and .1 mfd condenser, which is ok if you pick the pulse off at some low impedance point in the circuit, such as the secondary of the vertical output transformer; if you pick it off at either the plate circuit of the 6K6GT output tube or the vertical oscillator plate circuit, on the other hand, these values must be entirely different, as I have indicated by the blanking component values given for the RCA models in my article in TECHNICIAN. These values will usually vary from .0005 to .002 mfd for the capacitor (C-1), and 25k to 200k for the resistor (R-1). Capacitors used should have a minimum voltage rating of 600 volts or higher; a 1000 or 1600-volt type will be fool-proof, of course. Use the largest value of resistance, and the lowest value of capacitance, that will do the job well without affecting the linearity of the picture, especially at the top."

Unmarked Field Coils

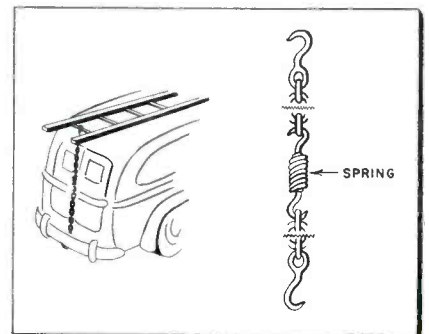
In the absence of means to determine the resistance of a burned-out and unmarked speaker field coil, so as to supply a replacement, connect a variable resistance in series with coil L across the field coil terminals



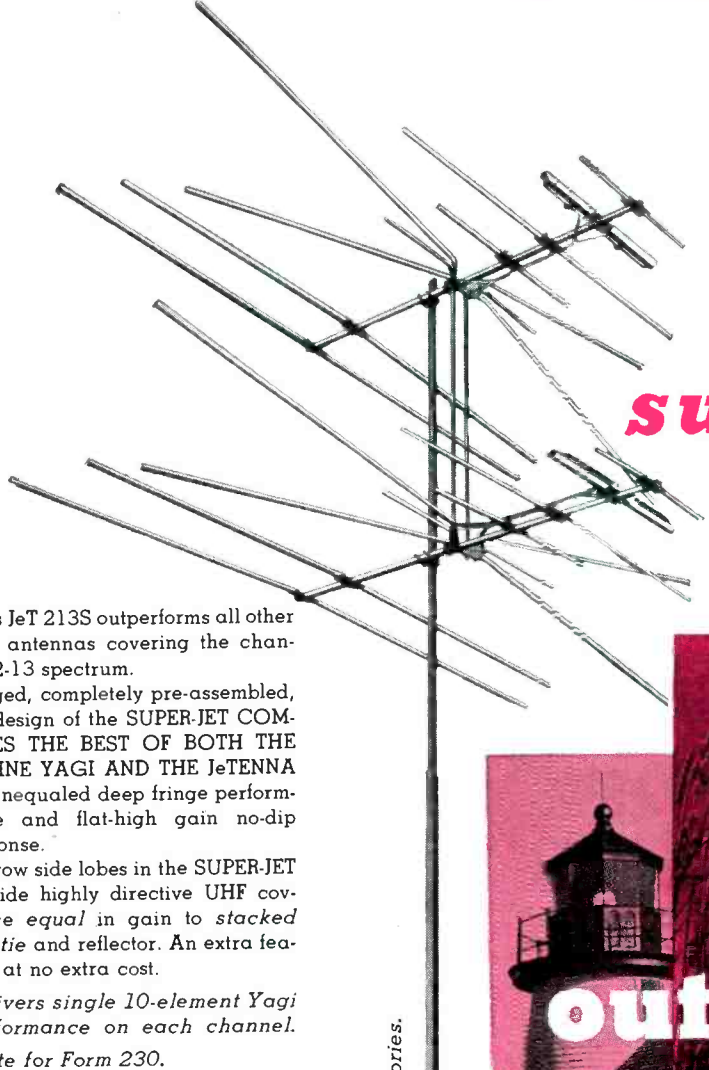
of the receiver. The set-up and recommended values are shown in the illustration. Vary R until proper plate and screen voltages appear. Turn off the juice and measure resistance between points A and B. This is the ohmage for the replacement.—Stanley Clark, East Bradenton, Fla.

Fastening Ladders

We save a lot of time in our antenna service work by fastening our ladders to the roof of our trucks with two pieces of chain and a tension spring. This makes a speedy job of putting them on or taking



them off without the necessity of tying or untying ropes. If springs of sufficient tension are used, the ladders will be secure on short or long trips and rattling is prevented. Hooks are used at either end of the chain. One connects to a ladder rung, the other to the truck bumper.—Stanley Clark, East Bradenton, Fla.



THE JFD
super-jet

JFD's JeT 213S outperforms all other VHF antennas covering the channel 2-13 spectrum. Rugged, completely pre-assembled, the design of the SUPER-JET COMBINES THE BEST OF BOTH THE BALINE YAGI AND THE JeTENNA for unequaled deep fringe performance and flat-high gain no-dip response. Narrow side lobes in the SUPER-JET provide highly directive UHF coverage equal in gain to stacked bowtie and reflector. An extra feature at no extra cost. Delivers single 10-element Yagi performance on each channel. Write for Form 230.

HERE ARE THE FACTS—
COMPARE FOR YOURSELF.

JFD JeT 213 S	Competitor D CHS 2-13 YAGI	Competitor C RADAR SCREEN TYPE B	Competitor B RADAR SCREEN TYPE A	Competitor A MATTRESS (4 STACK)	CHANNELS
6.5	4.50	0.75	0.0	4.0	2
7.5	5.00	3.25	3.0	5.0	3
9.5	5.75	4.5	4.0	7.0	4
8.5	3.00	3.5	3.25	6.25	5
8.5	2.50	3.5	3.0	5.0	6
11.0	3.50	6.0	4.5	5.25	7
11.0	1.00	7.0	7.0	6.0	8
12.0	0.0	6.5	7.0	5.25	9
12.0	.875	7.75	8.0	7.25	10
11.25	.875	8.0	10.0	9.25	11
12.75	.50	7.5	10.0	6.5	12
12.0	7.5	6.0	9.0	7.0	13
DB GAIN					
YES	NO	NO	NO	NO	1" Square Cross Arm Completely Pre-Assembled
YES	NO	NO	NO	YES	LIST PRICE
\$42.50	\$65.90	\$47.50	\$34.95	\$55.00	

World's largest manufacturer of TV antennas and accessories.

outperforms
across
the nation

Model JeT 213 • single • \$20.75 list
Model JeT 213S* • stacked • \$42.50 list
*Complete with stacking transformers.

JFD MFG. CO.

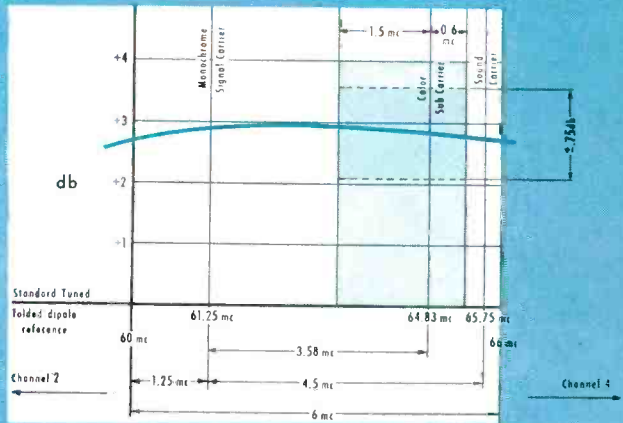
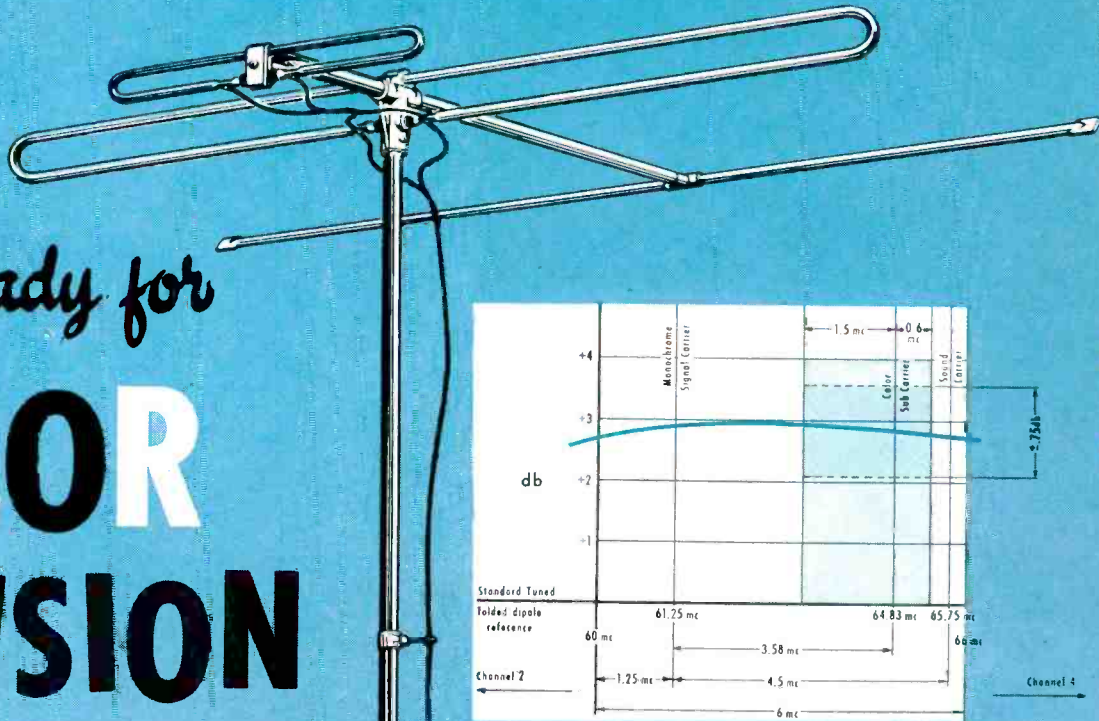
BROOKLYN 4, N. Y.

Burton Browne adv

you're ready for

COLOR TELEVISION

with an AMPHENOL **INLINE***



CHANNEL 3

Color television is fast becoming a reality! Sets are expected to be available the first part of next year and stations are purchasing the necessary transmitting equipment. Initial costs, unfortunately, will be high but as improvements in design and production are achieved the price of color television will become within everyone's reach.

The consumer is concerned with the problems presented by television in color. He has read reports on prices and availability; all have been conflicting. He knows, however, that his set will have to be replaced or converted. What he does not know is that if he has an AMPHENOL IN-LINE*, there will be no extra expense in antenna or installation! AMPHENOL engineers provided for color in the original design of the IN-LINE*.

Every dealer, distributor and installer will want to acquaint their customers with this reassuring information. The color television market is potentially tremendous. It certainly will prove of benefit if the consumer can be reassured on one part of the cost of conversion to color.

The fact that AMPHENOL IN-LINES are able to receive color television so well reflects favorably upon the engineering ability of AMPHENOL. For in ordinary black and white television the same level-gain design has proved valuable. Set owners know, now, that their AMPHENOL IN-LINE* is providing them with the best black and white picture their sets can deliver.

*Reissue U.S. Pat. No. 23,273

Antenna Electrical Requirements for COLOR TELEVISION

Information now available on color television has made it clear that the receiving antenna must have these characteristics:

- 1 Antenna gain must be flat, no gain or loss greater than one db, within 1.5 mc below and 0.6 mc above the color sub-carrier* (a width of 2.1 mc).
- 2 Antenna gain must be held down across the FM frequencies. Rejection of FM signals is much more important in color than in black and white television.

*Channel frequency widths are at present divided between the monochrome amplitude modulation picture carrier and the frequency modulation sound carrier. The addition of the color sub-carrier is made at 3.58 mc above the monochrome carrier.

The AMPHENOL IN-LINE* fully meets the two conditions listed above. Besides being engineered to reject FM signals, from 88 mc to 108 mc, the IN-LINE provides very level gain across all channels, particularly over the color sub-carrier. Typical of the IN-LINE's performance on all channels is the gain chart† illustrated above for channel 3.

†Measured in accordance with proposed RETMA standards.

AMERICAN PHENOLIC CORPORATION
chicago 50, illinois



TV Production Changes

Design Improvements in Sets Whose Schematics Recently Appeared in CIRCUIT DIGEST. Add This Vital Data to Your CD File.

Tweets in CBS Sets

"Tweets" sometimes appear in the UHF band when incoming signals beat against the receiver's local oscillator output. The resulting frequencies fall in and around the video IF band. When these beats are amplified and reproduced on the CRT, picture detail becomes slightly dis-

torted with what appear to be RF lines throughout the picture. A simple solution in the field is to re-adjust the 130 mc slug in the tuner. This slug is located on the front of the tuner and sticks out much further than the adjustment slugs for the VHF adjustments. (See Fig. 1.) The adjustment can be made while

looking at the picture. The slug will have to be rotated a few turns before any change is observed.

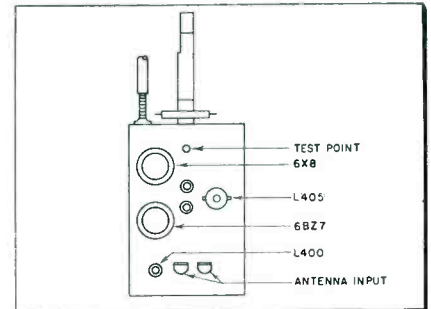


Fig. 1—Top view of CBS-Columbia tuner, 130 MC adjusting slug at top, left.

Fig. 2—Recommended production changes in Raytheon chassis 21T8, 21T11, 24T2 and 24T3.

CHASSIS CODE	SUB UNIT	UNIT CODE	CHANGE	REASON
	A11	A	START OF PRODUCTION	
133	24-DEF	B	R472 (3.3M) added pin 7 of V-21	To eliminate H. Mult. squeal interference in "PH" position.
233	21-DEF	C	R403 (47K) changed to 68K	Reduce Horizontal Phase shift
333	24-HV	*D	R505 (33K-2W) changed to 6800-2W and wired to pin 4 of power plug, R507 (10-1W) changed to 6.8	To provide more width and maintain high voltage
333	24-DEF	*D	C443 (47) changed to 22, pin 4 of power socket wired to 240V	Same as above
433	24-DEF	E	C406 (.033MF) changed to .047MF and brightness control wired to 300V	To increase brightness video capability
533	24-HV	F	C507 (5000) added to pin 6 of power plug	To accommodate varied 12AU7 (V-21) tube characteristics
533	24-DEF		R467 (1500) changed to 1800. R474 (220) added	Same as above
633	21-HV	G	C507 (.22MF) changed to .1MF, R504 (1800-1W) deleted and R505 (4700-2W) changed to 4700-2W, 7500 part number changed to -1	To increase high voltage
733	40MC-RF	H	R327 (22K-2W) changed to 12K-2W	To maintain UHF oscillation strength at 105VAC
833	24-DEF	I	R403 (15K) deleted, R406 (15K) changed to 33K, C405 (.047MF) changed to .01MF, R441 (68K) deleted, V. size control wired to boost and R403 (1M) added to pin 5 of V8. V-16 (6AV6) changed to 6BP6, R439 (22K) changed to 22K-2W	To increase vertical sync stability
933	21-DEF	J	R434 (47K) changed to 100K	To improve vertical and horizontal sync
043	24-HV	K	L502 added to pin 6 of power plug, C507 changed to .22MF	To improve horizontal sync
134	20MC-RF	L	R306 (33K) changed to 22K	Improve IF response
243	21-DEF	M	C437 (.22MF) changed to .1MF	Reduce Horizontal waves
343	20MC-RF	O	V-2 (6BQ7A) changed to 6BZ7	To increase sensitivity
443	21-DEF	P	R417 wired to boost instead of 240V	Increase resolution
543	21-DEF	Q	R419 (3300) changed to 5600, R418 (1800) changed to 22K and relocated, C443 (100) added to pin 2 of V-10	Improve vertical retrace
643	40MC-RF	R	C100-101 (100) changed to 5 and L107-108 add to UHF Tuner antenna terminals	Improve 40MC rejection

NOTE: Unit Code "N" not used.

*NOTE: Earlier code 24" deflection and high voltage units cannot be interchanged with code "D" units.

Raytheon Production Changes

A series of alterations on the 21T8, 21T11, 24T2 and 24T3 chassis, involving improvements in sync, brightness, sensitivity, definition, high voltage and interference rejection, are presented in Fig. 2.

"Pie-Crust" in Magnavox TV

If "pie-crusting" or jagged picture is experienced at high line voltage on the 105N series chassis (CT372N, CT390N, etc.) the following corrections should be applied: Disconnect R-420 from the 250-volt supply and connect it to the black lead from the deflection yoke. It will now be necessary to re-adjust centering and horizontal linearity. Two positions of the linearity slug will be found to offer uniform horizontal linearity. Choose the position nearest maximum inductance. If the procedure outlined does not effect a complete cure, shunt C-417 with a 10 mfd electrolytic capacitor.

Caphart CX-37: Noise, White Line in Pix

Noise in Picture and Sound.—Check for poor mechanical ground between the width tuning core screw and the coil mounting bracket. Correct by adding a 6-32 hex nut to the core screw and tighten the tinnerman nut securely. **White Line at Top of Picture.**—Add a 470k ½w resistor in parallel with R-564 (47k) in the vertical oscillator.

NEWS of ASSOCIATIONS

NBC Promoting Associated Radio-TV Servicemen of NY

Stations WNBC and WNBT in New York City have joined forces with the Associated Radio-Television Servicemen of New York, Inc., in a continuing campaign for better, more fairly priced radio and television receiver service in the Greater New York area, announces Ernest de la Ossa, station manager.

NBC's flagship stations in New York will salute members of the organization with on-the-air "spots" outlining the objectives and rigid code of ethics of the service organization. Other spots will urge viewers and listeners to put their television and radio receivers in top operating condition "to get the most enjoyment out of WNBC-WNBT's new winter programs."

Station executives are working with Max Liebowitz, president, and Arthur E. Rhine, executive secretary of ARTSINY. Mr. Liebowitz is also president of the Empire State Federation of Electronic Technicians.

Broadcasters Dependent on Servicemen

Commenting on the project, Manager de la Ossa stated, "We have long realized that we at WNBC and WNBT rely on the hundreds of reputable service men who keep millions of radios and television receivers in operation. We commend ARTSINY's continuing project of better, more fairly priced service and its technical help to its membership."

Organized seven years ago with the objective of promoting better television and radio receiver service, ARTSINY now numbers more than 400 greater New York service men in its membership and was the pioneer organization for associations of its type scattered throughout the country.

ARTSINY is a member of the National Electronic Technicians and



Arthur E. Rhine, executive secretary of Associated Radio-TV Servicemen of New York, who is co-operating with NBC in a series of TV programs for benefit of service industry, photographed with O. H. Caldwell, retiring editorial director of Technician

Service Dealers Association and Mr. Liebowitz is a past president of the national organization.

ARTSINY is a non-profit organization. Among its many services to its membership is a weekly clinic discussing latest service techniques and answering questions of servicemen. In addition, the organization will schedule a series of monthly technical lectures and service demonstrations starting in January.

Officers of ARTSINY are: Pres., Max Liebowitz, 101 W. 53rd St., New York, N. Y.; Executive Secretary, Arthur Rhine, 855 Midland Ave., Yonkers, N. Y.; Treasurer, Jack Ornstein, 1431 Flatbush Ave., Brooklyn, N. Y.; V. P. Technicians, O. Capitelli; V. P. Business, Phil Goldfarb; Recording Secretary Technicians, Jacob Allen; Recording Secretary Business, Jerry Maccherone; Cor. Secretary Technicians, Harold Levinson; Cor. Secretary Business, Arthur Rhine; Legal Counsel, Joseph Forman.

CR Tests Discussed by LIETA

At the October 8th Technical Forum of the Long Island Electronic Technician's Assoc. (LIETA), Mr. James Seddon, coordinator of the technical committee, opened the meeting showing problems associated with basic alignment.

Calendar of Coming Events

- Jan. 10-12: National Appliance & Radio TV Dealers Association, Conrad Hilton Hotel, Chicago, Ill.
- Feb. 4-6: The Audio Fair, Alexandria Hotel, Los Angeles, Calif.
- Feb. 8-12: Western Winter Radio-Television & Appliance Market, Western Mart, San Francisco, Calif.

Victor Robinson, Julius Futterman, and Howard Coleman, of Precision using a 21" TV, with intercarrier sound, a Precision 'scope (ES500A), a Precision Sweep Generator (E400), a Precision marker generator (E200C), a Precision CR Tube Tester (CR30) and a Precision 'scope probe kit (SP5), proceeded to highlight important factors often neglected in TV servicing.

First, types and usages of CR tube testers were explained. Then 'scope and 'scope testing, types of 'scopes and probes and their applications to TV circuitry were concisely demonstrated.

Methods of using sweep generators and markers, along with injection methods were developed and a procedure shown of loosely coupling the antenna to the antenna post, and using the sound and pix signals of the station itself as the AM markers on the overall response curve for alignment, setting local oscillators or checking trouble, was of interest.

Discussions of FM and intercarrier circuits and alignment completed the demonstration.

La.—Miss. NEDA Group to Incorporate

A luncheon meeting of the Louisiana-Mississippi Chapter of National Electronic Distributors Association was held October 24, at Arnaud's Restaurant in New Orleans.

The meeting, presided over by Lealis L. Hale, president, was attended by Glen Matherne, Southern Radio Supply; Joseph F. d'Aquin, Crescent Radio & Supply, Inc., of New Orleans; Ralph G. Thibodeaux, Ralph's Radio Electronic Supply, Lafayette; Donald M. Menard, Ralph's Radio Electronic Supply, Baton Rouge; Otto V. Wise, Cabell Electric Co., Jackson, Mississippi; R. K. Andrews, Central Radio Supply Co., Alexandria, and of course Mr. Hale from Monroe, Louisiana.

Ralph Thibodeaux, chairman of the committee on incorporation, presented to the members the charter of incorporation of the chapter.

R. K. Andrews, chapter director, reported on the annual board meeting in St. Louis and the subsequent Executive Committee meeting in Chicago.

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:
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Please mail the filled-out coupon to

Associations Editor, **TECHNICIAN**,
 480 Lexington Avenue, N.Y.C. 17, N.Y.

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GREAT UHF ANTENNAS

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HIGHEST GAIN and
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This great series once again reaffirms Finco leadership! Model 502 is a 2-bay unit of the colateral* type with a "snap-out" screen for instantaneous installation. Model 504 is the 4-bay version, highly effective in super fringe areas where ultra high gain is consistently required. Both models feature high front to back ratio and excellent impedance match to 300 OHM line for low signal fringe areas. Completely preassembled — corrosion proof aluminum throughout (including screen) — one antenna, one transmission line!

Both Units available in 3 models which peak on channel ranges shown below and maintain high gain on balance of frequencies:

502A — channels 14-32
 # 502B — channels 29-55
 # 502C — channels 53-83

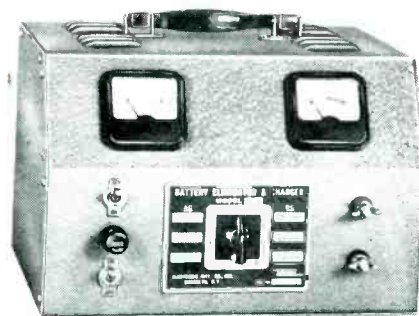
504A — channels 14-32
 # 504B — channels 29-55
 # 504C — channels 53-83

Patent No. 2,566,287
 *Reg. U.S. Pat. Off.

Shop Equipment and Instruments

Eico BATTERY ELIMINATOR

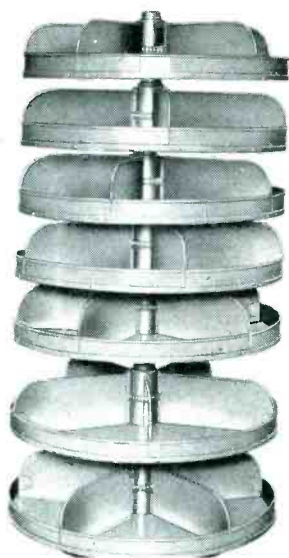
The Model 1050 is a 6-volt and 12-volt automobile battery eliminator and charger for auto radio and



battery work. The DC output is in two steps, 0 to 8, and 0 to 16 volts, both continuously variable. A voltmeter and an ammeter show the output under all operating conditions. The price for factory-wired model 1050 is \$38.95, and for model 1050-K, in kit form, \$29.95. Electronic Instrument Co. Inc. 84 Withers St., Brooklyn 11, N.Y.—TECHNICIAN.

Lyon STORAGE BINS

Lyon revolving bins are storage units for bulk stock, parts, nuts, bolts, screws, etc. Shelves revolve easily in either direction on ball-bearing rollers. Each shelf has five permanent dividers. Additional di-



viders can be added. Available in 7-shelf and 4-shelf units. Lyon Metal Products, Aurora, Ill.—TECHNICIAN

See **CIRCUIT DIGESTS**, page 65

RCP VTVM

Model 655 VTVM allows measurement of complex and sinusoidal voltages. Peak-to-peak or RMS values can be read directly. Of high impedance design, the meter permits peak-to-peak AC measurements of from .2 volts to 4200 volts, AC RMS measurements of .1 volt to 1500 volts, DC measurements of from .02 volts to 1500 volts, and resistance measurements of from 2 ohms to 1000 megohms, on seven ranges. The electronic measuring circuit uses a balanced-bridge type DC amplifier, meter, and a high-impedance voltage-divider; an additional peak-to-peak rectifier with compensated attenuator is used for the AC measurements. Radio City Products Co., Inc., 152 W. 25th St., New York 1, N. Y.—TECHNICIAN.

Argos TUBE CADDY

The Carry-All Tube Caddy opens from the top in spread-eagle fashion, making three compartments available. It can carry up to 262 receiving-type tubes in the various sizes normally needed, and any compartment is big enough to accommodate a soldering gun, meter or similar equipment, according to the manufacturer. Dealer net is \$13.95. Argos Products Co., Genoa, Ill.—TECHNICIAN.

Metalectrics CONNECTORS

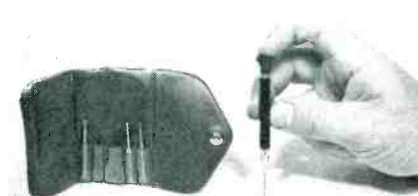
Bakelite wire connectors of several sizes, packed ten to a polyethylene bag, are available with a counter merchandiser which holds 30 bags. The smallest connector can accommodate two wires as small as no. 18, while the largest size will take up to three no. 10 wires. Metalectrics, Inc., 677 Broadway, New York 12, N. Y.—TECHNICIAN.

Super-Cast LAG SCREW SHIELDS

Lag screw shields, said to simplify and speed the setting of cut thread or rolled thread lag screws, are made in four sizes— $\frac{1}{4}$ -in. to $\frac{1}{2}$ -in.—short and long. They are precision cast so that threads line up perfectly with threads of lag screws. Rings on the outside are designed to give maximum holding power, and are re-inforced so that they will not flatten out, as with ordinary shields. Recommended for use in all types of masonry, brick and stone. Holub Industries, Inc., Sycamore, Ill.—TECHNICIAN

Insuline SCREWDRIVER KIT

This screwdriver combination, designed for work on electronic or other equipment using small screws,



is known as the Mini-Kit. It consists of a swivel-top handle into which can be fitted any of four hardened steel blades measuring .100-in., .080-in., .070-in. and .055-in., respectively. The tools are packed in a folding vinylite case. Kit sells for \$1.15. Insuline Corp. of America, 3602-35th Ave., Long Island City 1, N. Y.—TECHNICIAN.

Service Instrument BOOSTER



The Up-Ten voltage booster is designed to add 10 volts to the existing line voltage. It is intended for use with any TV set or other electrical appliance which draws up to 300 watts. Lists for \$7.95. Service Instruments Co., 422 S. Dearborn St., Chicago 5, Ill.—TECHNICIAN.

Speedway DRILL KIT

This drill kit is contained in a holster that enables the wearer to carry the SpeedDrill and its accessories on his trouser belt, leaving both hands free. The kit includes a $\frac{1}{4}$ -in., $\frac{1}{4}$ -HP SpeedDrill, seven chrome vanadium steel drill bits, assorted aluminum oxide abrasive discs for sanding,



rubber backer, and lamb's wool bonnet. Retail at \$29.50. SpeedWay Mfg. Co., 1834 S. 52nd Ave., Cicero 50, Ill.—TECHNICIAN.

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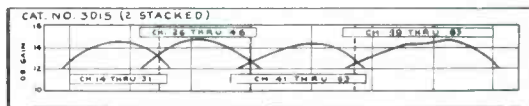
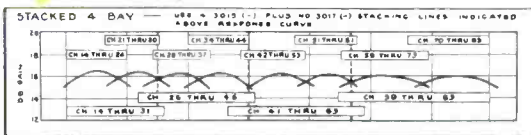
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A new high in UHF antenna design — with new and better performance
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All welded!—perfect mechanical and electrical union between all elements—
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Extra-high gain—yagi performance improved through
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Packed two per carton with stacking lines for dual stacking.
 Use as single antenna or as stacked array for extra gain.

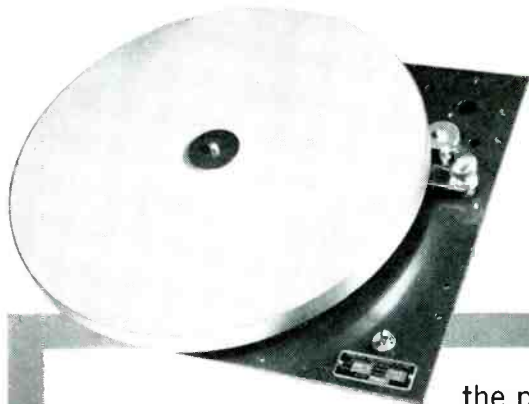
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PLUS — Four stack installation
 by addition of full-wave stacking
 lines for the ultimate in
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CUSTOMER
SATISFACTION

the precision engineered

PRESTO 15-G

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designed and manufactured by
the world's largest producer
of professional tape and disc
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Retails at \$53.50 (chassis only)

Write for
dealer arrangements
and attractive
counter display



Bigger Biz in '54, say Technicians

In a nationwide "How's Your Business?" survey, the GE Tube Dept., Schenectady, N. Y., mailed questionnaires to 40,000 service organizations all across the country. More than a thousand trend-setting replies were analyzed to give the results.

Technicians replying were divided into three types—TV service dealers (with 75 per cent of their business in TV service); general service dealers (with 25 to 74 per cent of their business in TV service), and radio service dealers (with less than 25 per cent of their business in TV service).

Each of these three types was further divided by the number of technicians employed, to provide a closer basis for comparison.

Bright spot in the survey was that without exception, every group of service dealers of all sizes predicted their volume of business would be higher in 1953 than in 1952.

The survey produced detailed average tabulations on several other phases of service operations. These results follow.

The survey showed that the typical technician handles between 35 and 40 jobs per week. The detailed breakdown of jobs per week per technician, shows a wider span, however: (All following figures are for 1953.)

For TV service dealers:

Number Technicians employed:	0-2	3-5	6-9	10-24	25 plus
Number of Jobs/week:	35	42	50	47	49

For general service dealers:

Number Technicians employed:	0-2	3-5	6-9	10-24
Number of Jobs/week:	35	38	41	42

For radio service dealers:

Number Technicians employed:	0-2	3-5	6-9
Number of Jobs/week:	36	31	33

In the number of hours worked per week, the survey showed the average technician works about 44 to 45 hours, regardless of the size or type of the business. Technicians in general service firms employing between six and nine servicemen, work the longest hours. They average 48 hours per week. At the other extreme, with 44-hour week averages, are technicians in radio firms with six to nine technicians, and those in TV firms with 25-plus technicians.

The survey results showed that

THE NEW MODEL TV-11

TUBE TESTER



- Uses the new self-cleaning Lever Action Switches for individual element testing.
- Because all elements are numbered according to pin number in the RMA base numbering system, the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TV-11 as any of the pins may be placed in the neutral position when necessary.
- Uses no combination type sockets. Instead individual sockets are used for each type of tube. Thus it is impossible to damage a tube by inserting it in the wrong socket.
- Free-moving, built-in roll chart provides complete data for all tubes.
- Phono jack on front panel for plugging in either phones or external amplifier detects microphonic tubes or noise due to faulty elements and loose external connections.

EXTRA SERVICE—The Model TV-11 may be used as an extremely sensitive Condenser Leakage Checker. A relaxation type oscillator incorporated in this model will detect leakages even when the frequency is one per minute.

Operates on 105-130 Volt 60 Cycles A.C. Hand rubbed oak cabinet complete with portable cover

\$47.50

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Try it for 10 days before you buy. If completely satisfied send \$11.50 and pay balance at rate of \$6.00 per month for 6 months.—No Interest or Carrying Charges Added. If not completely satisfied, return to us, no explanation necessary.

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Please rush one Model TV-11. I agree to pay \$11.50 within 10 days after receipt and \$6.00 per month thereafter.

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the average billing per service call for TV service dealers varies between \$8.75 and \$11.50. General dealers' billings range between \$8.65 and \$10.10 with the average close to \$9. Radio dealers average about \$7 per service call.

The survey findings on these figures also show that parts charges vary consistently between 40 and 50 per cent of total charges, with labor charges running between 50 and 60 per cent. The detailed breakdown:

For TV service dealers:

Technicians:	0-2	3-5	6-9	10-24	25 plus
Av. billing:	\$8.75	8.90	11.10	10.30	11.50

For general service dealers:

Technicians:	0-2	3-5	6-9	10-24
Av. billing:	\$8.65	9.30	9.10	10.10

For radio service dealers:

Technicians:	0-2	3-5	6-9
Av. billing:	\$6.75	7.00	12.00

The survey showed that tube inventories vary by size and type of dealer, with TV firms tending to carry the largest inventories of tubes because of their larger picture tube stocks. Dollarwise, receiving-tube inventories outweigh picture tubes in stock by about four or five to one, probably because of space limitations.

In the findings on location of service work, the survey showed that over two-thirds of the TV service dealers' work is done in the home. The larger the concern, the greater the tendency to do servicing in the customer's residence. The largest dealers reported that almost four-fifths of their servicing is in the home.

In contrast, between 80 and 90 per cent of the typical radio dealer's work is in the shop. General service dealers do about half of their work in the home and half in the shop.

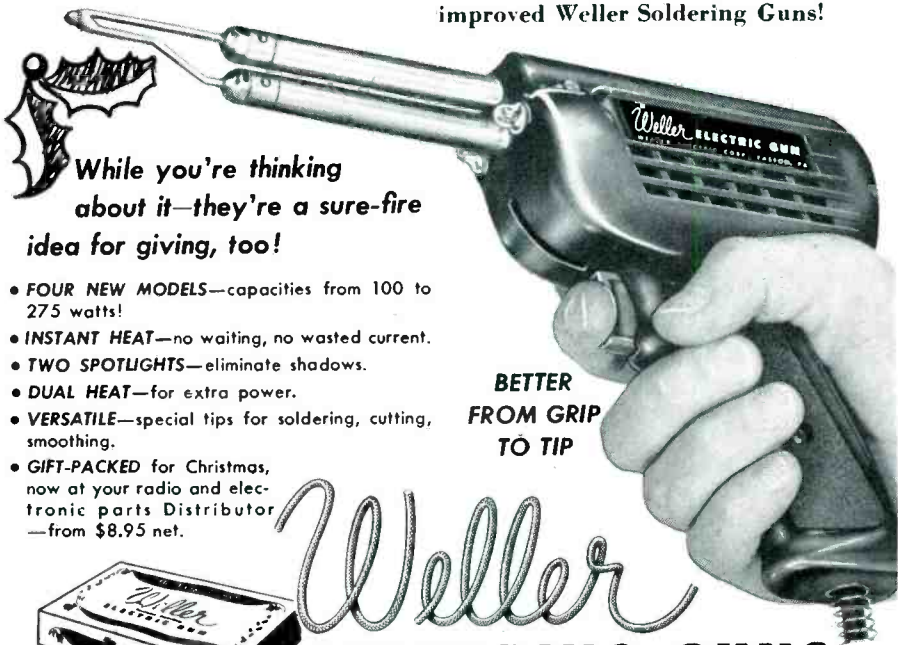
In service characteristics, the survey found that the typical TV dealer does 85 per cent of his work on TV sets, nine per cent on home and portable radios, four per cent on auto radios, and two per cent on all other work.

The representative radio service dealer does about 57 per cent of his work on home and portable sets, 25 per cent on auto sets, about 15 per cent on TV sets, and three per cent on all other. General service dealers come in between, except that they account for most of the servicing of other electronic equipment.

Comparing radio service business in 1952 with that of 1951, the survey found that 50 per cent of all dealers reported an increase in this, while 15 per cent reported a decrease and 35 per cent reported no change.



You can certainly hint hard enough—telling everybody a Weller Soldering Gun tops your "want" list because it makes all kinds of jobs easier, neater, faster and better. So if you don't get one, it's because the old guy kept it for sled repairs and his toy factory. Even around the North Pole, there are endless uses for the new, improved Weller Soldering Guns!



While you're thinking about it—they're a sure-fire idea for giving, too!

- **FOUR NEW MODELS**—capacities from 100 to 275 watts!
- **INSTANT HEAT**—no waiting, no wasted current.
- **TWO SPOTLIGHTS**—eliminate shadows.
- **DUAL HEAT**—for extra power.
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- **GIFT-PACKED** for Christmas, now at your radio and electronic parts Distributor —from \$8.95 net.

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FREE: Tube caddy on Special Windsor Offer! Write for details.

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- 1 **JUDGE** a new publication . . . its editorial objective . . . by where it's going and how fast it's going there. Never judge a new publication solely by where it is at the moment.

- 2 **REMEMBER** that a new publication can't parade its end-product during its first months of publication. During that time, the publisher has to build paid circulation and advertising from a *standing* start. If all buyers took a "wait-and-see" attitude, there wouldn't be any publishers—and there wouldn't be any manufacturers, either.

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UHF Package by Houston's Sterling

Now that K-NUZ-TV, Houston's first UHF station, is telecasting regularly, the public's interest in UHF antennas and converters is increasing daily. The signal is reported to be loud and strong as far as Needville and Baytown, even though the new station is operating at only half power. To help the serviceman demonstrate and display the necessary UHF components involved, Sterling Distributors have devised a unique display package which actually makes money for the servicer. For the low price of \$43.50, he receives a Regency converter, a Channel Master Bow Tie and Reflector Model 408, a Channel Master Ultra-Tie, a five-foot mast and the necessary hardware and lead to make the display complete. To top this offer, the advertising department of Sterling Radio will set the display up at his request—at no charge. The resale value of the UHF display package is \$62.72. The final clincher is that with the purchase of each package, goes a gift certificate worth \$5 on the purchase of \$50 worth of antennas and/or converters.

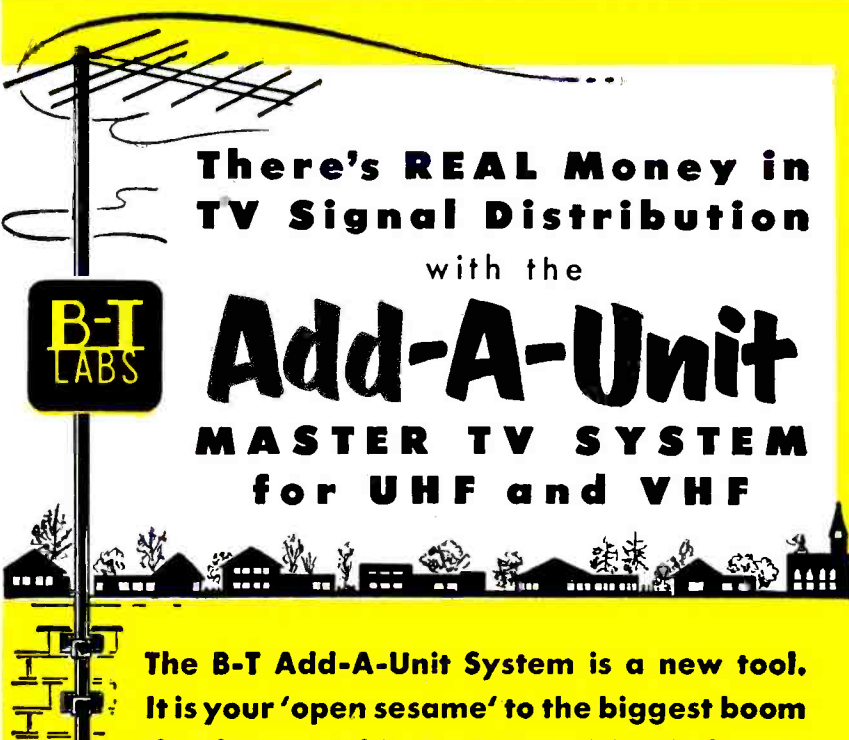
Magnavox Names Kayhart

The Magnavox Co. has appointed Charles C. Kayhart as its service training director, according to an announcement by Ray Yeranko, general service manager. Kayhart will headquarter at the company's general offices in Fort Wayne and in his capacity will supervise Magnavox service training activities that will include resident as well as field service clinics.

He is former district service manager for Magnavox in its eastern division; also senior engineer with Industrial Instruments, Inc. Kayhart returns to Magnavox after three years in the retail field in a service management capacity.

Dittenhoefer, Olympic Service Mgr., Adds Sales

Harold Dittenhoefer, service manager of Olympic Radio & Television Inc., has been appointed sales engineer, it was announced today by Al Friedman, Vice-President in charge of Sales. Although Mr. Dittenhoefer has directed technical and service activities since the start of television he has always been closely associated with sales and in his new assignment he will contact distributors handling both sales and service problems, devoting more of his attention directly to sales activities.



There's REAL Money in TV Signal Distribution

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Add-A-Unit

MASTER TV SYSTEM for UHF and VHF

The B-T Add-A-Unit System is a new tool. It is your 'open sesame' to the biggest boom that has ever hit the TV servicing industry.

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This is YOUR BIG MARKET... your real money market

The B-T Add-A-Unit System offers you these advantages:

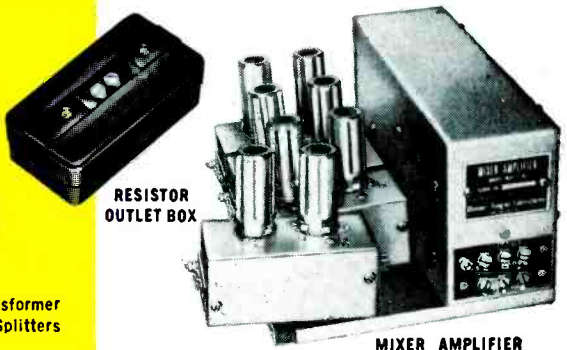
1. It is the lowest cost amplified distribution system ever designed.
2. It is the easiest system to install under all conditions... requires no special tools and no outside engineering assistance.
3. Its flexibility is practically unlimited and it can serve 2000 TV receivers as effectively as it can serve 2.
4. It has no 'bugs' and requires little or no maintenance.
5. It permits complete control of signal strength: amplification or attenuation, as may be required, assuring high quality reception at all TV outlets from all available channels.
6. Every B-T Master System installed by you is a sure fire 'clincher' for additional business.

Let the B-T System Work for You.

The B-T Add-A-Unit Master TV System consists of the following B-T units:

- MIXER AMPLIFIER
- DISTRIBUTION AMPLIFIERS
- COMMERCIAL ANTENSIFIER
- RESISTOR OUTLET BOX
- TV SYSTEM ACCESSORIES

Attenuator Matching Transformer
Remote Control Line Splitters
Line Loss Equalizer
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RESISTOR OUTLET BOX

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by J. R. Johnson

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First book on all types of signal and sweep generators. Gives test uses and discusses problems and their solutions in using this equipment. Applications of all signal and sweep generators in AM, FM radio and TV servicing.

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POSITIVE CURES FOR TV TROUBLES

TV MANUFACTURERS' RECEIVER TROUBLE CURES VOL. 1, VOL. 2, VOL. 3 and VOL. 4

Positive cures for TV troubles! Gives you exact directions for correcting TV receiver performance "bugs". Each cure is official, factory-authorized, direct from the receiver's manufacturer. Listings by manufacturer and model or chassis number. Helps correct the most difficult faults—picture jitter, hum instability, buzz, tearing, etc.

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Covers 12 brands, Admiral through Dumont

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TV SWEEP ALIGNMENT TECHNIQUES

by Art Liebscher, Test Equipment Specialist

Never before has there been a book such as this on TV sweep alignment! An expert gives you accurate time-saving methods—and tells you how they work. Introduces the new Supermark method. Chock-full of sweep curve pictures. Valuable for servicing in UHF signal areas. 123 (5½ x 8½") pp., illus..... \$2.10

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Antenna Installations

(Continued from page 27)

in most cases, receive the attention of the station's engineering staff. If the location actually is in a shadow (no signal) area, the station will have it on record, and inform the technician of the fact. Should the station's surveys, on the other hand, indicate that the receiver is in an area where fair reception is possible, additional attempts are called for.

The technician should make signal-strength surveys of his own, using a well-calibrated field strength meter. Use the meter on every installation, to avoid wasting time, as well as to convince the customer (when necessary) that Channel "X" is not receivable in his location. The fair-minded individual will accept as proof the results of a thorough, scientific investigation. The stubborn, narrow-minded man will never be satisfied, but it is gratifying to know that his kind is in minority.

Choosing An Antenna

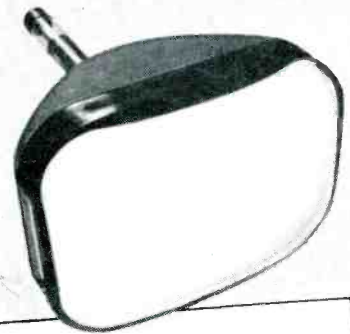
There are more than a hundred companies in the U. S. putting antennas on the market. Most of them have more than one design in production. Obviously it is impractical to even attempt a pro and con discussion of all types. Relatively few types are, however, available from any one parts distributor. Judging from the volume of sales of each type he handles, and from the comments of the technicians he serves, the parts distributor should be able to decide which antenna has gotten best results in his area. In almost all cases, the technician will benefit by following the distributor's advice.

Rotary Antenna Advantages

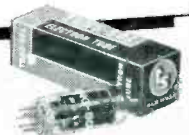
In locations where signals are being received from many directions, the use of more than one antenna, or an antenna rotator, may prove necessary. The question of whether to use separate antennas, each facing the desired station, with a special switching arrangement, or a single highly-directional antenna with a motor to rotate it, is chiefly an economic one. The customer will most likely want the least expensive arrangement. In the author's experience, the rotatable antenna has proven cheaper and more efficient.

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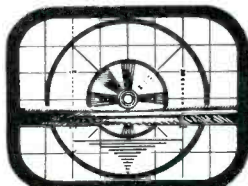


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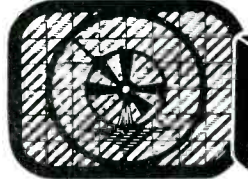
Sales Offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Seattle

NEW! ... at a glance

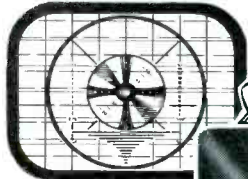
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- ADVERTISING AGENCIES—Use AC operated animated or illuminated displays in or on the car.
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MFRS' Catalogs & Bulletins

Motorola "Service News"

A new monthly house organ, the "Motorola Service News," is announced by Tim Alexander, Motorola's national service director. The new organ, published by the Service Department, will be sent free to 19,000 service contractors and dealers' and distributors' servicemen.

The technical section will feature service hints, bulletins, and new circuit schematics, and will be a lift-out suitable for filing. The service hints will come from readers as well as factory personnel.

The articles will be written by field service and factory engineers and by the service department staff. In addition to technical articles, there will be those on business news and methods, human interest stories, and tips on customer relations. Outstanding articles in other publications will be listed for recommended reading. Editorials will be furnished each month by the staff or by guests chosen from management, engineering, and other departments.

The new publication will be edited by Russell C. Hansen, Motorola's service contract manager.

Ram Replacement Guide

The 1954 Replacement Components Manual, is a guide to the Ram line of replacement parts. Available from Ram Electronics Sales Co., Irvington-on-Hudson, N. Y.

Westinghouse Tube Guide

A 47-page receiving tube guide, RU-020, contains characteristics and ratings for over 300 tube types; tube symbols are closely associated with their tabular information. Priced at 35 cents a copy from Westinghouse Electronic Tube Division, Elmira, N. Y.

Turner Mike Bulletin

A technical bulletin on the Turner ADA 95D, a general-purpose dynamic microphone, is available from electronic parts jobbers or from the Turner Company, 900 17th St. N. E., Cedar Rapids, Iowa.

Newcomb PA Catalog

This 20-page catalog of public address equipment lists the three lines of Newcomb amplifiers, portable systems and accessories, as well as rack and panel assemblies. Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood, Calif.

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Webcor Service Data

This large, fully indexed manual covers record changers, tape recorders, wire recorders and other equipment manufactured by Webster-Chicago. The use of a loose-leaf binder permits removal of individual service manuals or bulletins when necessary, and also provides for convenient filing of new Webcor data as it is released. Five subject separators, marked with tabs, divide the manual into service bulletins, sales engineer bulletins, tape recorder service manuals, wire recorder service manuals, and disc changer manuals. Price, \$1.98. Webster-Chicago, 5610 W. Bloomingdale Avenue, Chicago 39, Ill.

W-W ANTENNA FOLDER

A folder released by Wells and Winegard features the manufacturer's complete antenna line, including UHF and VHF types. Copies can be procured from dealers, W-W distributors, or by writing direct. Wells and Winegard, Burlington, Iowa.

Royal TV MAST BOOKLETS

Two illustrated booklets describe the manufacturer's TV antenna masts and mounting accessories, and give hints, diagrams, and step-by-step instructions for erecting and guying TV masts up to 50 feet in height. Available as RCC No. 1C and Catalog SRT No. 2A. Royal Television Supply Co., 126 Tenth St., Mcdesto, Calif.

Snyder ANTENNA GUIDE

A pocket-size reference manual, the 1954 edition of *TV ANTENNA TIPS* contains recommendations for antenna types for various areas, installation instructions, data on UHF and VHF antennas and a chart of dimensions for tuned antenna elements. Free copies are available from the manufacturer. Snyder Manufacturing Co., Philadelphia, Pa.

Davis ANTENNA BULLETIN

A technical data bulletin has been prepared by Davis Electronics for their Supervision all-channel VHF antenna. The information, based on a series of recently conducted field tests, includes radiation patterns, gain charts, and information concerning impedance characteristics, standing-wave ratio, and front-to-back ratio. Catalog information is also included. The bulletin, listed as No. SV-7 Catalog Data Folder, is available through jobbers or may be obtained by writing to Davis Electronics, Box 1247, Burbank, Calif.

Federal Data Books

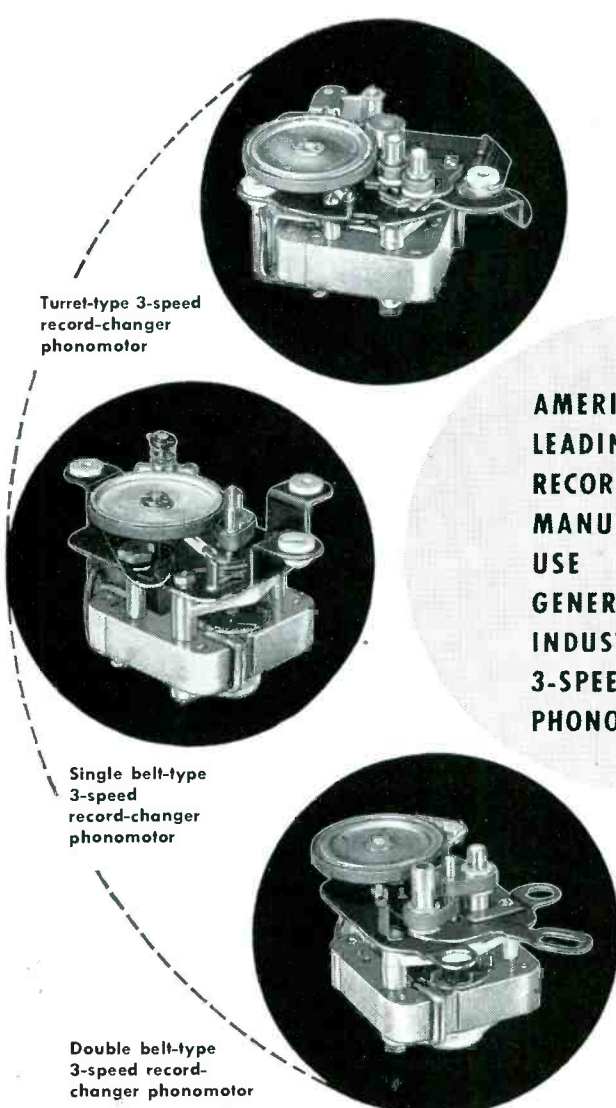
Federal Quality-Controlled Cables lists all the wire and cable types manufactured by Federal for electronic applications, and has useful data for the servicer on cable impedance characteristics. For a copy, contact Selenium-Intelin Dept., Federal Telephone and Radio Co., 100 Kingsland Rd., Clifton, N. J. The *Federal Picture Tube Data Book*, giving dimensions and electrical characteristics of commonly used CR tubes, is also available. Vacuum Tube Dept., Federal Telephone and Radio Co., 100 Kingsland Rd., Clifton, N. J.

G-C CATALOG

General Cement's 64-page catalog, No. 156, lists the manufacturer's complete line of radio, TV and other electronic products. More than 3000 items in over 150 classifications are listed in index form for quick reference. Available from the manufacturer. General Cement Mfg. Co., 904 Taylor St., Rockford, Ill.

Du-Mac Antenna Brochure

A brochure describing UHF and VHF antennas and antenna kits manufactured by Du-Mac is available from Du-Mac Engineering, Inc., 14428 Oxnard St., Van Nuys, Calif.



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Complete Index of

ALL "CIRCUIT DIGESTS" TO DATE

Including Current Issue. CIRCUIT DIGEST NOS. 101 to 105 will be found in this issue of TECHNICIAN.

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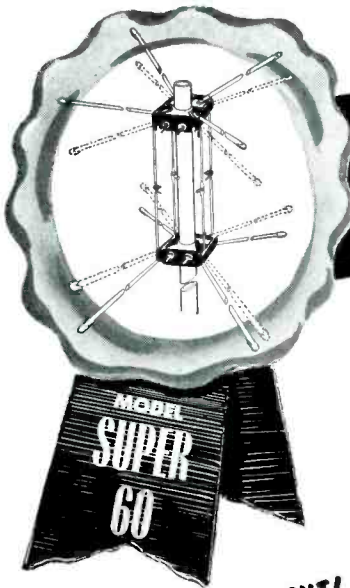
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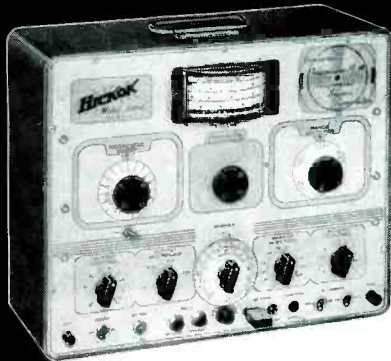
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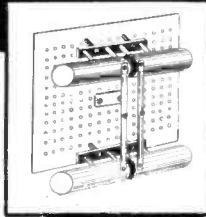
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NEW BOOKS

PRACTICAL TV ENGINEERING, by Scott Helt. Research Division, Allen B. DuMont Laboratories, Inc.; Lecturer in TV Engineering, Columbia University. 744 pages. 400 illustrations, \$7.50. Second edition.

Designed to acquaint technical workers with all components of television transmission and reception—how they work, and how they are combined in the complete television system, this book opens with an analysis of the fundamentals of picture transmission. Next the author describes the circuits used in modern cathode-ray oscillographs and how these valuable instruments are used for routine examination and maintenance of commercial television transmitting and receiving equipment. A brand new chapter in this second edition is devoted to the latest developments in UHF and color-television including electronic color systems. All UHF and color transmitting and receiving systems and components in current use or under serious consideration are fully explored. In short, the broad appeal of Scott Helt's book can be summed up in two words—"practicability" and "teachability." Now, with over 400 photographs, schematics, and block diagrams, the new edition seems destined to take an important place in colleges and technical trade schools dealing with the practical design, operation, and maintenance of all modern television equipment.

TV SWEEP ALIGNMENT TECHNIQUES, by Art Liebscher. Published by John F. Rider, Inc., 480 Canal Street, New York 13, N. Y. 213 pages, \$2.10.

This profusely-illustrated book discusses the following subjects: markers, the "supermark," sweep curves, tuner curve formation, intermediate-frequency alignment, intermediate-frequency curve adjustment, sound IF and sound detector alignment, video amplifier response testing, and UHF sweep alignment.

Liebscher's stated intention is to describe an alignment system that will enable the technician to "obtain the best possible picture in the shortest time." Servicemen will find a good deal of useful information in this book.

Two Join J.K.M. Inc.

John S. Margolin, sales manager, and Will Brooks, chief engineer of Tape Master, Inc., have resigned to become full partners in the Chicago rep firm of J.K.M. Inc., according to R. M. Karet, president of J.K.M.

capacitor replacements

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ADMIRAL CHASSIS 22A3, 22A3Z

Symbol No.	Rating MF@ Volts	Admiral Part No.	Sprague Replacement
C206	4 @ 50	67A4-9	TVA-1303
C213	10 @ 450/20+10 @ 25	67C15-19	TVL-3719
C307	20 @ 450/60+40 @ 350	67C15-27	TVL-3770 TVA-1608
C329	20 @ 475	67A25-1	TVA-1804
C407	20 @ 400/80 @ 350/100 @ 50	67C15-28	TVL-3722
C438	20 @ 475	67A25-1	TVA-1804
C401 etc. } R401 etc. }	Integrator Plate	63B6-2	101C1

HALLICRAFTERS CHASSIS A1400D

Symbol No.	Rating MF@ Volts	Hallcrafters Part No.	Sprague Replacement
C128	20 @ 400/10 @ 350/80 @ 300/20 @ 25	45C238	TVL-3727 TVA-1205
C129	1 @ 50	45C163	TVA-1300
C132	4 @ 300	45B241	TVA-1601
C138	5 @ 50	45B175	TVA-1303
C303	40 @ 400/80 @ 50	45C239	TVL-2653
C304	80+40 @ 400	45C236	TVL-2675
C315	8 @ 475	45A103	TVA-1902
C142 etc. } R164 etc. }	Audio Coupling Plate	PC-80	102C1
C339	500 MMF @ 30,000	47A314	30DK-T5

RCA CHASSIS KCS77D, KCS77H

Symbol No.	Rating MF@ Volts	RCA Part No.	Sprague Replacement
C111	5 @ 50	74521	TVA-1303
C118	50+25 @ 400/100 @ 50/20 @ 25	77817	TVL-4663
C120	40+35+10+10 @ 400	77819	TVL-4673
C149	90+10+5 @ 400	77820	*TVA-4675
C175	5 @ 450	28417	TVA-1702
C201	500 MMF @ 30,000	76488	30DK-T5

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Symbol No.	Rating MF@ Volts	G.E. Part No.	Sprague Replacement
C500	30 @ 350	RCE-159	TVA-1610
C501, C502	680 MMF	RCW-3045	5GA-T68
C517, C518 } C519, C520 }	470 MMF	RCW-3067	5GA-T47
C521, C522 } C524	2.2 MMF	RCW-039	5TCCB-V22

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First Fact: There is no such thing as a "second" RCA Receiving Tube that can find its way to market. If an RCA Tube fails to pass its final test, it is not only rejected . . . *it is broken up, dumped into a "meat chopper" and ground up into so much hash.*

Second Fact: The quality of RCA Receiving Tubes is continually being "upgraded." For instance, when television came, you asked for an improved 6SN7-GT. As a result, RCA's 6SN7-GT is a far better tube than the 6SN7-GT of yesterday. You see, we guard our reputation as zealously as you guard yours.

So let's face it . . . you just can't afford to buy anything less than the best in receiving tubes—and that's RCA.



To be sure you're getting unused, factory-fresh RCA Tubes, buy them only in the familiar red, white and black RCA Tube cartons through your authorized RCA Tube Distributor.



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