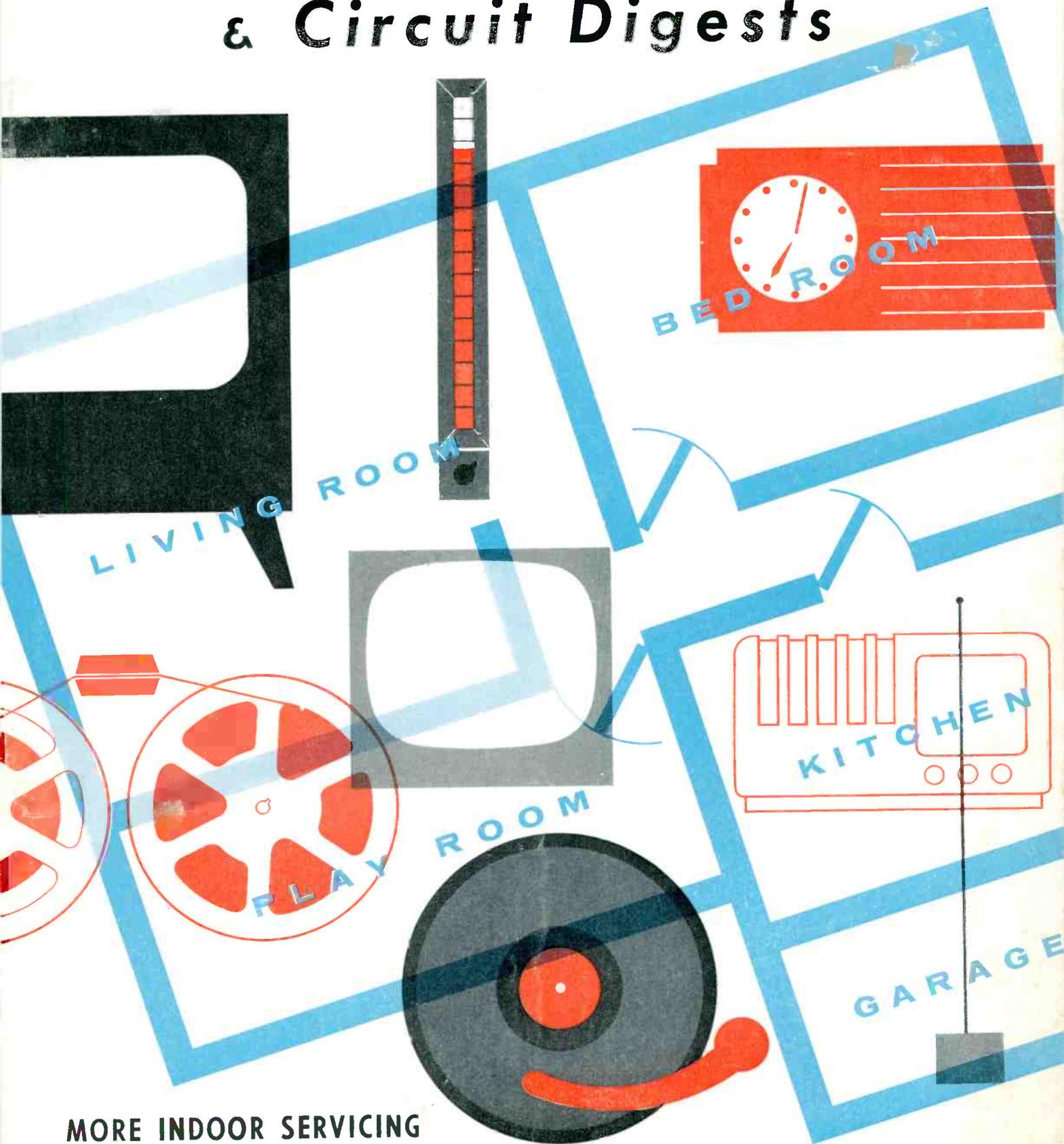


TECHNICIAN

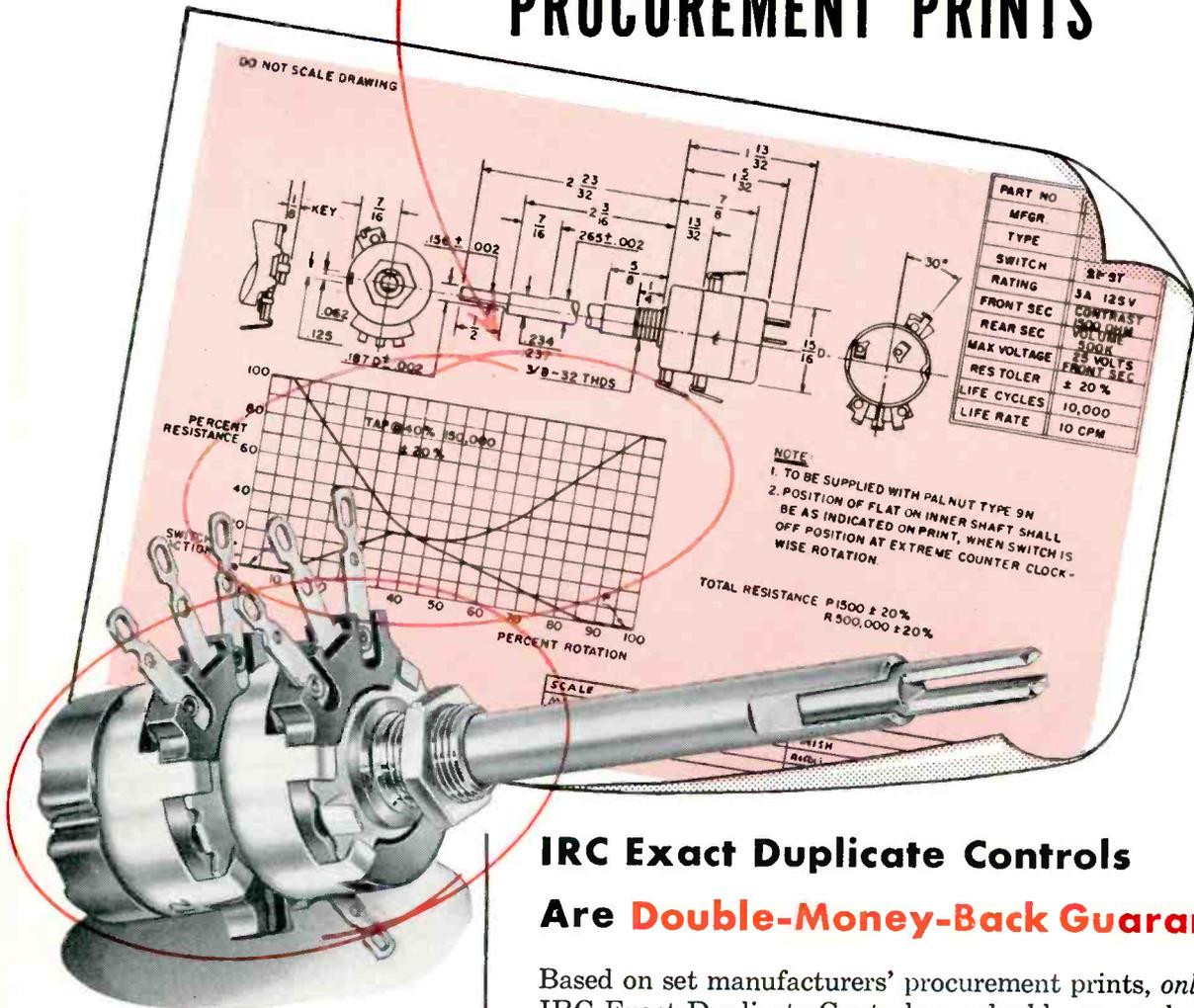
& *Circuit Digests*



MORE INDOOR SERVICING

November • 1954

ASSURED ELECTRICAL ACCURACY BASED ON MANUFACTURERS' PROCUREMENT PRINTS



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

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

IRC Exact Duplicate Controls Are Double-Money-Back Guaranteed

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

Set manufacturers' electrical specifications are closely followed.

Resistance values are carefully selected to match. Tapers are watched carefully; IRC doesn't arbitrarily substitute tapers to obtain wide coverage.

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



Wherever the Circuit Says ~~~

INTERNATIONAL RESISTANCE CO.

425 N. Broad Street, Philadelphia 8, Pa.

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

X-RAYS SHOW THE DIFFERENCE.....

3 more new

G-E SERVICE-DESIGNED TUBES



- Cost no more
- Have longer life
- Improve TV performance
- Cut servicing call-backs
- Interchangeable with prototypes

See your G-E tube distributor today! Tube Dept.,
General Electric Company, Schenectady 5, New York.

**PROVED
PACE SETTERS—
G.E.'s FIRST 6
SERVICE-DESIGNED
TUBES!**

NEW 1B3-GT

Does a superior job for longer. Special lead glass wards off electrolysis and air-leakage. New ring around filament stops "bowing" and the filament burnouts that result.

NEW 5U4-GA

Husker. New mica supports, at both top and bottom. New straight-side glass bulb. New double-fin plate, new button-stem base with the many advantages of this construction.

NEW 5Y3-GT

New sturdiness, new long life. Mica supports now brace tube structure at both top and bottom. Double-fin heat-dissipating plate construction. New button-stem base.

NEW 6BQ6-GA

Runs far cooler, because of larger bulb. Handles higher pulse plate voltages. High-melting-point solder keeps cap-terminal in place when removing tube for testing.

NEW 25BQ6-GA

Runs cooler. Handles higher pulse plate voltages. Same extensive improvements as new 6BQ6-GA, including larger bulb, high-melting-point solder for cap-terminal, etc.

NEW SERVICE-DESIGNED 12SN7-GTA

Side-by-side X-ray pictures at right show that G.E.'s new SERVICE-DESIGNED 12SN7-GTA is smaller (28% less bulb height) than ordinary 12SN7-GT's . . . sturdier . . . with the many advantages which button-stem base construction offers.

Comparison with the prototype's pressed-stem base, shows that the tube leads now pass through individual seals at bottom of envelope. Prevents loose bases . . . gives shorter leads and better lead separation . . . and brings about better heat conduction, reducing electrolysis

and tube leakage. *You get a longer-lived tube than ever before.*

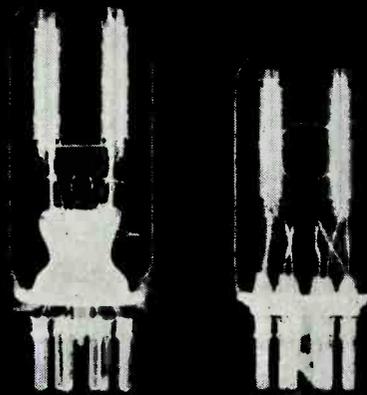
Tube ratings have been substantially increased. Compare below:

	Old 12SN7-GT	New 12SN7-GTA
Max plate voltage	300 v	450 v
Max plate dissip. per plate	3½ w	5 w

And the new 12SN7-GTA is specially tested for dependable operation in all synchro-guide and other circuits! *Every tube gets a "chopper" pulse test, made at the lowest TV line voltages that will be encountered.*



INSIDE STORY of more compact design, new button-stem base!



OLD 12SN7-GT

NEW 12SN7-GTA

NEW SERVICE-DESIGNED 6AX4-GT

1. A new "pigtail" winding guards against heater-cathode shorts by interposing a separate insulated barrier between heater wire and cathode. This is much more efficient than other insulating methods used before. *Tube failures are greatly reduced.*

2. Two design features cut down on plate-cathode arc-overs. The plate is notched to avoid any contact with mica spacers in the critical plate-cathode areas. Also, micas are slotted to set up barriers to electrical conduction. Result: *fewer fuse blow-outs in horizontal-deflection circuits—a common cause of call-backs.*

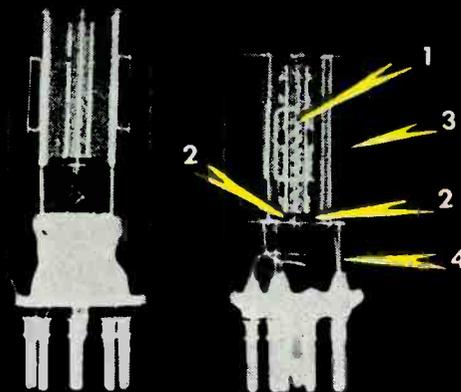
3. Edge of the plate now is flattened out to dissipate electrostatic charge under high-voltage conditions. Stabilizes performance—prevents erratic operation of the tube.

4. New button-stem base adds strength, shortens tube leads, and improves heat conduction . . . increasing tube life. Helps to make possible a new bulb 18% shorter, more compact.

ANOTHER PLUS: new SERVICE-DESIGNED 6AX4-GT's are specially tested for arc-overs at maximum ratings. *Every tube gets this important test!*



INSIDE STORY, why shorts and arc-overs are reduced.



OLD 6AX4-GT

NEW 6AX4-GT

NEW SERVICE-DESIGNED 6BX7-GT

1. New "flipper" (criss-cross) apertures in the mica spacers apply a firm 4-corner grip to the grid legs—keep grids locked in place top and bottom. This greatly reduces microphonics that result from changes in tube inter-element spacing . . . *helps prevent vertical picture jitter.*

2. Covered "penthouses" (box enclosures) now shield cathode and heater from getter contamination that causes electrical leakage, disturbing the relationship of tube elements.

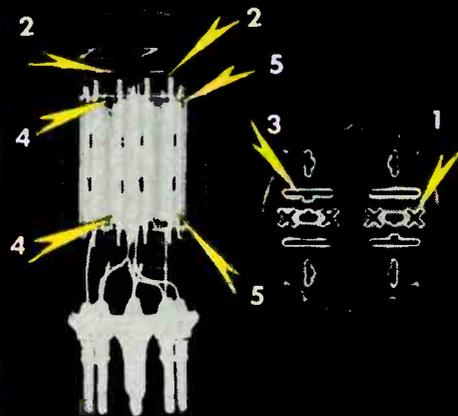
3, 4. Special slots in mica spacers, and notched plate design, further ward off inter-element arc-overs and leakage.

5. Barrels of the plates now are flared out at ends to avoid disturbing delicate grid wires when tube is assembled. Helps assure uniform tube performance.

ALSO: gold-plated grid wires minimize grid emission, a cause of picture shrinkage and fold-over . . . arc-over test of *every tube* assures dependability of SERVICE-DESIGNED 6BX7-GT's.



INSIDE STORY, why electrical performance is improved.



NEW 6BX7-GT

NEW 6SN7-GTA

Redesigned to give top performance in all synchro-guide and other TV circuits. *Every tube gets "chopper" pulse test at low line voltages. Ratings substantially increased.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

THIS 980 LINE COMBINATION can save up to 50% of your time

Here are the two famous 980 Line instruments that form the basis of the new Weston simplified method of TV receiver alignment . . . eliminating the troublesome, time-wasting procedures heretofore involved, and enabling servicemen to cut alignment time almost in half. This new method is possible when these two instruments are used with the Weston scope, or scopes with provisions for Z-axis intensity modulation. They also can be used with available test equipment in the conventional method of alignment. For the complete story, write . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, N. J.



WESTON MODEL 985 CALIBRATOR FEATURES

SCALE CALIBRATION: Crystal calibrating points are available at 1.5 and 4.5 megacycles throughout the entire scale. A scale shift knob is provided to align the scale with the crystal calibrating dots.

SCALE PRESENTATION: Slide rule type in which one scale is visible at a time. Ten scale range bands available . . . total scale length of 8¼ ft.

DUAL MARKERS: 4.5 mc side band markers permit simultaneous observation of video and sound carrier.

INTERNAL MARKERS: Special circuitry provides an internal marker of either a positive or negative pulse suitable for Z-axis intensity modulation of the scope pattern. Marker is visible even at the sound trap frequencies.

HETERODYNE DETECTION: With an input sensitivity of 500 microvolts, the local TV receiver-tuner channel oscillator frequency can be determined without tuner disassembly.

BAR PATTERN GENERATOR: Amplitude modulated signals of the band oscillator at 400 cycles and 300 KC are available for linearity checks.

SPECIFICATIONS

Frequency Range (with Variable Frequency Oscillator): 4-110 megacycles in 7 bands. 170-260 megacycles in 3 bands.

Output Attenuator Range: 100% to 1%

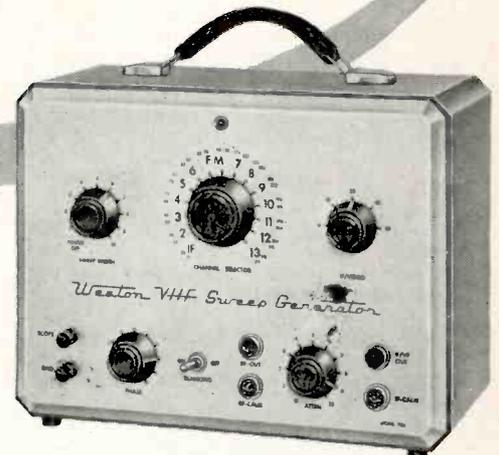
Crystal Marker Accuracy: 1.5 mc position $\pm 0.01\%$; 4.5 mc position $\pm 0.01\%$

Internal Modulation Frequencies: 400 cps, 300 KC, 4.5 mc

Heterodyne Input Sensitivity: 500 microvolts (VFO)

Linearity Adjustment: Horizontal—400 cycles, Vertical—300 KC

Dual Markers: video and sound . . . available for either Z-axis intensity modulation of scope or conventional marker pip display.



WESTON MODEL 984 SWEEP GENERATOR FEATURES

BLANKING: Special circuitry produces a zero output reference base which is essential for relative gain measurements.

RF OUTPUT: Frequency modulated signal, TV channels 2 to 13 inclusive, complete FM coverage available by means of two preset selector positions. *Frequencies are fundamentals of the oscillator frequency.*

IF/VIDEO OUTPUT: Frequency modulated signals ranging to 50 megacycles, continuous tuning, signals free from harmonics.

SWEEP WIDTH: Full 10 megacycles on all channels.

Z-AXIS TERMINAL: For use with the Model 985 Calibrator.

SPECIFICATIONS

Sweep Width: 0-10 Megacycles (continuously variable for both IF and RF)

Output Voltage (RMS): 0.1 Volt . . . sweep is linear

RF Output: TV channels 2 to 13 preset. Complete FM coverage available by means of two additional preset selector positions.

IF/Video Output: 50 Megacycles (continuous tuning)

Horizontal Sweep for Oscilloscope: Phase adjustment range . . . 165° Frequency . . . Power Line 60 cycles per second.

WESTON 980 LINE

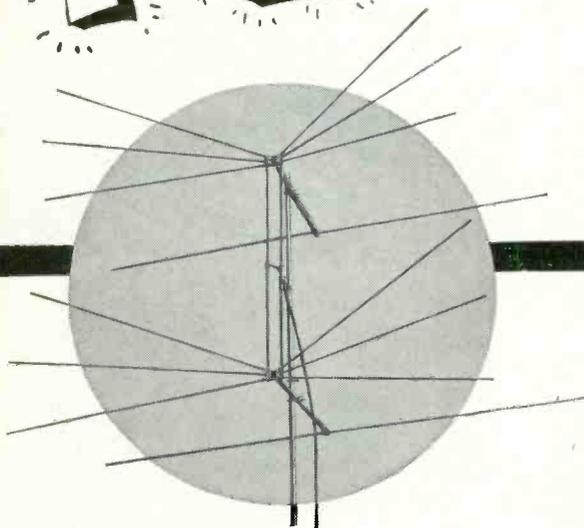
TV TEST EQUIPMENT

NEW PHILCO

Super Performance

TV

ANTENNAS



**PHILCO TWO-BAY
SUPER CONICAL**

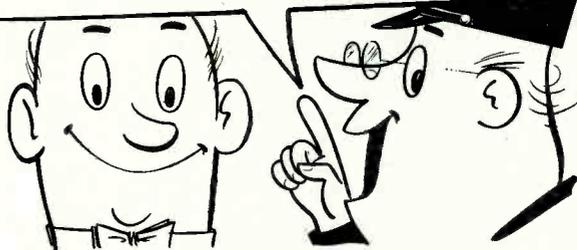
Strong signal pick-up on all VHF-UHF channels. Ideal for fringe area reception... aluminum construction with dowelled elements: Part No. 45-3096-2. Single bay design: Part No. 45-3096.

BUILD CUSTOMER CONFIDENCE... MORE SALES FOR YOU!

Designed to outperform any equivalent antenna in its class, each Philco Super Performance TV Antenna provides the finest picture possible... long life and ease of installation. Powerful Conical... all-aluminum VHF Yagis, engineered for quick rigging... light weight. Stacked versions provide top-quality fringe area reception. Only six UHF Yagis cover the entire UHF spectrum. Here's powerful reception on all channels... the kind that builds customer confidence... more sales for you!

GET YOUR "PHILCO FREE RIDE"

That's right! Ride any way you like it... or earn all of them! They're yours FREE with PHILCO FREE RIDE TICKETS... and there's no waiting! Collect your selected "ride" as soon as you have the necessary number of tickets. You can enjoy Rollfast Roller Skates; Radio Flyer Coaster Wagon; Rollfast Bicycle; BMC Juvenile Tractor; Airplane Trip for Two; 1/2 Ton Panel Dodge Truck; Plymouth Plaza Sedan. Concentrate your parts and accessories purchases on PHILCO and make double profits... profits through the great ready-made PHILCO market of PHILCO owners and PLUS



PROFITS with these great FREE RIDES... all at no extra cost to you. Don't wait... register NOW! Get started on your FREE RIDE with PHILCO!

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PHILCO CORPORATION

ACCESSORY DIVISION

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

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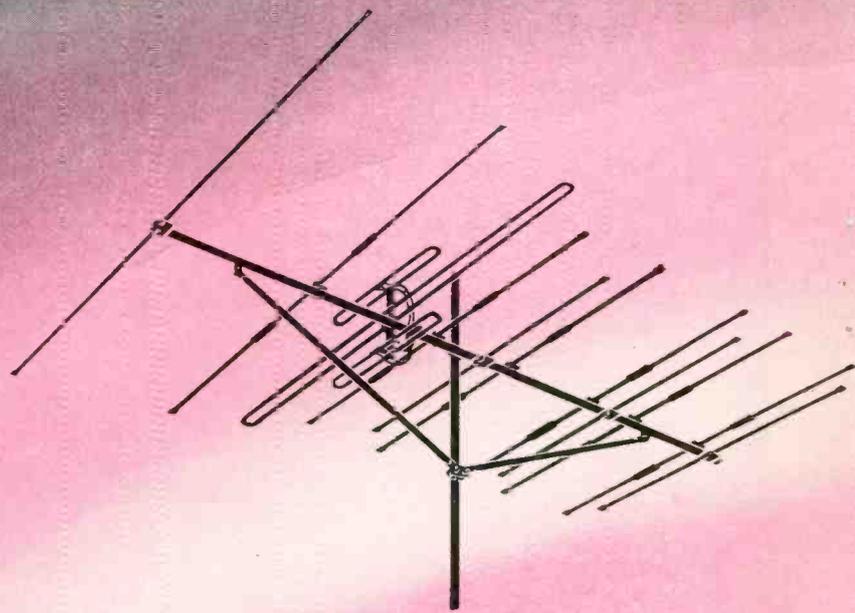
CHANNEL

MASTER'S

greatest

antenna

discovery!



the

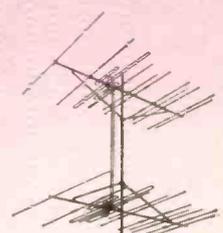
RAINBOW*

**the most important antenna
development since the
introduction of the basic Yagi!**

The World's First
Triple-Powered Yagi...

Brilliant all-channel
VHF performance —
and really ready for **COLOR!**

- No other antenna provides such outstanding long distance reception in black and white.
- No other antenna is so well prepared to meet the exacting requirements of color television: Uniform high gain, flat frequency response, extremely narrow polar patterns, highest front-to-back ratios.



Stacked
SUPER RAINBOW
model no. 331-2

Single bay
SUPER RAINBOW
model no. 331

*Pat Pending

these 3 basic engineering advances

make the RAINBOW the most powerful all-channel VHF antenna science has yet produced.

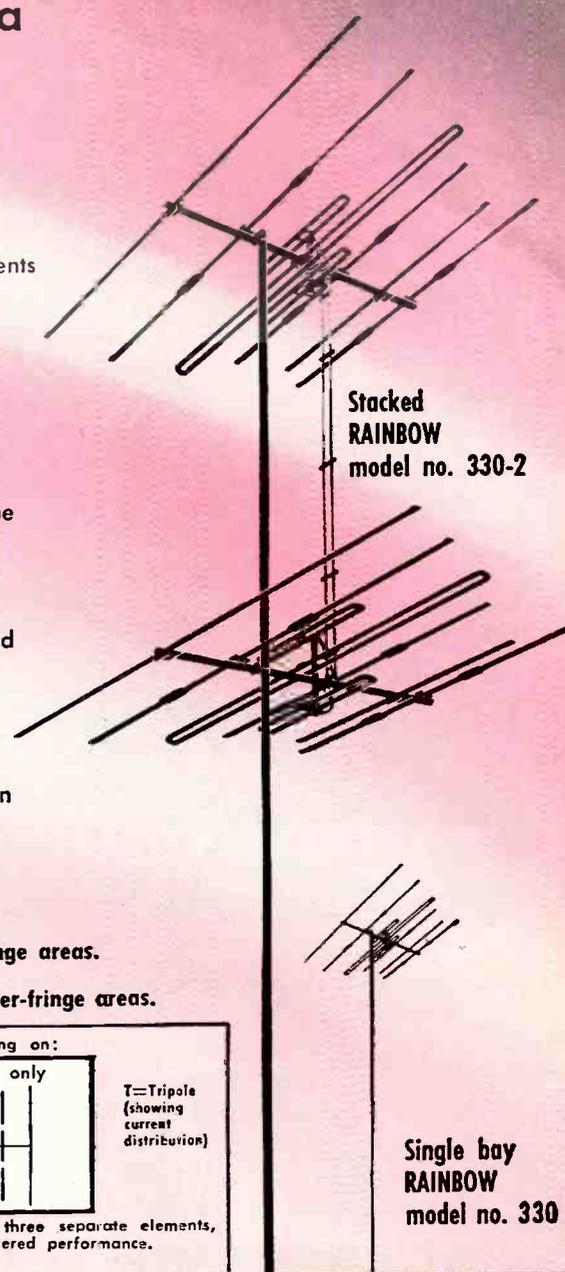
- 1. New spacing formula:** Channel Master research has now established new, more efficient relationships between the Yagi's parasitic elements (directors and reflectors) — far greater efficiency than a screen. The radical new spacing arrangement between these elements has, for the first time, extended the full efficiency and high gain of the basic narrow band Yagi over the full width of an entire VHF band.
- 2. New "triple power" High Band directors and reflector:** Three-segment directors and reflectors, with each segment insulated from its adjacent segment, provide the combined power of three High Band Yagis, operating side by side, in perfect phase. This is the first time an entire antenna has been made to operate on the same high gain principle as the fabulous Tri-Pole.
- 3. New "intermix" design:** Combines — into one single antenna — two separate, independent sets of directors and reflectors, one for High Band, one for Low Band. Each parasitic system operates only on its own band. No compromise design. No interaction. No signal loss.

PLUS Channel Master's original, super-gain TRI-POLE . . . the unique triple-powered dipole that made the Champion the most wanted antenna in America.

2 great models available:

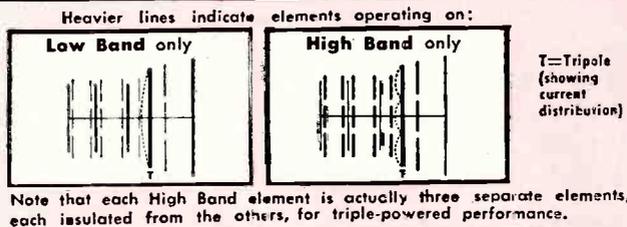
RAINBOW, Model No. 330 — for secondary and near-fringe areas.

SUPER RAINBOW, Model No. 331 — for fringe and super-fringe areas.



Full band width — highest gain — of any all-channel antenna.

Diagram illustrates independent operation of the RAINBOW's High Band and Low Band parasitic elements. Note unique new spacing arrangement between elements.



Here's how the RAINBOW out-performs the famous Champion.

CHANNEL		2	3	4	5	6	7	8	9	10	11	12	13
Gain Over 1-Bay Champion	1-Bay RAINBOW	0 DB	0 DB	0 DB	+1 DB	+2 DB	+3 DB	+2.5 DB	+1 DB	+1.5 DB	+1.5 DB	+2.5 DB	
	1-Bay SUPER RAINBOW	+1 DB	+1 DB	+1.5 DB	+2.5 DB	+3.5 DB	+3.5 DB	+3 DB	+2 DB	+1.5 DB	+2 DB	+3.5 DB	+4.5 DB
Gain Over Stacked Champion	Stacked RAINBOW	+1.5 DB	+2 DB	+1.5 DB	+1.5 DB	+2 DB	+5 DB	+5 DB	+0 DB	+0 DB	-0 DB	+1 DB	+1.5 DB
	Stacked SUPER RAINBOW	+2 DB	+2.5 DB	+3 DB	+3 DB	+4 DB	+5 DB	+1 DB	+1 DB	+2 DB	-2 DB	+2.5 DB	+3.5 DB



Single bay RAINBOW model no. 330

Seen in October



CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

THE WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS

Write for complete technical literature

You can REPAIR PICTURE TUBES right in your own shop



with the sensational new
RAYTRONIC CATHODE BEAMER

Only Instrument of its Kind—The Cathode Beamer not only thoroughly tests every TV kinescope, but really repairs many faults. It reactivates tubes by exclusive Cathode Sweeping, restoring emission, and greatly increasing picture brilliance and contrast. It burns off shorts, even those tough ones between Cathode and Grid. It welds broken Cathode Tabs. It expands the grid of old tubes allowing them to produce a satisfactory picture once again. And, all these repair procedures are done with skill quickly acquired right in your own shop.

Service Dealers Report Good Profits—Here is one instrument that actually pays for itself, and in only a few weeks. Dealers save their customers big tube replacement costs, yet make a good profit on almost every service job. And, customers are mighty pleased with the results. The Cathode Beamer has been thoroughly tested in actual service work and is endorsed by set manufacturers.

See the Cathode Beamer at your distributor's today. Or write

RAYTRONIC LABORATORIES, INC.

9701 READING ROAD

CINCINNATI 15, OHIO

LETTERS To the Editors

Anti Color TV

EDITORS, TECHNICIAN:

Your series on color TV, which I've been following for over a year, is a very good one—in fact, about the best I've seen—but I'm beginning to wonder whether it's worthwhile. I haven't gotten to see a single color set yet; neither have any of the other people I know in the field. Isn't a color series a waste of good space that could otherwise be turned over to more fine articles on black-and-white TV like those you have already been running?

E. PIPER

Detroit, Mich.

•Estimates as to color sets to come into use in 1955—just around the corner—run into the hundreds of thousands. When they hit your bench, you'll need BOTH hands to work on them; it will be tough enough without using one hand to hold a copy of an elementary book on color circuits. The time to prepare is now. There's too much in color to pick up all at once. A painless dose, once a month, with copies kept for review and reference, will take off a lot of the pressure.—Ed.

Test Equipment Squawk

EDITORS, TECHNICIAN

This addition to your editorial on test equipment grows out of my own experience. Very often we buy a new instrument that is everything it is claimed to be, but we're handicapped in its use by the maker. Did you know that the roller charts on many tube checkers recommend incorrect settings, with the result that good tubes are branded defective, and vice versa? And how about the pathetic books of so-called instructions and specs that are packed with most scopes and generators? What's the good in a fine instrument that can't be used properly?

The makers seem to think that, once they've unloaded the instrument on you, the deal ends right there. If any of your readers ever got an answer to follow-up inquiries on incomplete or inaccurate roller charts or instruction manuals, I'd like to hear about it.

R. SANDS

Oakland, Calif.

In Our Corner

EDITORS, TECHNICIAN:

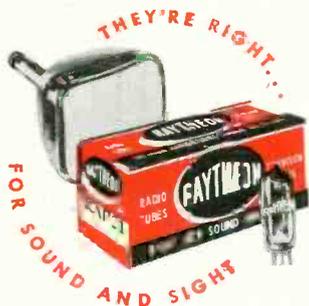
I cannot let the opportunity pass without a word of commendation. The small independent dealer has long needed a powerful champion. We believe that your publication is filling that need. More power to you!

WILLIAM H. JOHNSON

St. Louis, Missouri



The **RAYTHEON** BONDED Electronic Technician PROGRAM
will reflect more business and profits in your shop, too!



Customers have confidence in Raytheon Bonded Dealers for two important reasons: (1) they value the security of the Raytheon Bond and (2) they appreciate the fairness and good sense of the Raytheon "Code of Ethics" to which these dealers adhere. And this confidence is reflected in more volume and profit for the Raytheon Bonded Dealer.

If you can qualify for this exclusive business builder you'll find it will inspire greater customer confidence in your shop and result in more profitable business for you. Ask your Raytheon Tube Distributor about it, today.

RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations
Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.



Excellence in Electronics

RAYTHEON MAKES ALL THESE:

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • SEMICONDUCTOR DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

Field Tested and Proven

by Hundreds of Thousands of Satisfied Users



C★D★R
Automatic
TV Antenna
ROTORS

model AR-2 ... complete AUTOMATIC rotor with thrust bearing ... and handsome modern design cabinet, uses 4 wire cable

model AR-1 ... same as AR-2 without thrust bearing

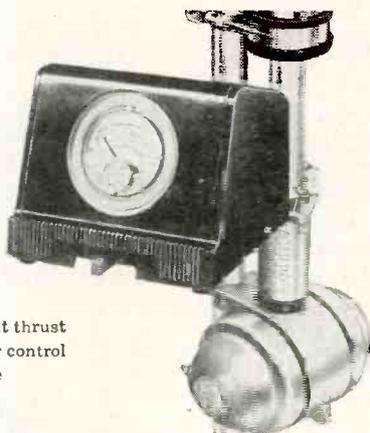


model TR-12

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

model TR-11

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

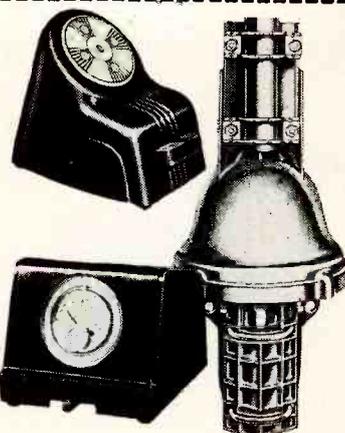


model TR-2

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

model TR-4

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



CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.



THE RADIART CORP.
CLEVELAND 13, OHIO

Drive-In Theaters need more than

3/4 million speakers
yearly
to keep operating!

Sell 'em the new, ruggedized

Jensen *Weather MASTER*

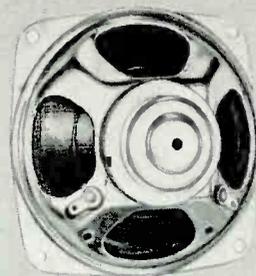
for dependable service

Military practice and Jensen's long experience with military production have dictated the truly weather resistant features of this speaker line.

- Military spec phenolic or moisture-proof and anti-fungus impregnated fiber cones
- Electronically cured non-softening thermo setting adhesives
- Phenolically impregnated spiders
- Baked varnish impregnated voice coils
- Non-swelling gaskets
- Magnets permanently locked in center position unaffected by mechanical shock
- Fiber cones withstand more than three times as many test cycles of immersion and drying
- Phenolic cones unaffected by immersion cycling and resistant to corrosive blown sand and grit
- Acoustically designed specifically for sound-on-film reproduction

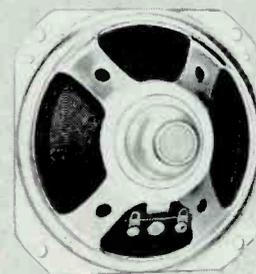
get your share
with

Weather MASTER



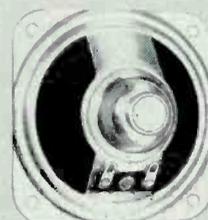
Jensen

4" WP-401
phenolic military
type cone \$3.90



VIKING

3 1/2" WF-350
\$2.30



VIKING

4" WF-400
\$2.30

both with moisture
proof and anti-fungus
impregnated
fiber cones

The world's quality
standard for more
than a quarter century

Jense
MANUFACTURING
COMPANY

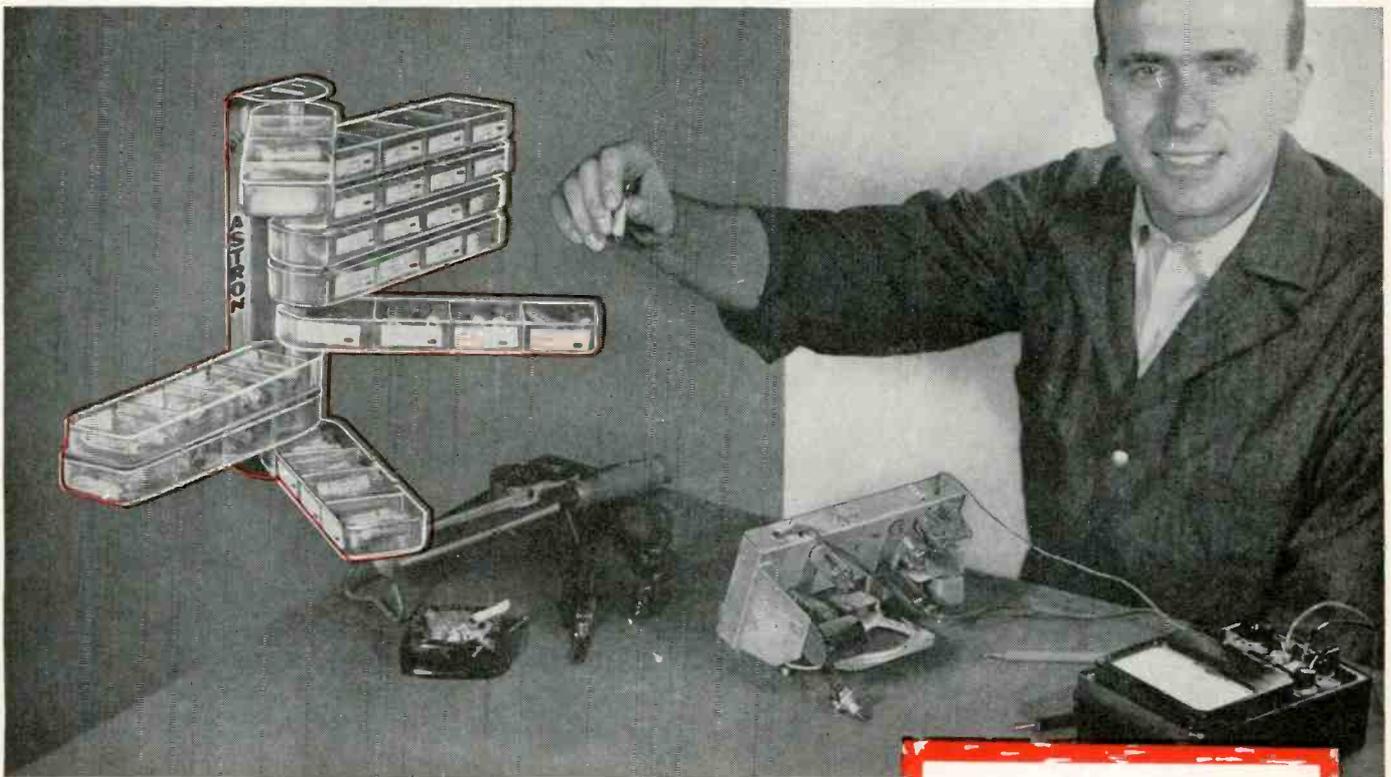
Division of
the Muter Company
6601 S. Laramie Avenue
Chicago 38, Illinois

In Canada: Copper Wire
Products, Ltd.,
Licensee

AKRO-MILS

FREE SWING BIN

NEWEST ASTRON SPECIAL OFFER includes complete BLUE-POINT® capacitor stock!



New ASTRON introductory offer is giving service technicians a complete assortment — 166 units — 36 different popular values — of fabulous BLUE • POINT plastic tubulars at 55% off list *plus* free "Swing Bin" for better servicing. Individual "Swing Bins" swing out. Keep entire capacitor stock in easy reach... off the bench for more work space. Visual stock control.

Fabulous BLUE • POINTS are newest, most dependable molded plastic capacitors made. New solid thermosetting impregnant for high capacitance stability • continuous 85°C operation **WITHOUT DERATING** • bonded shell and seal impervious to heat and moisture • low power factor • high insulation resistance • individual tests — all add up to guaranteed performance of ASTRON BLUE • POINTS.

Get in on this sensational offer today. Jobber stocks are limited. Be sure — get yours now!

Available nationally through authorized distributors.

ASTRON
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DEALERS—This special offer available from local distributors or write to ASTRON for full details.

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How you save

\$64⁷⁰ BLUE • POINTS

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55% off list

PLUS

FREE SWING BIN

TECHNICIAN

& Circuit Digests

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

Carrying the Load

It is almost a rule that rapid progress is uneven progress. Caught up in the middle of great changes, we overlook minor obstacles—until they are major roadblocks.

This month's cover, for example, only hints at the variety of electronic devices now in the home. If this were 1943, most of the items could not have been included. Add to these, in 1953, the increasing number of non-electronic appliances that serve us as soon as they are plugged in—air conditioners, washing machines, dryers, freezers, electric broilers and the like.

Let us consider a disturbing factor that has already aroused concern among power companies, insurers and builders: although we have barely begun to put the electron to full use, power facilities in the average home are inadequate for carrying the loads they must handle *even now*. More than three out of four American homes fall into this class, including recently built units. Some 30 to 40 millions of dwelling units are involved.

Don't decide the problem doesn't affect you. Take your TV set owner, for example, who complains that his picture "pumps" while the washing machine is on, that the raster shrinks or loses sync when the broiler is used, or

that his wife's favorite program, which comes on when he decides to use his electric power tools, can't be watched. All he knows is that the receiver isn't acting right and why in the world can't you fix it? This is only the beginning. Can you even guess at the trouble you'll be having with color circuits? These sets, imposing added drain on facilities, will aggravate the very conditions that hinder their usefulness. Every new appliance that enters the home also enters this vicious cycle. A saturation point, determined by inadequate facilities, is being placed on the number of items you'll be able to sell and service.

For your own long-range good, then, you have to do a job that no one else can do for you. You are the only person in direct, frequent contact with the appliance owner who knows the story on inadequate wiring.

When you're out on a service call, you should be just as sharply on the lookout for "octopus outlets" and excessive open wiring as you are for phonographs and small radios that also need repair. The warnings and recommendations you give, coming from an expert, will be welcomed. You will enhance your own prestige while you do yourself another favor. Pound away at the theme.

Accreditation—A Feather in Your Cap

Industry leaders have been hard at work trying to formulate an accreditation plan to give official, national recognition to the hard-won skills and long hours of study that go into the making of a good TV-radio-electronic technician. It would do this by a test, or by an advanced schooling arrangement employing an approved course, such as has been devised by the Radio-Electronic-Television Manufacturers Association (RETMA).

The certificate you earn would be a mark of true accomplishment, a deserved boost in prestige that has been sadly lacking heretofore. Since the practical and theoretical requirements for accreditation would approach a national standard, the set manufacturer would benefit as well, because the technician who enters the customer's home—and indirectly represents the entire industry in the customer's mind—would command more respect.

Aside from these public relations factors, there are several practical and immediate considerations which should encourage all of us to get behind the idea:

1. Accreditation requirements for technical achieve-

ment provide a goal which would encourage technicians to keep learning. More know-how means more money in your pocket, and better jobs.

2. Self-regulation heads off government regulation.
3. Shop owners with more capable men can render more effective service, and instill in their customers a greater feeling of confidence.
4. A publicly recognized higher status for accredited technicians will tend to eliminate incompetents and hustlers, bringing more business to the qualified.

We've made a spot check of technician reaction to accreditation. The result was highly favorable. A few objections have been raised, but we feel that they can be overcome by proper planning, and that none of them outweigh the many advantages.

Are you in favor of accreditation? Write and state your opinions. We'll publish as many of your letters as space allows. As always, TECHNICIAN will provide the editorial forum where your voice may be heard, and we will fight for better recognition of all technicians.

Tuning In the

AS 1954 MOVES TOWARD ITS END, the majority of service shops will have enjoyed a healthy increase in service revenue. It now appears that the total dollar volume at the service level will be approximately 12 percent ahead of last year. So far as actual profits go, however, they are not expected to be substantially ahead of last year. This is due to ever-growing costs of doing business, particularly in such items as wages, rent, taxes, and operation of trucks.

THE TV BUSINESS NEVER LOOKED BETTER, with sets selling at a surprisingly fast clip. Although many people in the industry predicted that '54 volume would run at about 5,400,000 at the time the new year bowed in, such forecasters are now extremely happy that their guesses will probably turn out to be about a million-plus short! **TECHNICIAN** editors now estimate that '54 will ring up a total of 6,500,000 B & W sets sold to consumers!

MIRACLE MINIATURE ANTENNAS, one of which was exposed by this publication months ago, have been checked by the National Better Business Bureau. The NBBB found that, with three antennas tested, in no case did the end attachment in which the wire was terminated improve reception over that obtained with a simple length of wire. None of the "antennas" performed as well as conventional outdoor or indoor types, despite claims.

HERE'S A UNIQUE ITEM: On many occasions, servicemen employed by Mort Farr, prominent Upper Darby, Pa. dealer, have been working on TV sets and seeing the boss' face or hearing his voice at the same time. Mr. Farr, who started in at the bench in the early days of radio, has been airing his own programs, and is now using both radio and TV. His firm employs about 20 technicians, and the total organization numbers approximately 50 people. His slogan, "Farr Better Service," is well known throughout a wide area in the territory he serves.

A RECORD RENEWAL MARKET in '55 is expected by mgr. of distrib. sales Harold Bersche of RCA's Tube Division. The '54 year-end index is expected to show an 11 percent increase in number of radio, TV and phono units in home use. Comparison of units in use from the beginning to the end of this year include these figures: radios—from 117 to 124 million; record players—from 24 to 26 million; TV sets—from 27 to 32 million. That's good news for the service industry! There will also be substantial growth in industrial electronics.

TV GOES TO THE POLLS. A hot controversy as to which community antenna system was going to be installed in Dubuque, Iowa was put before residents in an election. Despite bad weather, turnout at the polls was larger than in two recent city elections and only slightly under the total vote of 1950, when council elections took place. Guess TV will never mean much to the public after all.



"What's taking so long? All I asked you to do is repair one tiny little wire in the set."

BUSINESS TRENDS: Lively interest by manufacturers in the export market these days on components and sets. Watch for volume to rise sharply next year . . . Baseball was one of the chief factors in keeping Summer & early Fall service revenue at a satisfactorily high level . . . Large home-building development areas prime spots for new shops nowadays . . . In many localities, consumer credit is reported better than it has been for some time along the service front. For awhile, collections had lagged.

THE TV PRICE PICTURE is swinging up, with leading makers announcing increases in the vicinity of \$10-\$20 on some models. Good news for the far-seeing members of the industry who have been dismayed by the tendency to sacrifice quality for price. Good news, too, for the technicians who have to work on the sets.

LIST-PRICE CUTTING may also be slowed down or stopped. This could happen when large-screen color sets reach the market, opines Dan Halpin, gen. sales mgr. of DuMont's TV Receiver Division. Since the demand for these sets will at first outstrip the industry's ability to supply them, there will be little pressure on retailers to cut into their profit margin. Once dealers become accustomed to reasonable profits on these receivers, reasons Halpin, they will not be so eager to give away monochrome sets.

FREE 90-DAY SERVICE to buyers of radios, in addition to parts warranty, is gathering momentum. Westinghouse is the latest to make the offer. All the owner has to do if the set goes defective during the 90-day period is bring it back to the dealer, who sends it to the nearest factory-authorized service station.

Picture



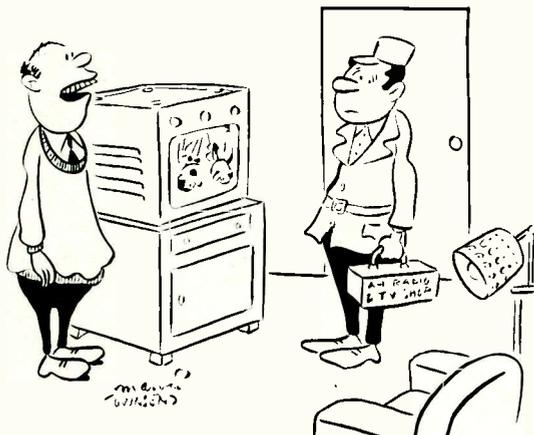
PAYMENT PLANS FOR PARTS & SERVICE sponsored by the manufacturer, or by financing outfits, will become more important to the independent service technician if he wants to meet the competition. More service departments operated by department stores are offering to bill repairs on charge accounts. Now Spear and Co. (Pittsburgh) will sell a new pix tube for a dollar down, the rest on easy terms. You can compete only by doing business with manufacturers who will give you support in similar programs.

A **DETAILED BILL FOR REPAIRS**, carefully drawn up, is important aside from the confidence it instills in your customers. It gives you protection against unjustified customer complaints if you are ever brought to court. You'll need this support if you are ever sued, because the courts seldom give technicians the benefit of the doubt, what with all the unfavorable publicity.

THAT TECHNICIAN'S DUMB GIRL FRIEND is still AWOL from the man with the net. She thinks broadcasting is the art of selecting gals to play parts in a movie, that resistive controls are a dame's best weapon against bold males, and she'll take her dying oath that AC sets won't work in Washington, D.C. . . . Just before someone pushed her off the pier, she said that spurious osculation is a kiss by a joker whose intentions are insincere.

TECHNICIAN EDITORS ESTIMATE that more than a million TV sets will be junked in 1953—and that about 9,500,000 radios will also end up in the scrap heap. Figures do not include those sets reconditioned and offered for resale.

SINCE MOST TECHNICIANS like to work on good sets, a new trend in the market will be well received. Consumers are buying expensive sets more readily now than at any other time during the year. "Selling-up" techniques are partly responsible, since dealers are trying to steer away from low-price low-profit sets.



"The picture is clear, but it always comes in upside down."

TV MEMORY MIRROR: What ever happened to dc restorers? Once considered essential to good picture reproduction, they seldom crop up, except in the older sets. One day an alert engineer discovered nobody could tell the difference when the restorer was left out of the circuit. . . . The 72-ohm antenna input system is another item for the history books. We'd forgotten they ever existed until we came across a 7-year old set in a friend's house. . . . Remember the problem of 4.5-mc grain that occasionally used to mar viewing on the old split-sound designs? We may be heading back toward a similar effect as color shows are more regularly scheduled. The grain produced by the 3.58-mc color subcarrier looks mighty familiar.

TWO-WAY RADIO is an important factor in harvesting peas. Believe it or not, pea crops reach and maintain peak quality only for a few hours. Gibbs Food uses 2-way radio to move pea-pickers from field to field over a 30-mi. area on its Pennsylvania farm as soon as a newly ripening crop is spotted.

VTR (VIDEO TAPE RECORDING) is getting closer with the award of the first contract for a video recorder by the U. S. Air Force. The device will be built by Bing Crosby Enterprises. With acceptance of its monochrome recorder, the company will now concentrate on perfecting its color tape machine.

UNUSUAL-BUT-TRUE DEPARTMENT: Some TV-radio dealers selling "fix-it-yourself" books to consumers, displaying such publications in show-windows! What gives? . . . Red-Face Item: "Some butcher has been working on this set," the manager of a Midwest shop told a customer after checking a small receiver. "It was serviced by one of your men less than a week ago," replied the owner. "Hereafter I'm going to keep my big mouth shut," the manager told a **TECHNICIAN** editor. . . . Numbers of technicians are servicing TV sets in Indian reservations these days! . . . Cincinnati servicer opened back of a TV set in a customer's home and was scared stiff to meet a praying mantis face-to-face. He and the lady of the house spent some bad moments before chasing the insect out. Seems neither knew what the thing was.

HI-POWER UHF: The first 45-kilowatt UHF transmitter, being built by GE, will open up the fringe for WILK-TV of Wilkes-Barre, Penna. Operating on 12 kilowatts until now, this station, on Channel 34, will soon be able to give primary coverage from Binghamton, N. Y. to Reading, Penna.

WOULD YOU EAT IN A FILTHY RESTAURANT, or would you avoid taking a risk on the place that makes a poor appearance? Many TV owners value their sets as pieces of furniture, would never put them in the hands of service outfits whose shops look more like dirty old cellars than places of business.

Analysis of Chrominance Sync

Operation of the Burst Separator and Its Associated Circuit

BY PETER ORNE
and
SOL HELLER

• Beginning with this article, we will consider the circuitry of the chrominance sections of the color receiver—i.e., those sections which have no counterpart in the black-and-white set. The circuits referred to are those in the color sync section, the color demodulators, the matrix and adder section, the band-pass amplifier and the color killer. We will first discuss the color sync section.

The color sync section consists of a number of stages. These are: The burst separator (also called the burst amplifier), the sync discriminator, the color phase amplifier, the 3.58 mc oscillator and the reactance tube. We are going to discuss each of these stages individually, after a preliminary consideration of their relation to each other (refer to Fig. 1).

Since we are going to talk at some length about the processing of the burst signal, let's briefly review the nature and function of this component. The keyed burst is an 8-cycle signal that is sent out just after the horizontal sync pulse. The function of the burst is to keep the receiver's 3.58 mc oscillator synchronized, with respect to frequency and phase, to the transmitter subcarrier oscillator, permitting proper detection of color signals in the receiver.

The composite video signal com-

ing from the first video amplifier is fed to a *burst takeoff coil* (see Fig. 2). This coil is tuned to the burst frequency; its output therefore contains a large-amplitude burst signal, as well as color subcarrier sideband signals. The signals developed across the burst takeoff coil are applied to the grid of the *burst separator*.

Keyed Separation

Burst separation is accomplished by *keying*—that is, by application to the separator of a negative pulse from the horizontal output transformer. This negative pulse is applied to the cathode of the separator. The separator cathode has a positive dc voltage on it of sufficient amplitude to keep the tube cut off. The separator operates only during the time that the keying pulse cancels the positive cathode voltage. The timing is such that separator conduction occurs at the time of the burst.

The burst signal output of the separator is applied, through a transformer, to the two diodes which make up the sync discriminator. The transformer secondary is center-tapped, so that one diode receives a burst signal equal in amplitude, but 180 degrees out of phase, with the burst signal fed to the other diode.

The 3.58 mc oscillator is a crystal oscillator. The feedback required for sustained oscillation is achieved via the capacitance (both interelectrode

and external) present between grid and cathode; a portion of the signal developed across a tank circuit in the cathode is fed back to the grid.

To permit control of the oscillator frequency, a reactance tube is effectively placed in parallel with the crystal of the oscillator. In order to prevent the loading of the oscillator by the discriminator, a buffer amplifier is inserted between the two stages; this amplifier is called the *color phase amplifier*. The 3.58 mc output of the color phase amplifier is fed to the two diodes of the discriminator, and serves as the reference signal.

The discriminator output will be zero when the phase of the oscillator reference signal is the same as the phase of the incoming burst. The output will vary with the amount of phase difference, and will be positive or negative, depending on whether the oscillator leads or lags the burst signal with respect to phase.

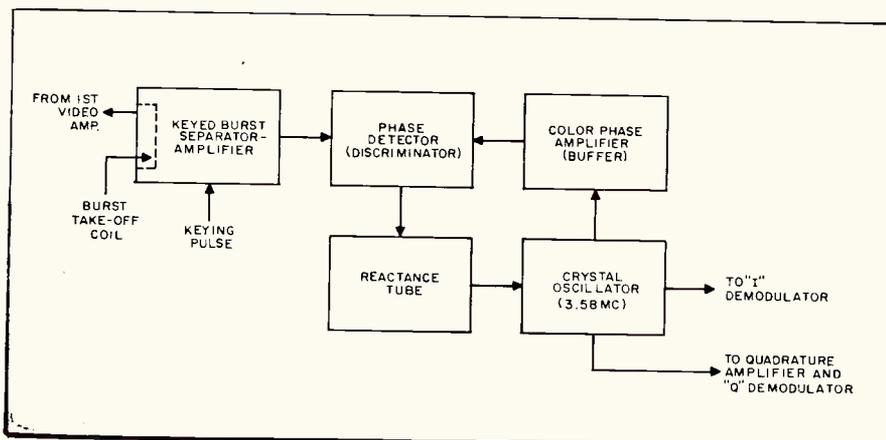
Oscillator Control

The output of the discriminator is fed through a filter network to the reactance tube. The latter's reactance is varied by the output of the discriminator; since this reactance is effectively in parallel with the oscillator tank circuit, changes in it will vary the oscillator frequency, maintaining it in the proper relationship with the transmitted burst.

We can now analyze the burst separator in detail. This stage (see Fig. 2) uses the pentode half of a 6U8. In the cathode circuit of the tube there is a dc voltage divider, made up of a 220k and a 12k resistor; the series combination is fed from a +300 v "B" supply point. As a result of the voltage division (the resistance of the transformer can be neglected, since it is only a few ohms) +25 v, app., appears between point x and ground.

The winding on the flyback that feeds the separator cathode develops a pulse of about -37 v between cathode and ground, permitting the tube to conduct during this time. The keying pulse begins about the center of the horizontal sync pulse, due

Fig. 1—Block diagram of the color sync section in the color television receiver.



Stages in Color Receiver

Procedure for Aligning the Burst Coil

to the action of the synchroguide-controlled horizontal system, and therefore arrives too early to provide proper burst separation. (It will be remembered that the burst is transmitted immediately *after* the horizontal sync pulse.) The keying pulse must therefore be delayed a bit.

The delay necessary is provided by the r-c combination of .01 mfd condenser and 220k resistor in the separator cathode circuit. This network has a time constant of 2.2 microseconds, which means that any sudden pulse applied to it will take 2.2 microseconds to reach 63% of its full amplitude at the condenser (C-1), or the cathode of the tube. Partial integration of the signal occurs here; the C-1 R-1 network is fundamentally the same as the integrating network in a black-and-white TV set.

As a result of C-1, R-1's action, the pulse turns on the burst separator tube at the time that the burst is being received. Since the tube current that flows at this time must pass through both R-1 and R-2, additional voltage will be developed across these resistors. The sum of the voltages produced by bleeder action and cathode current flow is +40 v (as measured with a vtvm, between cathode and ground of the separator). Since this voltage combines with the -37 v burst pulse that is applied to the cathode from the flyback transformer, a bias of -3 v is present at the time of the pulse, while a cutoff bias of -40 v exists the rest of the time.

Separator-Grid Input

Let's now consider the control grid circuit. As evident in Fig. 2, the grid is connected to ground through the burst takeoff coil, and is therefore at dc ground potential. Biasing is supplied entirely by the cathode resistance.

The signal applied to the grid is condenser-coupled from the plate of the first video amplifier. The condenser is a 3 mmfd unit. The grid impedance is the loaded coil, which has a high impedance only at the frequency to which it is tuned; this

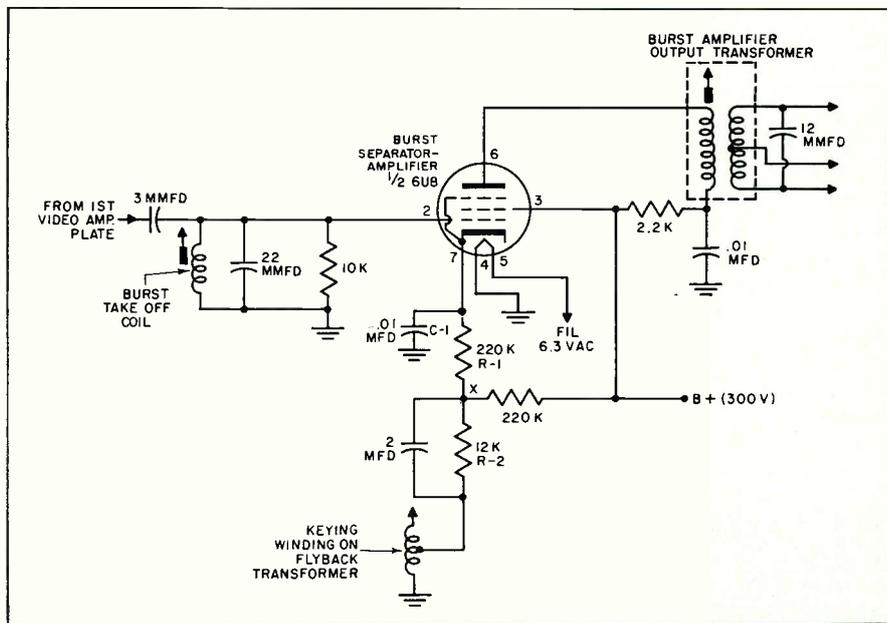


Fig. 2—Schematic of the burst separator-amplifier and the circuit that is associated with it.

is 3.58 mc. Because of this tuning, only the subcarrier signal and the subcarrier sidebands develop an appreciable amplitude in the grid circuit. The coupling condenser blocks signals of lower frequency, and the 22 mmfd tuning condenser bypasses higher frequencies.

The advantage of limiting the amount of unwanted signal present may be described as follows: Some input signal will be coupled to the plate, through the interelectrode capacitance of the tube; this will take place even when the burst separator's plate current has been cut off. The condition is called *feedthrough*. The tuned burst takeoff coil will, when it is properly tuned, minimize any bad effects due to feedthrough by reducing the amplitude of every signal except the burst signal.

The burst takeoff coil can best be tuned by observing the output of the burst amplifier on a scope. When maximum burst output has been obtained by suitable adjustment of the coil, correct tuning of the circuit is indicated. If a color signal is not available, an accurate signal generator may be used; or else the local 3.58 mc oscillator (if it is op-

erating properly) may be used as a signal source, and coupled to the burst takeoff coil through a "gimmick" (a piece of wire that is anchored near, but not connected to, the oscillator and the burst takeoff coil).

The screen voltage of the burst separator is taken directly from B+ and merits no special comment. A transformer is present in the plate circuit. B+ is supplied to the plate through a de-coupling network. The de-coupling network—a 2.2 k resistor and a .01 mfd condenser—prevents the burst from appearing on the B+ line, and interfering with proper operation of either the oscillator or the color demodulators. The transformer primary resonates with the interelectrode capacitance at the burst frequency. This winding can be aligned with the aid of any of the signal sources mentioned in connection with the alignment of the burst takeoff coil.

Care must be taken not to detune the circuit by applying a scope or meter to the coil. One good place to check for the amount of output is at the phase detector; this will be discussed in a later article. The primary
(Continued on page 53)

Vertical Lines in Pix and

Part 1

By CYRUS GLICKSTEIN

• A common TV trouble is the appearance of one or more vertical lines on the screen. These lines can appear because of a fault in any part of the horizontal sweep circuit: the horizontal oscillator stage, horizontal output stage, damper circuit or yoke. In addition, vertical lines can be due to other causes, such as stray pickup by crt leads, or defects in the age circuit.

Since there are many different causes for vertical line troubles, the source of trouble is sometimes hard to localize; and, in some cases, hard to cure after the source has been found.

While there are many possible causes of vertical lines, it is possible

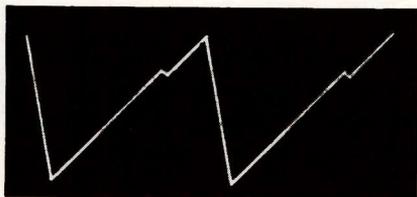


Fig. 1—Waveform of sawtooth current in horizontal deflection coil, showing characteristic dent responsible for single overdrive line.

to classify the kind of lines present, and very often localize the trouble to a small section of the horizontal circuit, by close observation of the screen pattern. In cases where there are several possible sources of trouble, additional tests may be used to pinpoint the cause.

As a background for hunting down vertical line trouble, it is helpful to know how the main types of vertical lines are formed. A thin white line is caused by the electron beam in the picture tube stopping or slowing down for an instant as it moves across the screen. This produces a spot on the horizontal line which is brighter than the rest of the line. When this occurs in every line, a light thin vertical bar is produced on the screen.

Fig. 1 shows a sawtooth-current yoke waveform with a characteristic dent in it that accounts for the line. A thin line—or several lines (see Fig. 2)—may be produced by *overdrive*—a setting of the horizontal drive control which produces too large an amplitude of sawtooth sig-

nal. Varying the setting of the horizontal drive control varies the amplitude and linearity (shape) of the horizontal sawtooth wave.

A similar line or lines may appear when the linearity control is not adjusted correctly. Several other types of defect may also result in thin white lines. In these latter cases, other symptoms, such as non-linearity, are usually noticeable. This will be discussed in greater detail shortly.

Thin *black* lines are generally due to pickup in the signal circuits. A common example is Barkhausen oscillation (Fig. 3). The symptom described is caused by spurious oscillations in the horizontal output stage which are radiated to the front end. These signals heterodyne with the r-f oscillator; the beat-notes generated pass through the signal circuits, appearing at a specific point along each horizontal line, and producing the characteristic black lines along the left side of the picture or raster.

Foldover, Nonlinearity

Two other basic troubles in the horizontal circuit will be discussed briefly at this point: non-linearity and foldover. One or both are very often found along with vertical lines. A clear understanding of why these occur helps in diagnosing the causes of vertical line trouble.

A picture that is linear horizontally is produced when the beam is deflected at a constant speed across the screen. A *non-linear* sweep occurs when the beam slows down or speeds up at one or more points as it sweeps across the screen. A beam which travels faster at the start of the sweep than it does during the rest of the scanning interval covers more ground than it should, initially, and causes stretching of the picture at the left side. A beam which moves *slower* at the start of the sweep causes crowding at the left. If the change in speed takes place towards the *end* of the sweep, on the other hand, the *right* side of the picture becomes non-linear.

A rule of thumb by no means infallible but often helpful in a preliminary diagnosis of trouble is: In the case of obvious non-linearity at the right side of the picture, the trouble is most likely to be in the oscillator or horizontal output stage; if the non-linearity is at the *left* side of the picture, the initial suspect is

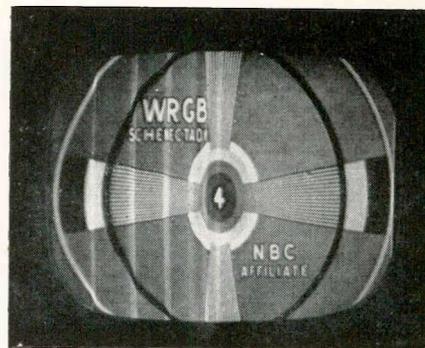


Fig. 2—White lines produced by overdriven horiz. output tube. (Courtesy G.E. Technitalk)

the damper circuit. The damper stage conducts during the initial portion (left side) of the trace, during which period the horizontal output stage is cut off (in flyback circuits). The output stage conducts during the last half to two-thirds (right side) of the trace. It should be emphasized that vertical lines may appear either on the *same* side of the screen as the non-linearity or at the *opposite* side. Actually, a thin, white vertical line is in itself a small non-linearity in the picture.

Wrinkles (see Fig. 4) can be considered a special type of foldover, and may be caused by ringing in the output or damper stages, or in the yoke. Yoke ringing is most common. The oscillations in the yoke that are responsible for this trouble cause the beam to go back and forth as it scans across the screen, producing a wrinkled or rippled effect in the picture. White vertical lines are frequently seen when this condition exists.

Yoke Capacitor

The usual cause of ringing is an incorrect (changed or initially wrong) value of yoke-balancing capacitor. The function of this condenser is to balance the capacitance of both halves of the horizontal deflection yoke to ground. A value of capacitance either too large or too small results in increased ringing.

The inductance of the horizontal yoke, and the stray capacitance in the yoke windings, form a resonant circuit at a certain frequency. The oscillatory action that takes place here is utilized to obtain a faster retrace. The conduction of the damper tube tends to damp out most of the oscillation. Usually, there is some (undesired) residual oscillation, un-

Raster

Causes and Remedies for Hard-to-Localize Troubles

less the stray capacitance across both halves of the yoke is exactly balanced.

In high impedance yokes, such as those used in most current TV chassis, the value of yoke-balancing capacitance is especially critical. (A high impedance yoke has more inductance and more stray capacitance, and the likelihood of unbalance between both halves of the yoke is therefore greater.) Many current TV receivers show some evidence of residual ringing, on close inspection of the picture. Some manufacturers vary the value of yoke-balancing capacitance from set to set, to obtain the best results; individually-balanced yokes, each with its own value of yoke-balancing condenser, are used. Yoke ringing is most pronounced at the start (left side) of each horizontal scanning line, and tends to die out toward the middle or end of the line.

List of Symptoms, Cures

At this point, we are ready to classify the main types of vertical line symptoms and their most common causes.

Black and white vertical lines in pix and raster:

a. Defective tube in the horizontal circuit (horizontal oscillator, output,

damper, or h-v rectifier).

b. Defective condenser in keyed agc filter; this trouble may cause two or more black and white lines at the left of the picture, because of the unfiltered horizontal ripple fed back to the video i-f grids by the agc line.

c. Coupling between the crt grid or cathode lead and horizontal output leads.

d. Defective damping resistors across the primary or secondary of the horizontal blocking-oscillator transformer.

White lines on the left side of the picture or raster:

a. Defective damper tube.

b. Improper setting of the horizontal drive control may cause one or more white lines on the left.

c. An open linearity filter condenser can cause fold-over at the left side of the picture; a loss in capacitance causes crowding (non-linearity) at the left, sometimes with a heavy white line near the left edge and several white lines in the rest of the picture, the lines becoming narrower and less pronounced toward the right. This is true both in direct drive circuits (no separate secondary winding) and separate secondary (low-impedance) flyback output circuits.

d. Mismatch of replacement unit in horizontal circuit—flyback trans-

former, yoke, linearity or width coil, etc. This may also cause non-linearity alone, or non-linearity in combination with the white lines on the left side.

e. An open charge-discharge condenser can produce a non-linear picture stretched to the right; thin white line near the left edge; brilliance about normal.

f. Open screen bypass condenser in horizontal output stage can cause dim picture with less width; stretching at right side of picture; thin bright vertical line near left edge; increased height. The reduction in horizontal output signal (due to degeneration in the output tube screen circuit) lowers the high voltage; vertical deflection is increased in consequence (horizontal deflection decreases to some extent) and brightness. A softening of focus (slight blooming) may also be noted.

g. Change in value of the charging resistor in the horizontal oscillator plate circuit can cause one or more white lines on the left of the picture, as well as stretching on its right side.

(Tabulation of more symptoms and cures, together with some general troubleshooting procedures, will appear in the second and concluding article of this series.)

Fig. 3—Characteristic vertical lines produced by Barkhausen oscillations in horizontal output tube. (Courtesy G.E. Technitalk)

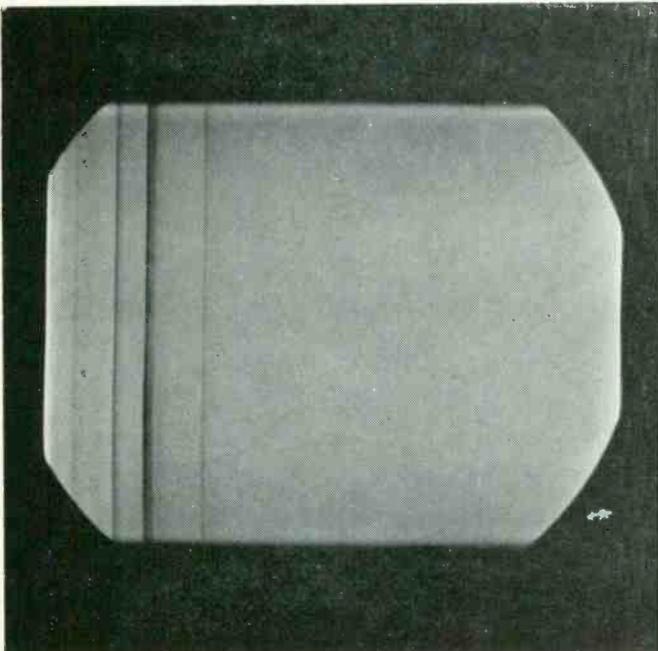


Fig. 4—Effects on test pattern of ringing produced by an incorrect value of yoke-balancing capacitance. (Courtesy G.E. Technitalk)

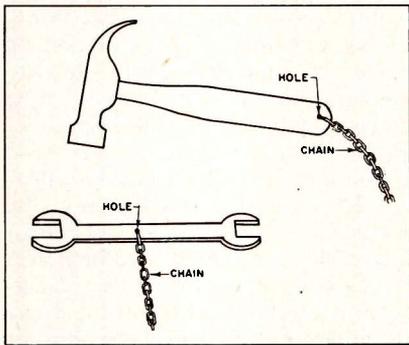


Antenna Installation Notes

Hints on Handling Tools and Guy Wires; San Bernardino Ordinance

Securing Tools

Here is a handy and simple kink you can use in installing TV antennas on peaked roofs. Many times the tool you are using will slip out of your hand and fall down to the gutter. Then you have to move your ladder in order to retrieve it. I have



bought a small-size chain with swivel snap-hooks at both ends. I snap this chain onto the tool I am using; the other end of the chain is snapped to my clothes. All the tools I use have wire loops, or holes drilled in them to fit the chain.—L. E. Peterson, New Haven, Conn.

Handling Guy Wires

When installing an antenna where guy wires are needed, much anxiety and time can be saved if, after attaching the guy wires to the guy-wire rings, the guy wires are stretched, uncoiled and taped to the mast, within easy reach after the mast has been raised. Each wire can then be taken loose and easily brought to its proper position. Advantages of the method: 1—No kinks form in the wires. 2—An accurate estimate of the length of guy wire needed can be made. 3—One man can handle the job without getting tangled up.—Larry Grashin, Republic, Penna.

Safe Installations

The following excerpts from an ordinance regulating the installation of TV antennas in San Bernardino, Calif., should prove of interest to technicians everywhere who want specific data re "safe" installations.

(a) Installation shall be not less than a four (4) point anchorage. No point of horizontal anchorage shall

be closer to the base of a mast than one-half of the vertical height of the mast, and shall be anchored with a three-eighths ($\frac{3}{8}$) inch galvanized eye-bolt with washer on top and under the nut, or three-eighths ($\frac{3}{8}$) inch galvanized screw-eye, five (5) inches long, and screwed into roof rafter four (4) inches.

(b) All guy wires shall be galvanized wire not less than No. 12 gauge spaced ten (10) feet apart vertical, except the top mast guy wire, which may be not less than No. 14 gauge galvanized wire, and shall be anchored within twelve (12) inches of the top of mast.

(c) The saddle on the roof shall be of not less than fourteen (14) gauge metal, eight (8) inches wide, and extend on each side of ridge at least ten (10) inches with a two and one-half ($2\frac{1}{2}$) inch O.D. stud two and one-half ($2\frac{1}{2}$) inches high, together with a three-eighths ($\frac{3}{8}$) inch set screw to hold the first joint firmly in the stud welded on the saddle, and must be placed over roof rafter.

(d) On flat roofs, a flat plate shall be used in place of saddle—size to be eight (8) inches by twelve (12)

inches, No. 14 gauge set on a two (2) inch by eight (8) inch flat wood support extending over three (3) rafter bays.

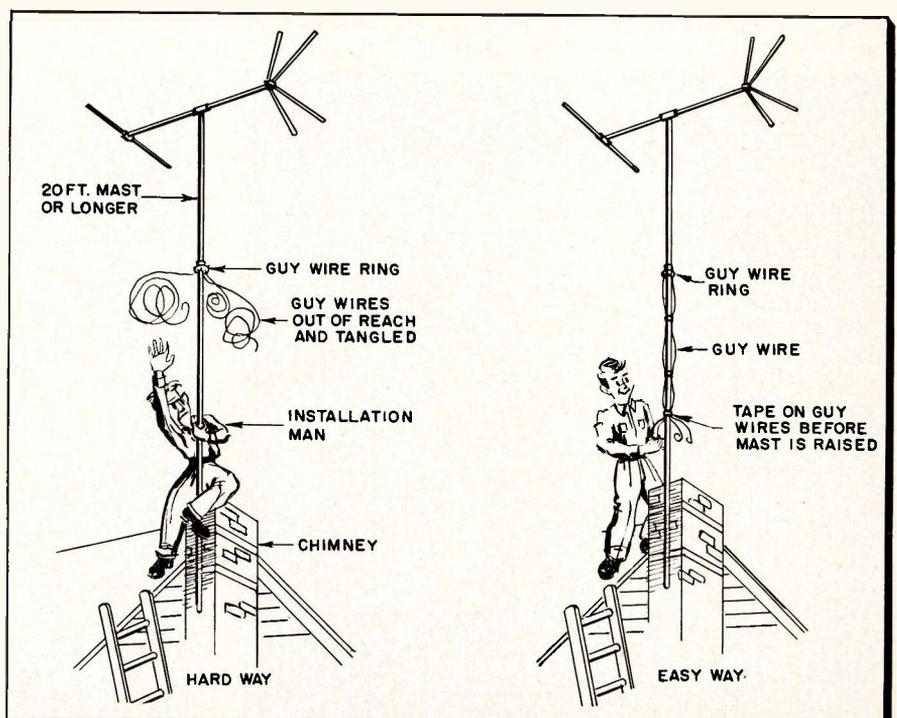
(e) Where installation is to be made from the ground up, base of mast shall be set on a concrete block twelve (12) inches by twelve (12) inches square and twelve (12) inches in the ground. All guy wires on this type of antenna shall be of the same size and points of anchorage from the base as already mentioned.

(f) All free standing masts shall be engineered and plans signed by a registered engineer.

(g) The mast shall be of not less than standard-gauge galvanized steel tube or double-strength aluminum tubing, and the top-most section of the mast shall be at least one (1) inch steel tube or double-strength aluminum tube; each section of the mast shall be telescoped into the one below at least one (1) foot, and keyed with at least a one-quarter ($\frac{1}{4}$) inch cotter key with ends of key flanged to prevent slipping out. Drilled washer rings shall be used to tie guy wires to mast.

(Continued on page 60)

Taping guy wires to the mast while the latter is horizontal averts subsequent difficulties.



Printed Chassis Repairs

Servicing Admiral's New Printed Circuit TV Receivers



Fig. 1—Avoid soldering directly to the printed wiring by leaving an extra long lead.

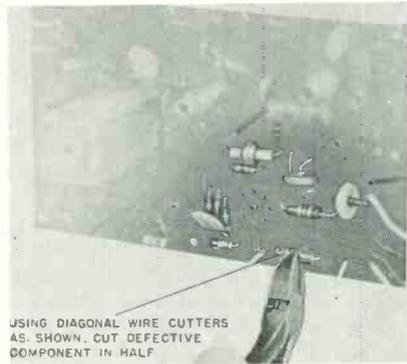


Fig. 2—For extra length you can use the section normally buried within the component.

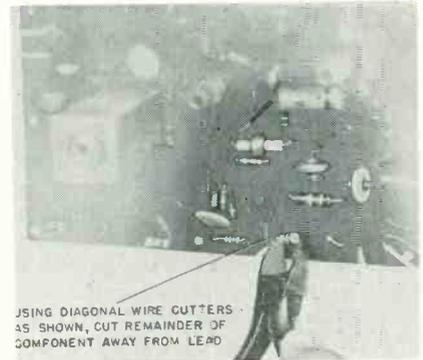


Fig. 3—Clean the ends by crushing the carbon composition and removing the excessive grit.

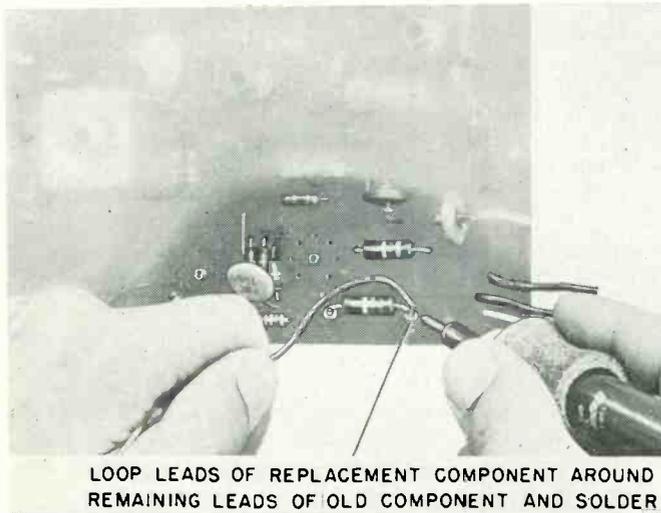


Fig. 4—Use a soldering iron of 35 watts, or less. Excessive heat will break the bond between the board and the printed circuit foil.

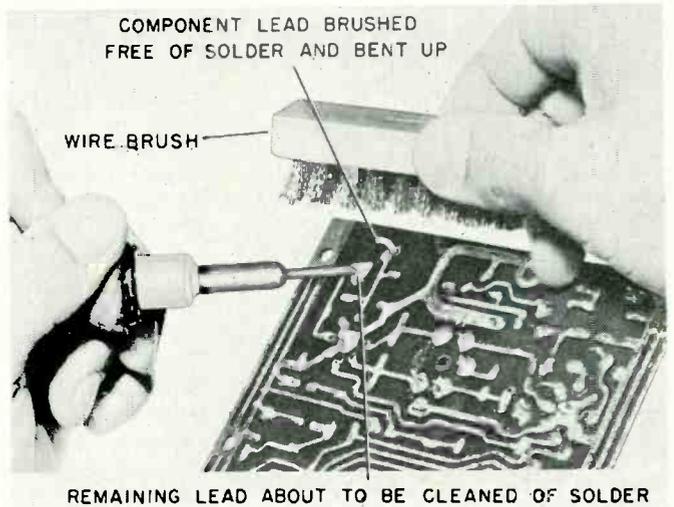


Fig. 5—When the component must be completely removed, apply the heat at short intervals, brushing away the solder each time.

Fig. 6—In removing transformers, heat and clean each lug repeatedly until its connection with the printed wiring is completely broken.

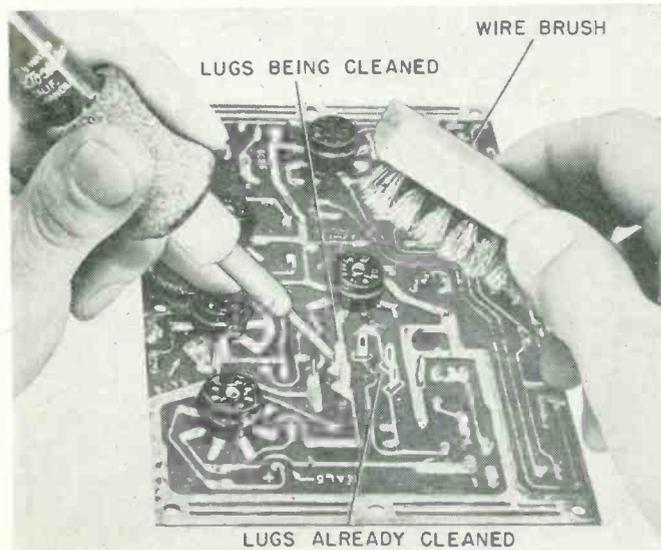
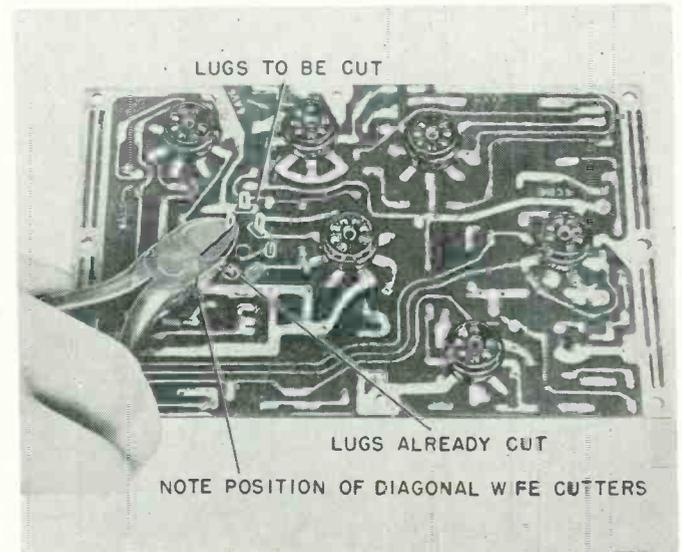


Fig. 7—Then cut the lugs off as short as possible and clean the surrounding area with thinner to remove any specks of solder.



(Photos through courtesy of Admiral Corp.)

Maintain and Repair Your

Don't Let a Breakdown Tie Up the Bench. Fix It

BY JAMES A. McROBERTS

• A real calamity may present itself when the shop's vacuum-tube voltmeter—sometimes the only voltmeter in the shop—gets sick and needs troubleshooting. It becomes desirable under such circumstances that the serviceman be able to repair his own vtvm, to locate and remedy many common troubles that afflict this type of meter. Since an additional meter may not be available, we will discuss methods of troubleshooting with very little equipment; i.e., a jumper or two (wire with clips on either end), tubes for substitution, and a few resistors or potentiometers.

Basis of the Method. Despite the apparent complexity of vtvm schematics, their basic circuitry may be simplified in block diagram form (see Fig. 1). The following sequence of tests is recommended: the power supply, the differential amplifier, the range network and accessories such as probes (unless, of course, the symptoms present point to one particular circuit or component). If no other ohmmeter is available, the defective instrument being serviced may itself be used, as will be discussed later.

Power Supply Tests. The power supply of a typical instrument approximates the filament and B supply of a conventional ac radio

(see Fig. 2). The B rectifier, however, derives its filament voltage from the same winding as the other tubes. The B filter used in a vtvm is rather rudimentary.

As a first step in troubleshooting, note whether the panel bulb lights; also check to see if the tubes light or heat up. If the answer is *no* to all three questions, try a jumper across the "on-off" switch—it may not be closing the circuit. You can use your fingers (like many old-timers) to test for line voltage at the transformer input terminals; or else a neon tester, or an open 1/4-watt neon bulb may be employed or the extra ohmmeter (if you have one), or the improvised continuity tester shown in Fig. 3. Trouble in the power transformer primary circuit can readily be located with one of these test devices.

If the tubes light, and no meter movement can be obtained on any range or function, possible failure of the B supply must be investigated. Since the supply voltages in this circuit are low, you can test for them with your fingers; or you can rig up an ordinary panel lamp in a spare panel bulb socket, and connect it between B+ and B-. The lamp will blow with a flash if you have enough B voltage. As an alternative, use the neon tester; or you can insert a fixed resistor in series with the vtvm's meter movement, making it possible to use the latter as a voltmeter of sorts.

The value of the resistor can be worked out by Ohm's Law. Suppose you have a 200-microampere meter, and you want it to read 200 v at full scale deflection. Using the equation $R = E/I$, we get $R = 200 \text{ v}/.0002 \text{ amps}$, or $R = 1 \text{ meg}$. The resistance of the meter movement itself is so small, compared to the resistor, that it can be neglected.

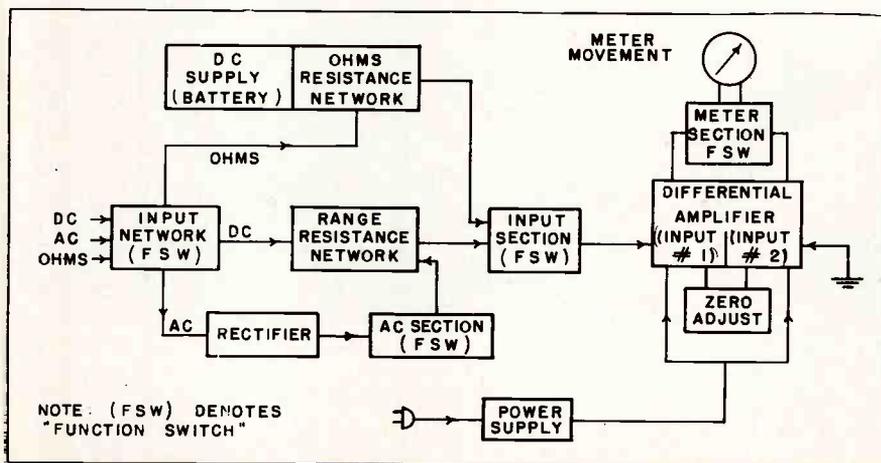
Substitution of the rectifier tube—and the other tubes as well—should be one of the first steps in troubleshooting.

A shorted filter condenser may be detected with the aid of an ohmmeter, or the continuity tester shown in Fig. 3, or even more simply by visual inspection. All popular makes of vtvm use a resistor in series with the lead going from the cathode of the rectifier tube to the filter condenser. If the filter condenser is shorted, this resistor will either blow or become very hot in operation. (Normally this resistor runs *warm*, but not *very hot*.) Thus you can check visually, or by feel, or by substitution of the suspect condenser, or by simple disconnection. (In the last-named case, the technician notes whether some reading is obtained with the condenser disconnected.)

The Differential Amplifier: All vtvm's—with the exception of certain center-zero instruments—use a differential amplifier in a so-called bridge arrangement. The nature of this bridge was discussed in *Understanding Your Vacuum-Tube Voltmeter* (Oct. issue of *TECHNICIAN*). Its two arms are either the plate or cathode resistors of the two amplifiers. The Zero Adjust pot is part of the arm resistance of such a bridge. The mechanical indicating meter is connected between these opposite terminals of the bridge, in series with a calibration potentiometer for each function; this pot is switched in by the function switch.

Now the first step in troubleshooting the amplifier is to get the amplifier to balance, or null, on all functions. Note that one tube or tube section is grounded through a resistor, while the other is more or less "free" to be acted on by the voltage

Fig. 1—Block diagram of a typical vacuum-tube voltmeter.



Own Vacuum-Tube Voltmeter

Yourself—Quickly and Without Another Meter

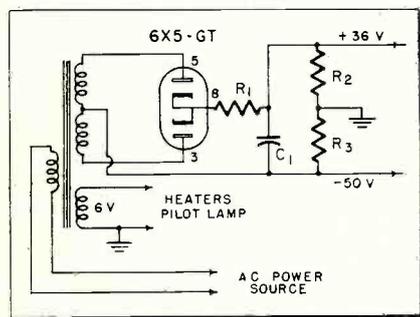


Fig. 2—Based on RCA voltohmyst #195, this power supply resembles those in most vtvm's.

from the *Volts* or *Ohms* sections. We proceed to troubleshoot by using a jumper to ground the "free" control grid. Movement of the *Zero Adjust* should electrically zero the meter on each setting of the function switch. Be sure to remember that, in some meters, the "free" grid is not the same one at all settings. Always ground the grid that is not grounded by the function switch in such a case.

Failure to zero indicates an unbalance, which may be the result of one tube (or tube section) not drawing the same current as its mate. First try tube substitution. Next, resistors that may have increased in value can be checked. Shunt a suspected resistor with another, or with a potentiometer, while watching the mechanical meter. A test may be made by directly shorting out the resistor with a jumper—although the meter may be damaged if this is not performed quickly. Bad switch contacts are a frequent cause of trouble that shows up on a single range or function—you can connect the suspected contacts with a jumper. Shunting a calibration pot with another resistor or potentiometer will tell if the control so shunted is open or too great

James A. McRoberts (Ph.D.) is an old-time serviceman who was born in Denver and educated in Spain. Dr. McRoberts was formerly service manager of a retail radio chain. He also operated a service shop of his own. "Mac" currently works on "tough dogs," teaches radio and TV in a trade school, and writes articles.

in value. You can often use one pot in the meter circuit itself to shunt or replace another that is under examination—say the *minus dc volts* for the *plus dc volts*.

New Tubes. When replacement is required for new tubes in the differential amplifier, try more than one substitute. Choose the one that will cause *minimum* shift in readings as the range switch setting is changed. This shift may be noted particularly in the *Ohms* function. Even after this careful choice, new tubes in the differential amplifier should be aged by running the entire instrument for hours, or even days, so that residual gas in the tubes is baked out. Aging may be considered complete when the shift is only a small division on the scale.

The Range Switch and Resistance Network. Having determined that the differential amplifier will zero-adjust and calibrate on all functions (calibrate insofar as no "open" or great change in reading will occur), we can proceed to the ranges, the ohms section and the ac volts rectifier.

A "creeping" reading during the presence of a constant dc input voltage indicates too high a resistance, or a changing value, in the dc resistance network of the range switch. With the instrument hooked up to a constant voltage—say the battery of a portable radio—try shunting the different resistors with a jumper (while on the *next higher* range, so that the meter needle will not be "banged" by the short-circuiting of a resistor) and see if the creeping stops—if it does, you have found the trouble. With a symptom of "no reading" above a certain range, the same method may be employed with the precautions mentioned to safeguard the meter—either keep input test voltage low or move to a next higher range. The dc voltmeter ranges (including the differential amplifier and the power supply plus the indicating meter and its calibration controls) must be in good order prior to any trials on the *Ohms* and *AC Volts* functions.

The Ohms Network is Simple. The battery may be tested by the dc voltmeter section, now in order. Voltage drops across resistors in the ohms range may be measured by putting the instrument on *DC Volts* and closing the ohms circuit with a jumper to the chassis. The dc meter probe may now be used to measure voltages around the closed circuit. Values of the resistors may be calculated from the known battery voltage, the voltage drops, and Ohm's Law.

Accessories. Touching the finger to the dc probe of a properly working instrument will cause a jump of the meter needle, particularly on the low ranges. The same is true of the

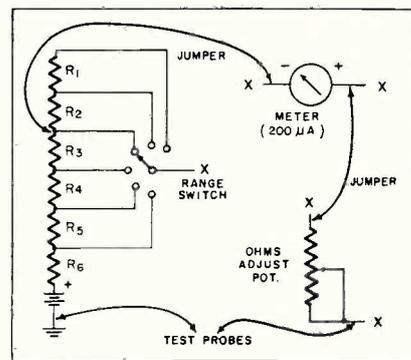


Fig. 3—Self-tester made from defective vtvm.

ac probe. Failure to obtain this jump or bounce means that the "hot" terminal of the jack should be touched with the body (a bare wire held in the hand may be used) to find out if the probes are at fault or the instrument proper is bad. The wire may be inserted through the jack hole in some meters and wiggled, to avoid opening the meter up. The ac function may be tested similarly. Ohms can be checked directly by measuring a known resistance.

The ac section gives little trouble except for a bad rectifier tube (substitute), open condensers (bridge), shorted condensers (disconnect and substitute), open resistors (bridge), partially open resistors (bridge). Open or partially open switch con-

(Continued on page 60)

\$ in Tape Recorder Service

Launching a Profitable Hi-Fi Side-Line Business

• Are you so engrossed in your present television or television-electronic service business that you're ignoring the possibility of expanding to one or more additional sidelines? If so, you're overlooking some good bets.

Tape recorder service is a good example of a supplementary service which can bring you a nice extra income, at a minimum of investment. Furthermore, tape recorder service can help you build a loyal customer following which can be counted on to increase your regular TV-electronic service business.

The technical aspects of tape recorder repair will not be discussed here. This article will be limited to a business discussion of the field—the requirements for getting into it. It is assumed you have the necessary technical knowledge, and are prepared to begin actively promoting and handling business.

First, survey the market in your community. Who owns tape recorders?

1. Business and industry uses tape recorders for a wide variety of purposes.

2. Professional people like doctors, entertainers, writers, lawyers, teachers and clergymen use them.

3. The general public uses them for an enormous variety of purposes, ranging from home entertainment to the recording of important family events.

Reaching Customers

How are you to go after this market?

Newspaper advertising won't be of much value. You'll reach—and pay to reach—an overwhelming percentage of persons who are not tape recorder owners.

Direct mail would be much better. To use this approach, get a good-sized list of tape-recorder owners. Next, work up a brief but effective message to be sent to these prospects.

First step in compiling the list should be a visit or phone call to the various tape-recorder dealers in your area. This includes television-appliance store, music and record stores, camera stores, and similar outlets. These stores are not gener-

BY ARTHUR H. SMITH

ally set up for service; if informed that you are prepared to offer reliable repairs on these machines, they should be happy to give you the names of recorder purchasers from their records. Leave a few dozen cards at these shops bearing your business name, address, phone number and some simple phrase like "Tape recorder repairs a specialty"; this will make it simpler for dealers to refer service requests to you.

Your mailing list will no doubt be small. If you want to supplement it, add names from telephone directory



classified listings of doctors, lawyers, musicians, teachers, and similar likely prospects. These additions to the list will not all be tape recorder owners, but you're bound to get a better percentage than you would by "shooting in the dark."

Your next step is the mailing itself. First set down your idea of a simple, brief message, telling the prospect that his recorder should always be in perfect repair, if he is to get the most out of it; that you have the equipment and know-how to do any needed repair job quickly, without undue expense or delay; and that if he does not need service now, to please save the attached card (listing name, address, and phone number of your company) for future reference.

Depending on the number of copies you'll want to mail, your message can be mimeographed, printed, multigraphed, etc., at low cost.

For more prospects, place an ad

in any local publication aimed at business men and executives, such as a Chamber of Commerce paper.

Don't sit back and wait for a flood of calls. They won't come that fast. You'll get scattered requests for awhile; on your handling of these calls will depend the success or failure of your new "department." If you exert every effort to do the best possible job on those early calls, word-of-mouth advertising will eventually establish you as a tape recorder expert. If you don't, a good promotion isn't apt to do much good.

Leave several business cards with each satisfied customer. This procedure is especially effective in the case of home-entertainment and home-movie enthusiasts, most of whose friends have similar interests—and recorders.

It Won't Cost You Much

Your initial investment need not run over \$300 to \$400, including accessories and servicing material. This expense will cover the cost of one or two recorder models (when a recorder needs extensive repairs, you can offer the customer the alternative of buying a new unit); a quantity of tapes and leaders; splicing tape and splicers; and accessory adapter cables. Such items as AM and FM tuners, amplifiers, high-quality microphones and speakers have not been considered as part of this initial investment; they are, rather, viewed as part of your present or obtainable stock, which will move faster when combined with a recorder sale, or when "pushed" during a service call.

Little or no additional tools or equipment are required, with the exception of test erase and recording heads, test and blank tape, tension scales (if you don't already have them) and a slight addition to your tube stock. Since there is little standardization of mechanical or larger electronic parts, interchangeability is rare or impossible, making it impractical to stock any.

The future in the growing recorder field looks promising for the technician with a bit of push and imagination. Get ready to set up that tape recorder service department soon!

Electrostatic Hum Pickup

Pinpointing and Suppressing Obscure 60-Cycle Signal

• Aside from faulty tubes or power-supply filters, which are easy to locate and service, the frequent problem of hum in the audio output of a radio may originate in a more obscure fashion. A common means of entry is by electrostatic pickup in the audio section. This problem occurs, principally in compact sets, due to the proximity of wires and parts to each other. Unseen and unwanted capacitances between such parts, not shown on the schematic, are unavoidable where such closeness exists. Our discussion will deal mainly with the transfer of hum through such hidden coupling.

A typical case of electrostatic hum pickup is shown in Fig. 1. The wire is a filament connection, and so carries a 60-cycle current. The dotted

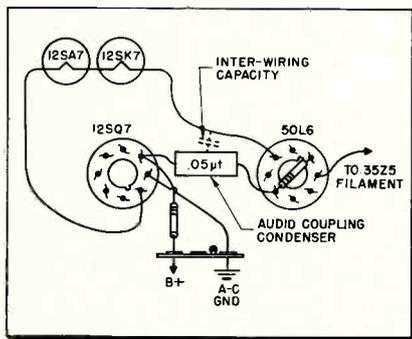


Fig. 1—How hum is coupled from part to part.

condenser represents the inter-wiring capacitance that exists between the filament lead and the audio coupling condenser. The inter-wiring capacitance couples the 60 cycles to the audio condenser, which in turn feeds it to the tube, and hum is developed. An important point to note is that this undesired capacitance is very small, and so its internal impedance is very high; because of this, the hum becomes noticeable only when it is coupled to a high-impedance circuit. Unfortunately, critical high-impedance circuits that are most susceptible to such pickup are in the audio section of the radio. This symptom can also develop in the r-f and i-f sections, but the characteristics here are different and will not be discussed in this article. The audio-circuit hum we are concerned with

BY HARRY MILEAF

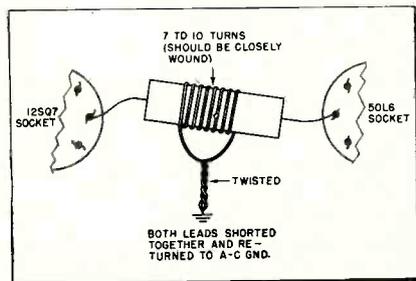


Fig. 2—Wire-wound shield grounds hum.

has the following symptoms:

1. Sound is not distorted, but the hum is evident in the "background."
2. The hum becomes more noticeable when the volume is turned down.

Ordinarily, radios are designed with the placement of the parts and wires in positions that afford minimum electrostatic coupling; also, the values of the critical parts are chosen to nullify any tendency for electrostatic hum to develop. Unfortunately though, there are always some sets in which there are oversights. Either they contain an inherent background hum or the fault is easily introduced when the serviceman repairs the set and causes the placement of a part or wire to be slightly different. In some radios, when the manufacturer puts a component, such as a coupling condenser, in a critical position, he compensates for it with a wire-wound shield that grounds out any hum pickup. Such an arrangement is shown in Fig. 2. The technician can make this wire-wound shield and use it on other radios, after the offending part has been located.

Determining the point of origin of hum pickup is relatively simple. Move the metal end of a screwdriver in the area around the audio circuits; when the screwdriver is near the spot where the hum coupling is taking place, inter-wiring capacity will change, and the amount of hum present at the speaker will vary. (When checking for hum in this manner, turn the volume down so that any small hum variations can be detected.) Once the troublesome part has been isolated, try to correct

the condition as follows:

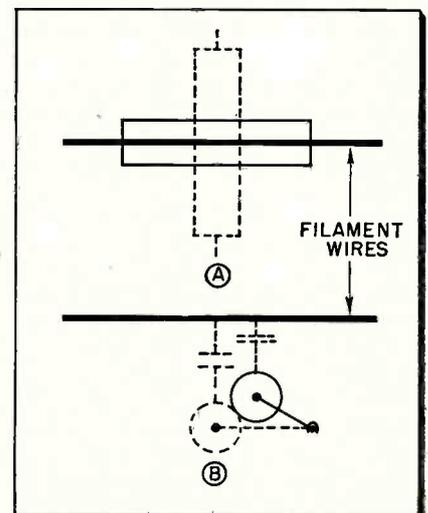
1. Change mounting position, as shown in dotted lines in Fig. 3, to reduce the inter-wiring capacitances.
2. Install a wire-wound shield.
3. Re-route the radiating wire.
4. Place the troublesome part in another section of the chassis (this relocation is critical because the extended leads are also subject to hum pickup).

5. Check the values of the critical parts as discussed in the following text.

If the hum trouble persists, check the values of the critical parts shown in Fig. 4, since they are most susceptible. If the grid resistors of both audio stages were low enough in value, their potentialities as hum pickup points would not be so great. But, since the signal developed at the grid, in both stages, is determined by the value of the grid resistor, this part unfortunately must be high enough in value. Because these resistors are fairly high in most ac-dc radios, any change in them or their associated components can bring about hum.

The R1-C1 combination in the audio output stage will be discussed first. Sometimes the value of R1 increases with age, or it may have been designed with too high a value to obtain more volume. The first case is easily handled by a simple replacement. If the resistor has not changed value, yet is still too high

Fig. 3—Relocation of a component is one cure.



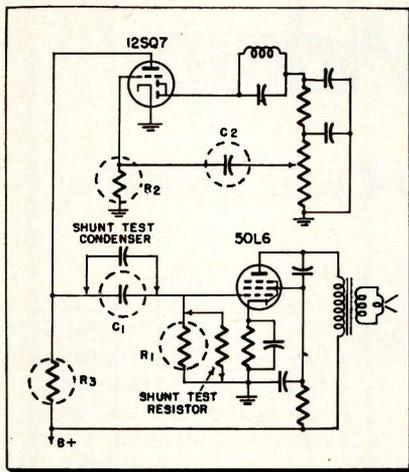


Fig. 4—Hum-susceptible components in typical audio stage (circled). See text for details.

from the point of view of hum pickup, it should be checked by shunting it (Fig. 4) with another resistor that has the same rating. If R_1 is the troublemaker, since its value is now halved, the hum will be eliminated or greatly reduced. Using the process of trial and error, substitute a low enough value resistor in place of R_1 to eliminate the hum. Remember that, when this resistor is too low in some sets,

sufficient volume cannot be obtained. If this occurs, attempt to find a happy medium; if too much trouble is encountered, C_1 is probably at fault.

When the technician finds that resistor R_1 is critical, it is usually because coupling condenser C_1 is too low in value; either because of original design, because the condenser was improperly replaced, or because it has decreased in value. When the value of C_1 decreases, its impedance increases, and the circuit becomes hum-susceptible. This condition can be relieved by increasing capacitance. Check by shunting C_1 with a 0.05 mfd condenser, as shown in Fig. 4. Using this shunting method, and the process of elimination, determine which value is required to take out the hum. If an abnormally high value of C_1 is required, coordinate the values of R_1 and C_1 for the hum elimination.

The grid coupling resistor and condenser (R_2 and C_2) in the first audio stage present a similar problem as R_1 and C_1 . But, since almost all of the ac-dc radios employ contact bias in this stage, this combination is much more difficult to change. If the R_2 - C_2 time constant is altered so as to increase or decrease the bias, clipping, clamping, or distor-

tion will result. If it is determined that these parts must be changed, use identical replacement values. If this is not sufficient, change mounting positions, reroute wires, or use shielding.

The plate load resistor R_3 in the first audio stage is effectively in parallel with the grid circuit of the output stage. Thus, resistor R_3 can be treated in the same manner as R_1 , except that R_3 is more of a determining factor on the volume. When the latter increases in value too much, distortion will most likely accompany the hum.

In conclusion employ the following precautions to minimize hum pickup:

1. Do not mount resistors or condensers too high off the chassis.
2. Keep wiring as short as possible.
3. Do not run filament leads close to any critical parts. (The B-plus supply leads also contain some ac ripple, so isolate these leads as well.)
4. Check the parts that were discussed for high impedance. See (Fig. 4.)
5. Use shielding when the values of the parts cannot be changed without hindering the performance of the radio, or if remounting does not help.

Hi-Fi Trends

Price Protection

More manufacturers of audio equipment are showing willingness to support realistic prices, so the dealer can sell Hi-Fi profitably. Fair trade is definitely in the picture. Berlant Associates, maker of Concertone tape recorders, is the latest to fair-trade its products. "Fair-trading is essential to solving the basic problems of this industry," says prexy Berlant. "Our future lies with the creation of strong outlets who will aggressively promote our lines."

Audio Shows

Last month's High Fidelity Show in Chicago, held at the Palmer House, attracted an estimated attendance of 28,000. Topping all past Chicago Hi-Fi shows, the 3-day affair showed a 33% percent increase over last year's turnout.

With final figures on attendance at the New York Audio Fair not yet

in as we went to press an increase over last year's turnout also seemed assured.

Tape Equalization

With pre-recorded tapes looming as a threat to long-playing records, a familiar disc problem now crops up in the tape field. There is no standard pair of equalization curves for recording and playback among manufacturers of recorders, playback-only devices or recorded tapes. In

Hi-Fi Belongs to the Service Technician!

addition, while tape speeds have been set at 3 $\frac{3}{4}$, 7 $\frac{1}{2}$ and 15 in. per second, there is some variation around these figures from one machine to another, especially as a single reel of tape is played from beginning to end. The problem was not serious as long as tape fans were restricted to recording and playing back on the same machine.

In the long run, there will have to be industry agreement on equalization and speed regulation. In the meantime, why not adopt the solu-

tions now in use with discs? Tape machines could have a set of switch-selected equalization curves, also a speed adjustment.

"Long-Play" Tape

Another bottleneck is smashed with the introduction of mylar backing, which results in tape that is 50 percent thinner than the familiar acetate-backed variety. Now a 7-in. reel will run 45 minutes at 7 $\frac{1}{2}$ in. per sec., instead of half an hour. This permits uninterrupted recording or playback of most lengthy musical works, allows ample opportunity for changing reels in the case of operas and other longer works, at the ends of acts or movements.



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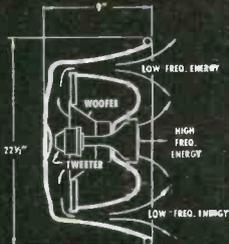
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Better Lows: BALANCED "COMPRESSION" TYPE FOLDED HORN, starting with eight inch throat and energized by top quality low frequency "woofer" driver provides more lows than other bulky designs.

Better Highs: DRIVER UNIT TWEETER with exclusive patented "reciprocating fibres" wide angle horn transmits more highs with greater uniformity . . . high frequency response that you can hear!

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Eliminating Warranty Headaches

A Technician Proposes a New Mfrs' Parts Guaranty Set-Up

• The subject of parts warranties in television and radio service has become a major headache for all concerned: the manufacturer, his distributor, the retailer, the technician, and even the customer himself.

The system used by the majority of manufacturers is itself the cause of the trouble. As it works now, most manufacturers pack with the television or radio receiver a set of cards to be "mailed in"—one copy to the manufacturer, one to the distributor. Statements are made to the effect that should these cards *not* be turned in, the customer has no warranty.

Unfortunately, several things act toward making the system rather unworkable. If the technician or dealer leaves it to the customer, the warranty cards are just as likely to end up somewhere in a bureau drawer and forgotten. Many times a distributor unpacks, checks, then re-packs a set, the dealer doing likewise, and the warranty card gets lost.

In far too many cases a customer will state "This set has a parts warranty," the technician will spend one or two hours following up on this assertion, and will end up having the distributor refuse to replace the parts in question because of a lost, misplaced, or not turned-in warranty card.

Suggested Procedure

It is rather foolish for anyone to complain about a system and not suggest a better one. The plan below suggested itself to the author during the course of many thousands of TV repairs performed in his shop. It should not cost the manufacturer any additional money to put into operation, and it certainly would decrease the time spent by the technician, the parts counter man, and others all along the line, in handling defective parts. It also gets rid of a major headache—parts warranties on sets that are two years old, as well as on models which, for some reason or another, were not sold while the model was current.

The plan resolves itself into a simple procedure of the manufacturer codemarking his parts while or be-

BY CHARLES R. MADUELL, JR.

Delta Electronics, Inc.,
New Orleans, La.

fore they are placed in a set. Said manufacturer then guarantees all of the major parts for one and one-half years. By definition, a major part is any part which retails for more than \$1.00.

Here is how the set-up would work, from the manufacturer right down to the set purchaser:

All 1955 model TV sets manufactured prior to January, 1955 would be given a certain code marking, designating a guaranty expiring April, 1956. Those models manufactured between Jan. 1955 and April 1955 are given a code marking designating a guaranty expiring July 1956, and so forth, code markings changing every three months.

The distributor accepts defective parts returned by retailers, technicians, or customers, and replaces those parts up to the date the code number (on the part itself) expires. *After this date, parts on the set in question are no longer in guaranty by either the manufacturer or his distributor.* If a retailer wants to sell a set after it has been on his floor a year and a half, and gives his customer a parts guaranty, he is responsible for fulfilling the guaranty himself.

Parts whose code markings have been mutilated or destroyed would not be accepted in trade for replacement parts. Hence, "cheating" would be avoided. No technician with an inclination to cheat could turn in parts from non-warranty sets for warranty replacement, because the code destroys this possibility.

Let's now consider the set purchaser's problems. Is the customer who purchases a "last-year's model" at a cheaper price, entitled to the same parts guaranty as the customer who purchased the same set one year earlier, and paid full list price for it? The obvious answer is, *no*.

Under the system just described, a customer who purchases a 1955 model in late 1954 or early 1955 has a little more than a full year's warranty on all parts. The customer who

waits half a year, and takes advantage of summer sales, etc., gets only a half-year parts guaranty. After all, he is purchasing the set at a reduced price.

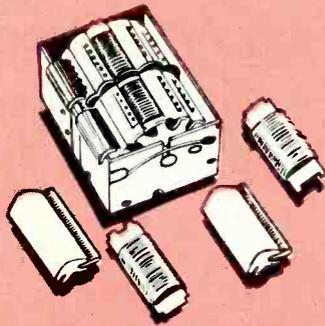
The customer who waits for pre-inventory clearance sales, after the new models are out, gets a 90-day parts warranty. Those who wait for "bargains" at warehouse sales, get no guaranty.

Small Parts Headache

Only one problem remains to be discussed. This is the one related to small items worth only a few cents—capacitors, resistors, and the like.

In our shop we find that the \$15.00 fee we charge for our 90-day "labor" warranty will pay for those parts. Actually, it is not worth our while to spend one or two hours fighting a distributor for a 15-cent part, unless a bagful is involved. The (wholesale) cost of the small parts replaced in the average TV set does not total \$2.00. We have therefore adopted the policy of throwing these defective parts away, and only turning in for
(Continued on page 47)

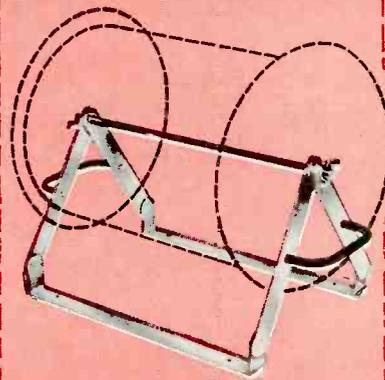
Typical warranty form used in tagging defective parts. This tag follows the basic format recommended by the RETMA, courtesy Hoffman



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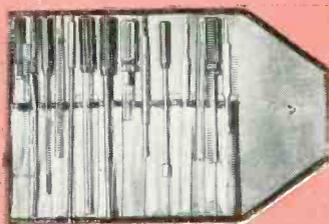
G-C SPEEDEX WIRE STRIPPERS New automatic "766" series has delayed return action to prevent crushing of fine stranded wires. Easy to use, with easy-grip handles for easy operation. Interchangeable blades. Specify wire size.
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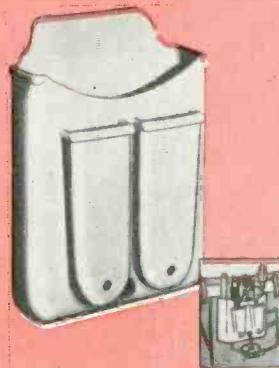
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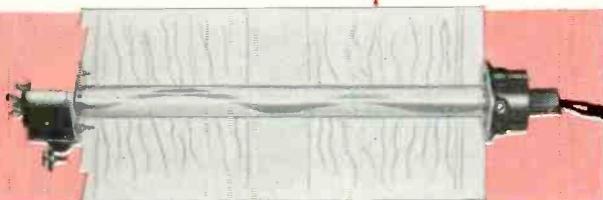
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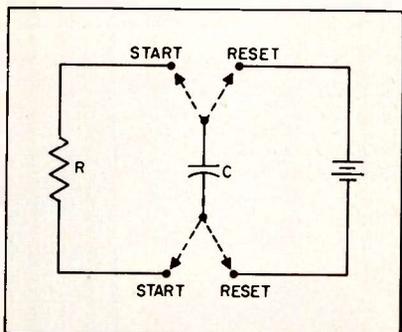
• Few flash gun or timer manufacturers make available service information on their units; the author therefore feels that information dealing with the theory of operation and servicing of one of these units—the electronic timer—would be helpful to technicians interested in adding such sideline repairs to their regular business.

Electronic timers are used not only to time film developing, but also to set exposure times when enlargements are made, or when important business records are copied on microfilm. (Timers are also used for other purposes.) In the microfilm process, the toggle switches on the timers may be snapped back and forth from fifty to several hundred times per day, and it is an unusual switch indeed which can last more than a few months—if that long—under such hard usage.

The basic principle involved in the operation of a timer concerns the time it takes for a charged capacitor to discharge through a selected value of resistance. A bit of simple theory will help us understand what happens.

Consider Fig. 1. A battery, (dpdt) toggle-switch, capacitor (C) and a resistor (R) are present in the circuit. When the switch is thrown to the right, or RESET position, the capacitor is connected across the battery and is quickly charged to the voltage of the latter. If the resistance of the circuit is low, the capacitor will charge almost instantly, while if there is appreciable resistance in the circuit, a longer time will elapse before the capacitor is charged. The higher the value of resistance, the

Fig. 1—Elements of a timing device. Two switch positions—start and reset—are shown.



BY M. G. GOLDBERG

Part 1

longer will be the charging time of the capacitor, or the *time constant* of the r-c network. This time constant is the product of C (in microfarads) and R (in megohms), and denotes the time in seconds that it takes for the capacitor to charge up to 63% of the maximum applied voltage.

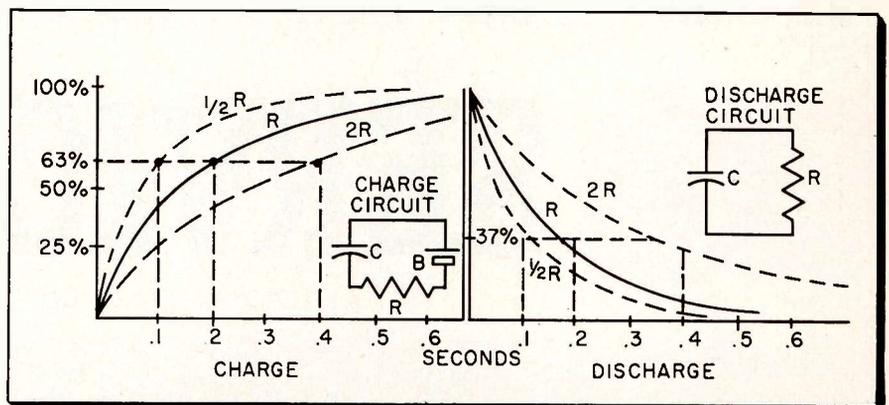


Fig. 2—Charge and discharge curves of a condenser when different values of resistance are placed in series with it. Note that the larger R is made, the more linear is the charging curve.

Fig. 2 shows the charging curves for three different values of R. Note that the curves are not linear, rising steeply at first, then tapering off to a more gradual climb. Doubling the value of either C or R will double the time constant and therefore cause the charging curve to rise more slowly, C taking twice as much time as before to reach 63% of the maximum applied voltage (in this case, the fixed dc battery voltage). By suitably changing the resistance in the simple r-c network of Fig. 1, we can obtain almost any reasonable timing value.

When we adjust the horizontal hold control on a TV receiver, we change the time constant of the horizontal oscillator. The hold control is either all or part of the R just referred to.

In a TV receiver, we are usually concerned with a relatively slow charging (or sweep) rate, and a fast discharge (retrace); in timers, however, the reverse is true. Here we want a fast charge (reset), and a discharge time which will vary ac-

ording to the setting of the timing switches, permitting the exposure of a print or enlargement to light for the correct length of time.

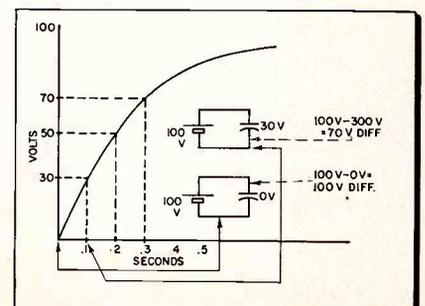
To understand why the charging rate tapers off as the capacitor in Fig. 1 is charging, refer to Fig. 3. Here the charging curve is shown once more, with the time split up into 1/10th-second intervals; a charging voltage of 100 v is assumed. Though not drawn to exact scale,

the curve presented will serve to illustrate the action.

During the 1st tenth of a second after the charging switch is closed, the voltage across the capacitor may rise to 30 volts. At the beginning of the next .1 second interval, therefore, there is only 70 volts (100-30) difference in potential between the battery and the condenser; at the end of the 2nd period, the voltage

(Continued on page 62)

Fig. 3—Voltage across condenser in parallel with 100-v battery at the end of three equal intervals of time. The charging voltage initially is 100 v; at the end of .1 second, it has decreased to 70 volts.



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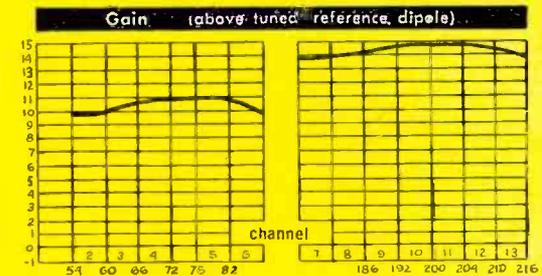
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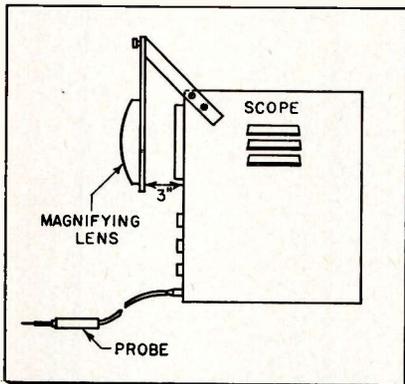
CONTI

Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

Scope Magnifier

I recently took an old 7-in. TV receiver as a trade-in. Since, among other things, the picture tube was defective, the set was relegated to the junk pile. However, there was a fluid magnifier on the set, and the thought occurred that it could be used to enlarge the trace on my 5-in. oscilloscope. Some experimentation showed that, by centering the magnifier over the scope tube and mounting it three inches away from



the tube face, a sweep could be obtained equivalent to that on an 8-in. tube, with no visible distortion.

I made up a mounting frame out of two old auto speaker brackets. By drilling two holes in each side of the scope and using self-tapping screws, the necessity of removing the scope from its cabinet was avoided.—*F. M. Dickinson, Stony Point, N. Y.*

Noisy Tuning Condensers

Quite often a small radio will come in with a complaint of noisy and intermittent tuning. This is often due to fine particles of the plating on tuning gang condensers flaking or powdering off the base metal of the plates, and shorting out as the plates are rotated. This difficulty can be quickly cleared up by removing the gang assembly from the chassis and giving it a bath in muriatic acid for a few minutes. This acid, which is very inexpensive, can be purchased in a local paint shop.

The tuning assembly is then bathed in water, rinsed in denatured alcohol and allowed to dry. When re-assembling the tuning unit into the set, make doubly sure that the oscillator and r-f trimmers are

dry. Re-align the oscillator and r-f stages as usual, lubricate pivot points and bearings and—presto—clean, noiseless tuning.—*Philip Smith, New York, N. Y.*

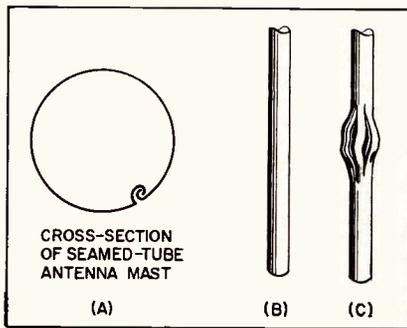
Oscillator Drift

The servicing of horizontal drift that appears after the set has been on for an hour or more is often difficult. The trouble is usually caused by some component heating up and changing in value. Putting a heat lamp near the horizontal circuits heats up too many of the components at the same time, I have found, making it more difficult yet to find the defective part.

A short cut to locating the defective component is to place the tip of a hot soldering gun just *under* each component being tested, while the set is still cold (i.e., immediately after the set has been turned on, after being off for a considerable period.) When the iron is placed under the defective component, the drift symptom will generally make itself evident immediately.—*F. S. Mattioli, Racine, Wisconsin*

What Freezing Can Do to Mast

Servicers who install seamed-tube antenna masts should take great care to make sure (1) the bottom of the mast is so positioned that it drains freely, or (2) that the top of the mast is so corked or stoppered that water cannot enter the hollow tube.



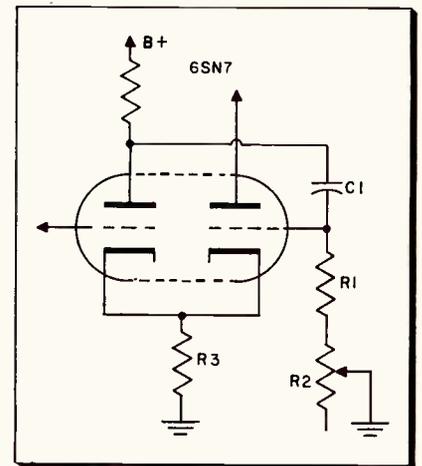
If water can get into the hollow tube and stays there, the mast may be destroyed at the base or other weakest point by the expansion force of freezing during cold snaps or prolonged zero weather. The accompanying sketch shows the re-

sults when A and B are filled with water changing to ice, with the destructive results shown by C.

Hor. Oscillator Blocking

When used as a horizontal multi-vibrator-type oscillator, the 6SN7 will sometimes show a tendency to block. The symptom is either a double image, which may be intermittent, or a sudden cutoff of a part of the horizontal scan for a number of lines.

The difficulty crops up if the value of the coupling condenser, C-1, going from one plate to the opposite grid (the one to which the hold control, R-2, is connected) is too high in value. If residual gas in the tube is high, a value for C-1 in excess of 2000 mmfd may cause blocking. Remedial measures include lowering the value of C-1 and trying other



tubes. Note that, as far as tube replacement is concerned, a seasoned tube is less likely to have excessive gas than a fresh one.

In substituting a part with less capacitance for C-1, note that the value of resistance in the circuit (R-1, R-2) may have to be increased correspondingly to maintain the proper time constant. The percent by which circuit resistance is increased should be about the same as the percent by which capacitance is decreased. For example, if a 2500-mmfd condenser is replaced with a 2000-mmfd unit, reduction is by about 20 percent; so resistance would be increased by about the same amount.—*J. A. McRoberts, Brooklyn, N. Y.*

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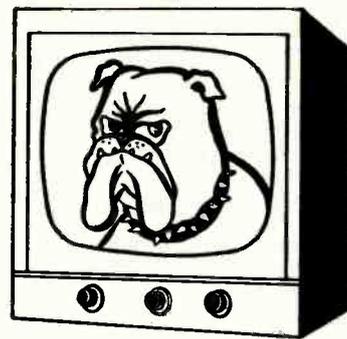
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"Tough Dog" Corner

Difficult Service Jobs Described by Readers



CRT Weakens Sound

This happened on an Admiral chassis 20A1, 20B1, in which the low voltage and audio sections are on a separate subchassis. The major complaint was very weak sound. During the troubleshooting process I noticed that, whenever a video i-f tube was pulled out, the sound would come in louder. This seemed strange at first. After a little analysis, however, I realized that pulling out a tube would result in less drain on the B+ supply, thus raising the voltage to the sound tubes. I checked all tubes by substitution and then measured voltages, which I found somewhat below normal.

After finding nothing else abnormal, I decided to take a long shot. Remember that pulling out tubes caused the sound to get louder? Well, this time I substituted a new 12LP4 crt. The raster and picture were brighter and sharper, but best of all—the sound came in with such a roar that I had to turn the volume control way down. Evidently a gassy condition in the original crt resulted in a terrific current drain and heavily loaded down the power supply. Ironically, it was the sound that was most noticeably affected. You'd have to try it to believe it.—*J. L. Mancini, Winthrop, Mass.*

Open Heater, Bright Heater

Following a complaint of no sound and no picture, open heaters were found on this GE 20C105 on the sound i-f tube (V-9, 6AU6) and the

discriminator (V-10, 6AL5). The tubes were replaced and the receiver worked—until a repeat call two days later.

This time it was just the 6AU6 whose filament was open. Also the B-plus fuse had blown. On the bench, with a new tube and new fuse in place, filament voltages were measured and found to be normal despite the fact that all heaters were unusually bright. Then the B-plus fuse opened and filament brightness appeared to return to normal.

A careful check of the schematic suggested that the 25W4 damper, whose filament was next in series with that of the 6AU6, might be the troublemaker. A test proved this to be the case. When first plugged into the tube checker, the damper's filament glowed very brightly, and then went out. A further check revealed a cathode-heater short. With a potential of 450 volts applied to the heater string through this short while the tube was in the set, it is small wonder that there were heater burn-outs. The intermittent nature of the damper short hid this condition behind normal heater readings for some time.—*Keith S. Jensen, Snohomish, Wash.*

Obscure Oscillation

The importance of using a scope in tracking down elusive troubles is well illustrated by the following "Tough Dog," which came to the writer's attention recently. The set was a 16-in Bendix; the complaint

was that the volume control was noisy and the tone of the set not quite up to par. The odd thing about the control was that it was noisy at the top half of the control, instead of near the bottom or grounded end, as is the more usual.

A new control was tried, but no difference whatever was noted. With the 6AL5 ratio detector removed from the socket (see sketch), there was still no change in noise when the control was rotated. The lead at point 1 was opened, to remove the possibility of dc being fed to the volume control because of a possible leak between the windings of the sound i-f transformer, but again no change occurred.

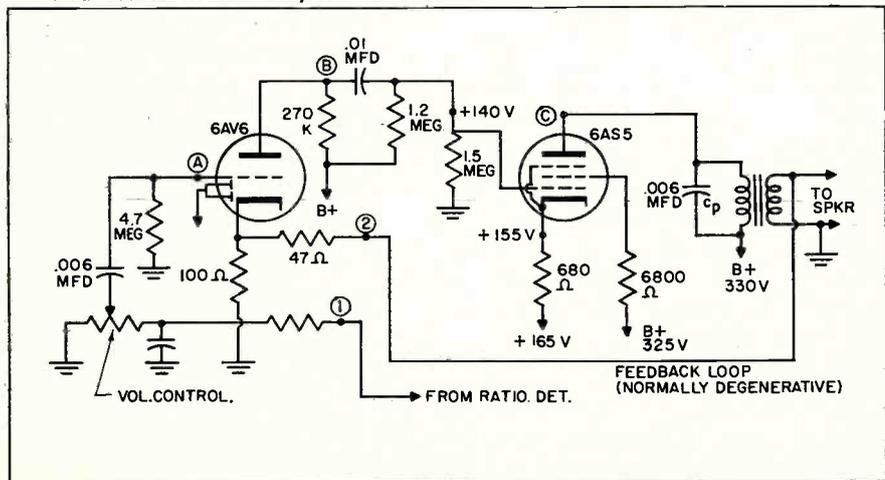
A positive reading of 140 v between grid and ground of the output tube raised hopes that a clue had been found, but these were dissipated when closer examination of the circuit showed both grid and cathode at high positive voltages toward ground, with a difference of approximately 15 v present for (negative) bias.

Connection of the scope input to point A showed that super-audible (25-30 kc) oscillations, about .2 v in amplitude, were present. At B, this low-frequency r-f had built up to around 15 v and at C it was almost two hundred volts to ground!

The strength of the oscillations varied with the position of the volume control arm, dropping out at approximately the half-way point. As the control was rotated, a faint high-pitched whistle could be heard which turned out to be the beat between the oscillation frequency and the 2nd harmonic of the horizontal oscillator. (Moving the horizontal

(Continued on page 61)

What seemed to be a noisy volume control in this circuit turned out to be oscillation.



\$ 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.

Hi-Fi Equipment

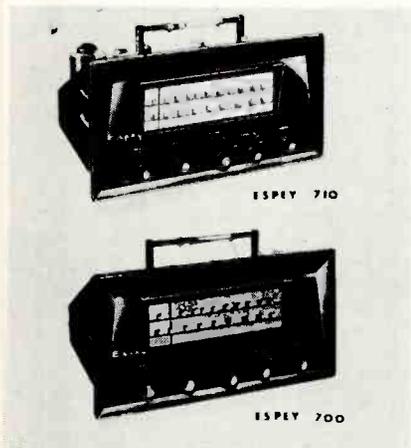
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Espey HI-FI GEAR

Model 710 receiver, Model 700 tuner, and Model 501 amplifier are leaders in Espey's line of hi-fidelity equipment. Model 710 has 17 tubes, is single-chassis mounted, incorpor-



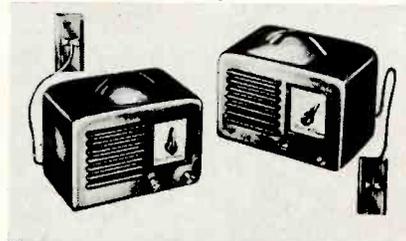
ating a 12-watt Williamson-type amplifier with an integral control panel, and employing limiter-discriminator circuits. Model 700 tuner has 14 tubes. The 501 is an 8-tube 24-watt Williamson-type amplifier. Retail price for the 710 is \$149.50; for the 700, \$119.50; for the 501, \$79.95. Espey Mfg. Co., 528 E. 72nd St., N.Y. 21—TECHNICIAN (Ask for No. 11-54)

Scherr STYLUS GAUGE

Precision dynamometers, which are finding increased use as pickup stylus pressure gauges, come in two models calibrated from 2 to 15 gms. or 3 to 30 gms. each way from center position. Models with range extended to 50, 100 and 150 gms. are available also. \$9.85. Geo. Scherr Co., Inc., 200 Lafayette St., N.Y. 12, N.Y.—TECHNICIAN (Ask for No. 11-55)

GIC WIRELESS INTERCOM

The Port-A-Phone, a new portable wireless intercom, allows instant 2-way communication between 2, 3 or more persons in separate departments or buildings. It will pick up



voices over distances of several hundred feet and transmit them up to 2½ miles within the same power-line transformer circuit. An exclusive silencer eliminates line noise when standing by. Complete 2-station system is priced at \$66.90; additional stations are \$33.45. General Industrial Co., 5738 N. Elston Ave., Chicago, Ill.—TECHNICIAN (Ask for No. 11-56)

Webster UNIVERSAL CARTRIDGE

Model WX cartridge is a single-needle, dual-voltage pickup for single- or 3-speed use. For high-output applications it develops 5 v at 78 rpm or 2 v at 33½ and 45 rpm. Using the shunting capacitor (furnished with the cartridge), the WX develops 0.75 v at 33½ and 45 rpm or 1.5 v at 78 rpm. The cartridge weighs 7.25 gms., comes with an extra needle screw, terminal clips and installation instructions. Webster Electric Co., 1900 Clark St., Racine, Wisc.—TECHNICIAN (Ask for No. 11-57)

Shure MICROPHONE

Recommended for hi-fi enthusiasts interested in high quality home recording, the Concert-Line "333" microphone has a frequency range of 30-15,000 cps, ±2½ db. Uni-directional and small in size. Shure Bros., 225 W. Huron St., Chicago—TECHNICIAN (Ask for No. 11-58)

MORE TECHNICAL INFORMATION describing the new products presented here may be obtained by writing on company letterhead to **New Products Editor, TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.,** listing numbers given at end of each item of interest. Please mention title of position held.

F-E AUDIO AMPLIFIER

Model 910 is a 10-watt Williamson-type linear amplifier which features a frequency response of 20 to 30,000 cps, at ±1 db. Total harmonic distortion is less than 0.5% at full rated output. Hum and noise level is 20 db below the rated output. Specially designed output transformer is constructed with grain oriented steel laminations and interleaved windings. Freed-Eisemann, 200 Hudson St., New York 13, N.Y.—TECHNICIAN (Ask for No. 11-59)

E-V MICROPHONE

Model 623 slim-type general-purpose dynamic mike has the Electro-Voice Acoustalloy diaphragm. Can be used on a stand or in the hand. Frequency response is 60 to 11,000



cps; output level, -55 db. Polar pattern is omnidirectional. Finished in satin chromium and comes with 18 ft. of cable. Choice of high or low impedance by changing one wire in the cable connector. \$49.50. Electro-Voice Inc., Buchanan, Mich.—TECHNICIAN (Ask for No. 11-60)

Scotch MAGNETIC TAPE

Identical in magnetic characteristics to conventional acetate-back tapes, types No. 111 AM and "High Output" No. 120 AM have high-strength polyester backing. Recommended for applications where extreme toughness and resistance to effects of temperature and humidity change are required. Cost of the new No. 111AM tape with "PE" backing and the standard red oxide coating is \$9.75 for a 1200-ft reel; for No. 120 AM, \$10.75. Minnesota Mining & Mfg. Co., 900 Faquier St., St. Paul 6, Minn.—TECHNICIAN (Ask for No. 11-61)

The **ONLY** Way You Can Get
an **FP** Capacitor is to Specify

P. R. MALLORY & CO. Inc.
MALLORY



Why?

Because Only Mallory Makes FP Capacitors

They were introduced by Mallory. For over 15 years they have set the standard of quality and performance in the industry. And they are available *only* from Mallory.

Imitations are available, of course, but they aren't FP's... and they won't have this combination of features that are exclusively Mallory—

When you ask for
FP Capacitors...
be sure you get
Mallory, not an
imitation.

- 85°C construction
- Ability to handle high ripple currents
- Well suited for voltage doubler circuits
- Ideal for use with selenium rectifiers
- Genuine fabricated plate anode
- Corrosive impurities held to less than 7 parts in 10 million
- Long shelf life
- Long service life
- Fast, twist prong mounting
- Standardized can size

P. R. MALLORY & CO. Inc.
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CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS
RECTIFIERS • POWER SUPPLIES • CONVERTERS • MERCURY BATTERIES

APPROVED PRECISION PRODUCTS

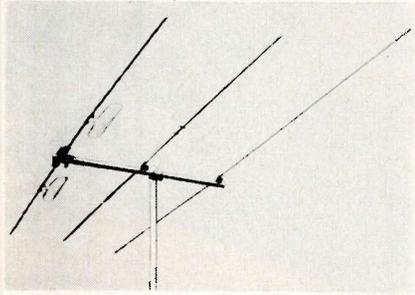
P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

Antennas & Related Products

Indoor and Outdoor Types; Converters, Couplers, Rotators

Taco VHF ANTENNA

The co-linear-yagi type "Trapper Jr." is designed for the VHF and FM bands, and the UHF band in medium signal areas. Driven element with wave traps is backed by high fre-



quency and low frequency reflectors providing six working elements on the high band. Snap-lock design requires no tools in assembling. Available as a single, 2-stacked or 4-stacked array. Technical Appliance Corp., Sherburne, N. Y.—TECHNICIAN (Ask for No. 11-20)

Marjo INDOOR ANTENNA

The length of the dipole arms on this new antenna are controlled by an insulated tuning knob. When not in use they can be retracted completely into the case. Cabinet measures 3¼ in. high and 4⅝ in. deep. In mahogany, ivory or black. List price—\$7.95. Marjo Technical Products Co., 1150 Henry E., Linden, N. J.—TECHNICIAN (Ask for No. 11-21)

Alliance CONVERTER

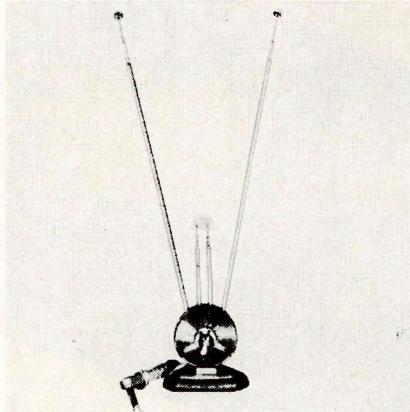
Continuous tuning over the entire UHF band is a feature of the new Model UC-2 converter. Employs a coaxial tuner and is claimed to provide particularly good reception due to low noise amplification characteristics. Dimensions—6⅛ x 4⅛ x 4⅛ in. \$24.95. Alliance Mfg. Co., Alliance, Ohio—TECHNICIAN (Ask for No. 11-22)

RCA LIGHTNING ARRESTOR

Resistance elements of this new UHF-TV arrestor are molded in a special form to present low capacitance across the transmission-line conductors. New design assures low loss—approximately 1 db at 800 mc. Resistance elements are made of conductive rubber which is non-corrosive and impervious to effects of moisture. Radio Corp. of America, Camden, N. J.—TECHNICIAN (Ask for No. 11-23)

JFD INDOOR ANTENNA

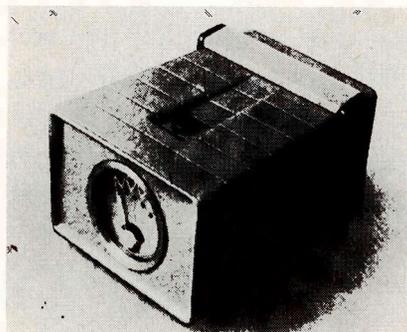
Matching stub built into the TA 150 VHF-UHF "Color-Tenna" is reported to make this antenna particularly suitable for color reception. The desired portion of the TV



signal is peaked by adjustment of the stub, which otherwise acts as the UHF element. Band pass thus achieved is claimed to be flat within 2 db across the TV channel. \$9.95. JFD Mfg. Co., 6101-16th Ave., Brooklyn, N. Y.—TECHNICIAN (Ask for No. 11-24)

Crown ROTATOR

Model CAR6-B "Tenn-a-Liner" features attractive 2-tone color styling, finger-tip control, constant di-

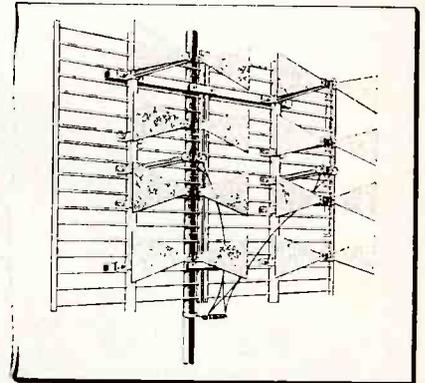


rectional indication and illuminated dial. Crown Controls Co., Inc., 124 S. Washington St., New Bremen, Ohio—TECHNICIAN (Ask for No. 11-25)

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Clear Beam UHF ANTENNA

Designated the Duo-Quad UHF Radar, the UF40 antenna is composed of a 4-stack bow tie with cross polarized dipole fans, and a closely spaced all aluminum reflector screen.



Features molded polystyrene insulators with air space at dipole centers and 1-piece construction of the reflector screen. Also available in double stacked version (UF 40-2), as shown. Clear Beam Antenna Corp., 21341 Roscoe Blvd., Canoga Park, Calif.—TECHNICIAN (Ask for No. 11-26)

Channel Master COUPLERS

New low-loss, single-channel bandpass filters permit the coupling of an unlimited number of antennas to a single transmission line. Design is pointed at fringe areas where stations are at a considerable distance, and in different directions, calling for individually directed yagi antennas. Each coupler is a sharply tuned filter which offers a high impedance to other than its resonant frequency. An additional Hi-Lo coupler is needed when joining antennas operating both VHF bands. \$5.42 per unit. Channel Master Corp., Ellenville, N. Y.—TECHNICIAN (Ask for No. 11-27)

Chance EARTH ANCHOR

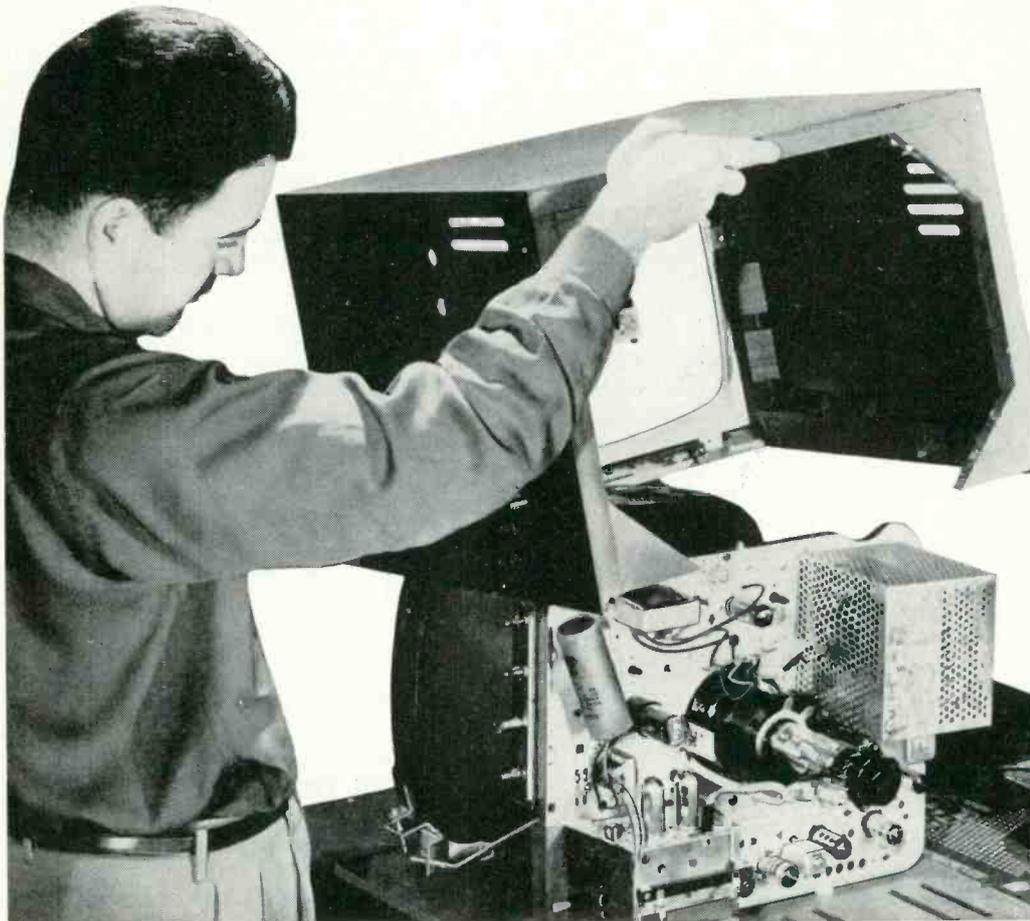
Especially adaptable to TV antenna guying, the "Keep-Stake" screw-type earth anchor is rated for a minimum holding power of 750 lbs. in average soil. Screws into the ground like an auger. Dimensions—3-in. screw, or anchor plate on a 30 x ⅞-in. rod with 1-in. round eye. Also available in larger sizes. A. B. Chance Co., 210 North Allen St., Centralia, Mo.—TECHNICIAN (Ask for No. 11-28)

Another break for service men!

NEW

CROSLEY SUPER-V

uses 600 mil tubes



New super-vertical chassis filament circuit—employs 14 new, ruggedized 600 mil tubes . . . provides faster warm-up and far less chance of tube failure than sets using transformers. Parallel tubes and resistors are eliminated.

4 other reasons why Super-V is a service man's dream

- 1. Fewer components to fail**
- 2. All tubes within easy reach by removing back**
- 3. Other components readily accessible by sliding chassis out of console or by lifting off bonnet-type cabinet on table model**
- 4. Easily portable for repair.**
Customers can bring table models in for service.

Crosley Division  Cincinnati 25, Ohio

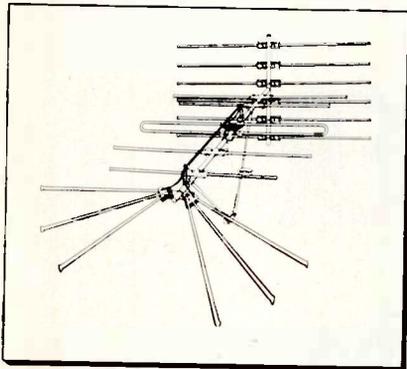
Crosley gives you more for your money!

New Antennas & Tools

TV Types & Installation Accessories; Servicing Aids

Snyder ANTENNA

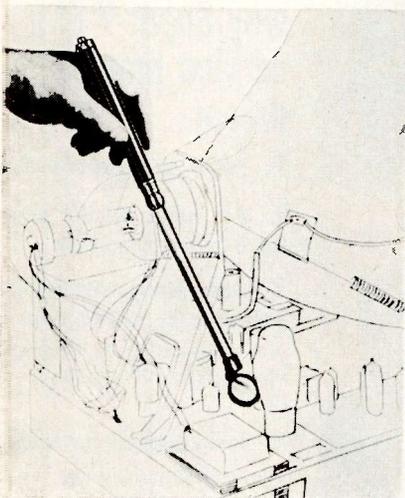
New combination conical-yagi antenna is said to provide excellent front-to-back ratio due to new "radar-flector" elements. Pre-assembled, umbrella-type construction.



Employs 17 aluminum elements, 3 perma-plastic insulators and a 6-element reflector. In two models: the AX-673, single array, and the AX-674, 2-array model. Snyder Mfg. Co., 22nd & Ontario St., Phila., Pa.—TECHNICIAN (Ask for No. 11-29)

G-C INSPECTION MIRROR

Similar in appearance to the familiar dentist's tool, a new long handled illuminated mirror enables the serviceman to inspect inaccessible parts of the TV chassis. Power



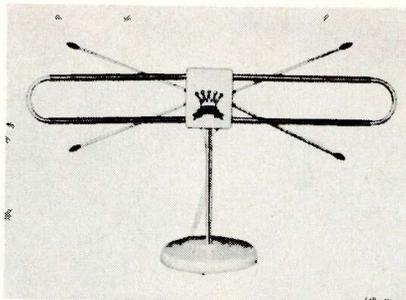
for the unit is provided by two self-contained penlight batteries. The case is of anodized aluminum, and the rod section of transparent Lucite. \$3.25 (without batteries). General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—TECHNICIAN (Ask for No. 11-30)

B-T VHF MIXER-SEPARATOR

Model MMS mixes and equalizes signals from any number of VHF antennas, and can also separate individual channels being transmitted on a single cable. Requires no ac power. Comprises a series of plug-in pads which supply up to 24 db attenuation on any one channel, and a group of precisely tuned circuits, to insure the maximum selectivity and signal transfer for each station handled. Handles 75 ohm cable. With aluminum weatherproof cover and mast mounting bracket. List price—\$59.50. Blonder-Tongue Labs Inc., 526 North Ave., Westfield, N. J.—TECHNICIAN (Ask for No. 11-31)

Coronet INDOOR TV ANTENNA

Feature of this new UHF-VHF antenna is the flexible construction which permits the VHF dipoles to serve as reflector elements for the



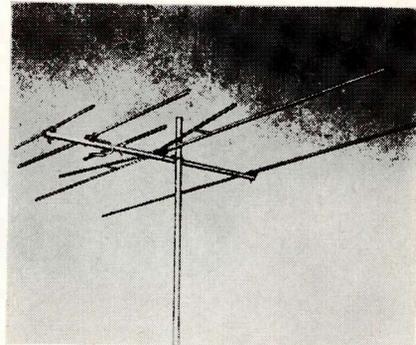
UHF fan when only UHF reception is desired. Matches 300 ohm inputs. Constructed of aluminum and shock-proof plastic, with 8 ft. of line. Coronet Electronics Inc., 505 N. LaSalle St., Chicago 10, Ill.—TECHNICIAN (Ask for No. 11-32)

CBS-Hytron TOOLS

4-way tool provides means of removing the back of any conventional TV receiver. Incorporates a Phillips head screwdriver, a standard screwdriver blade and 2 hex sockets, 1/4-in. on one end, 1/8-in. on the other. A knurled set screw locks the sliding screwdriver blade into any one of three recessed positions within the slotted barrel. CBS-Hytron, 100 Endicott St., Danvers, Mass.—TECHNICIAN (Ask for No. 11-33)

Winegard VHF ANTENNA

Constructed for streamlined appearance and low resistance to wind, the Model L-5 "Pixie" covers all the



VHF channels, 2 through 13. \$14.95 per bay. Winegard Co., 3000 Scotten Blvd., Burlington, Iowa—TECHNICIAN (Ask for No. 11-34)

JFD TELESCOPING MASTS

The "Aluzoom" line of telescoping aluminum masts comes in six sizes; 20, 27, 30, 39, 40, and 50 ft. They are 1/3 the weight of steel masts, and have a tensile strength of 45,000 lbs./sq. in. The top section is 1 1/2 in. O.D., wall thickness is 0.056 in. The top 6 in. is swaged to fit all rotators. It comes complete with guy rings, thumb screws and mounted T-nuts. JFD Mfg. Co., 6101 16th Ave., Brooklyn 4, N.Y.—TECHNICIAN (Ask for No. 11-35)

Leader ANTENNA ROTATOR

Model M-500 rotor features high torque output and rugged construction to handle large arrays. Employs cut steel worm gear drive and oil-impregnated cast bronze bearings. The control unit has an automatically illuminated dial which lights when the rotator is in operation and shuts off when tuning is completed. Has vernier tuning for precise orientation. Cabinet is available in mahogany and blonde. Leader Electronics Inc., 2925 E. 55th St., Cleveland, Ohio.—TECHNICIAN (Ask for No. 11-36)

MORE TECHNICAL INFORMATION

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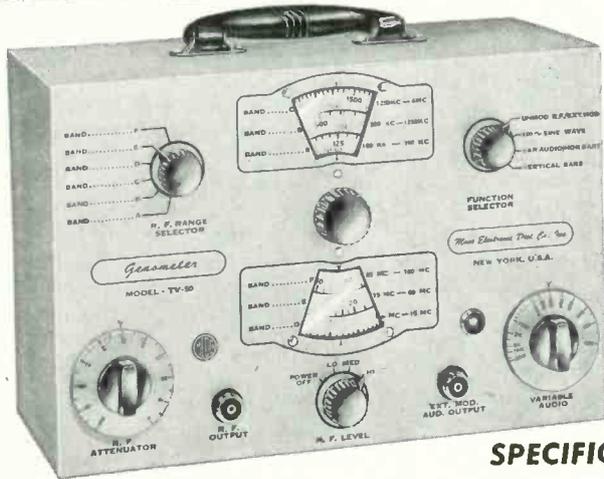
HI-FI & AUDIO NEW PRODUCTS ON
PAGES 34, 44, 46

The Model
TV-50

GENOMETER

A versatile all-inclusive GENERATOR which provides ALL the outputs for servicing:

A. M. Radio F. M. Radio Amplifiers Black and White TV Color TV



7 Signal Generators in One!

- ✓ R. F. Signal Generator for A.M.
- ✓ R. F. Signal Generator for F.M.
- ✓ Audio Frequency Generator
- ✓ Bar Generator
- ✓ Cross Hatch Generator
- ✓ Color Dot Pattern Generator
- ✓ Marker Generator

SPECIFICATIONS:

R. F. SIGNAL GENERATOR:

The Model TV-50 Genometer provides complete coverage for A.M. and F.M. alignment. Generates Radio Frequencies from 100 Kilocycles to 60 Megacycles on fundamentals and from 60 Megacycles to 180 Megacycles on powerful harmonics. Accuracy and stability are assured by use of permeability trimmed Hi-Q coils. R.F. is available separately, modulated by the fixed 400 cycle sine-wave audio or modulated by the variable 300 cycle to 20,000 cycle variable audio. Provision has also been made for injection of any external modulating source.

VARIABLE AUDIO FREQUENCY GENERATOR:

In addition to a fixed 400 cycle sine-wave audio, the Model TV-50 Genometer provides a variable 300 cycle to 20,000 cycle peaked wave audio signal. This service is used for checking distortion in amplifiers, measuring amplifier gain, trouble shooting hearing aids, etc.

BAR GENERATOR:

This feature of the Model TV-50 Genometer will permit you to throw an actual Bar Pattern on any TV Receiver Screen. Pattern will consist of 4 to 16 horizontal bars or 7 to 20 vertical bars. A Bar Generator is acknowledged to provide the quickest and most efficient way of adjusting TV linearity controls. The Model TV-50 employs a recently improved Bar Generator circuit which assures stable never-shifting vertical and horizontal bars.

CROSS HATCH GENERATOR:

The Model TV-50 Genometer will project a cross-hatch pattern on any TV picture tube. The pattern will consist of non-shifting, horizontal and vertical lines interlaced to provide a stable cross-hatch effect. This service is used primarily for correct ion trap positioning and for adjustment of linearity.

DOT PATTERN GENERATOR (For Color TV)

Although you will be able to use most of your regular standard equipment for servicing Color TV, the one addition which is a "must" is a Dot Pattern Generator. The Dot Pattern projected on any color TV Receiver tube by the Model TV-50 will enable you to adjust for proper color convergence. When all controls and circuits are in proper alignment, the resulting pattern will consist of a sharp white dot pattern on a black background. One or more circuit or control deviations will result in a dot pattern out of convergence, with the blue, red and green dots in overlapping dot patterns.

MARKER GENERATOR:

The Model TV-50 includes all the most frequently needed marker points. Because of the ever-changing and ever-increasing number of such points required, we decided against using crystal holders. We instead adjust each marker point against precise laboratory standards. The following markers are provided: 189 Kc., 262.5 Kc., 456 Kc., 600 Kc., 1000 Kc., 1400 Kc., 1600 Kc., 2000 Kc., 2500 Kc., 3579 Kc., 4.5 Mc., 5 Mc., 10.7 Mc. (3579 Kc. is the color burst frequency.)

The Model TV-50 comes absolutely complete with shielded leads and operating instructions.
Only _____

\$47⁵⁰
NET

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

Try it for 10 days before you buy. If completely satisfied then 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 unit to us, no explanation necessary.

MOSS ELECTRONIC DISTRIBUTING CO., INC.
Dept. D-80, 3849 Tenth Ave., New York 34, N. Y.

Please rush one Model TV-50. I agree to pay \$11.50 within 10 days and to pay \$6.00 per month thereafter. It is understood there will be no carrying, interest or any other charges, provided I send my monthly payments when due. It is further understood that should I fail to make payment when due, the full unpaid balance shall become immediately due and payable.

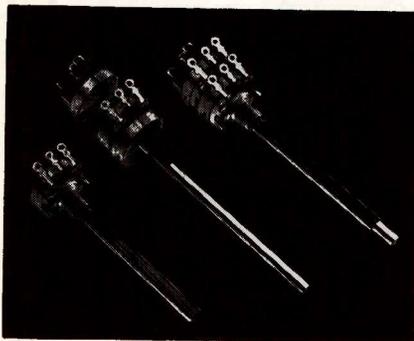
Name
Address
City Zone State

New Shop Equipment

Service Aids; Items for Replacement and Resale

Centralab DUAL CONTROLS

From the "Fastatch" line of concentric controls the technician makes any combination of TV replacement pots. Front and rear units, complete with shafts, are handled separately and are snapped together to make



the complete control. The new "Snap-Tite" controls, for replacing controls on the rear apron, need no bushing or twist tab. When pushed through the mounting hole they snap tightly in place. They come with the short 1/4-in. knurled and slotted shaft for fingertip or screwdriver adjustment. Centralab, 900 E. Keefe Ave., Dept. F 43, Milwaukee 1, Wisc.—TECHNICIAN—(Ask for No. 11-1)

Champion PLASTIC SEALER

Protection against shorts, corrosion and corona is provided by Sprayon plastic sealer. It insulates and waterproofs wiring, antennas, parts, receivers and h-v circuits; comes in a handy 12-oz. aerosol can with non-clogging nozzle. Champion Bronze Powder & Paint Co., Inc., 2101 N. Elston Ave., Dept. RAN, Chicago 14, Ill.—TECHNICIAN (Ask for No. 11-2)

Scotch SPLICING KIT

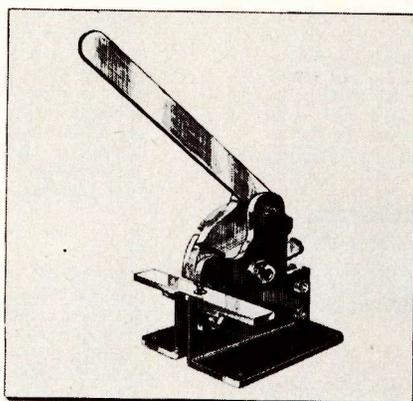
Factory-perfect cable splices under field conditions are possible with the "Scotchcast" kit, No. 82A, which embeds the splice in liquid epoxy resin that hardens into a hermetically sealed casting. No heat is required. Basis for the new method is the electrical embedment resin No. 4, and the "Unipak" container which mixes the resin and hardener in exactly the right proportions. Each kit makes exactly one splice. Minnesota Mining and Mfg. Co., 900 Faquier St., St. Paul 6, Minn.—TECHNICIAN (Ask for No. 11-3)

ITI WINDOW FEED-THRU

For bringing TV signal through a window without physically making an opening, this device consists of pairs of plates which adhere to opposite sides of the window pane. The plates are 4 sq. in. in area. Measured loss at Channel 2 is 2%, less at higher VHF channels. At UHF the device provides an automatic impedance match with no loss. Industrial Television Inc., 359 Lexington Ave., Clifton, N.J.—TECHNICIAN (Ask for No. 11-4)

Tatu METAL WORKING TOOL

Compact unit punches, forms, shears and rivets, with throat depth of 1 in. Separate threading attachment handles 1/8-in., 3/16-in., and 3/16-in. stock. Hollow rivets can be fastened in up to 1/4-in. stock. Heavy



duty steel plate construction. All cutting surfaces are of hardened steel and may be resharpened. \$9.95. Threading attachment \$1.00 extra. Albert J. Tatu Inc., Williamsville, N.Y.—TECHNICIAN (Ask for No. 11-5)

Xcelite NUT DRIVERS

New No. 77 kit contains 7 nut drivers, ranging from 3/16-in. to 3/8-in., with different colored handles to indicate the sizes. Comes in a pliable plastic kit which snaps shut to 6 1/4 x 7 in. Equally suitable for benchwork or home servicing. Xcelite Inc., Thorne Ave. & Bank St., Orchard Park, N. Y.—TECHNICIAN (Ask for No. 11-6)

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Insl-X INSULATING DIP

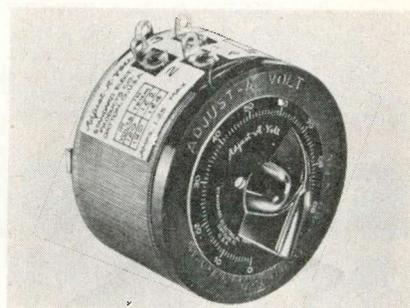
A dipping compound for insulating tools and equipment eliminates need for taping tool handles or purchasing tools with non-conductor handles. Designated E-33, this compound can be reinforced and built up to practically any dielectric strength desired. Items to be protected are dipped and then permitted to dry for 15 minutes. Dielectric strength (dry) is 1200 to 1500 v/mil, about the thickness of one coat. Insl-X Sales Co., 26 Rittenhouse Sq., Ardmore, Penna.—TECHNICIAN (Ask for No. 11-7)

Mucon UHF CAPACITOR

New subminiature ceramic capacitor Style S-3, incorporates a tin-plated copper mounting which almost completely encloses the dielectric material, allowing the supporting member to take most of the stress placed upon the wiring terminal. Available in capacitance values from 2 to 3300 mmf. Height above chassis is approximately 3/16-in. and mounting area is 3/16 x 1/4-in., with .127-in. hole. Mucon Corp., 9 St. Francis St., Newark 5, N. J.—TECHNICIAN (Ask for No. 11-8)

Standard VARIABLE TRANSFORMER

Designed to replace rheostats in electric and electronic equipment, the Adjust-A-Volt 100BU variable transformer is small and compact for back-of-panel mounting. Handles



50 to 150 watt loads. It is a toroidally-wound, hydrogen annealed autotransformer which can deliver any output voltage from 0 to above line voltage. Standard Electrical Products Co., 2240 E. Third St., Dayton, Ohio.—TECHNICIAN (Ask for No. 11-9)

**BRAND
NEW**

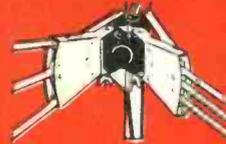
FEATURES

THAT MAKE **TRIO** THE LEADER IN '55



HEAVIEST BOOMS!

Thick-wall, extra-sturdy 1 1/4" diameter Booms. Nothing approaching them for strength! Now used on ALL low-band yagis.



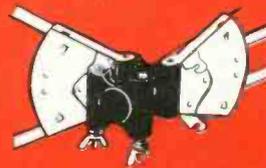
New "VARI-CON" HEAD

Four Hi-strength aluminum adjusting arms. Interlocking Butterfly sections. Heavier snap-action spring assembly. The "Vari-Con" is the only antenna with spring dampeners to lessen vibration and breakage. The "Vari-Con" head also used on the popular TRIO 88 Series.



Sensational
INSTA-LOK CLAMP
(Good-Bye Nuts)

This revolutionary clamp permits instant flip-out assembly, permanent alignment with ultra strength. Nothing stronger — nothing faster! Insta-Lok employed on ALL TRIO Antennas that have parasitic elements.



New MINIT-UP CONICAL HEAD

Swing out element mounting plates, fan out elements into snap-fastenings and it's set! Used throughout conical line.

New MYCASTYRENE INSULATORS USED THROUGHOUT TRIO LINE

 ZZ12L	 Twin-Six
 C44	 FDLH
 UBT-4	 SQ-1
 SV-2	 44

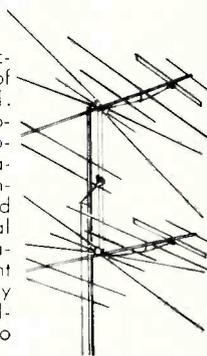
New TRIO ARISTOCRAT ROTATOR

NOW AVAILABLE IN **FOUR** GLORIOUS COLORS!



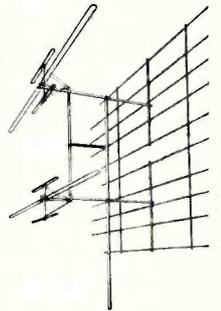
TRIO 88

Far superior construction. Rugged, foolproof — easily installed. Parasitic elements supported by TRIO's revolutionary new "Insta-Lok" clamps. Low channel dipoles supported by the strongest conical head made. No vibration — No element shedding. Completely pre-assembled. Available in single or two bay models.



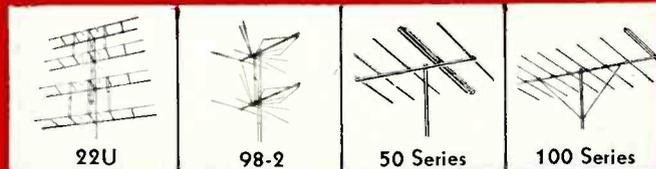
TRIO 66

Three dipoles provide exceptionally high gain on all VHF channels. Exclusive TRIO grid reflector gives improved performance. Extremely rugged yet lightweight. Pre-assembled — simply unfold and tighten reflector and dipole assemblies. Three vertical braces on reflector screen for increased strength. Available in single or two bay models.



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Ask To See America's Most Dependable And Beautiful Rotator:



The New TRIO "ARISTOCRAT"

TRIO
Manufacturing Co.
GRIGGSVILLE, ILLINOIS

TRIO Leader in Antenna Development

More New Shop Equipment

Meters, Components, Tools; Custom-built TV units

Lindgren SCREEN ROOM

Double-shielded electronic screen rooms, the "American 40" series are of pre-fabricated construction and can be easily erected or disassembled as required. This new, improved room has stronger floor construction which permits loads of up to 500 lb. per sq. ft. Full 30-in. door. Attenuation ratings for these rooms is reported between 110 and 146 db. Erik A. Lindgren & Assoc., 4515 N. Ravenswood Ave., Chicago 40, Ill.—TECHNICIAN (Ask for No. 11-10)

Welwyn CARBON RESISTORS

A new insulating material permits these deposited carbon resistors to withstand potentials up to 8,000 v. without flashover or breakdown. The insulating effectiveness is in excess of 100,000 megohms. The resistors are also protected against failure due to extreme humidity changes. Available in ¼, ½, 1 and 2 watt ratings. Distributed in the U. S. by Rockbar Corp., 215 E. 37th St., N. Y. 16, N. Y.—TECHNICIAN (Ask for No. 11-11)

Switchcraft MIXER CABLE

One-ft. long cable assembly No. 8266 adapts the Switchcraft No. 310 Mini-Mix, 2-input mixer, for use when the panel jack is recessed. The assembly is of 2-conductor shielded cable, one end of which has the No. 280 Littel-Plug and the other the No. 120 Extension Jax. \$3.75. Switchcraft Inc., 1328 N. Halsted St., Chicago 22, Ill.—TECHNICIAN (Ask for No. 11-12)

Chase PRESS

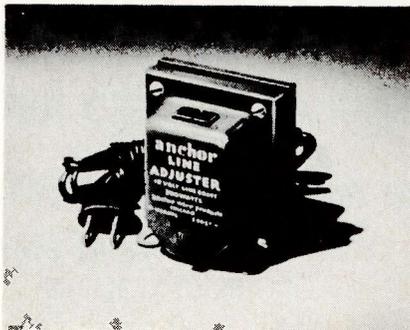
The Ham-R-Press, a hand operated punch press type tool, cuts clean, accurate shapes in metal or other punchable materials such as plastics and fibre. Hammer pressure is transferred through the vertical ram directly to the working point. The movable ram is precision piloted in the upper frame arm. Punches for round holes vary from ⅛-in. to 1¼-in.; square punches from ⅝-in. to ⅞-in. Slotting, notching, riveting, marking and staking tools are available in the line of attachments. Comes in 2 models: No. 75—with 7½-in. throat, \$24.95; No. 120—12-in. throat, \$32.95. Chase Mfg. Co., 5008 W. Jefferson Blvd., Los Angeles 6, Calif.—TECHNICIAN (Ask for No. 11-13)

PCI CAPACITORS

A new line of zero temperature coefficient capacitors with plastic film dielectric for use in integrating circuits, tuned filters and timing oscillators. These capacitors feature a temperature coefficient of ± 30 PPM/°C and are available in capacitance from 0.1 mfd. to 10 mfd. Voltage range is from 100 to 1000 v. Other characteristics: superior capacitance retrace, stability, wide temperature range and hermetic sealing. This line is known as the Type CC. Plastic Capacitors Inc., 2511 W. Moffatt St., Chicago 47, Ill.—TECHNICIAN (Ask for No. 11-14)

Anchor LINE ADJUSTOR

LA 300 instantly restores full picture size or picture brightness when low line voltage causes TV pictures to shrink or dim. Also corrects sync and oscillator drift caused by re-



duced voltage. Has 2-position, positive action; switch is located on the front of the unit. With switch in normal position, the LA 300 acts as a normal feed through for line voltage. Anchor Wire Products, 2712 W. Montrose Ave., Chicago 18, Ill.—TECHNICIAN (Ask for No. 11-15)

Chicago V.T.V.M.

Novel circuit employed in the Model 541 VTVM permits use of regular test leads from 10 cps to 100 mc. An isolation cartridge snaps on regular probe to use when necessary. Features full bridge circuit; tube complement 1X2A and 12AU7. Selenium rectifier powers ohms circuit. 4½-in. meter with both rms and peak reading scales; double the reading for true peak-to-peak. Black bakelite case with aluminum panel. \$30.00. Chicago Industrial Instrument Co., 536 W. Elm St., Chicago 10, Ill.—TECHNICIAN (Ask for No. 11-16)

Transvision TV CHASSIS

Designed for custom installations, a new TV chassis with aluminized 27-in. crt has provisions for a remote control system and dual sound arrangement. Features of the chassis include special interlace circuitry, keyed AGC and 18 kv second-anode supply. The remote control system, which is optional at extra charge, allows the viewer to completely control the set from a distance, and also permits the sound to be transferred from the TV receiver to a sound system incorporated in the remote control unit. \$299.00, for chassis and 27-in. tube. Transvision Inc., 460 North Ave., New Rochelle, N. Y.—TECHNICIAN (Ask for No. 11-17)

Ellis SHIELDS

A line of rectangular cans suitable for use as high voltage shields, transformer cases, condenser housings and similar applications comprises 25 different sizes and a variety of access openings and ventilating hole patterns. Parts are made from tinplate, steel, or any of the common non-ferrous metals such as aluminum, brass and copper. In gauges from .010 to .018. Geo. D. Ellis & Sons, Inc., American & Luzerne Sts., Phila. 40, Pa.—TECHNICIAN (Ask for No. 11-18)

RMI LIQUID RUBBER

Natural liquid rubber compound is applied like paint, dries to a true rubber coating. Properties include insulating, rustproofing, waterproofing, and making air tight seals. Useful in insulating tools and bare wiring, or outdoor electric fixtures. Non-inflammable in the liquid state. Withstands up to 220 degrees of heat, and 20 degrees below zero. ½ pint can, \$1.29; pint—\$1.98; quart—\$3.75. Rubber Magic Inc., 4312 Third Ave., Brooklyn 32, N. Y.—TECHNICIAN (Ask for No. 11-19)

MORE TECHNICAL INFORMATION describing the new products presented here may be obtained by writing on company letterhead to New Products Editor, TECHNICIAN, 480 Lexington Ave., New York 17, N. Y., listing numbers given at end of each item of interest. Please mention title of position held.

NEW

Model RM-15 ROOF MOUNT

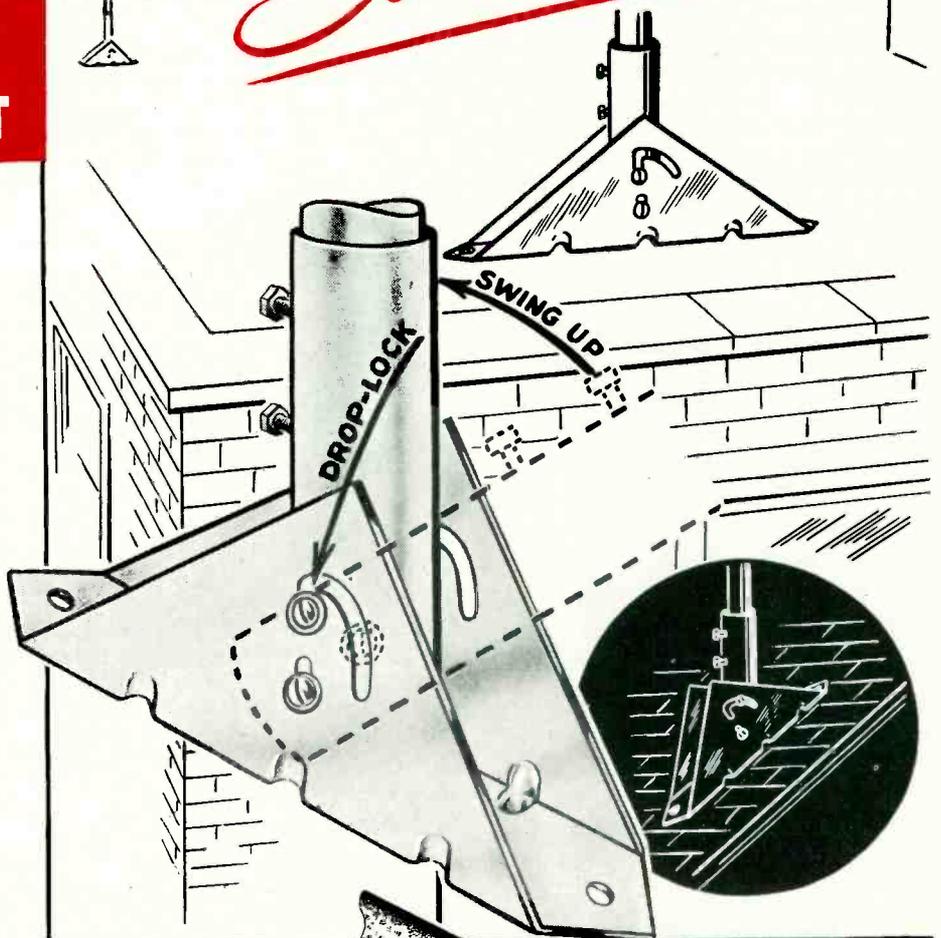
AGAIN South River has the serviceman in mind! With the new South River Roof Mount Model RM-15 his job is a quick, easy, efficient operation. A unique "walk-up drop-lock" feature permits ONE MAN roof-mounting for single mast installations. This mount allows fast, simple installation from a horizontal position. After the antenna and mast are "walked-up" to the vertical position, the mast holder DROPS into a special notch and LOCKS securely. The serviceman is then free to guy the mast.

Made of heavy-gauge metal, heavily plated for rust resistance and embossed at all critical points for extra strength and rigidity, the 5" long mast socket accommodates masts measuring up to 1 1/2" O. D.

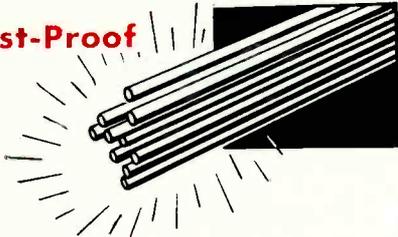
The mast is secured in the mounting socket with 2 rugged hex screws, eliminating the danger of the installation vibrating loose. Two "in line" holes in mounting base permit bolting directly into heavy roof cross member.

FROM

South River



Rust-Proof



ALUMINUM TUBING

Only South River is able to offer the industry this super-strength product extruded especially for us. The new aluminum tubing is fabricated of 63S-T6, a special structural alloy designed for maximum strength. Aluminum itself is bright and non-rusting, affording a lasting finish. Made with a .054 wall by 1 1/4" dia., in 10' lengths, the tubing is supplied 25 to a bundle.

Stronger, Tight-Twist GUY WIRE

Do the best installation job... use South River's new hot-dip galvanized guy wire, carefully drawn with a tighter, stronger twist for extra durability under stress—providing tensile strength up to 70,000 lbs. per square inch. Produced in either 18 gauge or GENUINE 20 gauge, both available in either 4 or 6 strands, this vital product comes to you in 1,000' lengths on metal spool, or in continuous loops of 50' and 100' lengths.



Exclusive STEEL TUBING

Hot-Dip Galvanized Inside and Outside!

South River presents another FIRST in the industry... 18 gauge steel tubing, hot-dip galvanized INSIDE AND OUTSIDE... affording maximum utility and long life because of complete, all-over protection. It greatly increases the resistance of steel to the extreme atmospheric corrosion of shore and industrial areas. Hot-dip galvanizing is the only experience-proven rust resistant finish known. The tubing is available in 5' and 10' lengths, 10 to a bundle, is 1-1/4" dia., and is supplied with either plain or swaged end for mast extension.

South River's INSIDE AND OUTSIDE hot-dip galvanized steel tubing is another step forward in combating rust and corrosion. Your use of this product will prove that you keep abreast of important, new developments, for increased customer satisfaction.

South River

METAL PRODUCTS CO., INC., South River, New Jersey

Write for Complete Catalog

PIONEER MANUFACTURER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTINGS

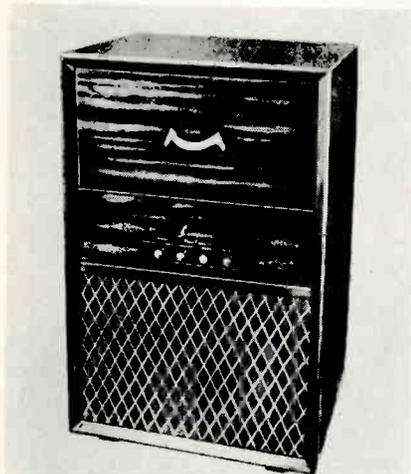
In Canada — A.T.R. Armstrong Co., Toronto, Ltd.

Hi-Fi and Audio Gear

Amplifiers, Recording Accessories, Mikes and Related Items

Masco HI-FI CONSOLES

Model 200 console, by Mark Simpson, features a Webster-Chicago #114-15 3-speed changer, with Hi-Fidelity magnetic cartridge and twin sapphire styli, and a Masco CM-8 8-watt amplifier with frequency response from 20 to 20,000 cps at less than 1% distortion. Hand rubbed mahogany veneer cabinet with 5 cu.



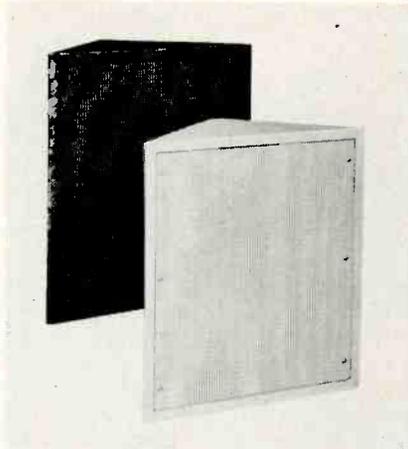
ft. infinite baffle speaker enclosure for the 12-in. coaxial speaker. Model 300 has a Garrard changer with GE magnetic cartridge, and a 10-watt Masco CM 10 amplifier, with an 8-position equalization switch. Speaker is an Electro-Voice SP-12. Model 200 sells for \$159.50; Model 300 for \$199.50. Distributed by Elcraft Electronics Inc., 32-28 49th St., Long Island City, N.Y.—TECHNICIAN (Ask for No. 11-37)

Scott POWER AMPLIFIER

The Model 232-A Laboratory Power Amplifier is a 32-watt unit for high-fidelity and lab applications. Distortion is extremely low with less than 0.5% harmonic distortion, and less than 0.1% first-order difference tone intermodulation. Frequency response flat from 12-30,000 cps. Controlled cutoff beyond upper limit eliminates possibility of ultrasonic oscillation. Long-time continuous maximum output is 28 watts. Output provision of 1 to 24 ohms allows any speaker to be properly matched. Two input circuits are provided with impedances of 0.5 and 1.5 megohms, requiring 0.5 and 1.5 v. respectively for full output. Hermon Hosmer Scott Inc., 385 Putnam Ave., Cambridge 39, Mass.—TECHNICIAN (Ask for No. 11-38)

Argos BAFFLES

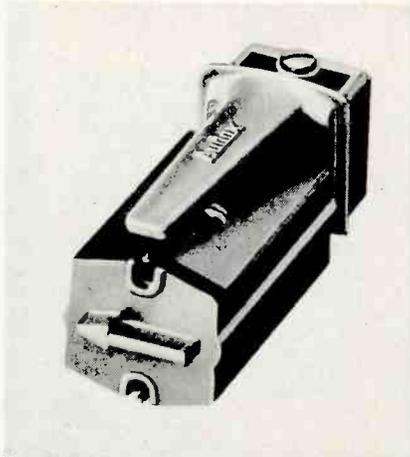
A new design in baffles features a woven plastic grille cloth which covers the entire front of the baffle except for a narrow edge. A full-size



hardboard under the cloth is cut for the proper speaker opening. Prices range from \$2.37 for 4 and 5 in. speaker sizes to \$9.30 for 12 in. Argos Products Co., 4753 N. Broadway, Chicago 40, Ill.—TECHNICIAN (Ask for No. 11-39)

Audak MAGNETIC CARTRIDGE

Designed to override the magnetic interference caused by certain types of motors, the Hi-Q7 has a frequency response of 20 to over 15,000 cps. One single magnetic unit plays all discs. Either stylus is replaceable



in the home, independently of the other. For best results, the Hi-Q7 should be fed into a resistive load of approximately 100,000 ohms. Gold-finished, with chromatic micro-groove diamond and a sapphire for standard discs. \$41.70. Audak Co., 500 Fifth Ave., N. Y. 36, N. Y.—TECHNICIAN (Ask for No. 11-40)

American PHONO CARTRIDGES

A package of five cartridges comes in a handy transparent plastic box suitable for storing small parts. The boxes measure 1½ in. high by 3½ in. long, are hinged and sturdily constructed. They may be bought separately at 25¢ each. Also available is the new cartridge display rack which holds 3 clear plastic boxes for use on store counter. American Microphone Co., 370 S. Fair Oaks Ave., Pasadena 1, Calif.—TECHNICIAN (Ask for No. 11-41)

Brociner AUDIO EQUIPMENT

Mark 30A power amplifier is rated 30 watts at 1% intermodulation distortion; at 20 watts the distortion drops below 0.2%. Performance is achieved through the use of 45 db of multiple-loop negative feedback. Printed circuit construction. Mark 30C audio control center is a self-powered preamplifier which provides complete facilities for selection



of radio, TV, tape or phonograph inputs, separate 'turnover' and 'roll-off' controls for record compensation, continuously adjustable bass and treble controls providing boost and cut, and a loudness control. Intermodulation distortion is less than 0.1% for outputs as high as 4 v. Brociner Electronics Laboratory, 344 E. 32nd St., N.Y. 16, N.Y.—TECHNICIAN (Ask for No. 11-42)

MORE TECHNICAL INFORMATION describing the new products presented here may be obtained by writing on company letterhead to New Products Editor, TECHNICIAN, 480 Lexington Ave., New York 17, N. Y., listing numbers given at end of each item of interest. Please mention title of position held.

Industry Keyhole

17-day all expense paid Caribbean cruise is the grand prize in G.E.'s radio-TV sales contest now under way. Points are given for each radio or TV unit sold, with quotas determined by the dealer's previous sales record. The contest ends on Dec. 31. . . . An attractive four-color display is being offered distributors by Radio City Products Co. Inc. to further sales of their new Model #480 Universal Multitester, which lists at \$14.85. . . . Leader in the 1955 Stromberg-Carlson TV line is the "Courier," Model 21-22 TQ 21-in. table model which sells for \$199.95.

Channel Master Corp. has incorporated a new "Snap Lock" feature into their preassembled antennas. New design eliminates need for wing nuts or similar hardware conventionally used for holding elements in position. . . . The "Glo-Bar Filament Resistor Kit" manufactured by General Cement Mfg. Co. comprises two washer-type thermistors suitable for replacement on any well-known TV receivers using series-string operation.

Complete line of Siemens (of Germany) hi-fidelity radio and phono chassis and speakers will hit the Fall market. They are being introduced by Leru Laboratories Inc. of Wayne, N. J. . . . New Sta-Kon kit, put out by the Thomas & Betts Co., contains an assortment of wire joint connectors and terminals, plus an installing tool, to make solderless electrical connections. Price \$7.50. . . . Tube Division, R.C.A. is pushing an inventory program to help service dealers and techs get quick service in ordering parts for the RCA-Victor 45 rpm phonos and record changers. Distributors are being urged to stock the 45 key parts which account for the bulk of the replacement demand.

Hi-Fi trade-in policy initiated by Hudson Radio & TV Corp. of N.Y.C. and Newark, N. J. provides for substantial allowances toward purchase of new equipment; in some cases, according to Hudson president, David H. Ormont, "a large percentage of the original cost." Reason given is that hi-fi equipment, generally, is exceptionally rugged, provides little trouble, and finds a ready second-hand market. . . . A full line of VHF and UHF antennas, telescoping masts and installation hardware is being marketed by Hy-Gain Television Products, 249 N. 48th St., Lincoln, Neb.

Altec Lansing Corp. has launched a nation-wide merchandising campaign in behalf of the Melodist, their new 2-unit speaker and amplifier hi-fi system. Keynote of the drive is "High Fidelity You Can Sell." Dealers are being provided with counter displays, window streamers, album stuffers and other selling aids, plus a dealer co-op advertising plan.

TELE-PLEX TV Couplers 

Join any 2 TV sets to 1 antenna.

No.	List
RA2	\$1.65
TT2	\$5.95

(for 72 or 300 ohm sets)

FREE display 

Model RA2 shipped in eye-catching, self-selling colorful display carton that stops traffic—starts sales.

JFD

CHECK LIST of FAST MONEY MAKERS!

CHECK FOR HIGH TURNOVER!

CHECK FOR HIGH CUSTOMER APPEAL!

Here are the items to stock for steady sales. Feature them . . . promote them . . . for plus profits. See your JFD distributor today.

FREE Flash-A-Light 3D 6-color Tele-Plex TV Coupler 

Display is yours for the asking. Steps up sales wherever demonstrated.

Lightning Arresters 

Patented strain-relief lips and saw-toothed contact washer design.

No.	List	U.S. Pat. Nos.
AT105	\$1.25	D-159-330
AT110	\$1.50	2,654,857,
		Canadian Pat. No. 504,067

FREE 3-color giant display boosts lightning arrester sales. 

No. LAD11

Antenna Couplers 

Join any combination of antennas into a single VHF or UHF-VHF system.

Model	Ter. Freq.	List
AC10	6 VHF-VHF 2-6 7-13	\$3.50
AC20	6 VHF-UHF 2-13 14-83	3.75
AC30	8 VHF-VHF-UHF 2-6 7-13 14-83	4.50

"TUNE-A-SCOPE" VHF-UHF Indoor Antenna 

Features unique 6-position electronic phasing switch.

No.	List
TA145	\$9.95

"PANORAMA" VHF Indoor Antenna 

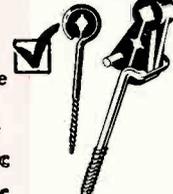
Exclusive tip-proof design. 7,000,000 sold.

No.	List
TA135	\$6.95
TA136	5.95
TA138	5.50

MAST Stand-Offs 

World headquarters for the widest assortment available.

No.	List
NUT350	19c
SPT125	10c

SCREW EYE Stand-Offs 

Your largest single source of supply.

No.	List
PAL213	9c
X18TL3	5c

Look to JFD for Engineering Leadership!

JFD Electronics

EXPORT DIVISION • 15 Moore St., New York, N. Y.
JFD MFG. CO., INC.
6101 16th AVENUE B'KLYN 4, N. Y.

3-WAY Antenna Switch 

Provides instant selection and connection of any one of three arrays to TV set.

No.	List
AS1	\$3.75

New Sound Equipment

AM-FM Tuners & Radios; Amplifiers and Speakers

Stephens SPEAKER SYSTEM

Re-designed version of the Tru-Sonic model 617 hi-fidelity cabinet with enclosed 2-way loud speaker system consists of a new 103LX low-frequency loud speaker and 800-cycle crossover network. Also includes a model 216 high frequency speaker with a 2 x 4 multi-cellular horn affording 40 degrees vertical and 80 degrees horizontal dispersion of high frequency energy. Cabinet employs a modified bass reflex using rear horn loading. \$397.00. Stephens Mfg. Corp., 8538 Warner Drive, Culver City, Calif.—TECHNICIAN (Ask for No. 11-43)

Fisher AMPLIFIERS

Main feature of the 25-watt 70-AZ and the 50-watt 50-AZ hi-fi amplifiers is a new design which provides for matching the voice coil impedance to the amplifier output at all frequencies. Trade-named the 'Z-Matic,' it is continuously variable and can be set to any degree. It is said to eliminate the need for over-size speaker enclosures and even to correct for the inherent deficiencies in the speaker and speaker housings themselves. Fisher Radio Corp., 21-21 44th Dr., L.I.C. 1, N. Y.—TECHNICIAN (Ask for No. 11-44)

Vidaire EXTRA SPEAKER

Model ES-200 connects to the radio or TV set, permits independent volume adjustment at any point up to 20 ft. from the receiver. The extension speaker or set speaker may be switched to operate independently or together. A separate volume control is included. Unit supplied with 20 ft. of thin flexible cable for under-rug or baseboard installation. Vidaire Electronic Mfg. Corp., Lynbrook, N. Y.—TECHNICIAN (Ask for No. 11-45)

Regency PRE-AMPLIFIER

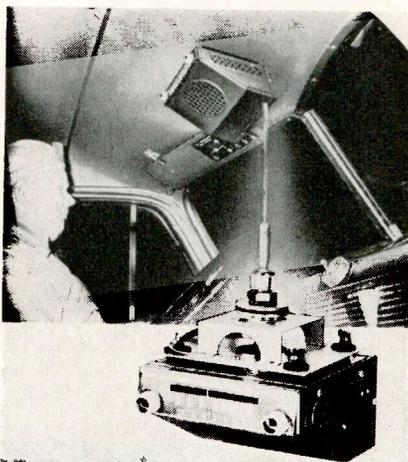
Model 350-P audio pre-amp features a frequency response of 20 to 40,000 cps, with intermodulation distortion of 0.1% at 2 v output. Equalization range of +18 to -20 db at 30 cps, +14 to -20 db at 20,000 cps. The crossover frequency is variable. Housed in a mahogany or blond cabinet. Control panel is of gold-like satin finish. \$154.50. Regency, Div. of I.D.E.A. Inc., 7900 Pendleton Pike, Indianapolis 26, Ind.—TECHNICIAN (Ask for No. 11-46)

Webster PICK-UP

Model GX is a lightweight, single-needle ceramic cartridge that will withstand heat and humidity. It develops 0.6 v at 33 $\frac{1}{3}$ rpm and 0.8 v at 45 rpm with 7 grams tracking pressure and a cut-off frequency of 10,000 cps. The Model GX fits any standard $\frac{1}{2}$ -in. mounting, the RCA 45 rpm or the Columbia 33 $\frac{1}{3}$ rpm record players. Sound Sales Div. of the Webster Electric Co., 1900 Clark St., Racine, Wisc.—TECHNICIAN (Ask for No. 11-47)

TRUCK RADIO

Airplane style, one-unit radio which suspends from the roof of the truck or car is said to provide remarkable freedom from static, engine and road noises. Speaker is in



direct line with driver's hearing, and requires only $\frac{1}{3}$ the volume of dash-mounted speakers. Drilling a $\frac{5}{8}$ in. hole in roof of cab permits mounting of both radio and antenna. 6 tubes. Neutral tan, baked-enamel finish. Comes with antenna and ball-and-socket swivel mount. \$54.95. Tru-radio, 228 E. Park Ave., Wheaton, Illinois.—TECHNICIAN (Ask for No. 11-48)

Hastings FM AUTO RADIO

Hi-fidelity sound reproduction is claimed for this new FM car receiver which features a full Armstrong circuit and 2 μ v sensitivity. Incorporates an independently tuned r-f stage and electronic tone control, to increase bass response without attenuating the high frequencies. Covers the FM broadcast range—87 to 109 mc. \$99.50. Hastings Products Inc., 171 Newbury St., Boston 16, Mass.—TECHNICIAN (Ask for No. 11-49)

University LOUDSPEAKER

Full range weatherproof coaxial loudspeaker, Model BLC, comprises a low frequency woofer coupled to a balanced compression type exponential horn. Horn starts with a large 8-in. throat which extends to a 22 $\frac{1}{2}$ -in. diameter mouth. High frequency tweeter is coaxially mounted and has its own driver unit. Built-in frequency dividing network provides crossover at 2,000 cps. Rated frequency response of the unit is 70 to 15,000 cps; power capability is 25 watts. \$75.00. University Loudspeakers Inc., 80 South Ken-sico Ave., White Plains, N. Y.—TECHNICIAN (Ask for No. 11-50)

Scott HI-FI TUNERS

Model 5001X is an FM-AM tuner with separate power amplifier chassis, offering automatic frequency control, and a new selector switch for automatic level and frequency compensation. Chrome chassis, with leather dial boards. Has seven controls and 14 tubes, including tuning-eye and rectifiers. Power amplifier, available separately, provides response flat from 30-15,000 cps, with power output of 20 watts. Scott Radio Laboratories, Inc., 1020 N. Rush St., Chicago 11, Ill.—TECHNICIAN (Ask for No. 11-51)

Tech-Master AMPLIFIER KIT

TM-15A Kit is a modified Williamson circuit providing 20 watts output. Distortion is less than .25% at normal listening levels. For ease of assembly and wiring, all tube sockets and terminal strips are riveted in place on the chassis and complete pictorial diagrams and schematics are provided. The TM-15P pre-amp-equalizer kit features a cathode follower output stage which permits the remote location of the pre-amp from the main power supply without the loss of high-frequency signals. TM-15A kit is \$49.95; TM-15P kit is \$19.95. Tech-Master Corp., 75 Front St., Brooklyn 1, N.Y.—TECHNICIAN (Ask for No. 11-52)

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Warranty Headaches

(Continued from page 28)

replacement the more expensive components (cost above \$1.00).

The \$2.00 just referred to could be "allowed" the retailer, to turn over to the technician-dealer servicing the set, thus covering at least in part, components not under guaranty.

Parts stocked by a distributor for replacement can be coded in the same manner as those marked by the manufacturer, with a small letter "R" or some other symbol designating them as replacement parts. The code marking is placed on the distributor's invoice covering the transaction. These replacement parts are themselves guaranteed for 90 days, or the balance of the warranty period on the TV set in which they are placed, whichever is longer.

To recapitulate:

A person purchasing a current-make TV set or radio receives a parts warranty ranging from a year and a quarter, down to 3 months parts warranty, depending on the time of year he purchased the set. A person buying a "last-year's" model receives no manufacturer's guaranty.

The technician who repairs the TV set does not have to bother filling out all kinds of "forms." He just returns the defective part to the distributor who notes the coding; if the unit is in guaranty, the part is replaced without question. The technician does not bother returning small defective items unless they are "epidemic." He just throws them away.

The system outlined will, we believe, eliminate one of the technician's biggest headaches.



"No . . . A little more to my right!"

HIGH ACCURACY

LOW COST

With a

HYCON VACUUM TUBE VOLT-OHMMETER

New Model 614



\$87.50

*Probes stow inside case —
connected, ready to use*

There's value worth telling about in Hycon's new Model 614 VTVM. You read peak-to-peak voltages directly on complex wave forms, without multiplying. You get 21 ranges for versatility . . . 3% accuracy (DC and ohms) for pin-point measurements . . . large meter for easy reading.

And probes are always ready to use when you want them — out of the way when you don't. So before you buy *any* meter try the new Model 614 . . . setting new standards "where accuracy counts."

- 21 RANGES: AC, DC, OHMS (28 with p-p scales)
- AC FREQUENCY RESPONSE TO 250 MC (with crystal probes)
- ACCURACY: DC \pm 3%; AC \pm 5%
- LARGE, 6½ IN. METER
- LIGHTWEIGHT, MATCHED, BENCH-STACKING CASES

The Model 614 VTVM is one of a matching set of precision instruments, which includes the Model 617 Oscilloscope (designed for color TV) and the Model 615 Digital VTVM. Distributed through Electronic Parts Jobbers.

Service facilities in your area.



Hycon Mfg. Company

2961 EAST COLORADO STREET PASADENA 8, CALIFORNIA

"Where Accuracy Counts"

News of the Reps

Murray Director, formerly with Tele-Matic Industries Inc., has formed his own reps firm, Murray Director Assoc., with offices at 115-62 237th St., Elmont, N.Y. He has been named national sales rep for Tele-Matic. . . .

J. K. Dooley Sales Co., 3606 Magnolia, Seattle, is representing American Screen Products Co.'s line of Unicorn TV antennas in Wash. and Ore. **H. E. Russell Sales Co.**, Iola, Kans. is han-

dling the line in Kans., Iowa and Neb. . . . **Bud Perreault Electronics Inc.**, 346 E. Apache St., Tulsa is covering the northeastern Oklahoma area for the Mobile Communications Dept. of Du Mont Labs. . . .

L. D. Lowery Inc. of Phila. has been appointed jobber rep for the Astatic Corp. to cover eastern Penna., southern N.J., Del., Md., Va. and the District of Columbia. . . . **The Texport Co.**, 5004 Ross Ave., Dallas, Tex. has been appointed industrial rep for La., Okla. and Ark. by International Rectifier Corp. . . . **Barron-Jur Co.**, 817 S. Hoover St., Los Angeles 5, is now representing the

General Cement Mfg. Co and the Television Hardware Mfg. Co. in southern Calif.

Boyd E. McKnight has joined Koessler Sales Co., Los Angeles as field engineer. . . . **Winegard Co.** of Burlington, Iowa, TV antenna mfr., has added two new reps: **Frank Siegmund**, P.O. Box 162, Phoenix, for Ariz., and N.M., and **E. W. Rowland Assoc.**, 110 Washington St., N.Y.C. for the New England States. . . .

Sid Levin of 4217 Okalona Rd., Cleveland, Ohio has been appointed by Mechanical Steel Tubing Corp. of N.Y.C. to represent their line of TV masts in Ky., W. Va., Ohio and Western Pa. . . . **Clarostat's** line of resistors, controls and resistance devices will be handled in Kans., Neb. and Western Missouri by the **Arthur K. Elliott Co.**, 8305 Cherokee Lane (P.O. Box 8493), Kansas City 13, Mo.

The recent conference of the Rocky Mt. Chapter of the Representatives at Evergreen, Colo. brought out 21 reps, 66 manufacturers and 53 distributors and their staffs. . . . The **Finney Co.** of Cleveland, mfr. of **FINCO** TV antennas, has announced the appointment of a number of new reps: **Ray Ripley**, 4306 N. Tripp Ave., Chicago, Ill. for Minn., Eastern N. Dak., Eastern S. Dak., and Western Wis.; **J. R. Hughes**, 51 Russell Ave., Buffalo, N.Y. for Vt., Conn. and Western Mass.; **Paul Hayden**, P.O. Box 331, East Point, Ga. for the states of Fla., Ala., Ga., Tenn., N. Car., S. Car., and Miss.; **John J. Nolan**, 314 W. Sparks St., Phila. for Pa. and Va.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF

TECHNICIAN published monthly at Bristol, Conn., for October 1, 1954.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, **M. Clements**, 898 Park Ave., New York, N. Y. Editorial Consultant, **Orestes H. Caldwell**, Catrock Road and Bible St., Cos Cob, Conn. Managing Editor, **S. C. Silver**, 259-36 148 Drive, Rosedale, N. Y. Business Manager, **M. H. Newton**, 583 W. 215th St., New York, N. Y.

2. The owner is (if owned by a corporation its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given.) **Caldwell-Clements, Inc.**, 480 Lexington Avenue, New York 17, N. Y.; **M. Clements**, 898 Park Ave., New York, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

(Signed) **M. CLEMENTS**

Sworn to and subscribed before me this 14th day of September, 1954.

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

The CHRISTMAS GIFT

that has everything for
servicemen, hams or
experimenters

EXCELLENT FOR
HI-FI ASSEMBLY
JOBS

Perfect gift to give or receive . . . useful all year 'round. Each kit includes:

- **Weller 8250A Soldering Gun**—250 watts
- **Famous Kester Solder**—general purpose spool
- **Soldering Tip**—for all kinds of soldering
- **Smoothing Tip**—for mending and sealing
- **Cutting Tip**—for plastic tile, etc.
- **Wrench**—for tip interchange
- **Instruction Booklets**—handy soldering and homecraft hints
- **Metal Case**—for storage and carrying

Nothing else to buy for soldering, sealing, cutting, mending, joining and smoothing.

SEE NEW WELLER GUNS & KITS AT ELECTRONIC PARTS DISTRIBUTORS

Junior SOLDERING GUN

- **New, Compact Design**
- **Heats in 5 Seconds**
- **Over 100 Watts**
- **Trigger Switch Control**
- **Dual Spotlights**

An ideal soldering tool for shop or home. No other soldering gun or iron offers the professional quality, practical features and low price of the Weller JUNIOR.

Weller

ELECTRIC CORPORATION
805 Packer St., Easton, Pa.

SOLDERING GUNS • SOLDERING KITS • POWER SANDERS



SYLVANIA'S "SILVER SCREEN 85"

PICTURE TUBE IS SWEEPING THE COUNTRY!

FULLY
GUARANTEED

NOTHING ELSE
LIKE IT . . . A NEW
CONCEPT IN
TV VIEWING!

SYLVANIA
SILVER SCREEN 85

Look for
this name

ITS AMAZING
CLARITY MEANS AMAZING
PROFITS, TOO!

Look at these sensational FREE
sales helps plus "Beat the Clock."

- Striking, full-color window displays
- Brilliant streamers and counter cards
- Professional newspaper ad mats
- A full mailing campaign of eye-catching postal cards
- Smart envelope stuffers
- Business-getting newspaper releases
- A fascinating new booklet telling the whole story of the "Silver Screen 85"

Plus powerful live commercials week after week on
the nation's high-ranking TV show "Beat the Clock."

The most dramatic picture in TV history!

Set owners everywhere acclaim this great picture tube . . . the Sylvania "Silver Screen 85."

This tube offers a SILVER-ACTIVATED SCREEN to produce television's sharpest, clearest pictures. Has a SUPER-ALUMINIZED REFLECTOR to catch and use all available light, giving pictures more depth than ever before. Also the PRECISION-FOCUS ELEC-

TRON GUN scans every inch of the screen, making images stand out in pin-point detail.

No wonder the results now place television enjoyment and *your television sales* in a splendid new light. Don't miss the good business, and dealer good will this "Silver Screen 85" now means for you! For full details mail the coupon or call your Sylvania Distributor NOW!

SYLVANIA

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

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

Sylvania Electric Products Inc.
Dept. 4R-4211, 1740 Broadway
New York 19, N. Y.

Please send me full details about Sylvania's "Silver Screen 85" Picture Tube and the big profit-making promotion plan behind it

NAME _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

COLOR SHORTS

COLOR FLASHES: The false starts are over; the industry seems settled on a firm basis for production and marketing. Newest **TECHNICIAN** guesstimate on color set sales for '55: 300,000—or more! . . . First rectangular color crt using 3 guns and a shadow mask is claimed by Du Mont. . . . Delivery of big-screen color pix tubes to set manufacturers is now being made in

freight carload quantities. . . . Motorola large-pix color sets are now on sale in key cities. . . . Color sales are expected to give a shot in the arm to the sagging list-price structure. Demand is expected to exceed supply, which means dealers will be asking—and getting—list prices.

THE SIMPSON COLOR CARAVAN, headed by Bob Middleton, is

winding up a tour of the Pacific Northwest. The practical color servicing demonstrations, performed on color receivers, were given in 8 cities in the states of Idaho, Montana, Oregon and Washington.

DU MONT CLAIMS A FIRST with a 21-in. rectangular shadow-mask color crt that has a picture area of approximately 225 sq. in. The tube uses a metal cone. Now that a rectangular prototype using 3 guns and a shadow mask has been



Dr. A. B. Du Mont, the new 21-in. rectangular pix tube, and F. B. Rice, Tube Division mgr.

successfully developed, Du Mont engineers are at work on glass-shell versions in 21-in. and 22-in. sizes. Sample rectangular large-size tubes are expected to be available this year, with quantity production in '55.

CARLOAD LOTS of large-screen tubes, according to CBS-Hytron, are being dispatched on a regular basis to set manufacturers. With mass production well under way, CBS-Hytron president Charles F. Strome foresees a chance that color sets may be available in quantity by Christmas. He expects his company alone to produce more than 30,000 of the large color tubes during the rest of the year.

NO COLOR THIS FALL is the policy of Sylvania Electric. Bernard Holsinger, Sylvania sales mgr., said the public will not be ready for color until large-screen pictures are available in combination with more moderate prices. Sylvania's 1955 line will concentrate on monochrome.

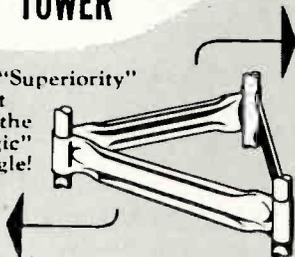
WESTINGHOUSE COLOR SCHOOLS now being conducted in about 50 cities are expected to draw technicians representing more than 10,000 TV retailers, as well as independent technicians. The concentrated 8-hour courses deal with practical problems, and give attending servicemen the chance to get the feel of color service by using actual receivers.

ROHN *the Foremost Name* in TV Towers...

PRESENTS
2 new additions

the "PACKAGE" TOWER

The "Superiority" secret is in the "magic" triangle!



The answer to your storage space dreams — reduced freight rates give you the edge on competition!

PAT. PENDING

Both towers are self-supporting and have all the Rohn "Superior Design" features that make the Rohn line truly proved in performance and nationally accepted!

the NO. 6 TOWER

Built to fill 75% of your requirements — structurally as sound as the Rohn Standard No. 10 Tower — yet costs less!

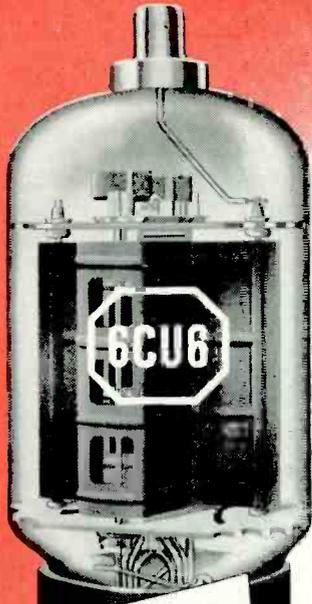
These new Rohn Towers continue to feature the famous triangular design, the self-supporting features and the simplicity of design which gives extraordinary ruggedness and durability! New, advanced Rohn designing utilizes mass production machinery to greatly lower cost — yet actually produce a tower structurally sturdier than before! Get full facts today on Rohn Towers that are loaded with "Sales Appeal" . . . so far advanced in design and engineering to be truly years ahead!

See your authorized Rohn Representative or Distributor for catalog sheets and complete details. Or . . . write, phone or wire . . .



MANUFACTURING CO.
DEPT. T 116 LIMESTONE BELLEVUE
PEORIA, ILL.

"Pioneer designers and manufacturers of towers of all kinds . . . sold with assurance and satisfaction coast-to-coast!"



GET LONGER . . . TROUBLE-FREE LIFE
AT NO EXTRA COST WITH CBS-HYTRON

CTS-RATED* 6CU6

Why the CTS-Rated* 6CU6? The 6CU6 horizontal amplifier is rated the same as the 6BQ6GT . . . is electrically interchangeable with it. *But . . .* because the 6CU6 is rated for continuous television service, it will *live* under 6BQ6GT maximum ratings.

The 6BQ6GT is a good tube. (Heck, CBS-Hytron originated it.) But, it was designed for 10- and 12-inch TV sets. Today it carries the load in 21-inch sets. Furthermore, it must combat the accumulated dissipation caused by: 1. Line-voltage variations. 2. Faulty receiver adjustments. 3. Shifting values of components due to age

and overload. Result: The 6BQ6GT is often operated above maximum ratings.

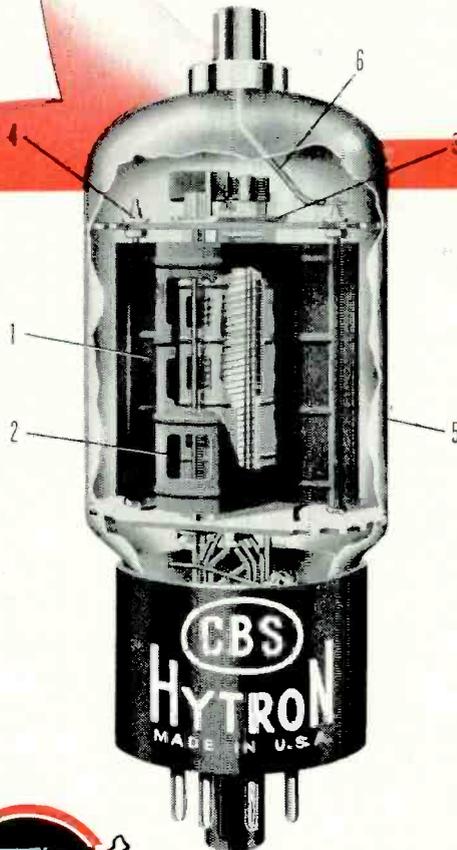
Obviously, a brand-new design . . . not just an improved 6BQ6GT . . . was needed. The husky CBS-Hytron 6CU6 (See Mechanical Features) is the answer: a premium-performance tube *at no extra cost*. CTS-Rated, it offers generous safety margins for plate dissipation . . . high-voltage insulation . . . and high-line protection. Note also the bar graph showing much larger plate and envelope areas of CBS-Hytron 6CU6.

In the 6CU6 . . . another CBS-Hytron first . . . high voltage and heat meet their match. You forget run-away plate current, high-voltage arc-overs, and shrinking TV pictures. You gain by longer life . . . minimized service . . . happier customers. Try the CBS-Hytron 6CU6 today.

FLASH!
NEW CTS-RATED 12CU6-25CU6
... with all the 6CU6's
features ... at no extra cost
... now available for
series-string operation.
Combined data sheet for
6CU6, 12CU6, and 25CU6
free on request.

MECHANICAL FEATURES OF 6CU6

1. Heavier-gauge plate with large radiating fins.
2. Vents in beam plates and plate aligned for maximum radiation of heat from grids.
3. Anti-arc rings for uniform distribution of electrostatic field.
4. Anti-arc mica eyelets.
5. T-12 transmitting-type bulb.
6. Plate connection "hard-soldered" and positioned to reduce heat conduction and arcing.



*Rated for Continuous
Television Service

6CU6 OFFERS GREATER DISSIPATION RESERVES

6BQ6GT

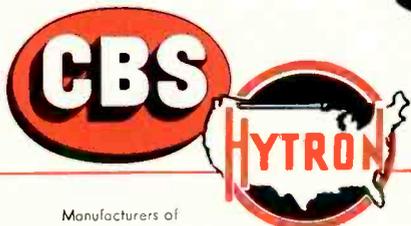
6CU6

WITH 48.5% MORE BULB AREA

6BQ6GT

6CU6

WITH 31.5% MORE PLATE AREA



Manufacturers of
Receiving Tubes Since 1921

CBS-HYTRON Main Office: Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

A MEMBER OF THE CBS FAMILY: CBS Radio • CBS Television • Columbia Records, Inc.
CBS Laboratories • CBS-Columbia • CBS International • and CBS-Hytron

RECEIVING • TRANSMITTING • SPECIAL-PURPOSE • TV PICTURE TUBES • CRYSTAL DIODES AND TRANSISTORS

SERVICE ASS'N REPORTS

Association Incorporates (RTGLI, N. Y.)

The Radio Television Guild of Long Island has been incorporated to permit flexibility in growth while freeing itself from liability or responsibility for actions of individual members.

The Guild is considering the idea of financing consumer repairs made by its members. Discussions on this point are being conducted with a local bank.

Newspaper Support (SARTA, Texas)

Members of the San Antonio Radio and Television Assoc. Inc., were aroused by an article on TV "gypps" which appeared in the gossip column of the San Antonio "Light." They immediately contacted the paper and the result was a collaboration between the organization and the paper on lengthy news article which explained in detail the problems of the serviceman.

NATESA Convention

The 3-day 5th Convention and Exhibition is now in the books. About 900 members of independent service registered during the convention period. Twenty-six exhibitors representing all facets of the service industry were represented at the convention, including **TECHNICIAN** and **Circuit Digests**. Seminars and lectures, business meetings and election of new officers were also part of the 3-day affair.

Business conducted at the convention included the furtherance of professional Standard of Classifications; resolutions calling upon manufacturers to refrain from invading the market of independent service, the latter being fully qualified to render



Vincent Lutz, NATESA convention chairman, addresses guests at banquet in Chicago.

service on all electronic equipment; resolutions calling for a re-appraisal of the UHF situation; and the election to national membership of several new local associations, including members in Venezuela and Canada.

In a bid for greater attendance next year, the 6th annual convention will be held in August, a traditionally slow month for service, when technicians will be more free to leave their businesses. Also, there will be an attempt to re-schedule business meetings with respect to seminars. Many delegates were unable to attend seminars because business meetings were going on at the same time.

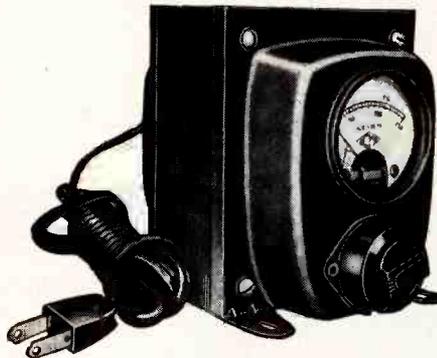
Exchange of Ideas (ESFETA, N. Y.)

A recent meeting of the Empire State Federation of Electronic Technicians Associations featured an exchange of suggestions among local affiliated organizations for increasing interest in association activities and attendance at meetings. Held in Binghamton, the conference was attended by delegates from local affiliates in Binghamton, Rochester, Kingston and Long Island. ESFETA delegates also selected a Certificate of Charter, a copy of which will be issued to each member association.

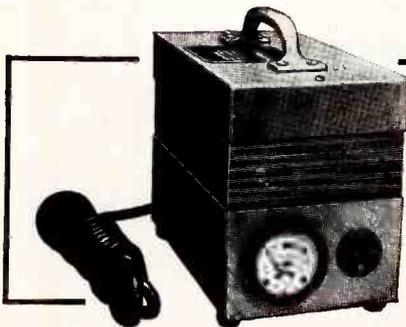
SEE HI-FI TRENDS ON PAGE 26

9 OUT OF 10 Fringe Area Installations Need ACME ELECTRIC VOLTAGE ADJUSTORS

Overloaded distribution lines and low voltage service are prevalent conditions in TV fringe areas according to a recent "spot check". As a result complaints on picture shrinking, fluttering and dimming plague the service man. Usually this condition can be readily corrected with an Acme Electric Voltage Adjustor, either the inexpensive manual type or the deluxe automatic design.



The T-8394M Voltage Adjustor can be used by the service man to reproduce the operating condition about which the customer complains by turning tap switch to the voltage which simulates such condition. For example, customer complains that evening program pictures flicker and shrink. When service man calls next day all operation appears normal — voltage tests out properly. But, by adjusting voltage to 97 volts the condition about which the complaint was made is reproduced. This indicates low voltage condition during evening that can be corrected with a T-8394M Voltage Adjustor.



Regardless of line voltage supply, the Automatic Voltrol corrects voltage fluctuation over a range from 95 to 130 volts. The voltmeter supplied indicates secondary voltage while unit is in operation. A built-in relay automatically disconnects circuit when set is turned off.

Acme Electric
TRANSFORMERS

ACME ELECTRIC CORPORATION
MAIN PLANT: 8811 WATER STREET • CUBA, N. Y.
West Coast Engineering Laboratories:
1375 West Jefferson Boulevard. • Los Angeles, California
In Canada: Acme Electric Corp. Ltd.
50 Northline Road • Toronto, Ontario

Analysis of Chrominance

(Continued from page 17)

is tuned to provide maximum output; this is the only adjustment required for the transformer. The fixed-tuned secondary is center-tapped, and applies signals equal in amplitude and 180 degrees out of phase to the two halves of the phase detector.

The burst signal normally fed to the grid of the burst amplifier has an amplitude of 10 v peak-to-peak. (Some sideband signal is also present.) This figure is based on the presence of a peak-to-peak video signal of about 5 volts at the video detector output. The output of the amplifier is a burst signal whose amplitude is about 60 v peak-to-peak.

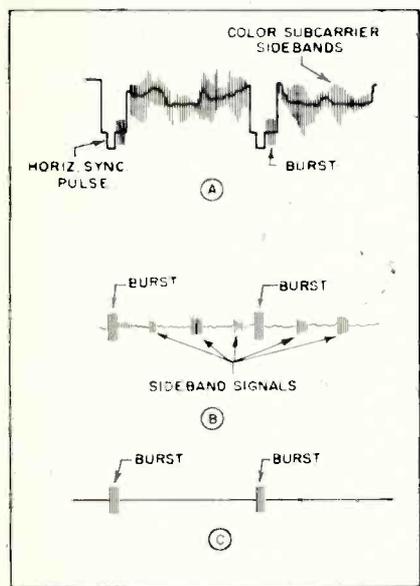


Fig. 3—Normal waveshapes of composite video and burst signals. A—Waveshape of color signal as it looks after detection. B—Signal applied to grid of burst separator. C—Signal at output of separator.

To check the burst amplifier for proper operation, it is usually necessary to inspect the shape of the signal present in the burst amplifier output with a scope. It must be remembered that we are dealing with a 3.58 mc signal; the scope used should therefore have a good response to 4 mc, if it is to perform its job satisfactorily.

In late-design receivers, a number of changes have been made in the burst separator circuit. The most important are:

1—A variable air condenser is added in shunt with the slug-tuned burst take-off coil. The condenser serves as a front panel customer-operated control, and regulates hue. (Formerly, hue was adjusted in a

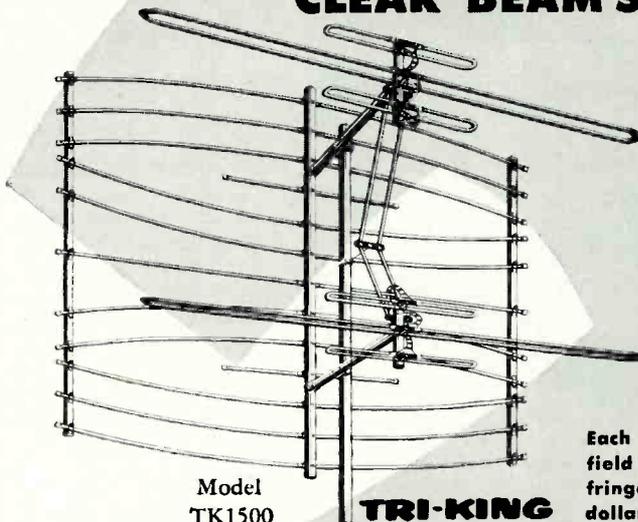
different circuit, by changing the phase of the receiver's local oscillator with respect to the burst signal. Here, the oscillator signal remains constant while the burst signal's phase is varied by manipulating the condenser.) Detuning the coil causes a phase shift in the signal passing through it; this effect is used to adjust hue.

2—A separate amplifier is used for the keying pulse. If the pulse is permitted to retain the shape it has at the flyback transformer, it will cause clipping of several cycles at the beginning and end of the burst to take place. The amplifier, by its

limiting action, makes the pulse flat-topped; as a result, the burst is faithfully reproduced in its entirety.

The cathodes of the keying amplifier and burst separator are tied together, to maintain the keying pulse at a substantially constant amplitude. An increase in signal at the input of one tube causes an increase in bias at the second tube, counteracting the increase; and vice-versa. In earlier circuits, the keying pulse amplitude would change with changes in line voltage, aging of tubes, etc., causing a shift in the phase of the burst signal and a resultant change in hue.

HOTTEST IN THE FRINGES..NATION-WIDE! CLEAR BEAM'S BIG



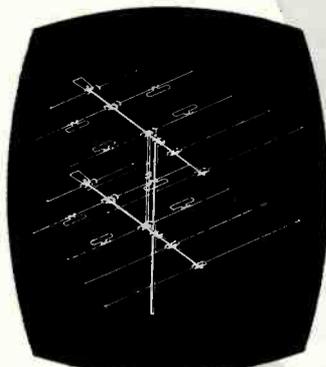
Model
TK1500

TRI-KING

ALL-BAND FRINGE ANTENNAS

Each a peak performer in its field . . . a triple threat to any fringe problem . . . with more dollar-for-dollar construction value!

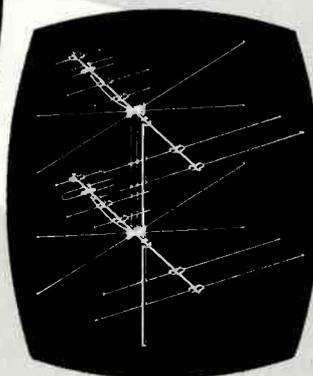
The Tri-King TK1500 offers super fringe performance through better design features. Half wave electrical spacing between dipoles for higher gain on every channel. Positive "back up action" through the use of a full radar screen . . . acclaimed industry-wide as the finest reflector ever designed for ghost rejection and elimination of co-channel interference! Fully wind tunnel tested. Available in single bay (Model TK1000) and Super, wide spaced array (Model TK1800).



Clear Beam
HUNTER

2 Bay Model MYH 50-2

New wave trap principle gives extremely high gain, sharp directivity, in-phase tuning on all channels. New, flat design for low wind resistance!



Clear Beam
BIG CHIEF
2 Bay Model BC 12-2

An advanced conical-Yagi with element diameters varied for precision tuning, matched sensitivity and peak performance on high and low band!

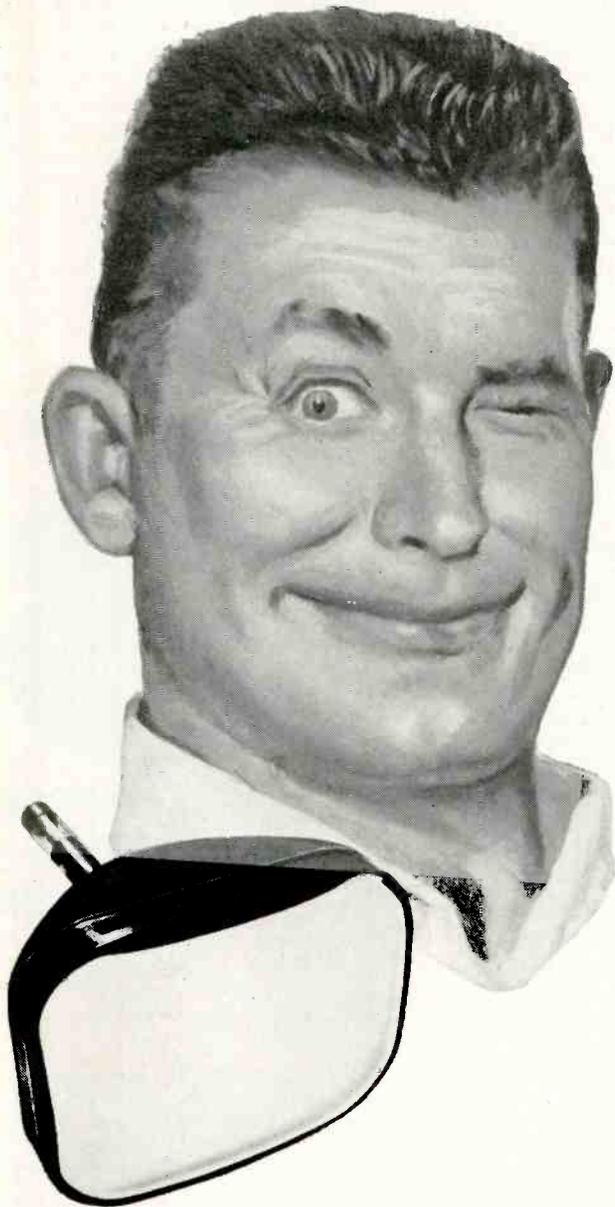


CLEAR ANTENNA CORP.
BEAM

Canoga Park, Calif. • Chicago, Ill.
affiliated with TEMPO TV products

Warehouses in Seattle, Portland, San Francisco, Honolulu, Dallas, Kansas City, Chicago, Detroit, Baltimore

**I NEVER LOSE A WINK OF SLEEP
WORRYING ABOUT TUNG-SOL TUBES**



Tung-Sol Tube quality is the best insurance a dealer can have against service call-backs. You safeguard your service work and protect your profit when you use dependable Tung-Sol Tubes for replacement.

TUNG-SOL® dependable **PICTURE TUBES**



TUNG-SOL ELECTRIC INC., Newark 4, N. J.
Sales Offices: Atlanta, Chicago, Columbus,
Culver City (Los Angeles), Dallas, Denver,
Detroit, Newark, Seattle.

MFRS' Catalogs & Bulletins

TRANSFORMERS: Bulletin No. 469, "TV Replacement Transformer Popularity Tables," lists the number of TV models in each of the 100 major TV lines which use Stancor replacement transformers. An inventory aid for TV servicemen and parts distributors. From Stancor distributors or Chicago Standard Transformer Corp., Standard Div., Addison and Elston, Chicago 18, Ill. (Ask for No. B11-1)

ELECTRONIC EQUIPMENT: Allied's 1955 general catalog contains 308 pages, and lists over 25,000 items. Includes a tabular listing of 31 complete hi-fi systems and data on the new RCA TV Eye closed circuit industrial TV. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (Ask for No. B11-2)

TEST EQUIPMENT: New catalog announced by Linear Equipment Labs Inc., Brightwater Pl. Massapequa, N. Y. provides full technical data on their line of laboratory test equipment. Includes an oscilloscope probe, square wave generator, noise figure tester, video line amplifier, UHF transformer, UHF wavemeter and UHF grid dip oscillator. (Ask for No. B11-3)

TUBES: The 7th edition of the CBS-Hytron Reference Guide for Miniature Electron Tubes, 12 pages, contains data on 329 miniature type tubes, of which 79 are new. Covers all miniature tubes, regardless of make. Available from CBS-Hytron distributors. (Ask for No. B11-4)

MICROPHONES: General catalog 55 covers microphones, accessories, magnetic tape and wire recording heads, crystal and ceramic pickup cartridges, crystal phone pickups and phono needles. Features replacement charts for pickup cartridges and magnetic recording heads. Available from Shure distributors, or directly from Shure Bros. Inc., 225 W. Huron St., Chicago 10, Ill. (Ask for No. B11-5)

TRANSFORMERS: Replacement guide No. 407 released by Merit Coil & Transformer Co., 4427 North Clark St., Chicago, includes 7,000 TV models and chassis with the replacement stock numbers of all transformers, yokes, fly backs, and i-f and r-f transformers. (Ask for No. B11-6)

ANTENNA TOWERS: Comprehensive 2-color folder describes a full line of towers and accessories. Also, catalog sheet describing the new No. 6 tower. Rohn Mfg. Co., 116 Limestone, Bellevue, Peoria, Ill. (Ask for No. B11-7)

CAPACITORS: 20-page cross index of C-D ceramic capacitors and equivalent types of 4 other suppliers lists over 830 types of capacitors and printed circuit units. Write for "Index CPX 654" to Cornell-Dubilier Electric Corp., 333 Hamilton St., South Plainfield, N. J. (Ask for No. B11-8)

PARTS AND EQUIPMENT: 1954-55 (19th) edition of Radio's MASTER catalog contains 1,440 pp. and lists over 85,000 items. Over 9,000 illustrations. Hard bound cover. Available from parts distributors at \$1.95 per copy. For a list of distributors who sell this buying guide, write United Catalog Publishers Inc., 110 Lafayette St., N. Y. 13, N. Y. (Ask for No. B11-9)

COMPONENTS: 24-page catalog lists a complete line of plugs, jacks, connectors, switches, terminals and hundreds of additional components and accessories, with detailed schematic dimensional diagrams. Herman H. Smith Inc., 2326 Nostrand Ave., Brooklyn 10, N. Y. (Ask for No. B11-10)

BACKGROUND MUSIC SERVICE: Colorful 12-page brochure describes a hi-fi system of continuous recorded music designed around pre-recorded magnetic tapes which provide 8 hrs. of music without repetition. Magnecord Inc., 225 W. Ohio St., Chicago 10, Ill. (Ask for No. B11-11)

OBTAIN THE BULLETINS

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

CAPACITORS: A 16-page combination inventory record and capacitor interchangeability chart available to dealers includes space for a 6-month inventory period and lists the major types of capacitors and their interchangeability factors. Also available is a 24-page catalog, J-8, listing all Pyramid capacitor products and their technical specifications. Write Pyramid Electric Co., 1445 Hudson Blvd., North Bergen, N. J. (Ask for No. B11-12)

New Books

OBTAINING AND INTERPRETING TEST SCOPE TRACES. By John F. Rider. Published by John F. Rider Publisher, Inc., 480 Canal St., N. Y. 13, N. Y. 192 pp. Paper cover, \$2.40.

As the title implies, this book concerns two functions; first, physically how to operate an oscilloscope and how to connect it into a given circuit, and second, how to interpret the waveform which results. It is not, strictly speaking, a course in servicing with the scope. The objective, rather, is to familiarize the technician with his scope and the simple and complex waveforms with which he ordinarily deals. (Ask for No. B-13)

HOW TO USE TEST PROBES. By Alfred A. Ghirardi and Robert G. Middleton. Published by John F. Rider Publisher, Inc., 480 Canal St., N. Y. 13, N. Y. 176 pp. Paper cover. \$2.90.

The subject of probes—those used with scopes, vtm's, and vom's—has, until now been covered largely by individual manufacturers. The claims, unfortunately, have been so exaggerated that technicians, in general, have become confused to the point where they no longer paid any attention to them. This book should clear the air.

The authors have separated the probes into four categories: high-voltage probes, isolation probes, rectifying probes and demodulator probes. In some cases, these are further subdivided into types of each. Instructions are provided for using each of these probes, with schematic diagrams and waveforms (in the case of scope probes); also, information on the internal construction of the probes and, in most cases, directions for building them from spare parts to be found around the shop. (Ask for No. B-14)

PICTURE BOOK OF TV TROUBLES. Prepared by the staff of John F. Rider Laboratories. Published by John F. Rider Publisher, Inc., 480 Canal St., N. Y. 13, N. Y. 80 pages. Paper cover. \$1.35.

First in a series of volumes devoted to servicing TV receivers through waveform analysis, this book deals with four types of horizontal afc-oscillator circuits—the synchrolok, synchroguide, phase detector-multivibrator, and phase detector-sine wave oscillator.

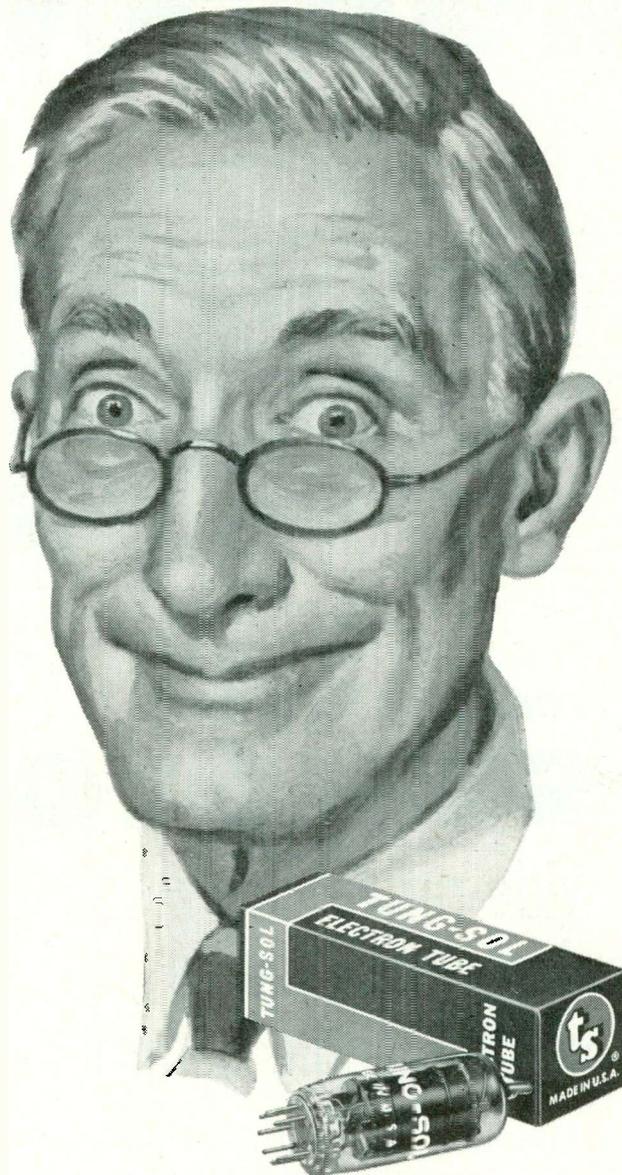
In each of these circuits, the authors have inserted stock troubles and then photographed the abnormal waveforms. The result is a collection of pictures and data which can prove a great time-saver to the TV technician. (Ask for No. B-15)

More Antenna "Specs"

File these additional listings with the master chart appearing in September TECHNICIAN. Also refer to earlier chart for code abbreviations.

Model Name or No.	Type	Channel Coverage	Signals Intended For	Special Features	List Price
ALL CHANNEL ANTENNA CORP. 47-39 49th St., Woodside 77, N. Y.					
Texan	9	2-83	M	SWI	27.95
Super 60	9	2-83	W	SWI	36.75
Riviera	9	2-83	VW	SWI	49.50
TENNALAB Quincy, Ill.					
5L7CQ to 5L13CQ ...	2	CSE, 7-13	VW	5 elem.	10.00
5L7X13Q	2	7-13	VW	5 elem.	15.00
5L2CQ to 5L6CQ ...	2	CSE, 2-6	VW	5 elem.	17.50-30.00
5L456Q	2	4-6	W	5 elem.	27.50
6213	8	2-13	VW(7-13), W(2-6)		29.95
6L2X6Q	2	2-6	W	5 elem.	32.50
12L2X13A	8	2-13	VW(7-13), W(2-6)	HFB	49.95
S7 to S13	2	CSE, 7-13	VW	72 ohms, SPC	50.00
S2 to S6	2	CSE, 2-6	VW	72 ohms, SPC	75.00-90.00

IT'S FUN TO STAY UP WHEN YOU HAVE SUCH GOOD, CLEAR RECEPTION



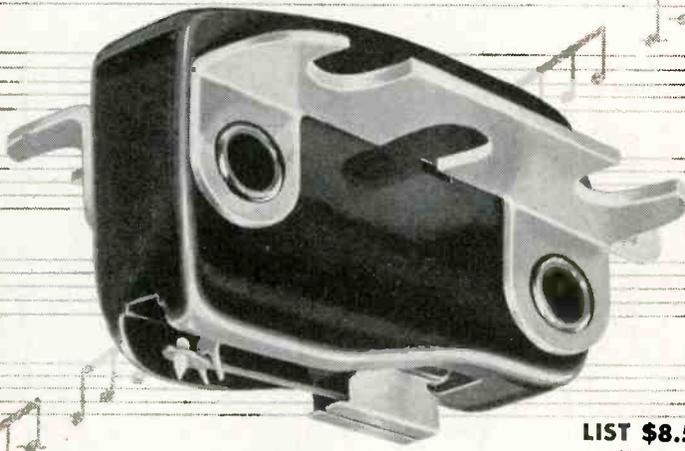
The Tung-Sol Tubes you get from your wholesaler are the same high quality tubes used by leading radio and TV set manufacturers. You'll be giving customers like me the best possible service when you replace with Tung-Sol Tubes.

TUNG-SOL® dependable TUBES—DIAL LAMPS

TUNG-SOL makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.



NEW!



LIST \$8.50
sapphire needle

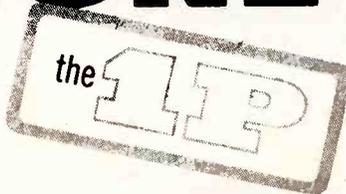
... another first from

SONOTONE

wide-range

high-compliance

single-needle ceramic cartridge



Here at last is a high fidelity cartridge at a moderate price,
available in either of two needle sizes —
one for 45 and 33 $\frac{1}{3}$ rpm, the other for 78 rpm.

Performance is at the same high level as the world-famous
Sonotone "Turnover."

Send coupon for free bulletin showing the exceptional specifications
of this new cartridge.

ELECTRONIC APPLICATIONS DIVISION

SONOTONE CORPORATION

Elmsford, New York

SONOTONE CORPORATION, DEPT. T
ELMSFORD, N. Y.

Please send me free bulletin describing your new 1P Cartridge.

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ADDRESS _____ APT. _____

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News of the Industry

Douglas H. Carpenter, chief antenna engineer for JFD Mfg. Co., Brooklyn, N.Y., was selected chairman of the RETMA R-17 Antenna Committee for a one year term. As chairman, Mr. Carpenter will be responsible for improving antenna standards and measurement techniques.



Douglas H. Carpenter



B. V. K. French

B. V. K. French is the new service manager at I.D.E.A. Inc., Indianapolis, in charge of all technical writing and correspondence on service problems. Prior to this appointment at Regency, Mr. French had been on the field engineering staff of the F. W. Sickles Div., General Instruments Corp. He is a fellow of the Radio Club of America and a senior member of the I.R.E.

Seymour Reich has been promoted to general service manager, in charge of both the radio and TV service departments, at the N.Y. division of the Zenith Radio Corp.

William H. Henrich, former chief development engineer for Sorenson & Co. Inc., has been named asst. general manager in charge of production and sales at Condenser Products Co., division of New Haven Clock and Watch Co.

Carrol W. Hoshour has joined Mag-record Inc. as products manager. He will be responsible for sales engineering, quality control, product service and technical sales promotion for all divisions of the company.

Albert J. Frankel, purchasing agent at CBS-Columbia, has assumed the position of vice-pres. in charge of purchases, following the resignation of M. A. Gardner.

Harold J. Adler resigned from Guthman & Co. to become chief engineer in charge of color TV development at Lion Mfg. Co., Chicago.

Dr. Leonard C. Maier was appointed manager of engineering at the G.E. Cathode-Ray Tube Sub-Department.

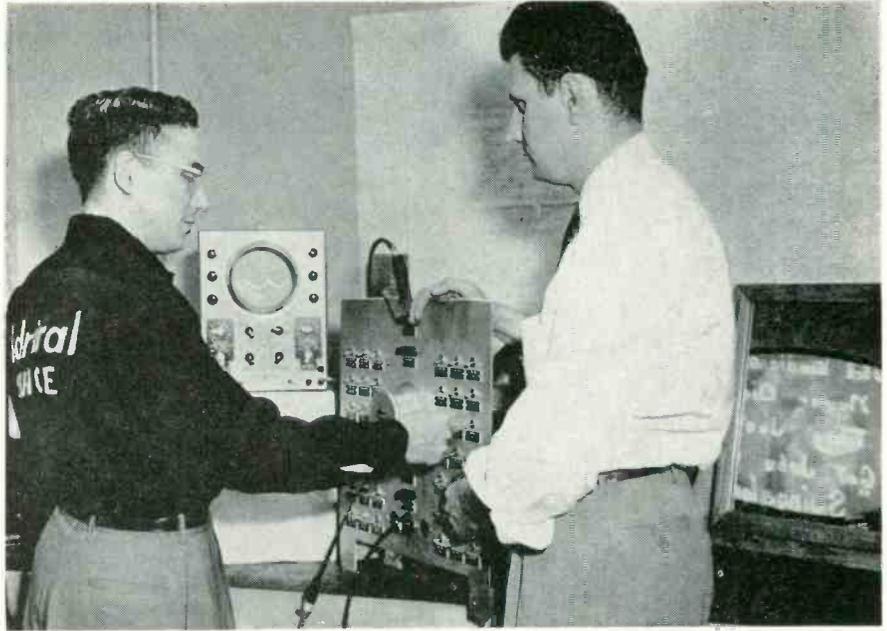
C. D. Vannoy has joined International Resistance Co., Phila. as controller, and member of its operating committee.

Muzak Corp. of N. Y. background music firm, has initiated a lawsuit against a Yonkers, N. Y. restaurant to enjoin them from making use of its copyrighted music emanating from a N. Y. FM station. At issue is whether non-licensed establishments can install devices to eliminate commercials and thus utilize copyrighted musical selections for which Muzak licenses its customers.

First meeting of the Florida Electronic Distributors Assoc. (FEDA) in Miami was attended by 19 jobbers. Plans call for signing up all distributors in the state. Acting chairman is Harvey Herman of Herman Radio Supply, Miami . . . C. Robert Ingram Inc. of Oklahoma City has been appointed a distributor of Du Mont television receivers . . . Robt. Steindler and Edmond Ariessohn have joined the sales staff of Hudson Radio & TV Corp., N.Y.C.

JFD is packaging their new "Roto-King" rotator in an attractive carrying case suitable for either window or counter display. . . . The Walsco 99 Line of hardware and chemicals is being marketed in a new merchandising display which features sliding drawers with automatic feeding and eye level presentation. Housing is black and gold with wrought-iron legs. . . . Price reductions of \$10.00 are announced by Alliance on all models in their Tenna-

TELEVISION TROUBLE-MAKER



'Dynamic Illustrator' TV receiver, shown at Admiral's national service dept., inserts any one of 21 stock TV troubles at the flick of a switch. Additional switches permit observing the troubles on a scope. Rig was put together by Admiral service engineers for their training schools.

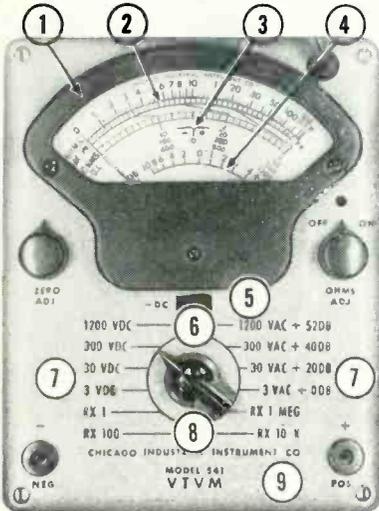
Rotor line. Aim is to fight the sales resistance brought on by the cut in TV prices. Outlay for antenna installation and rotator was approaching the cost of the TV receiver in many areas.

Peoria Telematic Co., 107 N. Glendale, Peoria, Ill. and Consolidated Music Systems, 1442 Walnut, Cincinnati, Ohio have been named distributors for Magnecord background music services.

HI-FI RADIO TV

MODEL 541 VTVM

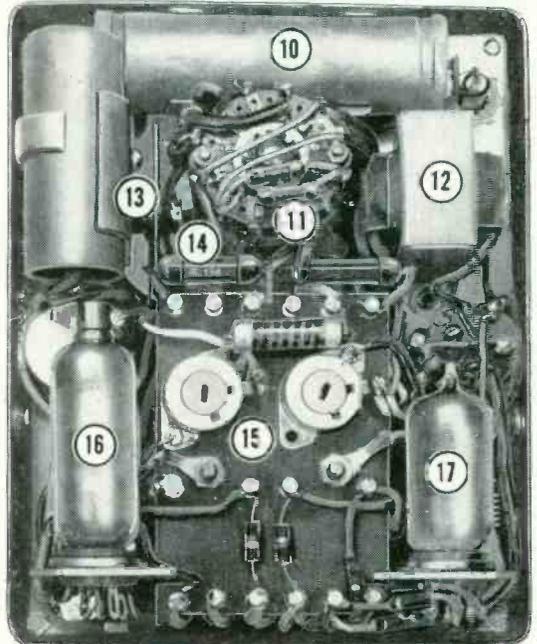
- 1—High-torque meter, cupped jewels. No sluggish pointer. No tapping. Electronic burnout protection.
- 2—Peak volts scale for audio, sawtooths, square waves. (Not peak-peak.)
- 3—TV sound and FM radio alignment with center zero.



5/8 by 6 1/8 by 3 1/2 inches. Weighs only 3 1/2 pounds.

- 4—Decibels. Range ratios on panel.
- 5—Polarity reverse for d-c volts.
- 6—One selector knob for all ranges, all functions. No mix-ups.
- 7—Voltage ranges, both DC and AC. Zero to 3—30—300—1200 volts.
- 8—Ohms. 1/8 ohm to 1000 megohms.
- 9—Bakelite case. Aluminum panel. No shorts to bench or chassis.
- 10—AC volts unaffected by DC in same circuit. 2 1/2 kv input capacitor.
- 11—DC input 11 megs. AC 8 megs and 60 mmf. All range resistors 1%.
- 12—No overheating if left on all day. Less than 7 watts from line.
- 13—No battery to run down. Rectifier-filter for all ohms ranges.
- 14—Long time constant. 96 1/2% of peak amplitude at 15 cycles/sec.
- 15—Accessible test points and adjusters. All service data supplied.
- 16—TV type rectifier. 18 kv peak.
- 17—TV type twin triode in bridge circuit. Good frequency response.

Factory built, tested, calibrated. Priced in the range of kits. \$33.00 net.

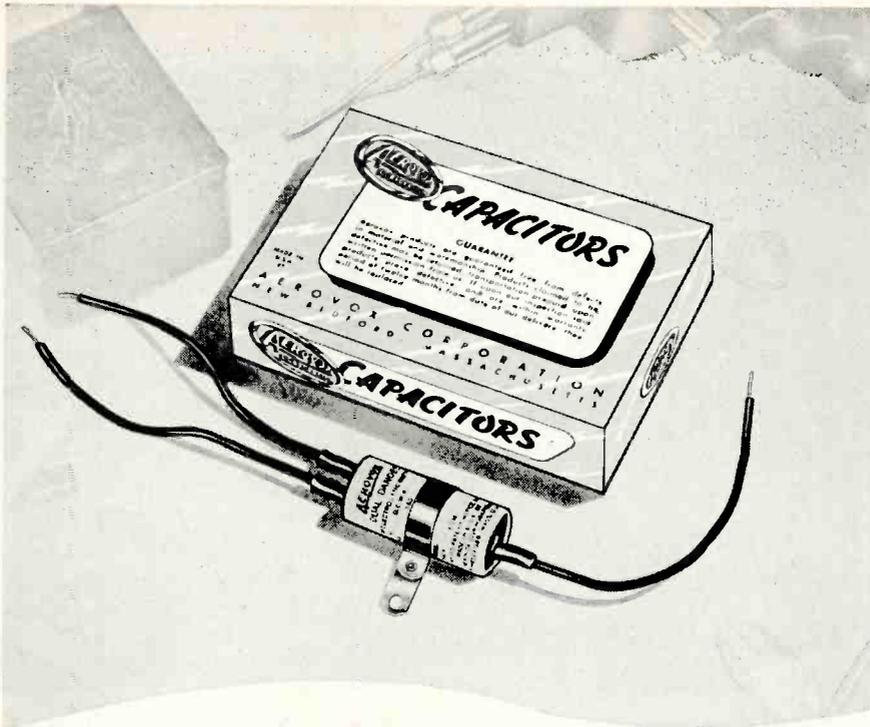


See the "541" at your distributor's. For the story of VTVM's and what they can do, write to

CHICAGO INDUSTRIAL INSTRUMENT CO.

536 West Elm St.

Chicago 10, Ill.



Serving the Service Trade Still Better

OPERATION "ANYWHERE"



Convinced that TV antennas could best be sold by actual field demonstrations, American Screen Products Co. of Miami outfitted this mobile unit with their Unicorn antenna, a telescoping mast, TV receiver and field strength meter, and sent it out to roam the Florida Gold Coast. The result—discovery of brand new TV fringe areas, and valuable data for local servicemen and TV engineers

ULTRA-HIGH FIDELITY AM-FM radios, manufactured by Grundig Radio GMBH, Fuerth, Germany, will hit the market in a short time. They are being sold through Majestic International Corp., Chicago, under the trade name "Grundig-Majestic International." . . . "HOLIDAY ON ICE," touring ice extravaganza, has special music and vocal effects created by the Cyclosonic, a unique audio control console designed by Altec Service Corp. Special twin tape recording and reproduction system blends live and record music throughout the performance.

Transistor Pocket Radio

The first commercial adaptation of the transistor to a radio is claimed by Regency. Model TR-1, which measures 3 x 5 x 1 1/4 in. and weighs less than 12 oz. should be on the market right now at \$49.95.



The circuit includes 4 grown junction n-p-n transistors (1 mixer-oscillator, 2 i-f amplifiers, 1 audio amplifier), 1 germanium detector and a tiny 22 1/2-v. battery.

Low drain permits the use of a miniature battery that has long life. The demands of extreme miniaturization required the collaboration of several organizations on component design, including Texas Instruments (transistors), Jensen Mfg. (speaker), Vokar (i-f xformer), Chicago Tel. (vol. control), Radio Condenser (tuning condenser), Centralab (ceramic caps).



The
ASD
TELEVISION
Tube Tester

NET \$124.50

MODEL TV-20

HERE IT IS

- NO ROLL CHART
- PRACTICALLY NO SET-UP
- 20 CONNECTED SOCKETS
- LARGE 4 1/2" METER
- HIGH GAS SENSITIVITY

The tube tester designed especially for the television serviceman. With this tester you can test an entire set of TV tubes in a few minutes. This means less time spent per job, more profit, more tube sales and fewer call-backs.

Write for Details or See Your Distributor.

Developed and Manufactured by
AMERICAN SCIENTIFIC DEVELOPEMENT CO.

334-336 S. Main St., Ft. Atkinson, Wisc.

TV TUNE-UP is theme of new drive by the Tube Division, RCA. A national advertising campaign, supported by direct-mail, is pushing the idea of a fall check-up as preventive maintenance for home receivers . . . **AGE OF CHIVALRY** was revived by fun-loving officials of the Assoc. of Electronic Parts and Equipment Mfrs. in observing the election of Helen Staniland Quam to her 18th consecutive annual term as treasurer. To avoid any mistaken estimates of her age, in view of her long tenure in office, they officially proclaimed that Mrs. Quam "was a mere infant" when elected to her first term, and declared her to be 18 yrs. old for the duration of her term of office."

5,000,000TH INDOOR ANTENNA manufactured by JFD Mfg. Co., Brooklyn, N. Y. was observed with the presentation of a special gold-plated version to Julius Finkel, president and founder of the firm . . . **FIRST ISSUE** of "International News," a 6-page newspaper for foreign distribution, was recently announced by Raytheon Mfg. Co. Aim of the new publication is to maintain closer contact with Raytheon customers throughout the world. . . .

20TH ANNIVERSARY



Carl Goudy (l), board chairman of the Technical Appliance Corp. (TACO), Sherburne, N. Y. receiving wrist watch presented by the organization on its 20th anniversary, from A. C. Lescarboua, advertising counsel. Other Taco execs and sales reps look on.

BRUNO-NY is distributor in the N. Y. area for Espey Mfg. Co.'s new "Overture" Hi-Fi Phonograph Reproducer, speaker-amplifier unit which lists at \$59.95. All-State Distributors Inc., of Newark, are handling the line in New Jersey.

HAVANA BOUND



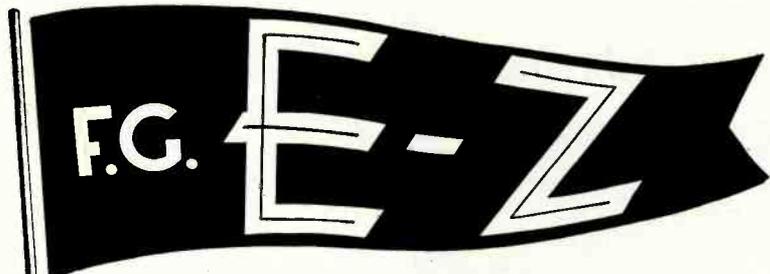
Roy Lake (l), general mgr. of Jontz Mfg. Co., Mishawaka, Ind., TV mast mfrs., tells Bob Eshelman of Radio and TV Distr. Co., Kokomo that he has won a 2-week, all-expense paid vacation in Havana. Looking on is Betty Moss.

KESTER

Since the most important single step in Radio-Television Servicing is soldering . . . it's just plain good sense to use the best — **KESTER SOLDER** . . . Key Name in Solder for More Than 50 Years.

KESTER SOLDER COMPANY
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SOLDER



ROOF MOUNT

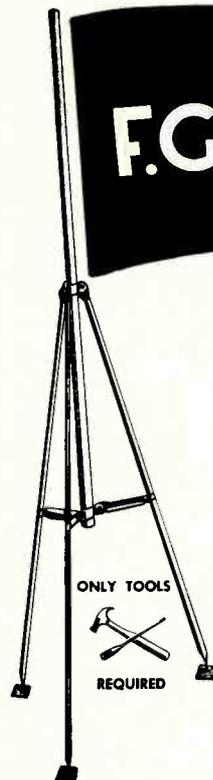
Completely pre-assembled — including mast, Standoff and Parker-Kalon hardened screw nails in package.
Sealing compound permanently affixed to the adjustable feet.

Screwdriver and hammer only tools required for installation. Made of steel with rustproof zinc finish. Adaptable to most roofs. Self-supporting at all times during installation.

NO GUY WIRES

TECHNICAL DATA

	E-Z-5	E-Z-9
Overall height	5 ft.	9 ft.
Mast diameter	1 inch	1 1/4 inches
Span of feet	22 inches	32 inches
Unit pack	1	1
Master Package	12	6
Approximate shipping weight/Unit	4 lbs.	8 1/2 lbs.



SOLD ONLY THROUGH AUTHORIZED DISTRIBUTORS

A Few Territories Still Available

FRETZ, GROSS COMPANY

MANUFACTURING IN PHILADELPHIA, PENNA. SINCE 1895.

You Can Solve Your Problems in Handling

VHF and UHF

TV SIGNAL AMPLIFICATION

CHANNEL CONVERSION

TV SIGNAL DISTRIBUTION

**Easily...
Effectively...
Economically!**

USE THIS HANDY COUPON

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Dept. VL-18, Westfield, New Jersey

Please send me the following FREE Literature:

- The B-T 'Add-A-Unit' Master TV System
- 'Add-A-Unit' Installation Manual
- TV Calculator
- UHF Converters

Name _____

Address _____

City _____ Zone _____ State _____

Vacuum-Tube Voltmeter

(Continued from page 23)

tacts are another source of trouble on the *Ohms* and *AC Volts* functions; jumpers may be used for checking suspected contacts.

Fig. 3 shows how jumpers may be used to make a continuity tester from the mechanical meter movement of one fairly typical vtvm. While the set-up is based on the RCA model 195, it suitably illustrates the arrangement that can be worked out easily with most types. The symbol X indicates points where existing connections inside the vtvm must be severed in order for the tester to work properly. Alternatively, the meter leads may be disconnected, and the mechanical meter may be used in conjunction with a battery in series with a potentiometer to make up a simplified tester. Choose a pot whose value is about 20 or 25k. Be sure that you have not cut out too much of the resistance of the pot before using it, or you may bang the meter. To avoid the last-mentioned possibility, it is a good idea to use, in place of the single pot, a fixed resistor of about 10k and a pot of about the same value, if available.

Antenna Installation

(Continued from page 20)

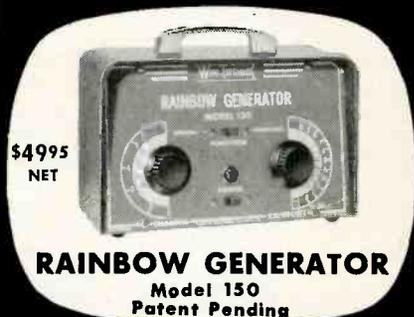
(h) If manufactured television towers or mast are used, they shall be installed according to manufacturers' specifications, provided such television towers meet all the minimum requirements of this ordinance.

(i) Whenever an antenna is installed near power lines, or where damage would be caused by its falling, a separate safety wire of eight (8) gauge galvanized wire must be attached to the cross-arm of the antenna, and secured in a direction away from the hazard. When turnbuckles are used, they must be secured by a safety wire. Guy wires shall clear all electric wires by at least twenty-four (24) inches. Every antenna mast must be adequately grounded for protection against a direct stroke of lightning, with an adequate ground wire.

(k) Masts and antennas shall be of noncombustible materials.

NEW PRODUCTS BEGIN ON PAGE 34

**'COMPLETELY
SERVICE...
COLOR TV
with only two
NEW instruments!**



\$4995
NET

RAINBOW GENERATOR

Model 150
Patent Pending

NEW CIRCUITS incorporated in this instrument greatly simplify the TEST and ALIGNMENT of color TV circuits. NEW LINEAR PHASE SWEEP produces the COMPLETE PHASE RESPONSE CURVE, assuring greater accuracy with faster alignment and elimination of color bar drift problems.

APPLICATIONS

- MASTER PHASE CONTROL test and alignment
- CHROMA DEMODULATOR test and alignment (either I/Q or R-Y/B-Y)
- QUADRATURE TRANSFORMER test and alignment
- MATRIX CIRCUIT test and alignment
- BURST AMPLIFIER test and alignment
- PHASE DETECTOR CIRCUIT alignment for reference oscillator
- REACTANCE CONTROL and REFERENCE OSCILLATOR adjustment
- 3.58 MC TRAP alignment
- TROUBLESHOOTING and PHASE ALIGNMENT in the home by picture patterns.



\$7995
NET

WHITE DOT GENERATOR

Model 160

THE WHITE DOT GENERATOR ENABLES COMPLETE ALIGNMENT OF ALL COLOR CONVERGENCE CIRCUITS PLUS SWEEP CIRCUIT LINEARITY AND SIZE, AS WELL AS GENERAL TROUBLESHOOTING BY SIGNAL TRACING.

APPLICATIONS

- DYNAMIC CONVERGENCE—vertical and horizontal test and adjustment
- DC CONVERGENCE—test and adjustment
- DEFLECTION COIL—positioning for best convergence
- BEAM MAGNETS—alignment for best convergence
- DYNAMIC PHASE ADJUSTMENT—vertical and horizontal
- FOCUS—test and adjustment of DC and dynamic focus
- TROUBLESHOOTING of all circuits affecting convergence
- LINEARITY—test and adjustment of horizontal and vertical sweep linearity

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BUILD Professional Finished CABINETS
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Used in Many
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The Widney-Dorlec Cabinet System, consisting of a series of pre-fabricated, dural die-cast corners, extruded dural sections and other special components, now makes it possible to build modern, fully-radiused cabinets to any set of dimensions without special tools!

For Free Catalogue & Price List, write Dept. T 11
BRITISH INDUSTRIES CORPORATION
 164 Duane Street New York 13, N. Y.

"Tough Dog"

(Continued from page 33)

oscillator control changed the pitch of the beat.) Opening the degenerative feedback loop at point 2 eliminated the trouble completely.

Tracing back along this lead to the output transformer secondary, and thence to the speaker, it was found that the latter had been recently re-coned. Hanging onto this faint clue, the leads were disconnected from the speaker and connected to a speaker matching setup in the shop. It was now found that the trouble occurred at some output impedance settings and not at others (the feedback loop was re-instated for this test). Since no normally-operating amplifier would become so unstable with a slight output impedance change, it was decided to look further.

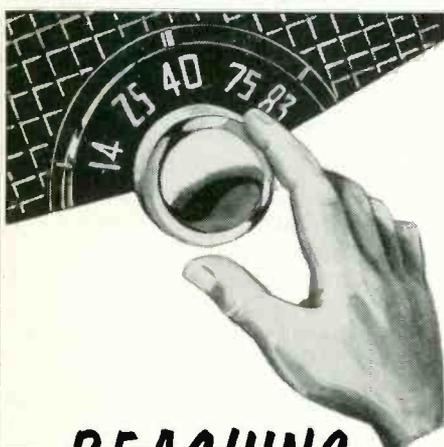
Needless to say, every bypass and coupling capacitor was shunted temporarily with good units, as were the filters, to eliminate the possibility of feedback through the power supply. Opening one lead to C_p intensified the difficulty; replacing it with a good capacitor cured the trouble, except for a setting at the very top of the control. On checking the old C_p , it was found to have a high power factor, equivalent to placing a resistance in series with it, which drastically reduced its bypassing effect for the spurious high frequencies present in the set. This meant that the reflected impedance from primary to secondary of the output transformer was higher than normal at these frequencies, and consequently the voice coil winding presented more than the normal impedance to them.

The defect in C_p also had the effect of shifting the signal phase at these frequencies in the feedback loop, so that a certain amount of regeneration was being applied to the cathode of the 6AV6 1st audio tube. A higher-than-normal speaker cone impedance aggravated this condition.

Changing the 47-ohm resistor in the feedback loop to 100 ohms wiped out what little oscillation still remained when the re-coned speaker was connected back.—M. G. Goldberg, St. Paul, Minn.

California Plants Merge

Clear Beam Antenna Corp. and the Tempo TV Sales Corp. have announced the merger of their operations and the opening of a new plant at 21341 Roscoe Blvd., Canoga Park, Calif. The new organization will employ approximately 225 persons. The production goal is 12,000 antennas and 3,000 telescoping masts per day.



REACHING—

FOR BRAND NEW TV THRILLS

WITH THE

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UHF CONVERTER

More programs . . . more variety . . . more pleasure—from ANY TV set new or old. Choice of Granco models for any purse and purpose. Granco means more for less money!

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Buy Direct
 from manufacturer to you

TV ANTENNAS
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 The Basic Principles—Construction—Installation—Operation—Repairs—Trouble Shooting. Shows How to get Sharp, Clear T.V. Pictures. Install Aerials—How to Test. Explains Color Systems, Methods of Conversion, Terms, etc. Includes Ultra High Frequency (U.H.F.)—Valuable for Quick Ready Reference & Home Study. Tells How to Solve T.V. & Radio Troubles—Answers Your Questions.

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FLY-BACK INTERVAL & INDUCTANCE CHECKER

AT A GLANCE!



NO DISCONNECTING NECESSARY

EXCLUSIVE **SECO** FLY-BACK INTERVAL CHECKER

MAKE THIS 3 WAY CHECK:

1. Fly-back interval (Exclusive Feature!)
2. Checks flyback transformers individually.
3. Checks yokes individually.

See your Jobber or write for literature and prices.

SECO MFG. CO. 5015 PENN. AVE. S. MINNEAPOLIS, MINN.

CLEAR TV PICTURE PERMANENT INSTALLATION—

WITH A

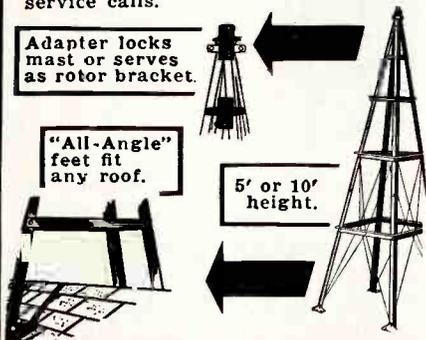
WINPOWER TV TOWER

Permanent, one-man tower erection—fewer guy wires—no special tools. Offer better reception at lowest cost—eliminate mounting troubles and service calls.

Adapter locks mast or serves as rotor bracket.

"All-Angle" feet fit any roof.

5' or 10' height.



WRITE FOR FREE FOLDER TODAY!

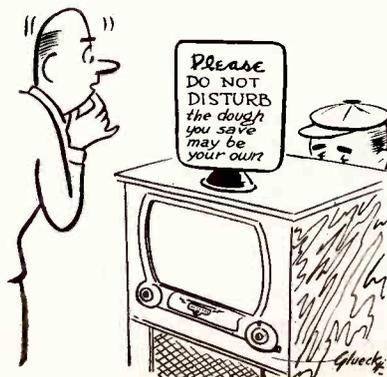
WINPOWER
NEWTON, IOWA

Electronic Photo Timers

(Continued from page 30)

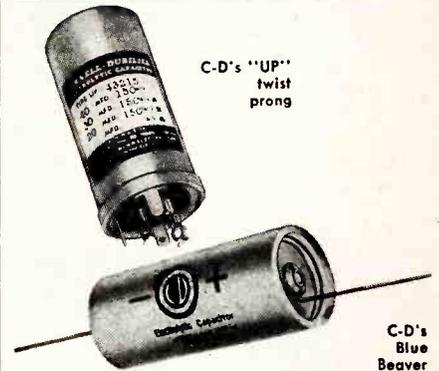
across the capacitor has risen to 55 v, an increase of 25 v, instead of the 30 v gained in the first period. Now there is only 45 v difference of potential between the capacitor and battery. At the end of the 3rd .1 second interval, the voltage goes up only 15 v to 70 v. Each interval, then, raises the voltage across the condenser less than the one before it. Because of this decreasing difference between the charging voltage and that present across the capacitor, the rate of charging, or slope of the charge curve, becomes more and more gradual.

The circuit action is similar, but in reverse, during C's discharge. By throwing the toggle switch (Fig. 1) to the left, or START position, the capacitor may be discharged through one of a series of resistors, although only one resistor is shown in the sketch. The greatest drop in voltage takes place during the 1st interval of time, tapering off in each interval thereafter, as shown in Fig. 2. The time constant in this case is the number of seconds it takes for the voltage to drop to 37% of its original value. A 5 meg resistor and a 1 mfd capacitor will have a time constant of 5 seconds, which means that a capacitor of the value cited, when initially charged to 100 v, will take 5 seconds to discharge through a 5-meg resistor to 37 v. Of course, if the capacitor has an internal resistance, as all electrolytics do, the resistance of the capacitor, in parallel with that of R, must be substituted for the value of R to obtain the correct time constant. For timing purposes, either very good paper capacitors or oil-filled types are used, so that only resistances selected for the timing intervals need be considered.



WHY LOOK HIGH AND LOW?

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No matter what you need in electrolytic capacitors—C-D has it. Every type, shape and rating... all of consistent high quality proven by outstanding field performance. C-D capacitors are always reliable... and readily available—because Distributors who know, carry the complete Cornell-Dubilier line.

Free! TV Capacitor "Replacement Guide"—and C-D Twist Prong Cross Index from your C-D Distributor. He's listed in your local Telephone Directory.

CONSISTENTLY
CORNELL-DUBILIER
DEPENDABLE
DUBILIER



THERE ARE MORE C-D CAPACITORS IN USE TODAY THAN ANY OTHER MAKE.

PLANTS IN SO. PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY, RADIART CORP., CLEVELAND, OHIO.

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TELTRON TUBES**

**GUARANTEED
LOWEST PRICE EVER!**

GIFT OFFER! One 6BG6G Tube will be shipped FREE with any order accompanying this ad.

All tubes individually boxed and unconditionally guaranteed for one year.

1A7GT .53	6A1S .96	6F6 .42	12A27 .65
1H5GT .51	6AK5 .96	6F5GT .44	12B4 .72
1L4 .51	6AL5 .43	6H6 .50	12BA6 .46
1L6 .49	6AR5 .48	6I5GT .49	12BA7 .58
1LC6 .49	6ARS .48	6K6GT .39	12BE6 .46
1N5GT .51	6AT6 .37	6L6 .78	12BH7 .61
1R5 .51	6AU5GT .60	6S4 .41	12BZ7 .63
1T4 .51	6AV5GT .60	6S8GT .65	12K7 .40
1U4 .51	6AX4GT .60	6SA7GT .45	12SL7GT .60
1U5 .43	6AX5GT .60	6SK7GT .45	12SN7GT .56
1X2 .65	6BA7 .58	6SL7GT .60	19BG6G 1.48
2A3 .35	6BC5 .48	6SQ7GT .38	19T8 .71
2A7 .53	6BE6 .46	6U8 .76	25BQ6GT .82
3Q4 .53	6BF5 .48	6V3 .80	25Z5 .55
3Q56T .61	6BF6 .48	6V6GT .53	25Z6GT .36
3S4 .48	6BG6G 1.18	6W6GT .53	35B5 .48
3V4 .48	6BK5 .75	6X4 .37	35C5 .48
5V4G .49	6BJ6 .51	6X5GT .38	35W4 .33
5Y3GT .30	6BH6 .51	6X8 .80	35Y4 .42
5Y4G .40	6BK7 .78	7F8 .49	35Z5GT .33
5Z3 .42	6BL7GT .78	7H7 .49	50A5 .49
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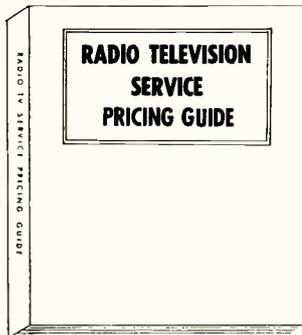
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HOFFMAN CHASSIS 407-21

Symbol No.	Rating μF @ WVDC	Hoffman Part No.	Sprague Replacement
C105	5 @ 50	4174	TVA-1303
C112	140+40 @ 150/50+30 @ 50	4270	TVL-4408
C605			
C802			
C804			
C113	100+20+10 @ 300	4275	TVL-3584
C706			
C803	10 @ 600	4253	R-1222
C608	140 @ 150	4245	TVL-1428
C801			

MAGNAVOX CHASSIS 250

Symbol No.	Rating μF @ WVDC	Magnavox Part No.	Sprague Replacement
C413	10 @ 350	270027-23	TVA-1604
C501	70+40+10 @ 350/50 @ 50	270021-52	{ TVL-3792 TVA-1308
C502	30+5 @ 350/100 @ 200	270021-55	TVL-3762

PHILCO CHASSIS 350

Symbol No.	Rating μF @ WVDC	Philco Part No.	Sprague Replacement
E1	30 @ 475/130+10 @ 350/ 10 @ 300	30-2584-1	{ TVL-4826 TVA-1638
E2	2 @ 50	45-3035-4	TVA-1301
E3	40 @ 400	30-2568-62	TVA-1712

SENTINEL MODELS 1U-901 etc.

Symbol No.	Rating μF @ WVDC	Sentinel Part No.	Sprague Replacement
C132	200+5 @ 150	B157836-1-3	TVL-2444
C138	20 @ 450	B157903-1-2	TVA-1709
C139	200 @ 300	B158557-1-1	*TVL-3585
C140	140+5 @ 300/200+ 30 @ 150	B157838-3-1	R-1553

* Note—Parallel sections to obtain desired capacity.

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TRAV-LER CHASSIS 510A4

Symbol No.	Rating μF @ WVDC	Trav-ler Part No.	Sprague Replacement
EC-16	40+40 @ 450	TV-EC-16	TVL-2764
EC-17	40 @ 450/50 @ 50	TV-EC-17	{ TVA-1713 TVA-1308
EC-20	10 @ 50	TV-EC-20	TVA-1304
EC-25	30 @ 450/50 @ 200	TV-EC-25	{ TVA-1711 TVA-1713
EC-27	100 @ 25	TV-EC-27	TVA-1207
C87 } R79 }	Integrator Network	TV-CC-26	V-1

ADMIRAL CHASSIS 20AX5

Symbol No.	Rating μF @ WVDC	Admiral Part No.	Sprague Replacement
C205	4 @ 50	67A4-9	TVA-1303
C211	60+40 @ 350/60 @ 200/ 20 @ 150	67D15-23	TVL-4609
C212	80 @ 350	67D15-64	TVL-1630
C409	80 @ 350/100 @ 50	67D15-22	*TVL-3722

* Note—Omit 20 μF section.

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