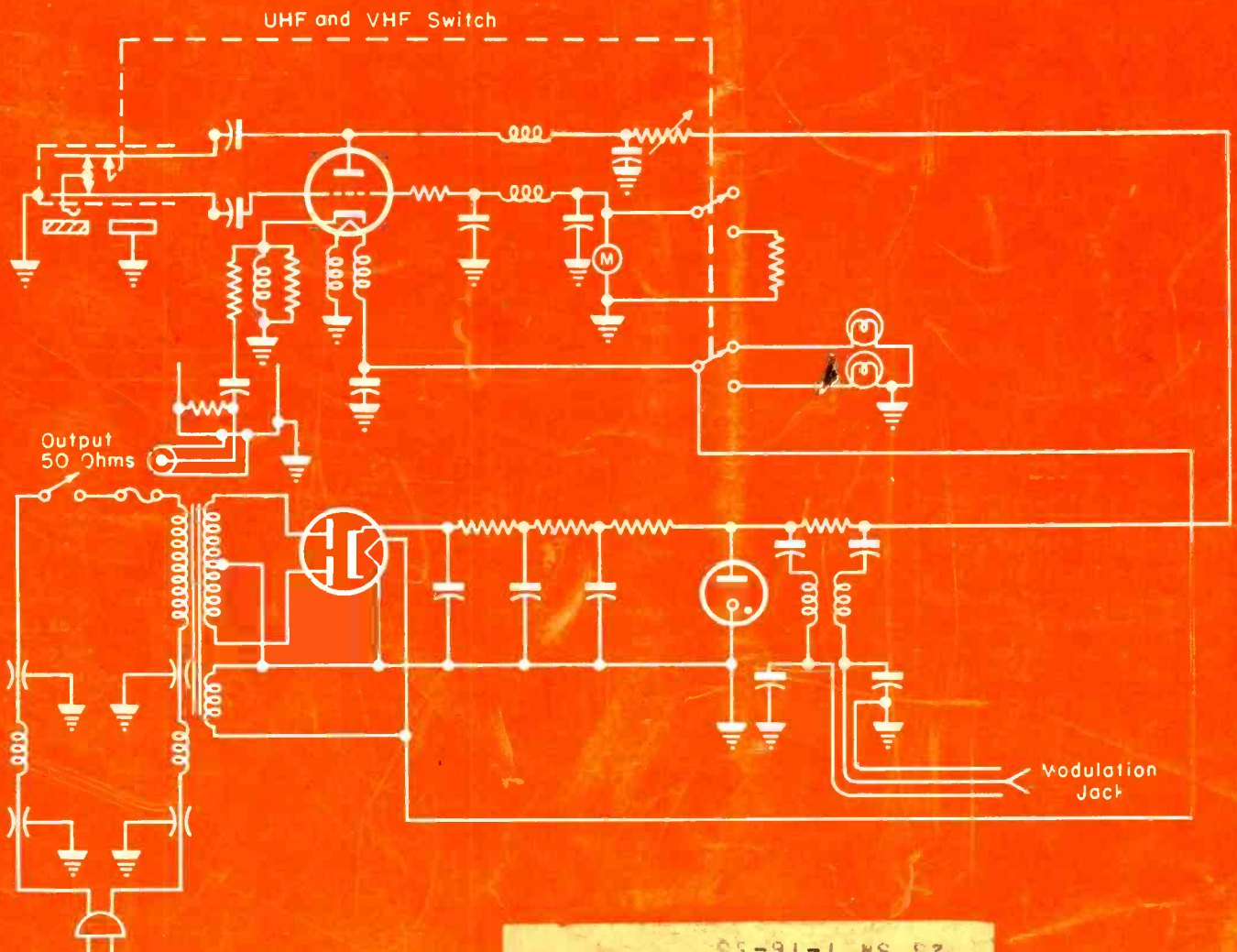


# SERVICE

VOL. 22

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

AUGUST  
1953



Spiral-wound line 50 to 950-mc signal generator.  
[See circuit analysis, this issue]

25 SR-1-16-53  
 C F MCCULLOUGH  
 58 DENNISON DR  
 DRAVOSBURG, PA  
 1-55

for the  
new 12 volt  
auto circuit

**RADIART**

announces its  
6300 series...

an addition  
to the full line of



**Seal-Vent**

RED SEAL VIBRATORS

### Faster Starting

The exclusive RADIART design permits the briefest possible "Warm-up" period, thereby making the RADIART vibrators practically instantaneous starting. This added feature means greater performance.

### Longer Life

There's more for your money in every RADIART vibrator—they last longer! Precision manufacture, using only the finest materials, assures long lasting, trouble-free performance.

### Complete Replacement Line

RADIART has a CORRECT replacement vibrator for every original equipment vibrator. 12 Radiart vibrator types serve over 89% of all popular replacements. NOW...THE NEW 6300 SERIES IS READY FOR THE NEW '53 car MODELS with radios having 12 volt circuits.

### Seal-Vented

Sealed at the factory to prevent the formation of an insulating film on the points while the vibrator is on the shelf...the sealed vent automatically opens when put in use to allow the vibrator to "breathe".



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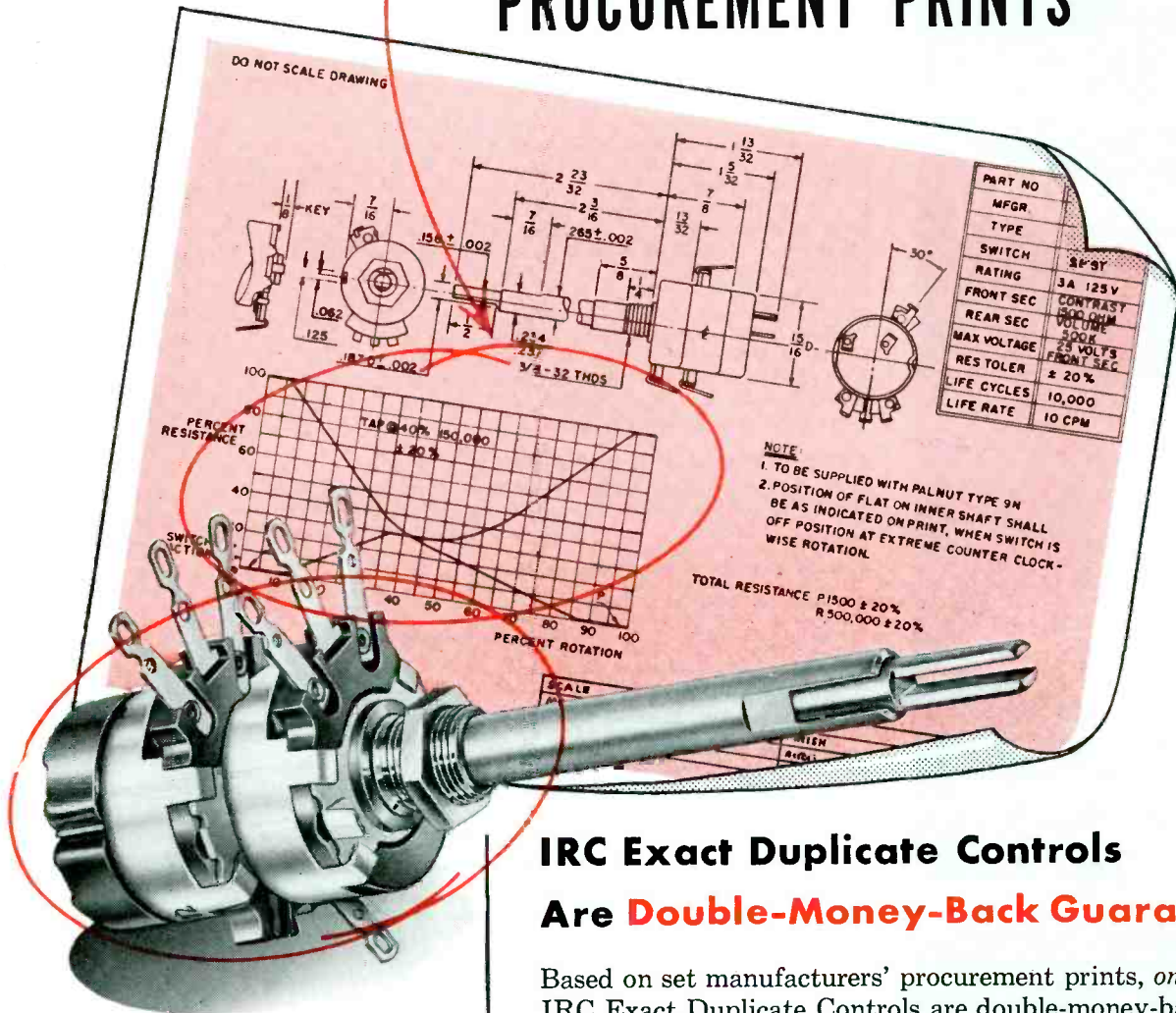


*preferred by Servicemen Everywhere*

**THE RADIART CORPORATION** CLEVELAND 13, OHIO

VIBRATORS • AUTO AERIALS • TV ANTENNAS • ROTORS • POWER SUPPLIES

# ASSURED ELECTRICAL ACCURACY BASED ON MANUFACTURERS' PROCUREMENT PRINTS



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

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



Wherever the Circuit Says 

## IRC Exact Duplicate Controls Are **Double-Money-Back** Guaranteed

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

Set manufacturers' electrical specifications are closely followed.

Resistance values are carefully selected to match.

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

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

## INTERNATIONAL RESISTANCE CO.

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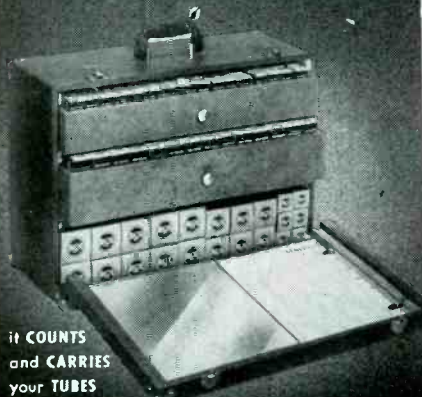
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**THE ORIGINAL**

Television  
tube caddy

TRADE MARK



it COUNTS  
and CARRIES  
your TUBES

**CARRIES EASIER**  
**LOOKS NEATER**  
**PAYS FOR ITSELF**

The Customer only knows what she sees. She probably wouldn't know a rectifier from a resistor, and couldn't read a meter. But she can read the writing on a wall—and on her floor when you set your tools down.

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Original	20 x 13 1/2 x 9"	\$13.50*
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DeLuxe	18 x 14 1/2 x 9 1/4"	\$14.95*

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# This man can save you service-time, work and money

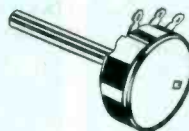
**Y**OUR Centralab Distributor has Custom Controls for 277 major manufacturer's listing in his Centralab Control Guide. Each is cataloged for quick reference so he can fill your orders accurately and systematically.

These controls are factory-specified type equipment on practically all major radio and TV sets on the market today. They're *exact* duplicates of the original part — some even closer tolerance than specified by the original set manufacturer — produced with the same modern, precision equipment and *carrying the same Centralab guarantee.*

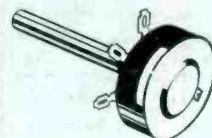
To give you an idea of the wide usage, these 277 major manufacturers use these same controls in 50,552 different applications. That's a mighty strong tribute to the performance of Centralab controls!

Remember, when you use genuine Centralab replacements, you have assurance of a lasting repair job. Because they are custom-designed, you work faster . . . make a cleaner installation . . . insure greater customer satisfaction. That's why it's a good idea to see your Centralab Distributor *first* for genuine control replacements.

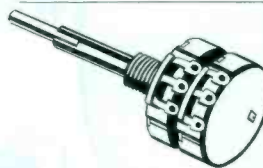
## HERE ARE JUST 4 EXAMPLES OF THE WIDE USAGE OF CENTRALAB CONTROLS



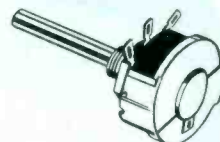
**SVS-926** — Focus Control — used as original equipment by 6 manufacturers in 120 applications.



**S-119** — Volume Control — installed as original equipment on sets of 5 manufacturers in 12 applications.



**SBB-505** — Vertical and Horizontal Hold Control — included as original equipment in 38 applications by 4 manufacturers.



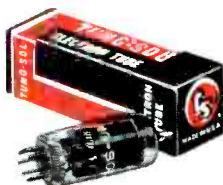
**F-122** — Volume Control — 6 manufacturers use this control as original equipment in 9 applications.

# Centralab

A Division of Globe-Union Inc. 908H E. Keefe Ave., Milwaukee 1, Wis. In Canada, 635 Queen Street East, Toronto, Ontario



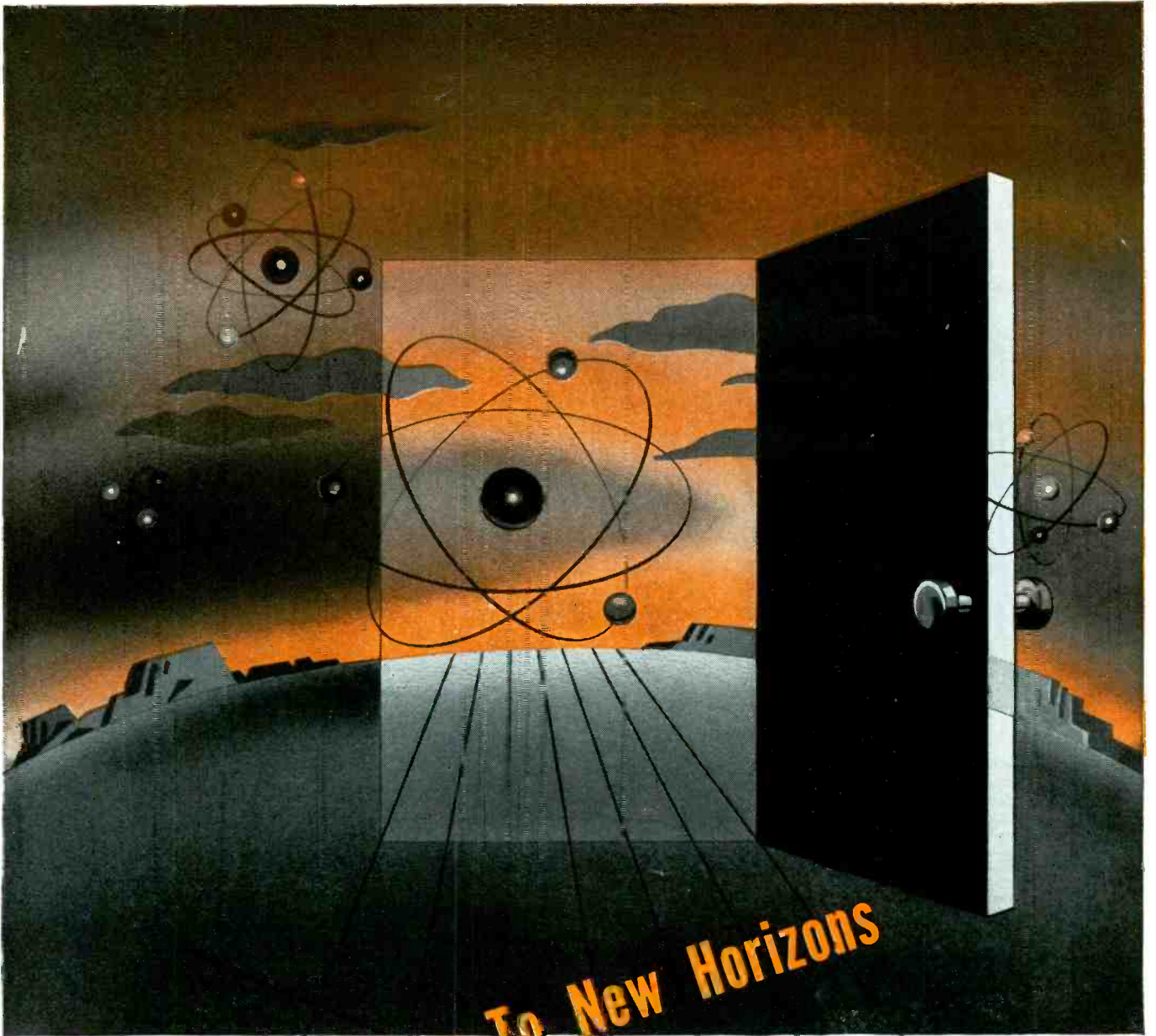
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produce  
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You've known Les Wildberg, key man in the field of electronics for 30 years . . . you've sold his products — *profitably* . . . and, you know he knows your problems.

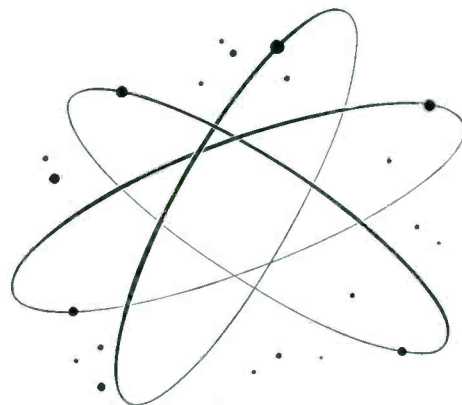
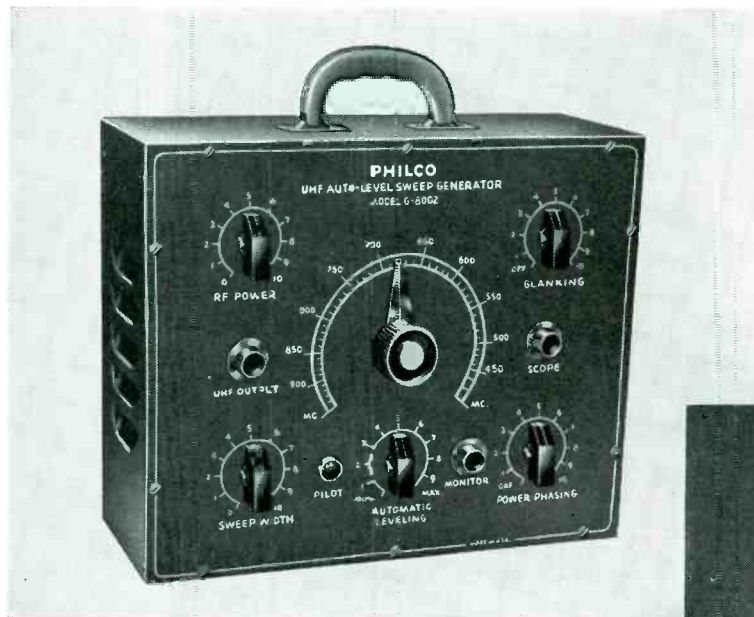
Watch for his important announcement of a new, unique, greatly improved antenna rotator next month — a rotator which he personally guarantees will be first in demand, regardless of market conditions.

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CLEVELAND, OHIO



LEADING THE WAY TO BETTER PRODUCTS

# Specifically DESIGNED FOR



## PHILCO Test Equipment

UHF Auto-Level Sweep Generator

**Model G-8002.** The newest, most modern, most inexpensive UHF sweep generator on the market. Checks sweep alignment with *any* test oscilloscope. Its output is controllable... makes possible overall trouble shooting and testing of low level units such as UHF tuners, boosters, converters, etc.



Field Strength Meter

**Model M-8104.** More features than any other unit at this popular price. Reads signal strength directly from the dial from 10 to 100,000 microvolts. A serviceman's time saver to measure actual TV picture signal strength.

**NOW YOURS  
ON NEW  
EASY PAYMENT  
PLAN**



3-inch TV Oscilloscope

**Model S-8200.** The most practical portable unit available for bench or field servicing. Preset horizontal and vertical sweep rates take the guesswork out of trouble shooting. Ideal for television because of its high sensitivity and wide response.



Cathode Ray Tube Checker

**Model 7053.** Tests *all* picture tubes used in home TV receivers. Special cathode-ray tubes are easily checked by using plug-in adapters. Eliminates trouble shooting guesswork. Neon lamp indicates shorts and open elements in the electrodes of the gun.



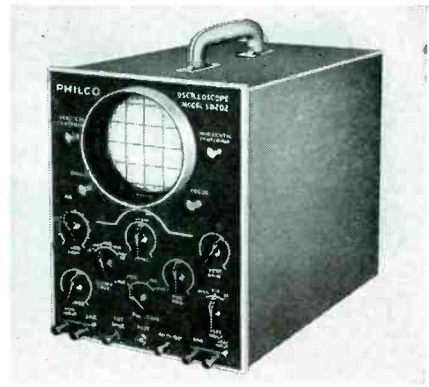
Dynamic Signal Tracer

**Model 7031.** An extremely versatile instrument... this unit is designed for fast diagnosis of radio trouble by audibly monitoring RF and AF circuits. Can be used to accurately check P. A. systems, microphones and phonograph pick-up circuits.



# THE SERVICEMAN

The Philco test equipment line is new! New circuits, new styling, new ruggedness, new versatility, new accuracy! Each piece of equipment is precision-built and now brings new features specifically designed *with your needs and your problems in mind!* Look over the individual instruments shown on these pages, and then mail the coupon below or get in touch with your Philco distributor to find out how easy it is to own a complete Philco Test Equipment Service Laboratory.



5-inch High Gain Oscilloscope

**Model S-8202.** This outstanding scope is built to the highest standards of test instruments... It features the highest gain 10 millivolts/inch, and widest frequency range at its popular price. Wide sweep ranges allow flexibility in sweep circuit trouble shooting.



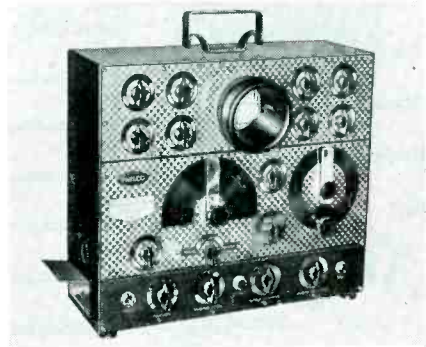
Model M-8100



Model M-8102

**Model M-8100.** The rugged PHILCO CIRCUIT MASTER is one of the finest vacuum tube voltmeters ever designed. With its companion unit the famous...

**Model M-8102.** PHILCO CIRCUIT TESTER you have a combination engineered to meet the most rigid specifications for reliability, durability and accuracy of design.



Visual Alignment Generator

**Model 7008.** Combines in *one* economical instrument functions that can be approached only in a cumbersome collection of costly devices. No special scope connections are required for the most accurate visual alignment that is possible to achieve.



Mutual Conductance Tube Checker

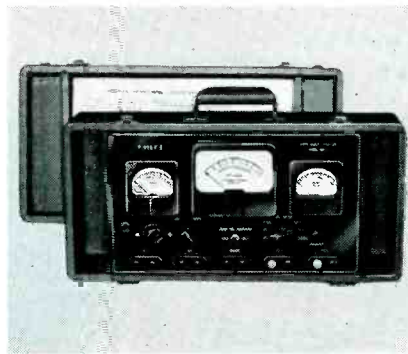
**Model 7052.** Tests more different type tubes than any unit on the market, from subminiature to acorn low power transmitting tubes... Forecasts tube life... employs roll chart instead of cards... for use as a portable or counter top unit.

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**Model G-8000.** The most economical system yet designed to produce UHF signals for TV receiver tests. Through a conversion process this unit produces from an input VHF signal, UHF signals having the same characteristics as the VHF signal.



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**Model 5007.** The ultimate in versatility. A one package, all purpose, portable appliance service unit. Permits over-all analysis of refrigerators, ranges, air conditioners and household appliances. With "pick-up" elements to determine temperature.

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Accessory Division  
Allegheny Ave. & "A" St.  
Philadelphia 34, Pa.

I am interested in the Philco Test Equipment shown here. Please send me details of your SPECIAL PURCHASE PLAN for obtaining these units.

Please send FREE copy of your new booklet on Philco Test Equipment.

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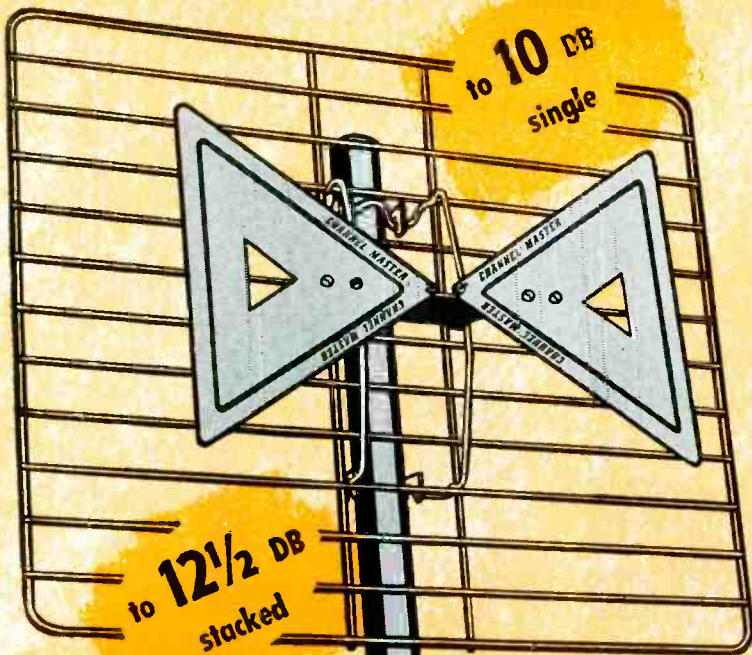


# 3 New Electrical Advances!

## CHANNEL MASTER'S all-new UHF BOW-FLECTOR

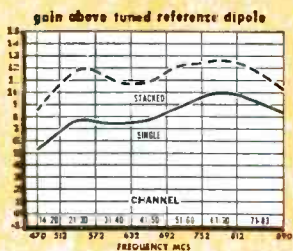
model no. 408

The highest gain Bow and Screen antenna ever developed — single or stacked!

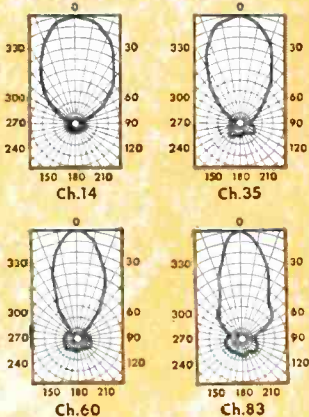


- 1. Enlarged Reflecting Screen.** 53% more reflecting area — higher, flatter gain level.
- 2. Full-Wave Spacing** of stacked antennas. Provides highest stacking gain ever obtained in an antenna of this type.
- 3. 2-Stage Stacking Transformers** for broad-band impedance match. Delivers high stacking gain over entire UHF band.

### Terrific gain!



### Horizontal Polar Patterns (Relative Voltage)



### New Mechanical Features

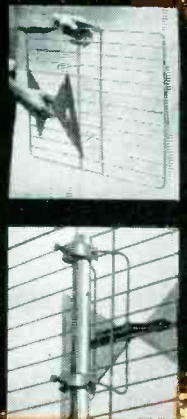
- Deep-embossed "rigidized" aluminum dipoles.
- Snap-in assembly. No U-Bolts.
- High-impact molded insulator.

**PLUS** "Free-Space" terminals that prevent picture dim-out caused by the accumulation of dirt, ice or rainwater between antenna terminals.



### Only 20 seconds to install!

Just snap Bow into Screen. Then fasten entire assembly to mast with Channel Master's exclusive "SPEED-NUTS." The antenna cannot move, twist, flutter, or vibrate! The light-weight Bow Flector is the most rugged, fastest-installing antenna of its type.



One of 5  
Great New  
Channel Master  
Products  
For Fall!

**CHANNEL MASTER CORP.**

ELLENVILLE, N. Y.



Ask your Channel Master distributor for complete technical literature.

# You've never seen a mast like it!

## CHANNEL MASTER'S

*all-new*

# STRATO-MATIC TELESCOPING MAST

for antenna installations  
that are

- easier • faster
- safer



### Featuring the Amazing "Third Hand!"

— an automatic, removable locking device that actually acts as your "third hand," holds mast sections up when you let go! The Third Hand converts each guy ring, in turn, into a "safety lock." This permits you to raise sections freely, using only one hand. And . . . sections cannot slide down when you let go.

### Automatic Mast Extension

The Step-Up Key, inserted through the bottom of the mast tubing, automatically extends each mast section 6 inches. Mast sections are kept partially extended even after mast is placed in vertical position — without using hardware or locking bolts!

### World's Finest Mast Protection!

15-Gauge Mastng  
HOT-DIP  
GALVANIZED

Most permanent type of mast corrosion protection available today. Sections are immersed in cauldron of molten zinc, until a thick layer of pure zinc is fused to inner and outer surfaces — so thick it actually adds to the weight of the mast; gives long-term protection!

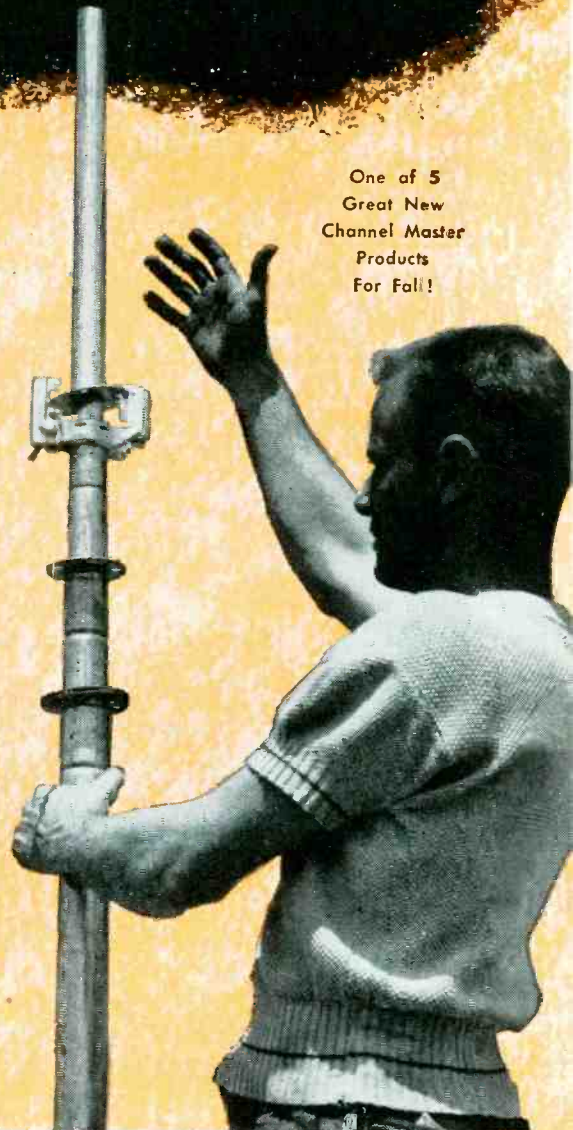
ZINC IS  
SELF-HEALING!

When the protective zinc coating is scratched or broken, the surrounding zinc actually goes to work to "heal" the wound. Thus, the base metal is automatically protected against damage due to installation or handling. The only coating with this ability.

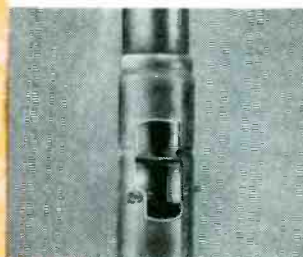
18-Gauge Mastng  
HEAVY ZINC  
ELECTRO-PLATING

Heavy layer of bright zinc, exceeding Army-Navy specifications, provides effective long-lasting protection against elements. A chromate dip adds brightness, increases corrosion resistance. The strongest, most durable protection jacket of its type.

One of 5  
Great New  
Channel Master  
Products  
For Fall!

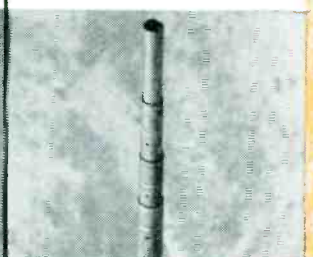


Inter-Locked Sections



Safety Rings prevent sections from pulling out of each other. Notches in sections engage bolts — no twisting.

No Hidden Holes



Step-Up Key automatically extends mast sections high enough to provide easy access to bolt holes. You don't have to pull up next section to insert bolt!

Model No.		Sections	Lengths	Weights	
15-Gauge	18-Gauge			16-Gauge	14-Gauge
1620	1823	A, E	20'	16 lb.	13 lb.
1630	1830	A, I, C	30'	26 lb.	22 lb.
1640	1840	A, I, C, E	40'	38 lb.	33 lb.
1650	1853	A, E, C, I, E	50'	52 lb.	48 lb.

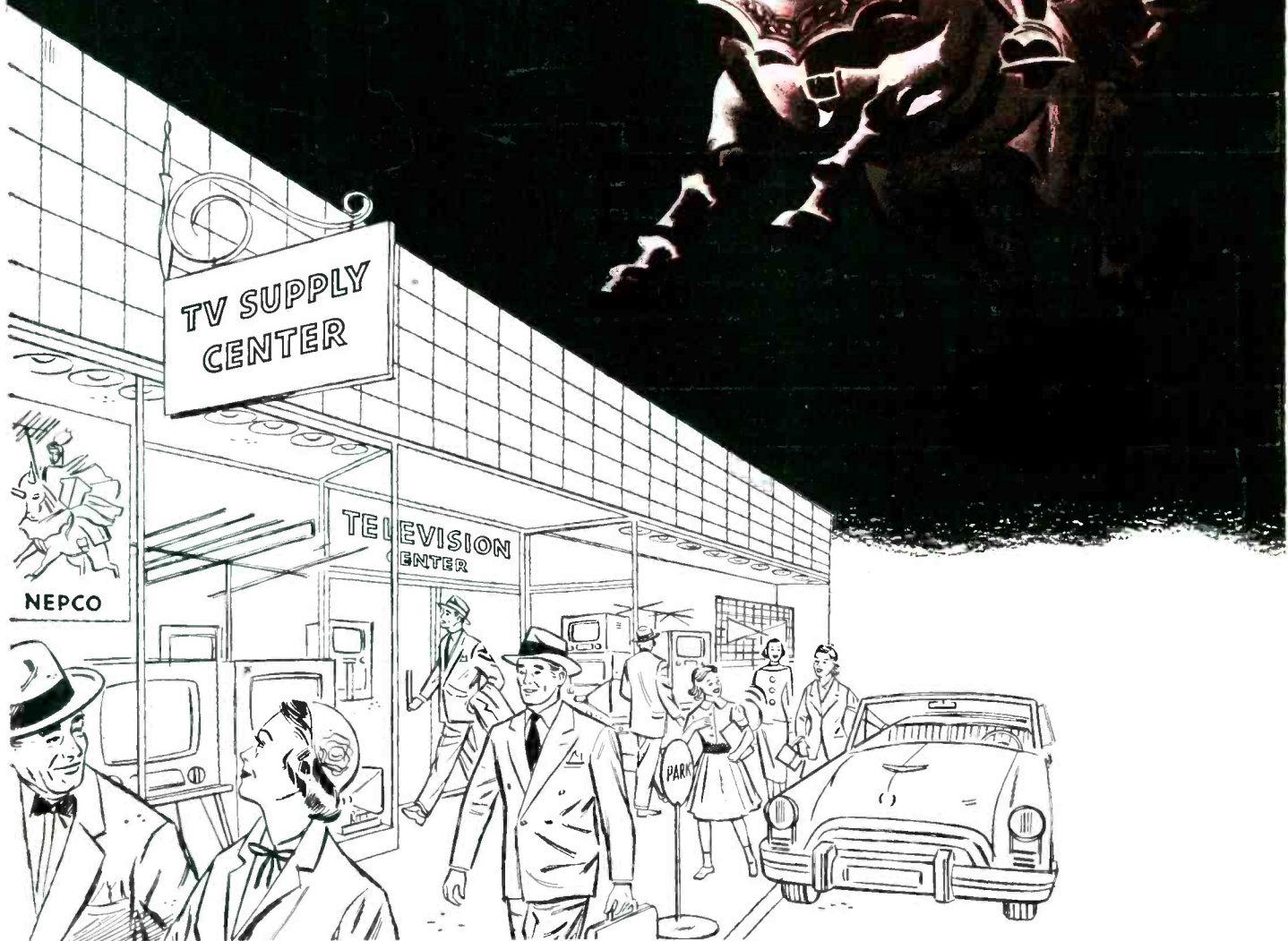
**CHANNEL MASTER CORP.** ELLENVILLE, N. Y.

Ask your Channel Master distributor for complete technical literature.



# Guard your name with

*Assure Yourself a Share of  
the New and Replacement Market*



# the Nepco Line

Your name and reputation depends on your customers' satisfaction. That's why it pays you to take a tip from the growing list of dealer-installers who have turned to the NEPCO LINE to make sure of quality materials that won't let them down. They've learned this complete line of TV Antennas, Mountings and Accessories provides built-in ruggedness . . . meets the test of time and weather and assures them of a reputation for good work.

## You Get EXTRA "Dividends" with the NEPCO Line!

Quality materials with the strength to stay on the job . . .

- All parts heavily zinc-coated plus baked enamel finish.
- Rigid heavy gauge  $\frac{1}{8}$ " steel used in all mounts.
- Two 15' stainless steel chimney bands (ample even for the larger chimneys),  $\frac{3}{16}$ " eye bolts, and four heavy gauge banding clips with patented imbedding screws available with each chimney mount.
- All hardware corrosion-protected in the same complete manner as the mounts.
- Every item in the NEPCO Line is engineered, tested and field proved to assure long service on the job.

### Plus features for fast, easy installation and handling

- Unique adjustable mast clamp with one bolt mounting.
- Exclusive antenna mast clamp with positive alignment in all planes.
- Slotted hex-head bolts for screw driver or wrench installation.
- Versatile mounts that accommodate all types of installations.
- A line designed with your handling problems in mind . . . strong compact boxes easy to move and stack.
- Large easy-to-read illustrated package labels.

DEMAND THE **NEPCO** LINE

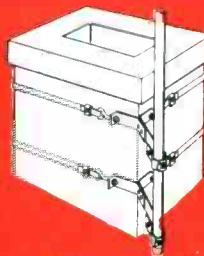
THE COMPLETE LINE FOR FAST, PERMANENT INSTALLATIONS

Write for the Name of Your Nearest Jobber Today  
Catalog on request.

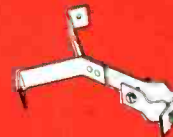
# National Electric Products

RADIO & TELEVISION DEPARTMENT, PITTSBURGH, PA.

## CHIMNEY MOUNTS

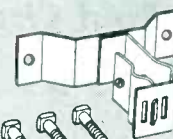
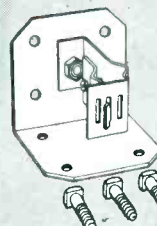


New "Y" Type Chimney Mount for extra rigidity using  $\frac{3}{16}$ " eyebolts, extra heavy banding clips.



Complete with installation hardware and two 15' coils of stainless steel banding.

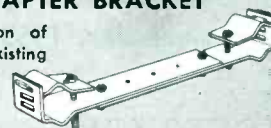
## DORMER MOUNT



Used with 4" wall bracket for mounting masting to homes with dormer where other roof type installations would be hazardous. Furnished with 6 lag screws.

## MAST ADAPTER BRACKET

For quick installation of UHF antennas on existing mast. Two to a unit.



## WALL BRACKETS



Allows 4" clearance.

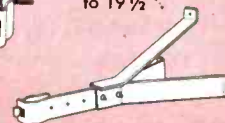


Allows 6" clearance.

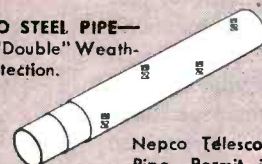


Adjustable clearance of 9" to 13 1/2".

Adjustment range 12" to 19 1/2".

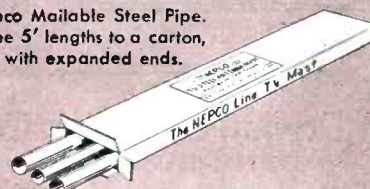


NEPCO STEEL PIPE—  
With "Double" Weather Protection.



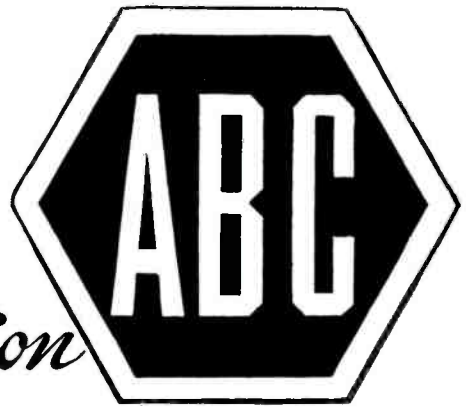
Nepco Telescoping Steel Pipe. Permit installations up to 40'.

Nepco Mailable Steel Pipe.  
Three 5' lengths to a carton,  
two with expanded ends.



# Before Any Other Consideration

## *Integrity of Circulation*



**JUNE 1953**

**ABC Net Paid Circulation**

**42,789**

An increase of over  
3000 NET PAID  
since Jan. 1953



**22nd year  
of SERVICE  
to the service  
industry**

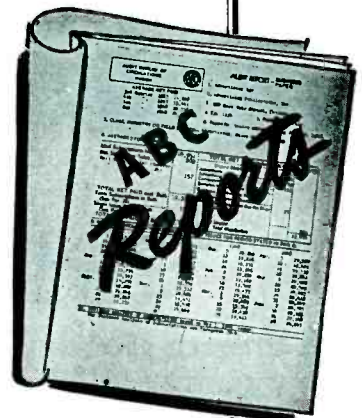
SERVICE is a member of the Audit Bureau of Circulations because we want our advertisers to know what they get for their money when they advertise in SERVICE. Our A. B. C. report gives the facts. Ask for a copy and study it.

### **SOME OF THE AUDITED INFORMATION IN A. B. C. BUSINESS PAPER REPORTS**

#### **SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE**

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate a reader audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

- How much paid circulation.
- How much unpaid circulation.
- Prices paid by subscribers.
- How the circulation was obtained.
- Whether or not premiums were used as circulation inducements.
- Where the circulation goes.
- A breakdown of subscribers by occupation or business.
- How many subscribers renewed.
- How many are in arrears.



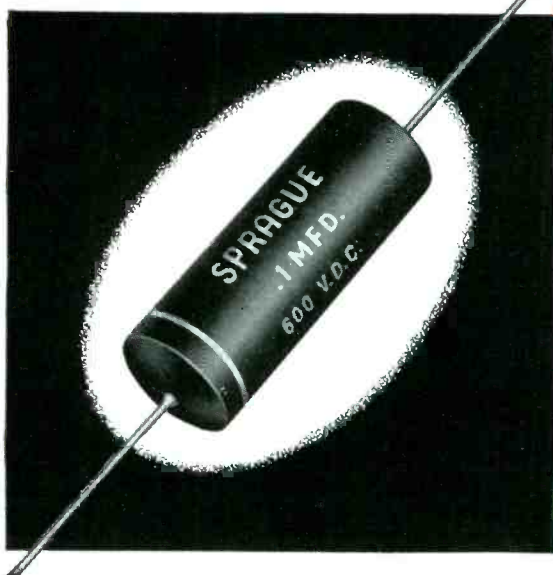
**Bryan Davis Publishing Co., Inc. — 52 Vanderbilt Ave. — N. Y. 17, N. Y.**  
333 N. Michigan Ave., Chicago 1, Ill.      2253 Delaware Dr., Cleveland 6, O.  
1052 W. 6th St., Los Angeles 14, Calif.

**BLACK  
BEAUTY<sup>®</sup>**

**dry-assembly  
phenolic-molded**

# TV TUBULARS

**The Standard By Which Others Are Judged**



**ACCEPT NO SUBSTITUTES**

There is a Sprague Distributor in every sales area in the United States. Write for the name of your nearest source of supply today.

**L**OOK at the critical points in any TV set. That's where you'll find Sprague Black Beauty Telecaps. Over 250 million of these molded tubular capacitors have been made since 1947 and demands are still increasing . . . thanks to their unprecedented failure-free record.

Sprague's unique patented design and "dry assembly" processing make these *the first* tubulars made just like more expensive metal-encased oil capacitors. Every Black Beauty Telecap from 200 to 12,500 volts is molded *dry* in non-flammable phenolic. After molding it is impregnated thru an eyelet under high vacuum; the lead is then inserted and the capacitor solder sealed.

Don't be vague—insist on Sprague Black Beauty Telecaps for your TV and radio service needs! You can depend on *extra high insulation resistance; minimum capacitance change with temperature variations; and absence of drift with repeated heating and cooling.* Avoid being misled—there are no others just-as-good!

Write today for complete Sprague television and radio service catalog C-609 to . . .

**SPRAGUE PRODUCTS COMPANY**

*(Distributors' Division of the Sprague Electric Co.)*

61 Marshall Street • North Adams, Mass.

**DON'T BE VAGUE . . .**

**ASK FOR**

# SPRAGUE

**WORLD'S LARGEST CAPACITOR MANUFACTURER**

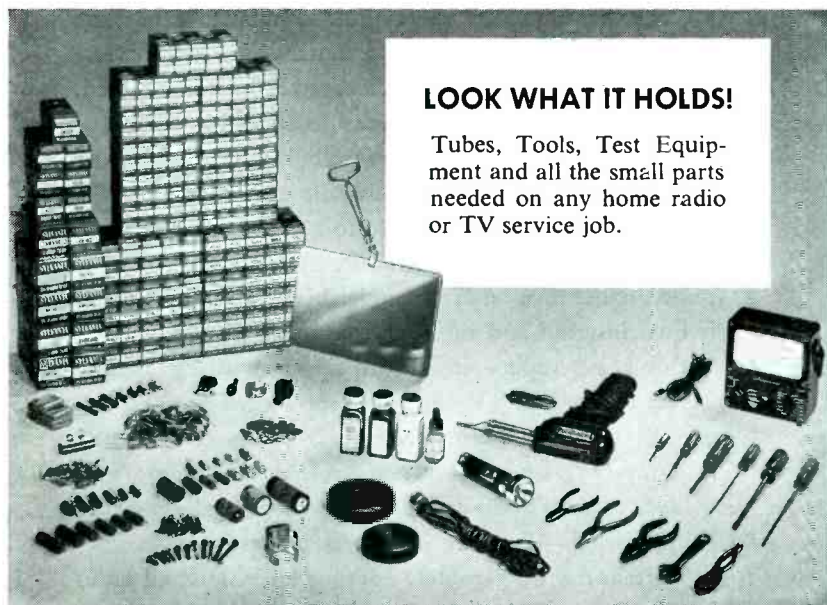


**Servicemen! Here's Your Sylvania**

# T-N-T CHEST

**(TUBE AND TOOL)**

*The Most Valuable Service Aid You've Ever Seen!*



**LOOK WHAT IT HOLDS!**

Tubes, Tools, Test Equipment and all the small parts needed on any home radio or TV service job.

Talk about a useful servicing aid . . . this Sylvania T-N-T (Tube and Tool) Chest is really it! Carries more tubes, tools and parts than any chest on the market!

**LOOK AT THESE FEATURES:**

- Bass and fir plywood case
- Waterproof Du Pont Fabrikoid cover
- Holds 187 receiving tubes
- Lightweight folding aluminum tool and parts tray
- Unbreakable plastic handle
- Brass-plated hardware
- Room for mirror and ohmmeter
- It's a complete, portable service shop!

**ACT NOW . . . Offer Limited!**

This chest is now yours for only \$5.00 and 30 Sylvania Premium Tokens. Offer good only between August 1st and November 15th. See your Sylvania Distributor who has these kits now.

# SYLVANIA

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

**LIGHTING • RADIO • ELECTRONICS • TELEVISION**

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

*Remember, you get 1 Sylvania Premium Token with every 25 receiving tubes or with every picture tube you buy.*

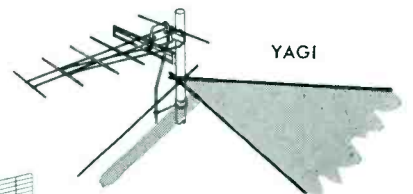
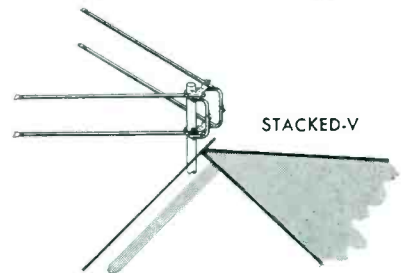
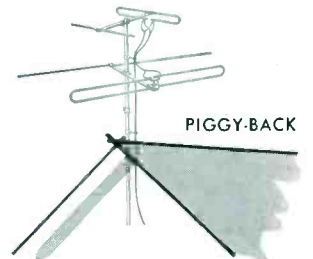
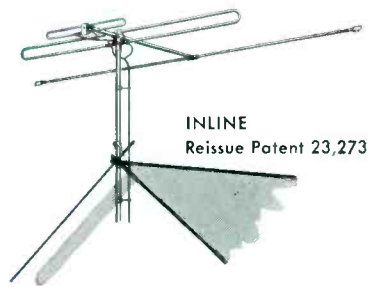
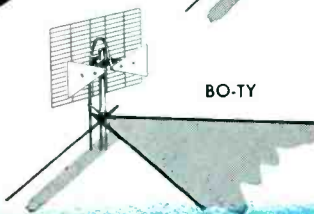
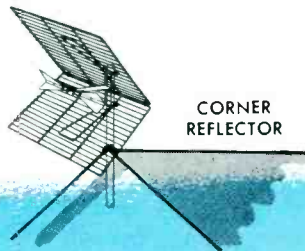
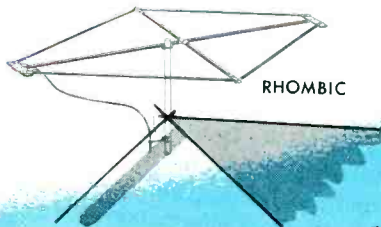


# an Amphenol antenna on the roof means a satisfied customer for you!

What is the reason that AMPHENOL antennas are not only maintaining but increasing their front position as the finest antennas ever offered? The answer, of course, is that the name AMPHENOL has become synonymous with quality—to more and more dealers and servicemen. They know, first, that *antenna quality is measured in performance* and that the performance of AMPHENOL antennas is outstanding. Dealers in cities where there have been severe ice storms or high winds feel proud that the AMPHENOL antennas they have installed are still standing when other antennas have collapsed. They like, also, to hear the satisfied comments of customers about the fine picture quality they are getting on their TV sets—and dealers know how much that picture depends on the AMPHENOL antenna.

Important to dealers, and further proof of performance, are published antenna measurements. Making all such measurements in accordance with current RTMA standards, AMPHENOL provides accurate information that can be relied on. Dealers realize they can read the db gain of an AMPHENOL antenna and believe it.

**AMPHENOL**



**IT PAYS TO BUY QUALITY**

## See the new UHF-VHF Antenna Film



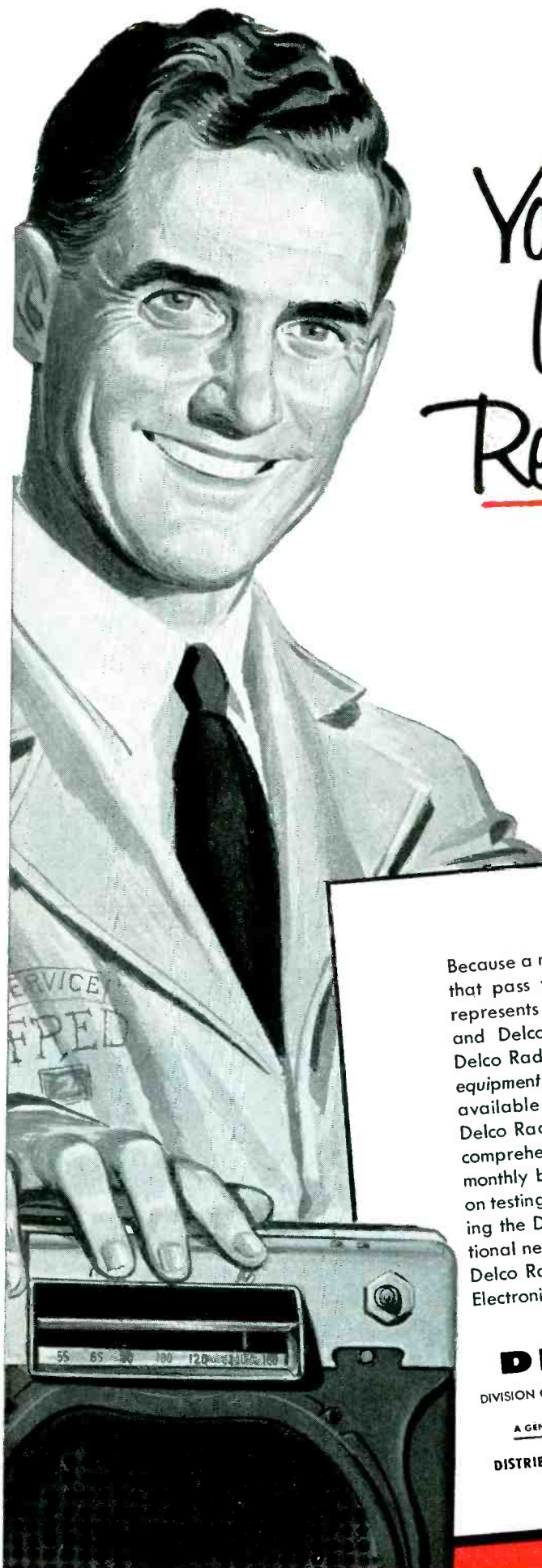
AMPHENOL has prepared an attractive new folder with Kodachrome illustrations from the new AMPHENOL film "The UHF-VHF Television Antenna Story". Besides giving a short version of the important facts in the film, it also encloses AMPHENOL antenna and accessories catalog sheets—and is designed to hold new sheets as they are issued. Write AMPHENOL today for your copy of "The TV Antenna Folio".



## See this complete antenna folder

The new AMPHENOL film "The UHF-VHF Television Antenna Story" is now available for you to see by just contacting your distributor. Done in slide-film and full color, it gives helpful information on UHF and VHF television. It discusses, fully and frankly, antenna characteristics for the different frequencies—shows gain charts and radiation patterns. Be sure and see "The UHF-VHF Television Antenna Story".

see your **AMPHENOL** dealer...



# You can build a better Auto Radio Repair Business!

Because a majority of the radio-equipped cars and trucks that pass your door have Delco radios, their servicing represents a great business-building opportunity . . . and Delco Radio's service program offers real help! Delco Radio alone is the source for Delco Radio original equipment and universal replacement parts—readily available through United Motors Electronics Distributors. Delco Radio alone can supply you with its complete and comprehensive Service Manual and its "Testing Tips," a monthly bulletin giving you the latest factory information on testing and repairing Delco radios—including the Delco models equipped with the sensational new Signal-Seeking Tuner! To get on the Delco Radio team contact your United Motors Electronics Distributor today!

## **DELCO RADIO**

DIVISION OF GENERAL MOTORS CORPORATION, KOKOMO, INDIANA

A GENERAL MOTORS PRODUCT   A UNITED MOTORS LINE

DISTRIBUTED BY ELECTRONICS WHOLESALERS EVERYWHERE



# TRIO

## AMERICA'S MOST DEPENDABLE TV ROTATOR



**FACTORY TESTED** to equivalent of three months normal use before shipment.

**TEMPERATURE PROOF.** Operates perfectly at  $-50^{\circ}$ , even under heavy icing conditions.

**FOOLPROOF.** Stops itself at ends of rotation. NO burned out motors: NO broken feedlines.

**IMPROVED BRAKE.** NO coasting; NO drifting.

**TWO MOTORS.** Separate motor for each direction of rotation.

**SMART—EASY TO USE** Control unit. Indicates direction without turning rotator.

**TWO YEAR GUARANTEE** instead of the usual one.

*\*Write for literature.*



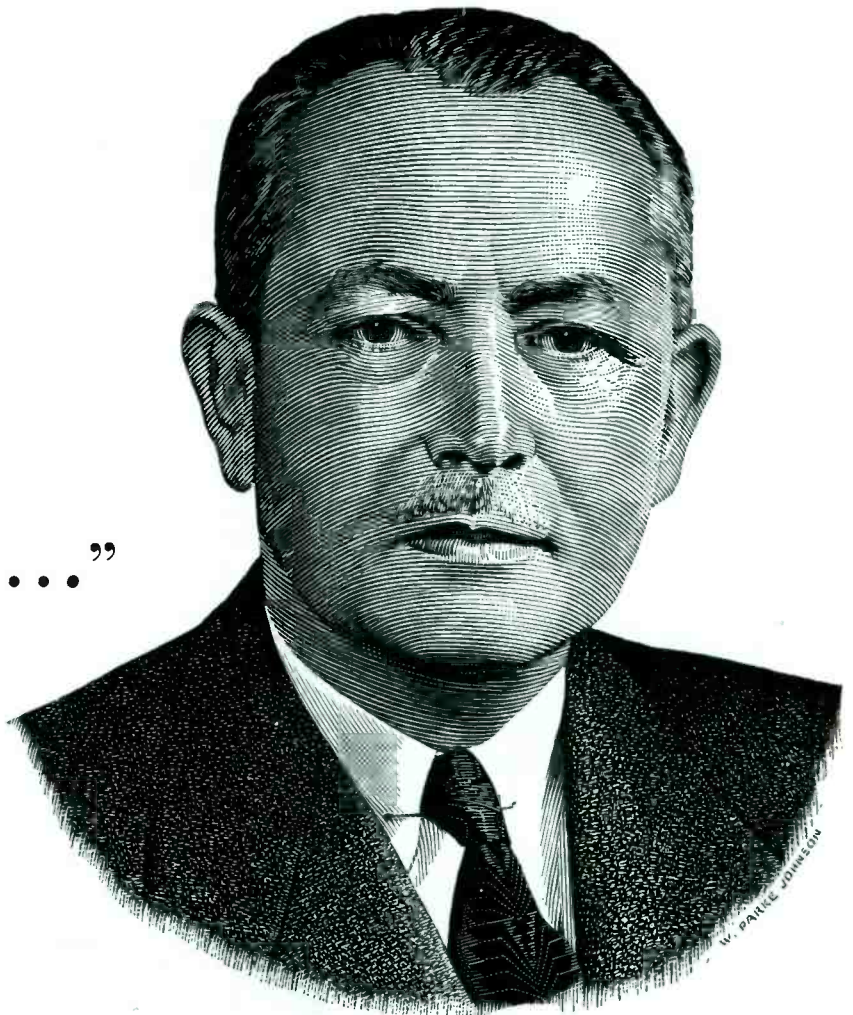
**TRIO** Manufacturing Co.

GREGGVILLE, ILLINOIS

*“... opportunity  
is freely given...”*

**PAUL M. HAHN**

President, The American Tobacco Co.



*“Our nation has grown great largely because opportunity is freely given. Only very few people actually make their own ‘breaks.’ Today, millions of Americans are providing for their personal financial security and at the same time helping in the building of our national defenses. The opportunity to do so is given by business management which affords employees the means of practicing systematic thrift through the Payroll Savings Plan for the purchase of U. S. Defense Bonds.”*

Nearly seven million employees of industry are “providing for their personal security and at the same time helping in the building of our national defenses.”

- they are the men and women who availed themselves of the opportunity referred to by Mr. Hahn—the opportunity to enroll in the Payroll Savings Plan for the systematic purchase of U.S. Defense Bonds.
- they represent a high percentage of their companies’ employees—in plant after plant, the averages are climbing to 60%, 70%, 80%—even higher.
- their investment in Defense Bonds—and America—add up to \$140 million per month.
- they constitute a large block of the men and women who on December 31, 1951, held Series E Bonds

amounting to \$34,727,000,000—\$4.8 billions more than the cash value of Series E’s outstanding in August, 1945.

Not far from you is a State Director of the Savings Bond Division. He will be glad to tell you how easy it is to give your employees a Payroll Savings Plan. Or, if you already offer the Plan to your people, he will show you how to conduct a simple person-to-person canvass of your plant—a canvass intended to do only one thing—to put a Payroll Savings Application Blank in the hands of every man and woman on your payroll. Your employees will do the rest.

Phone or write to Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Building, Washington, D. C.

*The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

**SERVICE**



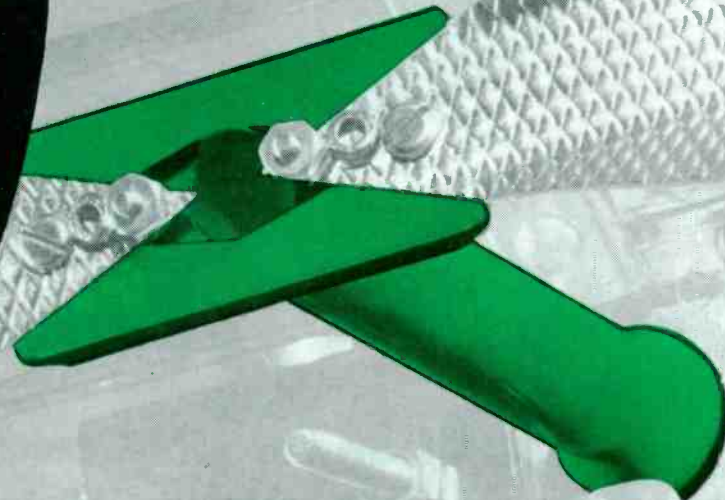
# WALSCO

## HAS THE ONLY UHF ANTENNAS WITH AMAZING

# X-77

## INSULATOR

Hollow, unbreakable X-77  
Insulator used exclusively on  
Walsco Corner Reflector and  
Reflecto-Fan.

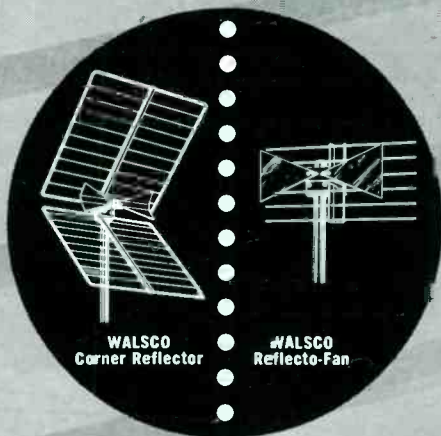


X-77 insulator makes Walsco the most efficient, all-band UHF antennas in America. Nothing compares with it!

X-77 is hollow, allowing lead-in wire to pass through the center. Wire is kept completely out of field pattern. It eliminates broken wires caused by strain of wire on antenna terminals.

X-77 can't break . . . ever! It's 5 times stronger than polystyrene. Silicone treated to shed dust and moisture . . . not affected by extreme heat, cold or wind.

X-77 is non-hygroscopic. Outstanding insulating qualities will last indefinitely.



Largest in demand everywhere

	Catalog No.	Description	Avg. Gain (db)	List Price
Reflecto-Fan	4400	Single Bay	7.0	\$ 6.75
	*4402	Dual Stack	11.0	14.25
	*4404	4 Bay Stack	14.5	35.00
Corner Reflector	4450	Single Bay	11.2	14.50
	*4452	Dual Stack	16.4	32.00

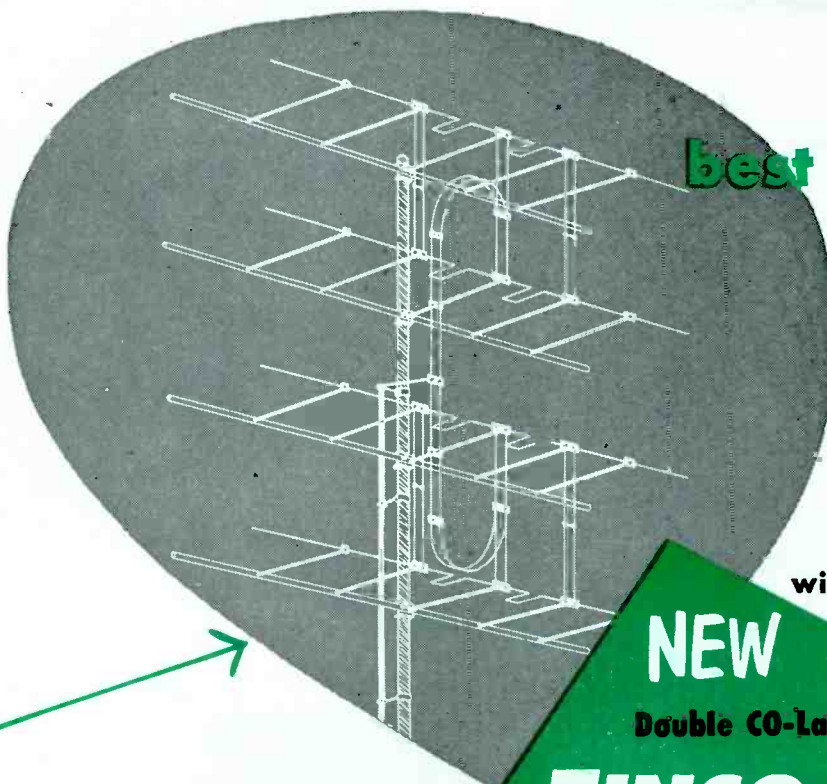
### WALSCO

Walter L. Schott Co.

Los Angeles 18, Calif.  
Chicago 6, Ill.

\* Supplied with complete stacking kit.  
Mast not included in prices.

Overseas Representative: Ad Auriema, Inc., 89 Broad St., New York 4, N.Y.



**best possible**

**Fringe area  
installation**

with the remarkable

**NEW**

Double CO-Lateral

**FINCO 400-A**

**ALL Channel UHF and VHF Antenna  
for excellent reception 120 to 150 Miles from stations**

**32 Driven Elements**

Here is one truly great antenna for the fringe area market — an antenna that can give YOUR installations recognition in the community. The new 400-A was tested all over the country under all types of conditions. Reception was the finest — we can prove this! The traditionally superb Finco engineering is evident in the performance and symmetrical design. One antenna — one transmission line. All-aluminum construction — rugged, lightweight, completely pre-assembled. Total weight only 8 lbs.

*Fringe area TV buyers demand Quality installations... **FINCO** is Quality!*

Fringe area buyers more and more ask for the FINCO by name. Let them know you handle the best—advertise the low cost way with Finco co-op ad mats—tie-in with LIFE—watch your sales soar! Get the complete story from your jobber or write direct.

TO PUT THE **FINCO** NAME BEFORE  
YOUR CUSTOMERS WE ARE ADVERTISING IN . . .

**LIFE**

**RADIO**

**TELEVISION**

**LOCAL NEWSPAPERS**

**FARM MAGAZINES**

**Tie-In With This Program**

The Finney Co  
Dept. S-15  
4612 St. Clair Ave.  
Cleveland 3, Ohio

**RUSH**

- Information on the new 400-A and UHF Conversion Kit No. 12
- FREE LIFE merchandising display material.
- Co-op newspaper ad mat brochure.

NAME .....

COMPANY NAME .....

ADDRESS .....

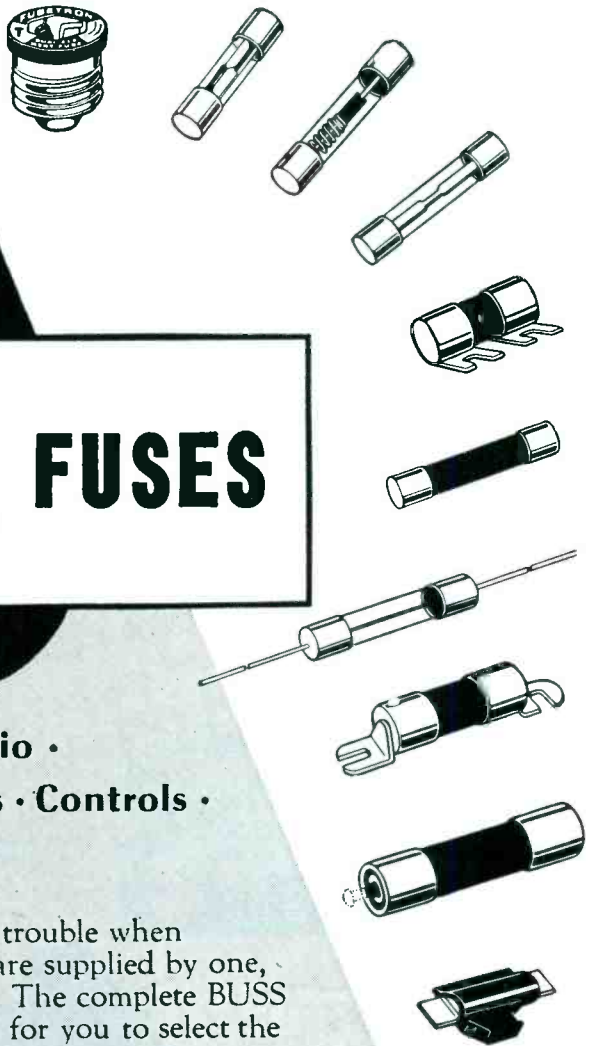
CITY ..... ZONE ..... STATE .....

**the  
FINNEY  
COMPANY**

Dept. S-18 • 4612 St. Clair Ave. • Cleveland 3, Ohio

**YOU'LL FIND THE  
RIGHT FUSE, FASTER  
in the Complete Line  
of Electronically  
Tested**

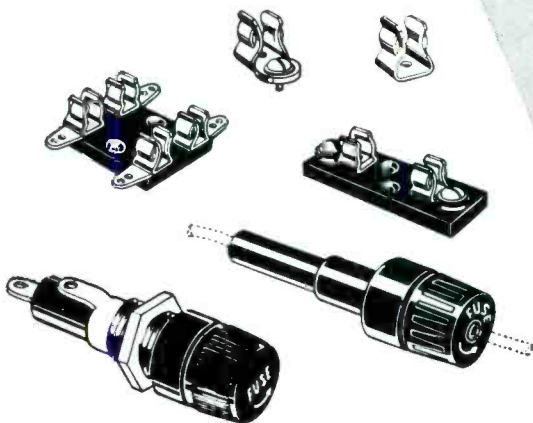
# BUSS FUSES



**for Television • Radio •  
Radar • Instruments • Controls •  
Avionics . . . .**

You'll save time and trouble when all your fuse needs are supplied by one, dependable source. The complete BUSS line makes it easy for you to select the fuse to do the job right.

*Plus*  
**A COMPLETE LINE OF FUSE CLIPS,  
BLOCKS AND HOLDERS**



The makers of BUSS fuses insist on perfection. Every fuse is electronically tested in a sensitive device that rejects any fuse not properly calibrated, properly constructed and right in all physical dimensions.

Take advantage of the profit-saving efficiency that you can gain by standardizing on the complete line of BUSS fuses.

**MAIL THIS COUPON TODAY . . .**

IT'S GOOD BUSINESS to stock and use BUSS fuses. Your customers know the name BUSS . . . famous for protection in homes, on farms and in industry for 39 years. When you use BUSS, they know you've used the finest fuses available.

**BUSSMANN Mfg. CO.,** Division of McGraw Electric Co.  
University at Jefferson, St. Louis 7, Missouri

BUSSMANN Mfg. Co. (Division of McGraw Electric Co.)  
University at Jefferson, St. Louis 7, Mo.

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

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

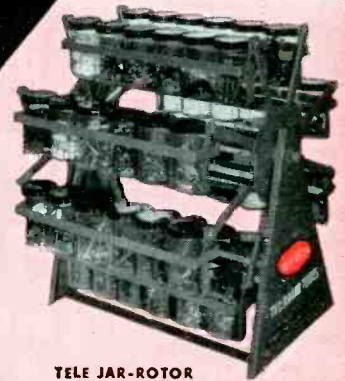
Address \_\_\_\_\_

City & Zone \_\_\_\_\_ State \_\_\_\_\_ S-853

To help you boost your sales  
and make more money



makes these  
**SALES AND SHOP AIDS**  
available to you



**TELE JAR-ROTOR**  
A perfect small parts storage unit. Only 17" x 15" x 13". Has 48 transparent plastic jars.



**ILLUMINATED OUTDOOR SIGN**  
Double sided, formed plastic sign. 36" x 24" UL approved.



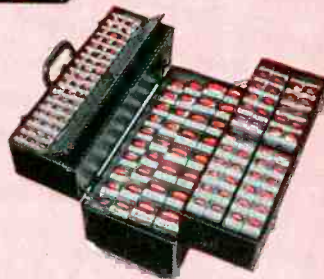
**THREE DIMENSIONAL PLASTIC ILLUMINATED SIGN**  
A colorful "3-D" flasher illuminated formed plastic beauty.



**DISPLAYS**  
Six color displays that sell your service.



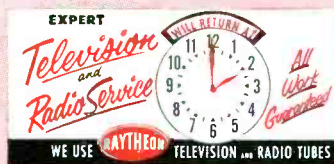
**REFLECTORIZED OUTDOOR METAL SIGN**  
Two sided metal sign to catch the eye of passers-by.



**TUBE AND TOOL CARRYING CASE**  
Holds 137 tubes — plus all regular tools.



**TRANSPARENT PLASTIC WINDOW STREAMER**



**PLASTIC "WILL RETURN" DIAL SIGN**



**SHOP JACKETS AND COATS**  
Full length or jacket style.

**ILLUMINATED TEST PATTERN CLOCK**  
A Telechron Motored beauty.



Write  
for  
**FREE  
BOOKLET!**



Pictured are only a few of the many useful shop aids and sales promotion items that Raytheon has made available to you. There are many others — job tags and record cards, imprinted stationery, post cards, ad mats, shipping labels, decals, paper bags, giant outdoor thermometers, etc. — all designed with your needs in mind. Many items are free, the rest available at very low cost. Ask your Raytheon Tube Distributor about them or write for free Booklet. Address your request to Department D, Raytheon Manufacturing Company, Receiving Tube Division, 55 Chapel Street, Newton 58, Mass.



*Excellence in Electronics*

**RAYTHEON MANUFACTURING COMPANY**

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

RAYTHEON MAKES ALL THESE:  
RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

Ask Your RAYTHEON TUBE DISTRIBUTOR About RAYTHEON'S \$10,000.00 TRANSISTOR CONTEST. It's Not Too Late to Enter!



RADIO • TELEVISION • ELECTRONIC  
**SERVICE**

### Telecasters Pitch In

OFTEN, during the early AM days when reception problems were frequent and stations found their audience shrinking, broadcasters discovered that the Service Man was their salvation. For, usually, the dip in listener interest stemmed from drifting out-of-line chassis, plus corroded, battered antennas that were, in many instances, simply cut off from the receiver.

Through newspaper advertisements and direct mail, the transmitter operators urged setowners to have their receivers inspected and serviced to insure reception of all stations. And, to arouse consumers further, Service Men were invited to appear in special air clinics to discuss both problems that might affect reception and steps that should be taken to curb the difficulties—through preventive maintenance and service. The effort proved fruitful to all: Service Men were called in to spruce up antennas, realign chassis and make other pertinent repairs that would assure better pickup. Stations found their audience ratings jump, and listeners were delighted with their rejuvenated receivers.

As receiver design improved, and the need for antennas disappeared, interest in these cooperative campaigns drooped. The advent of FM rekindled interest, for once again broadcasters realized that only through properly installed and serviced receivers could they have any assurance of a real audience. In many areas, vigorous programs were initiated, and at this moment, they are still in force.

The arrival of TV spiraled enthusiasm in the broadcast-service alliance idea. Station after station began working closely with associations and Service Men, crusading for better installation and service. Stressed was the urgent need for a good antenna, that was not only properly put up, but maintained and checked up regularly. Today, telecasters and Service Men are more active than ever in concerted drives to alert consumers on the importance of planned servicing.

The T-S theme has become particularly keen in *uhf* areas. In one city in Pennsylvania, a new ultra-high station, in collaboration with a service association, has scheduled daily

15-minute programs devoted entirely to a review of not only *uhf* conversion and installation, but general TV problems. Featured speakers on most of these programs are Service Men who specialize in TV. The program is complemented once a week by a special half-hour guest-speaker setup devoted to a particularly important subject. To illustrate, the antenna was the star of one program. In a graphic report, the guest speaker described how aging antenna installations could affect reception seriously. He noted that constant attacks by dust, grease and smoke particles, plus moisture condensation, all contributed to a slow deterioration of not only the elements in the antenna system, but the contacts at junction points on the rooftop, as well as at the external base of the installation. In describing the efficiency loss of the lead-in, it was estimated that these lines could lose up to 50% of their usefulness because of weather and man-made problems. The provoking troubles caused by rain and foliage, discussed often in these columns, were also described during the program.

During another half-hour feature, the test bench and its import were reviewed. Consumers were told that in many service shops as much as \$10,000 might be spent for equipment to provide adequate test facilities. It was also emphasized that the Service Man must spend a minimum of four years in schooling, studying the basics of radio, TV and electronics, so that he can be fully acquainted with the intricacies of chassis. In addition, it was stressed, Service Men must take refresher courses to keep abreast of the innumerable design and construction changes being made, and they must absorb the constant flow of new data which appears in technical magazines, such as SERVICE, as well as many new books now being published.

Consumer reaction to the programs have been excellent. According to the station prexy, one of the programs prompted mail from over 300 cities, villages and towns. Commenting on this striking acceptance, the station owner declared that consumers are particularly pleased to know that they have a place to turn with their prob-

lems. In addition, the station said that it was anxious to point out how valuable the Service Man really is, and the important job he can do for both station and consumer.

In another TV center, a similar series of *clinicasts* have been initiated, featuring talks by association members. During one broadcast, the involved structure of a receiver was aptly described. It was pointed out that the average TV set has over 300-odd operating capacitors, resistors, coils and transformers, as many as eight front-panel operating controls, over a dozen installation adjustments, and nearly three dozen alignment controls, in addition to more than 100 mechanical parts, and about a 1000-soldered connections for the scores of wires running between parts and tube sockets. It was also stressed that even though the receiver is well housed, it is still subject to many changes in humidity and temperature which can cause expansion and contraction of metals, and other physical and electrical defects. And, it was noted, these problems obtain even though the receiver is not being used. Thus, viewers were told, there is always the danger that something may go wrong, and only a skilled, properly-trained Service Man can effect a repair promptly, to the complete satisfaction of the consumer.

Not only are TVcasters joining hands with associations, in this move to educate consumers, but with specialists and consultants of many manufacturers. On many occasions, special half-hour forum programs on antennas, boosters, converters and allied accessories, have been featured, and with scintillating results.

This coop trend will really hit its stride this fall, many broadcasters have declared, when scores of stations will headline programs featuring informative talks and symposia by Service Men, associations and industry specialists.

Everyone is truly indebted to those who are fostering this strident move to bring better viewing to all.—L. W.

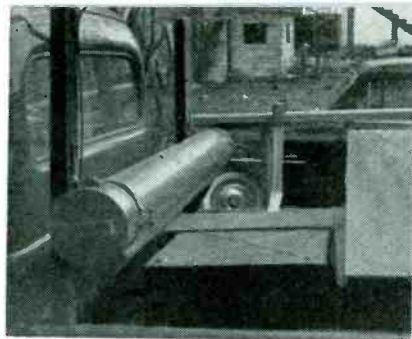


Fig. 1. Single-unit truck FM set mounted on rack across back of pickup truck.

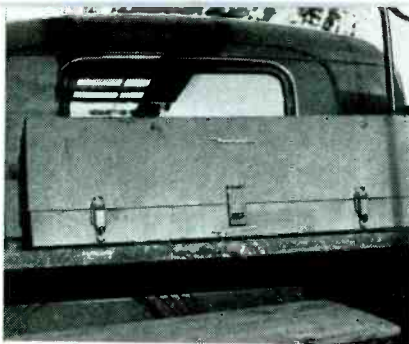


Fig. 2. Truck FM cabinet mounted on rack in pickup truck, to give floor clearance.

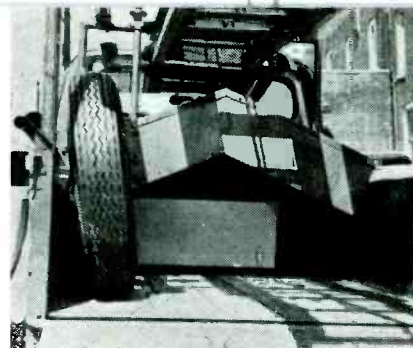


Fig. 3. An FM set mounted under toolbox in a linemen's truck. Toolbox slides toward back on rails to allow access to set.

# 2-Way FM Installation in

## Part I of Series: Positioning of Equipment to Expedite Service and Maintenance . . . Cable Routing Practices

THE EXCESSIVE vibration and trying en-route weather conditions encountered by truck-mounted FM equipment make it necessary to use an installation and servicing approach entirely different than that used for passenger cars. For in trucks chassis must be mounted so that they are vibration and jar-proof, and placed so that they do not interfere with the cargo; chassis also must be weatherproof since trucks must operate in all types of weather. It must also be possible to service the chassis quickly for trucks cannot be idle for too long.

The first problem normally encountered in an installation is the selection of locations for the various units. Practically all truck setups must be made in the body or bed of the vehicle, since there is very little room in the cab for the equipment which is quite bulky. There are exceptions, of course, but in the main most trucks must have the sets mounted in the bed.

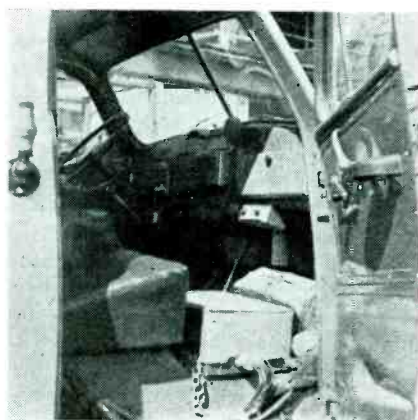
Any one of several locations can be used: A rack across the bed of a pickup (Figs. 1 and 2); beneath the tool cabinets of a lineman's truck (Fig. 3); inside of the cab, for a butane tanker or service truck (Figs. 4 and 5), installed here because these trucks carried only the driver; or under the butane fuel tank on a service-pickup truck (Fig. 6). In the latter installation the unit had a weatherproof metal cover which fastened in place with spring-hooks; it was removed for the picture. Any of these locations will be out-of-the-way, afford easy access for service purposes, and insure protection for the equipment. The linemen trucks feature tool-cabinets mounted so that they may be slid back

out of the way by removing two bolts, exposing the radio equipment.

An example of a crude and highly improper mount arrangement is shown in Fig. 7. The set is inside of a large wooden box barely visible beneath the mountain of equipment at the lower left. To gain access to this set, all of the assorted gear stacked on it must be removed and replaced afterward. Perhaps, it does meet one requirement; protection from the elements! Covered up as it is, positively *nothing* can get to it, including Service Men. This example has been offered to illustrate the importance of location. It is wise to study each job carefully before deciding on location; find out from the truck-operator what loads will be carried, and where the sets will be the least trouble.

In most instances, sets are installed in heavy sheet-metal boxes or cabinets. These are usually available from the manufacturer of the equipment, but can be fabricated locally if necessary.

Fig. 4. Truck FM installation in the cab of butane tanker.



Boxes must be mounted solidly to the frame of the truck-bed. If the box must be elevated above the bed to keep it out of the way of loading, it should be held on legs of heavy angle-iron or pipe. If an angle-iron rack is used, it can be fastened to the truck-body by welding. However, since some day the equipment may have to be removed and installed in another vehicle, it is best to fasten the rack in with bolts. At least  $\frac{1}{2}$ " machine bolts should be used with lockwashers on both sides, and tightened well. It would be even wise, for extra *safety*, to drill a fine hole through the end of the bolt and secure it with a piece of wire, following the practice used in aircraft work. Bolts with heads already drilled for safety-wire may be purchased at almost any auto-supply house. After tightening, if the strain is not too severe, the bolts may be *staked* by center-punching in at least three places, between the nut and end of the bolt. If the fastening must be made to the comparatively thin sheet-metal of a car-body or truck-bed, the use of large washers or small *fish-plates* behind each bolt may prevent damage to the body, and make a much more secure installation.

Shock-mounting is not too necessary, even when mounted in trucks. Practically all of the major brands of communication sets in use today are rugged enough to withstand the jarring they will get in truck service. A rubber washer, about  $\frac{1}{4}$ " thick, placed between the cabinet and each mounting bolt, will provide enough shock-mounting for the average set. If shock-mounting is used, one must be sure that it is not *too* flexible; too much *sway* and bounce is as hard on the

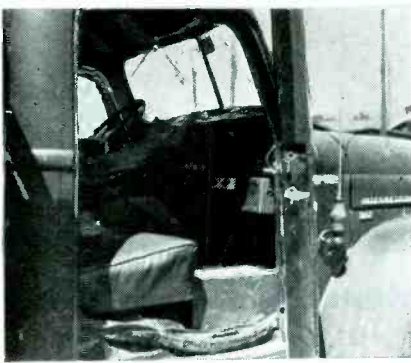


Fig. 5. Another butane service truck FM installation.

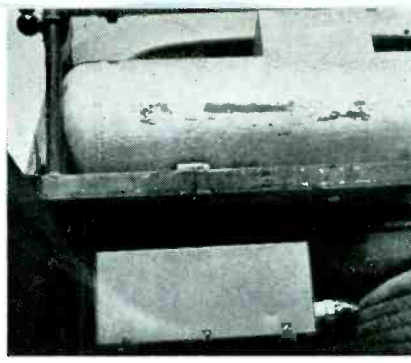


Fig. 6. FM equipment mounted below fuel-tank in butane-service pickup truck; cover removed to illustrate position

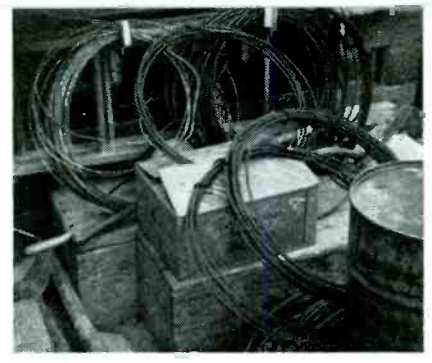


Fig. 7. Poorly-planned installation. Set is in wooden box, end of which is barely visible at lower left side.

# Pickup and Heavy Trucks

by JACK DARR

equipment as too little, and excessive flexibility is quite apt to cause cable-breakage, tube-loosening, and other troubles. Improper shock-mounting can actually subject the sets to more vibration than none at all.

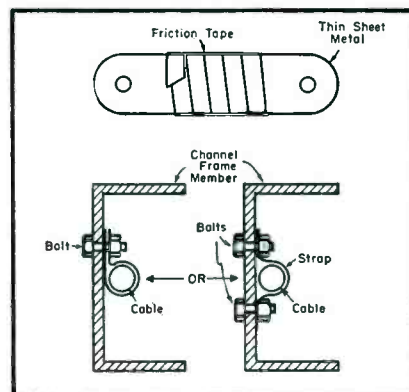
Cable-routing on trucks represents another problem. Most sets use one or two multiconductor cables from the sets to the control head; in addition there are two very heavy battery-supply leads. These must be protected from weather, physical damage and excessive flexing. Although a car installation generally provides an easy path for these cables, beneath the floor-mats, the truck setup demands a different method. As the sets are mounted outside, some safe way must be found to get the cables inside the cab, and also under the hood, to the truck's battery. Usually, the most practical way to do this is to route the cable up from the cabinet, over the side of the bed, down the back of the cab, inside of the frame-channel, up the channel to the front of the truck, and then upwards into the engine compartment, and through the firewall into the cab itself. This procedure will provide the maximum of protection for the cables. As this route is almost entirely outside of the body, some sort of protection against water and flying stones must be provided. The cables themselves are usually encased in a heavy vinyl jacket, but extra protection should be provided by applying an extra wrapping of plastic tape to the entire cable, starting at a point just inside the cabinet with the sets. If the cables must pass over a metal edge, the whole bundle should be wrapped with several thicknesses of old canvas and then covered with plastic tape. From there

on, the tape can be wrapped tightly over all cables until they divide and feed to battery or controls. Control cables need not be taped inside of the cab. However, just before the division point, the battery cables should be covered with a tight wrapping of tape, up to the point where they must be divided to reach the battery or relay-box terminals. Each lead should be covered clear up to the terminal, and doubled back for about six inches. If this is done when the cables are new and clean, the life of the cables will be extended, since the plastic tape offers excellent protection even against battery-acid.

When routing the cables under the truck, it is important to pad all sharp edge points or sharp-sided holes where cables pass over or through. This may be done by wrapping with several layers of old canvas and covering with tape. The cables should be *staked* securely in place to keep them from being flexed too much by the truck's

<sup>1</sup>Such as Bruno 100.

Fig. 8. Home-made mounting straps for fastening cables.



motion. If you encounter a place where there must be flexibility, as between the bed and cab of a large truck, a fair-sized loop should be left in the cables, and a piece of heavy rubber hose, such as a small car-radiator hose, placed over them. This should be fastened so that it may give when needed, but will still prevent the cables from being bent too sharply or flexed too much. When running the cables inside of the frame-channel, they should be fastened into place with metal straps, cut out of thin sheet-metal with a hole drilled in each end; see Fig. 8. There will usually be several empty holes along the average frame to provide for mounting bolts. If not, an extra nut can be used on the end of some long available bolt. The cables should not be fastened in place with wire; the wire will tend to cut into the cable and a break is almost certain. The straps should be at least an inch wide, and covered with three or more layers of ordinary friction tape in the center, for padding.

After the cables have been brought up under the hood, and divided, the battery cables should be fastened, where necessary, with *single-ended* clamps and a self-tapping screw. One must be sure to fasten these so that they will be entirely out of the way of mechanics or service-station men working on the truck's engine. They should also be dressed well away from exhaust pipes, manifolds, etc.

Using a holesaw or *fly-cutter*<sup>2</sup> a hole should be cut in the firewall large enough to permit entry of the control cables, room being left for more padding. Excess cable, which will usually be around two or three feet, should be

(Continued on page 48)

THE COMPATIBLE COLOR SYSTEM, evolved by members of the National Television Systems Committee, which it is expected will be officially approved by the Commission within the next few months, makes use of an ingenious combination of communication techniques and is inherently complex. To install, maintain and service tri-color receivers designed to pickup NTSC color, Service Men will have to become familiar with a new family of terms, circuits and allied equipment. For color employs subcarrier modulation, phase shifting devices, single sideband suppressed carrier transmission and delay lines, in addition to the relatively new synchronizing pulse techniques, and intercarrier sound reception utilized in present black and white TV.

#### Color Transmission

To understand the operation of color receivers, one must have a general idea of how the transmitter behaves.

The NTSC system is based on the transmission of a high-definition (wide-frequency range) monochrome signal upon which is superposed low-definition (narrow-frequency range) color information made up of three primary colors: red (*R*), blue (*B*), and green (*G*). The color information is combined with the monochrome signal in such a way that it is not detectable on a monochrome receiver, but a color receiver can separate the primary colors and apply them to a tri-color picture tube to produce a full color picture.

A simplified block diagram of the video section of an NTSC color TV transmitter is shown in Fig. 1. It will be noted that the composite color video signals are made up of a high-definition combination of the three primary colors, combined with a subcarrier, which is in turn modulated with two other combinations of the three primary colors. All three primary colors are transmitted, but not as individual color signals. The high-definition or *Y* signal is made up of proportions of the three primary colors corresponding to the color sensitivity of the human eye. It is this combined color signal which provides the black-and-white picture on a monochrome receiver. It is also this signal which provides the high-definition or high-frequency picture content in the color TV receiver. The human eye does not have color sensitivity to small objects which in television corresponds to high-frequency signals. Therefore, all the color information the eye can make use of can be transmitted in a relatively narrow bandwidth with the black-and-white signal being used to fill in the small

**First Complete Report on What Can Be Expected to Be Involved in the Installation and Servicing of Color Chassis, Which Will Follow NTSC Standards, Now Being Readied for Adoption**

# Preview of Problems Ahead in COMPATIBLE COLOR-SET SERVICING †

by W. KAY BROWNES

objects in the picture. It is this small-object color blindness of the human eye that helps to allow the compatible color picture to be transmitted in the same bandwidth as used to transmit the present black-and-white pictures.

Since the *Y* signal is made up of all three primary colors, it is only necessary to transmit two other color signals to be able to separate out the three individual colors in the receiver; *I* and *Q* constitute the required two-color signals.

The manner in which the *Y*, *I* and *Q* signals are combined in the receiver to allow the *R*, *B* and *G* signals to be separated into individual color signals will be discussed later. Because it is necessary to have only two color channels in addition to the high-definition channel, it has been found possible to use a single subcarrier for all of the color information; another reason that it has been found possible to fit the color television signal into the present channel bandwidth.

After passing through a 500-kc low-pass filter, the *Q* signal modulates the subcarrier directly in a balanced modulator which suppresses the subcarrier frequency. The *I* signal is then passed through a 1.5-mc low-pass filter and modulates the subcarrier after it has been shifted in phase 90° from the direct subcarrier frequency. This phase shift is necessary to allow the single subcarrier to be modulated with

the two separate signals. (The reason that the two color signals are passed through filters of different bandwidths is quite involved, requiring a detailed mathematical explanation beyond the scope of this article. However, a brief non-mathematical explanation of the selection of these bandwidths is presented in the section of this analysis dealing with the functioning of the receiver.)

The phase relationships of the subcarrier are such that the *I* and *Q* signals are transformed in the modulators to percentages of *R-Y* and *B-Y* modulation, respectively, of carriers which are 90° apart in phase with the *B-Y* carrier 180° out of phase with the subcarrier reference burst. The color signals which form a part of the composite video signal are, as shown in Figure 1, for color signals below 500-kc.

#### Placement of Color Information

It is interesting to explore the ingenious way in which the color information has been fitted into the channel bandwidth, already used for the black-and-white signal, without encountering mutual interference between the black-and-white and the color signals. Fig. 2a shows portions of a present black-and-white television signal spectrum as it would appear on a spectrum analyzer, an instrument which looks at each tiny section of the frequency range being investigated and displays the whole range simultaneously on a cathode-ray tube; like a panoramic

†Based on an exclusive report prepared by J. C. Geist.

adapter on a communication receiver. The modulation sidebands appear as signals grouped in narrow bunches about harmonics of the horizontal scanning frequency. There are narrow groups of signals every 15,750 kc from the picture carrier with relatively wide space between the bunches which contain no signals at all.

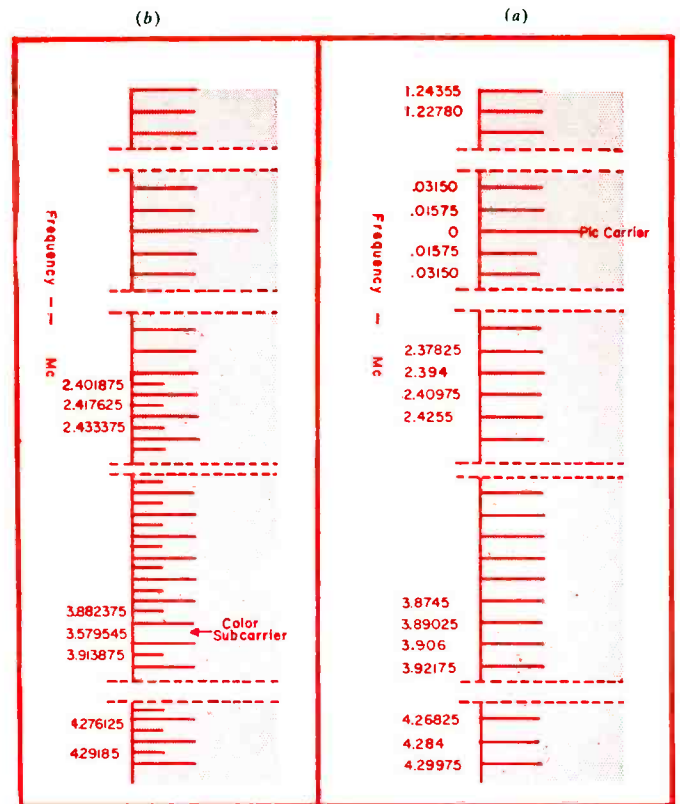
Figure 2b shows portions of an NTSC color television signal spectrum. The additional signals represent the color information which has been neatly fitted in the blank spaces between the *black-and-white* signals. This dovetailing of signals is accomplished by selecting the color subcarrier to fall in the center of one of the blank spaces so that the modulation sidebands of the color subcarrier which are in groups every 15,750 kc from the subcarrier will fall between the *black-and-white* signal groups. Any subcarrier which is an odd multiple of half the horizontal scanning frequency would fall in an empty space.

In the NTSC system the 455th harmonic is used. The horizontal scanning frequency, while still nominally 15,750 cps, has been changed to exactly 15,734.264 cps; close enough to 15,750 cps to allow operations of present receivers without adjustment. The

subcarrier frequency is then  $\frac{15,734.264}{2}$

$\times 455 = 3.579545$  mc. There is no signal shown at 3.579545 mc because

Fig. 2. Portions of black and white (a) and compatible color (b) signal spectrums.

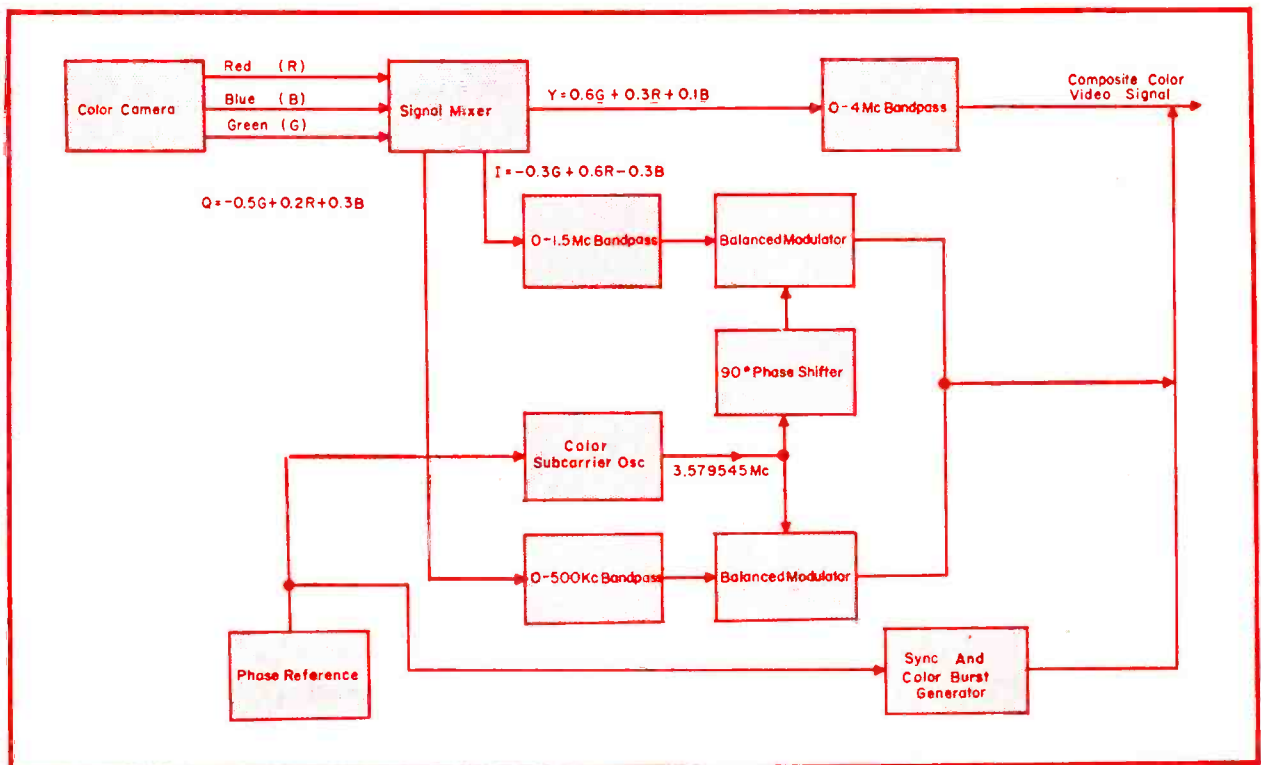


the color subcarrier frequency is suppressed in the transmitter.

It would seem that a black-and-white receiver would detect these dovetailed color signals and display them on the picture tube as an interfering signal. It is true that in a single line the color signal would appear as interference. However, over a period of two complete

frames the signals at odd harmonics of half the line frequency tend to cancel. The manner in which this cancellation occurs is shown in Fig. 3 (p. 77). At (a) is shown the relationship of a black-and-white signal at an even harmonic of half the horizontal scanning frequency for the four fields of two (Continued on page 77)



Fig. 1. Simplified block diagram of video section of an NTSC color TV transmitter.






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# Spiral-Wound Tuned-Line VHF/UHF

## Signal Generator<sup>1</sup>

[See Front Cover]

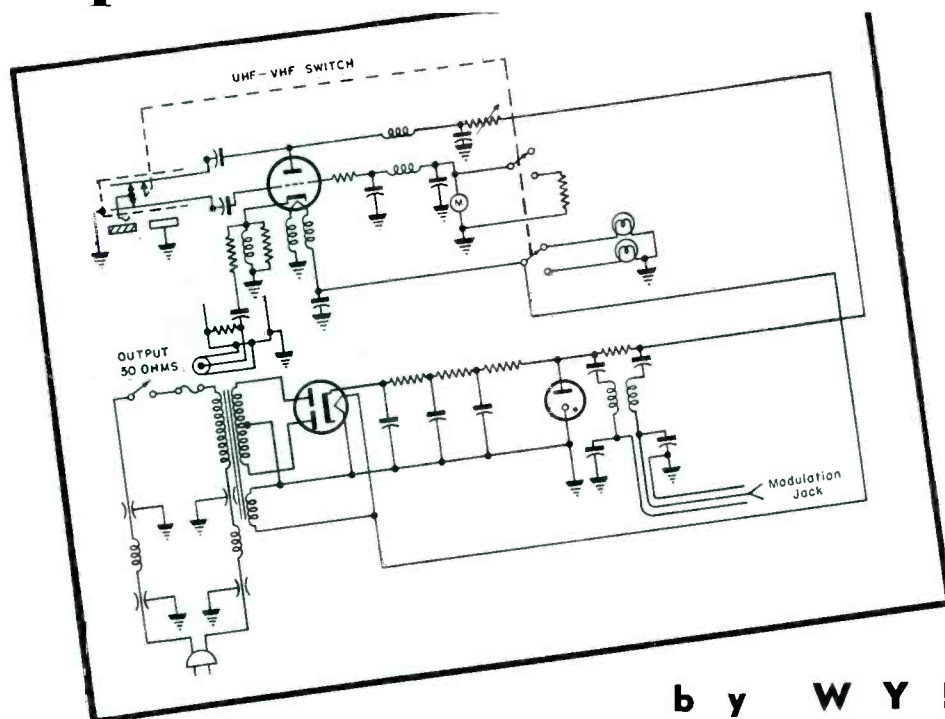


Fig. 1 (left)  
Circuit of 50-950 mc signal generator.

b y W Y N M A R T I N

THE RAPIDLY INCREASING number of *uhf* stations being placed in service around the country, coupled with the planning of most TV set manufacturers to incorporate *vhf/uhf* tuners in virtually all models, has accented the need for test instruments featuring wide-band facilities. Particularly important for such service is the signal generator.

In the design of a generator for low and high-band application it has been found necessary to provide a stable oscillator that will cover this broad spectrum; in addition the unit must have minimum leakage and a uniform output attenuation at all frequencies.

Tuned transmission lines lend themselves readily to application in an oscillator for *uhf/vhf* work. In developing a practical generator for a continuously variable selection of all the TV-channel frequencies, the use of a spirally-wound line with a sliding short seemed most feasible. Two problems, however, had to be overcome. First, the elimination of sliding contact difficulties, noise, suck out and intermittent oscillation throughout the range of frequencies.

This was overcome in the model diagrammed in Fig. 1 and on the cover,\*† by careful structural design of moving parts, isolation of the transmission lines from the tube elements by means of small capacitors at the termination

of the transmission lines and the use of rhodium-to-silver for the contacts on the transmission line, to produce quiet stable action. The second problem revolved about the adapting of the same transmission line to *vhf* frequencies.

A solution appeared in the use of an equally-spaced, silver-plated, spiral-wound line, tuned with sliding shorting contacts, and grounded at certain frequencies, in conjunction with alternately balanced or unbalanced lines to produce oscillation over the entire band of FM, *uhf* and *vhf* frequencies, on fundamentals. It will be noted on the schematic that at *vhf* the transmission line is a shorted line and is in an unbalanced condition. At *uhf* this changes to a balanced line which is grounded instead of shorted. This is partially accomplished by actuation of the band switch from *vhf* to *uhf*. The cam action of the switch changes the transmission line to a balanced mode of operation. Simultaneously, the position of the sliding contact unit arrives at a point of ground potential, thereby making the shorted line a tunable grounded stub, thus accomplishing this transition. The accomplishment led to the use of a 6AF4 oscillator

<sup>1</sup>From data prepared by G. K. Rustin, sales engineer and R. Tuttle, project engineer, Connecticut Telephone and Electric Corp.

\*Connecticut Telephone and Electric Model 10.

†Specific patent rights have been applied for.

tube. This tube is very useful as a *uhf* oscillator, since its interelectrode capacitances can be used to provide the required feed-back for oscillation.

During the development of the generator, it was found that two factors influence stability in an otherwise well-designed oscillator; temperature change and power supply regulation. Thus, in this model, a carefully filtered power supply regulated with an 0A2 tube was incorporated to minimize output frequency variation. The effect of temperature change in the usual indoor environment was reduced to satisfactorily low levels.

The problem of stray leakage was solved by careful shielding of the oscillator and oscillator tube, which minimized stray magnetic and electrostatic fields; judicious use of line filters; elimination of metal reradiating components; arrangement of the components; and use of a special common rf ground line coupled directly to the base of a type N coax connector.

The output of the oscillator is taken off the cathode and capacitively fed into a variable, plunger type of cavity which is logarithmic in its function. A continuously variable output from 10 to 100,000 microvolts is obtained through a 360° rotation of the output attenuator knob at all frequencies. Should it become necessary, in special

(Continued on page 48)

# In The Field<sup>‡</sup>

## Curve Distortion . . . Neck Shadow . . . Horizontal Linearity Troubleshooting

### Problem

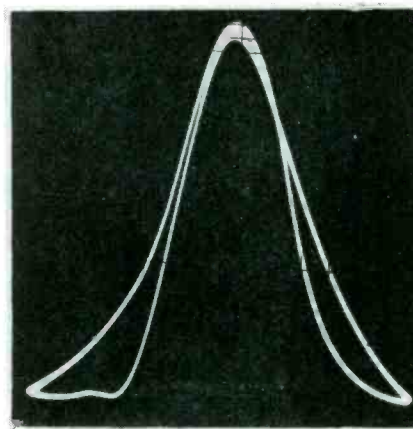
IT HAS BEEN EXPLAINED how the first evidence of too large a value for an isolating resistor appears as displacement of the markers on the steep sides of the response curve. If the value of the isolating resistor were still larger what would happen?



### Analysis

CURVE DISTORTION as shown in Fig. 1 would appear. It is a form of reactive distortion, because the effective shunt capacitance of the shielded input cable is now highly significant in determining the response characteristics of the 'scope input system.

Fig. 1. When the value of the isolating resistor is much too large, the waveform shown will appear; it is a form of reactive distortion, and can be noted in the shape of the reproduced visual-response curve.



WHY WOULD ONE find it impossible to obtain perfect linearity, no matter how carefully receiver controls are adjusted?



THIS IS OFTEN due to a compromise on tolerances. In meeting a price level for a chassis, designers are sometimes compelled to relax tolerances on linearity, among other tolerances. Where it is possible to hold closely to circuitry requirements, a diode-triode type of damper circuit, as shown in Fig. 2, is used; this is capable of providing unusually good horizontal linearity.

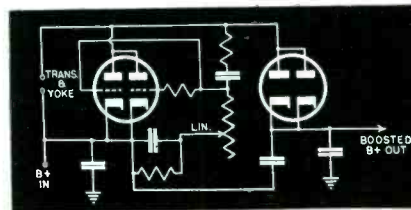


Fig. 2. A diode-triode type of booster-damper circuit capable of a very high degree of horizontal linearity. The grid element of the triode tube comprises a wave-shaping network, which is partially responsible for the high performance of the system.

IS NECK SHADOW always due to improper setting up of the components on the neck of the picture tube, or to wrong values of the components?



NECK SHADOW (Fig. 3) can be caused by partial failure of large capacitors in the power-supply system, responsible for poor regulation; the vertical-sweep circuit draws heavy transient currents from the power supply, which affects the bias on the picture tube electrodes under these conditions. The neck shadow, observed in such cases, is usually caused also to some extent by a marginal ion trap, improperly seated yoke, or other faults in the components.

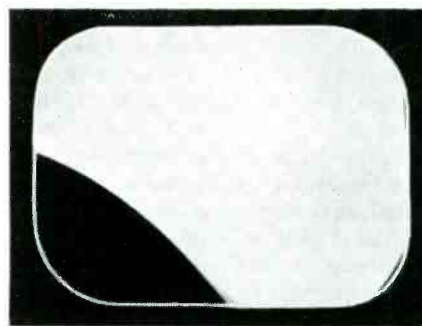


Fig. 3. Neck shadow, usually caused by improper seating of the yoke, improper adjustment or improper condition of the ion trap, improper placement of the focalizer unit, etc.; a contributing cause can also be poor regulation in the B+ power-supply system.

WHEN ALIGNING some receivers, an irregularity in the zero-volt reference line is often noted. This is a very puzzling symptom. Does it indicate trouble in the sweep generator?



WHILE IT IS CONCEIVABLE that the trouble could originate in the sweep generator, such irregularities are often due to some spurious voltage entering from the TV receiver circuits into the 'scope-input terminals during the zero-volt line interval. This situation is illustrated in Fig. 4. The fact that the defect is noted only when aligning some receivers, is itself a central clue to the location of the spurious voltage. The vertical-deflection circuit is a likely offender.

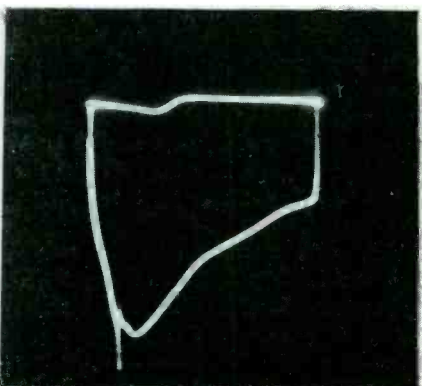


Fig. 4. The irregularity in the zero-volt reference line can be due to various causes, such as too long a time constant in a crystal probe, or, more remotely, a sweep-generator defect. Pattern illustrated appeared because of a crosstalk between vertical-deflection circuits in set and pix detector.

<sup>‡</sup>Based on questions posed during meetings conducted by R. G. Middleton, senior engineer at Precision Apparatus Co., Inc., and author of *TV Troubleshooting and Repair Guide Book*, published by John F. Rider.

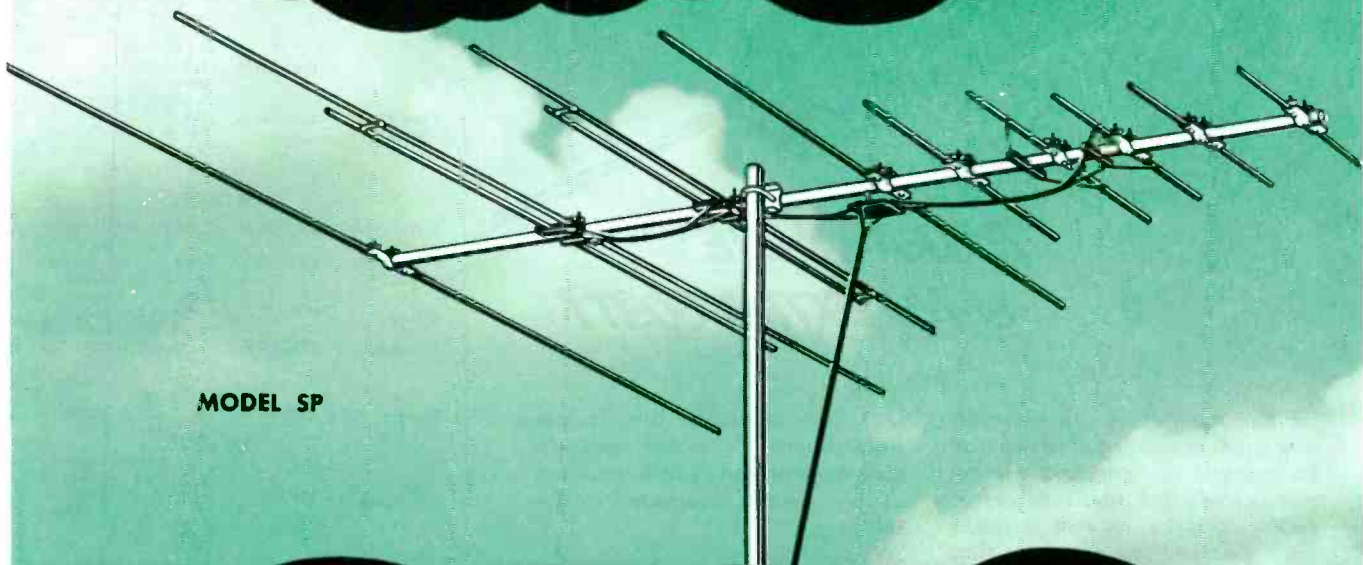


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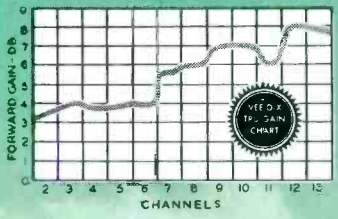


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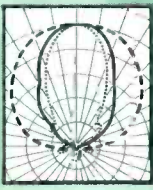


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**CAUTION:** It is the policy of VEE-D-X not to falsify gain charts for advertising purposes. This Tru-Gain Chart is exact and is based on standard specifications using a single dipole as reference.



**FEATURES**

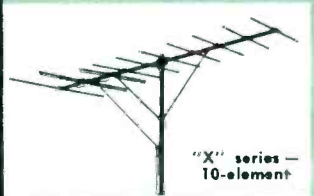
- Powerful all-channel VHF performance
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	WBRC-TV	Storer Bcstg Co., 199 Pierce St., Birmingham, Mich. 6‡		KOY-TV	KOY Bcstg Co., 840 Central Ave. 10st
	WJIN-TV	Johnston Bcstg Co., Box 147 48		KPHO-TV	Meredith Syracuse Tele. Corp., 631 1st Ave. 5‡
Decatur	WMSL-TV	The Tenn. Valley Bcstg Co., Inc. 520 Bank St. 23	Tucson	KVOA-TV	Ariz. Bcstg Co., Inc., 48 E Broadway, Box 2911 4*
Mobile	WKAB-TV	Pursley Bcstg Service, P.O. Box 1306 48*		KOPO-TV	Old Pueblo Bcstg Co., 115 W. Drachman St. 13*
	WALA-TV	Pape Bcstg Co., Inc., Box 1548 10*	Yuma	KCNA-TV	Catalina Bcstg Co., P.O. Box 2348 9
Montgomery	WCOV-TV	Capital Bcstg Co., P.O. Box 1029 20*		KIVA	Valley Telecasting Co., c/o Park Dunford, 4134 Bandini Blvd., Los Angeles 11

# TV Station

Now on the Air and

City	Call Letters	Channel
<b>ARKANSAS</b>		
Ft. Smith	KFSA-TV	Southwestern Publ. Co., 920 Rogers Ave. 22
Little Rock	KRTV	Little Rock Telecasters, Box 420, Wichita Falls, Tex. 17*
	KETV	Great Plains Tele. Properties, Inc., c/o U.S. Corp. of Ill., 33 N. LaSalle St., Chicago 23
	KARK-TV	Ark. Radio & Equipment Co., 112-141 E. Capitol Ave. 4
Pine Bluff	.....	Ark. Tele. Co., 6410 Dykes Way, Dallas, Texas 7
<b>CALIFORNIA</b>		
Bakersfield	KAFY-TV	Bakersfield Bcstg Co., Box 1432 29
	KERO-TV	Kern County Bcstrs Inc., 1420 Truxton Ave. 10
Chico	KHSL-TV	Golden Empire Bcstg Co., Box 717 12
Eureka	KIEM-TV	Redwood Bcstg Co., Inc., Radio Center, 6th and E Streets 3
Fresno	KMJ-TV	McClatchy Bcstg Co., 21st and Q Streets 24*
	KJED	J. E. O'Neill, Box 1832 47
Los Angeles	KPIX	John Poole Bcstg Co., Security Bank Bldg., Long Beach, Calif. 22
	KECA-TV	American Bcstg-Paramount Theatres, Inc., Prospect & Talmadge Aves. 7‡
	KHJ-TV	General Tele-radio, Inc., 1313 N. Vine St. 9‡
	KLAC-TV	KMTR Radio Corp., 1000 Cahuenga Blvd. 13‡
	KNBH	National Bcstg Co. Inc., Sunset and Vine Streets 4‡
	KNXT	Columbia Bcstg System, Inc., 1313 N. Vine St. 2‡
	KTLA	Paramount Tele. Productions, Inc. 5451 Marathon St. 5‡
	KTTV	KTTV, Inc., 202 W. 1st St. 11‡
Monterey	KMBY-TV	The Monterey Radio-Tele Co., 468 Calle Principal 8st
San Bernardino	KITO-TV	KITO, Inc., 569 4th St. 18
San Diego	KFMB	Wrather Alvarez Bcstg Inc., 6253 Hollywood Blvd., Los Angeles 8‡
	KFSD-TV	African Radio Corp., Ltd., 326 Broadway 10
San Francisco	KGO-TV	American Bcstg-Paramount Theatres Inc., 420 Taylor St. 7‡
	KPIX	KPIX, Inc., 2655 Van Ness Ave. 5‡
	KRON-TV	Chronicle Publ. Co., 901 Mission St. 4‡
	KSAN-TV	S. H. Patterson, 1355 Market St. 32
	KBAY-TV	Lawrence A. Harvey, 19200 S. Western Ave., Terrance, Calif. 20
‡Licensed pre-freeze station.		
*Operating under special authority since freeze lift.		
st—Sharing time.		
‡Old and new channel assignment.		

# Listing

## Authorized to Operate\*\*

City	Call Letters	Channel
San Jose	John A. Vietor, Jr., 6210 Camino de la Costa, La Jolla, Calif.	48
San Luis Obispo	KVEC-TV Valley Electric Co., 851 Higuera St.	6*
Santa Barbara	KEYT Santa Barbara Bcstg & Tele. Corp., Box 157 Long Beach	3
Sacramento	John Poole Bcstg Co., Security Bldg.	46
Salinas	KSBW-TV Salinas Bcstg Corp., Box 1651 Salinas-Monterey Tele. Co., Box 1070, Monterey	8st
Stockton	KTVU San Joaquin Telecasters, Clark Hotel	28
Tulare	KCOK-TV Sheldon Anderson, Box 119	36
Yuba City	KAGR-TV John Steventon, 320 A St.	27

### COLORADO

Colorado Springs	KRDO-TV Pikes Peak Bcstg Co., Alta Vista Hotel	13
	KKTV TV Colorado, Inc., Exch. National Bank Bldg.	11*
Denver	KFEL-TV Eugene P. O'Fallon, Inc., Albany Hotel	2*
	KBTV Colo. Tele. Corp., 1022 Midland Saving Bank	9*
	KDEN Empire Coil Co., Inc., 85 Beachwood Ave., New Rochelle, N. Y.	26
	KIRV Mountain States Tele. Co., 1520 Clarkson St.	20
	Aladdin Radio & Tele. Inc., 17th and Lincoln St.	7
Grand Junction	KFXJ-TV Western Slope Bcstg Co., Inc., Box 30	5
Pueblo	KCSJ-TV The Star Bcstg Co., Inc., 211 W. 5th St.	5*
	KDZA-TV Pueblo Radio Co., Inc., 3011 Elizabeth St.	3*

### CONNECTICUT

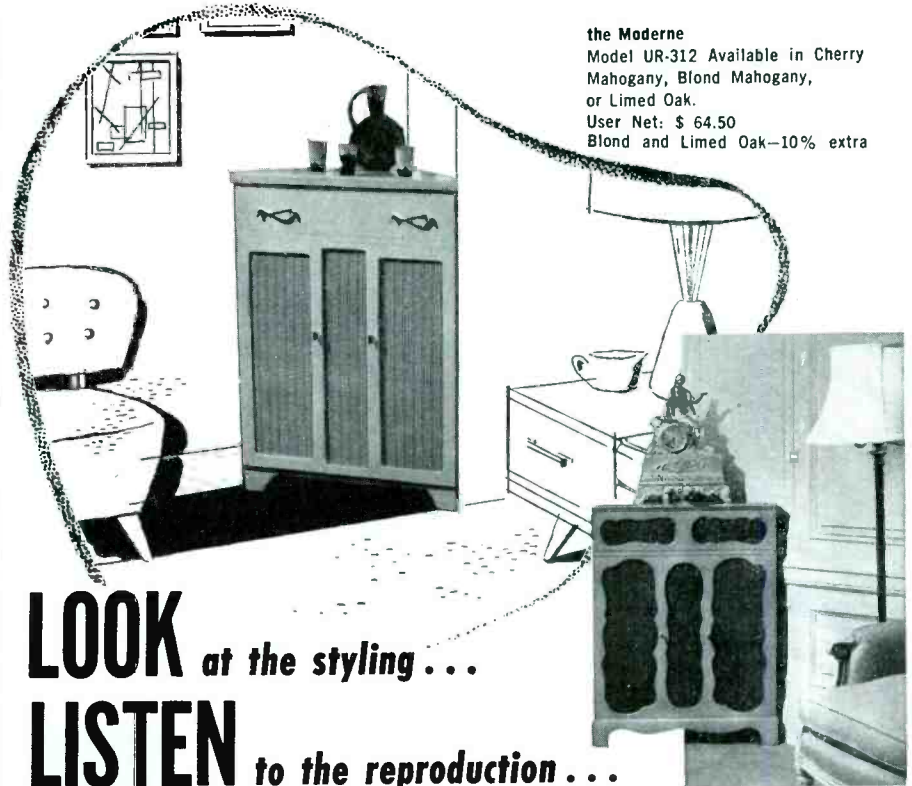
Bridgeport	WICC-TV The Southern Conn. & Long Island Tele. Co., 114 State St.	43*
	WSJL Harry Liftig, 40 Platt St., Ansonia, Conn.	49
New Britain	WKNB-TV The New Britain Bcstg Co., 213 Main St.	30*
New Haven	WNHC-TV Elm City Bcstg Corp., 110 Chapel St.	6 (8)†1
	Conn. Radio Foundation, Inc., 221 Orange St.	59
New London	WNLC-TV The Thames Bcstg Corp., 281 State St.	26
Stamford	Stamford-Norwalk Tele. Corp., c/o Prentiss M. Brown, Wash. Loan & Trust Bldg., Wash. D. C.	27
Waterbury	WATR-TV WATR, Inc., 440 Meadow St.	53

### DELAWARE

Dover	WHRN Rollins Bcstg Inc., Moore Bldg., Rehobeth, Del.	40
Wilmington	WDEL-TV WDEL, Inc., 10th and King Sts.	12‡

(Continued on page 64)

\*\*Stations without superscripts have been authorized to operate, but have not begun to telecast.



the Moderne  
Model UR-312 Available in Cherry Mahogany, Blond Mahogany, or Limed Oak.  
User Net: \$ 64.50  
Blond and Limed Oak—10% extra

**LOOK** at the styling . . .  
**LISTEN** to the reproduction . . .

the new *Musicorner*

by **UNIVERSITY**



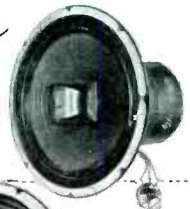
the Traditional  
Model UR-311.  
In Cherry or  
Cordovan Mahogany.  
User Net: \$ 64.50

Now you can have good "looking" with good listening! Each University MUSICORNER design is authentic in every detail, and reflects the traditions of the old masters of fine furniture. All genuine woods—hand rubbed! Designed to flatter the decor with stylings that smartly blend with any existing interior.

University Musicorner gives you wide angle coverage, clarity and brilliance with its full front radiation. High power handling ability and distortion control, with an internal and extended horn. And, boosted low frequency response with high efficiency, from its unique integral bass reflex system.

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Model 6201, 12" coaxial speaker system. A TRUE coaxial dual range system, with woofer, and driver type tweeter, built-in crossover network, and "balance" control. Finest to be had! User Net: \$ 45.00



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*University* **LOUDSPEAKERS, INC.**

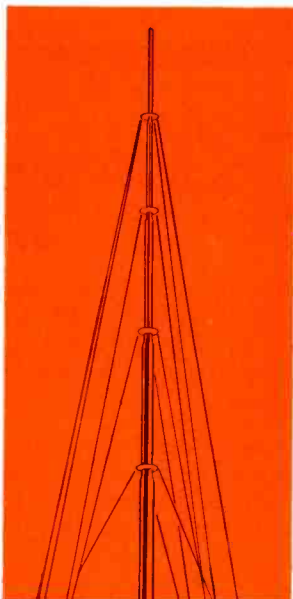
80 SOUTH KENSICO AVENUE • WHITE PLAINS, N. Y.



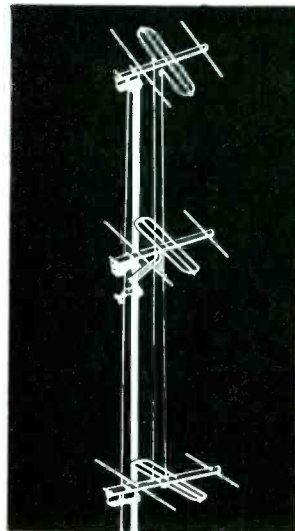
After-WARD You'll Install no Others.

WARD will give you the "HI" in sales — the "HI" in profits you seek . . . WARD Antennas always create greater customer satisfaction. Remember, WARD will keep your inventory lower and cut your "call backs" . . .

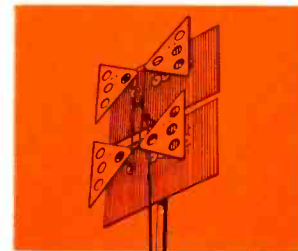
Ask Your Distributor for the new Ward Ultra Hi-Line and Signaline Catalog.



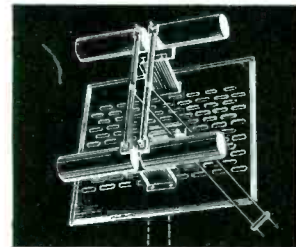
**ZIP-HI MAST** — Corrosion-proof 16 gauge permatube . . . easily assembled . . . in 2, 3, 4, 5 section models.



**3 X 3** — Original development for UHF band composed of 3 stacked 3 element beams. Full wave spacing between bays . . . clean cut pattern with sharp forward lobe and no side lobes . . . cut to frequency . . . unsurpassed for near fringe and fringe areas.



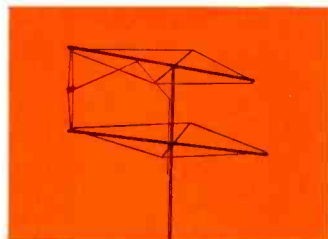
**BOW TIE** — Peak-A-Bow design with the only adjustable screen on the market . . . Available in single and stacked models.



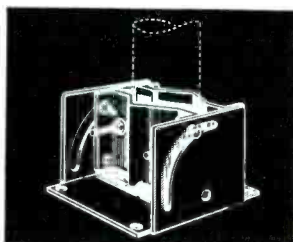
**CAN-CAN** — New lazy H design for entire UHF band . . . uni-directional pattern . . . sturdy compact unit . . . field tested and thoroughly proven.



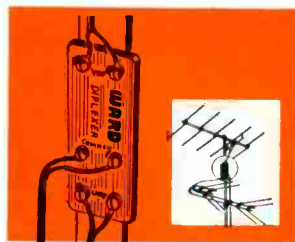
**CORNER REFLECTOR** — For semi-fringe areas . . . ruggedly designed to eliminate ghosts and vibration.



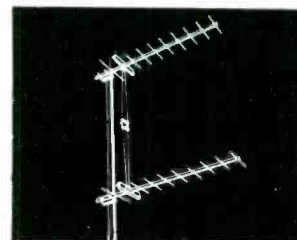
**RHOMBIC** — Highest gain of all UHF antennas . . . for fringe and super fringe areas.



**HEAVY DUTY BASE** — Ruggedly constructed to fit all masts from 1 1/4" to 2 1/4" O.D.



**DIPLEXER** — For separate UHF-VHF antennas . . . or for set and converters with separate UHF-VHF terminals . . . Foolproof . . . easily installed.



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# *SERVICE...The National Scene*

LEADING MANUFACTURERS SUPPORT NTSC BID FOR COLOR OKEH--Good news hit the color front a few weeks ago, when four\* of the country's foremost set and tube makers filed compatible-color petitions, urging adoption of the standards proposed by the National Television Systems Committee. . . . All agreed that the proposed system is capable of producing a color picture which has a high quality of fidelity, adequate apparent definition, good picture texture (not marked by such defects as misregistration, line crawl, jitter, or unduly prominent dot or other structure), and is sufficiently bright to permit adequate contrast range, and capable, too, of being viewed under normal home conditions without objectionable flicker. . . . Recognizing that the adoption of new standards for a new service is a serious matter, since once standards become official they cannot be changed without serious harm to the public and disruption to the complete industry, one petitioner declared that the proposed standards are complete, thorough and sturdy, and yet, sufficiently flexible to permit color TV to undergo such rate of growth, be it rapid or gradual, as the purchasing public may dictate.

IN WASHINGTON, the Commission also agreed that the system was acceptable and went on to issue a tentative approval, subject to comments and counter-comments. Unless objections are registered, and at this writing none have been officially recorded, a final okeh could appear in about a month. . . . Since most of the Commission's members and engineering staff have seen demonstrations of color, the time-consuming field studies may be shelved to expedite authorization; although sets of individual manufacturers will be studied at government labs in Laurel, Md.

MOST OF THE PETITIONERS felt that it should be possible to produce receivers within 6-9 months from the date of standard approval. Initial production costs will run high and thus prices of the first receivers will be far from moderate. However, several members of the Commission declared that such highly-priced chassis will not be a bar to system acceptance, even though criteria does call for comparatively low mass-market pricing. First black and white sets were extremely expensive, too, they said.

IN A FRANK COMMENTARY on one problem that does obtain at the present time in color TV, the color tube, one manufacturer declared that tubes which have been demonstrated thus far . . . "and for which production plans have been asserted, give only a small picture, and are complicated and costly to produce. The big task now confronting TV labs is the development of a simplified, large-screen color tube that can be manufactured at reasonable costs. A great deal of invention and engineering work will be required to perfect such a simplified tube." It was this manufacturer's opinion that this goal could be reached within 2 or 3 years.

NOTWITHSTANDING the delicacy of the tube situation, most feel that receivers will be available next year, with possibly June, '54, as the month when demonstration sets will appear in shops. Early fall of '54, it has been forecast, will probably see delivery of a larger number of color sets; several have estimated that at least 50,000 color chassis will be in operation before the end of '54.

ALTHOUGH COLOR is a year away, industry and government are deeply concerned with one item, that can gild or blemish red-green-blue chassis acceptance. That item is service. The complexity of color TV and its critical circuitry will introduce many taxing problems. A revealing preview of these problems and their solutions appears in this issue on page 26. It is the first of a series of searching analyses scheduled for exclusive publication in SERVICE.

\*Exclusive of first petitioner, whose brief was described last month in SERVICE, and letter filed by a national lab urging support of standards, too.

# SERVICE... *The National Scene*

MODEL SERVICE MAN TRAINING PROGRAM TO BEGIN IN SEPT.--Schooling plans for Service Men, under study for over a year by RTEMA, have been finalized, and on Sept. 14, at the N. Y. Trade School (N. Y. C.), 60 students, chosen by an entrance examination and interviews, will begin an intensive 16-week course, which will consist of two evening sessions of two hours each per week. . . . Set and parts distributors will assist in the selection of candidates for the initial course. . . . Course has been geared to meet the needs of practicing TV Service Men, who have a good knowledge of TV systems and circuitry, but whose skills are limited because of inadequate know-how and familiarity with test equipment. Through contributions of money and equipment by RTEMA member companies, a lab of 15 test benches, each supplied with a full complement of servicing equipment, will be available. Each test bench will be coupled to a master-antenna system, fed to current-model TV chassis. . . . The ultimate aim of the plan, according to RTEMA, is an industry-approved training program available to Service Men through all vocational and trade schools, with local advisory groups, including set distributors and parts jobbers in each community, sponsoring the course. . . . A system of accreditation, whereby Service Men will be certified for technical competence by RTEMA after successfully passing an examination, is now being developed. It is planned that this test will also be given by participating schools throughout the country.

SERVICE MEN-STATIONS SPARK UHF CONVERSION PROGRAM--A driving effort to promote ultrahighs in Reading, Pa., is now under way, under the direction of management of one of the uhf stations, in association with local Service Men. The broadcaster is providing newspaper, radio and TV advertising for those who will ring doorbells to encourage conversions. Left with prospects are copies of the station's programs which stress calibre of showmanship and superb reception possible from uhf. The results have been rewarding; consumers have become convinced that uhf really offers improved, interference-free reception, in contrast to that available from veryhigh stations located at distant points. . . . In other areas, viewers have also indicated that they are now sold on uhf, thanks to coordinated station-Service Men campaigns. In many zones, these efforts have resulted in striking spurts in uhf conversions. In one instance, after five months of ultrahigh telecasting, over 60% of TV setowners agreed to have their sets converted.

NEW STATION APPROVALS MOUNT--Dozens of applicants in the East, South and West, have recently received permission to begin telecasting, spreading the vast network of new market areas for Service Men. New assignments include channel 19, Utica, N. Y.; channel 62, Brockton, Mass.; channel 20, Cedar Rapids, Iowa; channel 17, Spartanburgh, S. C.; and channel 41, Trenton, N. J. . . . Many Service Men have written in asking for a detailed listing of all of the TV stations, including addresses of owners, so that they might contact owners, plan programs similar to the uhf deal described above, and expand their operations. Accordingly, such a listing has been prepared, and in this issue, the first section of it appears on page 32. Next month, the remainder will be published.

\$476-MILLION SPENT FOR SERVICE IN '52--According to the nation's most authoritative source, the Office of Business Economics of the U. S. Dept. of Commerce, \$476-million were spent in '52 for the repair of radio and TV receivers--over 100% gain since '49, when \$213-million dropped into the coffers for servicing. The '52 figure also represents a substantial increase over '51, when \$324-million were spent, and over '51, when service expenditures totaled \$420-million. . . . The report offered some interesting parallels; over 400% more was spent for servicing than for admissions to theatres, baseball and hockey, and even college football games. . . . According to a recent survey, the current rate of activity indicates that well over \$500-million will be spent this year for radio and TV servicing. That's quite a healthy prediction and a wonderful tribute to an industry still far from its peak.--L. W.

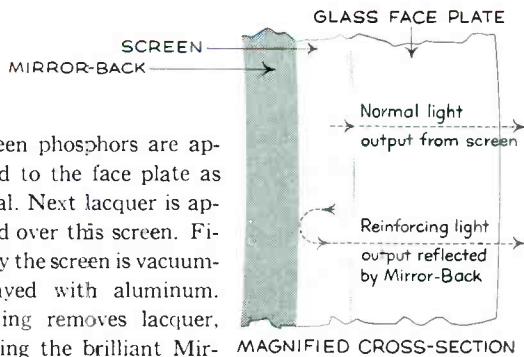
# You can see the difference...



ARTHUR GODFREY, FAMOUS CBS-TELEVISION STAR

## NOW CBS-HYTRON **MIRROR-BACK** BIG-SCREEN TUBES 27EP4 . . . 24TP4 GIVE YOU BRIGHTER PICTURES!

### HOW MIRROR-BACK TUBES ARE MADE



Screen phosphors are applied to the face plate as usual. Next lacquer is applied over this screen. Finally the screen is vacuum-sprayed with aluminum. Baking removes lacquer, leaving the brilliant Mirror-Back coating. Mirror-Back reflects light that would otherwise be lost to the rear of the screen. Boosts light output. Brightens picture.

#### ADVANTAGES OF CBS-HYTRON MIRROR-BACK TUBES

1. Stepped-up light output.
2. Brighter picture.
3. Greater contrast.
4. Reduced strain on component parts.
5. Full effective screen potential maintained by metallic contact between anode and screen.
6. Longer life . . . drain on cathode materially reduced.

Leading TV set makers demand maximum brightness from their large-screen sets — without strain on component parts. For them, CBS-Hytron introduced its Mirror-Back 27EP4 and 24TP4 (both spherical, electro-magnetic types). Mirror-like effect of their aluminum-backed screens reinforces light output. Gives brighter, sharper pictures.

You, too, will want CBS-Hytron Mirror-Back big-screen tubes for replacement. In 27- and 24-inch sizes, they are a must. Take a tip from leading TV set makers. Try the CBS-Hytron 27EP4 and 24TP4. See the difference for yourself. Let your customer see it too. Order performance-tested Mirror-Back tubes from your CBS-Hytron distributor.

**New . . . FREE CBS-HYTRON TRANSISTOR MANUAL** Just what you have been looking for: A down-to-earth, complete, 8-page introduction to transistors. In three parts: 1. Theory. 2. Data. 3. Application. CBS-Hytron Transistor Manual is profusely illustrated. Contains nine basic transistor applications. Explains by vacuum-tube analogy both point-contact and junction transistor operation . . . conduction by "holes" . . . P-N-P and N-P-N transistors . . . advantages and limitations of transistors.

An easy-to-take introduction to how transistors work . . . their characteristics . . . and how to apply them, this CBS-Hytron Transistor Manual is also *free*. Get it from your CBS-Hytron distributor. Or write direct today.



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SERVICE, AUGUST, 1953 • 37

**Part I of Two-Part Discussion Detailing How to Secure High-Quality Audio by Revamping Speaker System, Including Speaker Housing . . . Improvement of Amplifier...Addition of FM Systems and 3-Speed Player**

# Audio Conversions

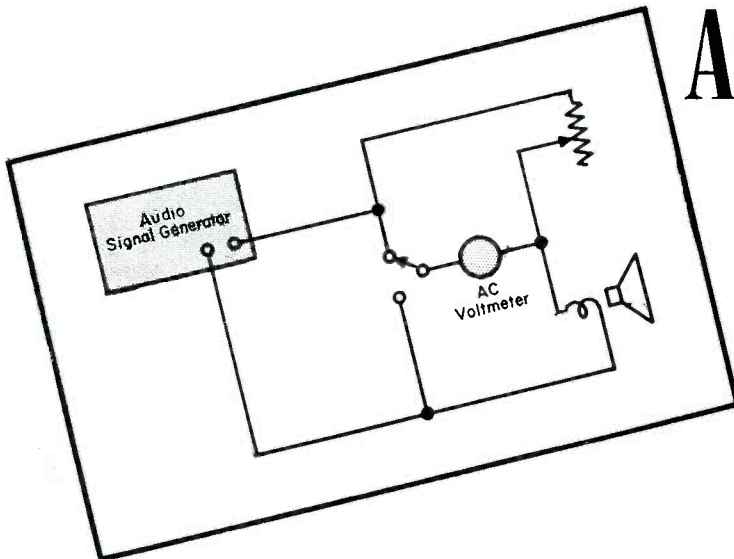


Fig. 1. Accurate method of measuring an unknown speaker impedance. The rated or nominal impedance of the speaker is its minimum value over the frequency spectrum, which will appear at about 400 cycles. When the ac voltage drops across resistor and speaker are equal, the impedance of the speaker is numerically equal to the value of resistance in the circuit.

HIGH-FIDELITY reproduction can often be achieved by conversion of the audio system of a commercial radio-phonograph.

The loudspeaker is a particularly vulnerable object in the improvement campaign. If the old speaker has poor quality in both the treble and bass ranges it must be replaced outright. The choice of a new speaker should be based on factors of price, performance, and available mounting space.

The idea that the amplifier may not have enough driving power for a speaker larger or heavier than the original is a common fallacy. The

fact is that most modern loudspeakers are more efficient than older types, which means that less electrical power is required from the amplifier to produce the same output level of sound. In general, the larger diameter speakers tend to be more efficient than many smaller models, and a speaker with a heavy magnet will be more efficient than another speaker of the same design and material but with a lighter magnet.

It would be a mistake, however, to choose a speaker too large for the available mounting space. The usual open-backed commercial enclosure will normally be converted to a totally enclosed or bass-reflex cabinet to eliminate cabinet boominess, and the larger the cone area the greater is the effective stiffness of the air trapped behind the speaker. The general order of cabinet dimensions suitable for different speakers has been discussed previously;<sup>1</sup> it was noted that the lower the bass resonant frequency of the speaker the larger the enclosure volume required. A smaller speaker, suited to the enclosure, will give better results than an unsuitable large one, and excellent speakers are available in sizes ranging from eight to fifteen inches. There are eight-inch speakers, for example, which cost up to five

times as much as twelve-inch replacement type speakers, and justifiably so.

Modern loudspeakers are almost exclusively of the permanent magnet type. When the speaker that is being replaced is also a *pm* unit it is only necessary to make sure that the new speaker has the same, or almost the same voice-coil impedance rating as the original. The majority of American speakers that are eight inches and larger have a voice-coil impedance close to eight ohms. The impedance of an unknown unit may be measured easily, by a method that is not very accurate but quite good enough for the purpose: The *dc* resistance of the voice coil (read with an ordinary ohmmeter) will normally be from  $\frac{3}{8}$  to  $\frac{3}{4}$  of the rated speaker impedance. An eight-ohm speaker thus will show a *dc* voice-coil resistance of from five to six ohms. A more accurate method of determining voice-coil impedance is illustrated in Fig. 1.

If the original speaker is an electrodynamic model, however, it is necessary to consider the amplifier circuit that energizes the speaker's field coil. Specifically, there are three main types of field coil circuits, as illustrated in Fig. 2:

- (1) Field coil across the high voltage line, connected between *B+* and ground.
- (2) Field coil in series with the positive side of the high voltage line (between the rectifier cathode and *B+* supply point) and acting as a filter choke.

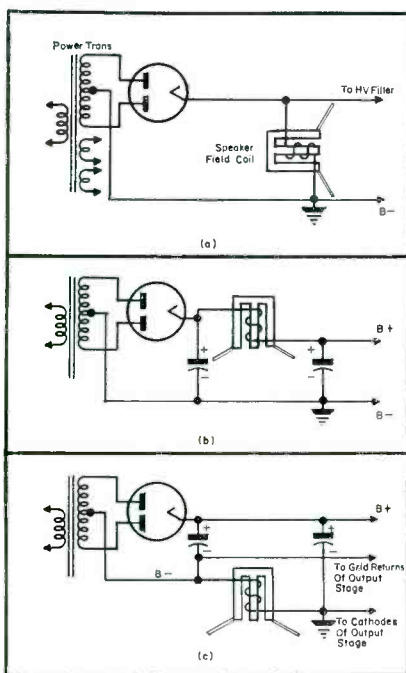


Fig. 2. Three types of speaker field-coil circuitry: (a) across the *B+* line; (b) in series with the positive side of the *B* supply, and acting as filter choke; and (c) in series with the negative side of the *B* supply line, acting as filter choke and as source of negative bias voltage for the output stage.



by MARK VINO

# for HI-FI Results

(3) Field coil in series with the negative side of the line (between *B*- and ground) acting as both a filter choke and a source of negative bias voltage for the output tubes. (This circuit is rare nowadays.)

The connections shown in *a* of Fig. 2 present the simplest problem. The field coil is simply removed from the circuit, a procedure which, far from hurting anything, gains a positive advantage in that the current drain on the *B* supply is reduced by at least seventy-five mils.

In the second type of circuit (*b* of Fig. 2) the field coil must be replaced by a filter choke. A choke inductance value of eight henries or more, with a current rating sufficient for the demands of the circuit (usually at least 100 mils), and as low a *dc* resistance as possible, fills the requirements.

The third type of field-coil circuit (*c* of Fig. 2) also requires a filter choke replacement, with a unit similar to the one described above. In this case, however, the *dc* resistance of the substituting choke must be approximately the same as the *dc* resistance of the original field winding, because the output-stage bias voltage will be formed by the *ir* drop across the choke. The new resistance should be within 10% of the original value.

Where the field coil is one of the last two types, and when tools, space,

and patience permit, the old speaker may be dismantled and its field coil allowed to remain in place electrically. It must be remembered that the complete U-shaped iron structure housing the field coil is an integral part of the inductive unit; only the cone, voice coil, and outer frame may be removed, as shown in Fig. 3.

### Addition of a Tweeter

Occasionally the old speaker will have good quality in the bass, but will show uneven and restricted response or high distortion in the treble. In such a case the addition of a high-frequency *tweeter* and dividing network can produce excellent results at reduced cost. The inductive-capacitive networks are superior to the resistance-capacitance types, as treble signals are kept from the *woofer*, and intermodulation and the effects of cone breakup in the woofer are reduced. Dividing networks may be either purchased or constructed. Instructions for making

such networks, including winding data for the coils, have been prepared.<sup>2</sup>

Most tweeters are more efficient than the woofers that they work with, and it is very important that a level control, preferably of the L-type, be provided for the tweeter circuit. This control is adjusted by ear for proper balance between bass and treble portions of the music. Too much signal to the tweeter creates an over-harsh sound; too little signal to the tweeter produces a muffled effect; and correct balance will produce the most natural sounding reproduction.

Since the tweeter and woofer handle the same signals in the mid-range of frequencies, they should be connected in-phase. This means that for the same frequency the moving elements of both units move forward together and backward together. When the two speakers are connected out-of-phase, cancelling interference will occur in the mid-frequency range, particularly if the tweeter is mounted very close to the woofer. The effect will be apparent to the ear as weak response in the range concerned. To remedy, the leads at the terminals of one of the speakers should be reversed. Figure 4 illustrates a method of testing for speaker phase by instantaneous reversal of tweeter leads. The output of the combined speakers must be checked, in both positions, from a normal listening position. When the woofer and tweeter are separated by an appreciable distance, the phasing may have little if any audible effect.

### The Loudspeaker Housing

The common open-backed commercial cabinet produces an acoustical resonance that can be heard as *boominess* in the reproduced bass. If the cabinet volume available for speaker housing is large enough it may be sealed off with a sturdy ( $\frac{3}{4}$ " back. Sometimes the enclosure volume can

(Continued on page 71)

Fig. 3. Dismantling the old field coil speaker so that it can conveniently remain in use as a choke.

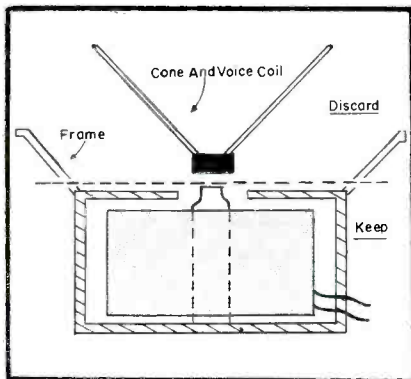
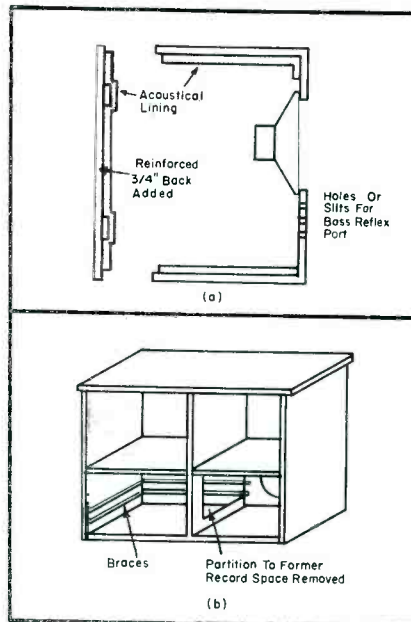
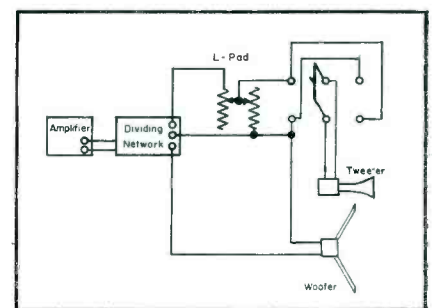


Fig. 5. Cabinet modifications to provide acoustically correct baffling.



<sup>1</sup> Mark, *Mounting the Loudspeaker*, SERVICE; March, 1953, p. 54.  
<sup>2</sup> *Crossover Networks for Speaker Systems*, University Loudspeakers, Inc.

Fig. 4. Method of testing relative phase of tweeter and woofer by instantaneous reversal of tweeter phase.



# Service Engineering

## field and shop notes

by THOMAS K. BEAMER

### Photoelectric Recorder Circuitry and Operation

IN A RECENT analysis<sup>1</sup> of photoelectric recorders, it was noted that this instrument serves a field in between the direct-acting pen and ink recorders and oscillographs using film. The device can have the sensitivity of a light-beam galvanometer such as is used in an oscillograph, but makes an immediately visible ink record.

This electronic-type of recorder is available in two forms: a deflection type<sup>2</sup> which employs pivoted or suspension-type basic measuring instruments, and a potentiometer type<sup>3</sup> which operates on the null-balance principle.

Basic measuring instruments for the deflection type are rated as *dc* microammeters or milliammeters although any measuring instrument of suitable size capable of rotating a small mirror, can be used as a basic instrument.

The potentiometer-type recorder is rated only in millivolts, and can be supplied with up to eleven full ranges.

Both deflection and potentiometer recorders are very sensitive. The deflection-type recorder uses mirror-type

indicating instruments as measuring means, and no additional mechanical or electrical burden is imposed on the circuit. The potentiometer recorder has a compensated galvanometer as a null-balance detector that can respond to minute changes in flow of current. A high-speed response is obtained by a photoelectric balancing system which rapidly moves the recording mechanism to follow the deflection of the measuring instrument or the null-balance detector.

#### Deflection-Type Recorder Operation

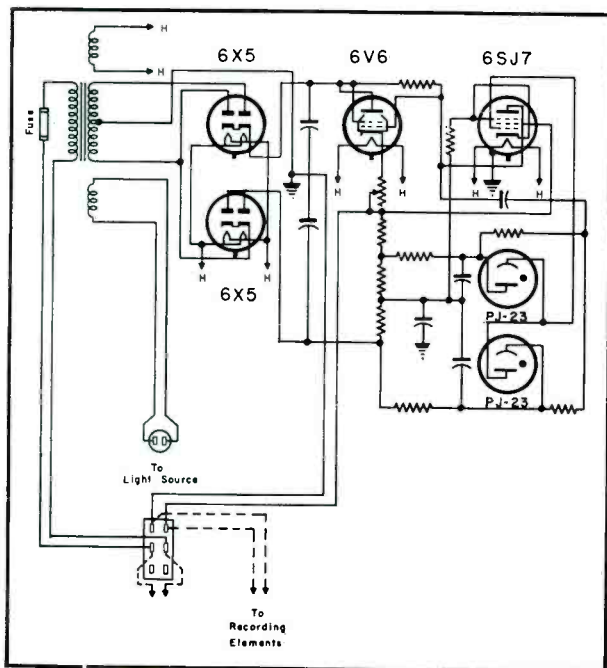
Fig. 1 shows the functional relation of the parts of a deflection-type photoelectric recorder. The shaft of the recording mechanism and the basic instrument each carry a small mirror, and are on the same vertical line. The light beam is provided by the small incandescent lamp, the light from which is focused by a pair of condensing

lenses. This beam is reflected, in turn, by the basic mirror, the spherical mirror and the recording mirror, until it is finally divided between two phototubes.

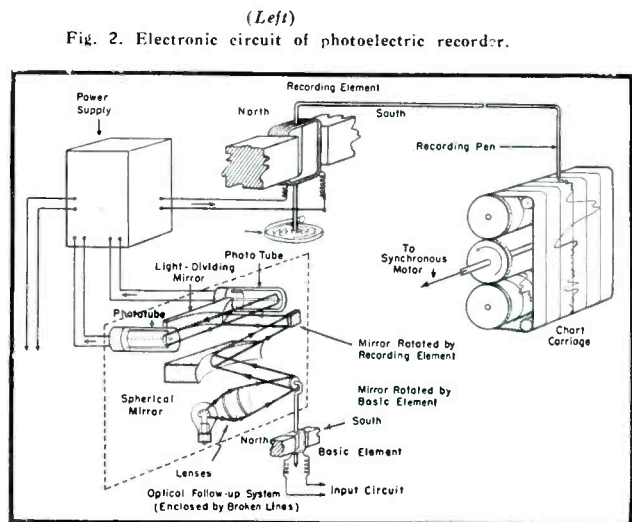
When the mirrors of the recording and basic elements are parallel, the light is equally divided between the two phototubes, and no current flows through the recording coil. To do this, the light from the basic instrument mirror is made to reflect from a spherical mirror, and thence to a light-dividing mirror. When these movable mirrors are in alignment, the light is equally divided between the two phototubes, and hence the voltage across these tubes is equal and the power supply, arranged to amplify the difference between these two voltages, applies zero voltage to the coil of the recording element. This is a stable condition and will remain stable until a deflection of the movable mirrors occurs.

As soon as the basic element mirror moves out of alignment, however, more light is reflected on one phototube than the other and the difference in voltage thus obtained is amplified and applied to the recording element coil in proper polarity to cause the recording-element mirror to move back into alignment with the new position of the basic element mirror. Alignment of the movable mirrors in this new angular position again sets up a stable condition where the light reflecting from the light-dividing mirror is equally divided between the two phototubes.

The operation of the recording mechanism is independent of the characteristics and rating of the basic measuring instrument. The recording  
(Continued on page 72)



(Below)  
Fig. 1. Operating diagram of the deflection-type photoelectric recorder.



(Left)  
Fig. 2. Electronic circuit of photoelectric recorder.

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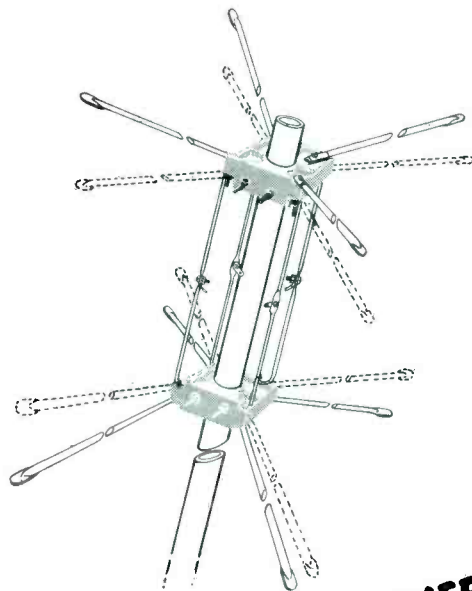
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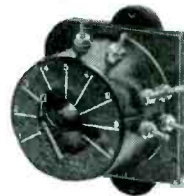
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The 9 position selector switch electronically rotates the antenna in a stationary position.

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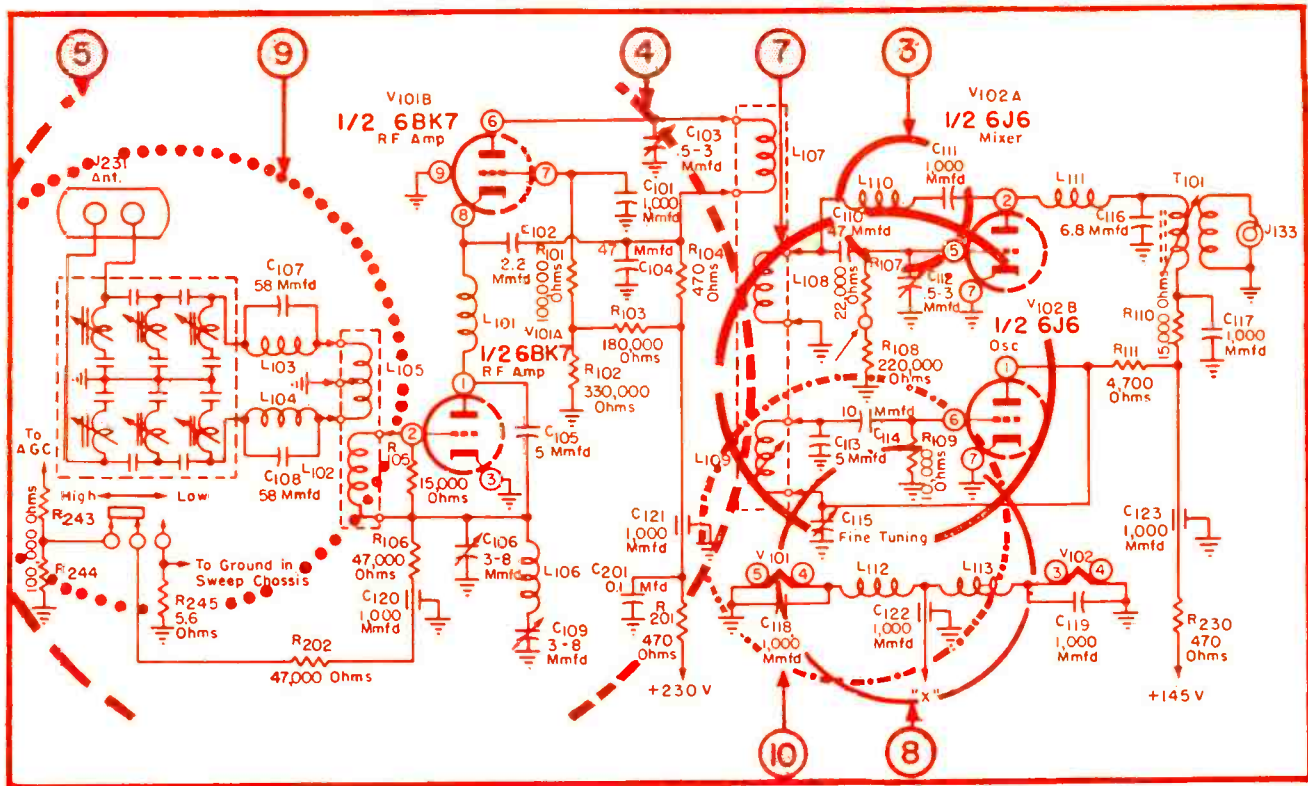
**ALL CHANNEL ANTENNA CORP., 70-07 QUEENS BLVD., WOODSIDE 77, NEW YORK**

# TV Front End Performance Factors

by CLARK R. ALISEN

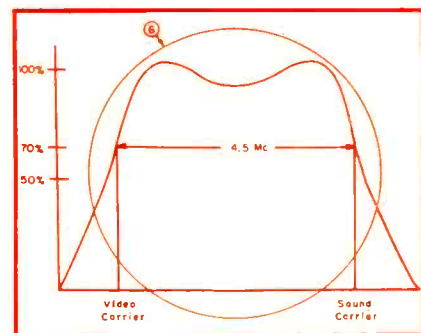
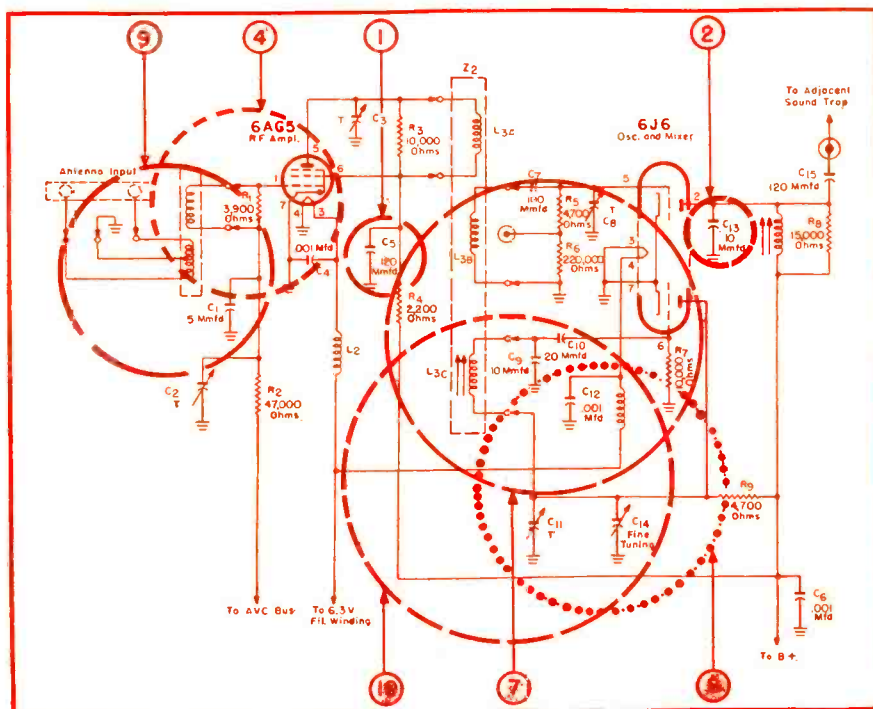
Condition	Reason	Control Method
RF bandwidth increases on high channels, and gain decreases. (1)	Due chiefly to increase of input conductance in <i>rf</i> tube, because of transit time.	Controlled regeneration must be introduced at the screen grid of the <i>rf</i> amplifier; if a screen grid is used. Regeneration on the high channels serves to narrow bandwidth and increase gain: See circuit at right; circle (1).
Mixer bandwidth becomes decreased excessively on high channels. (2)	Resonance of plate-lead inductance with mixer tuned grid circuit; <i>tptg</i> feedback.	Effective plate-lead inductance can be reduced by adding a 10-mmfd capacitor from plate terminal of socket to ground: See circuit at right; circle (2).
Mixer bandwidth becomes decreased excessively on low channels, when 40-mc <i>if</i> is used. (3)	Resonance of first <i>if</i> coil with mixer grid coil; <i>tptg</i> feedback.	Feedback can be reduced to an acceptable value by a 10-mmfd capacitor as noted above. Some front ends utilize an <i>lc</i> plate-grid neutralizing arrangement: See circuit at right; circle (3).
Superhet frequency conversion process makes receiver susceptible to image interference. (4)	Local oscillator, normally operating on the high side, can beat an interfering signal through as a low-side oscillator.	An <i>rf</i> amplifier stage should be utilized ahead of the mixer to provide more tuned circuits and hence greater selectivity. (The <i>rf</i> amplifier is often supplemented with traps, such as FM traps in 20-mc <i>if</i> systems): See circuit at right; circle (4).
Receiver noise is greater than atmospheric noise. (5)	VHF channels are relatively noise free.	Receiver noise can often be minimized by use of triodes in suitable circuits, such as the cascode amplifier: See circuit at right; circle (5).
Excessive snow, caused by compensating alignment procedure. (6)	RF amplifier provides a poorer signal-to-noise ratio at low gain.	RF amplifier response curve must be made as flat as possible. If the curve has a bad slump, and the signal falls below the noise level in the slump region, no further <i>if</i> gain can recover the signal: See plot at right; circle (6).
Mixer contributes appreciable noise when oscillator-injection voltage is incorrect. (7)	Conversion transconductance decreases when oscillator injection voltage is incorrect.	Injection voltage must be checked on each channel with a <i>vtvm</i> , and oscillator-mixer coupling adjusted for proper injection voltage: See circuit at right; circle (7).
Local oscillator interferes with neighboring receivers. (8)	Oscillator signal can radiate from <i>rf</i> chassis or from antenna.	Better shielding, and common grounding point will minimize oscillator radiation. The <i>if</i> frequency can be changed as required to throw the oscillator frequency out of active <i>rf</i> channels: See circuit at right; circle (8).
Maximum power transfer requires matching of antenna lead to <i>rf</i> input circuit. (9)	The maximum possible transfer is 50%; with a mismatch, part of the 50% is reflected back to the antenna.	The <i>lc</i> ratio of the input tuned circuits and coupling of antenna coils to grid coils must be adjusted for an impedance match: See circuit at right; circle (9).
Local oscillator tends to drift excessively on high channels. (10)	The effect of a small capacitance or inductance change becomes more pronounced on high channels.	Temperature-stabilized capacitors must be utilized, and components placed where thermal changes are smallest. A high-side low-side oscillator is used occasionally, if the <i>if</i> pass band is symmetrical. The intercarrier system is more tolerant of frequency drift than the split-sound system: See circuit at right; circle (10).

# Streamlined Analysis of Circuitry and Components Required to Insure Top Results from Mixer and RF Amplifier

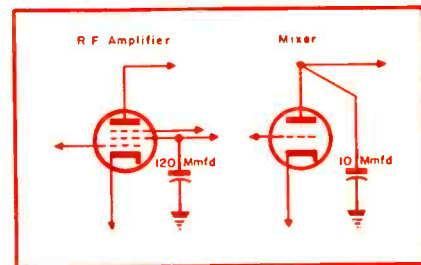


Front end featuring a turret-tuner which develops an unusually good signal-to-noise ratio as a result of cascade circuit. The use of  $C_{111}$  and  $L_{110}$  in the mixer plate-grid circuit are key factors in the circuit; this is a neutralizing arrangement which feeds back an out-of-phase signal from plate to grid to avoid changes in shape of the response curve on the low channels, due to mixer regeneration. Triodes are low-noise tubes, but subject to tuned-plate/tuned-grid regeneration, when the plate and grid circuits are tuned to approximately the same frequency, unless the triode is neutralized as in this circuit: Numbers in circles serve to identify portion of circuit similarly identified and analyzed in chart at left. (Courtesy DuMont)

Below, left: A popular turret-type tuner front end, utilizing a high-gain 6AG5 rf amplifier. (Courtesy Philco)



(Above)  
Picture and sound carrier waveform; carrier should never fall below 70% response point on the rf curve; see item 6 on chart. (Courtesy Philco)



Right: Controlled regeneration is an important factor in obtaining satisfactory front-end operation at both ends of the vhf band. Thus, it is important that capacitors be replaced exactly as in the original equipment. In rf amplifier, for instance, length of screen-grid lead controls rf gain and bandwidth on high channels, while in mixer, proper connection point of plate capacitor controls regeneration on lowest and highest channels.

# Design and Operation of Phonos Using Built-In Stroboscope

ONE OF THE MOST important items in phono operation control is the stroboscope disc<sup>1</sup> which makes it possible to determine the exact speed of turntables. Such discs are normally cardboard circular rings that can be placed on the record changer turntable; a neon bulb produces flashes above this disc, revealing turntable speed.

Some have always felt that this disc should be a basic part of every phono system and built in, if possible. Recently, one manufacturer<sup>2</sup> adopted this principle and included a small stroboscope disc in the record changer driven from the turntable through a rubber covered idler wheel attached to the stroboscope disc proper.<sup>3</sup> The ratio of speed of this disc to the turntable is 4:1. Since the neon bulb flashes 120 times per second when operated from a 60-cycle source, multiplying the 120 flashes per second times 60 seconds per minute, the bulb produces 7,200 flashes per minute.

## Wedges and Speeds

There are rings of wedges on these discs, often identified with the three speeds of  $33\frac{1}{3}$ , 45 and 78. On usual discs 92 wedges appear under the strobe light in  $\frac{1}{78}$  of a minute when a 78 speed is involved; the 78 ring of wedges on the disc appear to be standing still. If more or less than 92 wedges appear on the 78 ring during this period, the 78 ring appears to be floating forward or backward. The same situation applies to the 45 ring except that 160 wedges appear every  $\frac{1}{45}$  of a minute. For  $33\frac{1}{3}$ , 216 wedges must appear in  $\frac{1}{33.3}$  of a minute. Since, in this instance, the strobe wheel is rotating four times faster than the turntable, it is possible to reduce the number of wedges re-

quired on the wheel for each speed to one-quarter the required amount; therefore, for the 78 ring only 23 wedges are needed; for the 45 ring only 40 wedges are required, and for the  $33\frac{1}{3}$  ring but 54 wedges are used. The strobe disc is directly driven from the turntable; thus slippage between the two is said to be impossible, springs keeping the rubber drive wheel on the strobe assembly in direct contact with the turntable. Therefore, any indication given by the strobe serves as an accurate indication of turntable rpm.

The motor is shock mounted by the means of rubber grommets and fibre washers to a mounting plate and stud assembly. The entire motor and motor mounting plate revolve about a motor

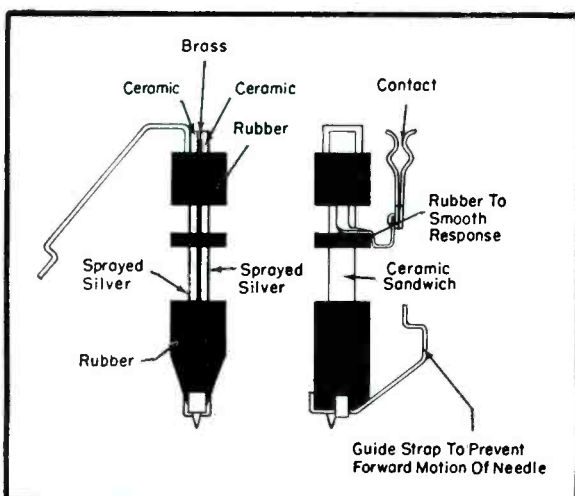
mounting stud. The point at which the motor mounting stud passes through motor mounting plate must be well lubricated to allow free action of the motor. The motor drive shaft is kept in contact and in constant pressure with drive wheel assembly by the means of a motor tension spring. This insures proper friction contact between the motor drive shaft and drive wheel. This wheel is firmly mounted in a drive wheel bracket and bearing assembly and pivoted on bearings at two points, eliminating possible lateral motion. This has been found to reduce the possibility of wows.

## Cycling in Strobe Phono System

The motor shaft contacts drive a wheel assembly and causes it to rotate

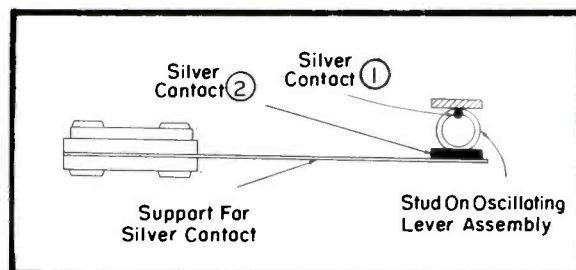
(Continued on page 59)

<sup>1</sup>Vino, Mark, *Record Players*, SERVICE; May and June, 1953.  
<sup>2</sup>Zenith. <sup>3</sup>Cobra-Matic; models S-14053/4/6/7.

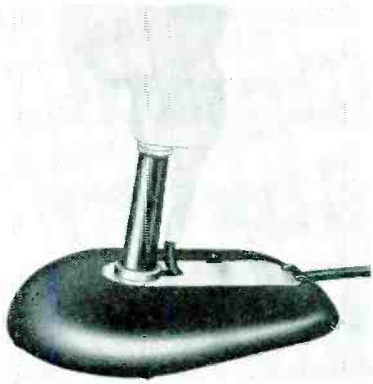


(Left)  
Simplified sketch of ceramic cartridge used in Zenith Cobra-Matic record changers.

(Below)  
Trip contact adjustment in Zenith 10/85 rpm changer.



## Features of Push-Button Tape Recorders, Remote Preamps and Amps



Desk stand designed for all types and styles of microphones with rear cable exit; microphone cable is concealed in a slot underneath the center section of chromium trim and is directed out at the rear of the base. Thus no removal of plugs or connectors is said to be necessary. (Model DS-10; Atlas Sound Corp.)



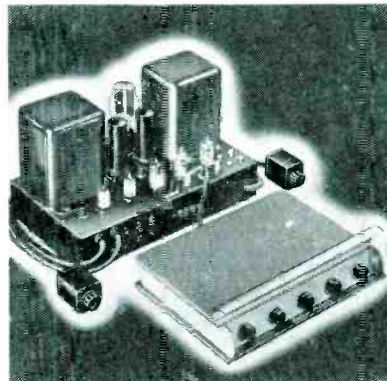
Speaker baffle kit for mounting extra speaker in auto package shelves. Kit includes a dash board 3-way switch which permits operation of the car radio speaker alone, rear speaker alone or both simultaneously; stamped baffle plate with tamper-proof perforated metal, and all necessary mounting screws. Designed for 6"x9" oval car speaker. (Lowell Mfg. Co.)



Packaged tape recorder containing recorder, preamp amplifier and speaker. Has a frequency range from 50 to 10,000 cps. Features push-button touch control system; push buttons for microphone or radio-TV recording, record or playback operation and base and treble response. Recorder offers recording speeds of both 7½ and 3¼ ips, on two tracks. (Model 303 Crestwood; Daystrom.)



A 3-speaker table model phono with a loudness control that is said to permit regulating sound from a whisper to full power without any change in frequency response. Unit is designed for placement on a table or buffet. Other features include response control that is claimed to permit one to vary frequency response to accentuate the treble or the bass. A five-tube (including rectifier) ac amplifier provides five watts. Automatic three-speed record changer is spring mounted to eliminate rumble and vibration. Equipped with automatic shut-off of the changer motor at the end of the last record. (Musical; Webster-Chicago.)



Audio ensemble consisting of a 20-watt master amplifier and remote control-preamp which is completely self-powered. Input selector and power switches are mounted on 5-foot extension cables, permitting flexible location in the cabinet housing the amplifier. A 6-position crossover and roll-off control provides automatic compensation for varying recording characteristics (in addition to loudness control for volume). Master amplifier uses two 12AX7s, one 12AU7, two 6AL5s, two 6L6s, one 5U4G and one 5Y3GT. Remote control-preamp uses three 12AX7 tubes. (Model 1826 and Libretto Remote; Rauland-Borg.)

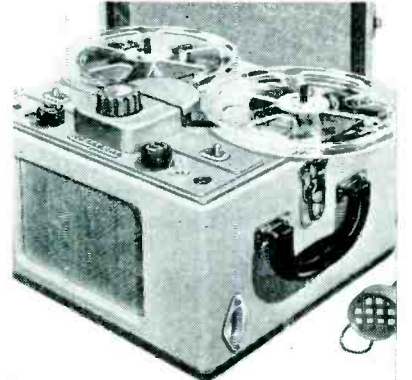
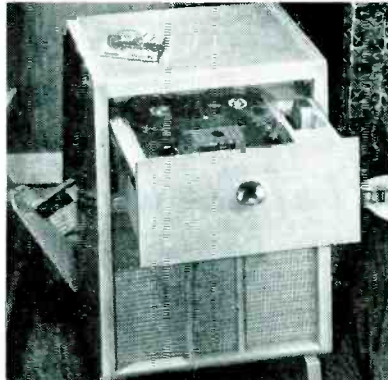
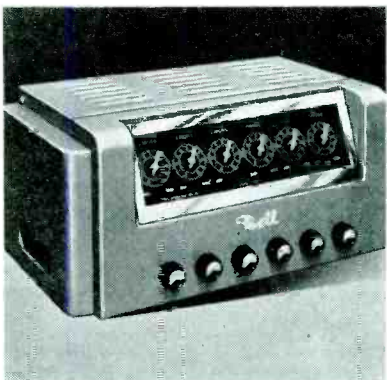


Tape recorder with a tape speed of 7½ ips, frequency response from 30 to 13,000 cps, and playing time on a seven-inch reel up to one hour, with dual-track operation. Five relay-operated piano keys control recording and playback; Record key is interlocked with a record safety button, thus preventing accidental erasure of recording; fast forward key provides rapid tape motion for accurate cueing or indexing. Amplifier is a 4-stage ac operated unit with a high-impedance input and 3.5-ohm output impedance. Tube complement includes one 58T9; one 12AX7; one 6AQ5; one 6C4; and one 6E5. (Model 756; Ampro Corp.)

An 8-tube 25-watt amplifier with a 70-volt constant voltage tap, which permits matching to any speaker load. Frequency response is said to be 30 to 18,000 cps  $\pm 2$  db. Gain at microphone channels, 122 db; phono channel, 80 db. Inputs: 3 microphone, 1 phono. Tubes include three 6AU6s; one 6SF5; one 6N7; two 6L6Gs and one 5U4G.

Automatic push-button 2-speed, dual-track magnetic tape recorder with a maximum recording time of 2 hours on both tracks of a 7" reel at 3¼" of tape per second. Features a push-pull beam power 6-watt amplifier and a 12-inch pm speaker mounted in a bass reflex chamber. Supplied with record lock button to prevent accidental erasure. (Model 3F40; Wilcox-Gay Corp.)

Tape recorder and 3-watt player designed for dual track recording. Handles up to 7" reels; two hours recording time on one 7" reel at 3¼ ips using standard tape. (Models 903 (3¼ ips) and 907 (7½ ips); Crescent Industries, Inc.)



# UHF Signal Survey Report‡

by DONALD PHILLIPS

DURING THE UHF signal surveys, it was found that measurements at 30', in congested downtown areas, between tall buildings, were meaningless unless taken at intersections or open areas, not always possible. In an alternative method signals were measured at roof top height. The purpose of this method was to duplicate the conditions of the average installation. In open country, it is possible to select locations so that one is in the clear, and thus average readings can be obtained over a distance of several hundred feet.

The purpose of these surveys was to determine how much signal was required to produce a good picture. The amount necessary will vary with personal opinion of what constitutes a good signal, other services available, programming, viewing conditions, and other factors. For the average receiver or selector-receiver combination, a signal of about 1,800 microvolts per meter was found to provide an image in which *snow* is not seen except by the most critical observer. Signals below this level may still be acceptable, depending on how critical the viewer is.

## Results of Findings in Four UHF Areas

**Portland, Oregon:** Portland is located about midway in a valley some 40 miles wide. To the east and west of the station, the signal was found to be in general, limited by the hills at the edge of the valley. To the east of the transmitter lives the major portion of the population. In this direction, the signal was found to measure 65,000  $\mu\text{v}/\text{m}$  at three miles from the transmitter, and 15,000  $\mu\text{v}/\text{m}$  at nine miles. There are shaded areas behind Mt. Tabor, Mt. Scott, and Rocky Butte. Extra receiver antenna height behind

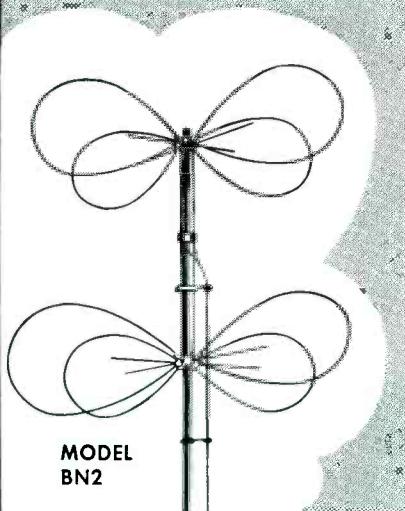
‡From a report reviewing surveys made by RCA Service Co. in Portland, Atlantic City, York and South Bend; initial installment appeared in July issue.

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We do not claim this antenna to have stupendous gain — however, in extensive field tests conducted, its gain exceeded by far our expectations. Judge for yourself, here is the report which can be verified by dealers and distributors who participated in the tests: The two-bay model when installed at Lufkin, Texas, and Henderson, Kentucky, brought in with good picture clarity and low noise level, channels 2, 3, 4, 8, and 11, up to distances of 150 miles or more—actual field strength meter tests showed gain ratio between this antenna and a single channel yagi—1 to 1½ in favor of yagi—a small difference in measured gain and little or no visible difference in picture and sound quality. The single bay when installed at Houston, Texas, brought in perfectly channels 2 and 8 in Houston, and channel 11 in Galveston, which is approximately 50 miles away.

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## JUST LOOK AT THE MARKET POTENTIAL

First: The single bay model will make possibly a highly desirable price installation that will appeal to the millions of primary area consumers who are getting limited reception with indoor or directional antennas.  
Second: The 2-bay model will bring antenna installation costs within the reach of the millions in fringe areas who have not been able to afford TV because of the expensive antenna installation necessary.  
Third: The 2-bay model will make a very effective advertising leader for step-up selling of higher priced directional and rotor installation to those who can afford it.

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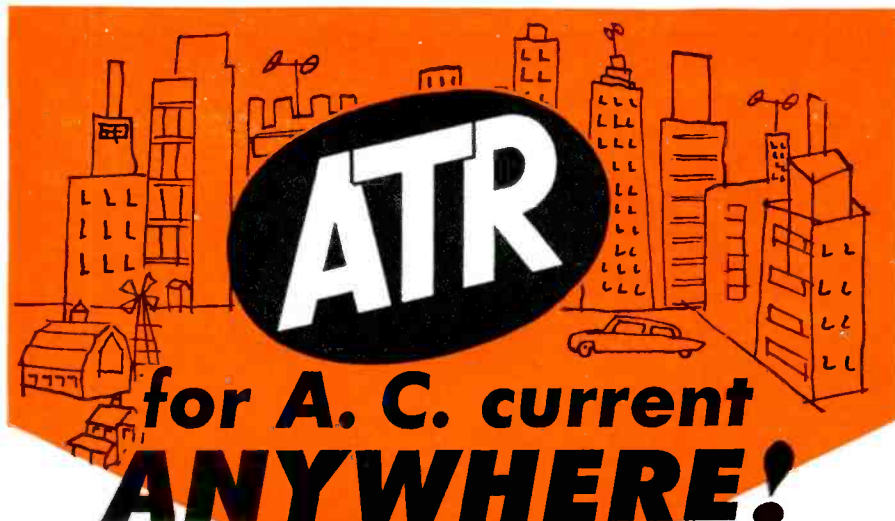
these obstructions will be of advantage. Five blocks behind Mt. Tabor, at 50' 1,500  $\mu\text{v}/\text{m}$  was measured. To the north and south of the station, signals travel over relatively flat terrain and approaches the theoretical. Close to the transmitter in the south is a large shaded area. This is caused by an intervening ridge of high ground. In this area, each installation will present a problem, and only a limited number will be satisfactory. Close to the transmitter in the north is another shaded area. Fortunately, there are relatively few people living in this area. In downtown Portland, directly under the transmitter, a problem is presented by tall buildings. There are signals in the order of 10,000  $\mu\text{v}/\text{m}$  on most of the rooftops.

*Atlantic City, New Jersey:* To the north and south along the coast, the signal was found to be slightly better than the theoretical. This was due to the fact that the signal travels in part over water. To the west, the signal fell short of the theoretical for several miles. Good pictures were obtained beyond that distance by adding extra antenna height. At Cape May Court House, 30 miles from the transmitter, a signal strength of 1,600  $\mu\text{v}/\text{m}$  was measured.

In the congested downtown area, readings ranged from a low of 7,800  $\mu\text{v}/\text{m}$  to a high of better than 100,000  $\mu\text{v}/\text{m}$ . Thus, it was obvious that a normal antenna installation will produce very satisfactory results. In the residential area of Pleasantville, Ventnor, and Margate City, higher signal levels were measured.

*York, Pennsylvania:* The area around York was excellent for observing the effects of hilly terrain on *uhf* signals and measurements helped to confirm theories. It was found that the signal would recover to some extent behind a close obstruction, but in many cases would not recover at all when obstructions were farther out.

*South Bend., Indiana:* Generally flat terrain surrounds the transmitter location, resulting in field intensities very close to the theoretical predictions. Signal level contours, when plotted on a map, approximated perfect circles. The outer limit of the grade *A* service range (5,000  $\mu\text{v}/\text{m}$ ) fell about at the 15-mile circle. The low end of the grade *B* service range (1,580  $\mu\text{v}/\text{m}$ ) fell about at the 25-mile circle. Close to the transmitter, lower field intensities were measured. At the three-mile circle, the signal averaged 8,000  $\mu\text{v}/\text{m}$ . At the five-mile circle, it averaged 50,000  $\mu\text{v}/\text{m}$ . South Bend came closer to the theoretical coverage than any of the other areas measured.



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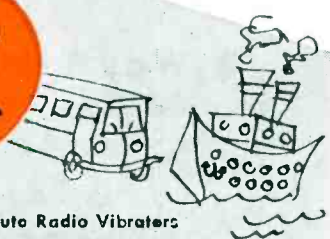


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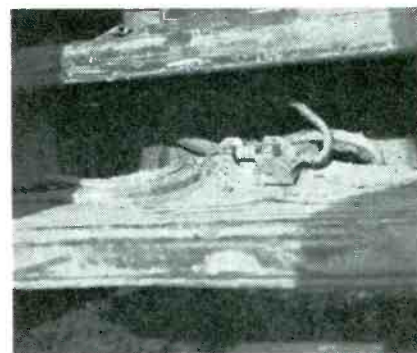
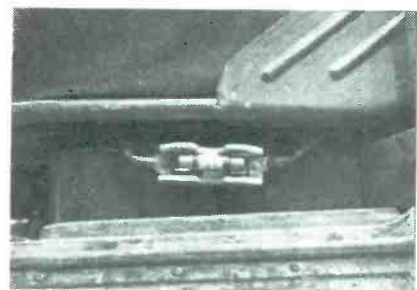


Fig. 9. Badly positioned fuseholder under floor-board of truck. Note accumulation of mud.

Fig. 10. Repositioned fuseholder above floor-board, under rim of seat. In this location fuse is accessible and removed from mud splatter.



relay box or fuseholder can be mounted on the inner fender-skirts, adjacent to the battery, with self-tapping screws, and will give very little trouble.

The best way to begin a cable-installation job is to tape the cables first, before they are installed in the body. Then they can be connected to the battery, control-head, etc., working back toward the sets, fastening them down as you go. By this method, the slack will be left at the set-end of the cables, and may be coiled inside of the box or cabinet. The excess length will permit the removal of the units for operation outside of the cabinet, for servicing or adjusting, if needed. If the units are to be tested mainly on the bench, the slack can be left at the battery and control head end.

[To Be Continued]

## 2-Way FM

(Continued from page 25)

coiled and tied up in place under the dash with friction tape.

Most sets use some sort of large fuse-holder or power relay-box where the battery leads are connected. Short leads from this go to the battery, and smaller leads usually go to the control box. If the battery is mounted beneath the truck floorboards, as in some vehicles, it is important to be sure and mount this fuse-holder where it will

not be damaged by mud and water. This point is illustrated in Figs. 9 and 10. The former installation under the car was very unsuccessful; the fuseholder was covered with mud at all times, and gave continual trouble until moved to the position shown in Fig. 10, above the floorboards, under the side of the seat.

### Relay-Box Fuseholder Mount

If the battery is under the hood, this trouble will not be encountered. The

## U/V Signal Generator

(Continued from page 29)

test applications, to use a lower value of attenuation than 10 microvolts, it is possible to use the second harmonic of the generator frequency, permitting one to obtain values down to as low as one-tenth of a microvolt. The leakage problem has been found to be no factor here, as operation on the second harmonic reduces the leakage still further. The output impedance is 50 ohms. An output meter is in the grid circuit of the 6AF4; this reflects the level of the


signal being fed to the attenuator. Since the grid of the tube will naturally draw more or less current at different frequencies of oscillation, it is necessary to establish a preset level of grid current to make possible a uniform calibrated attenuation of output. A potentiometer, or *meter set* control on the face of the generator, is in the plate circuit of the 6AF4. This can be readjusted at different frequencies to the calibrated red mark of the face of the output meter, thus affording a visual fixed value of grid current at all times, to make possible the constant calibrated attenuation for these changing frequencies.

In switching from *vlf* to *uhf* a resistor is placed in parallel with the compensated output meter to recalibrate properly the meter. The range of attenuation provided has been found to be more than enough to satisfy any of the usual sensitivity requirements.

The generator has provision for external AM modulation in the plate circuit capable of accepting a wide range of modulation frequencies. On production lines, it has been found increasingly advantageous, in making sensitivity checks, to use a piped TV pattern through a generator into the receiver, to a 'scope and observe its point of pattern disintegration at a given reading of attenuation on the generator, compared to a predetermined sensitivity rating. This can be accomplished on this generator with no trace of hum or distortion visible in the 'scope. To do this the output of the generator can be coupled, externally, through a simple diode crystal mixer to the receiver in use. For industrial applications, two generators can be used for this purpose, one tuned to the low *uhf* band and the other to the high end of the *uhf* band, with their output combined through a coax switch to the receiver. For extreme pin-point calibration of frequency during service work in the field, the generator can be zero-beat against existing *uhf* or *vhf* stations in operation in the locality. This is true in lab work also, from a calibrated crystal source.

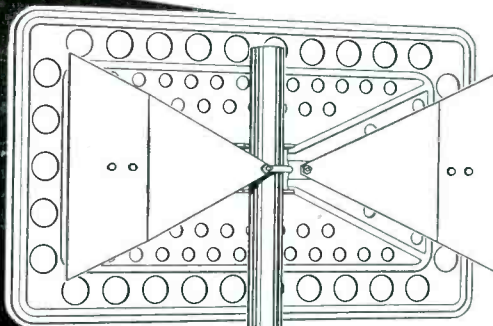
Some common uses of the generator consist of furnishing a calibrated *rf* signal source for alignment and adjustment of TV receivers and *uhf* converters, and as a signal source of sensitivity checks. It can also be used as a marker generator. A factor to consider also is that the unit covers the new citizens band of 460-470 mc and the 900-mc telephone band, as well.

The face of the instrument is provided with a calibrated frequency dial, which is driven by a set of anti-back lash gears.



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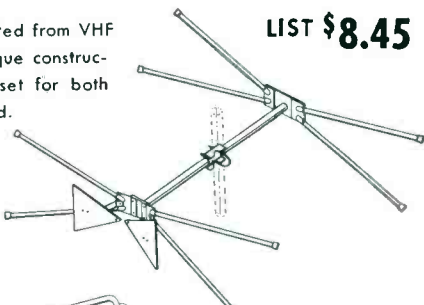
**NEW UHF-VHF "BOW-X" ANTENNA**

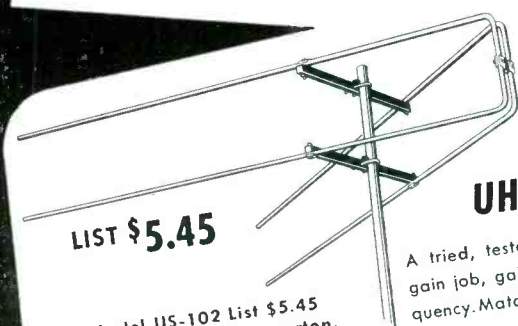
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Double Stack,  
1 to a carton.

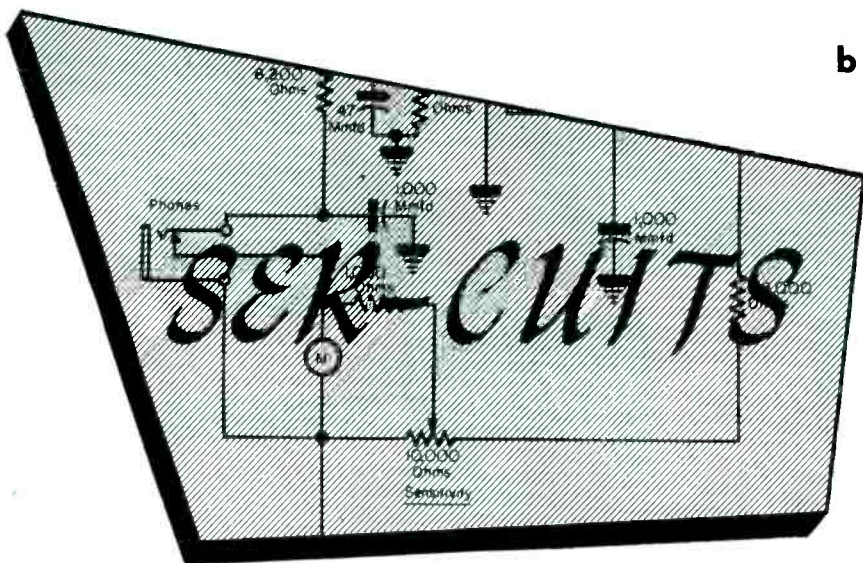
Model US-104 List \$11.75  
Quad Stack with  
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### Analysis of UHF/VHF Chassis Using Cascode Turret Tuner and Tunable Ultrahigh Channel Strips

MOST TV RECEIVERS, now coming off the line, have been designed for both *vhf* and *uhf* pickup. In some chassis, turret tuning is employed with provision made for insertion of *uhf* strips, while others offer continuous tuning for the high bands. In either case, special precautions have been taken in the selection of tubes<sup>1</sup> and circuitry for upper and lower channel tuning.

To illustrate, one series,\*† using a cascode-type tuner, employs a 6U8 triode-pentode, designed especially for mixer-oscillator applications; the triode section serves as a local oscillator and pentode as mixer. The pentode mixer has been found to be ideal for the purpose, since it would be difficult to neutralize a triode when it is used as an *if* amplifier on the ultrahighs. Block diagrams showing application of this tube and associated elements for *uhf* and *vhf* operation appear in Figs. 1 and 2.

A complete circuit diagram of the *vhf-uhf* tuner used in this series<sup>‡</sup> with switch in the *vhf* position is shown in Fig. 3. The antenna is connected to a

center-tapped primary. Two *if* rejection traps, resonated to approximately the center of the *if* bandpass, increase the *if* rejection on channel 2 and on *uhf*. These traps were designed so that additional resonant frequencies are not present in the *uhf* band; the coils are small self-supporting solenoids, while the capacitors are of the small ceramic disc type.

The *rf* grid coil is returned to ground through a trimmer capacitor (2.5 to 6 mmfd) which is adjusted to equal approximately the value of the input capacitance of a 6BK7. A 2-mmfd capacitor between the trimmer and the 6BK7 plate provides neutralization, which has been found to be substantially independent of frequency.

The 6BK7 was selected for *rf* amplification because it affords the lowest possible noise figure on all channels. The cascode interstage is series tuned near channel 13 by means of a series coil connected between the first plate and second cathode. The two triode sections are connected in series and, therefore, have identical values of plate

current. The grid of the second triode is held at a fixed potential by means of a voltage divider network between *B+* and ground, thus giving a relatively rapid cutoff of the plate current in the first triode section, which is controlled by *agc* voltage. So that the gain of the cascode stage may not be reduced before the signal is completely free of noise, the application of *agc* to the 6BK7 is delayed. This is accomplished by providing some cathode bias to the *if* amplifier and allowing the *agc* voltage to go positive by this amount. When the *agc* voltage is positive, a 2.2-megohm grid-leak resistor of the 6BK7 holds its grid near zero; actually slightly negative due to contact potential. When the *agc* voltage passes through zero, the signal level is sufficiently high so that the noise figure of the *rf* amplifier is no longer important and the 6BK7 is then rapidly cutoff by a further increase of *agc* voltage in the negative direction.

The pair of double-tuned circuits between the *rf* amplifier plate and the mixer grid are provided with a shunt trimmer capacitance and a series trimmer inductance on each circuit. The two coils are returned to ground through a common inductance which provides some coupling between the circuits on the high channels. On channel 13, the coupling between the coils and on the strip actually opposes this common inductive coupling slightly, while on the lower channels this common inductance coupling is reinforced in varying amounts by the coupling between the coils on the strip. All other coupling mediums between these circuits has been avoided.

The oscillator tube is decoupled from the coil on the strip by means of a 5.5-mmfd series capacitor. This effec-

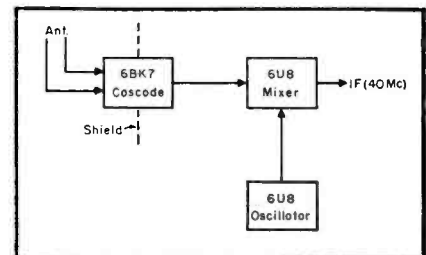
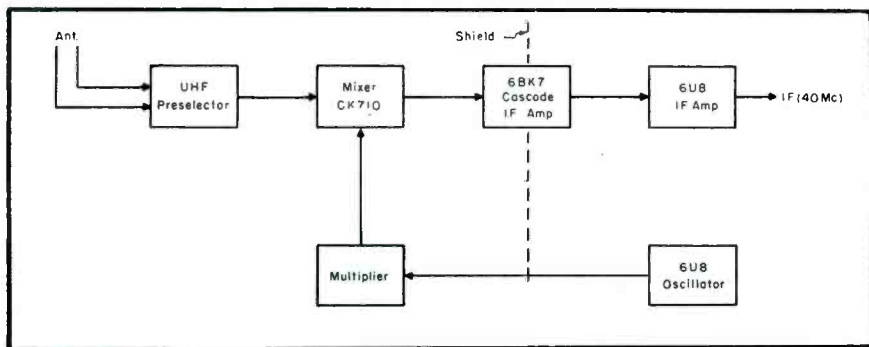
<sup>1</sup>See *Tube News* report, this issue, page 55.

<sup>2</sup>Zenith K and L series. <sup>3</sup>Zenith K-53.

<sup>‡</sup>From notes compiled by Harry D. Hooton of the Zenith Radio service division.

Fig. 2 (left): Setup of Zenith tuner system with *uhf* strips in place.

Fig. 1. Block diagram of tuner input for Zenith K chassis with *vhf* strips in place.



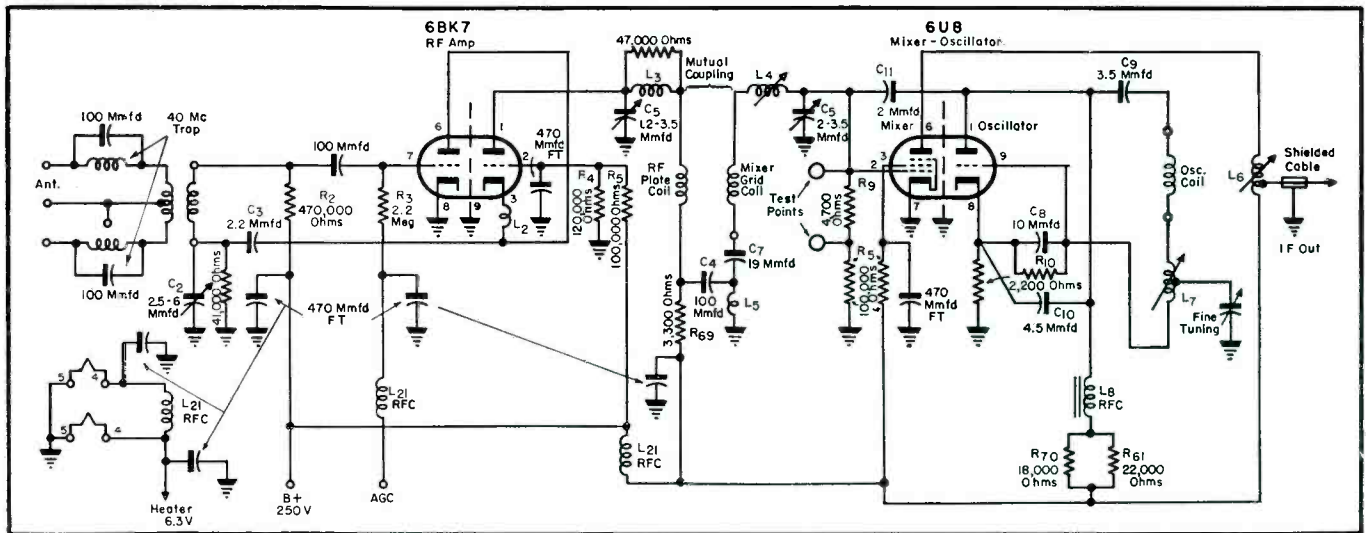


Fig. 3. Circuit diagram of *vhf-uhf* tuner used in Zenith series K chassis. Channel selector switch is in the *vhf* position. FT = feed-through capacitors.

tively increases the inductance value of the oscillator coil and thereby minimizes the effect of contact and other stray inductances, and reduces the effect of tube and voltage variations on the oscillator frequency. Since a larger percentage of the total circuit inductance is on the strip, a higher *Q* is obtained in the oscillator tuned circuit. The tube is further decoupled from the circuit by shunting it with two capacitors in a Colpitts arrangement; 4.5 mmfd between plate and cathode and 10 mmfd between grid and cathode. A variable capacitor tapped on *L7* and designated *fine tuning*, is used at the plant for standardizing the circuit and as a fine tuning control by providing a stop which, after the factory trimming adjustment, permits the capacitor to be turned only two turns out of the several in its complete range.

Where leads are brought out of the oscillator compartment for the *B+* and heater, feed-through ceramic capacitors and series *rf* chokes provide good isolation of all oscillator *rf* circuits.

For *uhf* operation, it is necessary to

feed the oscillator power into the crystal multiplier which is inside the antenna compartment. The possibility of coupling oscillator power to the antenna has been avoided by providing a stator contact which has an effective grounding finger on either side of it and shielding around it. This contact is fed by means of a short coax cable extending into the oscillator compartment to an extra stator contact which is not used on *vhf*. On *uhf*, a small capacitor is connected between this terminal (11) and the plate end of the oscillator coil. On *uhf*, further isolation between the multiplier contact, 6, and the antenna is provided by the *uhf* tuned circuits on the channel strip.

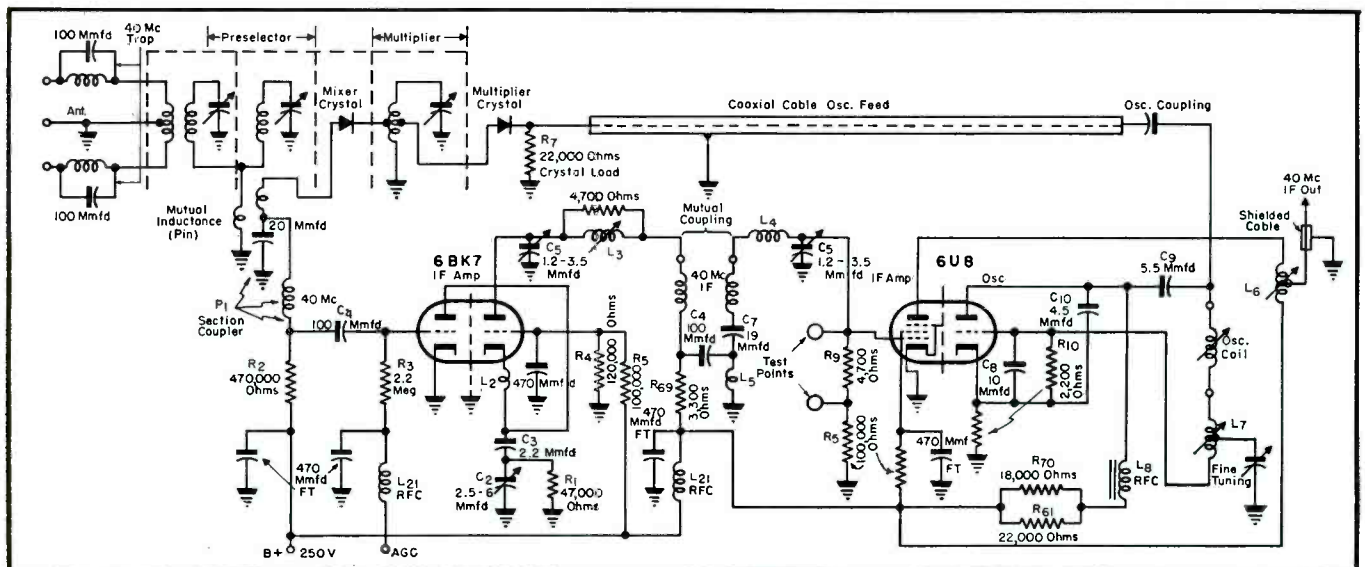
Fig. 4 shows a schematic of the tuner with the *uhf* channel strips in place. There are two tuned circuits in the preselector, and a multiplier tuned circuit, making a total of three *uhf* resonant circuits. Two crystal diodes are mounted in the antenna section of

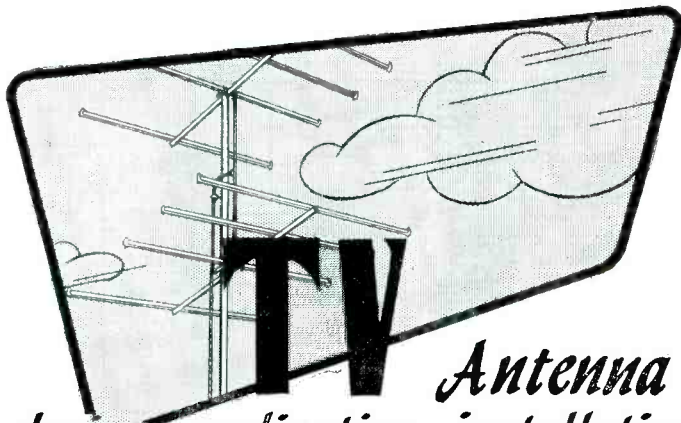
the *uhf* channel strip in a metal casting which also houses the preselector and multiplier tuned circuits. Coupling between the antenna and the first tuned circuit is by means of a very small center-tapped loop inductively coupled to the low potential end of the coil. Coupling from the second preselector circuit to the mixer is accomplished by a small loop, one side of which is returned to a 20-mmfd *rf* bypass capacitor, and the other side connected to the crystal. This *rf* bypass capacitor also forms a part of a matching network to the 6BK7 grid. The other side of the mixer crystal connects to a tap on the multiplier coil, near the low-potential end, to provide oscillator excitation to the mixer. The multiplier crystal is also connected to another tap slightly higher on the multiplier tuned circuit. The other side of the multiplier crystal connects to oscillator through turret contact and shielded cable.

The preselector and multiplier coils are extremely small; .4" long and 1/8"

(Continued on page 73)

Fig. 4. Circuit of tuner in *uhf* position.





## UHF Parabolic Antenna Design † . . . Wavetrap Applications

# TV Antenna Digest

*design.. application.. installation.. service*

by RALPH G. PETERS

BECAUSE OF its broadband effect, the bowtie type antenna has been widely used on the ultrahighs. During a recent developmental program, involving bowtie design, an open type bowtie was designed: it consisted of two loops of  $\frac{1}{8}$ " aluminum wire with a fundamental resonant frequency in the lower spectrum of the band; 500 mc. The study revealed that since the antenna also possessed the characteristics of a folded-dipole, it had resonant frequencies through the *uhf* spectrum to the highest frequency used. With such an antenna, it is possible to secure a relatively flat frequency response, with a tendency to rise in gain as higher frequencies are reached.

Tests indicated, too, that there was less tendency for flutter if the antenna were made with the greatest possible resistance to wind; the initial wave striking the antenna results in the greatest overall gain to the receiver. The study also highlighted the fact that a reflector makes use of that portion of the wave which is reflected in phase to the antenna, by returning it to the antenna; a solid type reflector should give maximum reflected energy.

In view of the foregoing results, it was decided to design an antenna

which offered broadband tuning and a minimum of wind resistance, and used a solid reflector of the parabolic type.

Actually, a parabolic reflector resembles an automobile headlamp which gives maximum forward energy or light due to fact that the reflector is solid. This feature it was felt would be very effective.

Parabolics have been frowned upon because they are critically sharp at the fundamental frequency, but it has been found that when a broadband antenna is used with a parabolic reflector the overall frequency response, gain and directivity are broadened. Thus an antenna with broadband tuning was coupled to the parabolic; some attenuation of signal was noted, but the gain has been found to be substantial and the directivity broadened.

Tests have proved that a TV signal, when reflected from a nearby building or structure, is sometimes stronger than the direct signal, especially from the transmitter, if the direct signal has interference such as trees, wires, etc. The reflected wave received at the antenna will increase the overall gain; this reflection must, of course, be in phase to prevent any ghost. Using a

parabolic form as a reflector has been found to be an efficient means of utilizing the reflected wave. The driven element energy, when spaced  $90^\circ$  from the reflector, will be added to the reflector energy. This condition has been found to hold only when the parabolic is a true  $90^\circ$  from the antenna, and not just  $90^\circ$  at the center and plus or minus any number of degrees at the extreme ends of the parabola.

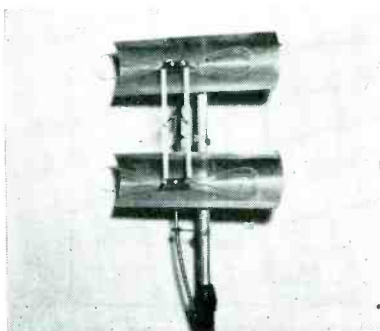
To convey the energy at the antenna to the receiver, 300-ohm lead-in contacts have been included. It was found that a distance between matching bars of  $2\frac{3}{8}$ " (using  $\frac{3}{8}$ " wide straps of .064" aluminum) between centers gave the lowest *swr* at extreme ends of the spectrum: The antenna, operating at 617 mc, has been found to have a *swr* of 2:1 reception.

### Antenna Components

The complete antenna consists of two parabolics tied together at a distance of  $10\frac{3}{4}$ " between antennas; if one antenna is to be used the matching stubs must be cut in half, and each stub used as a  $\frac{1}{4}$  wavelength matching section. The antenna lead can move

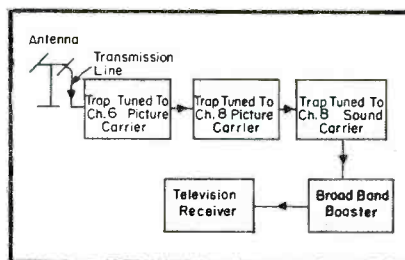
(Continued on page 74)

UHF parabolic antenna incorporating broadband and matching strips. (Industrial Engineering Corp., Tampa 4, Florida.)

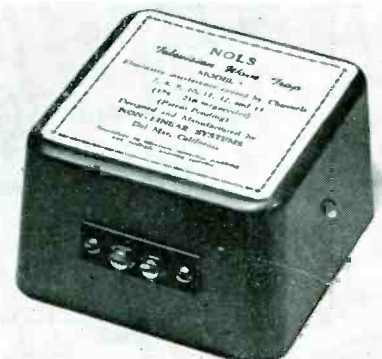


†From notes prepared by Ray Murphy, electronics engineer, Industrial Engineering Corp.

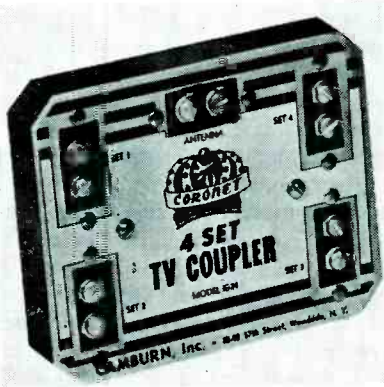
Fig. 1. Network of tuned traps in antenna-to-set line designed to eliminate channel 6 and 8 picture and sound-carriers interfering with signals on channels 5, 7 and 9. (Courtesy Non-Linear Systems.)



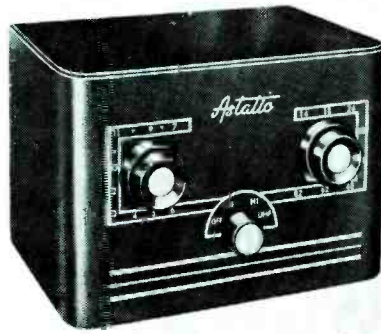
TV interference filter said to have an attenuation of 100:1. Rejected bandwidth is claimed to be 2-3 mc wide. Trap has balanced input and output circuits for use in 300-ohm line. One trap is required for each interfering signal; units may be cascaded for complex problems. Traps have a tunable range of from 20 to 40 mc. (Nols Wavetrap; Non-Linear Systems, Del Mar, Calif.)



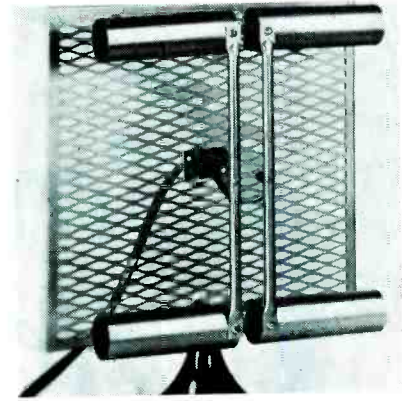
# Pictorial Report on VHF/UHF Antennas . Converters . Boosters . Hardware



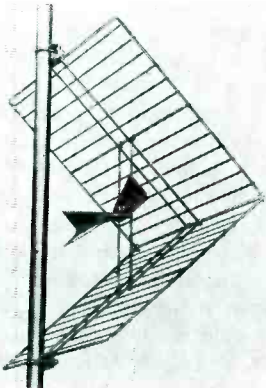
Two and four-set couplers using bifilar coils. May be used with either 300-ohm twinlead or 72-ohm coax cable. Housed in molded plastic container. (G22 and G24; Camburn, Inc.)



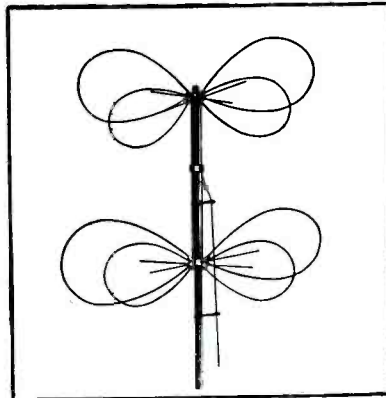
Combination *uhf* converter and *vhf* booster. Converter provides continuous tuning throughout the *uhf* channels. Employs two tuned preselectors, a 6T4 or 6AF4 *uhf* oscillator and a 1N82 silicon diode mixer. (Model CB-1; Astatic.)



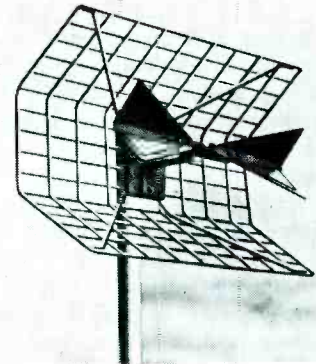
Frequency-tuned indoor antenna designed for veryhigh and ultrahigh use. (Model 600; Tricraft.)



Corner reflector antenna for *uhf*. Utilizes a collapsible reflector comprised of tuned dipoles. Receiving element is a bowtie with air gap at the signal takeoff points. The antenna is said to mount with its vertex in back of mast so that a fixed aperture is maintained, thus eliminating pulsating signal. (Model COR-U; RMS.)



Rocket type of antenna designed for *vhf* and available in single and two-bay models. According to manufacturer, two-bay models, when installed at Lufkin, Texas and Henderson, Kentucky, brought in with good picture clarity and low noise level, channels 2, 3, 4, 8, and 11, up to distances of 150 miles. (Models BN-1 and BN-2; Tel-A-Ray.)

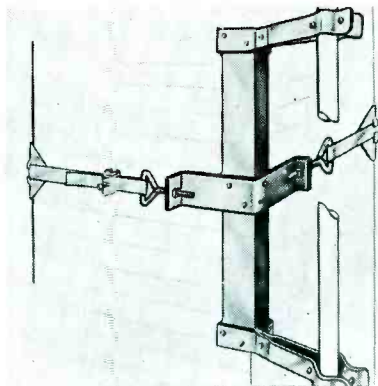
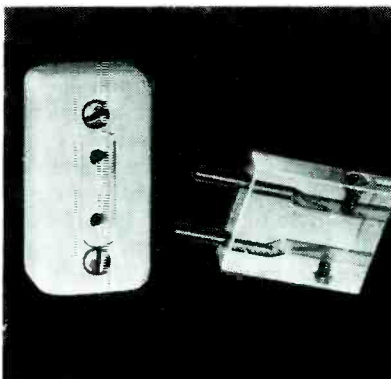


Gold-colored *uhf* antenna said to have average gain of 12 db (over half-wavelength folded reference dipole) and front-to-back ratio of 20 to 1. Matching stacking harnesses are provided to balance stacked units. Has Bronzidite electric plating, which consists of cadmium, iridite and chromate. (Model UHF 633 Golden Mini-Cor; IFD.)

Multiple TV set coupler and leadin socket combined in one unit, measuring 15/16" x 1 3/4" x 1/2". Coupler is said to minimize interaction between sets and reduce oscillator radiation from the transmission line. Each unit will operate two sets from one antenna and, under suitable conditions, several couplers may be employed to permit up to four or five sets to be used simultaneously, manufacturer claims. Designed for use with either flat or tubular transmission line. (Tiny-Mite; Mosley Electronics.)

One-piece chimney antenna mounting featuring rounded, wide-flared lips on the mast holder held under spring tension. Tension of the mast holders said to retain the mast and free the hands of installer so that he can bolt the mast in permanently. *Kwik Klip* banding closure (patented) is included. Mounting is supplied with hot dip galvanized finish. Banding is of stainless steel. Chimney corner guards included to protect banding and chimney when the banding is tightened. (UM-1; South River.)

UHF-TV converter said to be especially designed for low-signal area installations. Features a two-section preselector with two silver-plated coax cavity tuners; double-shielded fundamental oscillator, and broadband amplifier with cascade circuit. According to the manufacturer, signal power loss in the preselector is reduced to 3 db; noise figure is a maximum 17 1/2 db to a minimum 15 1/2 db. Oscillator tube socket and all associated circuits are inside coax cavity, self-shielded to confine the normal oscillator signal. (TV-3; Turner Co.)



# Servicing Helps

by **T. L. GILFORD**

UHF STRIPS for turret-type tuners, which are basically converter circuits built on coil forms, perform essentially in the same manner as external converters; change the *uhf* signal to a *vhf* frequency.

In Admiral chassis, the *vhf* oscillator stage is connected directly to a harmonic generation circuit, incorporated in the *uhf* channel strip. The harmonic selector circuit selects one of the harmonics of the oscillator and inductively couples it to the *uhf* mixer. The received *uhf* signal from the antenna is coupled to the *uhf* mixer by a preselector circuit. The resultant

signal at the output of the *uhf* mixer is a *vhf* frequency between 110 and 175 mc, and is coupled to the *vhf* *rf* amplifier. The output of the *vhf* *rf* amp is injected into the *vhf* mixer. The fundamental frequency of the *vhf* oscillator is also coupled into the *vhf* mixer stage. The resultant signal from the output of the *vhf* mixer (21.25 mc) continues through the remaining stages of the *vhf* receiver in the usual manner.

To illustrate a *uhf* conversion operation, let us assume that a 541.75 mc

†From *uhf* transmission and reception bulletin prepared by Admiral service department.

signal (sound carrier of channel 25) is being received at the antenna. The fundamental *vhf* oscillator frequency of 187.75 mc is multiplied to 375.5 mc (second harmonic) by the harmonic generator and inductively coupled to the *uhf* mixer. The resultant difference frequency at the output of the *uhf* mixer is 166.25 mc. This frequency is amplified by the *vhf* *rf* amp and then mixed at the *vhf* mixer with the *vhf* oscillator fundamental frequency. The result is a difference of 21.5 mc, which is near the sound *if* frequency of the receiver *if* section, and can be made to fall at the proper place on the *if* response curve with slight adjustment of the local oscillator fine-tuning control.

Most of the *uhf* channel strips, in the Admiral chassis, can be adjusted for optimum performance, using the signal from a *uhf* station or signal generator, by adjusting the slugs in the four coils on the antenna (5 contact) strip. It is usually advisable to *break* or loosen these adjustment slugs (using a 1/8" metal blade screwdriver) before attempting to make the adjustments with the non-metallic tool described below. This will prevent breaking the blade of the non-metallic tool if the slugs are tight. At the same time, the slugs should be inspected to see if they are slotted on both ends. In some strips the slugs were slotted only on the contact side. These strips cannot be readily adjusted and should be used only in good signal areas. If it is necessary to adjust these strips, the following procedure should be followed (except the third step) using the trial-and-error method.

### Non-Metallic Screwdriver

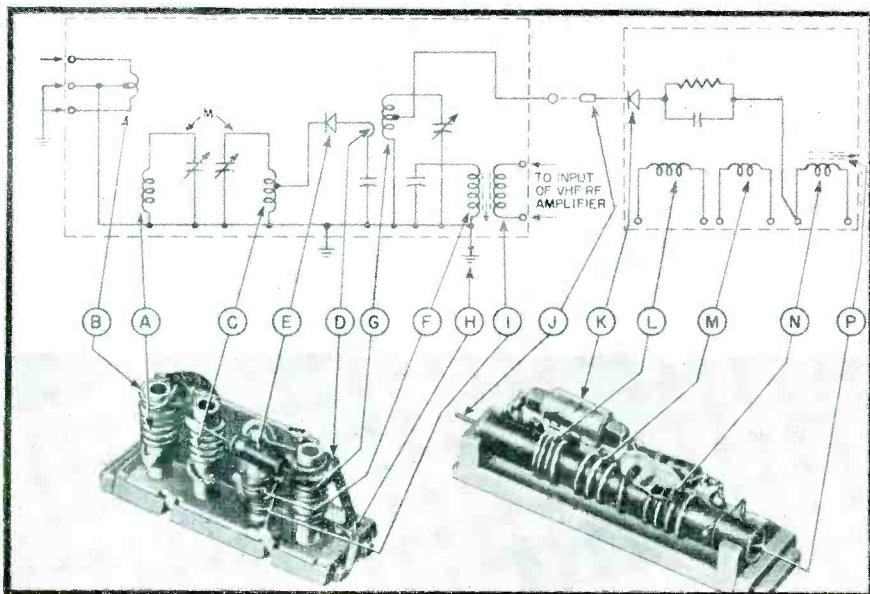
To adjust the slugs, a very small non-metallic screwdriver is required. This can be made by filing down an ordinary fiber oscillator slug-adjustment tool. One should be sure that the diameter of the tool is small enough to fit inside the coil forms without moving or distorting the forms during adjustment.

After the set has warmed up for about 15 minutes, the channel selector should be set to the *uhf* channel to be received, the fine tuning control set at the center of its range and the *uhf* channel slug adjusted for best picture. This adjustment is the same as for a *vhf* channel and the same precautions should be observed. Only slight rotation is usually required and the slug should be turned out first, then in, to prevent it from falling into the coil form.

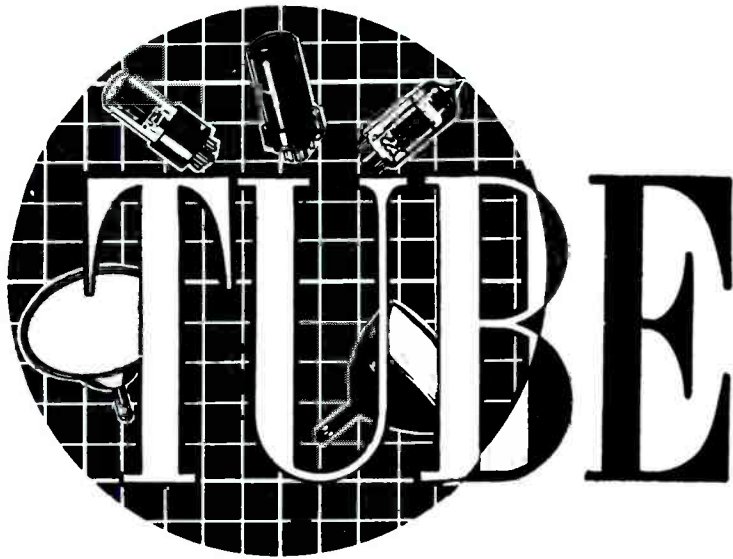
Now, one must remove from the tuner drum two or three of the *vhf*

(Continued on page 75)

Fig. 1. Schematic and pictorial diagram of *uhf* channel strips used in Admiral chassis, with turret-type tuners, for conversion. In the 5-contact antenna (left) and 6-contact oscillator-converter (right) strips: A = *rf* preselector; B = antenna coil; C = *rf* preselector; D = *uhf* coupling loop; E = crystal (*mixer*); F = first *if* coupling coil (primary); G = harmonic selector; H = added ground contact to turret detent disc; I = first *if* coupling coil (secondary); J = connecting pin between converter and antenna strips; K = crystal (harmonic generator); L = *rf* coupling; M = converter grid coil; N = oscillator coil; and P = oscillator slug.







# News — by E. A. TEVERSON

## Ultrahigh Amplifier / Mixer / Oscillator Tube Design and Circuitry Requirements

ON THE ULTRAHIGHS many unusual design and operational requirements obtain. For maximum amplification and conversion gain at these frequencies, tubes must feature element shielding and provision for external shielding, low plate and grid lead inductance, and high *mu* and *gm*.

For such service, several types of tubes have been developed. In one line\* a 6AN4 high-*mu*, high-*gm*, seven-pin miniature triode is now available for use as an *rf* amplifier or a mixer at frequencies up to 1,000 mc. Design features of this tube include high *mu* for reduced oscillator drive requirements when used as a mixer; internal shield between the plate leads, and the cathode and heater leads (connected internally to the grid connections) to isolate the input from the output when used as a grounded-grid amplifier; double grid and plate leads to reduce lead inductance; and basing

that is said to permit additional external shielding between the input and output circuits.

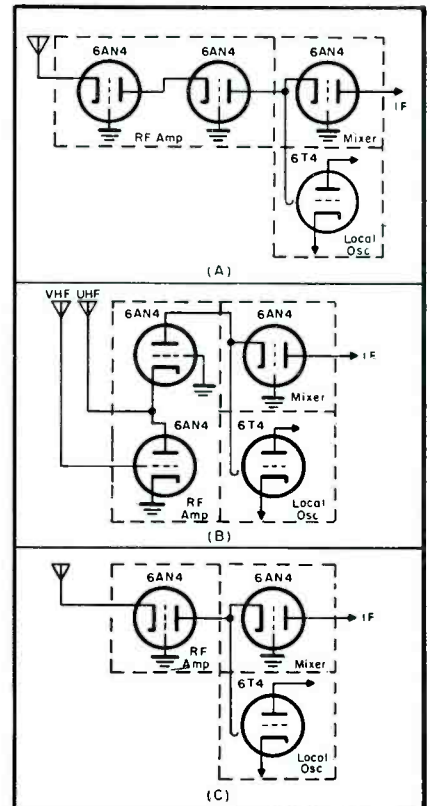
The 6AN4 has been found to be particularly effective as a mixer. With a high conversion transconductance of 2,900 micromhos, a gain is obtained in conversion. The high *mu* of this tube is claimed to require relatively low oscillator drive.

The tube can be used in *vhf* inputs, as illustrated in Figs. 1 and 2; the former being a single-tube amplifier for channel 13, and the latter a cascode setup using two 6AN4s for their channel 13. Tests revealed the gain of the single-tube amplifier to be 14 db with a 10-mc bandwidth and a noise figure of 9 db. Two type 6AN4s displayed a gain of 22 db with 7.5-mc bandwidth, and a noise figure of 8 db.

In Fig. 3 appears an amplifier designed for *uhf*. Such an amplifier can

\*Sylvania.

Fig. 4. Three possible tuner arrangements for *uhf* and *vhf* utilizing the 6AN4 and 6T4.



employ an open-ended coax line for tuning and cover the range from 450-900 mc by changing the line length. Representative gain and noise figures are 12 db at 450 mc; at 900 mc the gain is 10 db and the noise figure 15 db. In each case, the bandwidth is 10 mc.

Another of the new *uhf* tubes is the 6T4, a medium-*mu*, seven-pin miniature triode designed for use as an oscillator at frequencies up to 1,000 mc. It is of the short-bulb construction, and features double grid and plate leads. Operation at the higher frequencies is possible with a capacitive-tuned open line, or a tuned shorted line. A properly designed oscillator will develop 5 to 6 volts bias on grid (10,000 ohms in grid return) at 950 mc.

With the 6AN4 and 6T4 either of three *vhf-uhf* tuner arrangements are

(Continued on page 76)

Fig. 1. Grounded-grid *vhf* amplifier employing a single 6AN4.

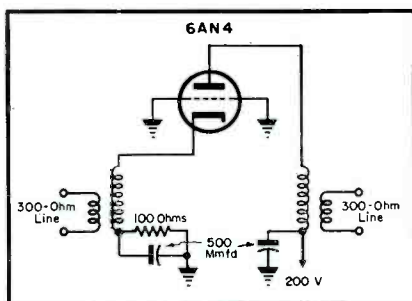
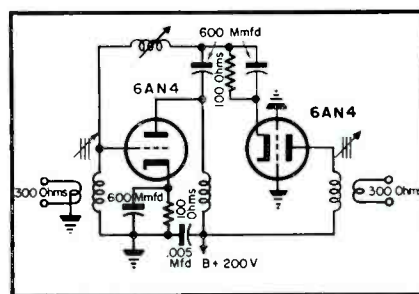
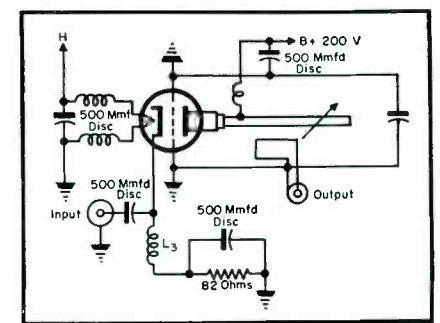


Fig. 2. Cascode *vhf* circuit with two 6AN4s.

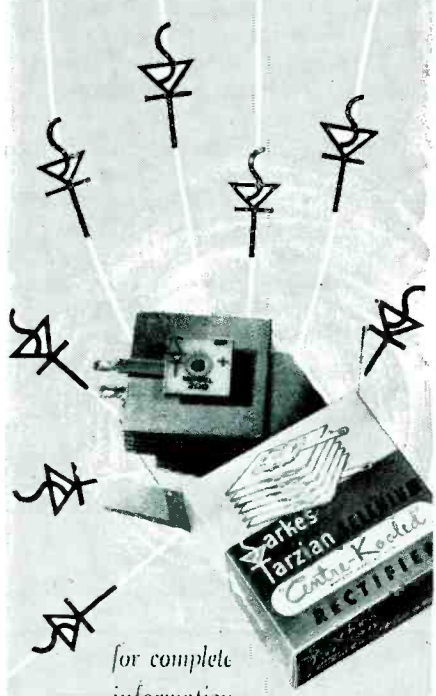


(Circuits courtesy Sylvania)

Fig. 3. Coax line *rf* amplifier for *uhf* using a 6AN4.



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## On Book Row

**CIRCUIT THEORY OF ELECTRON DEVICES**  
BY E. MILTON BOONE: Text emphasizes circuit theory rather than the physics of electron devices. Among the book's features are an integration of tube and transistor circuit theory. Chapters included, in addition to foregoing feature, are: diodes, triodes, tetrodes, pentodes, and equivalent circuits; *af* voltage amplifiers; audio-amplifier power stage; gas-filled tubes as circuit elements; single-phase rectifiers and power supplies; tuned *rf* and bandpass amplifiers, etc.—483 pages, priced at \$8.50. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

\* \* \*

**PRINCIPLE AND PRACTICES OF TELECASTING OPERATIONS** . . . BY HAROLD E. ENNES: All phases of telecasting operations from network and remote links through the monitors, cameras, control rooms, studio transmitters, and even production planning, are covered by the author in 12 chapters. In addition, book also contains a complete appendix on FCC rules and regulations, and a glossary of program production terms and technical definitions.—600 6" x 9" pages (to be published Oct., '53.) Howard W. Sams & Co., 2201 E. 16th St., Indianapolis 5, Ind.

\* \* \*

**GUIDE TO AUDIO REPRODUCTION** . . . BY DAVID FIDELMAN: An explanation of the reproduction of sound; book covers the fundamentals of sound and then discusses all phases of audio reproduction systems and their requirements. Design, construction and assembly of these systems and their components are detailed. Also featured are methods for testing individual units; explanations of the circuitry of preamps and amps, along with a discussion of pickup devices, loudspeakers and enclosures. Includes a section on servicing.—250 (5½" x 8½") paper-bound pages; John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.

\* \* \*

**THE RADIOTRON DESIGNER'S HANDBOOK** . . . EDITED BY F. LANGFORD SMITH: Fourth edition of this volume, covering the design of radio and audio circuits and equipment; contains more than 1500 pages, 1000 illustrations, cross-referenced index, and hundreds of circuit diagrams. Has 38 chapters grouped under seven major headings: general theory and components; radio frequencies; rectification, regulation, filtering and hum; complete receivers, covering the design and testing of AM and FM receivers; and sundry data, devoted to tables, graphs, etc.—Priced at \$7.00; RCA Tube Dept., Commercial Engineering, Harrison, N. J.

\* \* \*

**AUTO RADIO MANUAL** . . . VOLUMES 2 AND 3: Both editions contain data on auto radios, including circuits, alignment instructions, parts lists and descriptions, and voltage and resistance readings. Vol. 2 covers receivers used in '48, '49 and early '50 autos, and Vol. 3 covers receivers used in late '50, '51 and '52 autos.—288 pages each volume (8½" x 11" paper bound) priced at \$3.00 each; Howard W. Sams and Co., Inc.



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# CATALOGS, BULLETINS ETC.



GENERAL ELECTRIC Co., Electronics Park, Syracuse, N. Y., has prepared a 17-page pamphlet, *Quick Facts About Color Television*, which is said to answer almost every question that might be asked about color TV.

\* \* \*

CBS-HYTRON, Danvers, Mass., has released an 8-page substitution chart for TV picture tubes. Chart includes an index to the proper substitution group, listing all readily interchangeable types.

\* \* \*

HEATH Co., Benton Harbor, Mich., has issued a 4-page brochure describing a line of instrument and audio kits. Included are an isolation transformer, 12-volt battery eliminator, 20-watt hi-fi amplifier, and bar-generator kits.

\* \* \*

STANDARD COIL PRODUCTS Co., INC., 2732 N. Pulaski Rd., Chicago, Ill., has prepared a brochure on TV tuner and *uhf* coil strips. Brochure provides a circuit diagram of the tuner, trimmer location and mounting dimensions and explains how to adapt the *super* cascode tuner and pentode tuner to split-sound *if* systems.

\* \* \*

RCA TUBE DEPARTMENT, Commercial Engineering, Harrison, N. J., has published a 16-page picture-booklet on tubes featuring photos, cutaway drawings, and exploded views showing structural details of tubes. Tubes dissected include typical glass, metal and miniature types; subminiature triode; thyratron; *hw* rectifier; power triode, super-power triode; TV picture tubes, etc. Priced at \$.25.

\* \* \*

CHANNEL MASTER CORP., Ellenville, N. Y., has released a 16-page booklet, *Antennas and Boosters*, discussing factors which determine the performance of TV antennas and boosters. Subjects discussed include gain, directivity, impedance of antennas, and the gain, noise figure, *vswr* and balance-to-imbalance ratio of boosters.

\* \* \*

SHURE BROTHERS, INC., 225 W. Huron St., Chicago 10, Ill., has prepared a catalog, #1, covering microphones, parts and accessories, phono cartridges and pickups, wire and tape recording heads, and lists replacement information on phono cartridges, and magnetic recording heads.

\* \* \*

RADIART CORP., Cleveland 13, Ohio, has published a brochure on their *Rotor* line, including the TR-2, TR-11 and TR-12, as well as accessory items, including boosters and automatic clocks. . . . A catalog on a line of TV antennas for both *uhf* and *vhf*, as well as indoor models, is also available. . . . A supplement to the vibrator replacement guide, with up-to-the-minute listings, has also been released.

\* \* \*

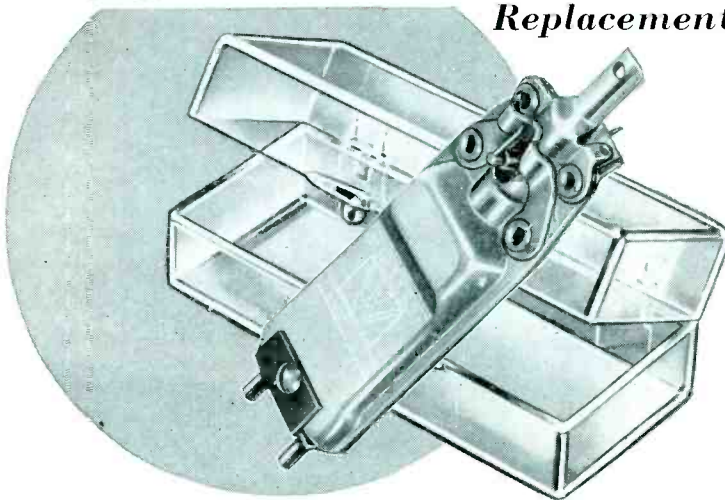
INTERNATIONAL RESISTANCE Co., 401 N. Broad St., Philadelphia 8, Pa., has prepared a 6-page catalog bulletin, *SR-3*, describing voltage current characteristics, current ratings, typical applications, and dimensions on *varistors* (non-linear resistors).

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# ALL-CHANNEL UHF CONVERTER



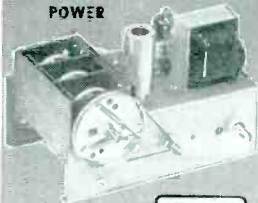
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Frank Wedel, Halldorson rep, and Ray Johnston, associate.



Right: Reviewing Rauland picture-tube promotional flyer, left to right: Nelson W. Wells, who handles the Connecticut area for the firm; W. B. Pray, Rauland New England rep; Robert Lang, Rauland distributor sales manager, and Ben Farmer, Rauland sales manager.

## Rep Talk

THE REPS membership now totals 612; 16 senior and 28 associate members have been added to the rolls within the past three months. . . . *Floyd H. Gleason* has joined the sales staff of Royal J. Higgins Co., 10105 S. Western Ave., Chicago, Ill. Gleason was formerly associated with the radio and electronics division of Montgomery Ward and Co. . . . *John Butler*, formerly with Radio Craftsmen and Newark Electric Co., has been added to the sales staff of R. Edward Stemm, who has moved to new offices at 5681 W. Lake St., Chicago, Ill. . . . *William C. First* is now a sales and service engineer for D. Dolin Sales, 1200 N. Ashland Ave., Chicago, Ill. . . . *W. J. Barron*, former sales manager for the Merit Coil and Transformer Corp., Chicago, has become a manufacturers' rep on the west coast. . . . *Henry G. Maerlender* has been appointed rep for Vee-D-X in Ohio, West Virginia and western Pennsylvania. . . . *Kaelber and Mack*, 1270 Broadway, New York, N. Y., has been named rep for Perma-Power Co., in metropolitan New York and surrounding counties. . . . *Fred Ellinger*, president of the Ellinger Sales Corp., 6540 Northwest Highway, Chicago, Ill., died recently. . . . *Frank J. Perna*, 2506 Stoney Brook Lane, Drexel Hill, Pa. (Washington, D. C., Delaware, eastern Pennsylvania), and *Russell G. Rago*, 1406 W. Idaho Ave., St. Paul 13, Minn. (North and South Dakota and Minnesota), have been appointed reps for Permoflux Corp. . . . *Paul W. Nief*, 15 Oak St., Westport, Conn., has been named rep for Halldorson Transformer Co., in Connecticut, Massachusetts, Rhode Island, New Hampshire, Vermont and Maine. *The Frank Wedel Co.*, 3215 Western Ave., Seattle, Wash., will cover Washington, Oregon, western Idaho and western Montana for Halldorson. . . . *Dan J. Connor Co.* has announced its incorporation as the *Danco Corp.*, 1346 Suburban Station Bldg., Philadelphia 3, Pa. . . . *Dave Werner* has been appointed direct factory rep for Vaco Products Co. in the state of Michigan. . . . *Leon L. Adelman* has been named rep by River Edge Industries for the metropolitan New York area and New Jersey. . . . *Ernest L. Wilks Co.*, 1212 Camp St., Dallas 2, Texas, is now rep for Baker Manufacturing Co., and will cover Texas, Oklahoma, Arkansas, Louisiana and western Mississippi. . . . *John T. Stinson Co.*, 219 Sagamore Rd., Havertown, Pa., has been appointed rep for John F. Rider, Publisher, Inc., in eastern Pennsylvania; Camden, Atlantic City and Phillipsburg, N.J., and Delaware.



## Audio

(Continued from page 44)

by friction contact with its rubber surface. A drive wheel assembly drives an idler wheel. The underside of the turntable is in contact with the idler wheel and driven in this manner. Speed of the turntable is controlled by changing the position of the idler wheel on the drive wheel. When the idler wheel is moved to the center of drive wheel, it will rotate more slowly than when moved to the outer edge. In this manner the turntable can be driven at any speed from 10 to 85 rpm. Minor adjustments for proper tonal pitch can be made by simply moving a speed change lever back and forth to compensate for turntable speed which may vary due to line voltage changes. When a record change button is depressed, it energizes a solenoid which then attracts a trip pawl assembly. The same thing occurs when the forward movement of the tone arm causes the friction lever and weight assembly to contact a silver plated contact on the trip switch assembly. When a gear segment is released a gear pawl spring causes the gear segment to engage the rotating pinion gear under the turntable, thus causing a clutch assembly to rotate.

As the clutch assembly rotates a tone arm lift lever swings in such a manner that it contacts a tone arm lift pin and raises the tone arm. Simultaneously a tone arm link and stud assembly slides towards and contacts one finger of the tone arm lever assembly, forcing the tone arm towards the outer edge of the turntable; then on its return swing it contacts the other finger of tone arm lever assembly swinging the tone arm back over the records. The position to which it swings the

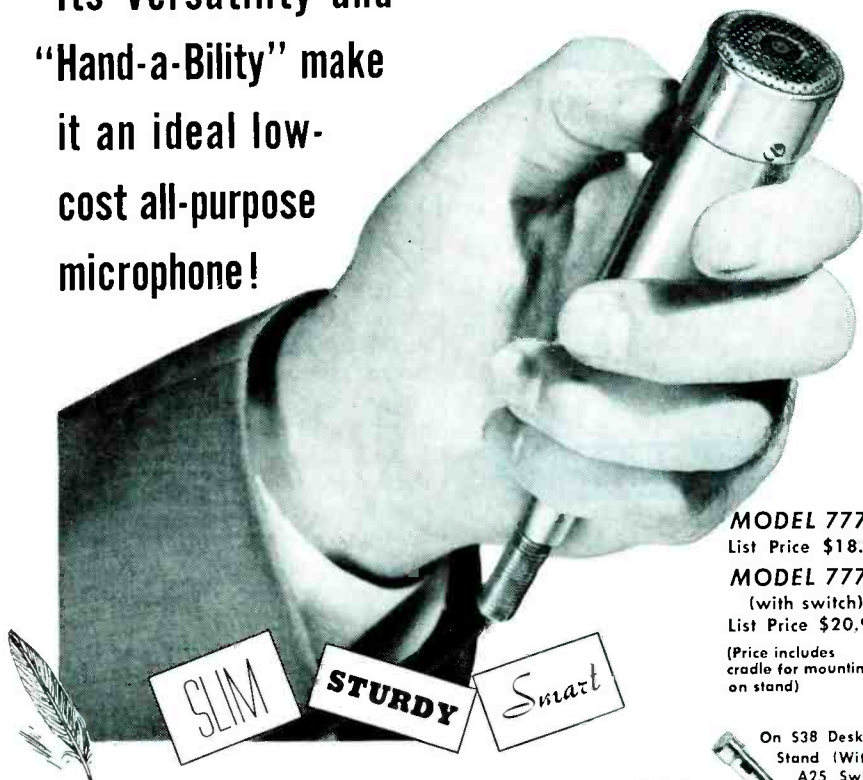
(Continued on page 60)

Portable sound system which consists of two 10" Alnico speakers mounted in a split-type carrying case of  $\frac{3}{8}$ " plywood covered in black and white no scuff plastic. Sliding shelf at the bottom of cases holds either a 15 or 25-watt amplifier, while shelf at the top of each case-half allows for storage of microphones and extension cords. (Model SS-464; Webster Electric.)



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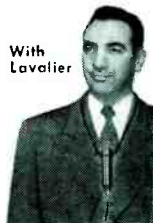
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(Continued from page 59)

tone arm over the records is determined by the position of a record size discriminator. There are three steps on this discriminator which determines the set-down position for 7", 10" and 12" records. The tone arm lift lever returns and releases a brake lever assembly which keeps the tone arm from moving erratically during cycle. Simultaneously, an ejector lever and link assembly rotates; this in turn causes the spindle shaft to rotate and the ejector cam to push the record off the spindle shelf.

This changer is provided with what is commonly known as a velocity trip rather than a ratchet and positive trip mechanism. A velocity trip depends for the tripping action on the rate of forward motion of the pickup arm with respect to the turntable rotation. The changer will trip only when the tone arm advances more in one revolution of the turntable, than the distance between normal grooves in a record. Only records having fast finishing grooves will operate the velocity trip. During the normal playing cycle, the friction lever and weight assembly continually moves forward toward the silver contact on the trip switch assembly.

On normal forward advance, the friction lever and weight assembly is kept from contacting the silver contact by a wiping action from an oscillating lever and stud assembly. Oscillation of oscillating lever and stud assembly is produced by an eccentric motion of the oscillating gear which is driven by the pinion gear on the lower portion of the turntable. The oscillating gear is mounted off-center so it will describe an eccentric action as it is being driven by the turntable gear. The tone arm moves in towards the center of the record and the repeated action of an oscillating lever keeps friction lever and weight assembly from coming in contact with the silver strip on the trip switch assembly, as the pickup arm moves slowly towards the spindle and lead-in grooves. During the first revolution of the turntable, in the eccentric cycling grooves, the pickup arm advances rapidly and the friction lever and weight assembly is moved forward fast enough so that the oscillating lever does not halt its progress; therefore, the friction lever and weight assembly contacts the silver trip contact on the trip switch assembly grounding it and making a complete circuit. This actuates a solenoid, causing the changer to cycle.

### Cobra Cartridges

This 10/85 model employs an all-purpose cartridge with a 2-mil diam-

For Quick and Accurate Testing All Types of ELECTRONIC GEAR!

## New INSTRUMENTS TECHNIQUES

The amazingly versatile LEE line of precision-engineered, professional quality test units for Radio, TV, Radar, Communications Gear—Low Cost, Complete, Pocket-Sized!



\$24.95

MODEL E-C Pat. Pending

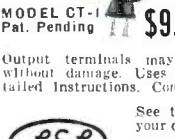
The LEE TV SERVISSET—for quick, convenient trouble shooting. Checks: sync, sweep, video, audio circuits, TV high-volt supplies (DC, RF, or Pulse), low-volt supplies, coils, condensers, resistors, tubes, transformers, speakers, etc. Localizes trouble to exact stage, determines defective component, can restore operation temporarily in 80% of component or tube defects. Complete with handy cloth pouch, accessories and instructions. . . . Only \$24.95.



MODEL PS-1 Pat. Pending

\$4.95

The LEE ELECTRONIC POWER SUPPLY—used with Models E-C or E-A—increases sensitivity to over 200 Megohms—provides both AC & DC test voltages permitting wide range of resistance and continuity tests. Output terminals can be safely shorted or grounded without damage. Rugged plug-in design with 6' power cord. Complete instructions. . . . Only \$4.95.



MODEL CT-1 Pat. Pending

\$9.95

The LEE ELECTRONIC CONDENSER TESTER AND LEAKAGE INDICATOR—built-in power supply with both AC & DC test voltages. Ideal for high resistance continuity testing AII electrical and electronic circuits and parts, indicating leakage, resistance or insulation breakdown to over 200 Megohms. Output terminals may be safely shorted or grounded without damage. Uses any 110-125 AC power line. Detailed instructions. Complete as shown. . . . Only \$9.95.



See these time saving profit makers at your distributor—or write for full details.

**LEE ELECTRONIC LABS, INC.**

DEPT. S, 233 DUDLEY STREET, BOSTON 19, MASS.

# CARBON-TET

Finest Cleaner for Electrical Parts

1. Quickly removes oil, grease, tar and other soils from electrical parts!
2. Safe, Won't burn! Won't explode!
3. Won't harm finest surface or finish!
4. Dries instantly—no odor or residue!
5. Economical for cleaning sliding contacts, condenser plates and chassis. Also as a wash for carbon deposits.

In gal. cans, qt. cans, 8-oz. bottles. Order from your jobber.

**THE KERDEN CHEMICAL CO.**  
5717 WALWORTH AVENUE • CLEVELAND 2, OHIO

# FREE! U.H.F. and "THE VERSATILE CRYSTAL PROBE"

Solve your U. H. F. ANTENNA PLACEMENT and ORIENTATION problems the easy way!

Get maximum picture strength - eliminate ghosts - no more roof-top shouting - no expensive field strength meters needed!

**ONE MAN CAN DO IT!**

Write for FREE bulletin today and other information about KLIPZON products.

**UNITED TECHNICAL LABORATORIES**  
207 LITTLETON RD. ★ MORRISTOWN, N. J.

eter stylus or a special type designed for 45, 33 $\frac{1}{3}$  and 16 $\frac{2}{3}$  records.

The outer shell of this cartridge consists of a 2-section plastic case with one pressure type contact on top of the cartridge, and another slide pressure type contact on the side of this cartridge.

Internally, the element consists of two strips of ceramic material soft soldered on either side of a brass strip in a sandwich-like unit. This construction, it has been found, adds the individual voltages of each ceramic unit, thus giving twice the electrical output. The sandwich must then be subjected to voltage for polarization purposes in a manner similar to the magnetization of a permanent magnet. The sole purpose of the polarization process is to align all of the individual crystalline structures so that they will be unified. One end of this ceramic sandwich is then inserted in a rubber cap at the top of the cartridge; this is the primary mounting point for this element. A rubber cap is put over the bottom of this ceramic cartridge, and the needle and bridle portion is then fastened to this lower rubber cap. The purpose of the metal bridle, or skid, is to prevent any longitudinal motion of the needle along record grooves, since it is only lateral movement that must be transmitted to this ceramic sandwich. In addition, the rubber cap provides good vertical compliance by allowing the needle to rise over hills or dirt in the record without causing the entire tone arm to be lifted. This actually is a shock absorber and has been found to reduce record wear. The two outer surfaces of this ceramic sandwich are sprayed with silver; one contact makes connection with one side and the other contact with the opposite side of the ceramic sandwich. As the needle follows the lateral undulations of the record grooves it bends the ceramic sandwich laterally, thus disrupting its crystal structure. This disruption of the crystalline structure creates electrical energy (*emf*) by what is known as the *piezoelectric effect*. The voltage created in this ceramic sandwich is then taken off the two outer silver surfaces of the ceramic sandwich by the contacts and fed back to the amplifier of the receiver through the shielded lead in the tone arm.

There is always, of course, the problem of controlling the frequency response of a cartridge; therefore, somewhere between the two ends of this ceramic sandwich a small rectangular rubber ring surrounds it. This ring can be moved up and down the length of this unit, and has the effect of damp- ing the cartridge.

**Now...**

**the 6300 series  
for the new 12-volt auto circuit  
has been added to the full line**

of



- ★ **Faster Starting**
- ★ **Longer Life**
- ★ **Complete Replacement Line**
- ★ **Seal-Vented**

Maintaining the reputation for the most complete replacement line, C-D now has available the new 6300 series of vibrators to take care of the 12-volt circuits on many of the new 1953 cars. Once again, this proves that all you need in vibrators for full coverage\* in the replacement market is C-D... longer life, dependable and trouble-free performance. And *seal-vented*... even greater than ever!

\*Ask your C-D Distributor about the NEW C-D plastic case VIBRATOR KIT.



CONSISTENTLY DEPENDABLE

**CORNELL-DUBILIER**  
SOUTH PLAINFIELD, NEW JERSEY



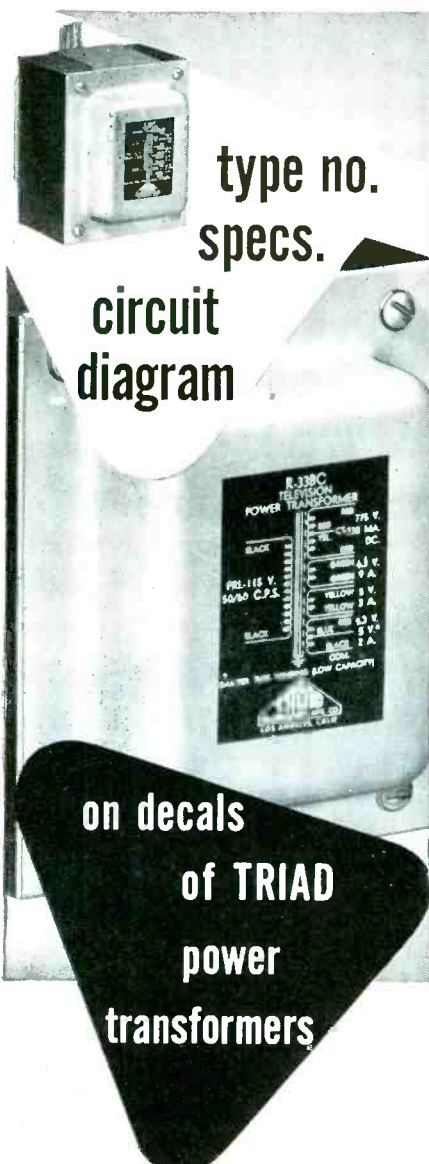
- CAPACITORS
- ANTENNAS
- ROTORS
- VIBRATORS
- CONVERTERS



Miniature 2-input audio mixer, available with jack or mike connector inputs; accommodates two high impedance inputs. Connected directly to equipment—no external cables. Minimum lead lengths inside shielding housing said to minimize stray pickups. Separate gain controls for mixing. Gain control knobs recessed inside housing. (Model 310 with phone jack inputs—phone plug output fitting standard jacks, and model 320 with microphone connector inputs and output mating with standard microphone connectors; Switchcraft, Inc.)



Barney Edwards, national sales manager; Hank Miller, midwestern sales manager; Jack Karns, executive vice-president and Jack Perlmuth, California rep of Recoton at recent Chicago parts show discussing audio kit available in a portable case, which includes set of tools, parts, and a jewelers' eye loupe, plus an assortment of the most popular replacement needles.



type no.  
specs.

circuit  
diagram

on decals  
of TRIAD  
power  
transformers

Triad Power Transformers—like other Triad transformers—have the essential information right where you want it—on the decal. It simplifies installation—speeds servicing—makes reordering easy. Whether used for replacement, industrial applications, PA amplifiers or amateur gear, they offer small size, maximum efficiency, low temperature rise and low cost. Also, they are "Climatite" treated, both coil and core, for protection against moisture and for elimination of lamination chatter. Laminations are painted to prevent rust. Copper straps are used for static shields, grounded to case and core. Leads are color coded, UL approved. Final tests include checking for proper operation. Cases are finished in durable, attractive grey baked enamel.

Write for Catalogs TR-53C and TV-53C

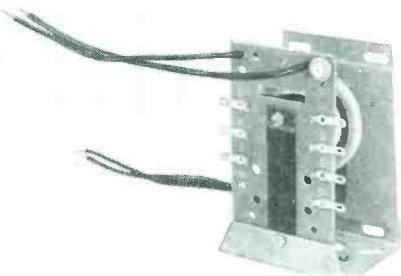


## TV Parts . . . Accessories

### HALLDORSON MULTI-PURPOSE FLYBACK TRANSFORMER

A multi-purpose flyback transformer, FB410, equipped with a universal mounting bracket which is said to permit replacement of many different mounting types without drilling a single hole, is now available from The Halldorson Transformer Co., 4500 Ravenswood, Chicago 40, Ill.

Unit accommodates horizontal yoke windings of from 8 to 25 mh and width coils whose control ranges fall between 0.1 and 30 mh. Flexible construction is said to permit conformation with popular inductively coupled and autoformer-type horizontal output circuits. A separate winding for *agc* and horizontal phase detection is provided. No additional dual-winding width controls are needed.



Halldorson FB410

\* \* \*

### CREST TV BAR GENERATOR

A TV bar generator, MA-4, designed as a pocket-sized portable linearity marker which will fit into a toolbox has been introduced by Crest Laboratories, 84-11 Rockaway Beach Blvd., Rockaway Beach 93, N. Y.

Generator is said to require only a 10-second plug-in installation to the back of the picture tube. Unit is self powered.



Crest TV Bar Generator

\* \* \*

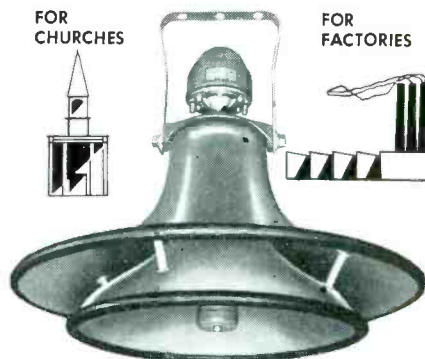
### RAM ZENITH FLYBACKS

Flybacks, models X070 and X073, designed to replace Zenith transformers (S16566, S17140, S18125, S17939, S18930, and S15709, 15710, S16191, S17265, S15911, S16204, S17130, S15710-9, and S17927) have been announced by Ram Electronics Sales Co., Irvington, New York.

## ATLAS RADIALS

FOR  
CHURCHES

FOR  
FACTORIES



FOR  
TERMINALS

FOR  
CARNIVALS

With uniform 360° coverage, non-resonant construction, and 100% storm-proofing, ATLAS Radial Driver Unit Projectors often solve the most difficult sound problems—are excellent for reproduction of speech, chimes and music. For complete details on Radials and the famous ATLAS line of Public Address and Microphone Stand Equipment . . .

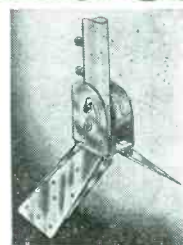
WRITE NOW for FREE Catalog 553



## ATLAS SOUND CORP.

1442 39th St., Brooklyn 18, N. Y.  
In Canada: Atlas Radio Corp., Ltd., Toronto, Ont.

## South River ★★ NEWS ★★



### Peak & Flat Roof Mount

#### Model PFM-1

(New improved model with drop lock feature.)

Heavy-gauge steel, embossed for extra strength, hot dip galvanized. Adjustable flaps permit mounting on any peak, flat or pitched roof. Mast socket, mounted on swivel, drops and locks securely. It accommodates masts to 1 5/8" O.D. With hardware.

South River Antenna Mounting Accessories are carried by every leading TV Parts Jobber from coast to coast.

Write for our new 1953 catalog.

In Can.:  
A. T. R. Armstrong Co., Toronto

### SOUTH RIVER METAL PRODUCTS CO., INC. SOUTH RIVER, N. J.

PIONEER AND OUTSTANDING PRODUCER  
OF FINEST LINE OF ANTENNA MOUNTS



### ROHN TV SERVICE TABLE

A TV service table, designed to facilitate the handling of TV sets while they are in the shop for repairs, and while moving them to the truck for delivery, is now available from the Rohn Manufacturing Co., 116 Limestone Bellevue, Peoria, Ill.

Table is 30½" high and has a 24" by 24" plywood top, flush-bolted to a metal frame to provide a smooth surface on which to place the set; 3" casters on the legs.



Rohn TV Service Table

### SEMCO TV REMOTE CONTROL

A TV remote control system, with provisions to receive *uhf* stations by installing snap-in *uhf* coil strips in unused channels, has been introduced by Semco Engineering and Manufacturing Co., 8407 S. Hoover St., Los Angeles 44, Calif.

Unit features cascade channel tuner, and a signal booster amplifier for weak stations or fringe areas. Also features a sound output connection for headphones at the control box.



Semco Remote Control

### GRAYBURNE IF BOOSTER

An *if*-signal booster, *TSB-1*, that provides an extra stage of *if* to amplify both *uhf* and *vhf* signals without switching, has been announced by the Grayburne Manufacturing Co., Inc., 4-6 Radford Place, Yonkers, N. Y.

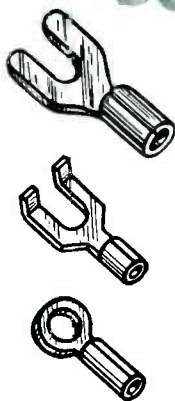
Booster, which is supplied in adapter form, is installed in an existing tube socket and requires but one wire connection to ground. Amplifies signals passing through the *if* stages, and is said to offer advantages which would be contributed by an additional stage of *if*.

### ITI TENNA CLIP

A redesigned version of the *Tenna Clip*, with provision for either screw terminal or solder connection with strain relief, has been announced by Industrial Television, Inc., 369 Lexington Ave., Clifton, N. J.

## Especially Designed for Radio & TV!

NO. 2195  
SERVICE KIT



Now you can get a positive, trouble-free connection on every terminal... as fast as you can close your hand. No messy soldering or waiting for an iron to heat! With a Lynn *Lightning* service kit you just strip primary wire from 10 to 22 gauge with handy, combination stripping and crimping tool... select the proper terminal... then *crimp* it on. Every job quick, clean, professional-looking! Kit comes complete with crimping tool, 10 different types of terminals in 11-bin, clear plastic box. Only \$8.50

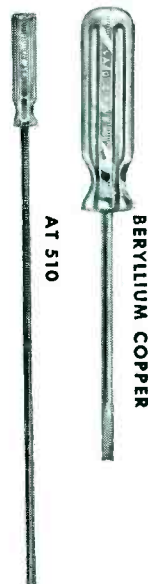
### Two New Television Screw Drivers

Reach hard-to-get-at spots with the new Vaco AT 510 non-metallic, fiber shank driver for critical tuning and aligning work... the 10" blade gives you all the length you need. Adjust the new type focalizers with specially designed Vaco Beryllium-copper drivers... non-magnetic, yet nearly as hard as steel for adequate torque without interference with the Ion trap field. Full information on other aligning tools, nut setters and special radio tool kits on request. Write for FREE catalog.



317 E. Ontario St., Chicago 11, Ill.

In Canada: Vaco-Lynn Products Co., Ltd.  
204 Laurier Ave., W., Montreal 8, Que.



### PECO TEST SOCKET ADAPTER

A test socket adapter, *TVS-1*, claimed to permit operating tests, while TV set is in operation, on all circuits entering the TV picture-tube socket, has been developed by Pomona Electronics Co., 524 W. Fifth Ave., Pomona, Calif.

Measurements, it is said, can be made without tracing circuit wiring to test points below the chassis. Unit is inserted between picture tube base and its socket to complete the circuit and make all connections accessible to meter test leads.

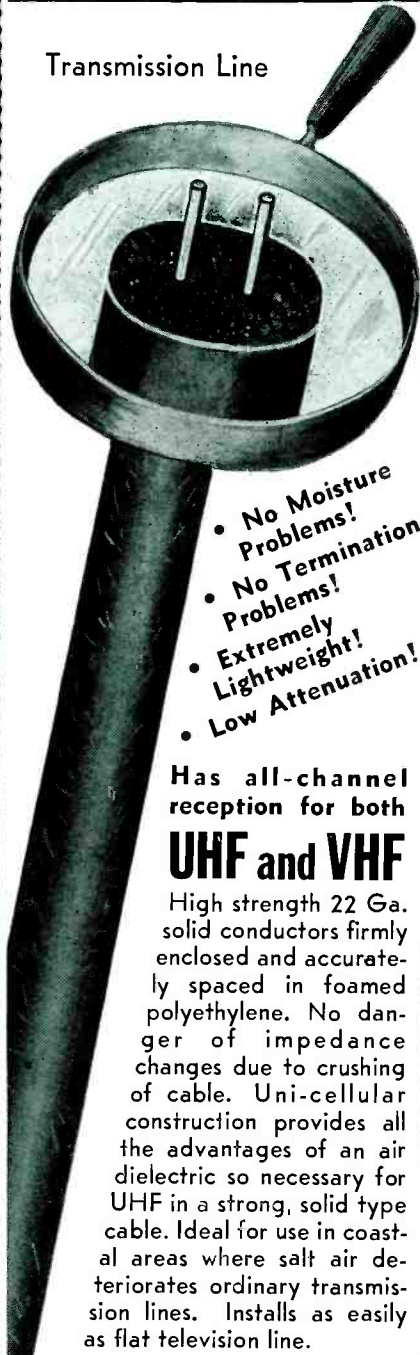
\* \* \*

Right: Coanter display merchandise, to promote interaction filters. Units featured on display are *Tenna-Tie* for *vhf*, and the *Triple-Tie* and *Ultra-Tie* for *vhf* and *uhf*. (Channel Master.)



# NEW! ANACONDA UHF FOAM POLYETHYLENE

Transmission Line



- No Moisture Problems!
- No Termination Problems!
- Extremely Lightweight!
- Low Attenuation!

Has all-channel reception for both  
**UHF and VHF**

High strength 22 Ga. solid conductors firmly enclosed and accurately spaced in foamed polyethylene. No danger of impedance changes due to crushing of cable. Uni-cellular construction provides all the advantages of an air dielectric so necessary for UHF in a strong, solid type cable. Ideal for use in coastal areas where salt air deteriorates ordinary transmission lines. Installs as easily as flat television line.

Write for Samples and New Descriptive Literature.  
Sold through recognized jobbers only!

"National distributors and warehouse for ANACONDA dansheath television and radio wires and cables"

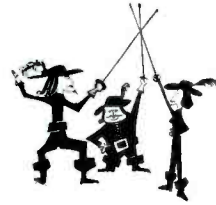
**Columbia**  
**WIRE & SUPPLY CO.**  
2850 Irving Park Road • Chicago 18, Ill.

## TV Station Listing

(Continued from page 33)

City	Call Letters	Channel
<b>DISTRICT OF COLUMBIA</b>		
Washington	WMAL-TV	Evening Star Bcstg Co., 4461 Conn. Ave., N. W. 7‡
	WNBW	National Bcstg Co., Inc., Wardman Park Hotel 4‡
	WTOP-TV	WTOP, Inc., Warner Bldg. 9‡
	WTTG	Allen B. DuMont Labs., Inc., Raleigh Hotel 5*
<b>FLORIDA</b>		
Ft. Lauderdale	WFTL-TV	Tri-County Bcstg Co., 231 S.E. 1st Ave. 23*
	WITV	Gerico Investment Co., Box 78 17
Ft. Myers	WINK-TV	Fort Myers Bcstg Co., 54 E. First 11
Jacksonville	WMBR-TV	The Wash. Post Co., 605 S. Main St. 4‡
	WJHP-TV	The Jacksonville Journal Co., 500 Laura St. 36
Lakeland	WOTV	WONN-TV, Inc., Box 2038 16
Miami	WTVJ	Southern Radio & Tele. Ept. Co., 316 N. Miami Ave. 4‡
Panama City	WJDM	J. D. Manly, Box 1188 Pensacola 7
Pensacola	WPFA-TV	WPFA-TV, Inc., Box 30, Baton Rouge, La. 15
	WEAR-TV	Gulfport Bcstg Co., Inc., 2nd and Hyer St. 3
St. Petersburg W. Palm Beach	WSUN-TV	City of St. Petersburg, Box 240 38*
	WIRK-TV	WIRK-TV, Inc., Box 2148 21
<b>GEORGIA</b>		
Atlanta	WAGA-TV	Storer Bcstg Co., 1018 W. Peachtree St. 5‡
	WSB-TV	Atlanta Newspapers, Inc., 10 Forsyth St., N.W. 2‡
	WLWA	Crosley Bcstg Co. of Atlanta, Inc., 140 W. 9th St., Cincinnati, Ohio 8(11)‡
Columbus	WDAK-TV	Television Columbus, Martin Bldg. 28
Macon	WTWV	Macon Tele. Co., 230 2nd St. 47
Macon (Warner Robins)	WMAZ-TV	Southeastern Bcstg Co., 666 Cherry St., Macon 13
Rome	WROM-TV	WROM-TV, Inc., 121½ Broad St. 9
Savannah	.....	Savannah Bcstg Co., Box 858 11
Valdosta	WGOV-TV	WGOV-TV, Daniel Ashley Hotel 37
<b>IDAHO</b>		
Boise	KTVI	Idaho Bcstg & Tele. Co., Cassia St., at Eagleson Rd. 9
	KIDO-TV	Kido, Inc., 709 Idaho St. 7
Idaho Falls	KID-TV	Idaho Radio Corp., Box 701 3
	KIFT	Idaho Falls Tele. Inc., 339 Broadway 8
Meridian	.....	Boise Valley Bcstrs, Inc., 311 N. 10th St. 2
Nampa	KFDX-TV	Frank E. Hurt & Sons, Inc., 1024 12 Ave., S. 6*
Pocatello	KWIK-TV	Eastern Idaho Bcstg & Tele. Co., Bannoch Hotel 10
	KISJ	Savannah Bcstg Co., Inc., 305 S. Arthur St. 6
Twin Falls	KLIX-TV	Southern Idaho Bcstg & Tele. Co., Elizabeth Blvd. & Eastland Drive 11

[To Be Continued]



one for all...  
all for one

## NEW JFD "3-in-1" LIGHTNING ARRESTER

1. for UHF or VHF tubular twin lead
2. for VHF flat twin lead
3. for VHF or UHF open wire



No. AT110 with hardware for wall or window sill mounting, \$1.50, list.

No. AT110S with stainless steel strap for pipe mounting, \$1.75, list.

Both feature the patented JFD strain-relief lips which prevent contact washers from ripping the lead-in wires apart!

**JFD MANUFACTURING CO., INC.**  
World's largest manufacturer of tv antennas and accessories  
Brooklyn 4, New York

## ILLINOIS CAPACITORS HAVE BEEN SERVING SERVICEMEN FOR OVER 19 YEARS



TYPE IHT

The complete dependability of ILLINOIS electrolytic capacitors has made them a favorite with servicemen everywhere!

For over 19 years, ILLINOIS CONDENSER COMPANY has been producing quality capacitors—and during this time has been responsible for many important advancements in electrolytic capacitor construction. Millions of ILLINOIS capacitors, now in service, are proving their absolute dependability.

Used as original equipment by leading TV and radio manufacturers, ILLINOIS electrolytics are "first choice" of servicemen for all replacements!

Write for new catalog!



**ILLINOIS CONDENSER CO.**  
1616 NORTH THROOP STREET • CHICAGO 22, ILL.

## I. E. MANUFACTURING EXPANDING

An expansion and modernization program is now in progress at the I. E. Manufacturing Co., 325 N. Hoyne St., Chicago 12, Ill.

Scheduled for completion in May of next year, project is designed to increase the plant area to approximately 100,000 square feet, doubling the present floor space.

\* \* \*

## CLAROSTAT MATCHED TV CONTROL REPLACEMENT LISTINGS

An addition of 23 RTV numbers to the matched TV-control replacement line, appearing in a 292-page second edition of the *TV Control Replacement Manual*, has been announced by Clarostat Manufacturing Co., Inc., Dover, N. H.

\* \* \*

## SKYLINE EXPANDS

A plant expansion, increasing space facilities by 25%, has been announced by Skyline Manufacturing Co., 1458 E. 17th St., Cleveland 14, Ohio.

\* \* \*

## SPRAGUE ELECTRIC BUILDING PLANT IN NORTH CAROLINA

Construction of a new plant for Sprague Electric Co., North Adams, Mass., about seven miles from West Jefferson, Ashe county, North Carolina, is now underway.

Plant will contain 50,000 square feet of floor space on a 30-acre tract of land. About 250 workers will be employed under full production.

\* \* \*

## MANNFRED ELECTRONICS MOVES

Mannfred Electronics Corp., formerly located at 136 Liberty St., New York, N. Y., has moved to larger quarters at 21-38 36th Ave., Long Island City 6, N. Y.

\* \* \*

## TV COUPLER PROMOTION



Display and consumer pamphlets designed to promote *tele-plex* set-couplers for 2nd, 3rd and 4th TV sets. Display, a 3-dimensional affair, which can stand atop TV sets, also provides on-and-off flashing lights behind pictures of two TV sets and behind copy saying . . . "2, 3 or 4 TV sets with 1 antenna," and . . . "for VHF-UHF." (JFD.)

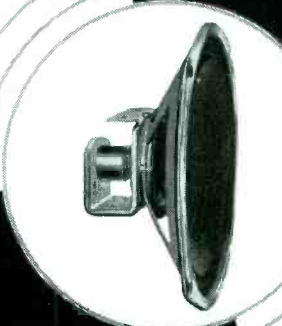
THERE ARE

# QUAM

*Adjust-a-Cone*<sup>®</sup>

# SPEAKERS

FOR ALL\* YOUR REPLACEMENT NEEDS



**Manufacturers of**

- High Fidelity Speakers
- Outdoor Theatre Speakers
- Quam Focalizer Units
- Tru-Match Output Transformers
- Quam Ion Traps

Be sure to get the latest Quam catalog, listing 94 replacement speakers — at the best distributors in every city — or write us for your FREE copy.

Quam replacement speakers are listed in Photofact Folders and in Counterfacts.

**QUAM-NICHOLS CO.**  
234 East Marquette Road  
Chicago 37, Illinois

\*Quam cataloged speakers are available in any voice coil impedance and field resistance.



Kitty Kallen, radio and TV star, with custom cabinet selected at recent Parts Show in Chicago, to house her TV set at home. (River Edge.)

## G.E. OPENS MIDWEST TUBE WAREHOUSE

A one-story tube warehouse, said to be the largest in the world, has been opened by General Electric, at 3800 N. Milwaukee Ave., Chicago, Ill.

Structure has almost 100,000 square feet of floor space. It also serves as headquarters for the company's central regional sales organization for electronic tubes.

Warehouse manager is John A. Cavaliere, while J. J. Shafter is supervisor of commercial service. Walter J. Fitzpatrick heads the replacement sales organization and Roger F. Long heads the original equipment sales organization.

# Thousands depend on PHOTOFACT! THEY TELL YOU WHY

Unsolicited letters tell what the world's finest TV and Radio Data means to Service Technicians



**L. A. Moe**  
American Engineering Co.  
13 S. Barstow  
Eau Claire, Wisc.

"SAMS PHOTOFACTS are without a doubt one of the most valuable tools in our service organization. Keep up the work."



**Raymond Murphy**  
Tampa TV Mart, Inc.  
8131 Nebraska Ave.  
Tampa 4, Fla.

"Running a service shop efficiently is a tough job. The people can't realize what a tremendous help you are. Our shop, without your complete set of SAMS, would be like back in the days of radio and the screw-driver technician. We really would be lost without your SAMS Library... you're doing a splendid job."



**Harry J. Kolodney**  
TV-Radio Service  
266 Belmont Street  
Fall River, Mass.

"In regard to PHOTOFACT Sets—I can only add my voice to thousands of others in praise. It is a pleasure to work from your schematics. Your folders are far superior to all others, including the manufacturer's own service notes."

## NOW! GET THE PROOF FOR YOURSELF!

**FREE**

We'll send you a Free Photofact Folder on any receiver covered in Sets No. 101 and following

Learn for yourself—at our expense—how PHOTOFACT pays for itself by earning bigger profits for you! Select any Folder appearing in PHOTOFACT Sets Nos. 101 and following, from the PF Index. (If you haven't a copy, see your distributor.) When you write for your Free Folder, be sure to state Photofact Set and Folder Number as shown in the Index (offer limited to Folders in sets subsequent to No. 101). Get your Free Folder now. Examine, use, compare—see why PHOTOFACT belongs in your shop!

HOWARD W. SAMS & CO., INC.  
2207 E. 46th St., Indianapolis 5, Ind.

**HOWARD W. SAMS & CO., INC.**

# Associations

## RTG, Rochester, N. Y.

ALFRED L. BEST has been elected president of the Radio Technicians Guild of Rochester, New York, Inc.; *William de Vries* was named vice president; *Francis G. Stoffel*, secretary; and *Bertram Lewis*, treasurer.

Also elected were *Harold Eskin* and *William Brewerton* to serve three years on the board of directors and *Donald Snell* and *Norman McGovern* to one-year terms. Others on the board include *Abraham Andzer*, *Theodore Cornish*, *Edward Fisk* and *Bertram Lewis*.

## RTTG, Boston

AT A REGULAR MEETING of the Radio Television Technicians Guild of Boston, the G. E. tube department was applauded for instituting and carrying out a nation-wide public relations program in the interests of the TV service industry. In appreciation, *Ben Sims*, guild president, presented to *John T. Thompson*, manager of G. E. replacement tube sales a special plaque honoring the tube department for "unselfish cooperation with the electronic service industry." *A. C. W. Saunders*, president of the Saunders Radio and Television School, was main speaker at the meeting. He declared that . . . "the foundation of any service business is customer confidence," and told guild members that . . . "in seeking to improve conditions in any industry, we help all honest Service Men."

At annual Lily Lake (Pa.) meeting of FRSSAP and NETSDA, left to right: *Fred Schmidt*, FRSSAP treasurer; *Leon Helk*, FRSSAP secretary; *ye editor*, who delivered a talk on association lecture programs; *Milan J. Krupa* and *B. A. Bregenzler*, chairman and vice-chairman, respectively, of FRSSAP. A complete report on the meeting will be published in the September issue of SERVICE.



## Introducing The New HUSH Jr. KIT SERVICER

*The Amazing, New  
TV-Tuner Cleaner  
That Sprays On!*

The new, "handy" size for TV and Radio Service Men to pack right along in their tube kits. So convenient on home service calls.

**HUSH Jr. KIT SERVICER—\$1.25**  
2-ounce bottle, complete with 24 karat gold plate spray attachment.  
8-ounce refill bottle only \$1.95

HUSH is made by the manufacturers of EVER QUIET—for volume controls—contact restorer.

EVER KLEER—for cleaning and keeping TV tubes clean.

Ask your local distributor for HUSH or write:

**CHEMICAL ELECTRONIC  
ENGINEERING, INC.**  
283 Main St. Matawan, N. J.

Left to right: *Bertram Lewis*, *W. de Vries*, *Alfred L. Best*, *F. G. Stoffel* and *Harold Eskin*, of RTG, Rochester, N. Y.





John T. Thompson (left), G.E. tube replacement sales manager, receiving RTTG plaque from Ben Sims, guild prexy. Looking on (center) is A. C. W. Saunders.

#### RETA, Vancouver, Canada

At THE annual dinner meeting of the Vancouver chapter of the RETA, *Fred Lewis* was elected as the '53-'54 prexy. Members of the executive board voted into office were: *H. A. Amos*, vice prexy; *J. Bair*, treasurer; and *Al Clarke*, secretary.

Guest speaker at the dinner-meeting was *Jack Clarke*, general manager of station KVOS-TV, who reviewed the station's facilities and their programming setup. He praised the Service Men for their excellent cooperation in seeing to it that receivers are aligned and antennas oriented to insure good pickup of KVOS-TV signals.

For outstanding service to the association, *Monte Lennox* received a life-membership award at the meeting.

#### TEN YEARS AGO

FIRST AID to Test Instruments, the first of a series of articles by *Alfred A. Ghirardi*, appeared. . . . A detailed report on solutions to photocontrol application troubles was offered. . . . The cover story featured a five-channel code practice oscillator, with output frequency channels adjustable from 3 to 5.5 mc. . . . *W. B. Gillen* was named manager of manufacturing of the tube division of G. E. . . . *H. A. Pope*, credit manager of National Union, was reelected vice chairman of the Eastern credit group of the R.M.A. . . . *L. W. Teagarden* was named assistant general sales manager of RCA. . . . Marine corporal *Robert J. Chenoweth*, former clerk in the NU maintenance department, was awarded the Silver Star. . . . *Kenneth C. Prince*, who served as executive secretary of the Sales Managers club, Western Group, was commissioned a Lieutenant J.G., USNR. . . . *I. J. Kaar* and *G. G. Nevin* were appointed managers of the receiver and tube divisions. . . . *Lieut. E. L. Berman*, formerly radio sales manager of Shure Bros, paid a surprise visit to the plant. . . . *John Q. Adams*, formerly sales manager of Champion Lamp Works, joined Hytron as a sales executive. . . . *P. M. Craig* was named radio engineering director by Philco. . . . *A. J. Beck* was appointed sales manager for Duotone. . . . General Radio received a white star for their Army-Navy E pennant. . . . Army-Navy E awards went to G. E. Plastics Plant, Pittsfield, Mass., and to Cannon Electrical Development Co., Los Angeles, Calif. . . . *Judson C. Burns, Inc.*, Philadelphia, were appointed distributors for The Crosley Corp. . . . *Ralph G. Stuart* was appointed manager of the Westinghouse Lamp division, Bloomfield, N. J. . . . *Engene H. Fischer*, Westinghouse ceramic engineer, was awarded the Order of Merit, chiefly for the development of *prestite*.

# 1 = 4 with RCP Model 324

Because the Radio City Products Model 324 "DO-ALL" Tube and Battery Tester packs into one instrument the performance of four...

## Sufficient Facilities to Test

1. **All TV and Radio Tubes**  
Sockets for all standard 4, 5, 6, 7, octal, loctal, miniature and subminiature are provided. Tests transmitting, hearing aid, ballast, pilot light, gaseous rectifiers and tuning indicator types. All readings are indicated on a large easily read meter.
2. **Cathode Ray Tube**  
Checks all magnetic deflection types right in the set or carton. Will locate and isolate all shorts or leaks.
3. **Batteries**  
Tests popular portable battery types under load. Indicates true condition of battery under check.
4. **All This and a Reactivator Too—**  
Gives extra life to otherwise dim or bad picture tubes.

Adds a professional note to any service bench or store counter. Available in both counter and portable models, complete with CR Tube Adapter Cable.



### Two Lines to Meet Your Service Needs—

Model 324C—Counter model with open style metal case. Size: 13¼" x 12¼" x 4". Weight: 10 lbs. Price: \$69.95.

Model 324P—Combination portable—counter model. Smart looking, hand-rubbed carrying case with slip-hinge cover—includes battery test leads. Size: 16¼" x 14¼" x 5". Weight: 12 lbs. Price: \$79.50.

Remember You Can Do More With A "DO-ALL"  
See it at your Parts Distributor today  
Write Dept. S-8 for RCP '53 catalogue

**RADIO CITY PRODUCTS CO., Inc.**

152 WEST 25th STREET • NEW YORK 1, N. Y.

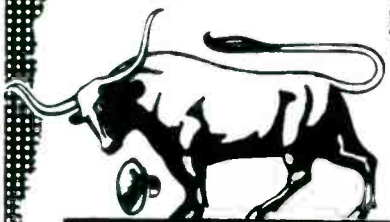
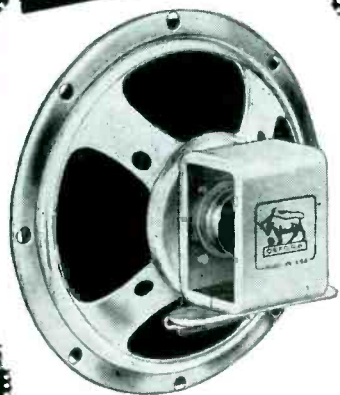


At recent ESFETA meeting in Rochester, left to right: *John Wheaton*, *Herb Snyder*, *Henry Wawryck*, *Wayne Shaw*, *Andy Wentworth*, *Mrs. Helen Wheaton*, *G. Budsik*, *David Violet*, *Harold Eskin* and *O. Capitelli*.



**Preferred  
for Original  
Equipment**

**Proven  
for  
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**Speakers**

There is an application for every Oxford Speaker . . . and an Oxford Speaker for every application.

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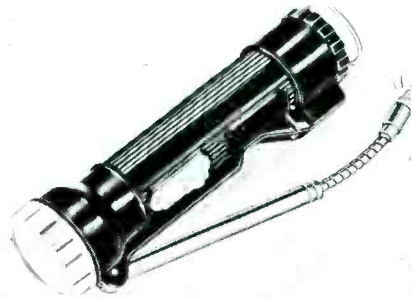
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NEW YORK CITY

## Tools . . . Instruments Parts . . .

### USALITE FLASHLIGHT-PROBE

An industrial flashlight, *Duo-Flex*, with a patented built-in dual lighting system providing a probe-light for pinpoint inspection of inaccessible parts and equipment, has been developed by the U. S. Electric Manufacturing Corp., 222 W. 14 St., N. Y. 11.

Features both a 1000-foot flashlight beam, and flexible slideout cable with bulb and plastic guard. When side-arm is extended, light is automatically transferred to the small bulb, and the extension tube encased in the arm can be goosenecked around corners or into deep out-of-the-way spots. The over-all extension of the probe-light arm measures 10½".



Usalite Duo-Flex.

\* \* \*

### RCA 75-V BATTERY

A 75-volt *B* battery, *VS217*, for portable radios, has been announced by the Tube Department, RCA Victor Division, Radio Corporation of America, Harrison, N. J.

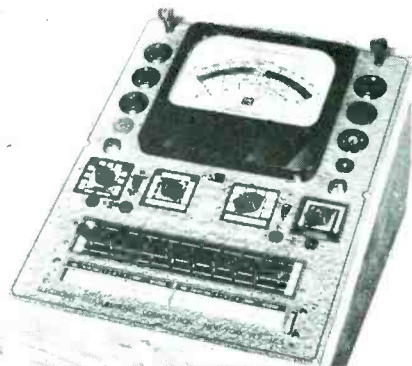
Battery has conventional LeClanche cell construction and measures 6½" high, 17⁄8" wide, and 1 15/32" deep.

\* \* \*

### EM TUBE-BAT.-OHM-CAP. TESTER

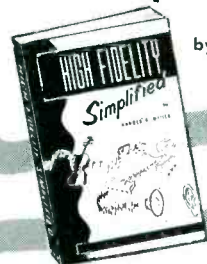
A tube - battery - ohm - capacity tester, *model 207*, that gives direct readings for tubes through standard emission method of testing, has been introduced by Electronic Measurements Corp., 280 Lafayette Street, New York, N. Y.

Four-position level type switches are used.



LIFE quotes:

**"HIGH FIDELITY  
Simplified"**



by H. D. WEILER

Radio and TV service technicians . . . familiarize yourself with high fidelity components, terminology and problems. High fidelity is booming! LIFE magazine's June 15, 1953 issue told over 15,000,000 people about the amazing difference Hi-Fi makes in sound reproduction . . . and LIFE reported enthusiastically how "High Fidelity Simplified" — the only book quoted — explains the complete Hi-Fi story. "High Fidelity Simplified" gives complete answers to all questions about Hi-Fi record players and changers, amplifiers, loudspeakers, tuners, tape recorders, etc. The best way to learn about this fast growing field is to read this best selling book which will pave the way for a profitable "extra" to your TV and radio servicing income. Order your copy from your parts jobber or bookstore today! If unavailable from these sources send \$2.50 to:

John F. Rider, Publisher, Inc.  
Dep't. S., 480 Canal Street  
New York 13, N. Y.

### MALLORY 12-V VIBRATOR TESTER

A 12-volt vibrator tester, *12-VT1D*, has been developed by P. R. Mallory and Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.

Designed as a companion unit to other Mallory Rectopower bench power supplies and will test directly, without adaptors, either 6 or 12-volt vibrators of the most popular types and all auto radio vibrators used since '40. In conjunction with a filtered *dc* power supply, such as the Mallory 12RS6D or 12RS14D, the tester will check either self-rectifying or tube rectified vibrators of any frequency from 100 to 250 cycles.

Input voltage (*dc*) may be adjusted for both *start* and *condition* tests by use of a push button switch. After passing the *start* test, the condition of the vibrator may be determined by reading on the good-bad scale.

Mallory Vibrator Tester.



### LUXO BENCH LIGHT

A flexible-type bench light, whose arms and shade provide a radius of 45", has been announced by Luxo Lamp Corp., 290 Madison Ave., New York 17, N. Y.

Arm may be adjusted into any position; tension of the springs holds the lamp set. Brackets are available so that lamp can be attached to any horizontal, vertical or slanted surface.

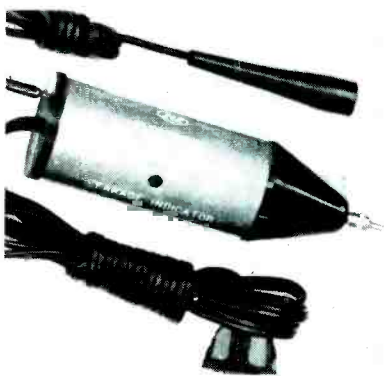


Luxo Bench Light.

\* \* \*

### LEE CAPACITOR TESTER AND LEAKAGE INDICATOR

A capacitor tester and leakage indicator, CT-1, that features a built-in electronic power supply providing both ac and dc test voltages, has been announced by Lee Electronic Labs., Inc., 233 Dudley St., Boston 19, Mass. Contains miniature selenium rectifier and dual capacitor rc filter network. Permits direct testing of capacitors for leakage with actual dc voltage applied, and indicates intermittent open capacitors with ac applied. May also be employed for high-resistance continuity testing of electrical and electronic circuits and parts, indicating leakage, resistance or insulation breakdown to over 200 megohms.



Lee Capacitor Tester-Leakage Indicator.

\* \* \*

### E-C VOLUME CONTROL LUBRICANT

A special solution, *No Noise*, that may be used to clean and restore volume controls, band switches, push button assemblies and electrical contacts, has been developed by Electronic Chemical Corp., 813 Communipaw Ave., Jersey City, N. J.

Lubricant contains *Perma-Film* said to clean and lubricate immediately on contact.

\* \* \*

### EICO ROLL CHART

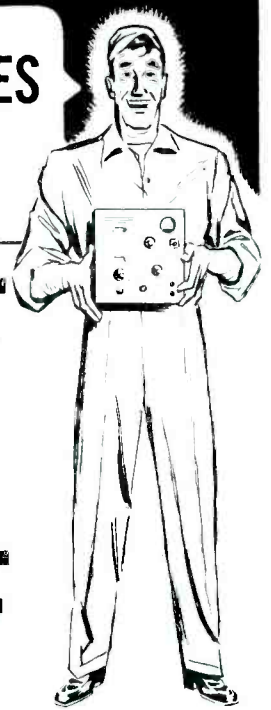
A roll chart for model 625 tube testers, has been released by the Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, N. Y.

Chart is printed on a 6-foot continuous sheet of paper and is said to fit into the tube tester's present roller mechanism.

NOW — ALL 3 FREQUENCIES  
IN 1 INSTRUMENT!



UHF  
FM  
VHF



## THE Connecticut SIGNAL GENERATOR

This completely portable, 3-in-1 Signal Generator has been developed to meet the needs of television and electronics engineers and service men. The unit operates on fundamental frequencies covering VHF through UHF television bands.

The two RF ranges are calibrated in megacycles, with an accuracy of  $\pm 2\%$ . The range of 54 to 330 megacycles is covered in the first band, and 300 to 950 megacycles is covered in the second.

RF output voltage is continuously variable over the range of 10 to 100,000 microvolts. Connecticut Signal Generator has calibrated frequency dial, power output meter, and calibrated output attenuator (wave guide beyond cut-off).

Regulated power supply is self contained in the instrument for operation from a 110 - 130 V 60 Cy AC supply. RF leakage has been kept to a minimum by

the use of line filters and adequate shielding. Dimensions: 11" high, 9 1/2" wide, 14" deep. Weight 20 pounds.

LIST PRICE \$375

**Connecticut**  
TELEPHONE & ELECTRIC CORP.

MERIDEN CONNECTICUT

Please arrange a demonstration of the Connecticut Signal Generator by my local distributor.

Name \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

### ACROLITE PLASTIC SPRAY

A plastic protective coating, *Acrylic*, designed to insulate, waterproof and stop rust and tarnish, has been introduced by Acrolite International, Hillside, N. J.

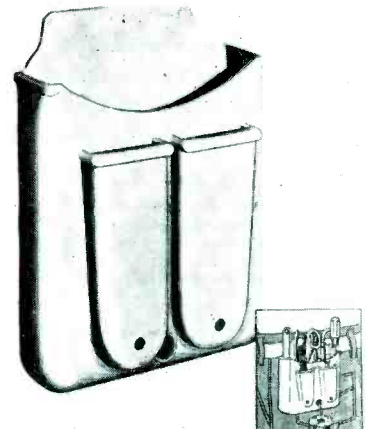
Plastic, in the form of a spray, is said to eliminate TV corona and prevent antennas from rusting. Available in a 12-ounce can.

\* \* \*

### G-C TOOL CASE

A tool case, 8943, designed to be worn on the belt, and fitted to hold a large number of hand tools, has been introduced by the General Cement Manufacturing Co., 919 Taylor Ave., Rockford, Ill.

Case is molded of *Alathon*, that is said to be tough and flexible.



G-C Tool Case.

# AT LAST!

a practical  
**VOLTAGE BOOSTER**  
that everyone  
can afford!



- ★ Increase or reduce line voltage with the flick of a switch.
- ★ Use with any TV set or appliance up to 300 watts.

**NOW—THERE IS NO NEED TO CONTEND WITH:**

- inadequate picture width
- insufficient height
- low picture brightness
- poor sync. and oscillator drift
- low sensitivity in fringe areas
- excessive tube failure

**LOOK AT THIS PRICE FOR VALUE!**

Installed in 3 seconds—Just plug it in.  
Convenient OFF-ON switch to quickly add or subtract 10 volts from the existing line voltage  
A really handy unit for checking on the service bench.

**\$9.95**  
LIST PRICE

Carried by leading jobbers!



# PERSONNEL



EDWIN A. FREED, formerly sales manager, has been appointed manager of operations of the General Instrument plant in Elizabeth, N. J. Freed joined G.I. in '51 after a nine-year stay at RCA where he was manager of sales of component parts.



E. A. Freed



G. B. Fraser

GEORGE B. FRASER has become president of The Astatic Corp., Conneaut, Ohio. Fraser, formerly vice president and general manager, has been treasurer since he joined the company in '36 and retains this title.

\* \* \*

VERNON A. DUPY has been appointed general sales manager of United Motors Service, and EDWARD L. LAPE has been appointed general merchandising manager. Dupy, who has been general merchandising manager since '42, moves into the sales managership, succeeding the late Wilmer A. Hagen.



E. L. Lape



V. A. Dupy

\* \* \*

RALPH R. STUBBE has been appointed assistant chief engineer for the General Instrument Corp., Elizabeth, N. J.



Laura Fisher



Ralph R. Stubbe

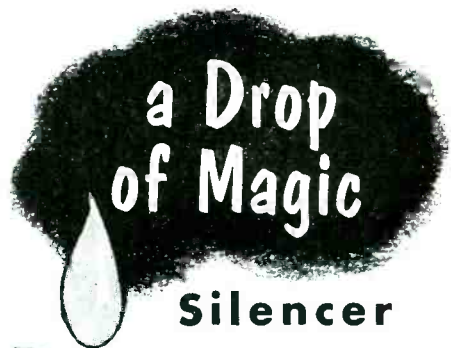
LAURA FISHER has been named media director for Burton Browne Advertising, Chicago, Ill.

\* \* \*

H. H. HANLON has been appointed sales manager of the Crestwood recorder division of the Daystrom Electric Corp.

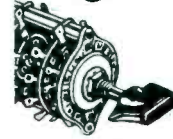
\* \* \*

JOHN C. McGRANAGHAN has been named a district sales manager for G.E. replacement tube sales, with headquarters in St. Louis. Territory includes parts of Missouri, Illinois, Indiana, Kentucky, Tennessee, Mississippi and Arkansas.



## Silencer

An Amazing Permanent Protective Film



which will

- Instantly clean and remove rust from controls, bandswitches, tuner assemblies, etc.
- Lubricate and Silence all moving parts indefinitely.
- Leave a protective coating which will last indefinitely.

3 Full Oz. (not 2 oz.)



Silencer is not an oil that gums controls or changes capacity. As a cleaner it is 100 times more effective than carbon tetrachloride.

Tell your Distributor you want Silencer

## Illinois

RESEARCH LABORATORIES

22 W. Madison St.  
Chicago 2, Illinois

Available in Quart and Gallon sizes.

Approved and used by TV and Radio Manufacturers, Telephone Companies, and thousands of Servicemen

BERNE FISHER, formerly chief engineer and production manager of General Instruments, has been appointed director of engineering for Standard Coil Products Co., Inc., Chicago, Ill.



Berne Fisher

\* \* \*

BILL PARNELL has been appointed merchandise manager for Philco Distributors, N. Y. . . . GENE GOLD succeeds Parnell as advertising and promotion manager.

\* \* \*

W. T. BUSCHMANN has been named to the newly created post of product sales manager of radio receiving tubes at Sylva.

\* \* \*

ROY E. NELSON has become manager of semi-conductor equipment sales for the tube department of RCA Victor, RCA, Harrison, N. J.

\* \* \*

DR. WILBUR A. LAZIER has been named vice president and technical director of the Sprague Electric Co., North Adams, Mass. . . . PAUL J. CRITTENDEN and HOLLIS R. WAGSTAFF have been appointed assistant treasurers. . . . NEAL W. WELCH is now vice president in charge of sales.



## Audio Conversions

(Continued from page 39)

be increased by incorporating an adjoining record shelf, removing the partition and closing and bracing the door so that it cannot rattle. Unless the original cabinet is exceptionally sturdy it is good practice to reinforce the inside walls against resonant vibration with wooden braces, especially where fairly large areas of thin plywood exist. In any case, whether or not this is done, the inside of the cabinet should be lined with sound absorbent material tacked loosely to the inside walls. Special commercial materials for this purpose can be purchased, or rug cushioning can be used.

The typical commercial cabinet will not provide an adequate enclosure volume for anything approaching infinite baffle conditions. Improved results can be achieved by providing additional openings or ports in the front, converting the enclosure to the bass-reflex type. It has been pointed out, however, that the bass-reflex enclosure must be carefully tuned and damped for optimum performance, and that the sound of an improperly designed bass-reflex cabinet may be actually worse than the results produced with the port stopped up. Symptoms of a poorly adjusted bass-reflex enclosure are increased hangover and *one-note boom* in the bass region.

An excellent way to get the port right is to drill a group of 1/2" holes into the baffle (either above or below the speaker opening) until the correct port area has been reached, and then to tack layers of burlap across the holes. The signal generator method<sup>3</sup> or the 'scope method', both of which have been described previously, can be used to determine when the holes and the layers of burlap are at optimum.

When the original cabinet is unsuitable as a speaker housing, by reason of its size or material, a separate speaker cabinet is the solution. The reverse of the cabinet modification described (conversion of the original speaker space to a shelf for records) may be possible, and may partly make up for the addition of a new piece of furniture to the room.

A new high-quality speaker must be driven by a corresponding high-quality audio system, or the total effect of the reproduced sound can easily turn out to be less, rather than more pleasing. A good speaker system will faithfully reproduce all of the distortion generated as well as the music.

The audio stages of relatively inexpensive commercial radio-phonos often contain the basic elements of

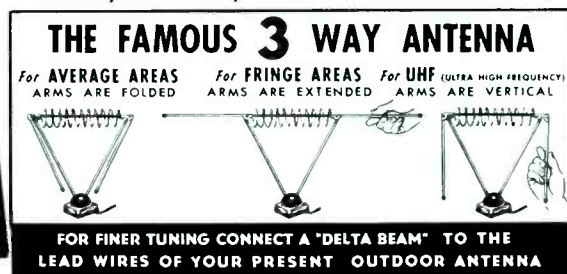
# OVER 150,000 Satisfied Televiewers—the first year!

GENUINE



THE WORLD'S MOST POWERFUL, ALL CHANNEL  
**INDOOR**  
**T-V ANTENNA**  
FOR "VHF", "UHF", and FM RADIO

**50% INCREASE**  
IN  
PULLING POWER  
BY EXTENDING  
DIPOLES



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*hi-fi* amplifiers. If the original circuit has push-pull output, and a surplus of signal voltage gain, it is usually possible to reduce considerably the distortion of the output audio stage. It is this stage, which must handle appreciable audio power, which normally introduces the most amplifier distortion.

Push-pull is indicated by the use of two output tubes and of an output transformer with a center-tapped primary. Reserve voltage gain is indicated by the volume-control setting

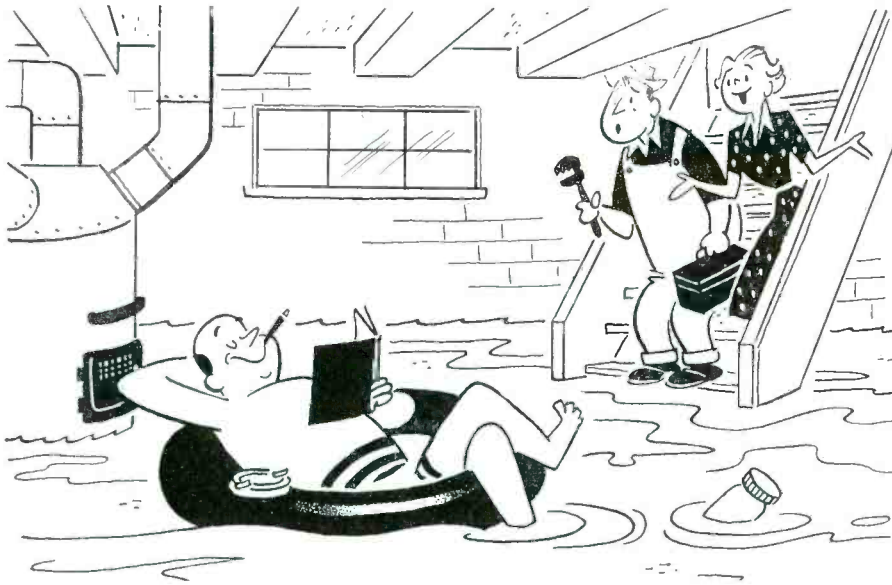
<sup>3</sup>Vino, Mark, *Testing and Measuring Audio Equipment*. SERVICE, June, 1953.

required for listening at the desired sound level; if the control still has a long way to go when the set is playing at good volume, it may be inferred that more voltage gain than necessary has been incorporated into the amplifier. The fact that turning the control too far overdrives the output tubes to high levels of distortion can be ignored. The circuit changes that will be introduced secure improved distortion characteristics at the expense of desensitizing part of the amplifier, and extra driving signal voltage will be required.

[To Be Continued]

## Service Engineering

(Continued from page 40)



"You can't worry Ed since he's switched to G-E radio dial lamps"

You'll have a vacation from at least one worry when you use General Electric radio dial lamps in your repair work. G-E lamps can't cause annoying static. Hundreds of laboratory tests assure top lamp quality, long life, fewer early burnouts. Be sure you give your customers the best. Replace old dial lamps with General Electric.

**GENERAL**  **ELECTRIC**



mechanism follows the angular motion of the basic instrument as determined by the deflection of the light beam through the optical system.

A schematic of the recorder's power supply appears in Fig. 2 (p. 40). The function of the power unit is to supply current to the recording element. The unit consists of two phototubes that collect the light output of the optical system, the power transformer furnishing plate and filament power for the vacuum tubes, and associated resistors and capacitors.

### Potentiometer-Type Recorder

The potentiometer-type and the deflection-type recorders are similar mechanically. The external appearance of the two is exactly the same, and both are available with various chart-carriage and rate-gear combinations. In the potentiometer type, however, the mirror reflecting on the dividing mirror is fixed, and a restoring spring is attached to a recording mechanism. The basic instrument in the potentiometer-type is a compensated-type suspension galvanometer, which is used as a null-balance detector.

The electrical circuit differs from that of the deflection type in that it includes a resistance, which is in series with both the measuring circuit. It is this interconnection between the recording system and the measuring circuit that gives the unit the potentiometer characteristics.

When an *emf* is impressed across the recorder terminals, the galvanometer deflects from its position of balance (which is the mechanical zero of the galvanometer at zero input). This deflection of the galvanometer results in a shift of light to one phototube and causes power unit to put out current through the resistor. The voltage drop across this resistor is in such a direction as to reduce the voltage across the galvanometer and restore it to a balanced position. When the voltage drop, for all practical purposes, is equal and opposite to the input *emf*, the circuit is at balance. Since the value of this resistance is predetermined, the deflection of the recorder pen that measured the power unit output is proportional to the input *emf* and calibrated in millivolts. A change in the applied potential causes the circuit to rebalance at a new value which is indicated by the position of the recording-element pen pointer. The rebalance occurs in less than one-half second on ranges above five millivolts.

**BUILD YOUR OWN**

*Heathkit*

**TEST EQUIPMENT**

Heathkits are completely engineered instruments supplied unassembled. Every kit goes together smoothly and easily. All drilling, punching, and painting has already been done for you. All parts are furnished and are of highest quality.

Detailed construction manual shows clearly where each wire and part goes and tells exactly how to build the kit. Write for free catalog.

**AUDIO GEN. KIT**  
\$29.50

**R. F. SIGNAL GEN. KIT**  
\$19.50

**5" SCOPE KIT**  
\$43.50

**SIGNAL TRACER KIT**  
\$22.50

**BATTERY ELIMINATOR KIT**  
\$24.50

**CONDENSER CHECKER KIT**  
\$19.50

**T.V. ALIGN. GEN. KIT**  
\$39.50

**VACUUM TUBE VOLTMETER KIT**  
\$24.50

**IMPEDANCE BRIDGE KIT**  
\$69.50

**TUBE CHECKER KIT**  
\$29.50

**GRID DIP METER KIT**  
\$19.50

**HEATH COMPANY**  
BENTON HARBOR 11,  
MICHIGAN

EXPORT AGENT  
**ROCKE INTERNATIONAL CORP.**  
13 East 40th Street  
NEW YORK CITY (14)

## Ser-Cuits

(Continued from page 51)

in diameter, and mounted in a cylindrical hole. Tuning capacitance is provided by a small machine screw which enters the top of the coil through a mounting bushing. No connection is made to the top end of the coil other than the capacitance due to the proximity of the metal screw. The minimum capacitance of the circuit is approximately .25 mmfd, and substantial tuning ranges are achieved. The *uhf* range can be covered with three different coils; the first can be tuned from 470-602 mc, the second from 608-734 mc, and the third from 740-890 mc.

The inductive coupling between the two tuned circuits in the preselector is provided by a small metal pin pressed into a recessed hole in the casting between the two coils. The junction between the low potential ends of the two coils is returned to the casting through this pin which forms an inductance common to the two circuits.

The mixer output is fed to a *pi* network composed of an *rf* bypass capacitor as the input capacitance and the grid-cathode capacity of the 6BK7 as the output capacitance. The *pi* network provides very nearly optimum coupling between the crystal and the 6BK7 grid for best noise figure, resulting in most of a 3-db improvement in noise figure, which is available if the *if* amplifier absorbs no power from the crystal.

To permit the circuit to operate with only the crystal as damping, current bias is provided for the crystal by means of a resistor connected from *B+* to *rf* grid turret contact. The 6BK7 grid is isolated from this point by a 100-mmfd blocking capacitor. With approximately 1/2 milliamperes of *dc* flowing through the crystal, its resistance presented to both the *rf* and *if* circuits is said to be constant and, in the case of the *if*, is roughly 180 ohms.

### Tuning Multiplier Circuit

The multiplier circuit can be tuned by connecting a voltmeter, which has a full scale reading of .2 or .3 of a volt, to the turret contact which connects to the 6BK7 grid. With the proper oscillator strip inserted, and the oscillator on the correct frequency, the multiplier tuned circuit can be adjusted for a dip in the voltmeter reading. A large value of excitation will cause the polarity of the voltage across the crystal to reverse, but optimum excitation is that which causes the voltage across the crystal to drop from, say 1/4 to roughly .1 volt. It is not necessary to

# TELEVISION MASTS

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open any circuit to measure the crystal excitation.

The *uhf* channel strip for the oscillator section consists of three coils and a small capacitor mounted on a molded turret strip. The 6BK7 plate and 6U8 mixer grid are tuned to *if* and the coupling between them is adjusted for proper bandwidth at both the sound and picture carriers. The oscillator coil is adjusted to its exact frequency by means of a metal screw which enters the coil and changes its inductance in exactly the same manner as on *vlf* strips.

A 40-mc type *if* amplifier is used in this chassis; it consists of three trans-

former-coupled stages with 6CB6s.

Three traps are used: sound (41.25 mc), adjacent picture (39.75 mc) and adjacent sound (47.25 mc). A degenerative trap, which tunes very broadly at 44 mc has been included in the cathode circuit of the 6CB6 first *if* amp. to improve the sound on weak signals. This trap does not affect the overall *if* response on strong signals. A small *rf* choke, between the cathode circuits of the first and third 6CB6 *if* amps, is used to prevent signal coupling between the two stages and still allow a *dc* path for the bias voltage applied to the 6CB6 first *if* cathode.

A crystal diode is used to rectify the video and sound *if* signals. The two *if* carriers beat together in the diode detector producing a 4.5-mc sound carrier, which is FM sound modulated.

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## TV Antenna Digest

(Continued from page 52)

up or down on the stub for best possible match.

If more gain is desired, four antennas can be stacked; matching strips are supplied with the antennas.

### Wavetraps<sup>1</sup>

The recent boosts in station power have created many odd and disturbing interference problems, not only in the local but fringe areas, too. In San Diego, Calif., for instance, an example of extreme adjacent channel interference has occurred. In this area there are two local stations operating, one on channel 6 and the other on 8. However, there are seven receivable channels from Los Angeles: 2, 4, 5, 7, 9, 11 and 13, one hundred miles away. In this case, the local channel 6 picture carrier has been found to interfere with the channel 5 picture, and similarly the local channel 8 picture carrier destroys the channel 7 picture, while the channel 8 sound carrier interferes with the channel 9 picture. Unfortunately, all the channels are received in approximately the same direction, and antenna rotation system provides no improvement. A solution has been found in the proper use of passive-network tuned-frequency wavetraps, as illustrated in Fig. 1 (p. 52).

These traps are designed to attenuate undesirable interference signals picked up by the receiver antenna system.

### Proper Use of Traps

Often wavetraps are improperly used and blamed for ineffective results. The traps cannot eliminate interference except that arriving through the antenna system. If interference is picked up directly by the receiver circuits or coupled into the set via the power lines, other methods must be used to eliminate the problem. In many instances it has been found that the length of transmission line from the receiver tuner to the terminals at the rear of the cabinet is extremely susceptible to interference pickup. Obviously, a wavetraps connected between the antenna and the receiver terminals will do little to eliminate the undesired signal. In such cases the trap must be mounted as close to the tuner as possible, and if this is not feasible, the line from the tuner to the trap must be shielded.

<sup>1</sup>From notes submitted by Andrew F. Kay of Non-Linear Systems.

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## Service Helps

(Continued from page 54)

antenna channel coils opposite the pair of *uhf* strips in operation. A *vtrm* should then be connected across the video detector load resistor and the lowest voltage scale possible used, while making the following adjustments: Using the non-metallic tool, the four slugs in the antenna strip should be adjusted. In this operation, it is important to start with slug *G*, nearest the oscillator-converter strip, and then adjust slugs *F*, *C* and *A* in order. Adjustment must be for maximum reading on the *vtrm* or for best picture with minimum snow. If the signal is weak, the amount of snow in the picture is the best visual indication.

The first two adjustments (*G* and *F*) are the most critical; adjustments *C* and *A* are broad. When adjusting these slugs, you must be careful not to turn them in or out too far, or the slug tension spring will snap out of position. If this happens, it will be impossible to reposition the spring and it will be necessary to hold the slug in position by some other means, such as shellac.

#### UHF Strip Troubleshooting

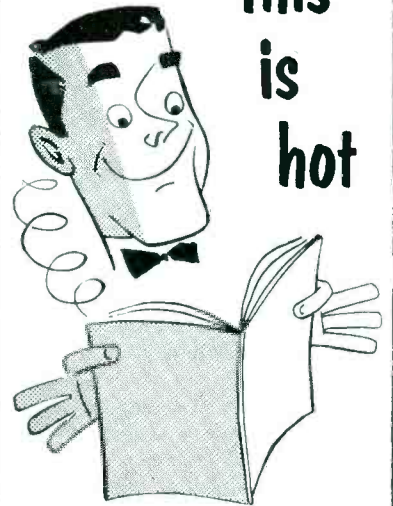
Lead dress and component placement are critical. The antenna (5 contact) strip should always be inserted first for ease of installation and protection against damage to the connecting pin (*J*) as shown in Fig. 1 (p. 54.)

In troubleshooting the *uhf* channel strips the receiver must operate normally on *vhf*. Sensitivity and alignment should be checked if necessary. If, after installing a set of *uhf* channel strips, the receiver does not perform satisfactorily, a set of strips, known to be good, should be tried. The 6J6 *vhf* oscillator tube in the tuner should also be changed. If the strips require servicing, they should be first inspected and checked for cold solder, broken, loose or shorted connections, and physical positioning of components as compared with another channel strip known to be good.

The metal sleeve for connecting pin, *J*, should be checked for good contact. Ground spring, *H*, on the antenna strip should make good contact with turret detent disc. If necessary, the connecting pin, metal sleeve, ground spring and turret detent disc should be cleaned with alcohol, then dried and buffed using soft canvas or rough cloth. Carbon tet should not be used, and no lubricants should be applied to these points.

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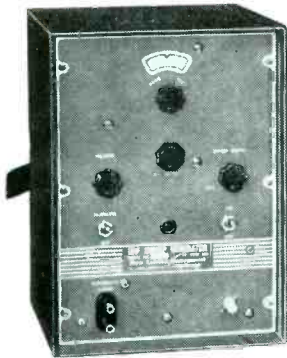
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1R5 ..... .65	6AK5 ..... .85	6BL7GT ..... 1.10	6V6GT ..... .55	25BQ6GT ..... 1.10
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1S5 ..... .55	6AQ5 ..... .55	6BQ7 ..... 1.05	6W6GT ..... .65	35B5 ..... .65
1T4 ..... .65	6AG5 ..... .65	6BK7 ..... .95	6X5GT ..... .45	35C5 ..... .65
1U4 ..... .65	6AT6 ..... .45	6C4 ..... .45	12AT6 ..... .45	35L6GT ..... .60
1U5 ..... .55	6AU6 ..... .49	6C5 ..... .59	12A7 ..... .80	35W4 ..... .45
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3S4 ..... .65	6BA6 ..... .55	6H6 ..... .55	12BE6 ..... .57	50L6GT ..... .60
3V4 ..... .65	6BC5 ..... .65	6J5GT ..... .50	12BH7 ..... .75	
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1S5 ..... .41	6AQ5 ..... .41	6BQ7 ..... .79	6W6GT ..... .31	35B5 ..... .49
1T4 ..... .49	6AG5 ..... .49	6BK7 ..... .71	6X5GT ..... .34	35C5 ..... .49
1U4 ..... .49	6AT6 ..... .34	6C4 ..... .34	12AT6 ..... .34	35L6GT ..... .45
1U5 ..... .41	6AU6 ..... .37	6C5 ..... .44	12A7 ..... .60	35W4 ..... .32
1X2A ..... .55	6AV6 ..... .34	6CB6 ..... .45	12AU7 ..... .49	50B5 ..... .49
3Q5GT ..... .58	6B4G ..... .82	6CD6G ..... 1.11	12BA6 ..... .41	50C5 ..... .49
3S4 ..... .49	6BA6 ..... .41	6H6 ..... .41	12BE6 ..... .56	50L6GT ..... .45
3V4 ..... .49	6BC5 ..... .49	6J5GT ..... .37	12BH7 ..... .56	
5U4G ..... .37	6BE6 ..... .41	6J6 ..... .54	12SN7GT ..... .49	
5Y3GT ..... .34	6BG6G ..... 1.19	6K6GT ..... .37		

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## Tube News

(Continued from page 55)

possible; Fig. 4; p. 55. Tuner *a* has two stages of *rf* amplification on *vhf* and *uhf*; tuner *b* has a cascade on *vhf* and a single-stage grounded-grid amplifier on *uhf*; tuner *c* has a single-stage grounded-grid amplifier on *vhf* and *uhf*. All three tuners use the 6AN4 as a mixer and the 6T4 as an oscillator.

Tuner *a* will provide good performance on *vhf* and *uhf*; tuner *b* will afford good performance on *vhf* and fair performance on *uhf*, while tuner *c* will provide fair performance on both *vhf* and *uhf*.

### Picture-Tube Developments

The 24-inch picture tubes, restricted to small runs of receivers for quite awhile, have now become a feature of many models. To accommodate this increased use, a number of different types of 24-inchers have been developed.

One tube maker<sup>1</sup> has produced a magnetically deflected and magnetically focused type,<sup>2</sup> with a tinted gray faceplate, and a 90° deflection angle. Picture size is said to be approximately 17¼" x 21¾". The tube is rated for operation with second anode potentials up to 18 kv, with typical operation calling for 300 volts on *G*<sub>2</sub> and 17 kv on the second anode.

The tube is claimed to produce a striking ratio of highlight brightness and small-detail contrast, which provides improved small-area detail and gives the effect of increased resolution.

Also being produced now are 24-inch aluminumized glass rectangular<sup>3</sup> with deflection angles of 90°. The tube measures 21½" in overall length.

The tube's aluminumized screen is said to increase light output and picture contrast; also uses a gray faceplate to improve picture detail under high ambient light conditions. The tube operates with magnetic focus and deflection.

### Large Screen Damper Diodes

Wider deflection angles and the increased second anode voltage required to maintain picture brightness on the 90° picture tubes calls for higher deflection power and increased circuit efficiency. To provide this power, a new damper diode<sup>4</sup> with a 175-ma rating has been designed.

The tube is said to feature insulation between heater and cathode, designed to withstand the full pulse plate-to-cathode voltage, which eliminates the need for separate power transformer windings insulated for high voltage.

<sup>1</sup>National Union. <sup>2</sup>N.U. 24CVP4.  
<sup>3</sup>G.E. 24CP4-A. <sup>4</sup>Tung-Sol 6AU4GT.

# Color Set Servicing

(Continued from page 27)

successive picture frames. In this case, the signal is in the same phase in every line. The picture resulting from this 47.25-kc signal would be three pairs of alternate black and white vertical stripes.

At *B* the relationship is shown for a signal at an odd harmonic of half the line frequency. Since each line contains exactly two and half cycles of the signal, it will be in opposite phase in alternate lines. Due to vertical interlace, the picture resulting from a single frame would then be pairs of horizontal scanning lines carrying in-phase signals, but with alternate pairs of lines carrying signals of opposite phase. Since the color signals are all above 2 mc there would actu-

ally be a large number of cycles each line, and the picture resulting from a single frame would appear as a fine dot structure. However, since alternate lines are carrying a signal of opposite phase the first line of the second frame will carry a signal of opposite polarity to that of the first frame. The second frame will then form an overall dot structure of opposite polarity to the dot structure of the first frame. Since the eye has a low sensitivity to signals of frequency as high as the frame frequency (30 cps) the interfering dot structure will tend to be cancelled out by the eye. The cancellation will not be perfect, and under certain combinations of color signals, inspection of the picture at close range would reveal traces of the fine dot structure. At normal viewing distances, however, the interference would not be discernible.

In the color channels the *Y* signal sidebands will appear as sidebands of the color subcarrier, but in relation to the subcarrier they will fall at odd multiples of half the horizontal scanning frequency. *Y* signal interference in the color channels will then be of opposite polarity in alternate frames

(Continued on page 78)

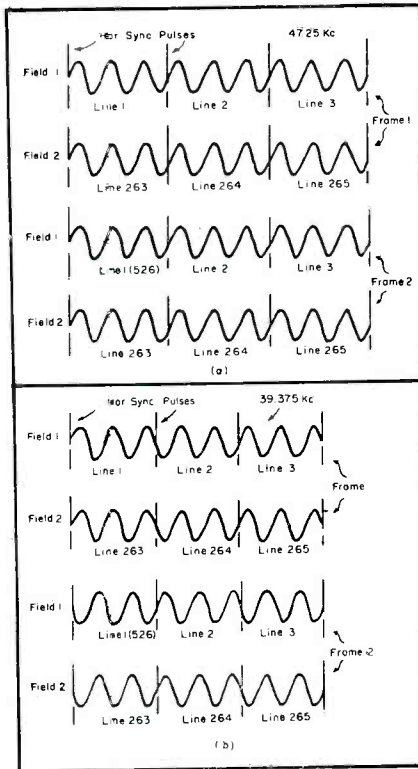
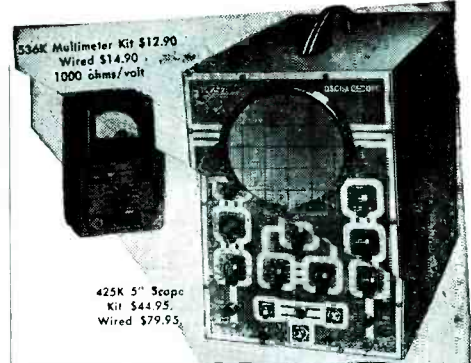
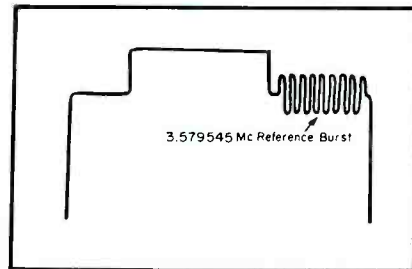


Fig. 3. Relationship of a black and white signal at an even harmonic of half the horizontal scanning frequency for the four fields of two successive picture frames is illustrated in (a). At (b) appears the relationship of a signal at an odd harmonic of half the line frequency.

(Left)

(Below)

Fig. 4. NTSC horizontal sync pulse, including the subcarrier reference burst.



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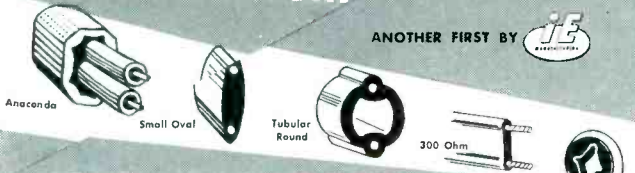
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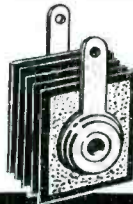
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(Continued from page 77)  
and will not be apparent to the viewer.

The sync pulses transmitted by the color transmitter are the same as presently used in the monochrome system, except that the back porch of the horizontal sync pulse carries about 9 cycles of the 3.579545-mc color subcarrier frequency. This signal is needed because the subcarrier is suppressed in the color modulators, and a reference signal is required to allow the exact subcarrier phase and frequency to be reinserted within receiver. Fig. 4 (p. 77) shows a horizontal sync pulse including the subcarrier reference burst.

As illustrated in Fig. 1 the reference signal is transmitted with a phase difference of 180° with the subcarrier frequency. One might say that this system uses everything in the pig but the squeal, and if the back porch of the sync pulse can be considered the squeal, that is used too.

### The Compatible Color Receiver

Because of the nature of the transmitted signal, the color receiver must not only be capable of responding to the three primary colors, but also it must be able to separate these three

colors from the complex signal received. It is this necessity for separating or decoding the color signals that requires the receiver to meet rather exacting requirements and which will cause the Service Man to be confronted with a number of new and complex circuit functions. As noted last month,† one manufacturer has developed several color-receiver models, and included such design data in their petition to the FCC. Others have also designed several types of color chassis. All, however, have followed the basic

†National Scope, SERVICE, July, 1953.



NTSC receiver concepts. A block diagram of a possible arrangement of a receiver to operate with the NTSC color system is shown in Fig. 5. The

conventional tuner, sound and picture, if, video, sound and sweep circuits are represented as a single block. Also, shown are the additional circuits required to decode the color information and provide red, blue and green signals to picture tube.

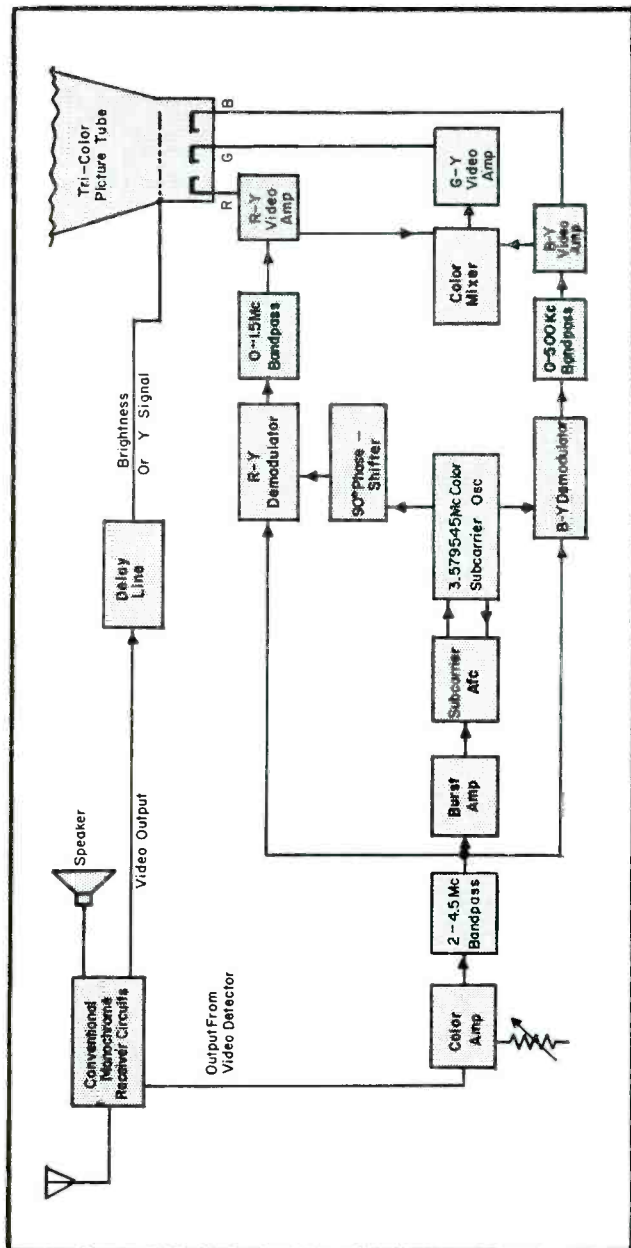


Fig. 5. Possible arrangement of circuits for an NTSC color receiver.

required to decode the color information and provide red, blue and green signals to picture tube. The video output of the receiver is passed through a delay line and is connected to the common signal grid of a tricolor picture tube. This signal is a high-definition (0.4 mc) monochrome or brightness signal corresponding to the Y signal from the transmitter. The delay line is necessary to retard the Y signal in time so that it will correspond to the picture information which is delayed by the low-pass filters in the sound channels. The output from the video-detector is fed to the circuits in the receiver which are used to resolve the color information. The composite video is first amplified by the color amplifier and then passed through a 2-4.5-mc bandpass filter which limits signal to that part of the spectrum containing color information. A gain control on color amplifier provides a color saturation control.

[To Be Continued]

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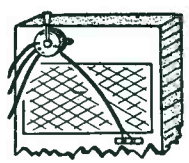
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for Multiple

### UHF and VHF ANTENNA INSTALLATIONS

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- Also available in Flush Wall Plate style.



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List Price..... \$3.75

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By WALTER V. TYMINSKI

## AN EVALUATION OF PASSIVE TELEVISION RECEIVER COUPLERS

The efficient operation of several television receivers from a single antenna has been the subject of a continuous development program at I.T.I. The original Multivision\* Antenna System used resistors to bridge a resistive terminated transmission line. For balanced systems 330 ohm resistors were placed between the tap point and the receiver twin lead on both sides of the line. This arrangement when used to operate two receivers has the following characteristics:

Loss Ant.-to-Set = 12 db (P/16)  
 Loss Set-to-Set = 22 db (P/160)  
 Directivity —  $\frac{\text{Loss Set-to-Set}}{\text{Loss Ant.-to-Set}} = 10 \text{ db (10)}$   
 Freq. Range — VHF and UHF

Because the insertion loss of the resistive coupler was considered excessive a lumped transmission line unit was developed. Essentially the IT-117A two-set *AutoCoupler* consists of two transmission lines having a characteristic impedance of 150 ohms, an electrical  $\frac{1}{4}$  wave length at 65 mc, and a  $\frac{3}{4}$  wave length at approximately 195 mc. The lines are connected in series at the antenna input and each line is then used to feed a separate receiver.

The *AutoCouplers* use no dissipative elements and the antenna-to-set insertion loss is almost entirely due to the 3 db loss encountered when power is divided into two equal loads. Operating characteristics for the IT-117A *AutoCoupler* are:

Loss Ant.-to-Set = 3.5 db (P/2.2)  
 Loss Set-to-Set = 9.5 db (P/9)  
 Directivity = 6.0 db (4)  
 Freq. Range — VHF

In areas where lower signal strength can be tolerated, resistive pads can be used in conjunction with the IT-117A. Since attenuation masks impedance variation, the use of pads exceeding 6 db will extend the frequency range of the *AutoCoupler* to include the UHF band. The use of resistive pads also increases the directivity of the Coupler. If for comparison purposes 8.5 db pads are placed at each receiver to obtain the same antenna-to-set insertion loss as the resistive decoupler, the operating characteristics become:

Loss Ant.-to-Set = 12 db (P/16)  
 Loss Set-to-Set = 27 db (P/500)  
 Directivity = 15 db (30)  
 Freq. Range — VHF and UHF

(to be continued)

\*Trade Mark

**Industrial Television, Inc.**  
 369 LEXINGTON AVENUE CLIFTON, N. J.  
 GRegistry 3-0900

## NEWS AND FLASHES

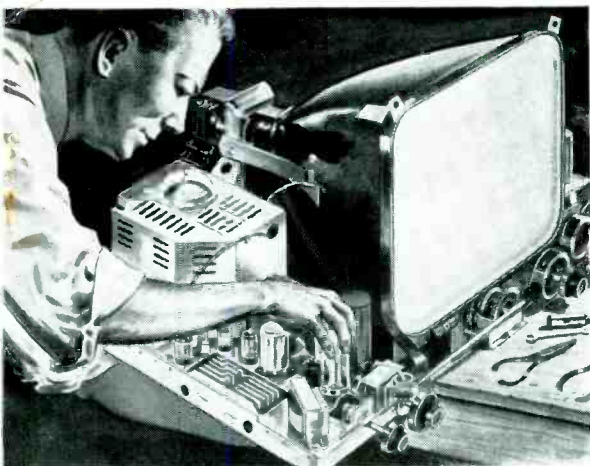
MULTIPLE-SPEAKER systems housed in console-type enclosures have become so popular that table-phonograph makers have decided to feature nests of speakers in their models. Thus far, about a half-dozen manufacturers have announced lines with 4", 6" or 8" speaker networks installed in 2 and 3-port cabinets. Design highlights on these new type phonos will appear soon in SERVICE. . . . *Keeping Pace with the Present and Building for the Future*, has been adopted as the theme of the fourth annual conclave of NEDA, which will be held in St. Louis, Sept. 14-15-16. . . . The 1953 Audio Fair which will be held at the Hotel New Yorker, Oct. 14-15-16-17, is expected to attract 20,000. . . . *John W. Hines* has been appointed director of sales of Magnecord, Inc. . . . A distributor of custom-built TV and audio units, *Teleparts of Long Island*, has established a wholesale dealer showroom at 248-52 Jericho Turnpike, Bellerose 26, L. I., N. Y. According to *Walter C. Hales*, firm sells only to Service Men and dealers, and features everything for the TV and audio custom assembler, including TV chassis, cabinets, tubes, changers, speakers, enclosures, etc. . . . *Simpson Electric Co.*, Chicago, Ill., has announced that it will spend \$250,000 in the next 12 months to promote its line of test equipment. . . . *John B. Couillard* has been named sales engineer for the G. E. components department in Syracuse. . . . A *glass bank*, which enables a distributor to turn in used glass in any quantity at any time, has been established by Pioneer Electronics Corp., Santa Monica, Calif. Distributor can order new tubes and apply the glass credit he has earned toward the purchase of these tubes. Balance of the used glass remains on deposit, credited to his account. . . . *Burlingame Associates*, 103 Lafayette St., New York 13, N. Y., celebrated its 25th anniversary recently. . . . *IRC* has started construction of a plant on a 20-acre tract located in Boone, Watauga County, North Carolina. Estimated building cost has been set at \$400,000. *John Kane* has been appointed plant manager. . . . The annual fall NATESA convention, set for Oct. 9-10-11, will be held at the Morrison Hotel, in Chicago. . . . *Richard J. Clark* has been appointed manager of the new Motorola regional parts depot at 171 Parkhouse St., Trinity Industrial District, Dallas, Texas. . . . When vibrator replacement becomes necessary in the vibrator-powered headlight dimming device, which is a standard accessory on many automobiles, a Mallory W859 vibrator can be used in devices operating on 6-volt automotive systems, and an 859 can be employed in those using 12 v. Both of these vibrators are inter-rupter types. . . .

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