RADIO · TELEVISION · ELECTRONIC

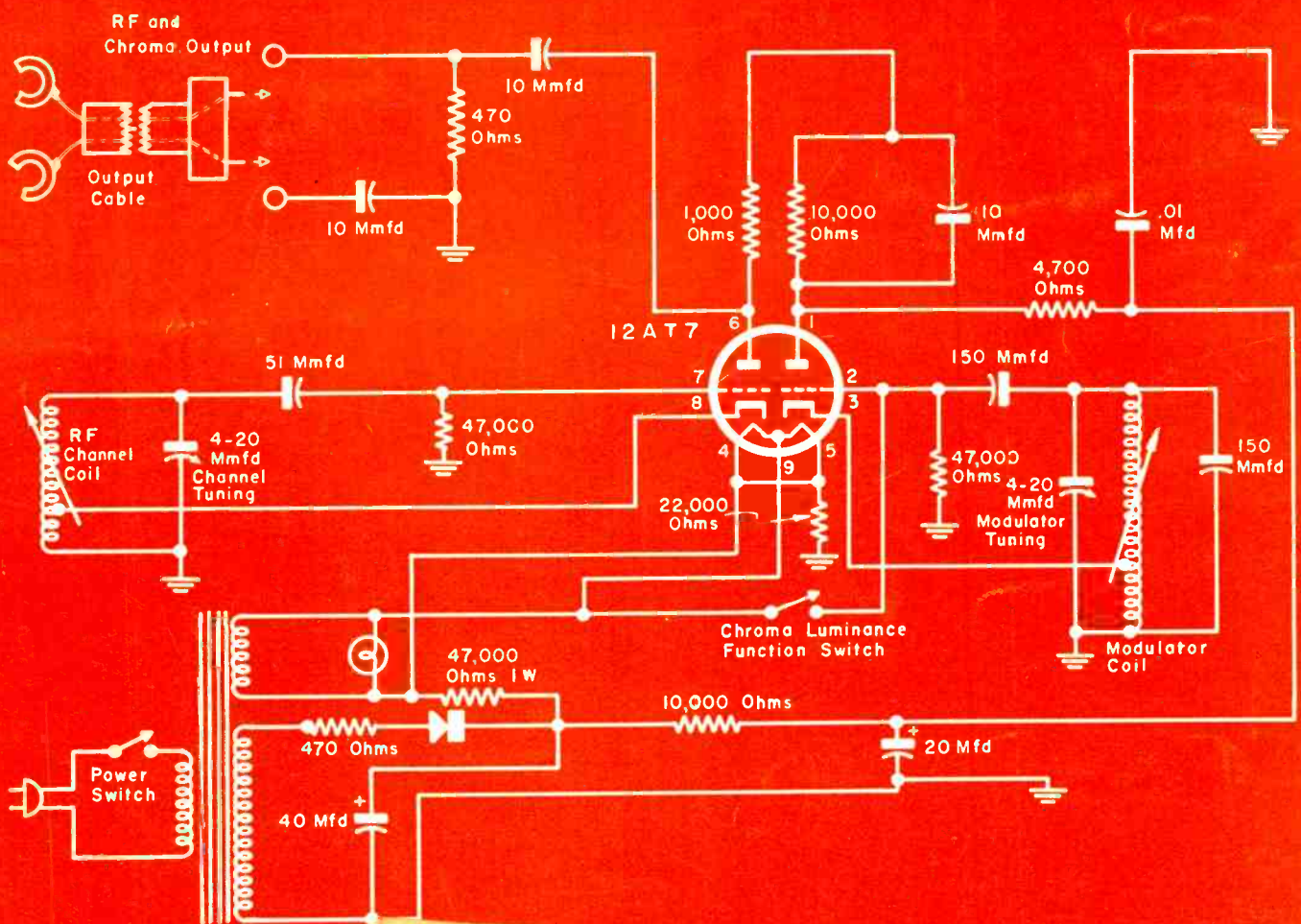
SERVICE

VOL. 23

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

NOVEMBER 1954

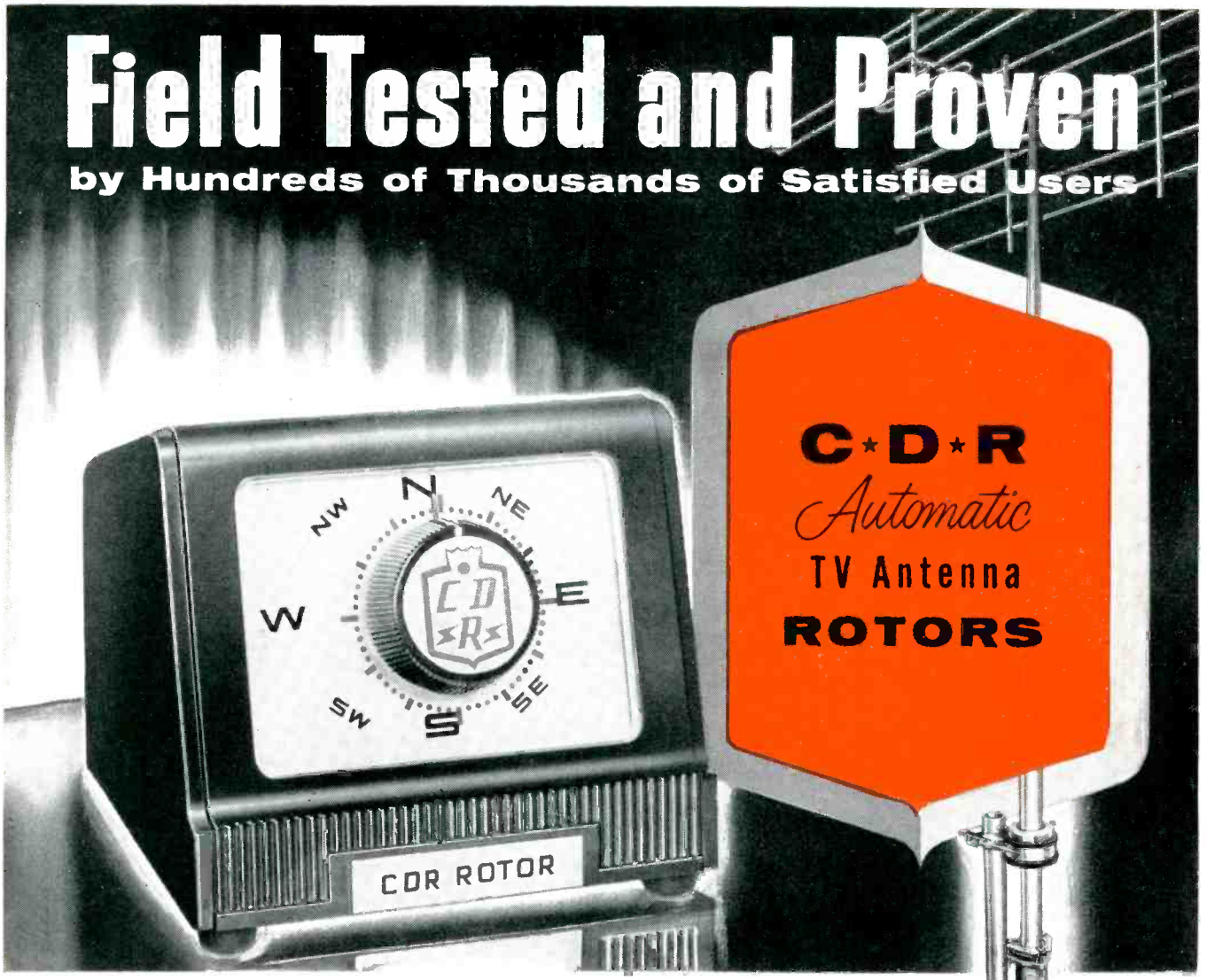
In This Issue: AUDIO FORUM



...matic of color pattern generator ... relative linear phase sweep ... circuit analysis, this issue.

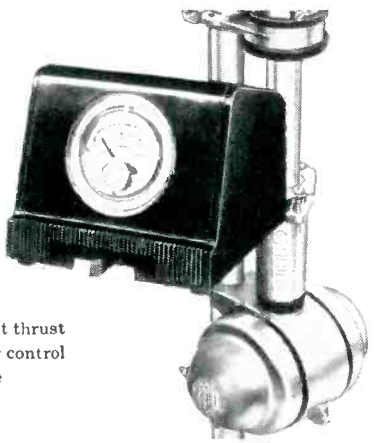
Field Tested and Proven

by Hundreds of Thousands of Satisfied Users



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

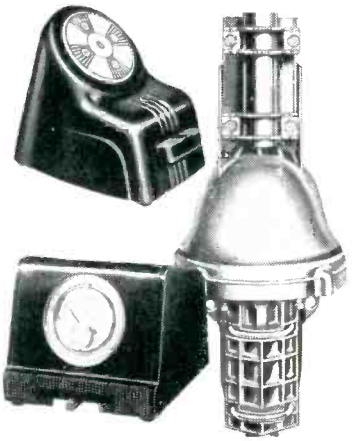


model TR-12

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

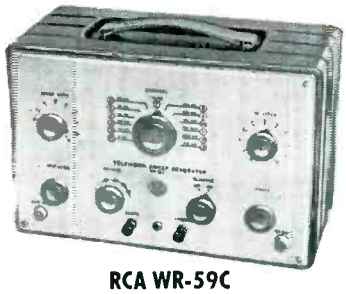
The heavy-duty rotor complete with handsome, modern design cabinet with meter control dial, uses 4 wire cable.

CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

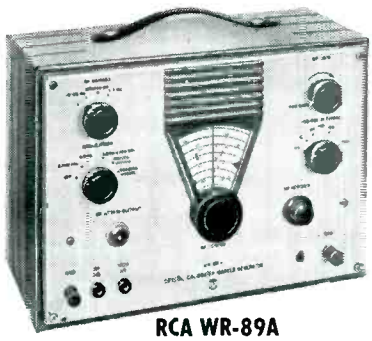
THE **RADIART** CORP.
CLEVELAND 13, OHIO

Your Best Buy

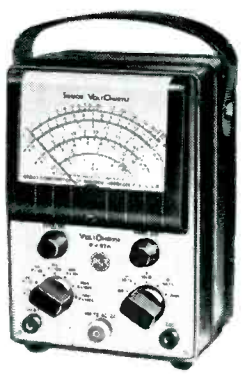
for BLACK-and-WHITE ...and COLOR TV!



RCA WR-59C
Television Sweep Generator



RCA WR-89A
Crystal-Calibrated Marker Generator



RCA WV-97A
Senior VoltOhmyst®

In color receivers, all of the color information is contained in the region from about 2 Mc to 4.1 Mc on the over-all rf-if response curve, as shown in Fig. 1. Any loss of gain in this region will weaken the color signals. If the loss is appreciable, it may result in such effects as poor color sync, poor color "fit" (incorrect registration of color and brightness information on the kinescope), or cross-talk or color contamination between I and Q channels.

The rf-if amplifiers must be aligned correctly to provide flat response for modulating frequencies up to 4.1 Mc. *The RCA WR-59C Sweep Generator and WR-89A Marker Generator provide the flatness of sweep output and crystal accuracy essential for aligning color circuits.*

In color receivers, there are a number of video-frequency sections, including the video amplifier, the bandpass amplifier, the demodulator channels (see Figures 2, 3, 4), and the green, red, and blue matrix networks—including the adders and output stages. A flat video sweep extending down to 50 Kc is a necessity in checking or aligning the tunable bandpass filter and the I and Q filters. *Late model RCA WR-59C Sweep Generators provide a flat video sweep extending down to 50 Kc. They also cover all rf and if ranges required for both color and black-and-white receivers.*

Get full details today from your RCA Distributor.

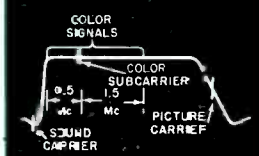


Fig. 1.
RF-IF Response

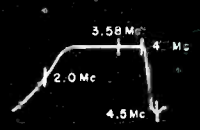


Fig. 2.
Bandpass Filter Response

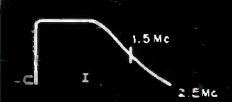


Fig. 3.
I Channel Response

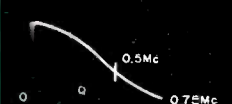
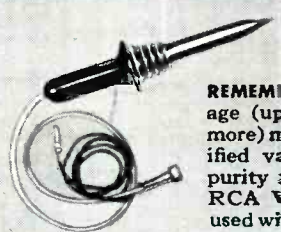


Fig. 4.
R-Y, B-Y, or Q Channel Response



RCA WG-289
High Voltage Probe

REMEMBER that the high voltage (up to 30,000 volts and more) must be set to the specified value before adjusting purity and convergence. The RCA VoltOhmysts can be used with the RCA High Voltage Probe (WG-289 and WG-206 Multiplier Resistor) to measure dc voltages up to 50,000 volts.

Now off the press — RCA's new enlarged 2nd edition of "Practical Color Television for the Service Industry." Price: $2.00 — from your RCA distributor.

RCA RADIO CORPORATION of AMERICA
TEST EQUIPMENT HARRISON, N. J.

Vol. 23, No. 11

RADIO · TELEVISION · ELECTRONIC

SERVICE

November, 1954

LEWIS WINNER
Editor

B. BLOCK
F. WALEN
Assistant Editors

Including SERVICE—*A Monthly Digest of Radio and Allied Maintenance*; RADIO MERCHANDISING and TELEVISION MERCHANDISING. Registered U. S. Patent Office.

CIRCUITS

COVER

Manufacturers

Published monthly by Bryan Davis Publishing Co., Inc.

52 Vanderbilt Avenue, New York 17, N. Y. **Telephone: MUrray Hill 4-0170**

Bryan S. Davis, Pres. F. Walen, Sec. John Iraci, Adv. Mgr. A. Goebel, Cir. Mgr.

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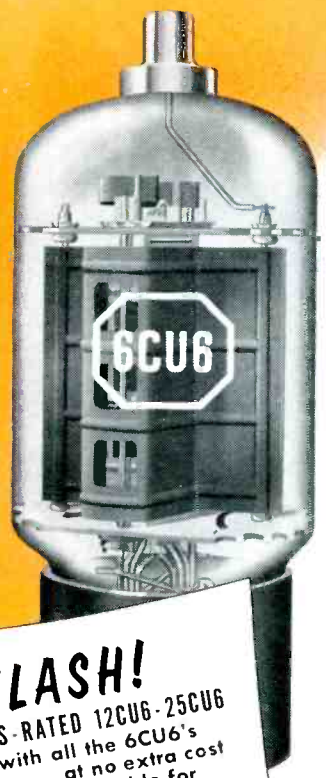
East-Central Rep.: James C. Munn, 2253 Delaware Dr., Cleveland 6, O. Tel.: ERieview 1-1726
Pacific Coast Rep.: Brand & Brand, 1052 W. 6th St., Los Angeles 17, Cal. Tel.: MAdison 6-1371

Entered as second-class matter June 14, 1932, at the Post Office at New York, N. Y., additional entry at the Post Office, Norwalk, Conn., Oct. 22, 1954, under the Act of March 3, 1879. Subscription price: $2.00 per year in the U. S. A. and Canada; 25 cents per copy. $3.00 per year in foreign countries; 35 cents per copy.

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

CTS-RATED* 6CU6



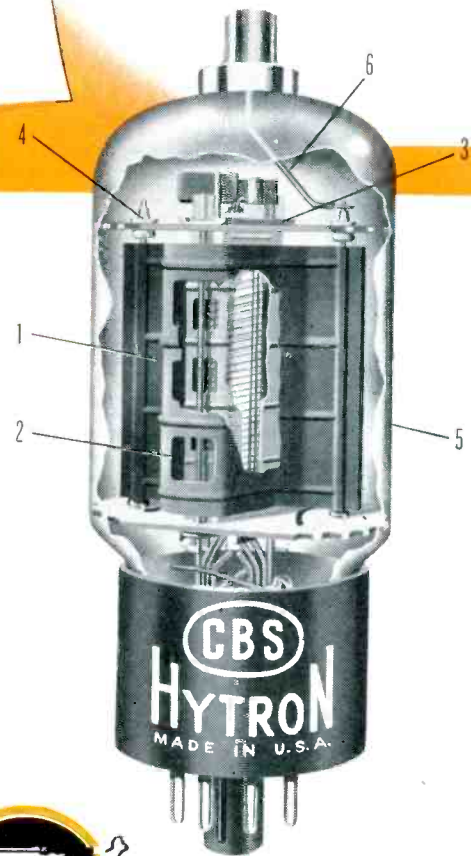
FLASH!
NEW CTS-RATED 12CU6-25CU6 . . . with all the 6CU6's features . . . at no extra cost . . . now available for series-string operation.
Combined data sheet for 6CU6, 12CU6, and 25CU6 free on request.

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.

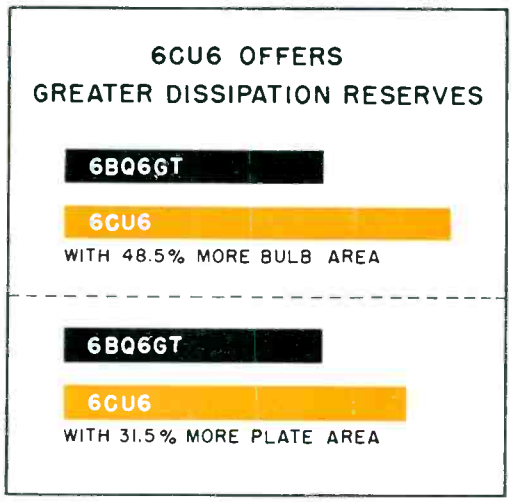
In the 6CU6 . . . another CBS-Hytron first . . . high voltage and heat meet their match. You forget run-away plate current, high-voltage arc-overs, and shrinking TV pictures. You gain by longer life . . . minimized service . . . happier customers. Try the CBS-Hytron 6CU6 today.



*Rated for Continuous Television Service

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.



CBS HYTRON

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

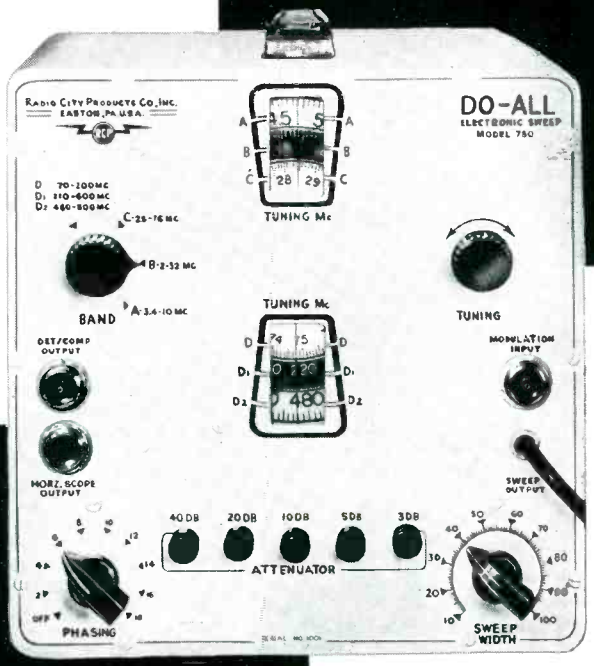
RECEIVING • TRANSMITTING • SPECIAL-PURPOSE • TV PICTURE TUBES • CRYSTAL DIODES AND TRANSISTORS

"Compatible" All Electronic SWEEP GENERATOR by RCP

LABORATORY PERFORMANCE

PRICED FOR THE SERVICEMAN

$189.50 net



Model 780

For Black and White and Color Television . . . plus FM and AM Radio . . .

Unexcelled in performance and versatility, the RCP model 780 is engineered as a completely electronic sweep circuit without motor or moving parts. Unique electronic unidirectional coupling provides for sweep in one direction only at a uniform output level (AGC). For use with any marker generator and oscilloscope, model 780 is the first laboratory type all electronic sweep generator priced reasonably enough for service use.

Service Designed for Ease of Operation:

- Built-in Detector/Comparitor Permits
  - (1) Visual observation and accurate settings of marker signals and sweep width of alignment of TV IF's and Wave Traps.
  - (2) Laboratory and service technicians to check their test equipment.
  - (3) Check of test set-up for improper grounding or long leads.
- Push button attenuator for rapid, precise alignment and measurements.
- Automatic internal blanking with straight line base generation for scope picture—eliminates return trace.
- 180° 60 cycle phasing voltage for use on all oscilloscopes available on front panel.
- Jack provided for modulation by external signal such as color generators (bar or dot) and is automatically mixed in the sweep circuit.

Features:

Anti-backlash dial—Electronically regulated power supply—Highly linear sweep to close tolerances of manufacturer's specifications—Range 3.2 megacycles to 800 megacycles — Wide sweep width control 0-30 megacycles—Automatic gain control—Precision, triple shielded attenuator.

SPECIFICATIONS

Sweep Linearity: Exceptional high degree of linearity not possibly obtainable in mechanical sweeps.

Band	Linearity Sweep Width Within 2 DB	Linearity Sweep Width Within 4 DB
A	0- 8 mc	Max. 15 mc
B	0-10 mc	Max. 25 mc
C	0-10 mc	Max. 22 mc
D	0-8 M @ 70 mc	Max. 25 mc
	0-20 mc @ 200 mc	Max. 30 mc

See Your Local Parts Distributor or Write Dept. S-11 for Latest RCP Catalog

RCP

RADIO CITY PRODUCTS CO.
EASTON, PENNSYLVANIA

A portable radio—the ideal Christmas gift

A PORTABLE radio is a gift of year-round enjoyment. And your customers know that there's a world of long-lasting listening pleasure stored in each "Eveready" radio battery.

In batteries, the best known brand is "Eveready". So no matter which brands of radios you sell, equip them with the batteries your customers *want* — "Eveready" brand.

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IDEAL BATTERY COMPLEMENT GIVES BALANCED BATTERY LIFE

No. 964 **No. 437**

Associations

ARTSNY

A VIGOROUS CITY-WIDE drive urging passage of an association-approved licensing measure has been instituted by the Associated Radio Television Servicemen of New York, under the chairmanship of Max Liebowitz. The campaign was sparked by the recent fraudulent charges hurled at several operators in New York and Philadelphia by the district attorneys' offices.

Need for licensing will be stressed in thousands of postcards that will be mailed to the Mayor by association members. Councilmen will also be hit by a barrage of mail seeking their support. The urgency of the legislation will be brought to the attention of the public through posters carried on trucks and cars of ARTSNY members. And all member shops will also carry window and counter displays playing up the importance of this bill, evolved to solidify the position of reliable Service Men in Greater New York.

NEW CLUBROOMS and clinic of ARTSNY have been established at 1431 Flatbush Avenue, Brooklyn, N. Y.

FRSAP

IN HARRISBURG, at a special meeting, where *ye ed* and G.E.'s manager of product service, Bill Parkinson, were honored guests, delegates of the Federation of Radio Servicemen's Associations of Pennsylvania, were told that association members could play an important role in the 90-day radio parts and labor warranty program recently set up by G.E.

Said Parkinson: "We will take a map of the city of Philadelphia and pinpoint the general areas in the city where we feel we need additional radio service stations. We will then ask the Federation to sug-

Service-charge chart prepared by the Northern Lancaster County Electronic Servicemen's Association, displayed at FRSAP meeting in Harrisburg by Jonathan Boyer, group prexy. The chart was on exhibition in group's booth during recent four-day Fair at Ephrata, Pa.

Northern Lancaster County Electronic Servicemens Association

SERVICE CHARGES

SERVICE CALLS . . .		
Within Five Miles of Shop and One Hour Service		$3.00
Within Ten Miles of Shop and One Hour Service		$4.00
Over Ten Miles and One Hour Service		$5.00
Plus $3.00 per hour after first hour.		
PICKUP AND DELIVER		
Add To The Service Call		$1.50
SHOP CHARGES		
Minimum Charge For TV Service on the bench		$5.00
Minimum Charge Covers One Hour		
After First Hour add $3.50 per hr. to the Minimum Charge		
REPLACE TUBE		
In Set That Customer Brings To Shop		$1.50
ANTENNA SERVICE		
One Man	per hour	$3.00
Two Men	per hour	$5.00
RADIO SERVICE		
Service Call		$2.50
Bench Charge	minimum	$2.00
Rate Per Hour	after first hour	$2.00
Auto Radio	minimum	$2.00
Rate Per Hour	after first hour	$2.00
Replace Tube in Auto Radio in the car	min.	$1.00

Max Liebowitz (left), NETSDA prexy, being congratulated by Maj. Gen. G. L. Van Deusen, RCA Institutes president emeritus and consultant, on inspiring talk on starting up a business today, delivered before the senior assembly of the school.

gest the names of qualified and competent contractors in each general area for appointment as factory-authorized service stations. If the names suggested meet all of our requirements, we will offer our proposition to those selected. . . ."

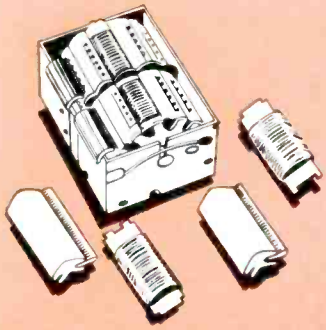
The G.E. spokesman added that they would also appreciate any recommendations from the Federation for *any* locations in the state, where additional service stations are required.

A STATE-WIDE drive, hammering away at the value of association membership, featuring descriptive bulletins and letters prepared by *ye ed*, was approved at the meeting. Program will also be highlighted by a state-wide minimum charge survey; Service Men will be asked to note their minimum charges for the repair of radio and TV chassis in the field and on the bench; their hourly rate of labor; antenna installation and repair charges; recall charges; flat and hourly rate for repair of tape, wire, recording and *hi-fi* amp equipment; and also their policy on tube testing charges. The information supplied should, it is felt, serve to establish useful standards of practice for various areas of the state.

[See page 64 for additional Association News]

TEN YEARS AGO

AN ENCOURAGING forecast that our radio-electronic industry will always teem with new developments and thus it will be kept young, alert and continually looking ahead to new and greater fields, was made by *Robert C. Sprague*, Sprague Electric prexy, during the first Electronic Parts and Equipment Industry Conference at Chicago's Stevens Hotel. The saturation point, he said, was not yet in sight; tube, part and set sales will continue to climb, and installation and repair requirements will mount. Progress reports were also presented by *Edward Butler*, manager of marketing division, P. R. Mallory and Co.; *Herbert Clough*, vice president, Belden; *K. C. Burcaw*, Radiart Corp.; *William J. Halligan*, Hallicrafters Co.; and *William O. Schoning*, president of Lukkos Sales Corp., newly elected president of NEDA. . . . Audio system of a radio-phone-recorder 2-band receiver (*Belmont 797*), with a 2-stage microphone preamp driving a 6V6 output stage, and utilizing a crystal cutter and microphone, was a front-cover feature. . . . *Irvin L. Aaron* was elected *Rep* prexy.



G-C TUNER-KLEEN'R For every Standard Coil tuner. Cleans both stationary and rotary contacts at every twist of the channel selector. Easy to install, means extra profit, better reception.
No. 9132.....Net $1.00

G-C SPRA-KLEEN The original power spray electrical contact cleaner and lubricant. Eliminates noises in TV tuners, contacts, controls, relays and switches. No waste, no need to remove parts.
No. 8666 6 oz. can.....Net $1.00

G-C PORTABLE WIRE REEL New, convenient way to handle wire coiled on spools. Just slip spool onto reel and pull out what you need. No more twisted or tangled wire when you go out on a job!
No. 9111.....Net $2.40

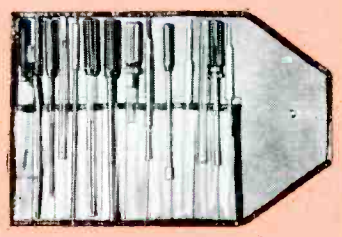
G-C SPEEDEX WIRE STRIPPERS New automatic "766" series has delayed return action to prevent crushing of fine stranded wires. Easy to use, with easy-grip handles for easy operation. Interchangeable blades. Specify wire size.
Series 766 (12 models)....Net $4.95

Save time... Save money... Speed up your service work!

with

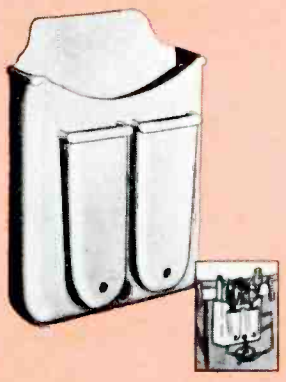
G-C SERVICE AIDS

AT LEADING PARTS DISTRIBUTORS EVERYWHERE



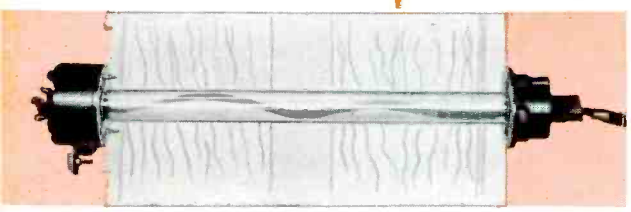
G-C DELUXE ALIGNMENT TOOL KIT Handy roll type case with 16 most-used tools. Tool tips are extra thin, of best grade hardened spring steel for long useful service. Value of tools sold separately $15.00.
No. 8280.....Net $7.74

G-C GENERAL SKRATCH STIK Easy to use, in handy carry-with-you case. Removes scratches on walnut, mahogany, oak—all shades and colors. Avoid embarrassment on the job . . . wipe Skratch Stik on that accidental scratch!
No. 909.....Net $0.30



G-C "TUX" TOOL KIT Made of remarkable new "Alathon" polyethylene. Flexible, tough, will not lose shape. Keep your tools with you, your tape on a chain. Lightweight.
No. 8943.....Net $2.37

G-C ILLUMINATED INSPECTION MIRROR Penlight batteries make this tool independent of cords or connections. Adjustable 1" hinged mirror mounted to 6" transparent lucite rod. No shock. On-off switch. Length 12¼". Bulb, less batteries.
No. 8725.....Net $1.95



G-C COMBINATION LEAD-IN TUBE AND LIGHTNING ARRESTOR Simplest feed-thru idea you ever saw. Drill ¾" hole, any wall up to 16" and insert. Arrestor on outside, wall plug inside. A new G-C exclusive!
No. 8641.....Net $2.37

FREE Your copy of the big, illustrated G-C catalog. Send postcard today!

GENERAL CEMENT MFG. CO.
901 TAYLOR AVENUE • ROCKFORD, ILLINOIS

SYLVANIA'S "SILVER SCREEN 85"

PICTURE TUBE IS SWEEPING THE COUNTRY!

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 ELECTRON 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!

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."

Sylvania Electric Products Inc.
Dept. 4R-4011, 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.

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COMPANY _____

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SYLVANIA

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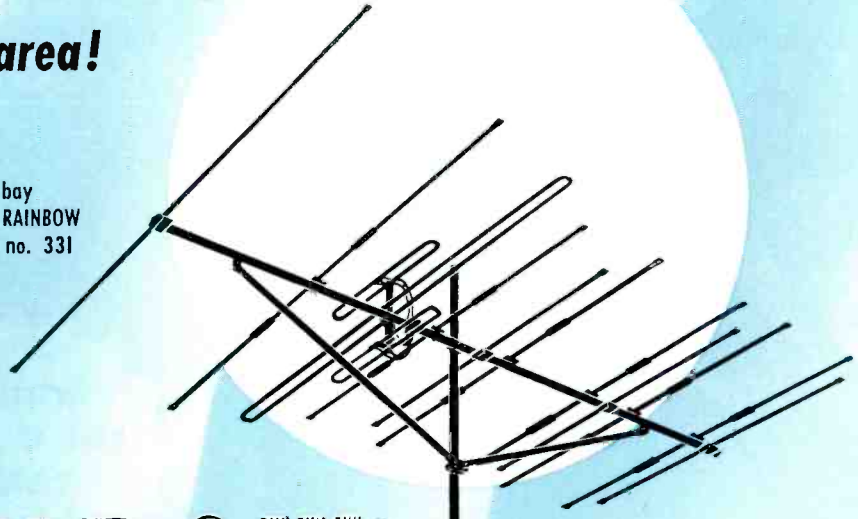
LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

this great all-channel antenna discovery is smashing sales and performance records in every TV area!



Single bay
SUPER RAINBOW
model no. 331

Stacked
RAINBOW
model no. 330-2

the CHAMPION RAINBOW*

brilliant black-and-white performance — and really ready for COLOR!

CHANNEL MASTER creative engineering

these 3 revolutionary, power-packed design features — found in no other antenna today!

1. **New spacing formula:** Radical new spacing arrangements between the directors and reflectors 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 reflectors:** Three-section directors and reflectors, with insulated segments, provide combined power of three High Band Yagis, operating side by side, in phase.
3. **New "inter-mix" 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. Fullest efficiency — no compromise design.

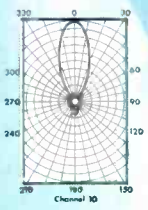
PLUS Channel Master's patented, super-gain TRI-POLE . . . the unique triple-power dipole that made the Champion America's most wanted antenna.

Write for complete technical literature

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	+.5 DB	+.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
	CHANNEL	2	3	4	5	6	7	8	9	10	11	12	13
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	+? DB	+2 DB	+2.5 DB	+3.5 DB

horizontal polar pattern (relative voltage)

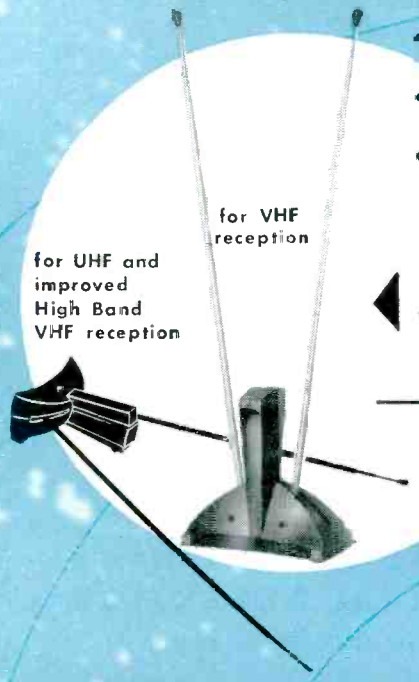


for fringe and super-fringe areas:
Super Rainbow, model no. 331
$37.50 list
stacked Super Rainbow, model no. 331-2
$75.70 list

for suburban and near-fringe areas:
Rainbow, model no. 330
$23.60 list
stacked Rainbow, model no. 330-2
$48.60 list

*Patent No. 2,691,730
Other Patents Pending

something new in indoor antennas



- features 3 telescoping sections.
- tilt-proof polystyrene base — cannot tip over.
- handsomely packaged for display.

the **ALL-VU***

*all VHF . . . all UHF

the only indoor antenna with this "2-Way" feature.

model no. 381 **$6.95** list

---

the **PRE-VU**

for all-channel VHF reception only.

model no. 380

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ALUMast

Aluminum Masting.

The new idea in antenna masting—

can never rust!

- in telescoping sections
- in swaged 5, 10, and 14 foot sections

Lightweight ALUMast is ⅓ the weight of steel, making it so easy to install — it swings right up! Stronger than steel, ALUMast is easier to stock and actually more economical.

brings you today's 5 newest installation ideas

for . . . more effective installations

. . . greater customer satisfaction

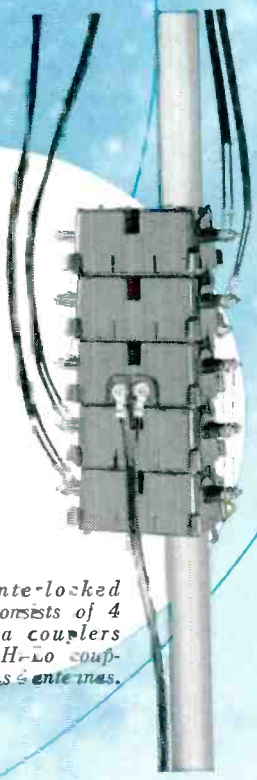
. . . higher profits for you!

SELECTENNA COUPLING SYSTEM

permits unlimited antenna combinations with only one transmission line!

- for the first time, you can tie together an unlimited combination of antennas, including separate antennas operating on the *same band.*
- ideal for areas currently using rotators, manually-operated selector switches, and "omnidirectional" antennas.

list price:
$5.42 each
including hardware and wire for joining couplers.



This interlocked stack consists of 4 antenna couplers and 1 Hi-Lo coupler; joins 5 antennas.

TV ROTATOR

with features found in no other rotator today:

- flexible worm gear, built-in thrust bearing.
- removable motor, electrical and mechanical stops
- weatherproof, lightweight, strong.
- straight-thru mast mounting, built-in chimney mount.
- extremely high torque

Beautifully-styled cabinet has great consumer appeal — is smallest on market (2¾" x 4"). Finger-tip control bar.

model no. 9521, **$49.95** list

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CHANNEL MASTER CORP. ELLENVILLE, N. Y.

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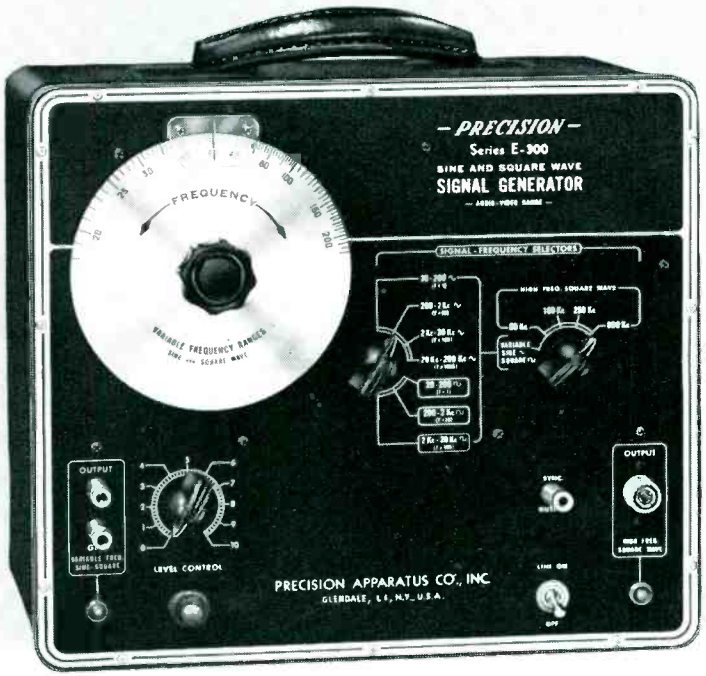
Announces a NEW BASIC TEST INSTRUMENT

...for Laboratory and Test Bench
...for Engineer and Technician



THE MODEL

E-300

SINE-SQUARE WAVE SIGNAL GENERATOR

(AUDIO-VIDEO RANGE)

GENERAL SPECIFICATIONS:

★ **VARIABLE-FREQUENCY SINE-WAVE RANGES:**
for testing audio amplifiers, low frequency RF amplifiers, etc.:
Continuous Coverage from 20 Cycles to 200 Kilocycles in Four Bands.

★ **VARIABLE FREQUENCY SQUARE-WAVE RANGES:**
for analyzing audio amplifiers, wide-range amplifiers, etc.:
20 Cycles through 20,000 Cycles in Three Bands.

★ **FOUR FIXED, HIGH-FREQUENCY SQUARE WAVES:**
for analysis of video and other wide-band amplifiers up to 20MC band-width:
50 KC — 100 KC — 250 KC — 500 KC steps.

★ **OUTPUT CHARACTERISTICS:**
Variable Frequency Ranges: 0-2000 ohms, 0-10 volts RMS, flat within ±1 db.
Accuracy: ±2% from 50 cps. to 200 KC. ±1 cps. from 20 cps. to 50 cps.
Distortion: Less than 1% from 20 cycles through 200 KC.
20 KC Square-Wave Rise Time: .5 microseconds.
Fixed High Frequency Square-Waves: 0-250 ohms, 0-5 volts P-P
Rise Time: .05 microsecond • **Overshoot:** Negligible

★ **TUBE COMPLEMENT:** 1-5879, 1-6CL6, 1-6J6, 2-6AU6, 1-6BL7, 1-6AH6, 1-6X4.

★ **SEPARATE OUTPUT CIRCUITS:** for the variable and fixed frequency ranges. Dual pilot lamps automatically indicate the active output jacks.

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transmits the H.F. square waves to circuits under test, without distortion.

★ **EXTERNAL 'SYNC' TERMINAL POST:**
for synchronizing oscillograph horizontal sweep to H.F. square-wave.

★ **ETCHED-ANODIZED TUNING DIAL and PANEL:** NO-glare, engine-turned dial finish and soft-black panel field afford utmost visibility and ease of reading.

MODEL E-300: in black, ripple finished, portable steel case — 10½x12x6".
Complete with tubes, coaxial output cable and operating manual.

Net Price $175.00

THE NEW SERIES E-300 has been especially developed to answer many modern electronic amplifier testing problems which cannot be handled with just the usual complement of test instruments.

The Series E-300 provides accurate sine and square wave signals for direct performance testing of:

High Fidelity Audio Amplifiers
TV Video Amplifiers
Carrier Current Systems
. . . and other wide range devices, etc.

Sine-Square Wave Analysis, with the Series E-300, streamlines amplifier test procedure and assures more uniformly high standards of apparatus performance, because sine-square wave testing is a most reliable indicator of:

Frequency Response
Phase Shift
Amplitude Distortion, etc.

The operating Manual for the Series E-300 has been especially prepared to describe the basic techniques of sine-square wave testing. The information establishes a foundation that will permit the operator to interpret sine-square wave-forms in terms of frequency response, distortion, etc.

You may obtain this comprehensive Manual, at only 25¢ per copy, to cover cost of printing and handling. Write directly to factory.

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PRECISION TEST EQUIPMENT — Standard of Accuracy

PRECISION Apparatus Company, Inc.
70-31 84th Street, Glendale 27, L. I., N. Y.

...from the Nation's Leading quality manufacturer of TV antennas and accessories

The World's Most Complete Line of Indoor Antennas!

headlining the **BRAND NEW**

CLOCK-TENNA

When it comes to TV antennas, nobody beats RMS for quality and performance. The RMS line of indoor antennas is the complete line . . . the fast moving line . . . the high profit line! Take the Clock-Tenna. It's a UHF-VHF antenna, precision engineered by RMS, combined with the world famous Sessions electric clock that automatically controls your TV set, or any electric appliance. Clock base is stationary, with swivel antenna top, plus 6-position Magic-Selector switch, for sharpest, clearest picture under all conditions. Doubly guaranteed by RMS, by Sessions Clock Co. No installation . . . just plugs in. **Model C1-2 LIST PRICE $19.95**

GET ON THE RMS PROFIT WAGON . . . STOCK UP TODAY WITH ALL OF THE RMS INDOOR ANTENNA LINE

Nevatip Vee-Ball. 3-section telescoping polished elements, securely seated into heavy, tip-proof, felt-cushioned base. 5 ft. twin lead attached.

Stereoscopic indoor antenna with phasing bar, features 6-position switch for peak sharpness, VHF and UHF.
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Similar to K-38 without phasing bar and 6-position switch. A product of excellent design
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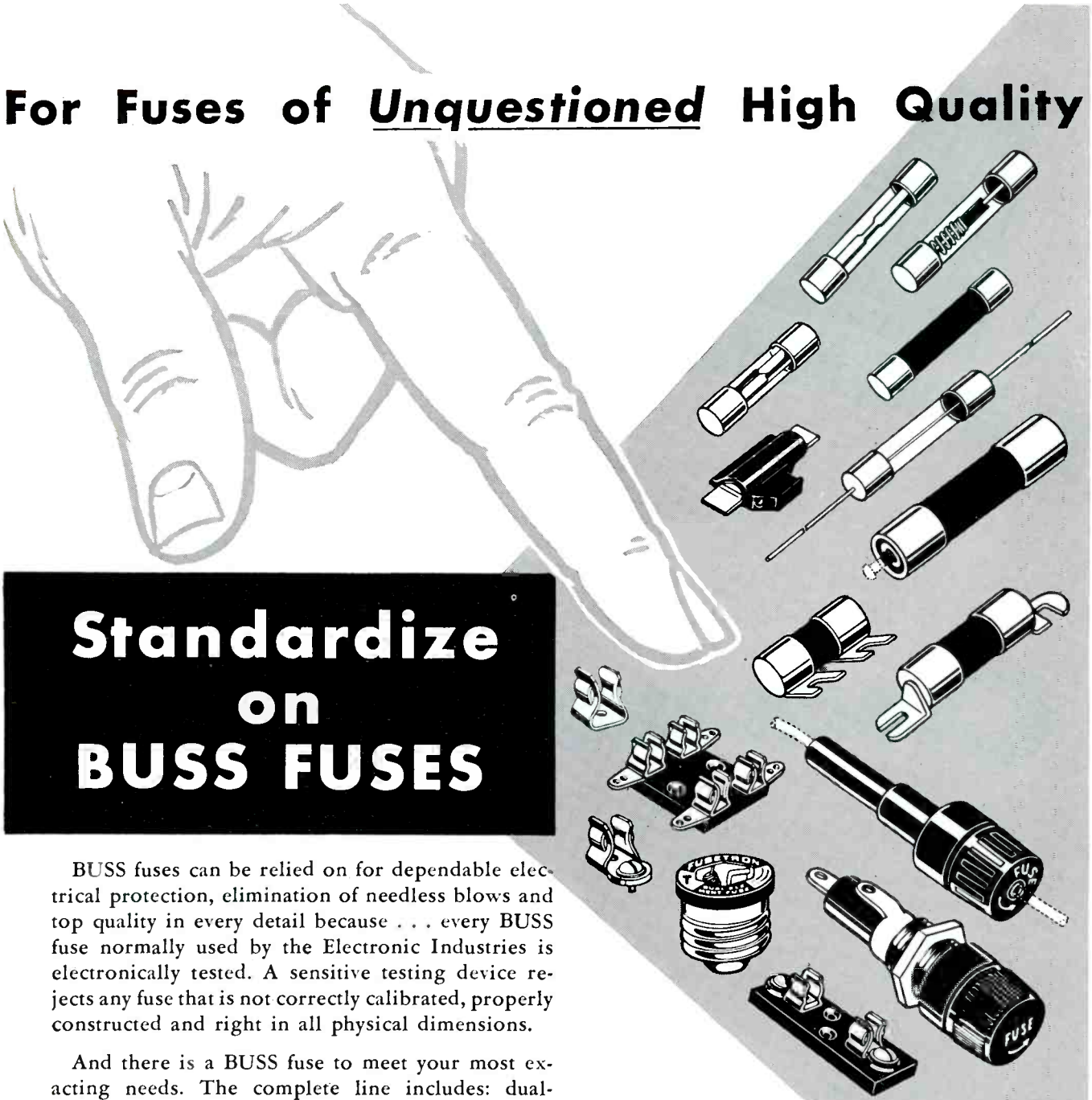
At leading Jobbers Coast-to-Coast

For Fuses of *Unquestioned* High Quality



Standardize on BUSS FUSES

BUSS fuses can be relied on for dependable electrical protection, elimination of needless blows and top quality in every detail because . . . every BUSS fuse normally used by the Electronic Industries is electronically tested. A sensitive testing device rejects any fuse that is not correctly calibrated, properly constructed and right in all physical dimensions.

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BUSS fuses give double protection against costly trouble. They reduce to a minimum the danger of damage to equipment when there is trouble on the circuit — helping you prevent unnecessary repairs and replacements. And BUSS fuses won't give a false alarm by blowing needlessly — helping you avoid costly and time-wasting callbacks. It's profitable to sell and install only BUSS fuses.

Makers of a complete line of fuses for home, farm, commercial, electronic and industrial use.

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Please send me bulletin SFB containing facts on BUSS small dimension fuses and fuse holders.

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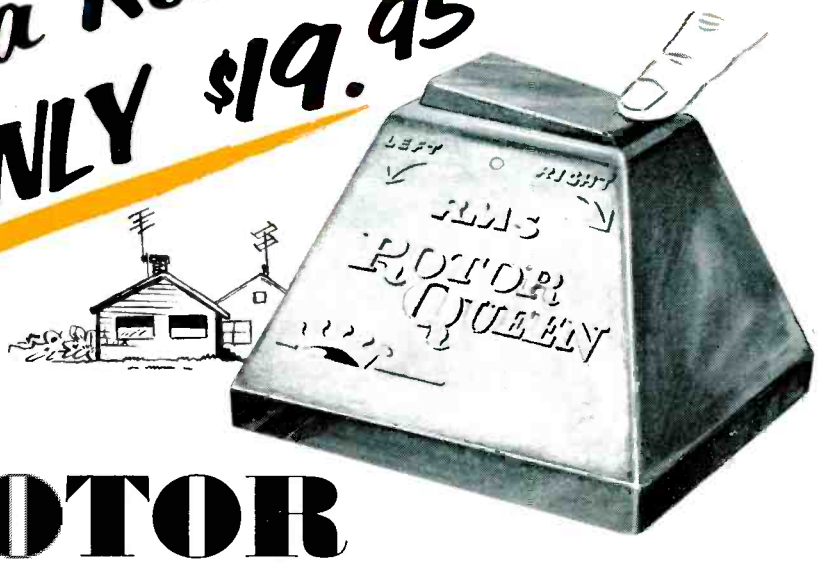
An Antenna Rotor to List For ONLY $19.95



the 1955 RMS

ROTOR QUEEN

Here it is . . . the sensational new RMS Rotor Queen, Model #55, that is making TV equipment history!

It's a *top-quality* antenna rotor that incorporates every engineering improvement, at an unheard of low price . . . much lower than any other rotor on the market.

The Rotor Queen opens up the door to every TV home and thousands of new customers for you. Now . . . for just $19.95 every TV channel can be tuned in at peak sharpness. It's a tremendous market that's hardly been scratched. Get in on it!

At jobbers everywhere

THIS IS A QUALITY ROTOR

Packed with quality features

Featherweight touch control.
Instant braking action . . . provides pin-point accuracy for black and white, for color.
Full 370° rotation right or left.
Direct gear drive—no worm gears.
Lifetime oilite bronze side thrust bearing.
Flagpole-type base for easy installation, maximum mast support.
Weather sealed all aluminum housing.
All parts rustproof.
Guy wire supports.

ATTRACTIVELY STYLED

Control moulded of non-breakable, handsome mahogany styrene. Smart design fits anywhere.
Ultra compact: 3¾" x 3¾" x 3⅜".

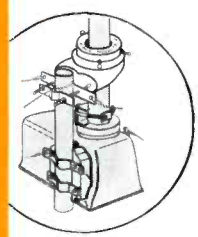
ADVERTISING SUPPORT

Powerful national advertising and promotional program to help you sell. Sales aids available upon request.

GUARANTEED

Full one year guarantee against defective materials and workmanship.

MORE PROFITS FOR YOU!



Also available:
Model TB-2
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Get your orders in today . . . *GET IN ON THE RMS PROFIT WAGON*

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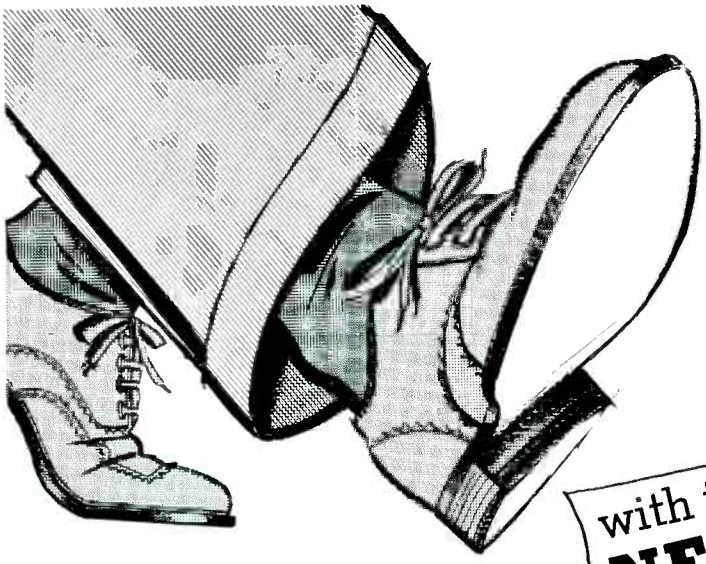


STEP INTO BIGGER BUSINESS

with the NEW

Radion

FIELD STRENGTH METER

Put yourself ahead of the "cut-and-try" boys. Find your problem immediately—and go directly to it. Save time, money. No guessing whether the antenna or receiver is at fault. You—and your customers—see positive proof.

On new installations you KNOW which antenna location is best before proceeding. A Radion Meter builds customer confidence, invites future business. Often pays for itself in two months' time, brings you handsome profits thereafter.

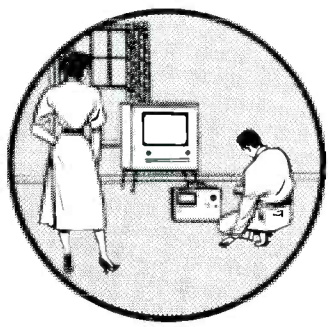
Beautifully designed, easy to use—the meter the industry has needed for a long time. Covers all TV channels 2 to 83 and FM band (50-220, 260-940 Mc.). Weighs only 16 lbs. with standard batteries. Battery power gives absolute readings in microvolts—switch for checking batteries. Monitoring jack for audio. Size 11 x 8½ x 6 in. Ask your distributor or write direct for specifications.

Model FSM 5000
Only $97.50
less batteries

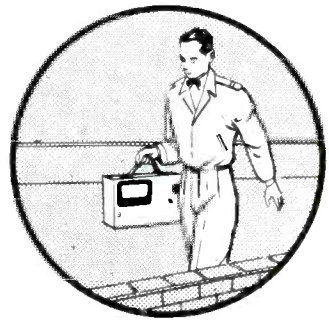
BATTERY OPERATED FOR VHF-UHF

Radion

THE RADION CORPORATION
Dept. S, 1130 W. Wisconsin Ave., Chicago 14, Ill.



Customers like to see there's no guesswork in your methods



You quickly locate the cause of weak signals—with proof

AMERICA'S MOST DEPENDABLE ROTATOR

ONLY ROTATOR AVAILABLE IN FOUR GLORIOUS COLORS:

BROEGE MARBLE
MAHOGANY
GOLDEN WHEAT
DECORATOR'S GREY

THE TRIO
"ARISTOCRAT"

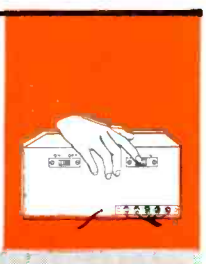
NOW...
America's most beautiful!

The sleek, modern, low silhouette of the new TRIO rotator control case marks a new high in styling.

Beauty, here, is more than skin deep since its low center of gravity makes it tip-proof! Note, too, that there are NO unsightly control knobs or switches to spoil its beauty. These are located at top rear of case — where your hand naturally rests in operation of rotator! There is no obscuring the easily-read lighted dial.

Available in either broege marble or mahogany, the unit with its graceful flowing lines blends perfectly with any decor.

Yes, America's most dependable rotator is now America's most beautiful as well!



Switch and directional controls are located at top rear of case for most convenient manual operation. Lighted dial permits operation in darkened room and also indicates when rotator is on. When on, pointer always shows exact position of antenna.

✔ Only Rotator With Two Motors

✔ Only Rotator With Two-Year Guarantee

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"ARISTOCRAT"
...CULMINATION OF SIX YEARS RESEARCH AND PRODUCTION

TRIO *Manufacturing Co.*
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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.

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RAYTHEON MAKES ALL THESE:

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

On the Horizon for '55

AN EXPANDING NEED FOR ANTENNA INSTALLATIONS: With scores of skyscraper towers now under construction, dozens of transmitter sites still being shifted, powers of a growing list of stations being pushed up and satellite-slave remotes slated for early approval, the prospects for deeper and deeper fringe installations are brighter than ever. Hundreds of thousands, who have been just beyond range, will now find it possible, with the proper antenna setup, to enjoy completely reliable reception.

In some areas, viewers will be faced with bi- and tri-direction signal or adjacent or co-channel pickup problems. Not too long ago, such a situation was hopeless. But today, there are the tools, in the form of high front-to-back ratio antennas and pin-point control rotators, to solve the problem easily. And also around are strikingly-improved transmission lines and couplers that can hold those signals and not dissipate them as in the past.

A stimulating scene also obtains on the new-station front. For it is believed that at least 100 new veryhigh and ultrahigh stations will begin operating within the next twelve months, boosting the number of on-the-air transmitters to over 500. Here we'll have a new audience of millions, and quite a rousing market for antenna systems.

And one should not discount the robust replacement requirements, either, where several million antennas and allied accessory packages will be sought, as in the past. The new antennas will be used to replace those which have been bent, broken or wrecked by storm—witness the recent hurricanes—or corroded or rotted by the elements.

No dull moments ahead in this antenna-installation business!

A CONTINUING CRUSADE TO ROUTE WILD PITCHMEN: When known flagrant operators run wild in their selling tactics, most are usually aware that their racy claims always demand close scrutiny. But when some of the nation's largest and most respected department stores follow suit and hawk merchandise that has been officially labeled by labs and experts as worthless, it is truly a sad, sad state of affairs.

It was felt that when the BBB issued its excellent reports several weeks ago pointing out that disc antennas were useless, all would take heed and avoid the midgets. But instead, several stores chose to ignore the warning and agreed to buy and peddle the pee-wees as a . . . "revolutionary discovery" . . . working on . . . "an unknown electronic principle."

Discs were sold, plenty of them, but they poured back, too, for customers soon found out that the gimmicks weren't as amazing as they were told; in fact they just didn't work. And the headman in one store had the temerity to blame the failures on bad judgment in installation!

We do hope that these stores have realized that they were duped and will join the drive to *banish* all pee-wee hucksters.

PLUSH OPPORTUNITIES IN AUDIO: With the advent of the new brilliant era of recorded music pleasure for the family, generated by the fabulous strides in component and equipment development and manufacture, audio today occupies a prized position in the home. The surging interest is expected to boost record sales from an annual $225-million to more than $300-million.

Better listening has become a national pastime, and Service Men have found that they can play a major role in decorating the home with the best in music through custom installations, by assembling hi-fi systems; through modernization of old equipment, and through component replacement with *quality parts* in packaged hi-fi.

In the repair and maintenance of phonos, it is imperative that the high degree of fidelity built into the original package be maintained; thus one must be particularly careful in servicing, and selecting and replacing components. To illustrate, the innocent-looking capacitor, often dismissed as a source of trouble, can ruin reproduction if it's leaky. Any *dc* leakage in the coupling and cathode bypass units can upset bias conditions and increase distortion, while a loss of capacitance can also result in bass losses. Of course, volume controls and resistors, too, must also be carefully checked for abrasion, tolerance losses and other resistive defects. And cartridges, changers and speakers, all demand careful inspection during a repair call.

Whatever the trouble might be, it is important to remember that *quality* components must always be used for replacement. Relaxation of this rule will always lead to repeated headaches and expensive callbacks.

Another particularly important item on the replacement agenda is the needle. Too many feel that needles last indefinitely; they don't. Even the rugged diamond will eventually wear out. Any needle point material that has to ride in the miles of record grooves, will wear. In one survey, it was found that over 90% of the phonos now in operation are using worn-out needles; needles that are ruining records and reproduction, too.

Because of the complexity of needle design, the sale of needles has moved out of the general music shop and become a prime project for Service Men. In five years, it has been predicted, Service Men will be selling 80% of all phono needles, with an annual value of $20-million. That's quite a sales figure for so small an item, and is indicative of the tremendous strides audio is destined to make in the busy months ahead.

STARDOM EARNED BY INSTRUMENTS: On numerous occasions, it has been stressed that successful troubleshooting can only be completed with the aid of a team of quality instruments; a stand based on conclusive test-by-instrument results, and not on frothy theory.

Today Service Men across the nation have become convinced that the era of poking and instinct alone, is gone, and gone forever. For there's only one way to check a chassis, and that's with a quality test set, whether it be for audio, AM or FM, or b-w or color TV.

Quality instruments are truly major assets of the modern Service Shop; sound insurance for continued success.—L. W.

For detailed progress reports, see* ***National Scene,* *page 37;* ***Phono Needle Report,*** *page 44;* and ***Audio Forum,*** *page 49, this issue.*

Line Needs . . . Working Extensions . . . Counter Desk Extension Feeds . . . Bench Outlets

POWER DISTRIBUTION In the Service Shop

by RONALD L. IVES

THE NUMBER of small line-operated instruments and appliances used in the average Service Shop has increased many fold during the past two decades. Yet, in most instances, the number of outlets and the current capacity of the lines supplying them has not been increased proportionately, if at all. In natural consequence, the average shop is an underwriters' nightmare, with all lines overloaded, and the outlets multiplied, by use of cube taps and other auxiliaries, until each resembles the hydra described in Greek mythology.

With connections of this type, an individual cord is hard to locate, and when a new device must be connected to the line, or one removed, Service Men get all tangled up like the Laocoon statues in the Vatican.

The shop power problem is twofold. First, there must be enough current capacity to take care of all probable loads with no overheating or overloading of the lines. Second, there must be enough outlets to accommodate the maximum number of power-consuming devices likely to be connected at any one time. Additionally, extension cords and multiple outlets for use outside of the shop, usually on the customer's premises, should be available.

Line Needs

The first need—adequate lines—can be met quite simply, although not always cheaply, by running enough lines from the distribution box to the shop to carry all probable loads, allowing also a generous factor of safety for future expansion. Several separately-fused lines are usually preferable to one high-current line; but a high current line from the meter to a distribution box in the shop is sometimes the best procedure.

Because labor cost in installing a line is likely to exceed material cost by a fairly large factor, it is usually good economics to run all lines with the largest wire permitted by the local code. Fairly standard current capacities for various wire sizes are:[1]

Wire size	Maximum current
No. 14	15 amperes
No. 12	20 amperes
No. 10	30 amperes
No. 6	50 amperes*

*Not permitted by some local codes.

Copper loss in lines having high current capacity, and hence low resistance, is very much less than that in lines of lower current capacity (and higher resistance). Use of a larger wire may pay for itself in the first year of operation.

Line loss and its costs can be shown graphically by an example. If line voltage at the meter is 120, and line voltage at the bench, with average loads connected, is 110; then eight per cent of the current passing through the meter is lost in the line, and has been used to heat up the interiors of partitions, cellar space, and other unused space. This loss amounts to one month's power bill each year, and is quite a bit of money to pour down the drain. This loss can be reduced to almost any value except zero by use of larger wire, and it is usually economical to run all lines in No. 10 wire, regardless of the current drain (up to 30 amperes). Drop in No. 10 wire, all other factors remaining the same,

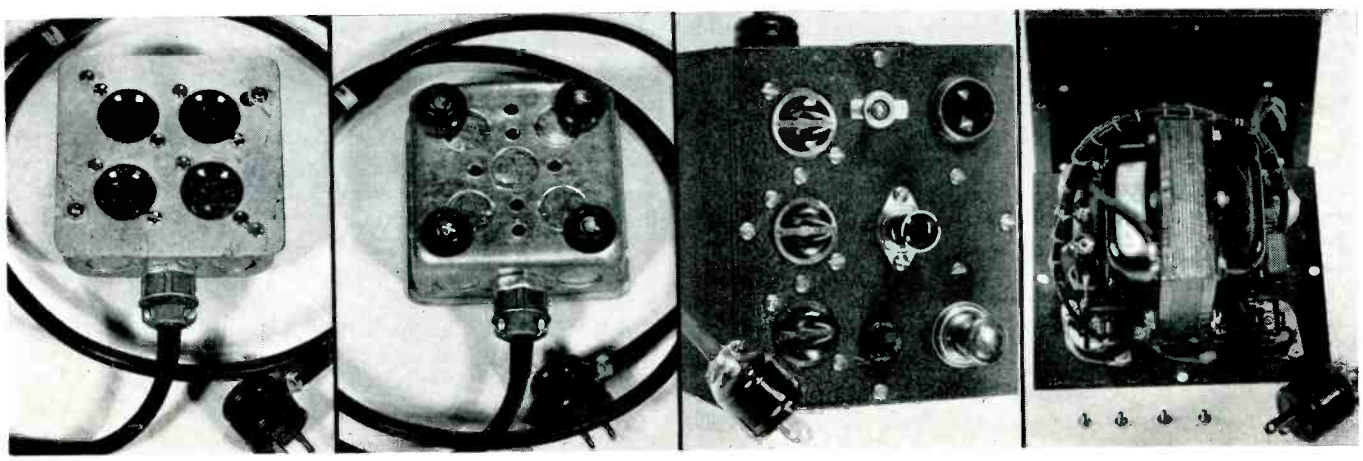
[1]Richter, H. P. *Practical Electric Wiring*, revised fourth edition: pp. 550-552.
[2]Additional data on line losses available in electrical engineering handbooks or in book by H. P. Richter on *Practical Electrical Wiring* (revised fourth edition): pp. 116-118.

Fig. 1 (below). Working extension with four outlets mounted in a standard 4" shallow box.

Fig. 2 (below, left center). Bottom view of working extension, showing rubber feet and cord connection.

Fig. 3 (below, right center). Front view of desk outlet, containing its own switch and fuses, and also equipped to supply 6.3 v at 10 a isolated from the line. Note cigarette lighter on the panel.

Fig. 4 (below). Interior view of desk outlet, showing arrangement of components and wiring methods used. Entire front panel can be swung out for servicing by removing four screws, and can be separated from case by removing two more.



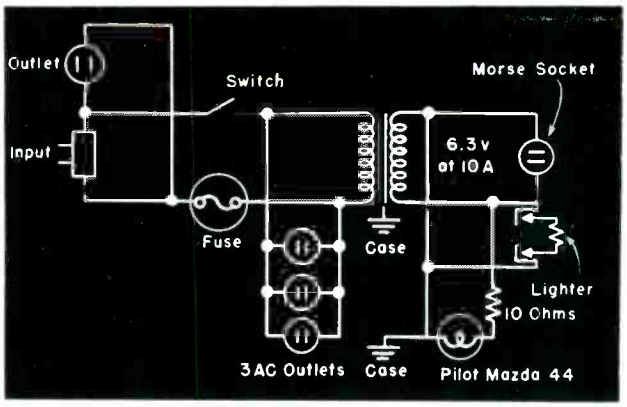


Fig. 5 (left). Circuit of desk outlet box.

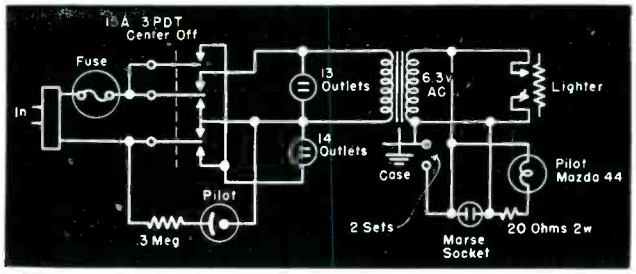


Fig. 6 (above). Circuit of bench outlet.

is only 40 per cent of that in No. 14 wire.[2]

Shop lines should be terminated in an adequate number of outlets, such as four per line (two duplex receptacles) or more. It is good practice to have an outlet, and adequate current capacity, for each device that is to be used much through the working day; and then to allow for an additional 10 to 15-ampere bench load.

Wiring of new lines and outlets is customarily done by an electrical contractor, who can and should follow the local and national electrical codes meticulously, to avoid difficulties with insurance, employers' liability laws, etc. Arrangement of lines in a shop should be done with somewhat more care than is required in an ordinary residence, to eliminate noise troubles. This entails careful anchoring and grounding of cable sheaths, and elimination of loose contacts with metal lath, gas pipes, etc. The cable sheath should either be insulated from such bodies of metal, or firmly bonded to them.

Needed in the average shop, as well as on the customer's premises, are extension cords of moderate to high current capacity, usually with a multiplicity of terminal outlets. Many service men wire up a group of porcelain sockets, mounted on a board, with almost any conductor available, and carry this from job to job until the device becomes useless because of socket breakage.

A more workmanlike and longer-lasting extension can be made from a shallow 4" steel box, with four outlets mounted on the cover, as in Fig. 1. To prevent skidding of the box, and scuffing of the surfaces on which it rests, the bottom should be equipped with four large rubber feet, as in Fig. 2. Cord should be firmly attached to the box by use of a standard thinwall-conduit connector, held to the box with its nut, and an A and N *3057-8* clamp fitting and rubber bushing. A standard No. 14 type *S* or *SO* cord, properly attached with these fittings, will withstand a tension of much more than 200 pounds. Use of smaller cords, or those which are less rugged mechanically does result in an immediate cash saving, but at a cost of very much shorter service life and possible trouble with local electrical codes and inspectors.

Extensions of this general type, equipped with fuses or circuit breakers, have appeared on the market from to time.[3]

Working extensions of several other designs can be constructed from rather obvious combinations of standard components. Because these extensions are tools, rather than parlor decorations, use of top grade components and careful workmanship is recommended.

Counter and Desk Extensions

Power needs at desks and counters are usually moderate, but the number of devices in use may be considerable. Socket needs commonly go as high as four outlets per desk; or one outlet per lineal foot of counter space. For some of these needs, commercially-made *plug-in strip* is ideal.

When it is necessary or desirable to isolate the desk or counter circuits, an outlet box equipped with its own

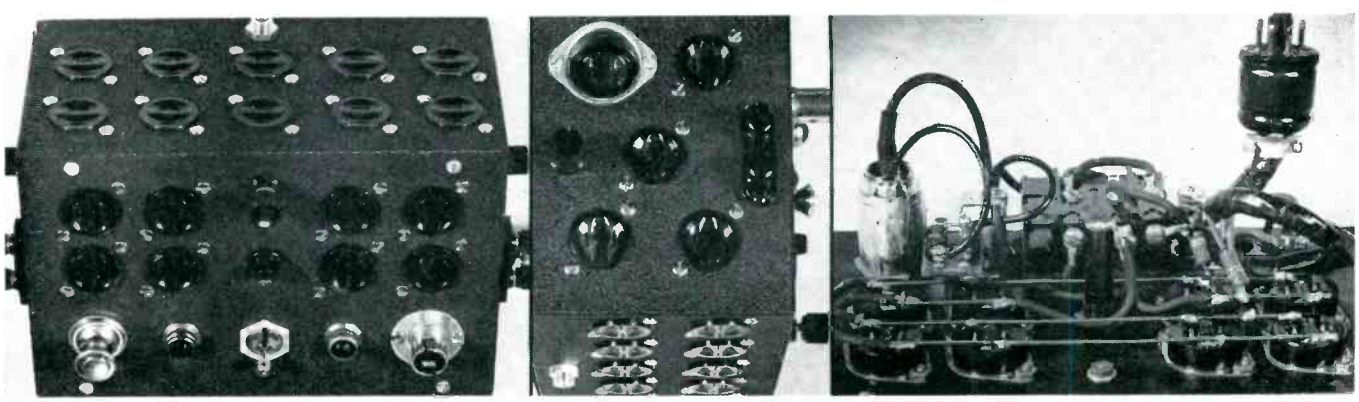
(*Continued on page 68*)

[3] A three-outlet extension, equipped with a pilot light, is now on the market: Fostoria POB-3 portable outlet box.

Fig. 7. Bench outlet box, showing front and bottom surfaces. The threaded lug is the ground cable connection. Dual binding posts and Morse socket are for 6.3 v ac; single binding posts are ground terminals.

Fig. 8. End view of the bench outlet box, which is diagrammed above, in Fig. 6. As a pilot, a NE51 can be used. Sunk plug is the ac input.

Fig. 9. Front panel of bench outlet box, showing local wiring and octal plug for connections to the other circuits in the box. Rubber-covered No. 12 stranded wire was used for connections subject to flexure; tinned hard-drawn copper for rigid connections which are mechanically isolated from other components.



Curbing TVI Through IF Shifts

by T. B. AITKEN, *District Service Manager, The Magnavox Company*

Field Tests Reveal That Strong TVI, Which Cannot Be Attenuated by Stubs, Filters or Traps, Can Be Controlled by Shifting or Moving IF Bandpass Beyond Carrier Frequency Point of Interfering Signals

NOTWITHSTANDING the number of steps that have been taken to overcome *TVI*, the situation is still a particularly acute one.

TVI actually involves any radiated signal in the vicinity of a TV receiver that hampers the normal performance of this set. The signal may be a single frequency or band of frequencies to which a tuned circuit or circuits of a TV chassis become resonant. It may be the fundamental of this frequency or even a train of harmonics above those which might be suppressed at the offending transmitter. The frequency of this signal is such that it falls within the tuning range of the *rf* or *if* stages.

Manufacturers have designed and produced TV models to conform with recommended standards; the standards having been determined and set up by the FCC. Because of the variety of commercial and industrial electronic radiating equipment, it has been found that the *TVI* problem can never be completely solved by a channel allocation plan. As noted on several occasions in SERVICE,[1, 2] *TVI* is a local problem created by assorted types of electronic equipment introduced into certain vicinities.

We have two basic types of *TVI*, The first is an undesired signal of such radiated frequency that it falls in the *rf* pass band of the tuner. This might be a harmonic of some carrier fundamental not sufficiently suppressed at its own transmitter. The suppression of this carrier's harmonic at its transmitter may be within specified limits, but because of the nature of the location, it is producing *TVI*. The offender may also be a neighboring band to the TV channel so that we have a heterodyning effect in the receiver's local oscillator producing a frequency point in the *if* amplifier's pass band. In the second type we have the carrier fundamental frequency directly in the tuning range of the *if* stages. It is this type of *TVI* that is creating the major problem. There are also a number of electronic and mechanical items causing trouble by radiating on the same band receivers employ for their *if* amplifiers.

The complete television receiver installation can be susceptible to *TVI* at any one or all of three feed points; the antenna, tuner, and *if* circuits. The interfering signal can quickly be localized. If the antenna section is the source of the trouble, disconnecting the leadin from the receiver will eliminate the condition.

Should *TVI* still be present with the antenna disconnected, then the trouble is in the tuner or *if*. The next step therefore is to disconnect the tuner output lead to the first *if*. This approach is suggested, rather than the removal of the tuner tubes, since the tuner sub-chassis could serve as an antenna for subsequent stages. Completely eliminating the tuner will definitely indicate where the pickup is from; the tuner or tuner chassis, or in *if* stages. For the severest cases of *TVI*, it is important that we determine the source of pickup to apply more efficiently a suitable solution.

Now let's analyze exactly what happens in a TV receiver when *TVI* is present. To illustrate the receiver's behavior to undesired signals, when the receiver is tuned to a certain channel, an exploded curve of an *rf* band pass is shown in Fig. 1. Points *A* and *B* represent the two variations of *TVI*: *A* is an interfering signal in the tuning range of the *if* amplifiers and *B* is a harmonic of a carrier fundamental falling into the *rf* tuning range. From this drawing, it can be seen that not only is the tuner offering gain to *TVI* in the *rf* band, but also it offers some gain for signals in the *if* band. The *if* or point *A* signal, can pass through the tuner due to capacitive coupling, besides receiving gain from the channel band pass. Once the interfering signal passes through the tuner and reaches the *if* amplifiers, it will appear as represented in Fig. 2; this is a typical *if* response curve. Point *A* is the carrier point of *TVI*. The picture, sound, and adjacent channel-trap frequency points

[1]Ives, Ronald L., *Annunciator TVI*, SERVICE; April and September, 1954.

[2]Phillips, Donald, *A Report on TVI*, SERVICE; July and August, 1952.

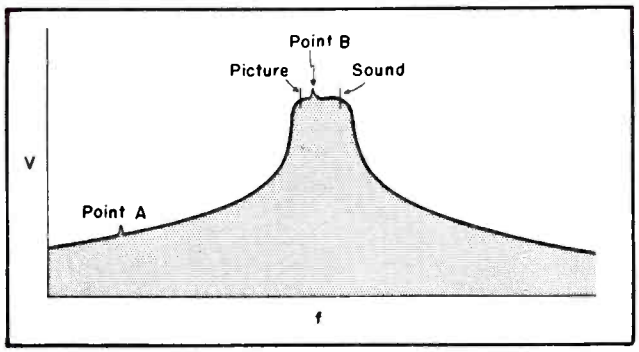


Fig. 1. Exploded curve of rf bandpass, with points A and B representing two variations of TVI. Point A is an interfering signal in the tuning range of the if amplifiers and point B is a harmonic of a carrier fundamental falling in the rf tuning range.

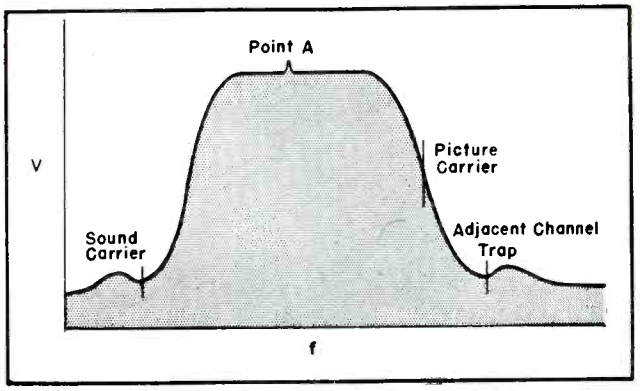


Fig. 2. Typical if response curve, with point A the carrier point of TVI as it appears in these stages.

are indicated. The frequency range of the *if* may be from 20 to 26 or from 40 to 46 mc. The Commission has recommended that manufacturers use 40 to 46 mc band because there are fewer transmitters radiating in this band. So for illustrative purposes, Fig. 2 might be classified as a three-stage 3-mc bandwidth (at the 6-db point down) 40-mc *if* system. In the *if* bandpass we have the picture carrier frequency, sound carrier frequency, and *TVI* frequency points. The stage following the *if* amplifiers is the video detector, often referred to as the second detector. The video detector, in addition to serving its main purpose to remove video modulation from the picture carrier, also acts as a mixer stage for the picture carrier frequency and the *TVI* carrier frequency. One could say, too, that the second detector becomes the first detector causing heterodyning or *beating* of the two frequencies in this stage which produces a resultant frequency that is carried through to the subsequent stage or the video amplifier.

It is this frequency, somewhere between 0 and 4 mc, being amplified in the video amplifier with the composite video signal, that modulates the picture tube and produces a herring-bone effect. In the case of the intercarrier type receivers, the picture and sound carriers heterodyne in the video detector to produce a 4.5-mc sound *if*. The *TVI* signal can also become part of this action and establish a carrier point in the sound *if* bandpass. Any sound modulation on the interfering signal then will be present in the final audio output stage and will be heard in the speaker.

Actually, *TVI* can be eliminated merely by keeping the interfering signal from reaching the *if* amplifiers. Manufacturers have provided traps in some models connected at the input to the tuner to accomplish this. Other receivers without this antenna trap require external attachments in the form of stubs. If the problem is an extremely difficult one high-pass filters might be necessary. These filters must attenuate all frequencies below 50 mc and pass all frequencies above this point. If the filter is not sufficient, more attentuation might be obtained from tuned traps. All of these devices serve to reduce *TVI*, so that coupled with the rejection characteristics of the tuner, interference cannot pass through to the *if* stages. The stubs can either be one-quarter or one-half wavelength of the *TVI* frequency; this depends on which might present more trapping effect to the undesired signal. The ultimate of attentuation is obtained from tuned traps, and this is in the order of 20 db. Filters have been found somewhat less effective.

However, in many instances, *TVI* is so strong in signal strength that complete elimination cannot be obtained from the installation of stubs, filters, or traps. In these cases, regardless of the attenuation and rejection of the undesired signal, interference may still reach the *if* and produce herring-bone patterns on the picture tube or background voices in the speaker. The only satisfactory corrective measures that can be taken are to shift or move the *if* bandpass beyond the carrier frequency point of the *TVI*. This places the receiver's *if* tuning range above or below the frequency of the interference and by doing so offers rejection to this signal.

In the majority of cases, it will be found that the shift will be below the present tuning of the *if* for the following reason. Most receivers employ an adjacent channel trap in their *if* system for the elimination of the adjacent channel sound interference, and the tuning of this trap is 1.5 mc higher than the *if* picture carrier point. If the shift of the *if* bandpass is such that the frequency of the *TVI* falls in the *null* of the adjacent channel trap, then attenuation as well as rejection can be obtained for the undesired signal. In areas where there are adjacent channels, this trap will then serve two purposes: First, to overcome adjacent channel interference and second, to provide attenuation for the *TVI* signal. By making use of the adjacent-channel trap. 50 to 60-db attenuation of the undesired signal can be obtained. This is certainly sufficient to suppress and reject any interference that might be present. Because of the variety of *TVI* signals, the shift or readustment of the *if* tuned circuits will be different in every case. No one prescribed shift will correct the trouble in all areas.

In view of the foregoing, the amount of shift in each case will be the difference between the adjacent-channel trap

(*Continued on page* 70)

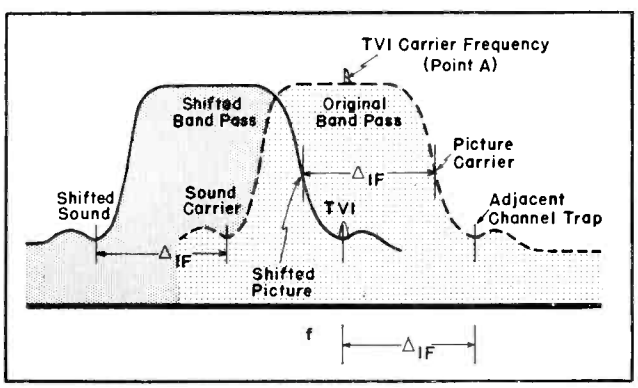


Fig. 3. Curves illustrating a shifted if response. A change in the bandpass is represented as △if.

COLOR TV in

by ROY C. ABBETT

In Charge, Antenaplex Engineering Design-Development, RCA.

Color has the effect of adding a third dimension to the black and white picture. Two types of information, hue and saturation, have to be added to the brightness information of the monochrome picture to produce a picture in color. Hue is that color sensation that allows us to separate colors in such classifications as red, green, blue, yellow, orange and others. Saturation is a term which describes the extent to which a color departs from white light. For example, pale or pastel colors are less saturated than the vivid colors.

Nearly all colors that can be seen by the human eye can be matched by a proper mixture of three colors called primaries. In the mixture of the colors two processes are used. One is known as the additive system; the other is known as the subtractive system. Only the additive system is used in color TV; the subtractive process is used in color printing, photography and painting.

The three primary colors chosen for color TV are red, green and blue. It is possible to use other primary colors, but red, green and blue were chosen because they permit the making of the greatest range of common colors. For example, an addition of red and green produces yellow; blue and green gives cyan, and proper mixture of all three of the primaries gives white.

Chromaticity and Chroma

Chromaticity is that characteristic of color representing hue and saturation. That is, it describes everything about color except its brightness. The term *chroma* usually refers to the saturation of colors. Thus, the chroma control on a color receiver affects the vividness of the colors, not their hues. However, *chroma* is often used as an abbreviation for chrominance signal which includes all color information, less brightness.

The color signal, as mentioned, contains three types of information; brightness, hue and saturation. The brightness signal has been given various names such as the luminance, monochrome, M or Y signal. For simplicity, let us refer to it as the M signal; this signal requires a 4-mc bandwidth and is the signal that produces a black and white picture on all b-w sets in use. In monochrome, the signal is produced by one tube. In color, the signal is produced by a mixture of signals from three tubes, each one picking up a different color. When mixing red, green and blue to obtain white, it has been found that a certain mixture of green, red and blue will be seen by the human eye as a white matching typical daylight. This M signal, from a color camera, approaches very closely the output signal from a black and white camera with optimum spectral response. For all practical purposes they are the same.

To get a picture in color, it is necessary to add to the M signal, hue and saturation information. The color information is supplied by two signals known as Q and I. In the development of color TV, it was found that large color areas in a scene could be reproduced by signals limited in bandwidth to .5 mc. It was also found that small color areas, equivalent to much over 1.5 mc in frequency, appeared as shades of grey instead of color. Therefore, it was found that it isn't necessary to transmit color with a bandwidth of over 1.5 mc. The Q signal has a bandwidth limited to .5 mc, while the I bandwidth is 1.5 mc. In the composite signal, frequencies up to .5 mc are handled by the M, Q and I signals. Those from .5 to 1.5 have no Q. Above 1.5 mc only the M signal is present. The I and Q signals are also made from the red, green and blue signals by proper mixing.

These signals are called the color-difference signals and consist of a certain mixture of red, green and blue. For example, the I signal is equal to $-.28\ G + .6\ R - .32\ B$ and the Q to $-.52\ G + .21\ R + .31\ B$. Their *color difference* identity stems from the fact that they show how the various colors in a picture differ from the neutral grey of the same brightness that would be produced by the M signal alone. The two signals each modulate, in suppressed carrier fashion, the 3.58-mc subcarrier frequencies separated by a predetermined phase angle. Then, the two signals are added together to give a resultant which varies in phase and amplitude. The phase shift between the two signals allows them to be recovered at the receiver by using a demodulator, sensitive only to one phase. For example, the I demodulator responds only to the amplitude variations at zero subcarrier phase, and the Q to its corresponding phase subcarrier.

Another problem one must consider is the manner in which the three separate signals are transmitted in the 6-mc bandwidth allotted for each TV channel. There is no problem with the M and sound signals since each has its own carrier. However, the I and Q signals have been combined to a single resultant of 3.58 mc. This resultant could be used to modulate a third carrier and the color information sent separate from the other signals. This would mean extra equipment and would require more transmitted power. What has been done is to use this resultant subcarrier to modulate the picture carrier. Fig. 1 illustrates how the color signal fits into a 6-mc wide system.

One might ask how the 3.58-subcarrier frequency (actual value 3.579545) was chosen. Studying Fig. 1, it appears as if the color signals are mixed up with the high frequencies of the M signal. However, research has shown that the channel space is not entirely filled with the M signal. Information in the M signal tends to bunch around harmonics of the frame scanning frequency (30 cps) and line scanning frequency (15,750 cps). This leaves holes between ach harmonic that could be used. By choosing the subcarrier frequency as an odd multiple of one-half the line frequency, the chrominance sidebands are caused to appear in these empty spaces. Field tests pinned the frequency to its present value of 3.58. This is the 455th harmonic of one-half the line frequency, when the line

‡From a talk presented at *Third Annual Convention* of the *National Community TV Association.*

Community Distribution Systems‡

frequency is specified as 2/572 times 4.5 mc; the standard spacing between picture and sound carriers in a TV channel. This results in slightly different scanning frequencies; the horizontal is now 15,734 cps instead of 15,750, and the vertical 59.94 cps instead of 60. This line frequency has been found to minimize a beat problem between the chrominance subcarrier and the sound carrier.

The system requires a method of locking the receiver color circuits in with those of the transmitter. This has been done by adding what is termed *burst* to the back porch of the horizontal sync pulse. The burst consists of about 8 cycles of 3.58-mc subcarrier at a particular phase. This is taken off at the receiver and used to lock the 3.58-mc oscillator of the receiver in phase with that of the transmitter. As mentioned earlier the 3.58-mc subcarrier was supressed at the transmitter; therefore, it is necessary to restore it at the receiver.

Reception and Distribution of Color Signals

Obviously the first point of consideration for reception is the antenna. Since the color signals, for any given channel, more completely occupy the width than black and white signals, the antenna used requires a bandwidth coverage corresponding to that required for color signals. It is a general assumption that most antennas have sufficient bandwidth. However, some antennas have sharp amplitude response characteristics, which in some cases can become displaced because of basic design features, improper installation technique, breakage due to icing or for other reasons. The multielement yagi, a commonly-used antenna, has a sharp response characteristic, with the sharpest response occurring in the lower channels *2* through *6*. If this response is such as to reject the low side of a channel, the resulting color signal could well be degraded (like monochrome signals). If the high-frequency side of the channel, containing the color subcarrier information, is mistuned and sharply rejects the color subcarrier burst, the color information will be degraded or a complete loss of color may result.

Interference pickup is more objectionable for color than for monochrome reception. Therefore, the directivity of the antenna can be of considerable benefit. If the antenna is properly directed it will help to discriminate against reflections. Reflections may appear in various hues and shades in the color picture at the edge of objects or may cause partial or complete cancellation of the color subcarrier burst. The latter will occur if the reflected path is an odd multiple of a half wavelength at the transmitted subcarrier frequency (i.e., 64.83 mc for channel *3*). Slight antenna reorientation may be necessary to reduce this problem.

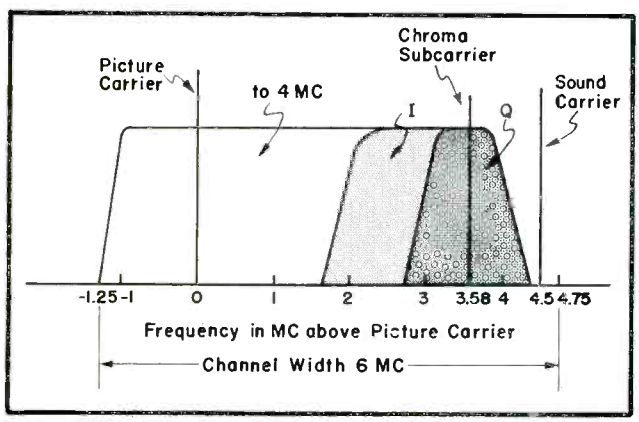
The overall system requirements of amplitude-frequency response (including antenna, amplifiers, converters, cable and accesories) indicate that for present receivers the color subcarrier burst may be attenuated 3 to 6 db and still be satisfactory. This compares to 20 db or more for monochrome signals, where the picture may be tolerable and yet the sound signals attenuated. The effect of poor amplitude response for the system is the same as for a single antenna feeding a single receiver. In other words, the cumulative effect of all the losses added up cannot exceed that limited for a single installation, without degrading a color picture or causing a complete loss in color signal.

When the color signal is attenuated excessively, a complete loss of color signal occurs as a result of the color-killer circuit acting within the receiver. The receiver contains control circuits which act to cut off the 3.58-mc oscillator for black and white reception. When the 3.58-subcarrier is reduced, because of lack in amplitude response in the receiving circuits, the color-killer circuit acts and the would-be color signal suddenly turns to b-w.

Assuming proper maintenance of amplitude response, an additional consideration of phase delay of the amplifier must be taken into account. In other words, the phase delay across

(*Continued on page 64*)

Fig. 1 (left, below). Video spectrum for compatible color TV system. The outer vertical lines indicate the usual picture and sound carriers. In between is the chroma 3.58-subcarrier. The shaded area immediately surrounding 3.58-mc is taken up by the Q and then the I signals. The M signal is transmitted in the full 4-mc bandwidth.



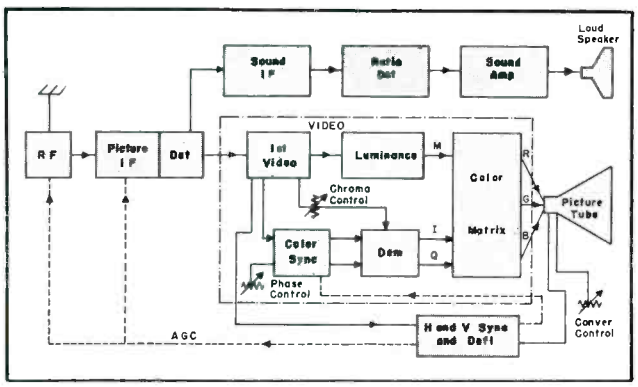


Fig. 2. Schematic of a color receiving system.

Service Engineering — field and shop notes

by

LEO G. SANDS

Servicing Citizens Radio Equipment

A NEW LUCRATIVE field is opening up for enterprising Service shops; *citizens radio*. Now that more equipment is becoming available, the number of *citizens-radio* users will certainly increase the demand for service.

Citizens radio was established by the FCC five years ago to permit the general public to enjoy the convenience and economic advantages of two-way radio communication. The use of two-way radio had been restricted to certain segments of the public such as transportation companies, public safety organizations, etc.

Any citizen of the United States, 18 years of age or over, is eligible for a radio station license in the *citizens-radio* service, provided the applicant is not eligible for licensing of a similar system in one of the other regularly-established radio services.

In addition to private or personal radio communications, *citizens radio* provides for radio control of objects and devices such as model airplanes.

There are three classes of *citizens radio* stations: class *A*, *B* and *C*. Class *A* and *B* stations can be used for voice, radiotelegraph, radioteletype and facsimile communications, as well as for the radio control of objects and devices. Class *C* stations can be used only for the radio control of objects and devices on a frequency of 27.255 mc with a frequency tolerance of ±0.04%, a maximum bandwidth of 10 kc and maximum input power of 5 watts.

Class *A* stations can be operated on any frequency between 460 and 470 mc, with a frequency tolerance of ±0.02% and a maximum bandwidth of 200 kc. Between 462 and 468 mc, power input to the final *rf* stage of the transmitter is limited to 10 watts, and on other frequencies in the 460 to 470-mc band to 50 watts.

Class *B* stations can be operated only on 465 mc with emissions confined within the 462.675 to 467.325-mc band and with maximum input power limited to 10 watts.

Although *citizens radio* can be used by the housewife for keeping tab on her husband, *citizens radio* is also an industrial tool for the businessman. The radio and television Service Man, the diaper service company, salesmen, and warehouse watchmen are among the potential users of *citizens radio*.

Soft drink distributors, building supply dealers, radio parts houses, fuel oil dealers, delivery companies, laundries and tire dealers are among present commercial users of *citizens radio*.

Most class *A citizens radio* systems are mobile radio setups consisting of one or more base stations and one or more mobile units. However, FCC rules permit point-to-point communications in the citizens band, so a system may consist of a pair or more fixed stations.

Class *B* systems generally consist of a pair or more hand-carried portable 2-way radio units.

Equipment for class *A* and *B* *citizens-radio* communications service is available from several manufacturers.‡

Equipment used in class *A* mobile-radio systems is generally identical to equipment designed for use in other radio services in the adjoining 450 to

(Below)

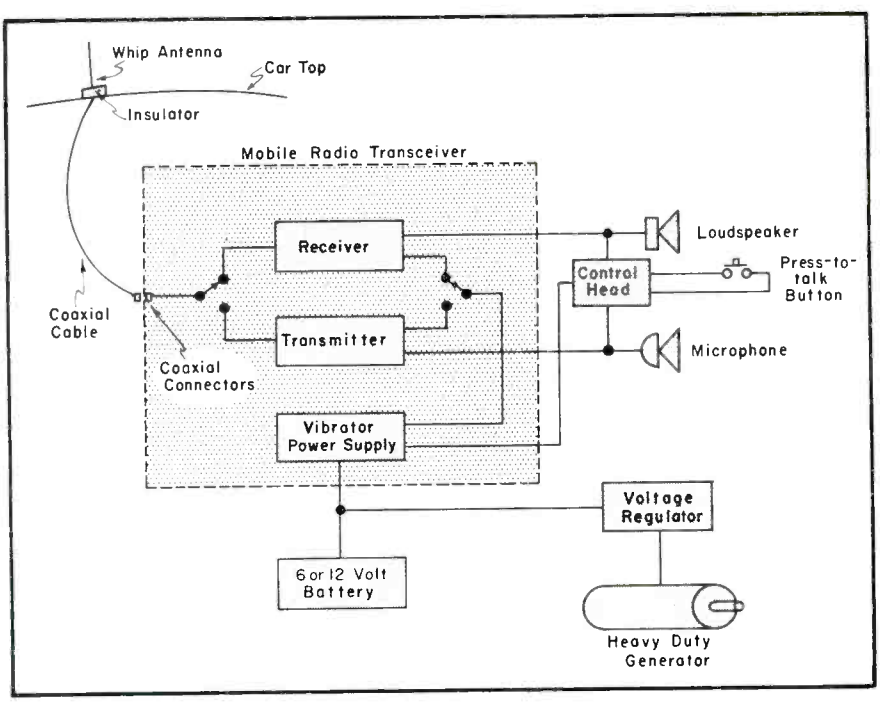
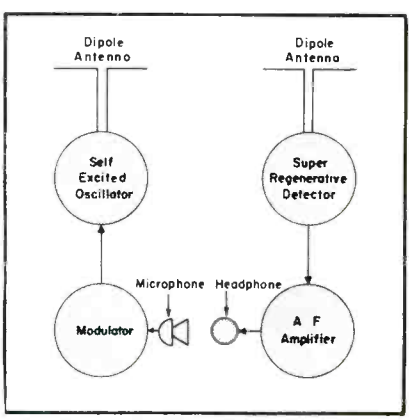


Fig. 1. Block diagram of citizens-radio unit. At left we have the basic circuit in transmitting position. Circuit at right illustrates circuit condition when press-to-talk button is released.



(Left)

Fig. 2. Typical mobile unit for Class A citizens radio setup.

460-mc band, the differences lying in tuning and crystal frequencies.

The typical class *A* mobile unit is a transceiver consisting of an FM transmitter, FM receiver and vibrator power supply. The accessories are the same as for 30-50 mc and 152-174 mc mobile-radio units, except that the antenna is generally a car top-mounted whip approximately 6″ long.

The transmitter and receiver are both crystal controlled and fixed tuned. Sometimes provision is made for operation on more than one frequency utilizing crystal switching for changing frequencies.

A typical mobile unit[1] for class *A* *citizen-radio* service employs 26 tubes and is available for operation from a 6 or 12 volt battery electrical system. The transmitter, receiver and power supply are packaged as a single unit weighing 39 pounds.

The transmitter power output is rated at 10 watts and the receiver sensitivity is stated to be better than 1 microwatt for 20-db quieting. Coax-tuned lines are used in the receiver *rf* section, and a coax filter separates the transmitter and antenna to reduce spurious emissions.

A new type of *JAN* approved tube, the 5894A, which is a redesigned version of the popular 829B, is used in the tripler-driver and power amplifier stages of the transmitter.

Base stations for class *A* communications service are similar electrically to the mobile units, except that an *ac* power supply is used in lieu of a vibrator power pack.

A base station can be controlled at the equipment cabinet or from one or more remote points. When remote-control operation is contemplated, interconnecting wire lines or a radio link may be used. The wire line is recommended when it is available, because the operator will have more positive control of the base station. When a radio link is used, others operating on the same frequency might capture control of the base station.

The communications range of a citizens-band mobile radio system is determined mostly by the effective height of the base station antenna. The higher the antenna, the greater the range. Since transmission line losses are quite great at 460 mc, it is considered good practice to keep the coax cable between the antenna and the base station unit as short as possible. When installing the base station on the roof of a tall building, the antenna can be mounted on a piece of pipe and the antenna transmission line can be kept fairly short, yet taking advantage of the effective height of the building.

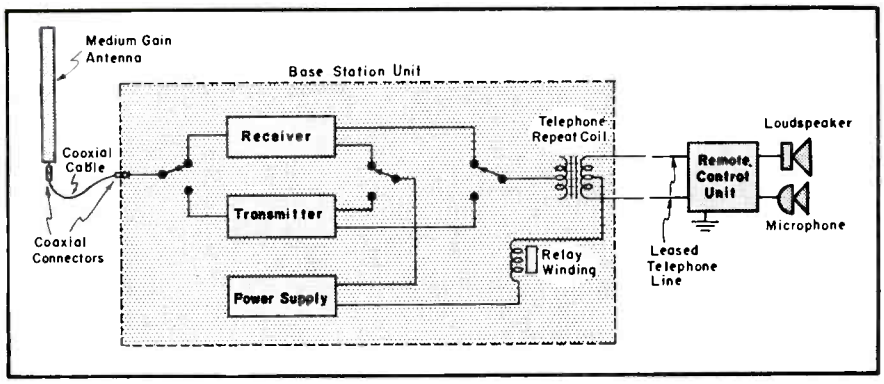


Fig. 3. Remote-controlled citizens-radio base station.

The typical class *B* *citizens-radio* unit is a super-regenerative receiver which is converted, when the press-to-transmit button is operated, into a self-excited AM transmitter. Inasmuch as crystal control is not used, printed or other form of rigid circuitry is employed to obtain reasonable frequency stability.

One typical class *B* *citizens-radio* unit[2] is 10½″ long and weighs 28 ounces, exclusive of carrying case and battery pack. Frequency stability of the unit, transmitting or receiving, is stated to be such that there is a drift of less than ±.5% over the temperature range of 0 to 125° *F* and from 0 to 100% humidity, with plate voltage at any value between 90 and 130, and filament voltage between 5.2 and 7.

To meet FCC requirements for frequency stability, the tank and antenna coils are fixed permanently and compensated for temperature and humidity changes within limits.

Although class *A* mobile-radio equipment can be checked and adjusted to a limited degree in the vehicle in which it is installed, it is recommended that the transceiver unit be removed from the vehicle to the service bench for preventive maintenance checks, retrimming and repairs. Where finances permit, spare transmitter units should be available for use as replacements so that the customer will not be deprived of his radio communications facility.

The base station unit must generally be serviced at its regular location. As the base station is not subjected to the same shocks and environmental conditions as the mobile units, base-station equipment should experience fewer failures.

Class *B* portable-radio units should, of course, be brought into the shop for servicing. At present, some of the manufacturers of class *B* equipment prefer that defective units be returned to the factory for servicing. As more of these units are placed into service, it is recognized that servicing will have to be done on a local basis.

The prime requisite to entering the *citizens-radio* servicing field is the required FCC operator's license. It is required by law that persons making adjustments to radio transmitters must possess a first or second class radiotelephone or radiotelegraph operator's license. However, an operator's license is not required by users of *citizens-radio* equipment.

Test Equipment Needs

To render effective service to customers, the *citizens-radio* service shop should have adequate test equipment. In addition to the usual tools, meters and tube testers, the following equipment should also be available: Special test meter for each particular brand of *citizens-radio* equipment; frequency and deviation meter; power output meter; *if* signal generator; and *uhf* signal generator.

Most equipment manufacturers market a special test meter designed for

(*Continued on page* 69)

Citizens radio unit for class B service. (Stewart-Warner Portafone.)

‡RCA, Motorola, Link, Platt, DuMont, G.E., and Connecticut Telephone make class *A* units. Manufacturers of class-*B* citizens radio equipment include Citizens Radio Corp., Vernon C. MacNabb Co., Multi-Products, Inc., and Stewart-Warner Corp.

[1]RCA CMU-10A.

[2]Stewart-Warner Portafone.

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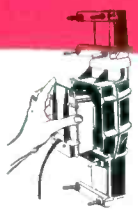

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4 POWERFUL INLINE DESIGN

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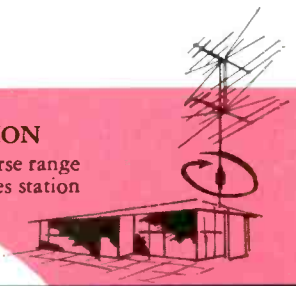

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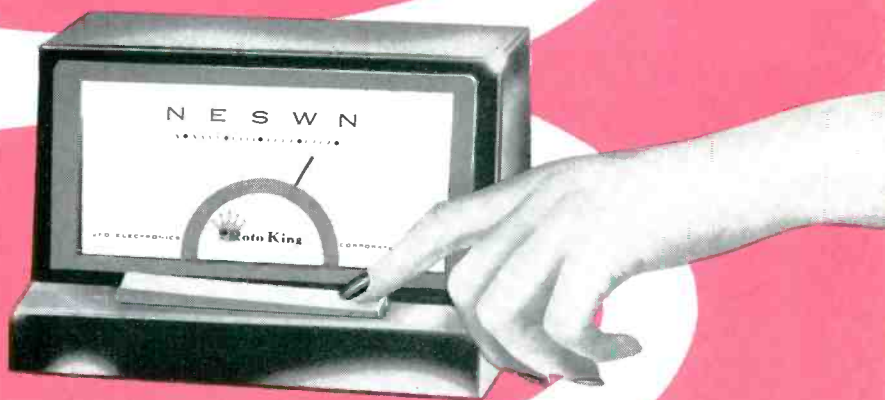

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by T. L. GILFORD

TV Remote System Installation . . . Preventing Burned-In Bars on Color Tubes . . . Auto-Radio Distortion Cures . . .

REMOTE CONTROL of TV chassis, once considered a pure novelty, has now become a solid installation factor. The turnabout has been prompted by the development of practical, simplified systems, as illustrated in Fig. 1.

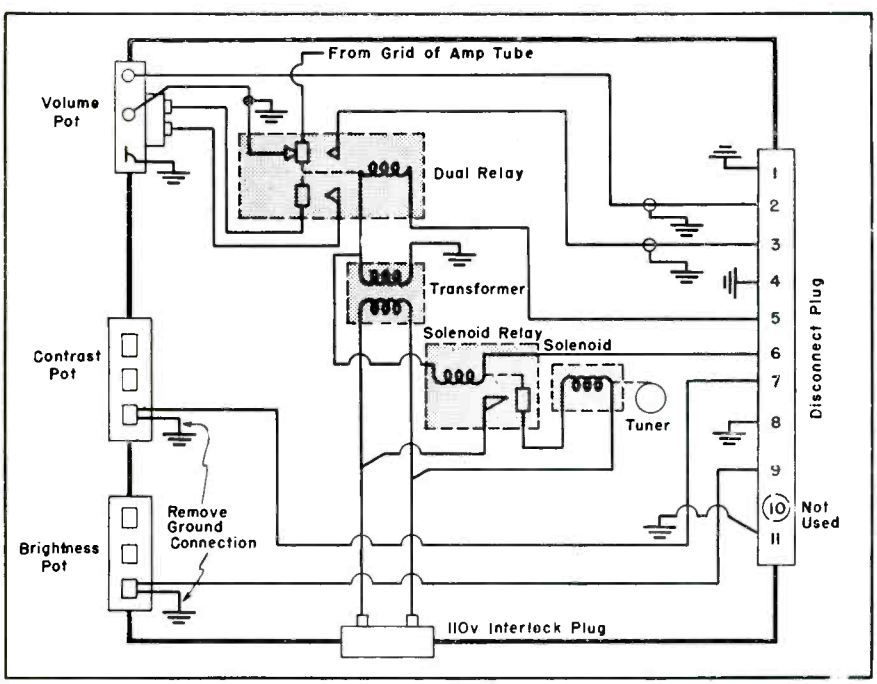
The unit diagrammed features on-and-off control; sound control; brightness and contrast control; channel changing. and provision to take the sound control away from the set, so that the sound operates only from the remote unit or can return it to the set at will.

The equipment operates on a 6.3-volt feed from the set to the control unit, thus avoiding a 110-volt potential hazard and home voltage (95 to 135-volt) variables, which can affect channel control.

When the solenoid in this unit is activated, it is only a cocking action; a coil spring actually changes the channel and overcomes problem of any voltage variance.

Installation of this remote, it is said, does not overload the chassis. The remote system was designed for TV models using Standard Coil tuners. The solenoid assembly is mounted on the tuner case; a fiber gear with a leaf and coil-spring support serve to control the operation of the tuner's detent mechanism.

Fig. 1. Wiring diagram of TV Remot-o-matic (De Luxe system) remote.



Servicing Tricolor Picture Tubes

WHENEVER A FIXED test pattern, such as is produced by a color bar generator, is used for testing a color TV receiver, care should be taken to prevent damage to the phosphor coating on the picture tube. When the receiver is on test for a considerable period of time with color bars, the brightness and color controls should be set for a low level of brightness to prevent *burned-in* bars on the face of the picture tube.

Normal usage of the tricolor tube has the effect of *aging* the phosphors so that they are less susceptible to burns from a stationery pattern. It is recommended, therefore, that new tubes should not be operated with a fixed pattern of high intensity for more than fifteen minutes. In the event that a picture tube has a burn in a localized area it can normally be scanned off in a few hours. This may be done as follows: One should tune in a strong black-and-white signal and turn up the brightness and contrast controls; then the vertical hold control should be adjusted until the picture rolls continuously.

Auto-Radio Distortion Cures[1]

DISTORTION ON the G-M auto models employing *sst* might be due to grounding of outut transformer secondary through station selection switch.

It is conceivable that after a year or two, the contact points on the station selector switch may have accumulated dirt. With a slight amount of resistance, created by dirt on the contact points which could ground out the output transformer, distortion could obtain.

The trouble could be a result of audio vibration on the points or perhaps the result of the fluctuating voltage (audio rate) across the resistance added to the points.

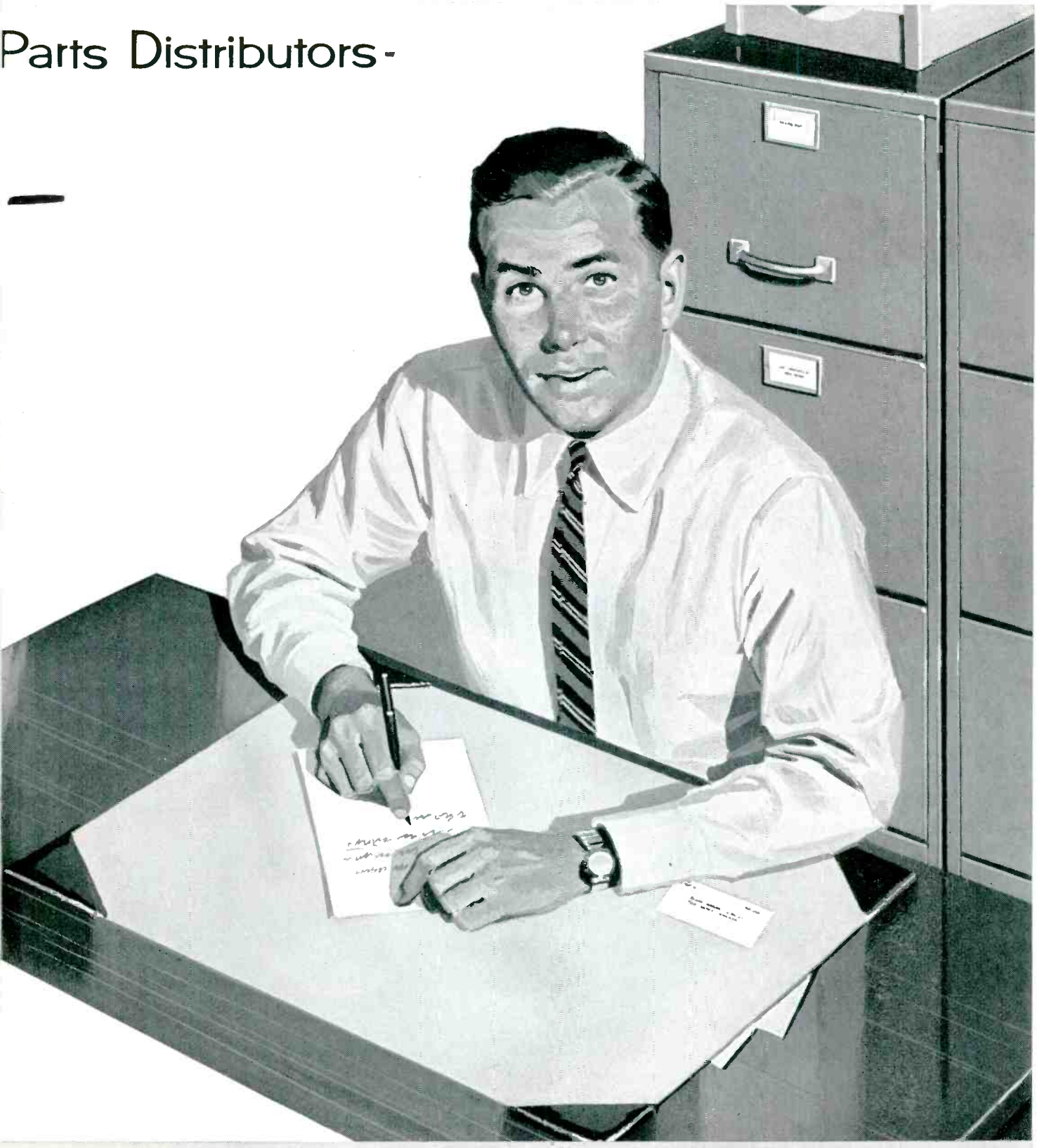
The distortion heard will sound similar to that caused by a defective speaker whose voice coil is being rubbed.

By making a good ground for the output transformer, one can ascertain if this is the real cause of the distortion.

Changing the station selector switch is not necessary if the points are only dirty. We all have our own methods of cleaning points, but one should not overlook the easiest method: rubbing the points with an ordinary piece of white paper.

[1]From Delco Testing Tips.

Parts Distributors -



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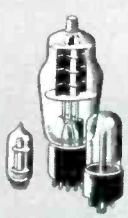
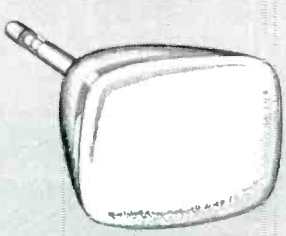
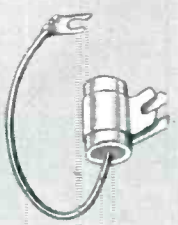


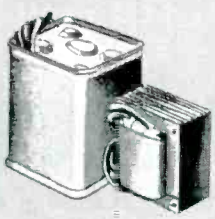
RECEIVING TUBES



PICTURE TUBES



SUPPRESSION PARTS



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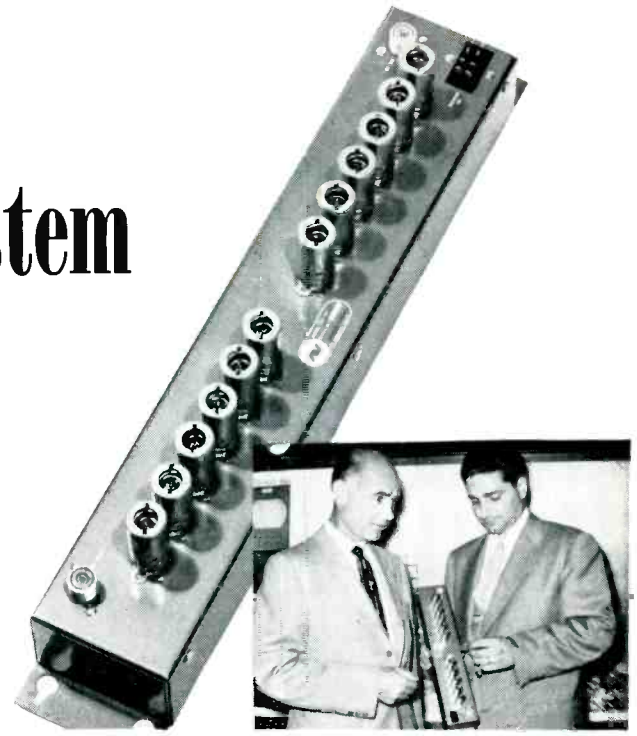
TV Chain Amplifier Master Antenna System

by **MURRAY SALIT**

Director of Service, Industrial TV Utilities Co., Inc.



Two Distributed Amplifier Stages, in Cascade, Featured in Master System to Minimize Call Backs and Maintenance

WHEN A MASTER ANTENNA system is installed in a multiple dwelling and there is a tube failure, building operators are plagued by tenants who demand immediate service. Accordingly apartment-house management usually insist that the service company maintaining the system provide 24 hours stand-by service. To minimize the economic and physical strain caused by this problem, there has been developed a technique featuring an amplifier in which each tube boosts the signal received from the TV antenna, but no individual tube can interrupt the performance of the over-all amplifier.[1] From a practical aspect it may be said that all these tubes are in parallel. Therefore, if there are a dozen tubes in the amplifier and each tube contributes 1.75 db gain, the overall gain of the amplifier equals 21 db. This means that when this amplifier is in service and one of the tubes fails, the gain of the amplifier is reduced by 1.75 db. It has been found that the loss of 1.75 db is not noticeable on any of the TV sets connected to the system, as the *agc* of the average TV receiver normally compensates for the failure of three or more of the tubes in the amplifier.

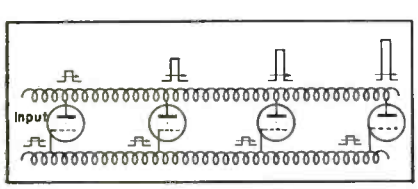
This amplifier has been found to have a flat response from 50 to 225 mc. Technically it may be said that this is a distributed amplifier consisting of two distributed amplifier stages in cascade. The amplifier uses 6AK5s; all grids are equally spaced along a grid delay line, as shown in Fig. 2, and all plates are equally spaced across a plate delay line. The delay times of both lines are equal. The TV signal enters a 75-ohm input, which is connected through a matching transformer, to the input of the first tube where it is amplified. The amplified signal at the plate of the first tube goes down the plate delay line towards the plate of the next tube at exactly the same instant that the original signal starts down the grid delay line towards the grid of the second tube. Since the plate and grid lines delay the signal

(*Continued on page 73*)

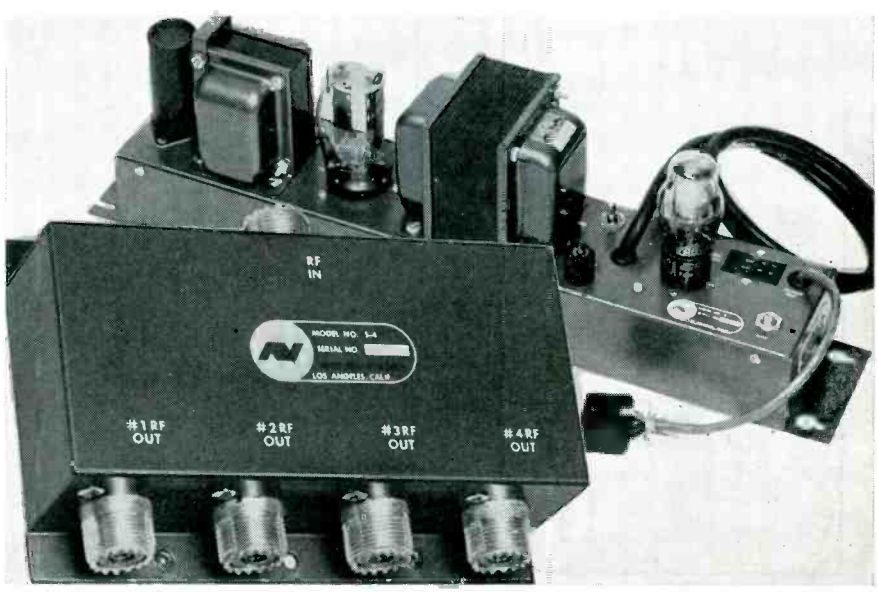
[1]Developed by Ampli-vision Division of International Telemeter Corp.

Fig. 1 (above, right). Murray Salit (right) discussing broad-band amplifier (shown in detail at left) that was installed in Riverdale master-antenna system, with Frank M. Viles, Jr., general manager of Ampli-Vision, who developed the amplifier.

Fig. 2 (below). Section of circuitry of grid and plate delay lines.



Figs. 3 and 4 (right). At top, power supply for broad band amplifier; note test jack, right side. Below, four-way line splitter which develops four rf outputs from one rf input.



by M. W. PERCY

Linear Phase-Sweep Color Pattern and SER-CUITS

THE ANTICIPATED growth of color TV has created a problem for the Service Man with respect to the test equipment which will be required to install, repair and align the new models.

The minimum test equipment which a shop will be obliged to use includes a complete set of b-w check gear plus two or perhaps three instruments for color. The b-w lineup incorporates a vacuum-tube voltmeter; high-voltage measuring device for up to 25 *kv* (this may be a high-voltage probe for use with the *vtvm* or an independent high voltage meter); tube tester; general purpose 'scope equipped with *rf* and high-impedance probes; and a *vhf* signal generator covering frequencies from 15 to 220 mc on fundamentals.

For problems that will be encountered in color TV work, the required instruments are a color pattern and a white dot generator.

An auxiliary instrument which will be beneficial is a wide-band 'scope with good sensitivity to 4 mc to signal trace the 3.58 mc *color burst* transmission.

The Color Pattern Generator

Both the dot and pattern generators are important in color TV servicing. The chroma circuits can neither be tested nor adjusted without the use of a color pattern generator. And if the customer complains about *off shade* colors one must have some way of generating standard colors for testing and alignment.

A color pattern generator should fulfill four requirements:

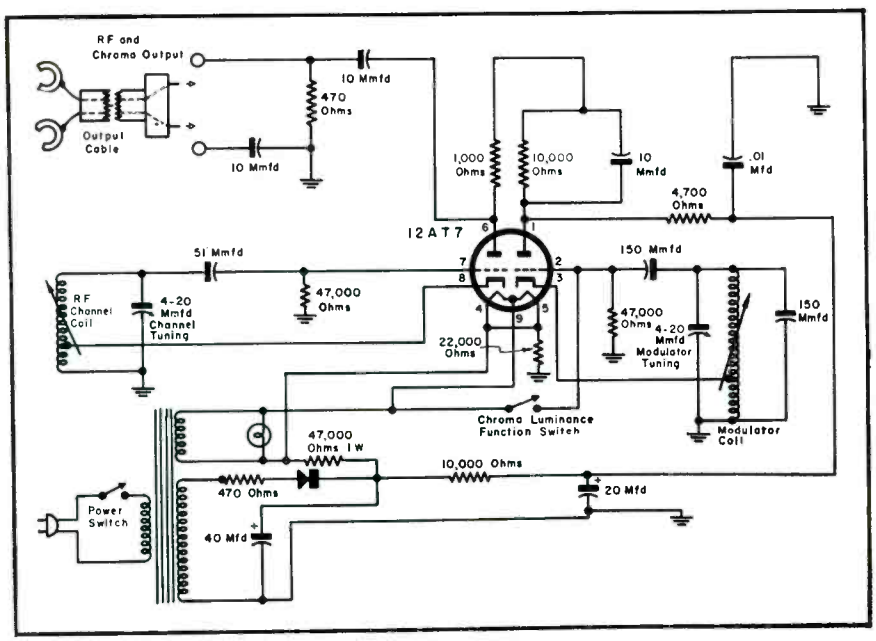
(1) It should produce a standard and predictable color pattern on the picture-tube screen for testing, trouble diagnosis and alignment of the chroma circuit phase controls. This may be either a color-bar or a linear phase sweep pattern.

(2) It should supply a luminance signal (black and white component, sometimes called the *Y* signal) or a luminance-reference signal to permit adjustment of the matrix circuits (color signal mixing circuits).

(3) The color pattern generator should permit feeding of the signal at the receiver antenna terminals to give an overall check of receiver operation with a signal having chroma modulation.

(4) If the color generator produces color bars having single phases representing a particular color signal, there should be negligible phase drift after the initial warm-up period to avoid erroneous alignment of phase circuits.

Fig. 1. Schematic of color-pattern generator which uses a relative linear phase-sweep generating technique. (Win-tronix 150.)



Types Of Color Pattern Generators

There are several different types of color pattern generators now available:

(1) MULTIPLE-BAR COLOR GENERATOR: This pattern generator serves to produce a pattern of several vertical stripes or bars of single phase colors. Basically intended for studio or lab use, it supplies standard proportions of sync pulses, luminance and chrominance components corresponding to FCC standards. Because of the possibility of phase drift some of these instruments are used in conjunction with a phase monitor, or vectorimeter.

(2) SINGLE-BAR COLOR GENERATOR: Generators of this type which produce a pattern having one vertical stripe or bar of one standard color and phase may be in either the lab or service shop category. This type of instrument provides only one standard color bar at a time, with a switch for selecting various standard color bars such as *red, blue, green, R-Y, B-Y, I, Q* and possibly the complementary colors of *magenta, cyan* and *yellow*. This type of generator will usually supply luminance and sync signals in combination with the chroma signal.

(3) TAPERED-COLOR BAR GENERATOR: Another basic form of the color pattern generator which produces

several bars whose colors taper or change gradually during the time of each bar and from one bar to another. This type of generator may or may not be supplied with sync and luminance signals, and in general may not produce color bars of standard signal proportions. However, for service work and many lab applications it is not necessary that the color bars conform to FCC standards, provided the characteristics of the bars are known.

(4) PHASE - SWEEP COLOR - PATTERN GENERATOR: Here is a new form of generator, a linear phase-sweep type, in which response curves from phase detectors and matrix networks become sine waves, simplifying alignment of chroma circuits. Linear phase sweep, in effect, produces a phase shift of the 3.58 signal, from zero to 360°, representing a generation, or scanning, of all hues of the NTSC color system. This sweeping of phase may be compared to the sweeping of frequency used in sweep-frequency generators for viewing frequency response curves. A sweep frequency generator is used to produce an *rf* or *if* response curve for faster alignment. In like manner, it has been found that a linear phase-sweep generator can be used to produce the phase response curve of a chroma demodulator (color phase detector) or matrix network to expedite troubleshooting and alignment.

A model which employs relative linear phase sweep is diagrammed on the *cover* and Fig. 1.‡ A channel dial permits selection of *rf* output frequencies including channels *2* to *6*. A *rainbow* control adjusts the relative linear phase sweep. When the control is set on *O CAL* the generator produces the 3.58-mc color burst. When the control is set on *PLUS ONE* the effective linear phase sweep is 360°, producing all the hues of the NTSC system in one pattern; a color spectrum or *rainbow*. Colors appear in definite locations on the picture tube in the following order, from left to right: *I, red, R-Y, magenta, Q, B-Y, blue, cyan, green* and *G-Y*, with yellow and burst phase occurring during retrace time.

†*Based on exclusive report prepared for* SERVICE *by* ***Winston H. Starks****, chief engineer and president, Winston Electronics, Inc.*

A *function* switch provides a selection of either 3.58 chroma or luminance modulation. The *chroma* position is used for adjusting phases and 3.58-mc coils in the TV receiver, as well as for receiver demonstration. The switch is thrown alternately from luminance to chroma during the process of matrix circuit adjustment, with luminance signal serving as a reference level. A 3.58-mc chroma oscillator modulates the *rf* oscillator.

Applications of the generator in color TV servicing are:

(1) Troubleshooting and trouble diagnosis by interpretation of the color pattern appearing on the color tube. (No 'scope is normally required for this application.)

(2) Phase alignment and touchup of the master phase control (or hue control) for the *I* or *R-Y* demodulator, and the quadrature phase control for the *Q* or *B-Y* demodulator by picture tube color pattern. Adjustments must be made to move the color bands to the proper location on the tube screen.

(3) Chroma demodulator phase controls can be aligned by observing sine wave demodulator output response curves, or by using a phase-circle curve on a scope.

(4) Matrix controls can be adjusted by observing the sine wave curves on the pix tube grids, adjusting amplitudes in reference to the luminance signal provided by the generator.

(5) Traps and 3.58-mc coils can be peaked by using the 3.58-signal provided by the generator.

(6) General troubleshooting of the chroma circuits is possible by operating with the 3.58-mc signal while tapping tubes, replacing tubes, applying various disturbance tests and tracing 3.58-mc with a *vtvm* and *rf* probe or a wideband 'scope.

‡*Win-tronix model 150 Rainbow Generator.*

White Dot Generator

The white dot generator, equally indispensable for color servicing, is used to service, align and adjust the convergence circuits associated with the tri-color picture tube. This tube, employing a shadow-mask type of construction, requires very precise adjustment of the deflection yoke, beam magnets, purity coil, as well as *dc* or *ac* voltages applied to convergence electrodes of the color tube.

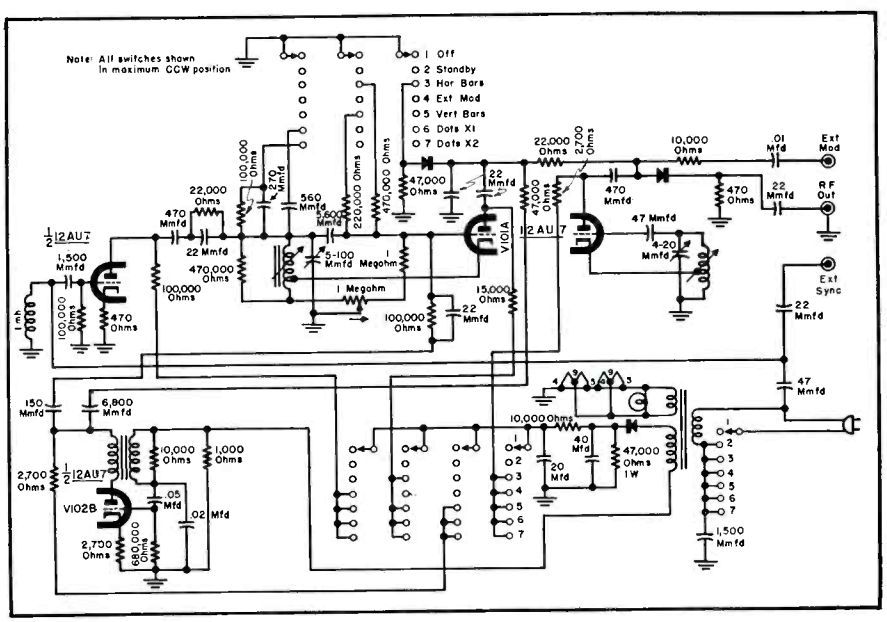
If, for example, any of the following situations arise in a color set, it may be necessary to readjust for convergence with a white dot generator:

(1) Change of convergence voltages due to aging or characteristics change of tubes or components.

(2) Convergence waveforms or volt-

(*Continued on page 71*)

Fig. 2. Circuit of white-dot generator. Bar and dot modulation is fed to modulator crystal after pulses have been shaped. The 60-cycle blocking oscillator, which provides vertical sync, is locked in step with the ac-line frequency, and is also locked with the pattern by a count-down circuit. (Win-tronix 160.)



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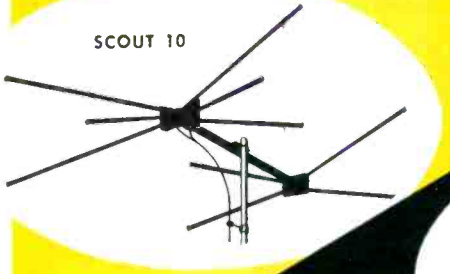

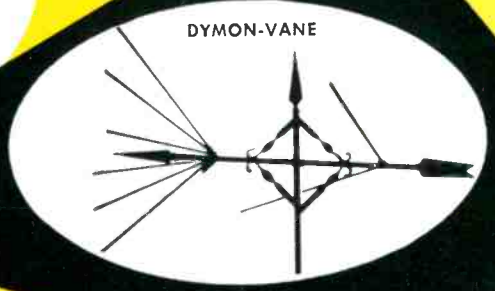

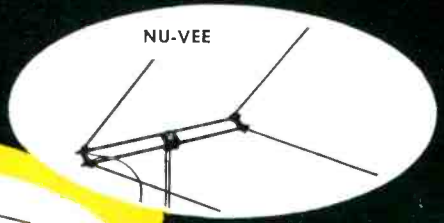

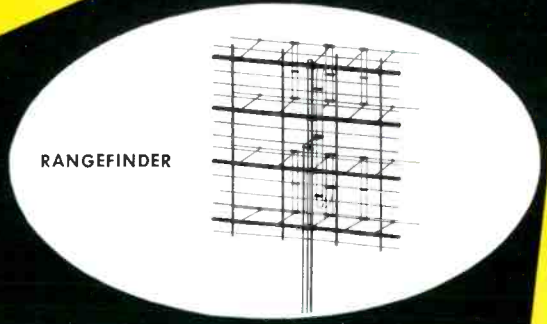

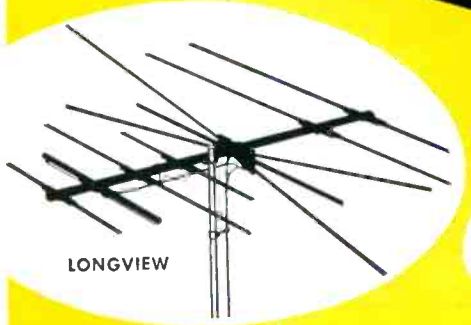

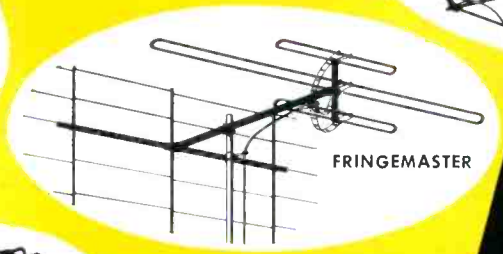

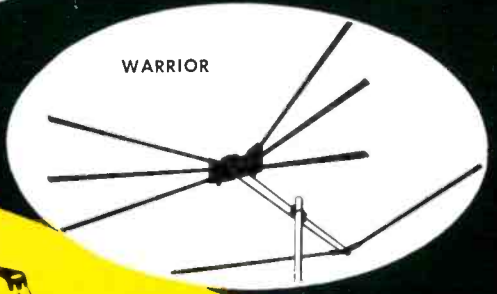

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A dvertising — Effective national advertising plus local tie-in.

M erchandising — Quality products, attractive prices, and actual sales leads for you.

SERVICE...The National Scene

TAPE, PHONO, SPEAKER PROGRESS REPORTS SHINE AT N.Y. AUDIO SHOW--Tape recording and playback which has skyrocketed into an $80-million annual industry (based on statistics compiled by licensing agencies), found itself in the dazzling limelight at the recent audio fair in New York City. Not only were there a number of striking displays around, but engineers unveiled a host of outstanding developments on the podium. . . . It is now possible, it was disclosed, to record and playback on battery-type pocket-sized gear (only 6½" long by 4½" wide by 1½" thick), using standard speed and standard tape, on reels that can operate on other machines. Thus, for the first time, we have midget equipment that is compatible, since reels can be transferred to other units for playback. All functions of ac recorders, except fast forward can be performed. That is, the tiny taper can record, erase, monitor, rewind, playback and provide listen-back. It is capable of one to two hours of recording time. For audio, a postage-stamp size resistance-coupled amplifier is used.

METHODS NOW AVAILABLE to control wow and flutter effects in tape were also revealed at the conclave. It has been found that under certain conditions, spontaneous frequency modulations at rates upwards of several kilocycles can cause audible noise effects, not unlike the modulation noise associated with signal amplitude fluctuations. . . . This FM noise can be minimized or eliminated by providing stabilizing rollers to contact the tape at or near the recording heads. The inertia of these rollers need not be very large to be effective against hf vibrations, it was pointed out. Small ball bearings about a half-inch in diameter placed so that the tape rides on the outer race have been found to be sufficient. The desired stabilizing effect has been obtained on some machines by positioning the heads to bear directly against the tape as it passes over the drive capstan.

OTHER TAPE EXPERTS reported that surface defects, which have assumed increasing importance, because the general level of recording quality has risen, have been minimized through improved binder formulation and coating techniques. The major problem, involving the nodule or clump of magnetic material, it was emphasized, has been solved.

ELECTROSTATIC SPEAKERS, which have suddenly forged to the front, since they have been found to afford an effective means of reproducing the very-high frequencies, were also carefully surveyed at the audio conference. It was noted that early attempts in electrostatic development were frustrated by many reasons, chief of these being the susceptibility to electrical breakdown, low efficiency, rapid oxidation of structural materials and the inability to obtain manageable membrane materials thin enough to classify as really thin membranes, a basic requirement in these 'static speakers. . . . One model shown featured sheathed conductors situated in two parallel planes, supported by a pair of plastic moldings in a push-pull arrangement, with a centrally-located diaphragm supported by the same plastic moldings.

TRIPLE-RANGE SYSTEMS, consisting of folded-horn woofer, horn-type mid-range and tweeter units, all of the indirect radiator type, were described by another audio engineer as a sound approach to good distribution. It was noted that there has been some resistance against the wider adoption of horn-type speakers for the middle range, usually on the grounds that a so-called horn-like quality was present. This prejudice was said to have no authentic basis; significant advantages are available from true horn-loaded speakers in almost every respect namely, conversion efficiency, smoothness of response and reduction of distortion.

THE RISING ACCEPTANCE OF CERAMIC ELEMENTS for cartridges was highlighted during a forum on pickups. The popularity was attributed to the stability of the elements and the fact that they are relatively unaffected by heat and humidity. In addition, it was said, ceramics are not sensitive to the magnetic fields from the record changer motor and hum-producing elements; and they are not attracted to steel turntables.

SERVICE...The National Scene

SNOWBALLING GROWTH OF COLOR TV ON DECK FOR EARLY '55--Thanks to vigorous air and national magazine campaigns, and the availability of large-screen picture tubes, color is rapidly moving out of the exploratory stage, and headed for across-the-board popularity. . . . At least 30,000 polychrome chassis will be in operation before the end of the year. And during the winter and spring months of the new year, it is believed that a minimum of 100,000 more receivers will find their way into homes across the nation. . . . An important assignment appears on the books for the Service Man during the installation of every color set; he must align skillfully a variety of the picture-tube's key elements and allied circuitry to insure acceptable performance, and of course, install an antenna, plus the usual assortment of accessories. Even where a b-w set is in operation, the antenna is a factor, for replacement of the old antenna with its weather-beaten elements and lead lines is a must; it is the only positive way to avoid losses and provide a solid signal to the color set.

CITIZENS RADIO NOW A FLOURISHING SERVICE ENGINEERING ACTIVITY‡--Two-way, which for years had been wrapped up for special services such as police, fire, taxicab, oil-exploration, railroad and forestry agencies, has now entered the general-public domain, in the form of citizens radio. Although the service was authorized over five years ago by the Commission, only recently has it begun to blossom. . . . Now the 2-way system has attracted the attention of a wide assortment of businessmen, farmers and even the Service Man for field use. The records show that laundries, tire dealers, milk companies, salesmen, linen service operators, special-delivery messenger outfits, reporters, installation men, food distributors and disabled persons have become avid users of the system. . . . Three types of licenses are available, and they can be obtained by any citizen of the country, who is 18 or over. Classified as A, B, and C for the 460-470, 465 and 27.255-mc bands, respectively, the licensed stations can be used for voice, radiotelegraph, radioteletype and facsimile communications, and for the radio control of objects, such as model planes. . . . The price and size problems, which bottlenecked production of transmit-receive equipment for a long time, have been solved, and a number of compact, efficient and moderately-tagged units are now available. And, the development score-board indicates that early next year we'll see an increasing assortment of walkie-talkies on the market-place. . . . Commenting on the prospects in this new field, one citizens-radio manufacturer said that this beaming infant has a tremendous potential, particularly for the Service Man. We, he said, are anxious to line up as many seasoned Service Men as possible for depot work. And, he emphasized, he was certain that other c-r makers are equally interested in locating shop operators who could properly maintain and service this equipment.

HOSPITAL TV PROJECTS BOOM--To help make the days of recuperation pass more pleasantly, an increasing number of hospitals are installing TV receivers in patients' rooms. . . . In an upstate New York hospital, over 200 large-screen sets have been installed in all of the private and semi-private rooms, and solariums, too. For those who cannot move and must lie in a prone or supine position, special glasses, with prismatic lenses, have been provided to facilitate viewing. . . . In addition, each set has been equipped with small pillow speakers and remote control systems. Thus, all reception is private and patients can turn sets off or on from their beds. . . . The increased sensitivity of receivers, improved aluminized picture tubes, simplified tuning systems, and the development of fool-proof remote-control attachments, were described as the factors which have overcome the objections which detoured acceptance of hospital TV for quite a spell.

TELECASTER BOOSTS UHF CONVERTER INSTALLATIONS THROUGH STATION CONTEST--A roaring radio-TV-direct mail campaign to spur the sale and installation of ultrahigh converters was inaugurated recently by WAKR-TV, operator of the channel-49 station in Akron, Ohio. Attractive prizes are being awarded to those who install the greatest number of converters. And uhf converters are really moving, all agree, thanks to this dynamic drive.--L. W.

‡See detailed report, this issue, page 26.

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 ± 0.01%; 4.5 mc position ± 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

Characteristics of Full-Wave Tube Rectifiers Such as 5Y3WGT and Selenium Rectifiers of Equivalent Rating.

TUBE News

by H. BRAVERMAN

THE DEMANDS OF ELECTRONICS today are increasing the requirement for direct current power. This, in the face of almost universal use of *ac* as the generated power source. The critical link between the two is the rectifier in which maximum efficiency and economy are essential.

The selenium rectifier, because of its versatility and adaptability to various applications and field conditions, is rapidly gaining recognition as the *ac*-to-*dc* link among many designers of radio, TV, and electronic equipment. The selenium rectifier was introduced commercially in this country during the latter part of '39. Since then, considerable technological progress, featuring development for more efficient usage. has been recorded.

The fundamental selenium rectifier consists of an aluminum base plate on which a layer of selenium has been deposited. The plate is then subjected to a heat treatment which initiates the formation of a *natural barrier* layer, the region where rectification takes place. The selenium is then coated with an artificial barrier layer (a thin film of special lacquer) which aids the reverse blocking properties of the rectifier plate. Then, in the final step, a thin layer of metal alloy is sprayed on the selenium. In its finished state, current flows from the selenium to the alloy, but only with difficulty in the opposite direction, when connected into a suitable circuit.

Mechanical Features of Tubes and Selenium Cells

Through techniques evolved over a number of years, the construction of electron tubes has undergone considerable change. New methods of fastening the internal elements are being used to give added strength and insure greater resistance to shock and vibration during rough usage.

Due to the construction of the selenium rectifier, it has been found that its electrical operation is not materially affected by shock or vibration.

Time Delay Factors

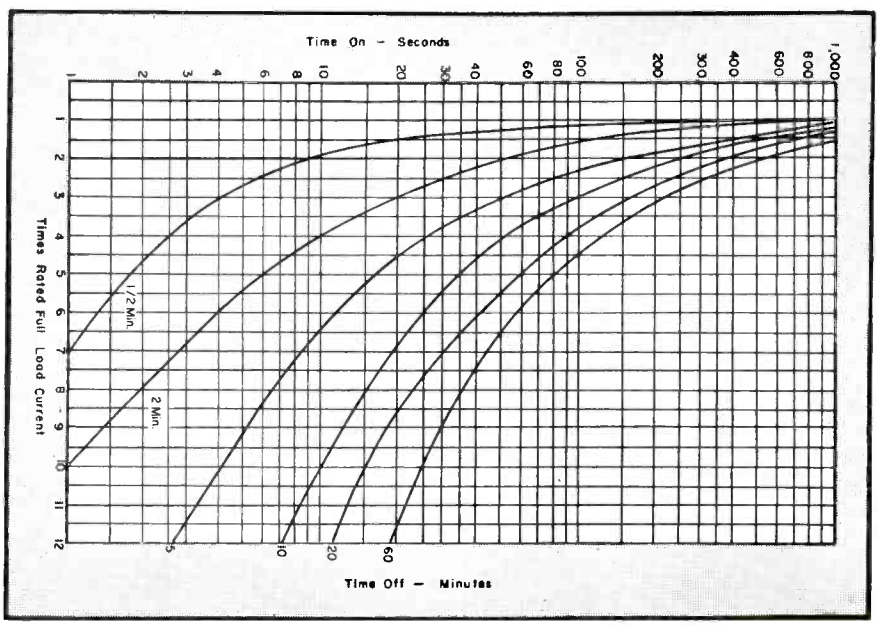
A tube rectifier requires that the filament be permitted to attain its normal operating temperature before the plate voltage is applied; otherwise, the tube may be damaged. Although not strictly adhered to, this procedure has saved many tubes which would normally be lost through improper usage. The time delay required (either manual or automatic) is dependent upon the type of tube employed. Typical values are 30 seconds to 2 minutes.

Unlike the tube rectifier. there is no warm-up period or appreciable time delay in the operation of a selenium rectifier.

Filament Supply

All vacuum type rectifiers require filament supply voltage, usually from

(*Continued on page 71*)

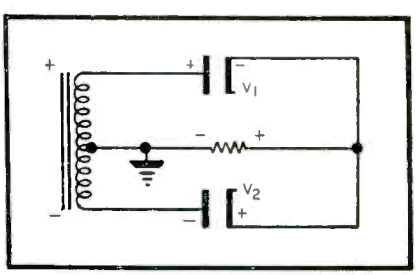


(Left)

Fig. 1. Current overload rating or duty-cycle curves of selenium rectifiers.

(Below)

Fig. 2. Simplified schematic of a full-wave rectifier system illustrating concept of reverse voltage.



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exact replacement FOR 1,252 tv set models

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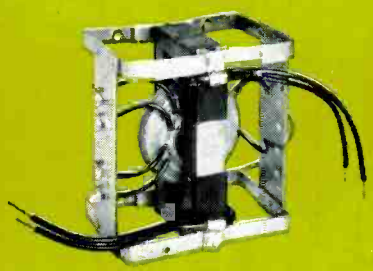
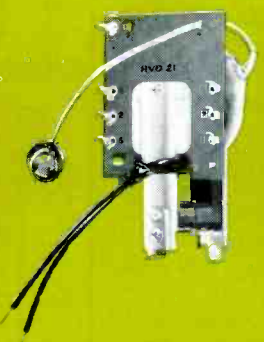


HVO-21
PHILCO



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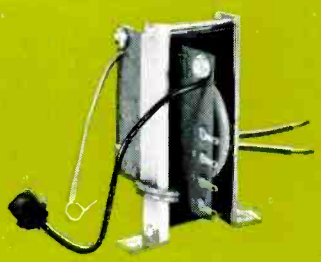
ADMIRAL



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Ask your jobber, or write for, your copy of Merit 1955 Replacement Guide #407 listing up-to-date replacement components for all models and chassis of TV receivers.

Burton browne advertising

BETTER AUDIO From Old Radio-TV-Phono Chassis

by SOL HELLER

Building Improved Frequency Response Into Old Models Through Installation of Loudness Controls, Modern Output Transformers and Well-Designed Speakers and Enclosures

THERE IS A considerable amount of money to be made in modernizing and improving the audio of TV-radio-phono units purchased some six to eight years ago. The fidelity of many of these models can be considerably improved, and the Service Man is the key man to sell the customer on the desirability of such improvements.

One low-cost, yet essential improvement that can be effected, is the addition of a loudness control.

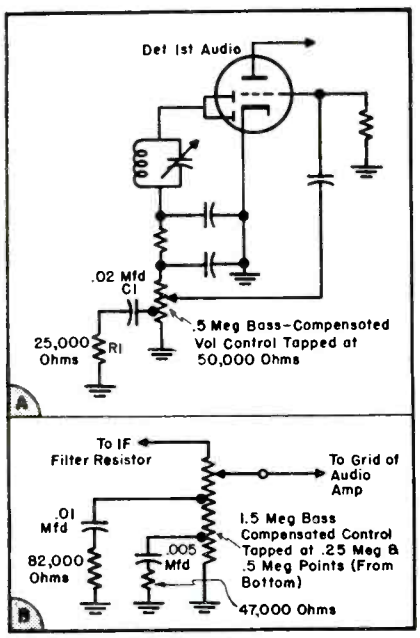
When sound is reproduced at a level lower than its original volume, the characteristics of the human ear will cause frequencies below 600 cycles to be markedly attenuated; those above 1,000 cycles will be reduced as well, but only slightly.

When radios and record-players are played, as they often are, at relatively low volume settings, bass notes sound weak and unsatisfactory to the ear, unless some system of bass compensation is present. In better-quality receivers and amplifiers, provision is often made for an automatic increase in bass response as the volume control setting is reduced. A common method of doing this lies in the use of a bass-compensated volume control; Fig. 1.

This control system is nothing more than an ordinary potentiometer with a tap at one or two points. A capacitor and resistor are placed in series between the tapped point and ground; and the lower the arm moves down the pot, the greater is the shunting of high and middle frequencies. The resistor and capacitor combination (connected from each tap to ground) provide this shunting action. Since low frequencies are substantially unaffected, their amplitude becomes relatively higher with respect to the reduced middle and high frequencies. The result is a form of bass boost that is pleasing to the ear. The pot and accessory components can be substituted for the conventional volume control, to produce a noticeable improvement in sound reproduction at low volume settings.

A more effective method of bass *and* high-frequency compensation may be

(Continued on page 67)

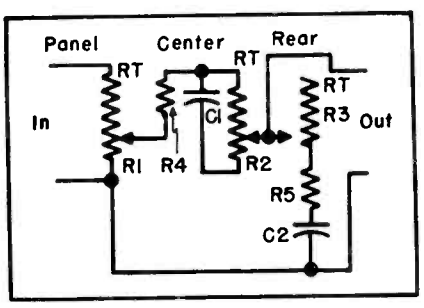


(Left)

Fig. 1a and b. In a is a schematic of a bass-compensated control with a single tap. If a 2-megohm pot tapped at .6 megohm is used, R1 should be 100,000 and C1 .005 mfd. With a 1-megohm tapped pot, R1 may be 27,000 ohms and C1 .01 mfd. A bass-compensated control with a double tap, for more effective compensation at different low volume levels, is shown in b.

(Below)

Fig. 2. Circuitry of loudness control; IRC model LCI. (Courtesy IRC.)



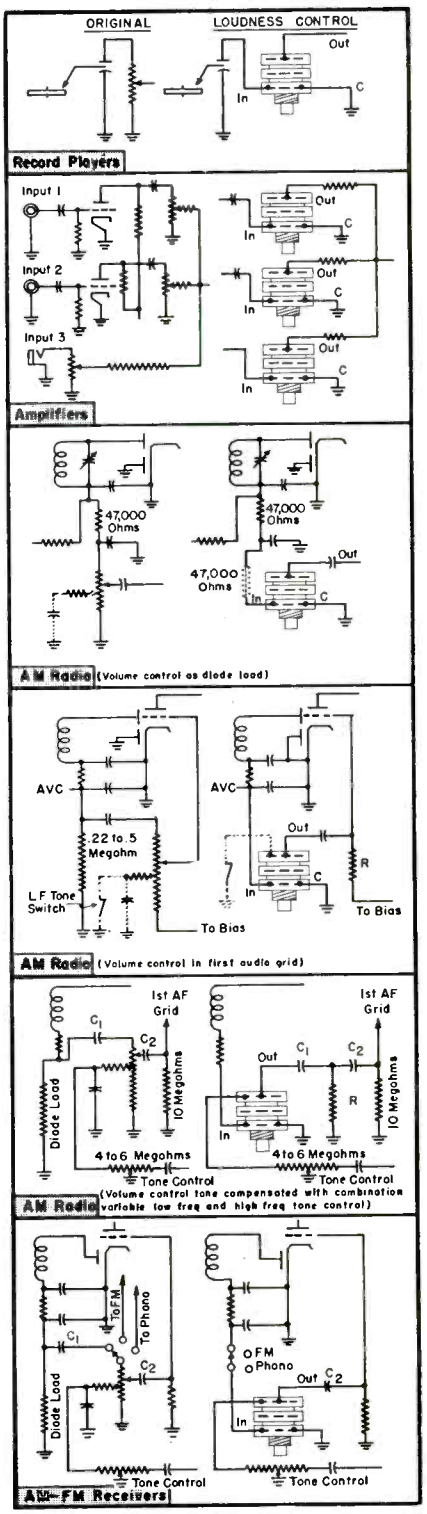


Fig. 3. Typical circuits showing how loudness control may be substituted for the original volume controls. In some cases, slight circuit changes are necessary, as indicated.

(Courtesy IRC)

Ever since Daddy got his

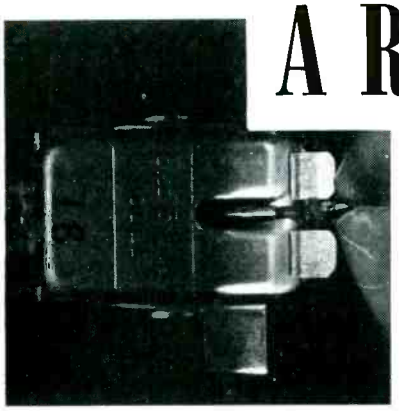
Jensen 1-A-DAY SALES PLAN

(and the cute little Needle Caddy Kit)

he's been selling needles like hot-cakes!

P.S. *This could be a sweet deal for you, too—*
sellin' needles on every service call!

A Report on PHONO NEEDLES



To remove needle in E-V cartridge, shown here, one should get firm grip behind tip of needle and pull forward. Then the needle can be inserted into tube by pushing it in firmly. (Courtesy Duotone)

In removing needle from Shure cartridge illustrated, needle tip must be held firmly between the fingers of one hand, and then the round needle lug nut under the cartridge loosened. After the nut has been loosened, the needle should be pulled straight out. To insert a new needle, the needle should be pushed straight into the hole. Then, the needle tip should be held with fingers of one hand, and the round lug nut tightened with the other hand. One should not use tools to tighten, as excessive pressure can damage the cartridge. (Courtesy Duotone)

by WYN MARTIN

Part III: Stylus Wear and Means for Checking... Standardization of Needle Assemblies... Needle Variables in Packaged Phonos... The Needle Replacement Market*

PHONO NEEDLES perform a unique function in that they represent the only connecting link between the derived mechanical energy contained in the recorded grooves and the electrical energy or voltage produced by the transducer, or as it is more commonly called, the cartridge or pickup.

The needle or stylus is the only element in the entire reproducing chain which is subject to constant physical wear and deterioration, and this of course is due to the friction between the sides of the stylus tip and the walls of the record grooves.

Many cannot understand why the harder the needle material the better for the record. They reason that since something has to give, it should be the needle rather than the record. The fact is that no matter how hard the needle is, the needle is still the item that *takes the beating.* This is so because the tip is microscopically tiny, while the length of the record grooves are fantastically long. Just a single 12" *lp* contains about a mile of grooves. In other words, even though a needle tip might be several hundred times as hard as the record, the wear on the record is spread out over an area which is probably several million times as great as the area on the sides of the tip. Because of this great inequality, we have the problem of flat spots ground onto the sides of the needle tip. These *flats,* as noted earlier, acquire well defined edges which become sharper and sharper, and as they do so inflict more and more damage to the record grooves.

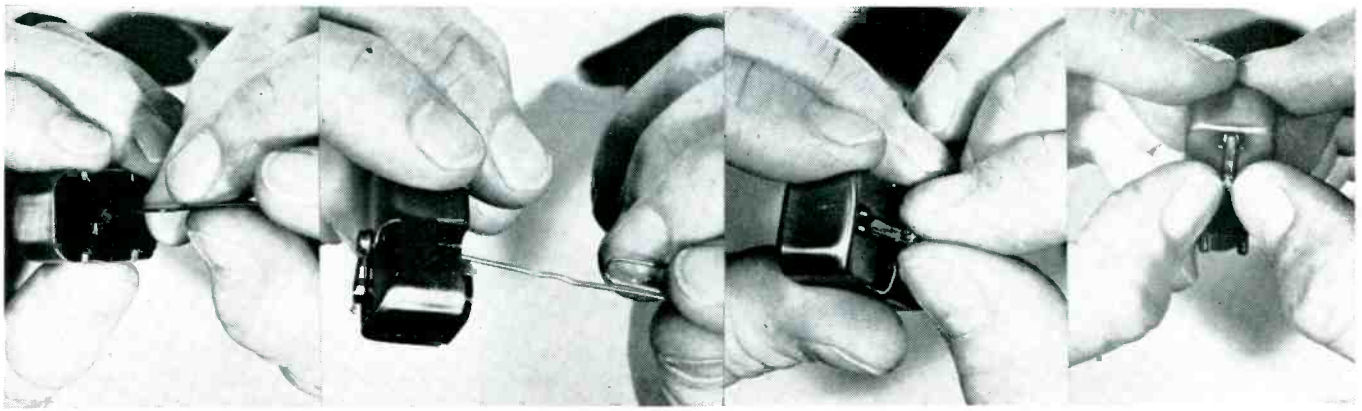
In checking a stylus for wear, the most reliable means is a microscope of at least 60 power, and with provision for illuminating the sides of the tip so that small flats can be detected. Hand-held microscopes are very useful, too, for they will reveal badly worn tips. Shadowgraph inspection (with light shining from behind the tip) normally reveals only the outline of the tip, and has been found inadequate for proper detection of wear in its early stages. The curved outline

(*Continued on page* 46)

From a report submitted by* ***Gerald Shirley,* *Televex Company.*

Removal and Replacement of Stylus in Single Stylus Variable Reluctance Cartridge

Stylus can be removed from cartridge by applying pressure with a paper clip or similar instrument at the end of stylus; it is held in cartridge by tension between shaft and socket. Thus no springs or retaining washers are used. Stylus can be inserted into cartridge with fingers. The stylus guide should lie within the recess between the magnet pole pieces. With stylus properly aligned between magnet pole pieces, pressure is then applied with thumb nails to shaft end and stylus is pressed into position as shown at right. One must not apply pressure along stylus guide. Adjustment of space between stylus and pole pieces can be made with tweezers by applying pressure only at point next to shaft. (Courtesy G. E.)



Don't let any Antenna Manufacturer pitch curves to you!

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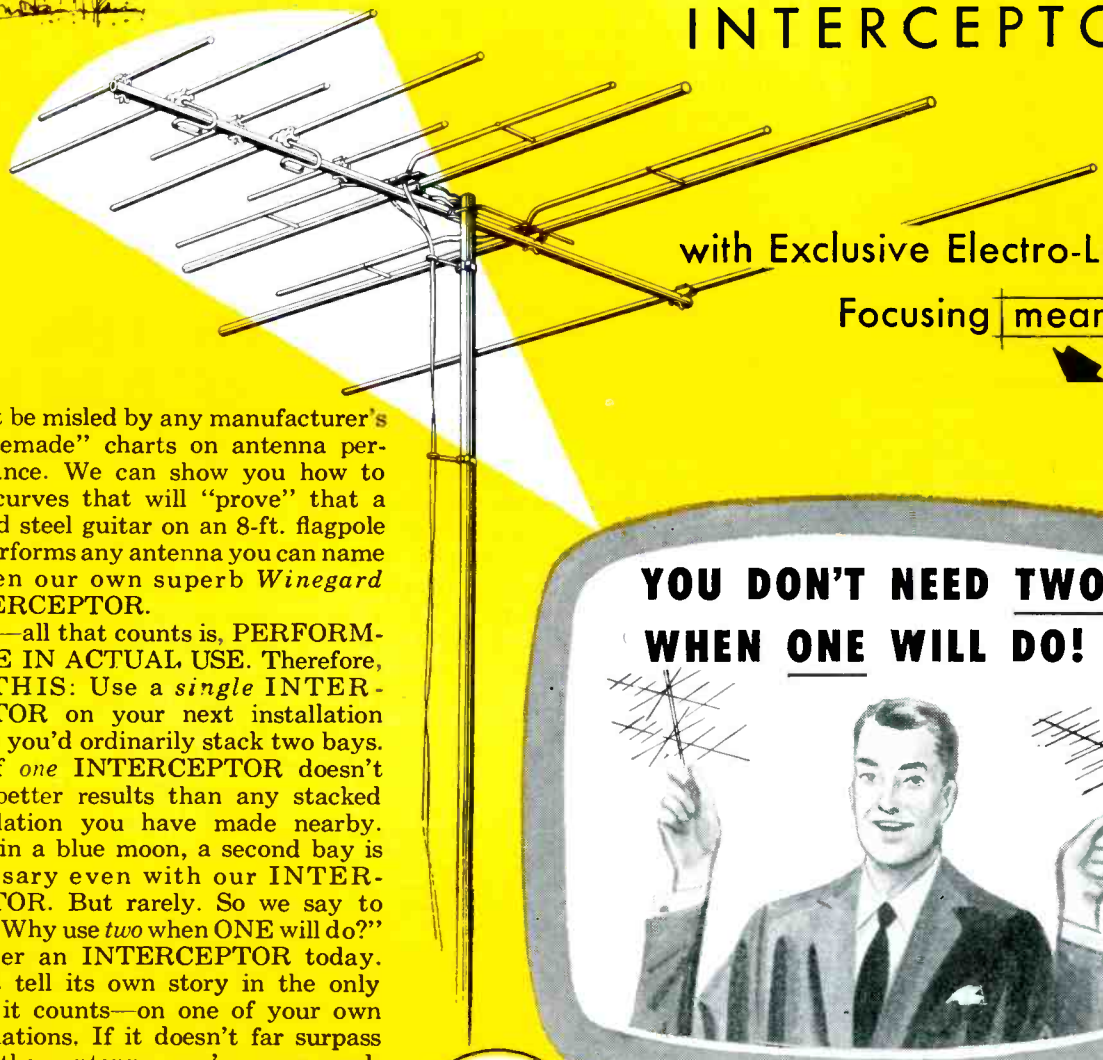


Don't be misled by any manufacturer's "homemade" charts on antenna performance. We can show you how to plot curves that will "prove" that a busted steel guitar on an 8-ft. flagpole outperforms any antenna you can name —even our own superb *Winegard* INTERCEPTOR.

No—all that counts is, PERFORMANCE IN ACTUAL USE. Therefore, DO THIS: Use a *single* INTERCEPTOR on your next installation where you'd ordinarily stack two bays. See if *one* INTERCEPTOR doesn't give better results than any stacked installation you have made nearby. Once in a blue moon, a second bay is necessary even with our INTERCEPTOR. But rarely. So we say to you, "Why use *two* when ONE will do?"

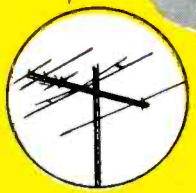
Order an INTERCEPTOR today. Let it tell its own story in the only place it counts—on one of your own installations. If it doesn't far surpass any other antenna you've ever used, fire it back to us! We'll return your money—and we'll still be friends! So . . . order NOW!

A FAR BETTER PICTURE OR YOUR MONEY BACK!

Antenna No.	Winegard Trade Name	List Price
L-4	INTERCEPTOR	$24.95 a bay
L-5	PIXIE	$14.95 a bay

Shipped, one L-4 to a carton (stacking bars available)
Shipped, two L-5's to a carton with stacking bars.

*Patent Pending



WINEGARD PIXIE
A quality all VHF channel antenna for top performance at a low price.

THE INTERCEPTOR gives the clearest, sharpest pictures obtainable . . . not just on one or two channels . . . but on all *12* VHF channels.

See your jobber now or write us for complete information.

WINEGARD COMPANY
3000 Scotten Boulevard, Burlington, Iowa

Phono Needles

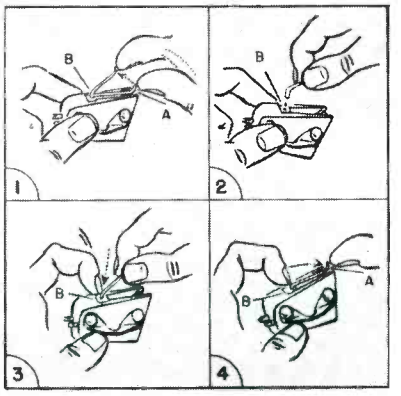
(*Continued from page 44*)

(or silhouette) of a needle tip will not show a noticeable change until the flats have become enormous, and by that time record damage can be substantial. A method of checking stylus wear by observing the change in color of the grooves on a special test disc was introduced about a year ago, but was condemned when it was found that under certain conditions badly worn needles caused no noticeable change in groove color, and that sometimes brand-new, highly-polished diamond styli did change the groove color slightly. Of course, whenever reproduction begins to sound poorly, this is a warning that it *may* be the stylus which is worn, and the wise owner will heed the warning. It may be something else in the system which is causing distortion, but a logical process of elimination would normally call for stylus examination.

Standardization of Needle Assemblies

The shapes, sizes, designs and configurations of phono needles on the market today would fill a small catalog. Some of the earlier tone-arm assemblies, whose microgroove-standard switchover facilities changed both needles and tracking force simultaneously, were highly complex. This situation is improving, and has been relieved by the appearance of new cartridges which will track both standard and microgroove records at the same low vertical force, requiring only that

Four steps in replacing needle in Astatic series GC ceramic cartridge. First, thumb is placed under needle tip so that needle can be raised to clear cartridge housing (as shown in Fig. 1); then needle is rotated in direction of arrow shown. Step two involves lifting of needle from socket B (Fig. 2). In step three, shank of new needle is inserted in socket B, and pressed completely into socket with forefinger (Fig. 3). Final step requires rotation of needle back to position between prongs at A, pressing again with forefinger at point B (Fig. 4). Pressure should be applied at point B only; it should never be applied at needle point.



the appropriate needle tip be swung into playing position.

The Needle Replacement Market†

A RECENT SURVEY* revealed that 93% of all the phonos in use today are using *worn-out* phono needles.

Radio and TV Service Men have found that it is good business to make it a practice to carry phono needles on their service calls. Frequently, they find that not only is the needle needed, but the cartridge, too.

Because of the complexity of needles today, the sale of needles has fallen into the laps of the Service Men; formerly 99% of the needle business was handled by record and music stores. Within 5 years, industry feels that Service Men will be selling 80% of all phono needles. This should amount to a sale of $20-million a year.

Needles and cartridges are simple to install. To make the job easier, every Service Man should familiarize himself with the various manufacturers' charts and catalogs.

Needles are precision assemblies, and are not turned out in screw machines. Tolerances are so close that manufacturers of other types of equipment shudder when they see the close microscopic work that needle companies must insist upon.

Needles do not last indefinitely, as the great majority of people believe; they generally wear out within 55 to 60 playing hours, with the exception of the diamond point which has a life of around 750+ playing hours. It is wise to remember that any needle point material that must ride in the miles of record grooves, encountered in all normal playing, *will wear.*

Needle Variables in Packaged Phonos

There are a number of changers included in radio, TV and packaged assemblies which provide for the use of needles with different tip diameters, and thus one must be extremely careful to consider this factor, when replacing, to insure best results.

To illustrate, in the Admiral changers involving the use of crystal, and ceramic (standard, *lp* and rotating) cartridges, needle tips range from .001″ to .003″. The RC600 changers use crystal units with .002″ osmium styli and a ceramic also with a .002″ osmium needle. The RC625 and 630, however, which uses a rotating cer-

(*Continued on page 66*)

†*Based on information supplied by* ***Karl W. Jensen****, Jensen Industries, Inc.*

*Completed by *Jensen Industries, Inc.*

Fabulous..Revolutionary ..Completely New..

MIGHTY MO*

*Pat. No. 2680196, others pending.

the most powerful antenna ever built, featuring TESCON'S NEW exclusive DDP (Double Diamond Phasing)

Tescon's miraculous Mighty Mo will make prime signal areas out of even the deepest fringe sections of the country.

Mighty Mo . . . complete with DDP, an entirely new and revolutionary concept of phasing, will trap even the weakest signal and perk it up to a clear, brilliantly sharp, deep-toned picture. Tescon absolutely guarantees that each and every Mighty Mo will perform where other antennas have actually failed!

Unshakeable proof, substantiated by exhaustive field tests, definitely shows that Mighty Mo **does more** than any other antenna manufacturer loudly **claims** his product will do. Theoretical ratings will never pay off. Rely on tested results . . . that's your real proof, that's your money in the bank.

Here's Mighty Mo's proof ...the results of ACTUAL FIELD TESTS.

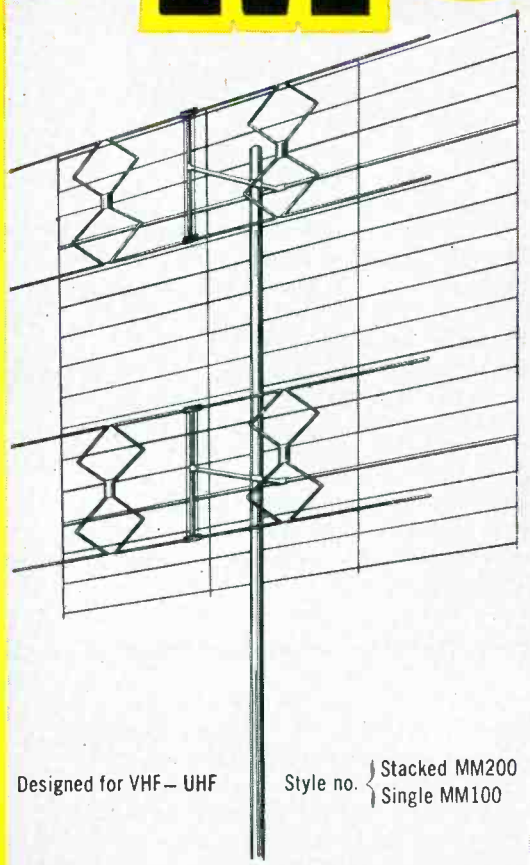
- On channels 2 to 13, Mighty Mo outperforms every other antenna manufactured today.
- Higher uniform gain over all channels. Does not vary more than 1½ D.B. on any channel across band. Perfect on color TV.
- Clearer, sharper, deeper pictures on all channels.
- Higher average gain than 6 of the most advertised antennas.

MIGHTY MO'S FEATURES

- DDP (Double Diamond Phasing) precision-timed phasing regulator enables the weakest of signals to be trapped and then boosted to a clear, magnificently sharp, photo-like picture.
- Flat response . . . a must for color reception.
- Largest screen area . . . over 70 sq. ft. Screen elements spaced less than 1/10 wave length apart for maximum reflector efficiency.
- Highest front to back ratio ever achieved.
- Absolutely no rear pick up or co-channel interference . . . no "venetian blinds."
- ½ wave element spacing on all channels for super-gain.
- Completely preassembled . . . not an erector set type antenna.
- Uniform gain response . . . no erratic audio and video patterns.
- Thoroughly tested for mechanical stress and strain . . . exceptionally rugged.
- Guaranteed to perform where other antennas fail.

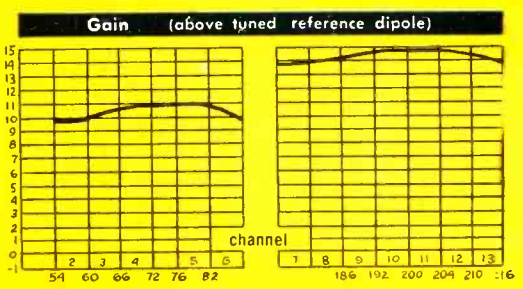
STOCK

this red-hot, fast moving, money-making antenna . . . right now!



Designed for VHF – UHF

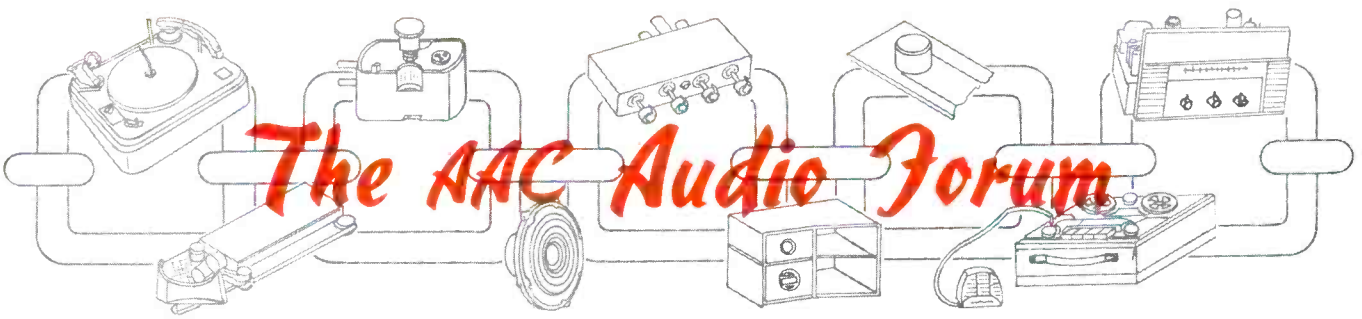
Style no. { Stacked MM200 / Single MM100



Most uniform gain response ever recorded.
Does not vary more than 1½ D.B. on any channel.
Extremely important for quality color reception.

CONTI

TESCON TV PRODUCTS COMPANY
SPRINGFIELD GARDENS 13, NEW YORK



Part IV of a Series of System-Component Evaluation and Progress Reports†

Amplifier Circuitry and Matching*

IN DESIGNING AMPLIFIERS, the matching factor, as emphasized in this *forum*, must be carefully evaluated. Studying this consideration during the development of an amplifier, it was found that through the use of a unity-coupled output stage and adjustable critical damping,[1] optimum matching could be obtained.

The basic output circuit is a balanced bridge which eliminates *dc* in the transformer primary. Circuitry is such, tests showed, that the output tubes are effectively in parallel for *ac* signals, thus achieving *unity coupling*, and allowing both tubes to work into an identical load.

The circuit also was found to eliminate switching transients and permit use of an output transformer with only a fraction of the usual leakage reactance and distributed capacity. As a result, it was found possible to obtain a larger margin of feedback phase stability.

In some amplifiers the problem of speaker-response smoothing has been attacked by reducing the internal resistance to a very low value. This has been found to result in, frequently, an overdamped condition, with bass response suffering due to the resulting mismatch. Even more unacceptable is the performance of an amplifier-loudspeaker combination which, because of insufficient damping, allows the loudspeaker to *take off* in an unloaded condition at its bass resonant frequency.

In this circuit, through the use of *critical damping*, by properly proportioning the amounts of voltage and current feedback sampled from the speaker, the amplifier can be matched to the motional impedance of the reproducer system. Negative impedance is not required, it was found; thus *positive* feedback, which could cause severe oscillation and probable amplifier damage should the load be removed, does not appear.

*From notes supplied by **Cullen H. Macpherson**, Electro-Voice, Inc.*

[1] *The **Circlotron**, developed by **A. M. Wiggins**, E-V engineering vice president; patent applied for.*

Dual-Weight Dual-Volt Crystal Cartridges**

CARTRIDGES for 78 *rpm* fall into two major classifications; the steel case and aluminum case types; the steel case cartridge weighs 25 grams and the aluminum case weighs 12 grams. This factor is important when making replacements. If an aluminum-case cartridge is used to replace a steel-case cartridge the balance of the tone arm will be thrown off by 13 grams, and the arm will not track properly, if at all. If a steel case is used to replace an aluminum-case cartridge the arm will track, but at double the weight intended, causing excessive wear on the record and needle, and considerable increase in surface noise.

To solve this weight-differential problem, there has been developed an aluminum-case cartridge[2] weighing 12 grams, with provision for affixing a 13-gram lead slug to the cartridge, using a shrink-on plastic band. The addition of this slug makes the total weight of the cartridge 25 grams, which is equivalent to a steel-case cartridge. The plastic band can be broken with the thumbnail, and the weight removed; the cartridge then becomes an aluminum-case cartridge. This avoids any need for weight adjustments to achieve proper balance.

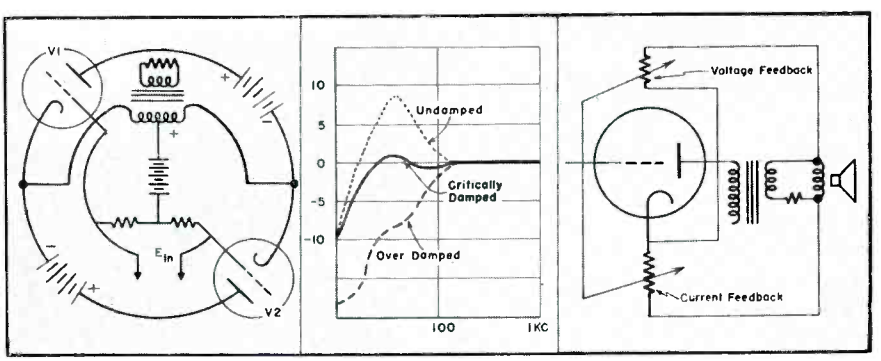
The cartridge is also a dual-voltage cartridge. Its normal output is 4 volts; an accessory capacitor (furnished), slipped over the terminals, provides an output of 2 volts. The great majority of 78 *rpm* cartridges are either in the 3½ to 4-*v* category,

(*Continued on page* 50)

**From notes submitted by Shure Brothers Inc.* [2] *Shure W78.*

† **Presented as a service to industry, in cooperation with the Audio Activities Committee (through its Promotion and Public Relations Subcommittee) of the Sales Managers' Club, Eastern Division, who have arranged for members of the audio industry to contribute authoritative data on all phases of audio in which they are most expert. Comprehensive reports submitted include technical and merchandising information on amplifiers, preamps, speaker enclosures, speakers, turntables, record changers, cartridges, needles, arms and accessories, recording discs and tapes and accessories, tape recorders, special output transformer kits and tuners.**

Left, below: Basic unity-coupled output stage circuit[1] showing B+ and bias sources, and balanced bridge arrangement. Center, below: Frequency response curves comparing the performance of undamped, overdamped and critically-damped amplifiers. Right, below: Feedback proportioning circuit similar to that used in the E-V circlotron amplifier.



Audio Forum

(*Continued from page 49*)

or the 1½ to 2-*v* category. The increase of ½-*v* output in the replacement cartridge usually will make for a better-sounding replacement, providing the amplifier with a stronger initial voltage. It has been found that the ½-*v* increase will not overload amplifiers designed for a 1½ or a 3½-*v* cartridge.

According to the manufacturer this cartridge can replace 149 different cartridge types currently found in 78-*rpm* equipment.

Amplifiers With Power Output Controls

by Victor Brociner*

HIGH-FIDELITY audio amplifiers are equipped with controls that fall into four general classes:

(1) Operating controls; on-off, input selector, volume.

(2) Tone controls for adjustment of tonal balance; bass and treble boost and cut.

(3) Noise and distortion eliminators; frequency range controls, or cutoff filters.

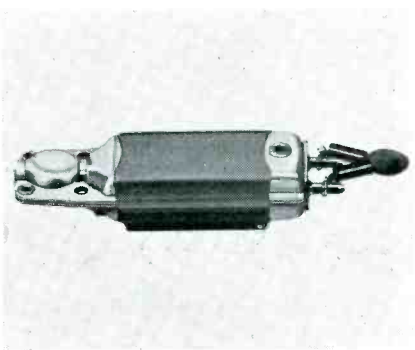
(4) Record compensators, for restoring tonal balance inherently lost in the recording process.

The controls should enable one to effect appreciable variations in the frequency response of the amplifier, and should be free of interaction with each other, and preferably calibrated, at least sufficiently to allow the amplifier to be set to *flat* response.

While an amplifier should have all the functions indicated for maximum flexibility, the degree of elaborateness will depend on allowable cost, and especially on the user himself. The most experienced audiophile may want the greatest possible flexibility of ad-

**Brociner Electronics Laboratory.*

Dual-volt, dual-weight cartridge designed to replace steel or aluminum case cartridges of either high or low output. (Model W78; Shure Brothers, Inc.)



justment and as many knobs as possible; his wife will almost certainly prefer to listen to music without feeling she has to learn to manipulate a frightening control board. A wide range of control may be an advantage to the *hi-fi* sophisticate, but a less self-assured user may be better off with controls that cannot injure the reproduction greatly, even when grossly misadjusted. Fortunately, amplifiers are available with controls ranging from formidable complexity to extreme simplicity. For the majority of users, a good compromise can be summed up in terms of 4 or 5 knobs. The *on-off control* may be a simple switch or ganged with the volume control. The *input selector* permits switching from phono to radio, TV or tape program sources. The *volume control* is sometimes present as a *loudness control*; this is essentially a combination *volume* and *tone control* that automatically boosts the bass range (and sometimes treble as well) as the volume level is lowered. When one listens to program material at lower-than-normal level, the ear's response is such that there appears to be a deficiency of bass. The loudness control improves realism by making up this deficiency. (The same result can be obtained manually by means of a bass boost control, but the automatic feature of the loudness control appeals to many, although it has certain inherent deficiencies. For this reason, means of eliminating the *loudness* feature is often provided.)

Tone Controls

The tone controls should permit increasing or decreasing the amount of bass and treble response as desired, with little effect on the middle register and on the volume level. Well-designed controls will not interact; changing the bass response will not affect the treble, and vice versa. (Step-type controls are favored by many engineers, because they can be designed to provide response curves of more desirable shape; however, continuous controls seem to be preferred by the public, and since they are also cheaper, are more generally used.) The theoretical function of the tone controls is to correct tonal balance that may be lost in a particular program or record, and to remedy deficiencies in loudspeakers and phono pickups. Many people use them to produce a new, and to them improved, sound that does not greatly resemble the original. This may not be high-fidelity, but neither is it illegal.

Cutoff filters are more useful than tone controls in eliminating unpleasant effects such as harshness (distortion)

(*Continued on page 66*)

Catalogs and Bulletins

JFD MANUFACTURING CO., INC., 6101-16th Ave., Brooklyn 4, N. Y., has prepared an 8-page evaluation report (form *288*), analyzing their *Roto King rotator*. Explained are needs for rotators, performance features that should obtain, and promotion and selling methods which can be applied to a rotator.

* * *

CBS-HYTRON, Danvers, Mass., has released a 12-page business builders catalog (*PA-37*) describing sales promotional material, technical literature and service tools now available. Among the items detailed are illuminated signs, solder dispenser and 4-way tool, repair stickers, service coat, and stationery.

* * *

ELECTRONIC INSTRUMENT CO., INC., 84 Withers St., Brooklyn 11, N. Y., has issued a 14-page catalog, *1955*, with information on 38 kits and 42 factory-wired test instruments. Features, specifications and application data of each model are included.

* * *

ARCO ELECTRONICS INC., 103 Lafayette St., New York 13, N. Y., has published the 21st edition of the *Elmenco* capacitor catalog, listing molded micas, steatite tubulars, mica trimmers and padders, and fixed and variable ceramics. Also details dipped and molded micas and type *40* and *42* trimmers.

* * *

CORNELL-DUBILIER ELECTRIC CORP., South Plainfield, N. J., has prepared a 20-page *Ceramic Cross Index, CPX 654*, listing over 830 types of disc, tubular and *hv* ceramic capacitors and printed circuit units, with over 400 corresponding C-D substitution catalog numbers. A special section also cross-indexes early versus new C-D catalog numbers.

* * *

PYRAMID ELECTRIC CO., 1445 Hudson Blvd., North Bergen, N. J., has issued a 24-page catalog, *J-8*, covering all capacitors normally sold through distributors. Includes catalog number, list price, capacities, and length and diameter in inches.

* * *

OXFORD ELECTRIC CORP., 3921 S. Michigan Ave., Chicago, Ill., has prepared a catalog, describing speakers for replacement uses.

* * *

BELDEN MANUFACTURING CO., P.O. Box 5070A, Chicago 80, Ill., has released bulletin *7633*, describing *Celluline uhf* and *vhf* leadin. Inner core of this cable is made of polyethylene, expanded 100% to a density of .47, forming tiny unconnecting cells, each filled with inert gas; approximately 50% of the internal area is inert gas.

* * *

RADIO CITY PRODUCTS CO., INC., Easton, Pa., has published a brochure describing test instruments. Included are equipment for color TV and b-w servicing, and tube testing. Industrial and electronic test devices are also featured.

* * *

TRIPLETT ELECTRICAL INSTRUMENT CO., Bluffton, Ohio, has prepared a series of test equipment catalog sheets. Specifications are included for a *voma*, load-check tester; pocket *vom, vtvm*, sweep generator-marker, 'scope, tube tester, and *uhf* marker generator.

* * *

SAXTON PRODUCTS, INC., 2101 Grand Concourse, New York 53, N. Y., has released a 4-page catalog describing *uhf-vhf* open-wire transmission line and accessories.

On Book Row

THE ABC OF COLOR TV . . . By HARRY G. CISIN: Streamlined book with simplified explanation of color TV. Includes sections on basic color principles, color transmission, compatibility, *I* and *Q* signals, principles of color-TV reception, luminance and chrominance channels, balanced modulation. Offers block diagrams of transmitters and receivers. Also includes descriptions of the Chromatron single-gun color tube and shadow-mask three-gun picture tubes.—*25 pages, 8½" x 11", priced at $1.00; H. G. Cisin, Publisher, Amagansett, N. Y.*

* * *

HOW TO USE TEST PROBES . . . By ALFRED A. GHIRARDI AND ROBERT G. MIDDLETON: A revealing study of the function, theory of operation and application of all types of probes. Described are resistive *hv dc*, capacitance-divider *hv ac*, resistive circuit-isolation, compensated *r-c* (low capacitance) and cathode-follower circuit-isolation, and demodulator probes, as well as rectifying probes for the *vtvm*. Also included is a chapter on test-cable shielding and test-circuit loading fundamentals.—*176 pages, 5½" x 8½", paper bound, priced at $2.90; John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y.*

* * *

TV SERVICE DATA BOOK . . . By MILTON S. KIVER: A practical reference source, with chapters on servicing, installation, components and mathematics, each with charts, tables and illustrations. Specific discussions cover test probes; test patterns; master troubleshooting (chart); TV signal-range (chart); TV channel frequencies; antenna guying (chart); capacitor and resistor color codes; transformer lead codes; mathematical service aids; formulas and conversion factors. —*112 pages, 5½" x 8½", paper bound, priced at $1.50; Howard W. Sams and Co., Inc., 2201 E. 46th St., Indianapolis 5, Ind.*

* * *

NATIONAL ELECTRICAL CODE HANDBOOK . . . By ARTHUR L. ABBOTT: Eighth edition, revised by *Charles L. Smith*, electrical field engineer of the National Fire Protection Association, which explains the NEC rules, and scope and intent of code requirements. Covered are rulings for wiring design and protection, wiring methods and materials, general equipment, special equipment and conditions, communication systems, and construction specifications.—*Priced at $7.50; McGraw-Hill Book Company, New York, N. Y.*

* * *

OBTAINING AND INTERPRETING TEST SCOPE TRACES . . . By JOHN F. RIDER: A non-mathematical explanation of the shapes of commonly encountered waveforms, and analyses of the causes underlying deteriorated voltage waveforms. Covered are sine and complex, square, rectangular, sawtooth and trapezoidal, and differentiated and integrated waveforms; amplitude and modulated wave envelopes; response and *S* curves; manipulation of 'scope controls for display; interpretation of 'scope traces; Lissajous figures; and test setups for observation with the 'scope—*192 pages, 5½" x 8½", paper bound, priced at $2.40; John F. Rider Publisher, Inc.*

* * *

ELECTROACOUSTICS . . . BY FREDERICK V. HUNT: A unified discussion of all types of electromechanical coupling, including magnetic, electrical, and mixed transduction fields. Dr. Hunt covers such topics as the origins of echo ranging, the crystal oscillator, electrostatic transducers, and the evolution of the dynamic loudspeaker.—*260 pages, priced at $6.00; John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y.*

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 *far 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
Huskier. 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.

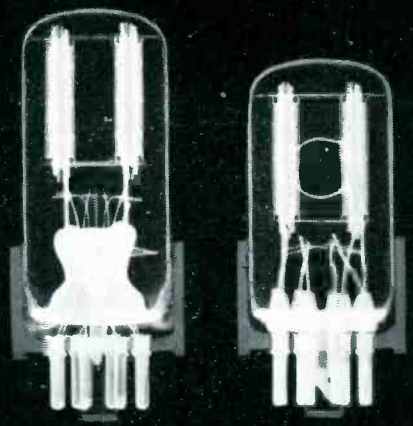
Comparison with the prototype's pressed-stem base, shows that the tube leads now pass through individual seals at bottom of envelope. Prevents loose bases . . . gives shorter leads and better lead separation . . . and brings about better heat conduction, reducing electrolysis and tube leakage. *You get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

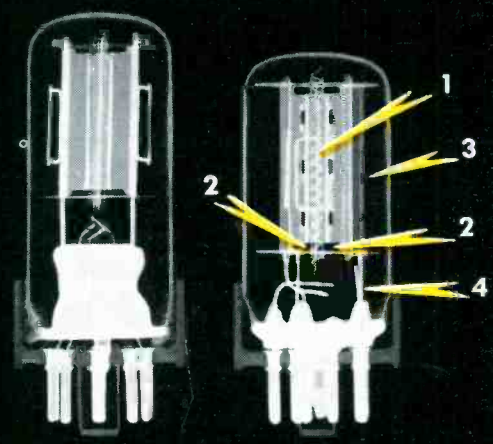
2. Two design features cut down on plate-cathode arc-overs. The plate is notched to avoid any contact with mica spacers in the critical plate-cathode areas. Also, micas are slotted to set up barriers to electrical conduction. Result: *fewer fuse blow-outs in horizontal-deflection circuits*—a common cause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

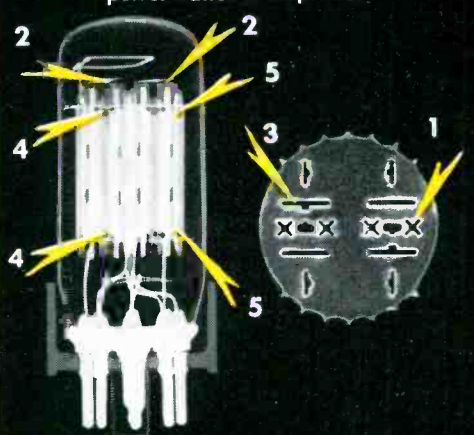
2. Covered "penthouses" (box enclosures) now shield cathode and heater from getter contamination that causes electrical leakage, disturbing the relationship of tube elements.

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

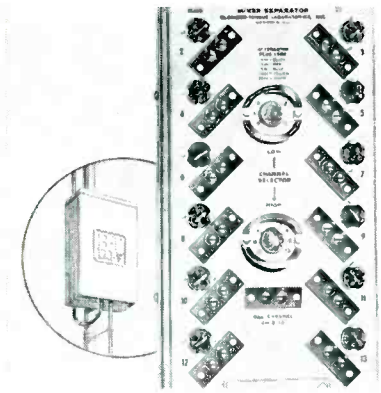
Redesigned to give top performance in all synchro-guide and other TV circuits. Every tube gets "chopper" pulse test at low line voltages. Ratings substantially increased.

Progress Is Our Most Important Product

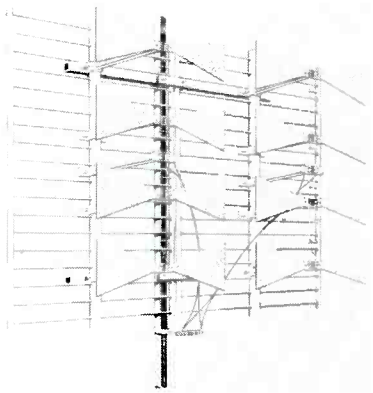
GENERAL ELECTRIC

161-1A7

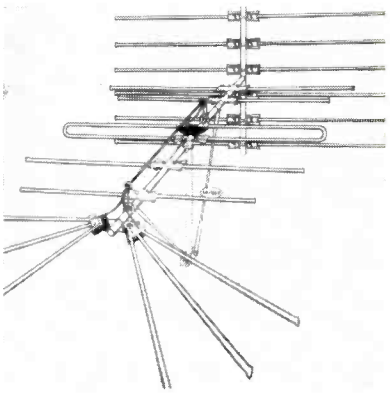
Pictorial Review of UHF/VHF Antennas



Mixer-separator model said to be capable of mixing and equalizing signals from any number of vhf antennas; can also separate individual channels being transmitted in a single cable. Uhf signals are handled by converting to an unused vhf channel at antenna. Includes complete series of plug-in pads to supply up to 24 db attenuation on any one channel. Model, it is claimed, can be used with individual yagis to eliminate ghosts and reflections. Equipped with screw terminals for handling 75-ohm cable. Strain relief for cables is furnished on the unit. Supplied with aluminum weatherproof cover. (Model MMS; Blonder-Tongue Labs., Inc.)

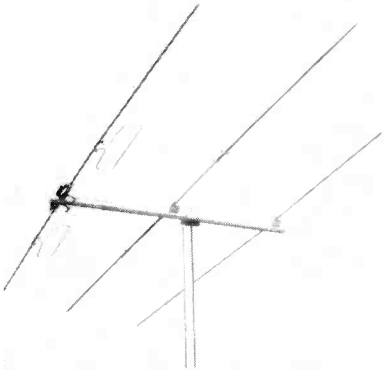


Antenna for the uhf fringe composed of a four-stack bow tie with cross polarized dipole fans. For ghost rejection a closely spaced all-aluminum reflector screen is utilized. Features molded polystyrene insulators with air space at dipole centers and one-piece construction of reflector screen. A double stacked version is available for extreme uhf fringe conditions. (Duo-Quad UF40 and UF40-2; Clear Beam Antenna Corp., 21341 Roscoe Blvd., Canoga Park, Calif.)

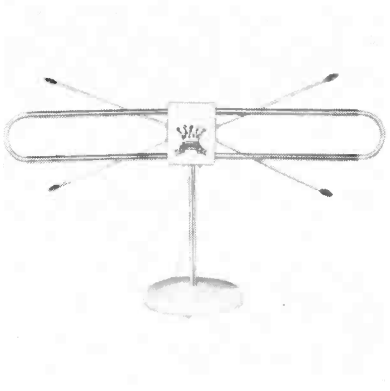


Combination conical-yagi TV antenna with radar-flector. Factory preassembled. Available in single array and 2-array models. Employs seventeen hi-tensil 3/8" aluminum elements, three perma-plastic insulators, a six-element radar-flector, plus a universal U clamp, crossarm support and 60" twin lead phasing stub. (Texas Ranger models AX673 and 674; Snyder Manufacturing Co., Phila., Pa.)

Indoor antenna designed for vhf and uhf. The uhf center section is adjustable in length allowing it to be resonated to the desired uhf channel. In other switch positions, the same adjustable center section acts as a variable stub on vhf. Effect of hand capacity is said to have been eliminated through the use of a plastic insulating knob at the top. (Model TA150; JFD Manufacturing Co., Inc.)

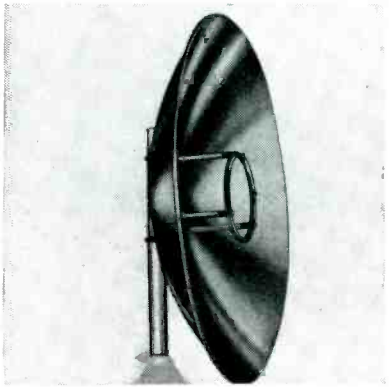


Antenna which utilizes collinear-yagi principle. Driven element with wave traps is backed by hf and lf reflectors providing six working elements on the high band. Snap-lock design. Available as a single, two stacked and four stacked array. Fiberglass insulators used to isolate the antenna sections; they also provide snubbing action said to add to life of antenna. (Model 1870, Trapper, Jr., Technical Appliance Corp.)

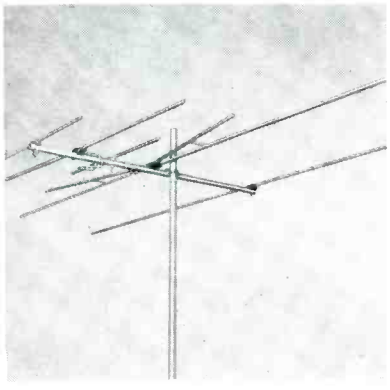


Indoor antenna designed for uhf and vhf. In areas where uhf reception only is desired, antenna can be adjusted so that the vhf dipoles serve as a reflector element for the uhf fan. Constructed of aluminum and shock-proof plastic, and supplied with 8' of 300-ohm line. (Coronet Electronics, Inc., 505 North LaSalle St., Chicago 10, Ill.)

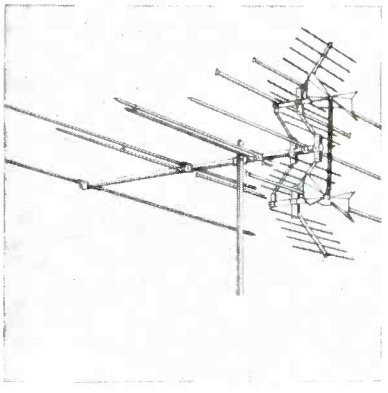
Parabolic type uhf antenna of spun aluminum. Dish is 24" in diameter. (Model F550; FKB Opticon Co., Inc., 1738 E. Calvert St., South Bend 14, Ind.)



All vhf-channel antenna. Constructed for streamlined appearance and low resistance to wind. Supplied with stacking bars. (Model L-5; Winegard Co., 3000 Scotten Boulevard, Burlington, Ia.)



Antenna designed around new phasing technique known as dyna-phase. Incorrect illustration appeared last month. (Vee-D-X Chief Series; La Pointe Electronics, Inc., Rockville, Conn.)



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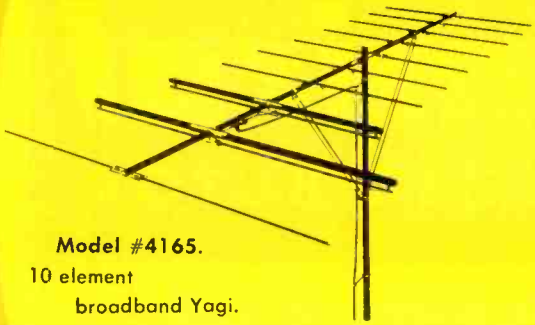
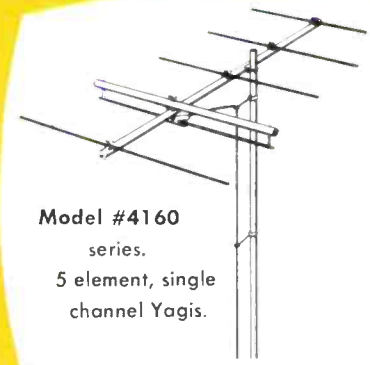


Model #4165. 10 element broadband Yagi.

WALSCO "futurized" YAGIS reach everywhere



Model #4160 series. 5 element, single channel Yagis.

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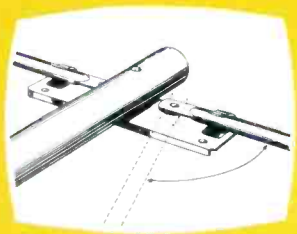

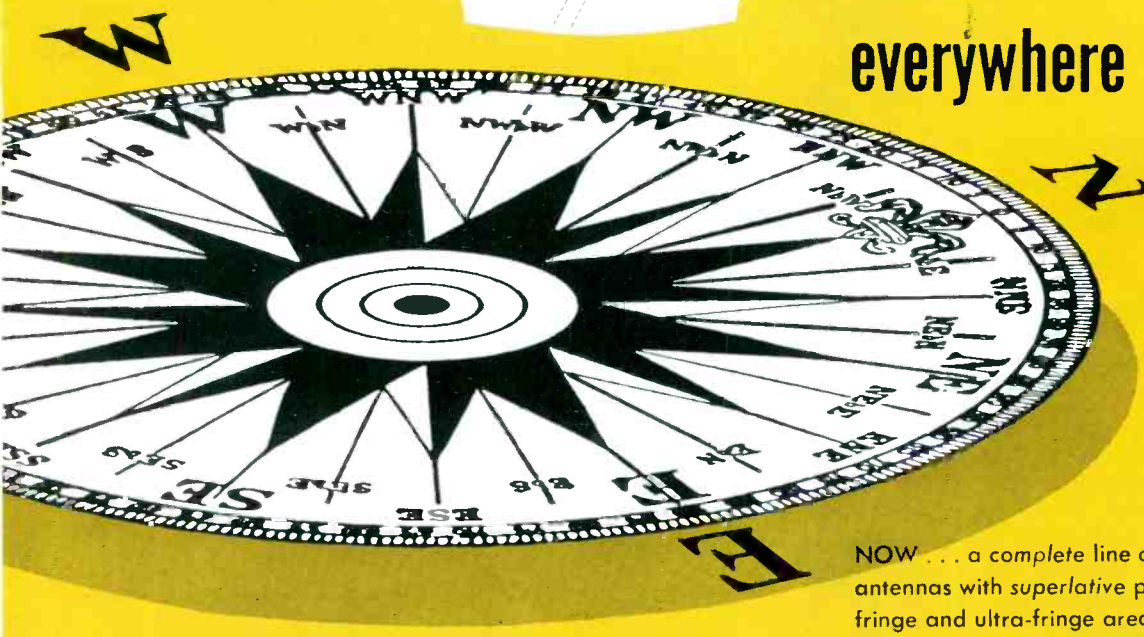

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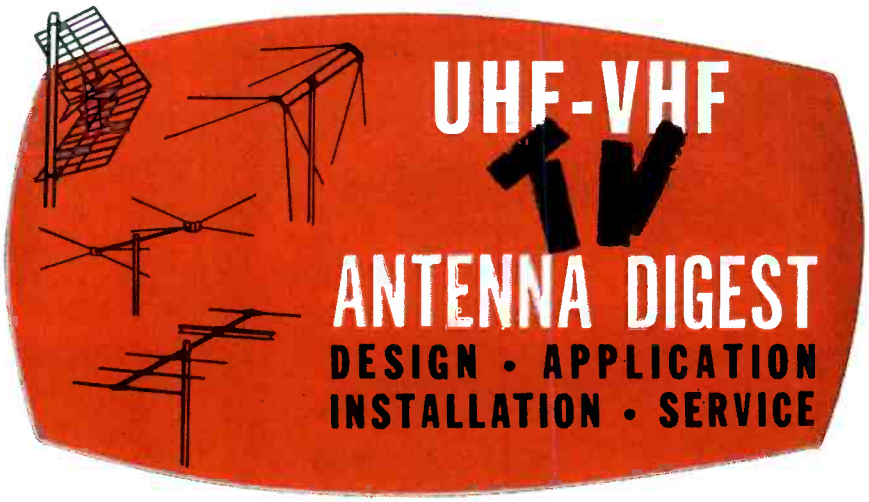
Window-Pane Transmission Line Couplers*



by RALPH G. PETERS

IN PRACTICALLY all TV installations, one is faced with the problem of determining what method should be used to bring the transmission line through the window. In the case of the ordinary wooden frame window, the situation is not too involved since it is usally possible to chip away part of the wood and fit the transmission line into the groove, or drill a hole, insert an approved feed-through insulator and run line through this opening. However, when we have a casement or other metal frame window to work on, then we are faced with a difficult proposition. To solve this problem some have used the wall-thru bushings, inserting them through a hole in the building wall. Still others have drilled right through the metal frame and passed the lead through. And some Service men have resorted to filing through the window pane and bringing the line through.

Set owners have rebelled at the metal-frame drilling and window-pane breakage. And Service men have found too that these methods have been very time-consuming and usually unprofitable operations. Thus there has appeared the need for a neat, efficient method of bringing transmission line through metal-cased windows.

In searching for a solution to the problem, it was found that a pair of metallic plates cemented on both sides of the window pane served as an ideal feed-thru. The plates actually serve to form a pair of capacitors, one in each leg of the transmission line; the plates are the conductors and the glass serves as the dielectric. It was found too that window pane glass has a high dielectric constant and thus helps to form a large capacitor. Since a capacitor passes *rf*, the TV signal, being high frequency *rf*, will pass right *through* the window.

One might feel that this feed setup could introduce assorted losses that could bite into signal strength. Tests have revealed that the loss factor is very low, and does not affect the signal; this condition is so because of the capacity the plates form and the reactance to TV frequencies.

Plate-Capacitance Values

To illustrate, if we study the formula established to obtain the capacity of a simple capacitor, we can arrive at the capacitance of the plates thus: $C = .224\ KA/d\ (n\text{-}1)$, where C = capacitance in mmfd, K = dielectric constant of material between plates, A = area of one side of one plate in square inches, d = separation of plate surfaces in inches, and n = number of plates.

Therefore $C = .224 \times 8 \times 4^* \times (2—1)/⅛ = 7.168/⅛ = 57.334$ mmfd.

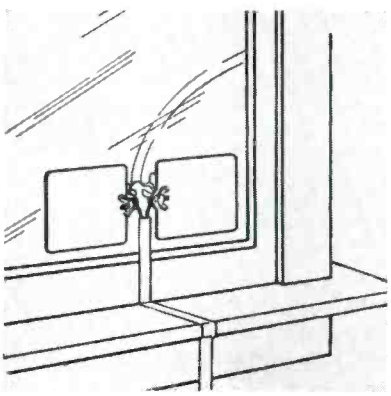
We find that the plates form a capacity of 57 mmfd in each leg of the line. It is now possible to determine the capacitive reactance that these capacitive couplers offer to TV channels.

By applying the capacitive reactance formula, we find that the capacitive reactance for channel 10 is 14 ohms and for an average *uhf* channel it is 4 ohms. In terms of *db*, the average loss for the *vhf* channels thus becomes 1.6 *db* and for the *uhf* channels it is 0.16 *db*.

*Based on data prepared by **Martin Schwartz**, chief engineer, American Electronics Company.*

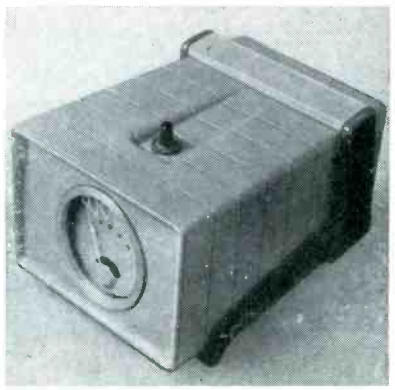
*The plates in the American coupler are four square inches in area.

Through-window coupler, which consists of two pairs of plates designed to be cemented to both sides of glass pane. Plates form a large capacity and permit hf rf to pass through with negligble loss. (American Electronics)



Screw-type earth anchor for guying TV antenna supports up to 40' high. Has a 3" screw or anchor plate on a 30" x 7/16" rod with a 1" round eye. Rated for a minimum holding power of 750 pounds in average soil. (Keep-Stake; A. B. Chance Co., Centralia, Mo.)

Antenna rotators which feature two-tone color styling, finger-tip control, constant directional indication, and illuminated dial. (Model CAR6-B Tenn-a-liner; Crown Controls Co., Inc., New Bremen, O.)



PERSONNEL

LEE HICKS has been named service manager of Crescent Industries, Inc., Chicago, Ill. . . . Other company appointments include GEOFREY EIRICH, customer relations manager; PAUL STENMARK, sales manager special products division; and RUSSELL D. GAWNE, sales manager distributor sales division.

* * *

DONALD L. MCKENNA, formerly in the production planning department, has been appointed sales rep in the southeastern states for Tung-Sol Sales Corp.

Donald L. McKenna

Frank Hickey

Edwin A. Freed

FRANK HICKEY has been appointed mid-eastern district sales manager for CBS-Hytron. Hickey will work through the company's Pittsburgh office.

* * *

EDWIN A. FREED is now general sales manager of General Instrument Corp., Elizabeth, N. J. In his new capacity, Freed will be in charge of sales of all products made by General Instrument and its manufacturing subsidiaries, including the F. W. Sickles and Elizabeth divisions, both here and in Canada.

* * *

LAURENCE M. EUGENE, formerly assistant sales-promotion manager in charge of catalog production at Allied Radio Corp., has been named advertising and sales-promotion manager of Permoflux Corp., Chicago.

* * *

BRUCE E. VINKEMULDER is now sales manager of the electronic division of the Carter Parts Co., Chicago, Ill. He was formerly with Sangamo Electric Co.

Bruce E. Vinkemulder

Nathaniel B. Nichols

NATHANIEL B. NICHOLS, manager of the research division, has become an assistant vice president of the Raytheon Manufacturing Co. . . . K. C. BLACK is now head of the communications engineering department. . . . ERNEST F. LEATHEM, assistant to the president, has been elected chairman of the National Security Industrial Association's procurement advisory committee.

* * *

JACK MOORE is now sales manager of Skyline Manufacturing Co., Cleveland, Ohio.

* * *

DOUGLAS M. CONSIDINE, formerly with Minneapolis-Honeywell Regulator Co., has been appointed sales promotion and merchandising manager of P. R. Mallory and Co., Inc., Indianapolis, Ind.

* * *

WILLIAM H. HENRICH has been named assistant to the general manager, in charge of production and sales, of the Condenser Products Co., division of New Haven Clock and Watch Co.

* * *

GENE MILLER, formerly with the Hotpoint Co., has been appointed ad and sales-promotion manager of the V-M Corp.

* * *

DONALD K. BAXTER has been appointed sales manager for Krylon, Inc., Philadelphia, Pa.

Rep Talk

JAMES GORDON is now an associate in Gordon Dougherty Associates, Lansing, Mich. . . . *Boyd E. McKnight,* formerly with North American Aviation, Inc., has been appointed field engineer for the Koessler Sales Co. In addition to covering jobber accounts, he will be in charge of the industrial department. . . . *Tom Butler* has joined Peyser and Co. (Columbia Wire and Supply reps), Colorado Springs, Colo., and will serve accounts in the Rocky Mountain area. . . . *I. R. Stern,* 406 S. Spring St., Los Angeles, has been appointed rep for Harman-Kardon, Inc., in southern California. . . . *Sid Levin,* 4217 Okalona Rd., Cleveland, O., has been named rep for Mechanical Steel Tubing Corp., in Kentucky, West Virginia, Ohio and western Pennsylvania. . . . *George P. Marron,* 712 Norman Pl., Westfield, N. J. (New York State, except metropolitan New York City); *Richard L. Stone,* 5864 Hollywood Blvd., Hollywood, Calif. (California south of Delano, Arizona, and southern Nevada); and *Walter S. Harmon Co.,* 121 Robertson Blvd., Beverly Hills, Calif. (southern California industrial and manufacturing accounts), have been appointed reps for Centralab. . . . *William G. Kelly Co.,* Burlington, Iowa, is now rep for Pyramid Electric Co., in Iowa and Nebraska. . . . *Mose Branum,* 123 Manufacturers St., Dallas, Tex., has been named southwest rep for Ward Products Corp., and will cover Texas and Oklahoma. . . . Technical Appliance Corp. has appointed *John Guenther* as rep in Texas, Louisiana, Oklahoma and Arkansas. . . . New Workman TV Inc., reps include: *Frank J. Perma,* 2506 Stoneybrook Lane, Drexel Hill, Pa. (eastern Pennsylvania, Delaware, Maryland and Fairfax County, Va.); *John Zenkus,* 801 Crotona Park N., Bronx, N. Y. (Virginia, except Fairfax County); *Al Levine,* 11 Jonquil Pl., Pittsburgh, Pa., (western Pensylvania and West Virginia); and *Bob Miller,* 805 Eldorado, Clearwater Beach, Fla. (Florida and Mobile, Alabama). . . . *Wally Schulan and Co.,* 136 Liberty St., New York City, has been named rep for the Crescent line of speakers in metropolitan New York and northern New Jersey. *Egert and Fields Co.,* 11 Park Pl., New York City, will cover the same area with the Crescent line of record changers and tape recorder mechanisms. . . . *Texport Co.,* 5004 Ross Ave., Dallas, Tex., has been appointed rep for the International Rectifier Corp., in Louisiana, Oklahoma and Arkansas. . . . *Mike Roth Sales Co.,* 13947 Cedar Rd., Cleveland, O., is now rep for The Astatic Corp., in Ohio, West Virginia and western Pennsylvania. . . . *Jack L. Weber,* 4348 N. Park Ave., Indianapolis 5, Ind., has been named rep for Oxford Electric Corp., speaker and transformer industrial accounts in Indiana.

G. P. Marron W. S. Harmon R. L. Stone

FRSAP MEETING IN HARRISBURG

At special session of delegates of the Federation of Radio Servicemen's Associations of Pennsylvania, which featured talks by ye editor and W. L. Parkinson, product service manager of General Electric. Left to right: Samuel Brenner, Dave Krantz, J. Palmer Murphy, ye ed, Al Haas, Milan Krupa, Bert Bregenzer, O. Capitelli, Max Liebowitz, and Robert Fisher, Fred Miller and Bill Parkinson of G. E. (See pages 6 and 7 for report on meeting.)

Color TV

(*Continued from page* 25)

any channel should remain constant for all frequencies. Non-linear phase delay will result in poor transient response and will cause misregistration at the edges of objects as viewed on the receiver. Misregistration within the receiver results in the same problem and should not be mistaken for system problems. Phase-delay problems frequently occur when sharply-tuned circuits are utilized, such as in traps, and these should be avoided as much as possible.

Overload effects and limitations apply to each piece of electronic apparatus, i.e., amplifier, converter, etc. Again the effects are cumulative; therefore, the addition of losses when units are used together put a tighter limitation on each individual unit. For color transmission, as compared to black and white, overload becomes more critical. Cross modulation occurs when a unit is overdriven and a 920-kc beat is produced between the color subcarrier components and the sound carrier. This appears in the picture as an interfering *rf* signal and cannot be tuned out by the fine tuning control. The amount of permissible beat has been determined to be about 1/200 of the picture-carrier level. Ordinarily any given tube will distort and the beat will appear at a lower operating level than when the same tube is used to amplify monochrome signals.

Overload may result in a differential gain variation with changing amplitude of the transmitted information. This will change the saturation, i.e., the amount of white mixed with each color.

Another effect of overload is differential phase variation, producing a phase shift with changing amplitude of the transmitted information. Here a phase shift of the 3.58-mc burst on the sync pulse, with respect to the 3.58-mc color information between the sync pulses, occurs and will cause a change in hue of the colors.

The presence of noise may become more objectionable for color signals than for black and white; however, the addition of color to a noisy black and white picture adds something that to some viewers will make the picture more desirable. It is known that to produce a comparable noise-free color picture, a level to the receiver should be approximately 2 db higher than for monochrome.

Community TV and Color

With the increasing interest in color TV, there has appeared the question as to whether or not community sys-

tems can be made to pass color signals, and if so what other problems may arise that will effect the operator. Certainly, color signals can be distributed effectively.

Color receivers have some circuits common to b-w receivers; however, additional tubes, circuit and controls are required. The added complexity to the receiver will result in a greater number of service calls.

The color receiver has several additional controls. Controls accessible on different models have been labelled hue or phasing, chroma, saturation or color control, convergence, and some sets have a color-sync control. Each must be adjusted in the proper sequence to give pleasing colors. Adjustment of the fine-tuning control is much more critical than for black and white sets. Improper adjustment of this control will result in a picture without color or a color picture with an interference pattern due to a 920-*kc* beat between the sound carrier and the subcarrier frequency.

The problems that may arise on the community system itself, due to transmission of color signals, once the critical design features are incorporated into the electronic and associated equipment, are probably not as great as the receiver problem themselves. Properly-designed equipment for black and white signals may also pass color. Levels of operation will be more critical and it may be desirable to adjust them downward. Response checks are likely to require more careful consideration. Cable-response irregularities will have to be kept to a minimum and it will be necessary to check all cable prior to installation to avoid costly removal, in the event that defective cable should be installed.

The effect of any added costs to the operator can be offset by additional sales appeal. Color pictures on a system having a better noise factor should have an even greater appeal than experienced today with b-w TV.

•

ELSCO NOW MAKING AM/FM ANTENNA KITS

Production of the all-wave noise reducing antenna kit, and transformers for master antenna systems, formerly manufactured by Technical Appliance Corp., has been announced by The Electronic Specialties Manufacturing Co., 76 Irving St., Worcester 10. Mass.

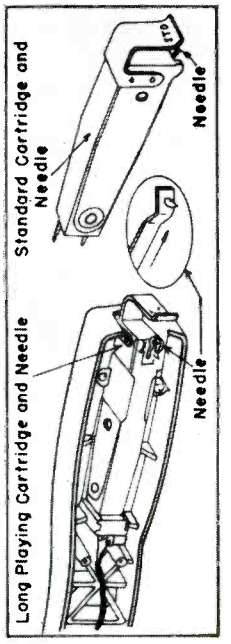
Transformers use *hf* iron dust cores said to permit full isolation between primary and secondary. By special design and spacing of winding, it has been found possible to block line noises passing from set into transmission line. As many as 15 to 25 sets can be tied through couplers to a single antenna.

Phono Needles

(*Continued from page* 47)

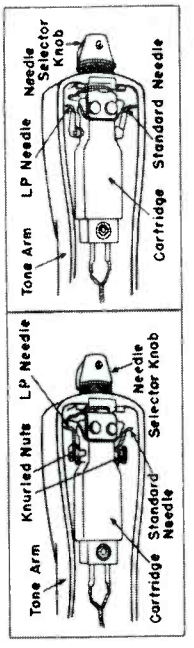
amic cartridge, employs a .003" tip for 78 and .001" for *lp*, both osmium. And in the 650 series, where rotating type ceramics are also used, four needle types have been included: Jewel or sapphire .003" for 78 and .001" for *lp*, and .003" diamond for 78 or .001" diamond for *lp*. For Admiral's RC600 *hi-fi*, 78 and *lp* ceramics are used. And here sapphire .003" is employed for 78 and .001" for *lp*, while a .001" diamond has been installed for *lp* work.

When replacing needles in these changers, either of two mountings must be considered. In one type of cartridge, there's a knurled nut, which must be loosened to remove needle. The other type of cartridge has a force-fit sleeve and the needle can be removed by pulling it forward. The shapes of the needles employed and their mounts are illustrated below.



(Below)

Fig. 2. Ceramic cartridges used in Admiral RC600 hi-fi record changer. Needles in original unit are sapphire and diamond.



(Above)

Fg. 1. Rotating ceramic cartridges used in Admiral RC625-RC630 (left) and RC650 (right) record changers. In original equipment osmium needles are used in cartrige at left, and sapphiress and diamonds in unit at right.

Audio Forum

(*Continued from page* 51)

and turntable-rumble, by reducing the frequency range over which the amplifier responds appreciably. They differ from tone controls in having little effect out to the *cutoff* frequency and almost totally eliminating response beyond it.

Record compensators are desirable because they permit adjustment of the amplifier bass and treble response to make up for the loss in bass and exaggeration of the treble intentionally put into records because of certain requirements of the recording process. Not all makes of records are alike in this respect, so the adjustable feature is advantageous. The simpler versions have one knob providing several different response curves, while maximum flexibility is attained by means of two separate controls for *turnover* (bass) and *roll-off* (treble). The required response curves are not accurately provided by the *bass* and *treble* controls; hence additional record compensation controls provide audibly improved reproduction.

Better Audio

(*Continued from page 42*)

obtained by using a *loudness control.* One such unit is illustrated in Fig. 2; page 42.

This device is composed of a 3-section pot that is operated by one common shaft, plus a number of associated capacitors and resistors. A potentiometer, R_3, serves as a standard volume control, regulating the over-all volume of the set; its setting establishes this volume level. The audio voltage tapped off at R_3 is transferred through the two other potentiometer circuits to the succeeding audio stages.

Center Pot Control

A center pot, R_2, in conjunction with C_1, causes a rise in output audio voltage at frequencies above 1,000 cps as the volume setting is lowered. The lower the setting of the three ganged pots, the greater is the boost given to the high frequencies. The reason the highs are boosted lies in the fact that, as the R_2 setting is reduced, the impedance offered to *hf* current through C_1 and the lower part of R_2 is reduced. This current flows through the section of R_3 below the arm, R_5 and C_2, producing an audio voltage larger than the voltage developed by the middle frequencies. This is so because the middle frequencies do not find the opposition of the C_1/R_2 combination as low as the highs do; the current through the lower section of R_3, R_5 and C_2 is therefore lower for these middle frequencies, and the audio voltage they develop is lower.

Rear potentiometer R_3, acting in conjunction with R_5 and C_2, causes an increase in the voltage output for low frequencies. It does so because the impedance of C_2 increases as the frequency of the incoming signal falls. The total impedance of the circuit made up of the section of R_3 below the arm setting, R_5 and C_2, therefore goes up; and the voltage drop for low frequencies across the section consequently rises with it, boosting the lows. The lower the R_3 setting, the more will lows be boosted with respect to middle frequencies, since the $R_3/R_5/C_2$ circuit becomes more reactive as the R_3 arm setting goes down, thus offering more and more opposition, proportionately, to lows than to middle frequencies.

Typical circuits in which the loudness control may be substituted for original volume controls are shown in Fig. 3; page 42.

[To Be Continued]

Power Distribution

(*Continued from page 21*)

fuse and switch is convenient. One such desk outlet, constructed in a 4" by 5" by 6" steel utility case, is shown in Fig. 3 (p. 20). This box has one outlet bridged across the input, to accommodate a constant load, such as an electric clock; and three outlets controlled by the panel switch and protected by the local fuse. The Morse bayonet socket in the center provides 6.3 volts at 10 amperes, isolated from the line; and the cigarette lighter on the panel, a standard automotive component, saves many trips across the room to fish matches out of a coat pocket.

Circuit of this outlet box is shown in Fig. 5 (p. 20).

All wiring was made with No. 12 B and S, stranded wire being used where flexing might occur, and solid wire, covered with sleeving, where no flexing was probable. To prevent stripping out, all case screw holes were tapped 6-32, and 6-32 binding head screws were used in place of the sheet metal screws supplied with the case.

Power needs at a service bench are somewhat different from those in either a kitchen or a machine shop. A relatively large number of devices are used repeatedly during each working hour, so that a large number of outlets is desirable; but only a few of these many devices will be used at the same time. Because of this low demand factor, the total current drawn from the line at any given time will be very much less than the total drain of the entire number of connected devices. Demand factors considerably below .3 are not uncommon at service benches.

For safe and convenient operation during repair and experimental work it is desirable that one bank of outlets be switch controlled independently of the other, so that high voltages can be turned off while soldering irons are kept on. Provision for disconnecting the bench outlets from both sides of the line at the end of the working day should be provided, particularly if much work is done with *hot chassis* equipment. A general survey of bench power needs disclosed a lack of 6.3-volt supplies, and a need for more ground terminals.

To meet these general requirements, a bench outlet box was constructed in a standard 5" by 6" by 9" steel utility box. The device has 27 separate *ac* outlets, wired in two circuits, one of which, containing 13 outlets, can be switched off independently of the box as a whole.

[To Be Continued]

(*Continued from page 27*)

rapid checking of their own brand of equipment. When more than one make of equipment is to be serviced regularly, the ingenious Service Man can modify one tester to serve all brands, or perhaps design his own tester.

Electronic *rf* wattmeters are available; these plug into a standard coax cable fitting and serve as a dummy load as well as a device for indicating transmitter power output. This is a very useful and necessary tool because it will quickly help one to determine when the transmitter is not up to par and can also indicate if excessive losses occur in the antenna transmission line.

For aligning the intermediate-frequency amplifier stages of a receiver employing tuneable *if* transformers, a standard broadcast receiver type signal generator will generally suffice. For *rf* section alignment, a good *uhf* signal generator, whose output can be attenuated to a fraction of a microvolt, is recommended.

The shop should also be provided with a source of 6 or 12-volt power or both for operation of mobile units. The average 460-mc mobile unit draws more current than *vhf* mobile equipment, so an adequate power source should be selected. Another factor to consider is that the current drain, with the transmitter *on*, is often twice as great as when the transceiver is in standby condition. Therefore, if a rectifier power supply is to be selected, its voltage regulation characteristics should be looked into carefully.

The expansion of *citizens-radio* is expected to rise sharply as more businessmen become aware of the economic advantages of 2-way radio. Equipment manufacturers are launching aggressive sales campaigns which are bound to result in many orders. The market for *service* therefore will expand just as rapidly.

Monthly Charge Rates

Rates for servicing of mobile units run from $7.50 to $10.00 per month per vehicle. This single fee often includes all tubes, parts and labor. The equipment owner must bring the radio-equipped vehicle to the shop, where the radio unit is removed from the vehicle for servicing. There is generally no limit to the number of times a mobile unit may be brought in for emergency service during shop hours.

A monthly charge varying from $20.00 to $50.00 is the normal rate for contract maintenance of base stations. This fee again includes tubes, parts and labor. Emergency calls are made at any time and preventive maintenance calls are made every 30 to 45 days.

The usual charge for installation of a mobile radio system in a vehicle runs from $25.00 to $30.00. This does not include material or labor for installation of oversize battery charging generators. The installation of a base station generally is charged for at a rate of $5.00 to $10.00 per hour or at a flat fee of $50.00 to $250.00, depending upon the individual circumstances.

Growing Opportunities

The servicing of *citizens-radio* can soon provide the progressive radio shop with a continuing source of income. The investment in equipment is quite small. Enterprising shop owners, interested in entering this field, should contact equipment manufacturers who are often desperately looking for competent service organizations to take care of new customers' installation and service problems.

Curbing TVI

(*Continued from page 23*)

frequency and the frequency of the *TVI* carrier. Fig. 3 (p. 23) graphically illustrates the shifted *if* response, and the change in bandpass is represented as Δ_{if}. This plot shows that Δ_{if} is the difference between the adjacent channel trap *null* frequency and the *TVI* signal carrier frequency. The maximum shift of any *if* system cannot exceed 6 mc and this certainly will not reduce the gain developed by the *if* amplifier. For example, let us consider a hypothetical case of a *TVI* signal existing in a certain locality at 43.5 mc. The engineering specifications of the receiver in question are such that the adjacent channel trap must be tuned to 47.25 mc. The shift or Δ_{if} then will be 3.75 mc. If the condition is severe enough for the *if* band pass to be shifted, then the new response will be 3.75 mc lower for optimum results. It can be observed in Fig. 3, that if the undesired 43.5-mc signal were point *A* on the dotted curve (original *if* setting), the new alignment would place the 43.5-mc signal in the adjacent channel setting.

Stagger-Tuned IF Example

The *if* bandpass curves shown in Figs. 2 and 3 (dotted line), are ideal curves and are illustrated for purpose of analysis. Actually there is always some deviation from these response curves due to production tolerances. In these illustrations we have the commonly used *if* system employing three stages that are stagger tuned. The bandwidth at the 6-db point on the curve is 3 mc. In a typical *if* system, the mixer stage of the tuner in most receivers is part of the *if* alignment. In some circuits the adjacent channel trap is incorporated in the second *if* transformer (top slug), but this trap might be in any of the *if* stages depending on the receiver design. This *if* system employs an input *if* coil which in conjunction with a mixer plate coil acts as an overcoupled stage providing a smoother overall *if* response.

To accomplish the shift of the *if* bandpass or Δ_{if}, as shown in Fig. 3 by the solid line, complete readjustment of the tuned circuits will be required. As far as alignment procedure is concerned, it is best to adhere to each individual manufacturer's specifications.

[Next Month: Sweep Alignment; Local Oscillator Adjustments]

Ser-Cuits

(*Continued from page* 35)

ages change when replacing a tube or component.

(3) Mechanical setting disturbance of picture tube, beam magnets, deflection yoke, purity coil, or any of the convergence controls, caused by moving chassis.

A tri-color tube, out of convergence, is indicated by either a black-and-white or a color picture having *halos* of color at all bright lines or edges. Any line in the picture having a change of contrast will show this *color edging,* or lines of colors, which will have the appearance of *color ghosts.* This defect in picture reproduction is much the same as the misregistration effect sometimes seen in poorly multi-colored pictures.

One type of white dot generator is illustrated in Fig. 2 (p. 35). This instrument provides for a selection of large white dots (rectangular) for viewing through a mirror (from the rear of the receiver), small white dots for direct screen viewing, vertical white bars and horizontal bars.

Two controls, vertical sync and horizontal sync, are used to adjust and stabilize the pattern. They are operated in much the same way as the vertical and horizontal hold controls on a TV receiver. Vertical sync and pattern locking to the line frequency is provided by a 60-cycle blocking oscillator in a *count down* line-locking circuit.

An *rf* oscillator which tunes from channels 2 to 6, feeds to a crystal modulator. The bar and dot modulation is fed to the modulator crystal after the pulses have been shaped.

In the process of color convergence, it will be found necessary to make a number of adjustments, which include the following: Deflection coil or yoke positioning; beam magnet positioning; horizontal dynamic amplitude adjustment; horizontal dynamic phase adjustment; vertical dynamic amplitude adjustment; vertical dynamic phase adjustment; *dc* convergence control adjustment; and focus adjustment.

•

Tube News

(*Continued from page* 40)

a separate winding on the transformer. In complex circuits, such as the three-phase bridge, as many as six separate filament supplies are sometimes required. Because of this, tubes are not widely used in bridge type rectifier circuits.

The selenium rectifier, on the other hand, requires no filament for its operation; and, hence, no filament supply is needed. Therefore, some miniaturization of equipment, desired in many applications, is accomplished by eliminating the need for a filament transformer or windings in a multiple-wound transformer. The size and weight of the latter are effectively reduced since the amount of iron and wire is decreased. Savings of this nature reflect back to the line source by decreasing power consumption. For example, the filament of a 5Y3 dissipates 10 watts of power, power which can be conserved by the use of selenium rectifiers. In applications requiring intermittent operation such as elevators, alarm equipment and many other control circuits, selenium rectifiers have been found to offer lower standby losses than tubes; that is, in the standby position, the tube filaments are left energized, but the high voltage (plate voltage) is deenergized.

Because of the complicacy of supplying power to many filaments, it was heretofore considered impractical to use voltage-multiplier circuits involving vacuum tubes. However, since the advent of the selenium rectifier, such circuits (voltage doubler, tripler, quadrupler) are now being used widely.

In a tube rectifier, output current is limited mainly by the emissive power

(*Continued on page* 76)

TV Antenna-Forum Telecast

BELIEVING that Service Men in the far west should have a first-hand report on the TV antenna scene as it obtains today and will hold in the future, *M. L. Finneburgh, Sr.,* vice prexy of the Finney Company, reviewed the situation recently during a one-hour antenna-forum telecast over KFDA-TV in Amarillo, Texas.

Declaring that the *future belongs to those who prepare for it,* Finneburgh told his viewers that the antenna business is a mighty important one, with great potentials for everyone, but . . . "the honeymoon is over and now is the time to prepare for a successful marriage with your own business."

Hitting hard at price cutting, poor management, and lack of human understanding, he urged Service Men to begin immediately to prepare for the future. It is extremely important that more trade papers should be read, he said, and we should study human relations, and, in general, become thoroughly familiar with the field of business and technological advancement. Employees were told that they should realize that they, too, are actually in business and should prepare to increase their personal assets. Preparation, determination, perspiration, and inspiration were pointed out as being the four keywords to business success.

R and R Electronics, Finney distributor, and the station publicized the meeting in advance to TV dealers and Service Men, as well as to leading north Texas commercial and industrial firms.

The telecast was described as part of an educational clinic program featuring talks by Finneburgh and offering engineering and merchandising counsel. During a recent swing in the southeastern states clinics were held at the Maxwell House Hotel, Nashville, Tenn., in conjunction with Electra Distributing Company; at the State Cafe, Jackson, Tenn., in conjunction with Carlton Wholesale Radio, Inc.; at the King Cotton Hotel, Memphis, Tenn., in conjunction with Lavender Radio Supply Company, Inc.; at the Rotisserie, Jackson, Miss., in conjunction with Ellington Radio, Inc.; at the Lamar Hotel, Meridian, Miss., in conjunction with Griffin Radio & Supply Co.; and at the Electricians Auditorium, Miami, Fla., in conjunction with Herman Radio Supply Co.

At Finney antenna-forum telecast, left to right: Gene Brown, manager of R and R Electronics; M. L. Finneburgh, Sr., and Max Heidenreich, southwestern Finney rep.

TV Chain Amplifier

(*Continued from page 33*)

by equal amounts, the grid and plate signals reach the next tube at the same instant. Here the grid signal is amplified again and added to the plate signal.

The amplifier can accommodate input signals up to .1-*v rms*, without distortion or cross modulation and will develop outputs of 1-*v rms* across 75 ohms.

The power supply, developed for the amplifier, is unique in that service is not interrupted by voltage measurements or adjustments. One merely plugs a test set into test jack included on the chassis. Operating voltages can thus be adjusted without interrupting equipment operation. The power supply has a built-in filter to prevent interference from entering the antenna system.

The output of the amplifier, in a practical installation, is fed into a four-way line splitter which takes the output and divides it into four equal signals. Each outlet has one quarter power; thus, a loss of 6 db is inherent with this unit. The output of the four-way line splitter is fed into a distribution system.

In an installation in Riverdale, N. Y. City, the signal area was found to be about 25 *uv*. The antenna selected has a minimum voltage gain of 2:1, which provides an average signal level of 50 *uv* from the antenna for the input to the amplifier. The amplifier, which has a minimum gain of 20 db, results in 500 *uv* at the output which is fed into the 4-way line splitter which drops the voltage to 250 *uv* per line. The attenuation of the cable and the resistive device in the TV outlet in each apartment develops a loss of approximately 20 db; this means that 2½ *uv* is available for each TV set connected to the system.

UHF AWARD

(Left)

Joseph B. Epperson, chief engineer of WEWS, Cleveland (left), presenting Channel Master's Resnick Foundation Award of Merit to John R. Whitworth, chief engineer of WJTV of Jackson, Miss., during fourth annual symposium of IRE Professional Group of Broadcast Transmission Systems, in Cleveland. Award was granted to Whitworth for his outstanding contributions of uhf television broadcasting.

(Right)

Plastic and metal swing bin stocked with 166 molded plastic Blue-Point tubulars of 36 different values, with a maximum of 5 of each type, now available from Astron on a special discount basis. Bin attaches on wall or under work bench, and each of 9 bins individually swing out 180° for access to stock and movable dividers.

SWING-BIN CAPACITOR KIT

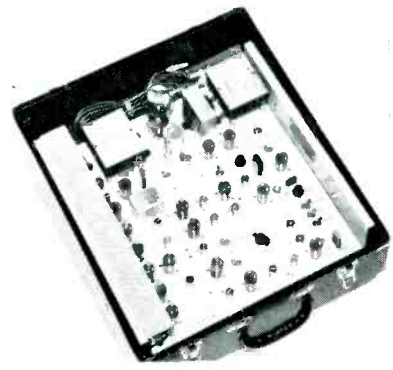
Instruments

HICKOK COLOR-TV BAR GENERATOR

A portable color bar generator, *655XC*, that produces a fully-saturated color-bar pattern, has been developed by The Hickok Electrical Instrument Co., 10521 DuPont Ave., Cleveland 8, Ohio.

Color bars appear in the following order from left to right: green, yellow, red, magenta, white, cyan, blue and black. Has either *rf* or video output. Video output is 0-2 *v*, p-p open circuit; 0-1 *v* p-p across 100 ohms, either positive or negative output. The *rf* output, modulated with color bar pattern, is available through channels *4*, *5* and *6*.

In addition to color-bar pattern, generator produces *I* (in phase) and *Q* (quadrature phase) signals for one type of receiver and *R-Y* and *B-Y* signals for other types of receivers, for demodulator alignment. These bars appear at black level with equal amplitudes. Provision for switching *Y* or chroma, as well as *I*, *Q*, *R-Y* or *B-Y*, on or off, are also included.



* * *

SECO FLYBACK INTERVAL AND INDUCTANCE TESTER

A flyback interval and inductance checker, *FB-4*, has been announced by the Seco Manufacturing Co., 5015 Penn Ave. S. Minneapolis, Minn.

Tester, utilizing *Q*-meter principle, checks flyback intervals to reveal horizontal circuit troubles. Discloses the condition of coil components as a connected group, namely from standpoint of self-resonant frequency established with the distributed capacity in the coils and circuits. Unit, it is said, can verify transformer and yoke matching and also test flyback transformers and yokes individually. Linearity and ringing coils can be checked by the comparison method.

Tools . Parts

AEROVOX POLYSTYRENE DIELECTRIC CAPACITORS

Availability of polystyrene as a dielectric in such standard capacitor designs as cardboard-case tubulars, metal-cased bathtubs, miniature metal-can tubulars, has been announced by Aerovox Corp., New Bedford, Mass.

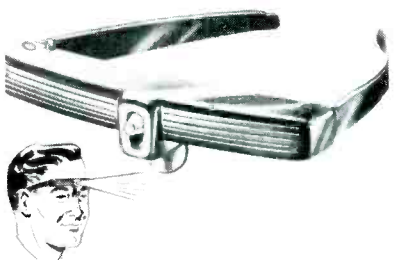
Polystyrene dielectric is said to feature high insulation resistance; low power factor; low change of capacitance with temperature change; and close tolerances. Units are available for operation up to 85° C.

* * *

GEE-LAR BROW-LITE

A flashlight, *Brow-Lite*, that is worn above the eyes, is now available from Gee-Lar Manufacturing Co., 819 Elm St., Rockford, Ill.

Unit is adjustable to any angle and fits just above the eyes. Uses a standard magnifying lens bulb and provides a concentrated beam of light.



C-D HIGH TEMP STEATITE-CASED CAPACITORS

Tubular subminiature capacitors, *Miniroc*, enclosed in steatite-tubular cases and using Myler polyester dielectric, have been announced by Cornell-Dubilier Electric Corp., South Plainfield, N. J.

To insure low *rf* impedance, non-inductively wound extended foils are soldered to wire leads. Capacitor ends are sealed with Polykane fill which bonds to the steatite walls and to the lead wires to prevent entrance of moisture. Available in 100, 400 and 600 *vdcw* ranges.

Bulletin 157 provides ratings, dimension and test data.

* * *

SPRAGUE MINIATURE 3-WATT WIRE-WOUND RESISTORS

A miniature 3-watt wire-wound resistor, which is the same size as conventional ½-watt molded carbon resistors, is now available from Sprague Electric Co., 61 Marshall St., North Adams, Mass.

Adaptable for printed wiring boards, unit is 13/64" *d* by 17/32" *l* and has a maximum resistance value of 10,000 ohms. Features vitreous enamel coating. Complete description appears in bulletin *111-B*.

SUPEREX HIGH-Q VARIABLE INDUCTORS

Two variable inductors, *V-70* and *V-80 Vari-Chokes*, have been announced by Superex Electronics Corp., 23 Atherton St., Yonkers, N. Y.

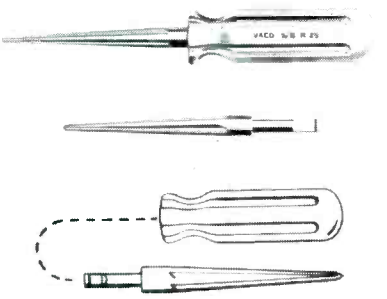
V-80 has an inductance range of .25 to .5 henry; *V-70* varies from 100 to 260 mh.

* * *

VACO TAPERED REAMER

A tapered reamer, *ZH-1-2*, that enlarges undersize holes from ⅛" up to a maximum diameter of ⅜", has been introduced by Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill.

Reamer has an overall length of 7¼"; shank is 3½" long, tapering from ⅜" down to ⅛". Handle is made of *Amberyle* that is chamfered, and has deep flute grips. Also available without handles for use with interchangeable kits.



Tube News

(*Continued from page 71*)

of the filament, which in turn depends primarily upon the cathode temperature. The rectifier must not be operated above the manufacturers' recommended ratings or else filament burnout and tube breakdown will occur.

Generally, the permissible output current capacity of a selenium rectifier is a function of the effective rectifying plate area and is dependent upon its maximum plate temperature (produced by its internal losses), plus the ambient temperature. Either by using a larger size plate (therefore a larger rectifying area) or by assembling the plates in a parallel arrangement, a higher output current can be obtained. The output current can also be increased many times by operating at overload ratings and limiting the plate temperature by means of wide-spacing of the plates or by the use of fans or blowers. Without these means, the rectifier can be operated above rated current for only short periods of time, depending upon the time allowed for the rectifier to return to its normal plate temperature.

[Next Month: Voltage-Temp Rating Data]

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 SERVICE, published monthly at New York, N. Y., for October 1, 1954.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher: Bryan Davis Publishing Co., Inc., 52 Vanderbilt Ave., N. Y. C. 17; Editor: Lewis Winner, 245 W. 107th St., N. Y. C. 25; Managing Editor: None; Business Manager: B. S. Davis, Ghent, 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 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.)

Bryan Davis Publishing Co., Inc., 52 Vanderbilt Ave., N. Y. C. 17; B. S. Davis, Ghent, N. Y.; M. T. Davis, Ghent, N. Y.; J. C. Munn, 2253 Delaware Drive, Cleveland 6, Ohio; P. S. Weil, 8 Barstow Road, Great Neck, L. I., N. Y.; G. E. Weil, 8 Barstow Road, Great Neck, L. I., N. Y.; F. Walen, 494 Martense Ave., Teaneck, N. J.; L. Winner, 245 W. 107th St., New York 25, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent 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) LEWIS WINNER, Editor

Sworn to and subscribed before me this 30th day of September, 1954.

(Seal) Georgia C. Workman, Notary Public

TV Parts... Accessories

UTL TEST PROD ADAPTOR KIT

A roll-up kit, for wall-mounting of test prods and self-holding points, has been announced by the United Technical Laboratories, Morristown, N. J.

Kit contains one pair of *Klipzon* type *A* test prods and leads; two type *T* alligator adaptors; two type *Q* banana plug adaptors; two type *R* banana plugs; two type *L* longie adaptors; and two type *J* jumbo heavy duty adaptors.

* * *

G-C THERMISTOR REPLACEMENT KIT

A *Glo-Bar Filament Resistor* replacement kit, consisting of two washer-type thermistors, suitable for replacement in TV receivers, employing one or more series tube heater strings, is now available from General Cement Manufacturing Co., 919 Taylor Avenue, Rockford, Illinois.

Acting as voltage regulator (not a rectifier), thermistor, it is claimed, can be used to insure better TV receiver performance and longer tube life.

* * *

TRIAD ADMIRAL-EMERSON FLYBACKS

Five replacement flyback transformers, three units designed for use in Admiral receivers and two for Emerson receivers, have been introduced by the Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif.

Model numbers and chassis for which the new transformers are suitable are listed in *Television Replacement Guide TV-54*.

* * *

PERMA POWER BRITENERS

Two picture tube brighteners, C201-202 *C-Brite* and *Vu-Brite*, are now available from the Perma-Power Co., 4727 North Damen Ave., Chicago 25, Ill.

Model *C201* is for parallel-wired sets and the *C202* for series-wired sets; both are 6-wire autoformers. *Vu-Brite* is said to provide a voltage boost to a full 7.8 *v*. It is also a 6-wire autoformer unit.

* * *

STANCOR REPLACEMENT FLYBACKS

Six flybacks, *A-8242-3-4-5-6-7*, that can be used in over 130 chassis and models of Muntz, RCA, Airline and Sentinel TV receivers, have been introduced by Chicago Standard Transformer Corp., Addison and Elston, Chicago 18, Ill.

Bulletin *492* details Muntz and RCA applications, while bulletin *493* covers Airline and Sentinel models.

NEWS

ERIE CAPACITOR BULK-PACK

A method of bulk packaging disc Ceramicons in a *Pallet-Pak*—with five discs inserted between two strips of cardboard and stapled in position between the leads, has been announced by the Erie Resistor Corp., Erie, Pa.

Initially, Erie *Hi-K Bypass* and *Coupling Disc Ceramicons* will be packaged in *Paks*.

* * *

RCA APPOINTS COLOR PIX TUBE PLANT STAFF

A separate operations staff, for administration of all activities connected with the engineering and manufacturing of color television picture tubes at the Lancaster, Pa., plant, has been announced by the Tube Division, RCA, Harrison, N. J.

Staff will function under the supervision of *Harry R. Seelen*, who recently was appointed manager of a newly created color-tube operations department.

* * *

CLAROSTAT ENCAPSULATED CONTROL PROGRAM

Methods of encapsulating controls, in which any one of several compounds may be used, depending on requirements, have been developed by the Clarostat Manufacturing Co., Dover, N. H.

Encapsulating is applicable to controls constructed with a cover. If required mounting and shaft seals may be utilized with the process.

* * *

STACKPOLE COMPONENTS NOW AT DISTRIBUTORS

Electronic components made by the Stackpole Carbon Co., will now be made available through electronic parts distributors.

Fixed composition resistors will be available in ½-, 1-, and 2-watt sizes in all RETMA *preferred* values with standard tolerances of 5, 10, and 20 per cent. Small slide switches, used in portables, will also be available in a variety of U. L. Approved 1-, 2-, and 3-pole types.

Distributor division offices are located at 26 Rittenhouse Place, Ardmore, Pa.

* * *

SIMPSON ADDS PLANT

Plant facilities of O. D. Jennings and Co., which include a 4-story building containing over 100,000 square feet of space at 4307 W. Lake St., Chicago, to be used to manufacture color TV test equipment, plus a suspension type meter, has been announced by the Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

* * *

CISIN BOOK-NAMING WINNERS

Fifty winners of a contest, set up to obtain the best possible title for a forthcoming TV service book, have been announced by Harry G. Cisin, Amagansett, N. Y.

First six winners include: *Ralph L. White*, Springfield, Mass. (winner of $100 cash prize); *Michael G. Palella*, Hicksville, N. Y.; *Norman Kuflik*, Brooklyn, N. Y.; *George W. Bailey*, N. Y. C.; *Louis Mirani*, Arlington, Va.; and *Harry Johnson*, Brooklyn, N. Y.

ADVERTISERS IN SERVICE NOVEMBER, 1954

JOTS AND FLASHES

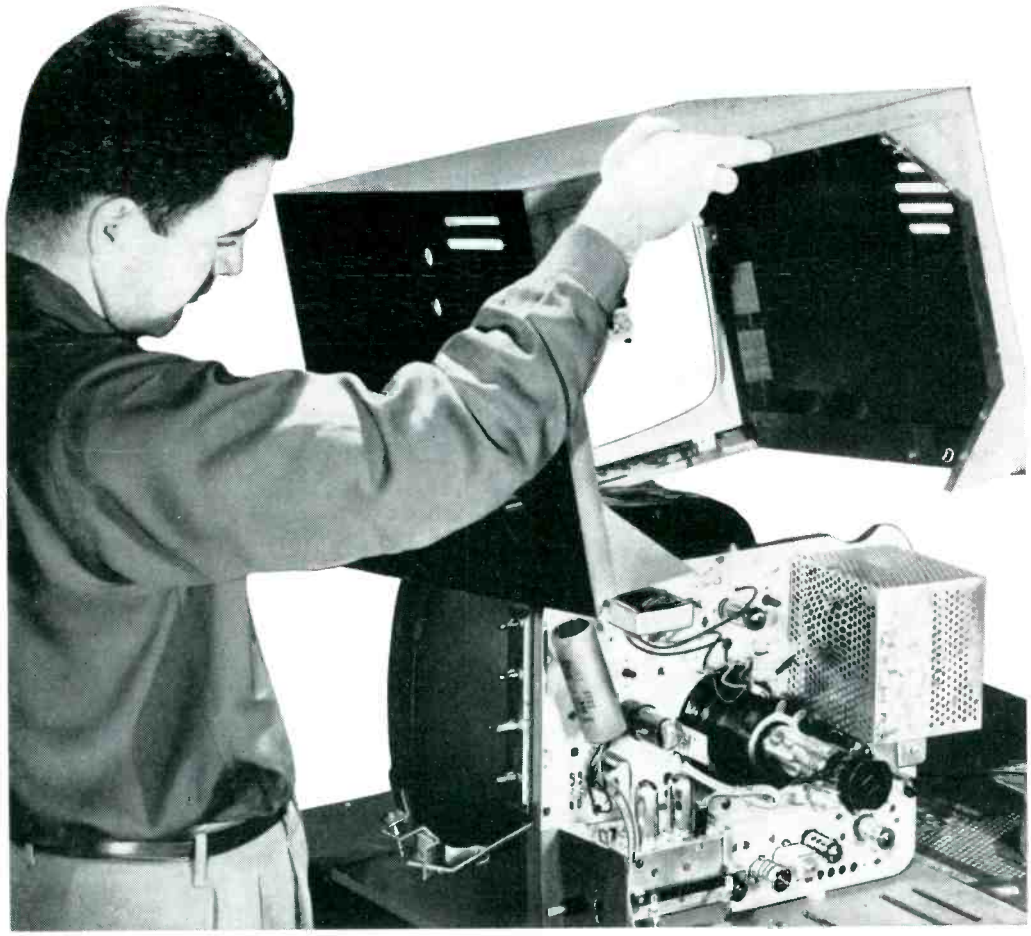
APPRAISING the outcome of the looming battle for popular favor between records and tape, *Everett W. Olson,* Webster-Chicago communications director, said recently, during a professional tape-engineering meeting, that recorded tape ultimately will replace discs in the quarter-billion home entertainment market, but not until both recorded tape and tape-playing instruments have been made simpler, cheaper and easier to handle and operate. Thus far, he added, nearly all of the approximately one-million tape recorders in use were bought primarily for business or educational uses, or for recording radio or TV programs, or building an album of precious memories. But, to all of these recorder owners, especially the educated music lovers and the *hi-fi* enthusiasts, Olson emphasized, recorded tape offers a new and exciting use for their instruments that in time may well overshadow all other uses. . . . Alprodco, Inc., is building a new fire-proof factory that will add 50,000 square feet of floor space to their present facilities in Mineral Wells, Tex. . . . A basic schedule of 27,000 (2,000 with 19″ and 25,000 with 21″ tubes) color-TV sets to be produced before the end of '55, has been announced by *Henry P. Argento,* vice president and general manager of the TV and radio operations of Raytheon. The 2,000 sets will be produced during the remainder of this year; they will utilize 19″ three-gun color tubes. . . . A course in color-TV engineering, under the direction of Dr. Edward L. Michaels, supervisor of advance development at Packard-Bell, is currently being offered at the engineering extension of the University of California, Los Angeles. . . . Stewart-Warner marked its return to the phono field by introducing recently ten models of standard and *hi-fi* phonos and radio-phono combinations. . . . *Harold J. Schulman,* CBS-Columbia, has been reappointed chairman of the service committee of RETMA. *John F. Rider* was reappointed vice chairman of the committee for '54-'55. . . . . *Fred Okon* is now ad manager of CBS-Columbia. . . . . The Third Annual Audio Fair-Los Angeles and the Audio Engineering Society technical sessions, will be held February 10 through 13, 1955, at the Alexandria Hotel, Los Angeles, Calif. . . . *Charles F. Stromeyer,* CBS-Hytron prexy, has announced that patent 2,690,518 has been issued on the CBS-Colortron picture tube. . . . Walco Products, Inc., have expanded their facilities and moved into an additional building in East Orange, N. J.

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 AVCO Cincinnati 25, Ohio

Crosley gives you more for your money!

NEW EDITION!

Now ready, the RC-17... the 1954 edition of the RCA RECEIVING TUBE MANUAL

Revised and up-to-date, this "standard reference tool" for radio-tv service technicians, engineers, and experimenters covers the complete line of RCA receiving tubes and picture tubes for home-entertainment use. It includes basic tube theory, installation and operation data, and features application information, comprehensive resistance-coupled amplifier charts, *plus* new circuits for hi-fi amplifiers.

Get your copies of the RC-17 Receiving Tube Manual from your local RCA Tube Distributor, from your technical bookshop, or from RCA Commercial Engineering Section K 44, Harrison, N. J. At only 60 cents* per copy, you'll want one of these manuals for every serviceman in your shop.

NEW COUNTER VENDOR

Look for the colorful display that holds your new RC-17 Receiving Tube Manual. See it on the counter of your local RCA Tube Distributor.

ONLY 60¢*

*SUGGESTED LIST PRICE

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