

# RADIO & TELEVISION NEWS

SEPTEMBER  
1952

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## IN THIS ISSUE

MOBILE RADIO

TRANSISTOR DEVELOPMENTS

TV CONVERSION GUIDE  
("Data-Print" No. 5)

THREE TUBES ON 2 METERS

CONVERTER FOR PHONE & C.W.

TWO-STATION INTERCOM

VARIABLE VOLTAGE SUPPLY

REMOTELY-CONTROLLED  
AM TUNER

TV RECEIVING ANTENNA  
TESTING TECHNIQUES  
(See Page 58)





## Quality control by feedback

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FOR MANY YEARS, RCA has employed a system, which might be called "feedback" control, in the manufacture of RCA Tubes. This system is recognized by industry as a most effective method for achieving superior product quality. Here's how it works . . .

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# I WILL TRAIN YOU AT HOME FOR GOOD PAY JOBS IN RADIO-TELEVISION

J. E. SMITH has trained more men for Radio-Television than any other man.

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2 FREE BOOKS SHOW HOW MAIL COUPON

### I TRAINED THESE MEN



**LOST JOB, NOW HAS OWN SHOP**  
"Got laid off my machine shop job which I believe was best thing ever happened as I opened a full time Radio Shop. Business is picking up every week."—E. T. Slate, Corsicana, Texas.

**GOOD JOB WITH STATION**  
"I am Broadcast Engineer at WLPN. Another technician and I have opened a Radio-TV service shop in our spare time. Big TV sales here . . . more work than we can handle."—J. H. Bangley, Suffolk, Va.

**\$10 TO \$15 WEEK SPARE TIME**  
"Four months after enrolling for NRI course, was able to service Radios . . . averaged \$10 to \$15 a week spare time. Now have full time Radio and Television business."—William Weyde, Brooklyn, New York.

**SWITCHED TO TV SERVICING**  
"I recently switched over from studio work and am now holding a position as service technician. I am still with RCA, enjoying my work more and more every day."—N. Ward, Ridgefield, N. J.

### WANT YOUR OWN BUSINESS?

Let me show you how you can be your own boss. Many NRI trained men start their own business with capital earned in spare time. Robert Dohmen, New Prague, Minn., whose store is shown at left, says, "Am now tied in with two Television outfits and do warranty work for dealers. Often fall back to NRI textbooks for information."



### 1. EXTRA MONEY IN SPARE TIME

Many students make \$5, \$10 a week and more EXTRA fixing neighbors' Radios in spare time while learning. The day you enroll I start sending you SPECIAL BOOKLETS that show you how. Tester you build with kits I send helps you make extra money servicing sets, gives practical experience on circuits common to Radio and Television. All equipment is yours to keep.

### 2. GOOD PAY JOB

NRI Courses lead to these and many other jobs: Radio and TV service, P.A., Auto Radio, Lab, Factory, and Electronic Controls Technicians, Radio and TV Broadcasting, Police, Ship and Airways Operators and Technicians. Opportunities are increasing. The United States has over 105 million Radios—over 2,900 Broadcasting Stations—more expansion is on the way.

### 3. BRIGHT FUTURE

Think of the opportunities in Television. Over 15,000,000 TV sets are now in use; 108 TV stations are operating and 1800 new TV stations have been authorized . . . many of them expected to be in operation in 1953. This means more jobs—good pay jobs with bright futures. More operators, installation service technicians will be needed. Now is the time to get ready for a successful future in TV! Find out what Radio and TV offer you.



## You Learn Servicing or Communications by Practicing With Kits I Send



### Television Is Today's Good Job Maker

TV now reaches from coast-to-coast. Qualify for a good job as a service technician or operator. My course includes many lessons on TV. You get practical experience . . . work on circuits common to both Radio and Television with my kits. Now is the time to get ready for success in Television!

This is Just Some of the Equipment My Students Build. All Parts Yours to Keep.

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Act Now! Send for my FREE DOUBLE OFFER. Coupon entitles you to actual Servicing Lesson; shows how you learn at home. You'll also receive my 64-page book, "How to Be a Success in Radio-Television." Send coupon in envelope or paste on postal. J. E. SMITH, Pres., Dept. 2 JE National Radio Institute, Washington 9, D. C. Our 39th Year.

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COVER PHOTO: Using a special "quick-rig" installation rack, JFD development engineers set up arrays for on-the-spot performance tests. Antennas can be oriented in any direction. (Ektachrome by Al Di Paolo)

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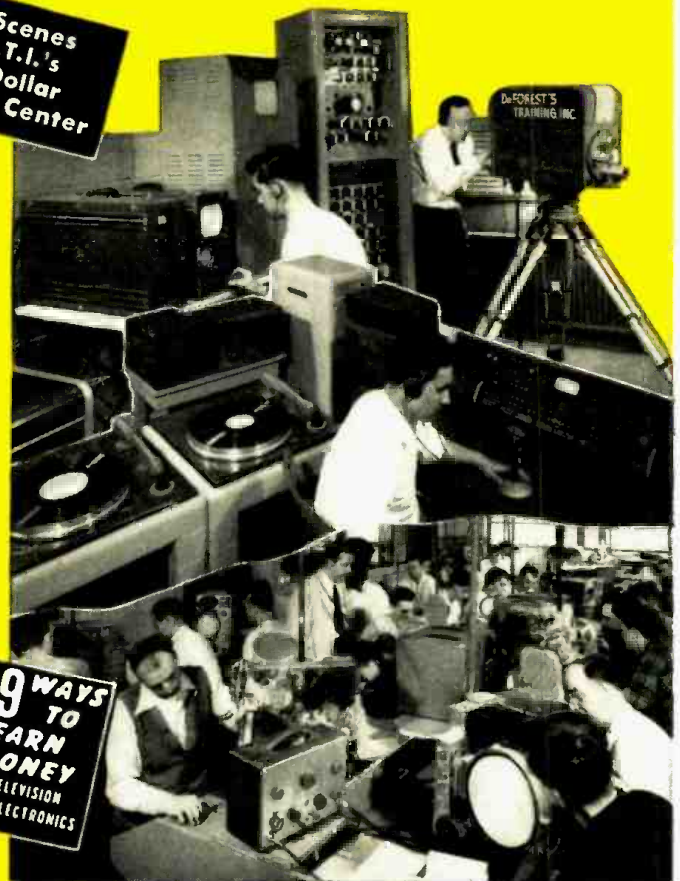
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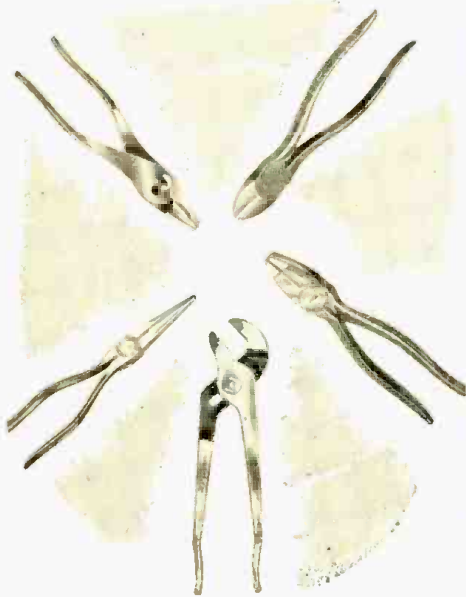


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MEADVILLE, PENNSYLVANIA

### Mac's Service Shop

(Continued from page 68)

"People are funny, to coin a phrase; but I know from experience that at least four out of five customers will not take the set away when the facts are presented to them in this fashion.

"Even if he doesn't leave it, you have suffered no real loss. For a service shop to gain a reputation for doing good work at reasonable prices is a good thing, but to get a reputation for 'working cheap' never really helped any shop—not in the long run."

"You know, I think the toughest thing of all to handle are requests for credit," Barney offered. "In spite of signs all over the place saying that service work is strictly cash, we still get these. What makes it really hard is that quite likely, in many cases, there is no intent to chisel. A lot of people just ask for credit sort of automatically."

"Yes, I know what you mean," Mac said: "but a strictly cash policy must have no exceptions if it is to be effective. In this case, the exception proves there is no rule—not really. You notice that new customers seldom give us any trouble in this respect. It is easy for them to understand that we cannot be asked to trust them since they are unknown to us. But when an old customer or, worse yet, a friend says, 'How about my paying for this Friday?' that really puts the pressure on the strictly cash policy."

"Yeah, but I've seen you handle that one more than once," Barney remarked.

"That's right. I explain quite truthfully that our bookkeeping system is

set up for a strictly cash operation and that there is absolutely no provision for a credit arrangement. Then, if it is a friend or someone in whom I have confidence, I suggest that I will make them a personal loan so that they can pay Miss Perkins for the set and keep our records straight. I have never lost a dime this way. It's kind of funny, but people who would let a bill owed the shop drag on and on will show up promptly Friday to pay back the money I let them have out of my own pocket."

"Do you think we lose some business because we don't do service work on tick?" Barney asked.

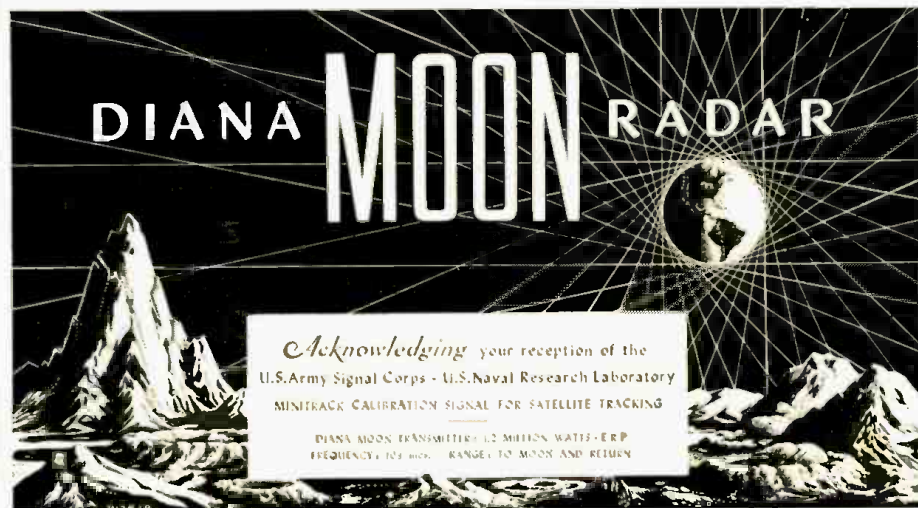
"Certainly I do, but I'm not worried about it. Maybe I'm wrong, but I think in the long run we come out ahead. I've talked to lots of technicians who tried to make a go of independent service and failed. Invariably, they closed their doors with a lot of credit on their books; and you can imagine how much of that was ever collected after the business failed. Every time someone walks out or hangs up when I say that our strictly cash policy means exactly what it says and I feel a little low about it. I just remember these failures and determine to keep right on as we have been doing. Say, what are you grinning about?"

"I was just thinking what a switch this conversation has been from some of the magazine articles I've read," Barney said. "They are always telling the readers how to keep the radio service shop from gypping them, and here we have been talking about how to keep the public from chiseling the service technician. Personally, I find it a delightful and refreshing change!"

"So do I," Mac said; "so do I!"

-30-

Amateur radio operators who successfully pick up signals from outer space during calibration of the satellite-Minitrack stations can now show cards acknowledging their reception. Before launching of U. S. satellites, the giant transmitter and antenna of the Diana moon radar at the U. S. Army Signal Research and Development Laboratory at Fort Monmouth bounce 108-mc. signals off the moon. This is done so that the far-flung Minitrack stations and amateur radio operators can calibrate their receivers for precise tuning to the transmitters aboard the U. S. satellites. When hams receive the moon-bounced signals, they notify the Laboratory at Fort Monmouth or the American Radio Relay League at West Hartford, Conn. In appreciation of their assistance, the Army sends each reporting amateur a customary acknowledgment or QSL card—the first one ever issued for picking up signals via the moon.



# The TRIRO ROTATOR



*Easy to Sell!*

It's easy to sell a product with as many plus features to talk about as the TRIRO ROTATOR. In design, in construction, appearance; it is by far the outstanding TV antenna rotator in the market today!

*Stays Sold!*

In addition to providing a powerful sales story, the features listed below are your assurance of complete customer satisfaction: Assurance that the TRIRO ROTATOR will give dependable performance year in and year out — in all kinds of weather!

- ✓ Two powerful 24 volt motors used — one for each direction of rotation. Each motor under load only fraction of time — will not burn out!
- ✓ Corrosion resisting, weatherproof housing of die-cast aluminum for greater strength, lighter weight, perfect alignment of parts!
- ✓ Positive electrical stops at ends of 360° rotation prevent damaging or twisting of leads!
- ✓ Will support heavy TV arrays — even in 80 MPH winds!
- ✓ Permanently lubricated with special grease that functions perfectly in high and low temperature extremes!
- ✓ Ball-bearing end thrusts on all shafts, including motor! Main shaft vertical load carried on large oversized "Oilite" self-lubricating bearing!
- ✓ All motors, shafts and gears mounted on a rugged, one-piece casting for true alignment and longer life!
- ✓ 1 1/16" diameter tool steel main shaft and mast holder will withstand 4500 inch pounds bending moment!
- ✓ Rotator and mast holder fits any pipe size up to 2" OD!
- ✓ Precision built to extremely close tolerances!



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Utmost ease in selecting the desired antenna direction is provided by a new "finger tip" control that operates at a light touch and the easy-to-read dial face that clearly and instantly indicates the exact antenna position.



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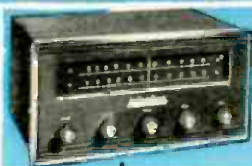
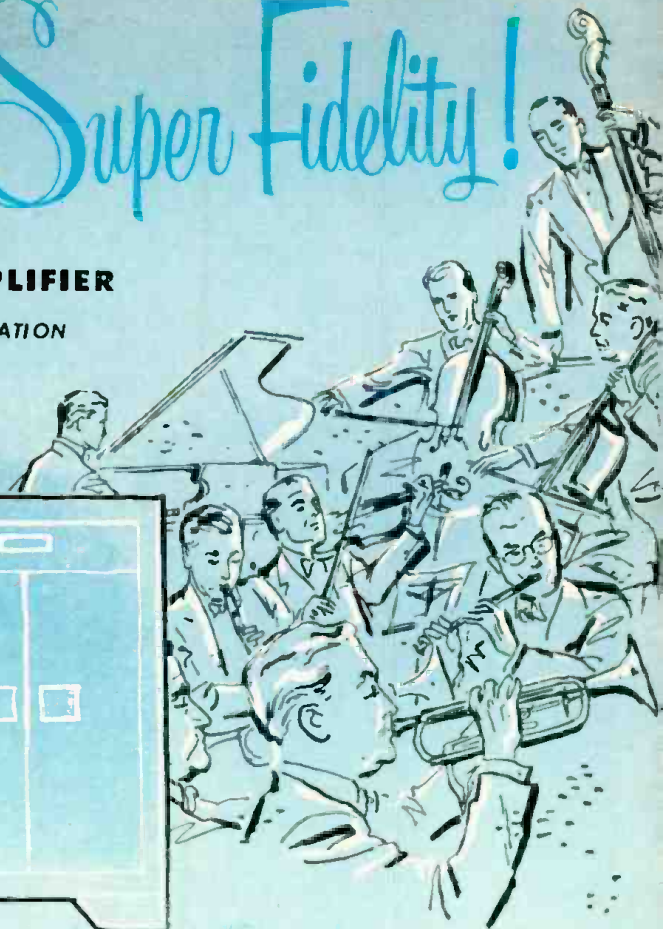
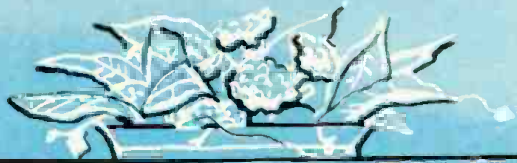
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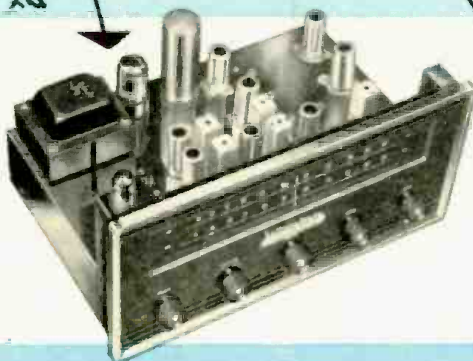
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The Super-Fidelity Amplifier utilizes a new output transformer which gives you the widest range ever produced heretofore. And harmonic distortion is less than 0.25% at 10 watts level! Also, U/L-Approved and completely encased for your protection.

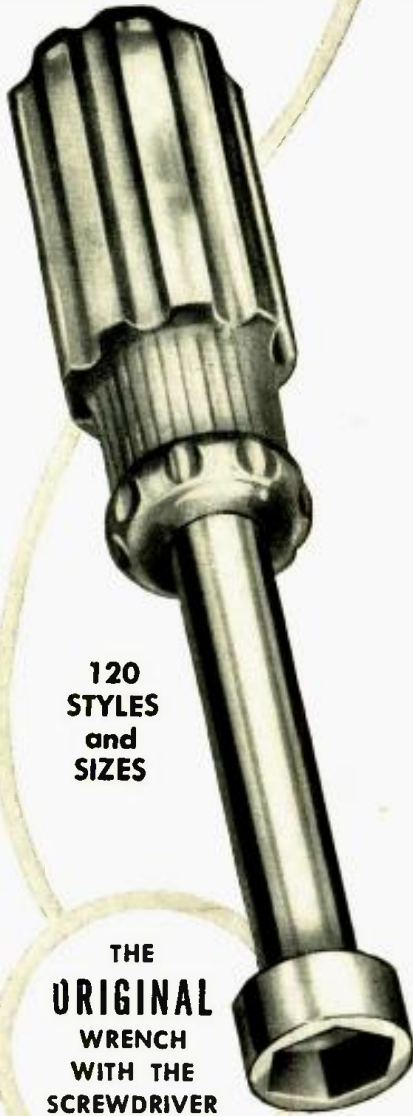
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## For the RECORD.

BY THE EDITOR

### AN AMATEUR'S RESPONSIBILITY

TO MANY of us, amateur radio is the greatest hobby in the world. Also, to some of us, amateur radio has grown to be a way of life. For years, dyed-in-the-wool hams have fitted amateur radio into their everyday lives more firmly than any other hobby has ever done. Life-long friendships, business associations, and even that most important partnership—marriage—have been formed through amateur radio contacts and acquaintances.

In years past it used to be that just to be a licensed ham was enough to merit a welcome in any circle, or group of other hams, anywhere. Today, the advanced state of the art has divided our interests so that there are many specialists' groups, each ardently pursuing their particular phase of the hobby. It is unfortunate that this has also tended to reduce the over-all bond that the operational and technical side of amateur radio once possessed.

There are many pleas made for tolerance but it is easier asked for than obtained. For example, an amateur vitally interested, qualified, and active on the v.h.f. bands finds it difficult to understand the motives behind the one-band operation of a confirmed 20-meter fone DX-er or an 80-meter c.w. traffic net operator.

Conversely, consider the viewpoint of an ardent and vocal "social net" operator on a 75-meter fone frequency. He may find it difficult to reconcile the enthusiasm with which a 10-meter mobile club enters into a Sunday picnic or hidden transmitter hunt.

With due consideration of the above (amateur radio does present a different facet to each licensee since we are all individuals) it must be realized that we do have, even now, one common bond—the so-called HAM spirit which has encouraged and stimulated the amateur until he is a vital force in the American scene. Through him amateur radio exerts its influence through public service and welfare, public morale and, through his contribution, has helped elevate the radio, television, and communication engineering art to its present high state.

We radio amateurs should be proud of our participation in this great hobby! True, in some isolated cases, amateurs are held in poor repute and their methods, results, and even their individualism have been ridiculed. Even some persons holding amateur licenses have been guilty of this type of intolerance.

There has never been a time in our history when it was so necessary that

we amateurs "stand up and be counted." The complexity of modern life, the constant distraction of other endeavors, the not-inconsiderable effect of spreading amateur radio over a too-wide area of interest and activity have all combined to reduce the cohesive qualities of our common bond.

One guiding element is always necessary in any endeavor. Organization! Amateur radio has long had its very own organization—*The American Radio Relay League*. It has been the greatest contributing factor in the continuance of the hobby of amateur radio, with the exception of those most indispensable elements—the rugged individualism, persistence, and the indefatigable effort of the amateur *himself*.

The majority of radio amateurs of this country are *not* meeting their responsibility, that of support, through membership, of the amateur's own organization—the ARRL!

It is the obligation of *every* amateur to be a *member* of the ARRL regardless of his personal belief concerning any individual or any group within the structure of the vast ARRL organization. Furthermore, it is vitally important that the *future* of amateur radio be insured by a strong voting membership in ARRL plus intelligent action on the part of ARRL officials on behalf of all amateurs. Thus, the power of ARRL will increase in proportion to its numerical strength.

ARRL membership has declined in recent years until approximately only one amateur in three is a member. Many factors have contributed to this sorry state. But, regardless of *why*, the major consideration must be that it need not be so!

Membership does not imply complete agreement with *all* the actions taken by any organization. It does qualify the member, authorize his opinions, and permit him a "voice" in the conduct of the organization.

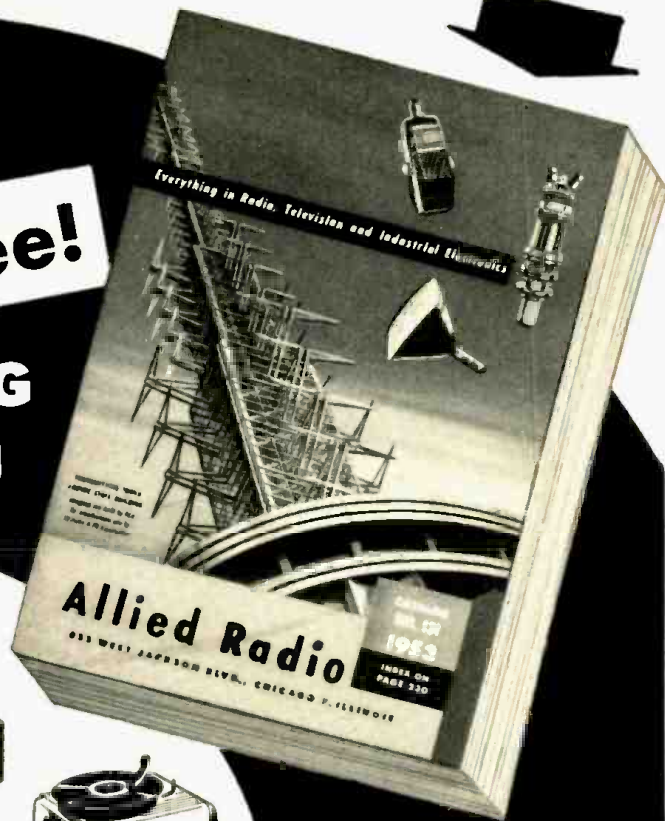
And, in amateur radio, the ARRL is the *one* organization carrying official weight and prestige gained by the efforts of the amateurs through long years of struggle. ARRL is fighting your battle, member and non-member alike. ARRL needs and must have the actual support—through membership—of all amateurs.

If you are not a member—join up and carry your weight in the effort to preserve, to continue, and to enhance amateur radio. The League must represent the *majority* of the majority—not the majority of a *minority* of the total licensees. . . . O.R.

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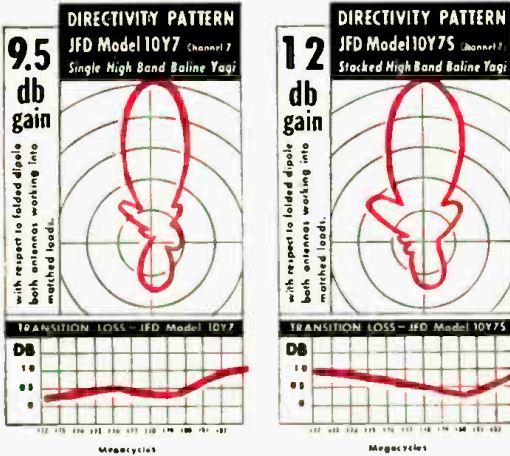
the greatest Yagi of them all  
**JFD 10-ELEMENT "Baline" YAGI**

\***12 db** (gain of stacked JFD BALINE over a tuned folded dipole)

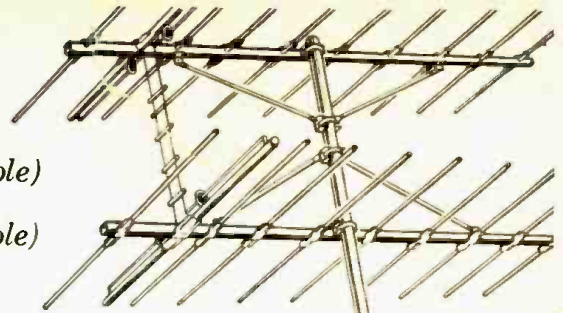
\***9½ db** (gain of single JFD BALINE over a tuned folded dipole)

\*These figures have been verified by the Hazeltine Corporation, world famous research laboratory. All JFD gain figures are based on a reference tuned folded dipole. Beware of exorbitant gain figures which are not based on any reference level.

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Single JFD High Band BALINE Yagis		
Channels	Models	List Price
7-13	10Y7-10Y13	\$13.85
Stacked JFD BALINE Yagis		
Channels	Models	List Price
2	10Y2S	\$63.70
3	10Y3S	63.70
4	10Y4S	56.90
4-5	10Y4SS	67.80
5	10Y5S	56.90
6	10Y6S	51.40
7-13	10Y7S-10Y13S	27.70
Includes JFD Baline matching transformers at no extra charge		
Single JFD Low Band BALINE Yagis		
Channels	Models	List Price
2	10Y2	\$31.85
3	10Y3	31.85
4	10Y4	28.45
4-5	10Y4S	33.90
5	10Y5	28.45
6	10Y6	23.70

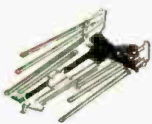


Illustrated: JFD No. 10Y2S-10Y6S Low Band Stacked Baline Yagi

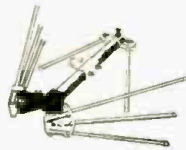
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 BALANCED LINE

*The antenna sensations of the Nation!*

**JETENNA**... the conical with jet-action assembly  
 ...no other fan conical assembles so fast, performs so well!



1. Pre-assembled JFD JeTenna as packaged. Note its compactness of construction and craftsmanship of design.



2. As the JeTenna swings open, dipole elements fan instantly into exact position by riding along unique fulcrum indices.



3. JeTenna elements lock into position effecting 35 forward inception angle and 40 dipole angulation for greater signal pickup. Reflectors snap into place for quick tightening by wing nuts.

Series with 1" seamless aluminum square crossarm and seamless aluminum elements reinforced with Fibreglas dowels.

No. JET160	Single Bay	Up to 8.8 db*	\$12.50 list
No. JET161	2 Bay	Up to 12.3 db*	\$26.40 list
No. JET164	4 Bay	Up to 15.5 db*	\$56.80 list

Series with 1" seamless square aluminum crossarm and wood-doweled butt-seam aluminum elements.

No. JET660	Single Bay	Up to 8.8 db*	\$ 9.75 list
No. JET661	2 Bay	Up to 12.3 db*	\$20.70 list
No. JET664	4 Bay	Up to 15.5 db*	\$45.40 list

\*Performance tested and figures verified by the Hazeltine Corporation, Little Neck, N.Y. World Famous Research Laboratory.

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Think of it! With guided missiles, radar, and other electronic devices so important to national defense! With big, new developments in TV. With over 90,000,000 home and auto radios, over 12,000,000 TV sets. With more than 3100 radio stations...over 100 TV stations—and more building every day...yes, imagine the great opportunity you have today! YOU are wanted in Radio-Television-Electronics! America's fastest-growing field. High-pay jobs—the kind you've always wanted—are waiting for YOU!

### Job Security! Big Money! For YOU! in Today's Expanding Industries!

Trained Radio and Television technicians really make important money these days. Thousands of National Schools graduates—men just like you—are earning good money all over the country. Why not you? And—National Schools graduates get the personal satisfaction of being highly-skilled technicians. Men people respect. Men who enjoy their work—rather than having to drag along in just any old job.

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In almost every state—and many foreign countries—National Schools graduates are filling big jobs with famous companies. Or running their own successful businesses. What are YOU waiting for? National Schools training is complete training. So when you graduate you can take advantage of today's big opportunities in Radio-Television-Electronics—fast.

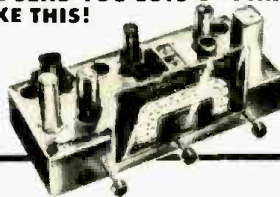
### You Train At Home—In Your Spare Time

National Schools Shop Method Home Training gives you basic and advanced instruction in all phases of Radio-TV-Electronics. And remember—your training is based on resident school training principles. You learn fast from hundreds of diagrams and pictures. All instructions are written by experienced technicians who work in Radio and TV every day. All instructions have been developed and tested in National Schools' own labs and studios, which are equipped with the latest RCA equipment. No wonder this National Schools course is so up-to-date, practical, interesting. And so easy to learn! And no wonder it is held in such high regard by leaders of American industry! Approved for eligible Veterans.

### We Teach You How To Make Welcome Extra Money—While You Learn!

Many National Schools students—men like you—make plenty of extra dollars each week in spare time! Fixing neighbors' radios, appliances—and other ways we teach you. You start learning and earning from the day you enroll. From the very first lesson!

### WE SEND YOU LOTS OF PARTS LIKE THIS!



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### Only National Schools Gives You This Professional Multi-Tester!

You get this amazing, new testing instrument—factory-made and tested—complete—ready to use! Simple to operate. Accurate and dependable. An instrument every Radio-TV man needs. Light enough to carry around—so you can use it at home or on service calls. You'll be proud to own this valuable equipment.

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Radio Station Engineer, District Service Manager, Aircraft Radio Inspector, Own Your Own Repair Shop, Inspector Technician, Service Specialist, Special Government Jobs, Complete TV Service, Sound Truck Operator. Many more!

National Schools graduates have secure, good-paying jobs like these! So don't wait—mail the coupon today. Now—while you're thinking about it!

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National Schools uses its great influence and prestige to help you find your place in the field of your choice. Don't put it off! Start yourself toward a skilled trade! Get the big pay you've always wanted!

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Mail in envelope  
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Mail me FREE the book mentioned in this ad. Also a free sample lesson. I understand no salesman will call on me.

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Check here if you were released from the Service less than 4 years ago.

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**GET THE  
BIG SALARY  
YOU HAVE  
ALWAYS  
WANTED!**

**NEW GENERAL ELECTRIC**

# "Golden Treasure"

**CARTRIDGE**



**First wide range diamond-and-sapphire combination delivers frequency response from 30 to 15,000 cycles. Tracks all 3 speeds at 6 to 8 grams**

High fidelity performance of custom quality—at the lowest price in G-E history—that sums up what audio engineers at Electronics Park have achieved with this latest de luxe addition to the General Electric cartridge line.

The replaceable stylus is of the famous double-twist design. A total of six damping blocks filter out harmonic distortion, needle talk and needle scratch. There are no moving parts in

this cartridge—nothing to wear out. Remember—when you replace a stylus assembly in a G-E pickup, you replace every component that is affected by age. A new stylus assembly means, in effect, a new pickup.

Ask your G-E dealer about the Golden Treasure cartridge, or write us for the nearest source of supply. *General Electric Company, Electronics Park, Syracuse, N. Y.*

*You can put your confidence in—*

**GENERAL  ELECTRIC**

**SEND FOR THESE NEW CATALOGS!**

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(Section 382)  
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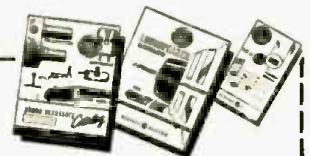
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**RADIO & TELEVISION NEWS**

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win \$5,000.00

in cash prizes!

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NEEDLE'S



"WIN  
A GRAND"  
CONTEST



\$1000 FIRST PRIZE!

187 WINNERS!

187  
CASH PRIZES

1st Prize .....	\$1000.00
2nd Prize .....	500.00
3rd Prize .....	250.00
Next 10 Winners ... each	100.00
Next 25 Winners ... each	50.00
Next 50 Winners ... each	10.00
Next 100 Winners ... each	5.00
<b>Total Prizes</b> .....	<b>\$5000.00</b>

Contest Closes  
DEC. 31, 1952

Special Prize  
FOR EARLY BIRDS!

A precision quality, high powered Jensen Needle Microscope will be given to each of the first 500 servicemen to send in a completed Official Entry Blank. \$5.00 value. Handy pocket size to take on your service calls.

Start saving those packages ... get your entry in soon!

**RULES OF ENTRY**

- 1. What You Have To Do** ... Jensen Phonograph Needles are packaged two ways—on a card or in a plastic box. Every time you sell or install a Jensen Needle during this contest, save the card or colored insert in the box (not the instruction sheet). Collect as many as you can during the contest period. Prizes will be awarded to the 187 servicemen sending in the most empty Jensen Needle packages.
- 2. When Is The Contest** ... The Jensen "Win a Grand" Contest opens September 1, 1952 and closes at midnight December 31, 1952.
- 3. Who Is Eligible** ... This contest is open to every bona fide radio-television serviceman in continental United States. This includes employees as well as employers, anyone who is actively engaged in this work during the period of the contest. No employee of Jensen Industries, Inc. or its advertising agency is eligible.
- 4. How To Enter** ... To be eligible for one of the 187 cash prizes, you must send in one completed Official Entry Blank (available at your regular Parts Distributor) together with all the empty Jensen Needle packages you have collected during the period of the contest. All Jensen Needle packages, EXCEPT the Jensen "Symphonette" and Jensen Coin Machine Needles, are acceptable.
- 5. 15-Word Statement** ... On the Official Entry Blank, you will find a sentence beginning, "I Sell Jensen Needles Because ...". Just complete this sentence in 15 words or less. As a suggestion, you might say, "I Sell Jensen Needles Because they are easier to install." (5 words).
- 6. Where To Send Entries** ... All entries to be considered for prizes must be sent, accompanied by a completed Official Entry Blank, direct to:  
Jensen Contest Headquarters, 329 South Wood St., Chicago 12, Illinois  
Do not send your entry to your Parts Distributor. You may hold your entry until the last day or send it in as often as you like, but be sure you have a suitable means of identification with each shipment (such as your original Official Entry Blank). REMEMBER: All entries must be postmarked before Midnight, December 31, 1952, to be eligible.

- 7. Duplicate Prizes** ... In the event of a tie, duplicate cash prizes will be awarded to all tying contestants.
- 8. Judges' Decision Final** ... Decision of the judges, chosen by Jensen Industries, Inc., will be final. All entries become the property of Jensen Industries, Inc., and none will be returned.
- 9. Only Entry Itself Counts** ... Only the total number of empty Jensen Needle packages, together with the completed Official Entry Blank, counts toward the prizes. Neatness, spelling, grammar or packing of entry do not count.
- 10. Winners To Be Announced** ... Winners in the Jensen Contest will be notified as soon after the contest closes as possible.

**HERE'S ALL YOU HAVE TO DO!**

*It's Easy!* Simply save the cards and colored inserts from all the Jensen Phono Needles you sell or install from now 'til the end of the year. Pick up an Official Entry Blank at your regular Parts Distributor, complete the sentence, "I Sell Jensen Needles Because ..." and mail this with your packages direct to Jensen Contest Headquarters before Midnight December 31st. That's all there is to it ... the radio-TV serviceman sending in the most Jensen packages wins \$1000 cash. It might be you!

**WHY JENSEN SPONSORS THIS BIG CONTEST!**

Every radio-television serviceman can get a lot more business for himself without additional tools, equipment or labor simply by just replacing worn-out phonograph needles. That's why Jensen sponsors this unique contest—to show you how easy it is ... and profitable, too. And Jensen supplies every assistance you need, with a precision made needle for every type of record player and complete easy-to-follow instructions.

**Jensen INDUSTRIES, INC.**  
336 South Wood Street, Chicago 12, Illinois

JENSEN ... Oldest name in Sound Engineering

Sell a **JENSEN NEEDLE** on Every Service Call!

BUY DIRECT  
AND SAVE

# COLLINS OFFERS FOR YOUR

## COLLINS "PRE-FAB" TUNERS and RECEIVERS

4 ALL NEW Complete Kits  
for Every High-Fidelity Need

ASSEMBLE YOURSELF AND SAVE

**Unsurpassed COLLINS workmanship makes this astounding announcement possible—A mighty proud FIRST FOR COLLINS!**

### The Famous COLLINS FM-11 NOW IN KIT FORM FM TUNER KIT

IF Amplifier mounted and  
wired right in Chassis.

**\$55**



A terrific value in an FM tuner! 11 tubes. Formerly sold for \$87.50. Nothing has been changed. The tuner is available in kit form with the IF Amplifier mounted in the chassis and wired and tested by us. You mount the RF Tuning Unit, power supply and after some simple wiring, it's all set to operate. If you had a million dollars, you couldn't buy a finer tuner than this COLLINS unit. It's the best at a really fair price! Buy direct and save! Tube lineup: 6J6 RF amp, 6AG5 converter, 6C4 oscillator, 6BA6 1st IF, (2) 6AU6 2nd and 3rd IF, (2) 6AU6 limiters, 6AL5 discriminator, 6AL7-GT double tuning eye, 5Y3-GT rectifier. Sensitivity 6 to 10 microvolts, less than 1/2 of 1% distortion, 20 to 20,000 cycle response with 2DB variation. Chassis dimensions: 12 1/2" wide, 8" deep, 7" high. Shipping weight 10 lbs.

### The New 1953 Model Redesigned Smaller Chassis

### FM-AM TUNER KIT \$77<sup>50</sup>



The original 15 tube deluxe FM/AM pre-fab kit redesigned on a smaller chassis. The tuner now measures 14" wide by 12" deep by 7 1/2" high. This attractive, new front and dial assembly opens up new applications where space is at a premium. Kit includes everything necessary to put it into operation—punched chassis, tubes, wired and aligned components, power supply, hardware, etc. Kit comprises FMF-3 tuning unit, IF-6 amplifier, AM-4 AM tuning unit, magic eye assembly and complete instructions. All tubes included. Shipping weight 17 lbs.

### A New Addition To The Pre-fabs!

### FM RECEIVER KIT

Tuning Eye and ALL Tubes Included

**\$78<sup>50</sup>**



New! A complete 15 tube pre-fab Receiver Kit requiring only an antenna and speaker for operation. Where space is at a premium, the COLLINS Custom FM Receiver Kit can be conveniently mounted in a book shelf or end table with a remote speaker. Highly sensitive and selective, the COLLINS FM receiver will pull in those distant FM stations with clarity and fidelity. Kit includes all necessary parts for assembly and operation: punched chassis, dial assembly, power supply, tuning eye, wired and aligned components, all tubes and complete instructions. 6 to 10 microvolt sensitivity, IF bond width 200 KC, 20 to 20,000 cycle response, low distortion, 6 watts output. Bass and treble tone controls, phonograph input. Tubes: 6J6 RF amp., 6AG5 converter, 6C4 oscillator, 6BA6 1st IF, (2) 6AU6 2nd and 3rd IF, (2) 6AU6 limiters, 6AL5 discriminator, 12AU7 1st audio, 6SN7-GT 2nd Audio, (2) 6K6-GT push-pull power output. Order today for the best FM package you'll ever find! Shipping weight 20 lbs.

### Another New Star in the Pre-Fab Galaxy

### FM-AM RECEIVER KIT \$89<sup>50</sup>



New! Another COLLINS FIRST. A complete FM/AM receiver kit on one chassis, with power amplifier capable of delivering 6 watts of high fidelity audio into a loud speaker. Tops in quality, easily recognizable in the fine workmanship and first grade materials. Kit includes all necessary parts for assembly and operation: punched chassis, dial assembly, power supply, tuning eye, wired and aligned components, all tubes and complete instructions. 20 microvolt sensitivity on FM, 10 on AM. Shipping weight 20 lbs.

COLLINS AUDIO PRODUCTS CO. is in  
no way affiliated with Collins Radio Co.

WHEN YOU THINK OF TUNERS —

# A COMPLETE LINE LISTENING PLEASURE . . .

BUY DIRECT  
AND SAVE

Selected Basic Components  
For Those With Special  
Applications

Coupled with tremendous popular demand for COLLINS Complete Pre-Fab Tuner and Receiver Kits, we have also supplied many users with many of the individual components shown below. These units, as well as being parts of the kits shown on the opposite page, are available separately to builders and those who experiment and who wish to use their own chassis or special layouts. Each assembly is completely wired, tested and aligned ready for immediate use. In buying these COLLINS custom components direct from our factory, you save many dollars and are assured of the highest manufacturing standards. All prices include tubes. Diagrams and instructions furnished with each unit. Operating voltages are all that are necessary to place these units in operation!

## FM IF AMPLIFIER



FM 10.7 MC, IF-6 Amplifier. **\$19<sup>75</sup>**

A remarkable value! 6 tubes are used in the IF amplifier: 6BA6 1st IF, (2) 6AU6 2nd and 3rd IF's, (2) 6AU6 limiters and 6AL5 discriminator. High gain, wide-band response for highest fidelity. 20 to 20,000 cycles. Distortion less than 1/2 of 1%. Chassis plate dimensions: 11 3/4" x 2 1/2". Shipping weight: 3 lbs.

## FM TUNING UNIT SPECIAL



... at a  
NEW  
LOW  
PRICE  
**\$10**

A precision FM tuning unit for a ten dollar bill! Permeability-tuned, 88 MC to 108 MC, stable and drift-free. Two tubes: 6AG5 converter, 6C4 oscillator. Sensitivity 20 microvolts. Used with 10.7 MC IF amplifier such as our model IF-6. Compact, small, light in weight, and adaptable to many, many FM applications. Chassis plate measures 4 1/2" x 4 1/2". Aligned, tested and calibrated—ready to operate. Tubes included as well as schematic and instructions. Shipping weight FMF-2: 2 lbs. Dial: 2 lbs.

Slide Rule Tuning  
Dial Assembly \$3.85

## COMPLETE FM TUNER CHASSIS (RD-1C and Slide Rule Dial) **\$28<sup>50</sup>**



Only Power Supply and  
Amp. Required.

The COLLINS RD-1C FM tuner chassis is unique in the field. A whole, compact FM tuner that fits in the palm of your hand. Convert AM sets to FM/AM receivers for only a few dollars! Unlimited applications where space is at a premium. So compact that you can get two in a cigar box! Use in conjunction with your phonograph amplifier. Full frequency response to 20,000 cycles. Sensitivity 20 microvolts, Permeability tuned. Tuning unit and IF amplifier on the same chassis plate. Tubes: 6AG5 converter, 6C4 oscillator, (2) 6AU6 IF amplifiers, 6AL5 in new ratio detector circuit. Shipping weight 2 1/2 lbs. Dial: 2 lbs.

## FM TUNING UNIT

FMF-3 FM  
Tuning Unit

**\$15<sup>25</sup>**



Slide Rule Tuning  
Dial Assembly \$3.85

The best for FM. The most sensitive and most selective type of "front-end" on the market. 6 to 10 microvolts sensitivity. Image ratio 500 to 1. 6J6 tuned RF stage, 6AG5 converter, 6C4 oscillator. Permeability tuned, stable and drift-free. Chassis plate measures 7" x 4 1/2". In combination with the IF-6 amplifier, the highest order of sensitivity on FM can be obtained. Tubes included as well as schematic and instructions. Shipping weight FMF-3: 2 1/2 lbs. Dial: 2 lbs.

## AM TUNING UNIT

Tubes Included **\$24<sup>50</sup>**



Taps in AM superhet performance! A 3-gang tuning condenser gives 3 tuned stages and consequently higher sensitivity and selectivity. Assembly is completely wired, tested and aligned ready for immediate use. Frequency coverage 540 KC to 1650 KC at a sensitivity of 5 microvolts. Tubes: 6BA6 RF amplifier; 6BE6 converter and oscillator; 6BA6 IF amplifier and 6AT6 detector. Mounts on a chassis plate measuring 4" x 7 3/8". Shipping weight 2 1/2 lbs. Dial: 2 lbs.

MAIL  
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To: Collins Audio Products Co. Inc.  
P.O. Box 368, Westfield, N.J.  
Tel. Westfield 2-4390

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> FM Tuner Kit    | <input type="checkbox"/> FM/AM Receiver Kit | <input type="checkbox"/> IF-6 Amplifier     |
| <input type="checkbox"/> FM/AM Tuner Kit | <input type="checkbox"/> FMF-2 Tuning Unit  | <input type="checkbox"/> RD-1C Tuner & Dial |
| <input type="checkbox"/> FM Receiver Kit | <input type="checkbox"/> FMF-3 Tuning Unit  | <input type="checkbox"/> AM-4 Tuning Unit   |

Amount for Kit \$ \_\_\_\_\_

See weights, add shipping cost \$ \_\_\_\_\_

Total amount enclosed \$ \_\_\_\_\_ Check  Money Order

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CITY \_\_\_\_\_

STATE \_\_\_\_\_

— THINK OF COLLINS AUDIO



Superior's New  
Model **82**

# RAPID TESTER

The Very Best Value in  
Multi-Socket Tube Testers!



Production of this Model was delayed a full year pending careful study by Superior's engineering staff of this new method of testing tubes. We don't expect it to replace conventional testers but if you want to try this new type of tester, you can do no better than mail the coupon below. Don't let the low price mislead you! We claim Model 82 will outperform similar looking units which sell for much more—and as proof, we offer to ship it on our examine before you buy policy.

Primarily, the difference between the conventional tube tester and the multi-socket type is that in the latter, the use of an added number of specific sockets (for example, in Model 82 the noval is duplicated eight times) permits elimination of element switches thus reducing testing time and possibility of incorrect switch readings.

To test any tube, you simply insert it into a numbered socket as designated, turn the filament switch and press down the quality switch—THAT'S ALL! Read quality on meter. Inter-element leakage, if any indicates automatically.

#### FEATURES:

- ★ Dual Scale meter permits testing of low current tubes.
- ★ 7 and 9 pin straighteners mounted on panel.
- ★ All sections of multi-element tubes tested simultaneously.
- ★ Use of 22 sockets in improved circuit permits testing over 600 tube types and prevents possible obsolescence.
- ★ Ultra-sensitive leakage test circuit will indicate leakage up to 5 megohms.
- ★ Employs new type 4" air-damped meter resulting in accurate vibrationless readings.

**\$36<sup>50</sup>**

Superior's New  
Model **TW-11**

# STANDARD PROFESSIONAL TUBE TESTER



- Tests all tubes, including 4, 5, 6, 7, Octal, Lock-In, Hearing Aid, Thyatron, Miniatures, Sub-miniatures, Novals, Sub-minors, Proximity fuse types, etc. • Uses the new self-cleaning Lever Action Switches for individual element testing. Because all elements are numbered according to pin-number in the RMA base numbering system, the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TW-11 as any of the pins may be placed in the neutral position when necessary. • The Model TW-11 does not use any combination type sockets. Instead individual sockets are used for each type of tube. Thus it is impossible to damage a tube by inserting it in the wrong socket.
- Free-moving built-in roll chart provides complete data for all tubes. All tube listings printed in large easy-to-read type.
- NOISE TEST: Phono-jack on front panel for plugging in either phones or external amplifier will detect microphonic tubes or noise due to faulty elements and loose internal connections.

#### EXTRAORDINARY FEATURE

- SEPARATE SCALE FOR LOW-CURRENT TUBES—Previously, on standard emission type tube testers, it has been standard practice to use one scale for all tubes. As a result, the calibration for low-current types has been restricted to a small portion of the standard scale. The extra scale used here greatly simplifies testing of low-current types.

The Model TW-11 operates on 105-130 Volt 60 Cycles A.C. Comes housed in a beautiful hand-rubbed oak cabinet complete with portable cover.

**\$47<sup>50</sup>**

Superior's New  
Model **TV-12**

# TRANS-CONDUCTANCE TUBE TESTER



ALSO TESTS TRANSISTORS!

#### TESTING TUBES

- ★ Employs improved TRANS-CONDUCTANCE circuit. An in-phase signal is impressed on the input section of a tube and the resultant plate current change is measured. This provides the most suitable method of simulating the manner in which tubes actually operate in Radio & TV receivers, amplifiers and other circuits. Amplification factor, plate resistance and cathode emission are all correlated in one meter reading.
- ★ NEW LINE VOLTAGE ADJUSTING SYSTEM. A tapped transformer makes it possible to compensate for line voltage variations to a tolerance of better than 2%.
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- ★ NEWLY DESIGNED FIVE POSITION LEVER SWITCH ASSEMBLY. Permits application of separate voltages as required for both plate and grid of tube under test, resulting in improved Trans-Conductance circuit.

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A transistor can be safely and adequately tested only under dynamic conditions. The Model TV-12 will test all transistors in that approved manner, and quality is read directly on a special "transistor only" meter scale.

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# Spot Radio News

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By RADIO & TELEVISION NEWS'  
WASHINGTON EDITOR

V-DAY FOR THE TV world, whose early appearance did not look too promising a short while ago because of legal rows, suddenly became an exciting reality in mid-summer with the announcement that *fourteen* applicants had won authorizations for new stations, with most grants being awarded to ultra-high candidates. The surprising news was particularly thrilling to the residents of Denver (Colorado), Portland (Oregon), Springfield-Holyoke (Mass.), Flint (Michigan), New Britain (Conn.), New Bedford (Mass.), York (Pa.), Youngstown (Ohio) and Bridgeport (Conn.) who may soon be receiving TV programs from the newly authorized stations.

The west, represented by Denver, won station-approval honors, for the first new telecasters to receive permission to transmit since the freeze was clamped on, over three years ago, were in that state. Specifically, *Eugene P. O'Fallon, Inc., Colorado Television Corp.*, and the *Empire Coil Co., Inc.*, received the authorizations for Channels 2, 9, and 26, respectively. In Portland, *Empire Coil* also won Channel 27. Two high-frequency stations were approved for Springfield-Holyoke on Channels 55 and 61, to be operated by the *Hampden-Hampshire Corp.* and *Springfield-Television Broadcasting Corp.* In Youngstown, the *Vindicator Printing Co.* and WBKN received Channels 73 and 27, respectively. Channel 28 was approved for Flint and will be owned by the *Trans-American Television Corp.* Portland, Springfield-Holyoke, Youngstown and Flint, may also receive an additional allotment of very-high stations in the near future, according to the Commission.

New Britain will have a Channel-30 station, which will be operated by the *New Britain Broadcasting Co.* In New Bedford, *E. Anthony and Sons, Inc.* will place Channel 28 on the air, and in York, the *Helm Coal Co.*, and *Susquehanna Broadcasting Co.* will operate Channels 49 and 43, respectively. The ultra-high stamping ground, Bridgeport, where so many experimental tests have been and are still being conducted, will now be officially allowed to use Channel 43, and the *Southern Connecticut and Long Island Television Co.*, will control that channel's operation.

The historic grants were made just twelve days after the official deadline

went into effect. On that *D-Day*, applicants poured their requests for stations into Washington, and at the end of the day, the records showed that over 500 had asked for station permits. Nearly two-hundred million dollars would be needed for building and operation of the 500-odd stations on file, with over \$157-million going for station construction and over \$120-million appropriated for operations.

Notwithstanding the approvals for the new stations, some attorneys were still disputing the assignments and protesting to the courts. The U.S. Court of Appeals, Third Circuit, Philadelphia, received a challenge from WWSW, Pittsburgh, who argued that Channel 4 should have been allocated to the Pittsburgh metropolitan area. The Pittsburgh situation had also been brought to the attention of the Commission by the city's mayor who declared that despite . . . "the fact that the Commission states in its Sixth Report and Order that population is the most important factor in assigning channels, 27 markets smaller (some much smaller) than Pittsburgh are assigned three or four commercial v.h.f. channels. No market of comparable size in the United States is given so few as two commercial v.h.f. stations." (Pittsburgh also received three u.h.f. channels, which it was said would not be completely effective because of the rugged terrain of the city.)

The U.S. Court of Appeals in Washington also received several appeals on behalf of WLOA, Braddock, Pa., KVOL, Lafayette, La., WISC, Madison, Wis., and WLAN, Lancaster, Pa., all concerning allocations, which the stations felt were not equitable.

Tower heights also loomed as a problem which might impede construction of new stations in some areas. According to aircraft committees assigned to a study of the situation, the 1000-foot heights suggested extend into altitudes normally used by small planes and . . . "regardless of the day and night marking placed on them, present some degree of hazard." To avoid such hazards, the committee recommended that operators should be encouraged to select sites on tall buildings or located on well-defined landmarks. The use of single-tower sites was also suggested as a solution. According to the air specialists,

RADIO & TELEVISION NEWS

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both the . . . "aviation and television industries must cooperate toward the end that neither industry is expected to accept unreasonable restrictions."

While the legal quarrels and aviation requirements might block some allocations, experts declared that the authorization schedule should move along and provide channels at quite a pace to many, many cities. The Commission's insistence that the younger u.h.f. service make a firm and rapid start, has been described as a strong impetus which will accelerate station assignments.

As we go to press, Washington reports that four more TV stations have been authorized to go on the air: KXLY-TV and KHQ in Spokane, Wash., using Channels 4 and 6 respectively; and the Texas Broadcasting Corp. and the Capital City Television Company, both in Austin, Texas, operating on Channels 7 and 18.

COLOR TV also became a headline item in mid-summer, although on a rather temporary basis; NPA amended the hotly debated M-90 stop-color-set order, declaring that color chassis could now be made if such production did not interfere with defense work, a condition most felt would be impossible to meet at present. One Midwest manufacturer declared that the relaxation of the curb will have . . . "little or no effect on the TV industry because all it does is give the go-ahead to something 90% of the industry is not interested in." According to another large set maker there won't be any quantity of color sets made until there is color programming and . . . "you won't have comprehensive color programming until there are lots of sets. No one is in an economic position to take the initiative in creating a market for either sets or programs."

Even the sequential-system operators who won FCC approval for their disc method did not view the ruling with any enthusiasm because of the resistance or lack of cooperation from the . . . "majority of the industry."

One bright sign did appear from the movie-mogul owners of the Lawrence tri-color tube who said that they would file for authority to produce sets that would pick up color and monochrome. The motion-picture operators declared that only a few minor changes would be required to alter standard chassis to accept their color tubes and permit color and black and white reception.

The ban lift did bring a sigh of relief to some, the theater TV operators, who were told that larger-screen research and development could continue, if, of course, substantial quantities of scarce materials were not involved in broad-scale operations.

THE TUBE SITUATION, as viewed by members of the military, has been of considerable concern to industry since the defense program was inaugurated, (Continued on page 122)

RADIO & TELEVISION NEWS



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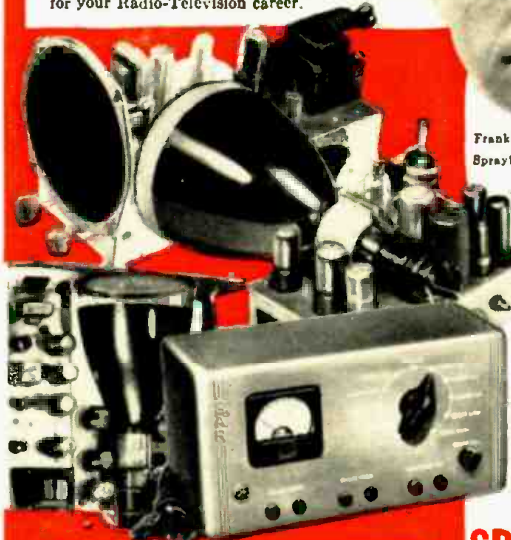
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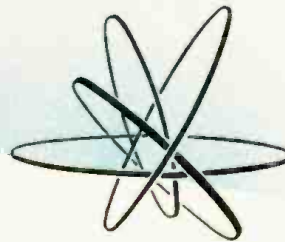
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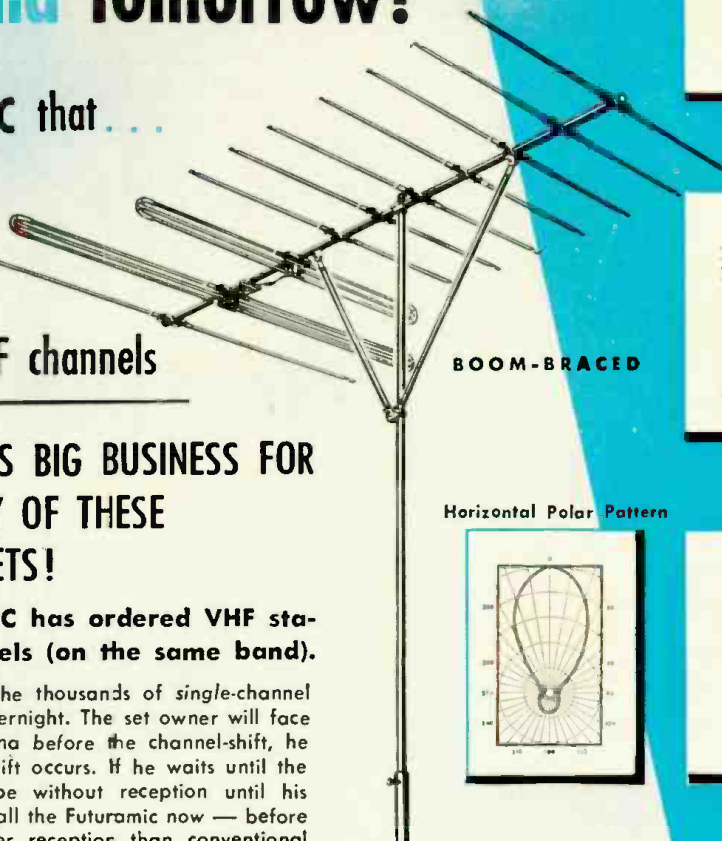
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The hundreds of thousands of single-channel Yagis now in use will not bring in the new channel. This means that an additional Yagi will have to be installed and tied into the present installation with a separate lead, through an annoying switching system. However, one Futuramic will do the job of *both* antennas — at lower cost — with better results on *both* channels. Install the Futuramic now to improve your present picture. And at the same time be ready for future channels on the same band.

### 3. Areas served at present by two or more VHF stations (on the same band).

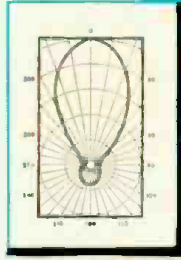
In such areas, the installation man must choose between conventional broad band antennas and separate Yagis for each channel. Each approach has important advantages. Only the Futuramic will give you the advantages of *BOTH*, combining highest gain, and sharpest directivity on each channel with simple, economical installation.

Model No.	Channels Covered	List Price
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1124	2, 3, and 4	
1125	2, 3, 4, and 5	
1136	3, 4, 5, and 6	
1146	4, 5, and 6	
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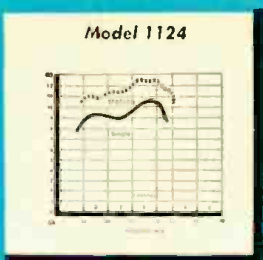


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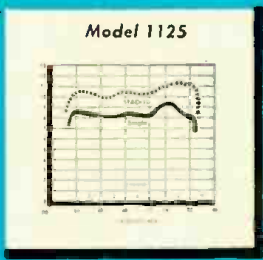
Horizontal Polar Pattern



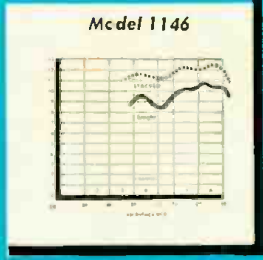
GAIN CURVES



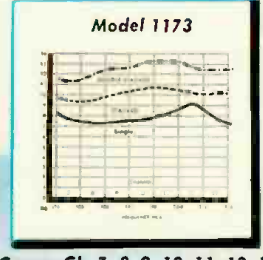
Model 1124  
Covers Ch. 2, 3, 4



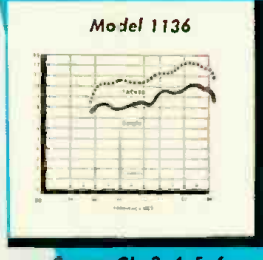
Model 1125  
Covers Ch. 2, 3, 4, 5



Model 1146  
Covers Ch. 4, 5, 6



Model 1173  
Covers Ch. 7, 8, 9, 10, 11, 12, 13



Model 1136  
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### ALL THIS AND Z-MATCH TOO!

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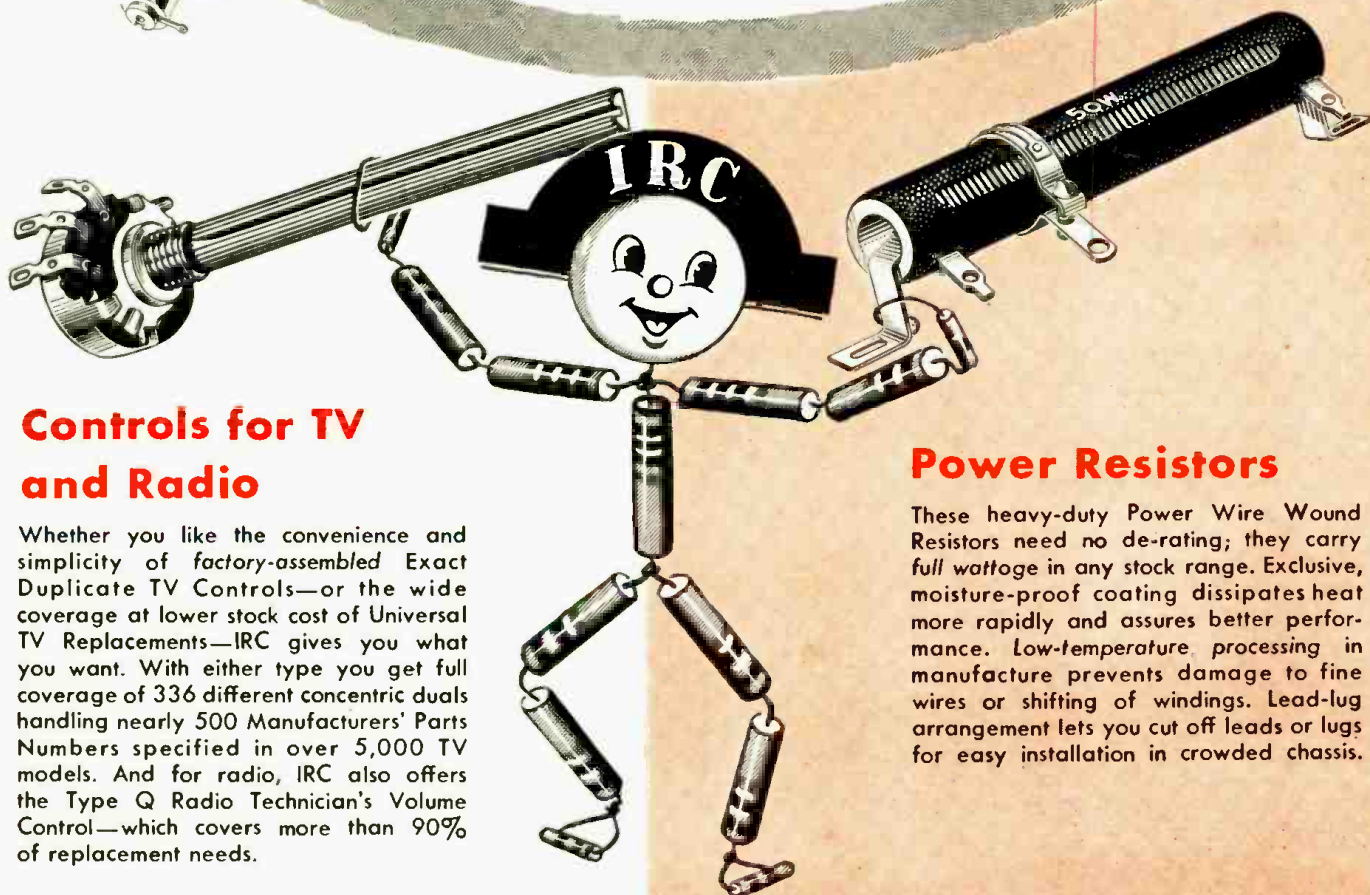
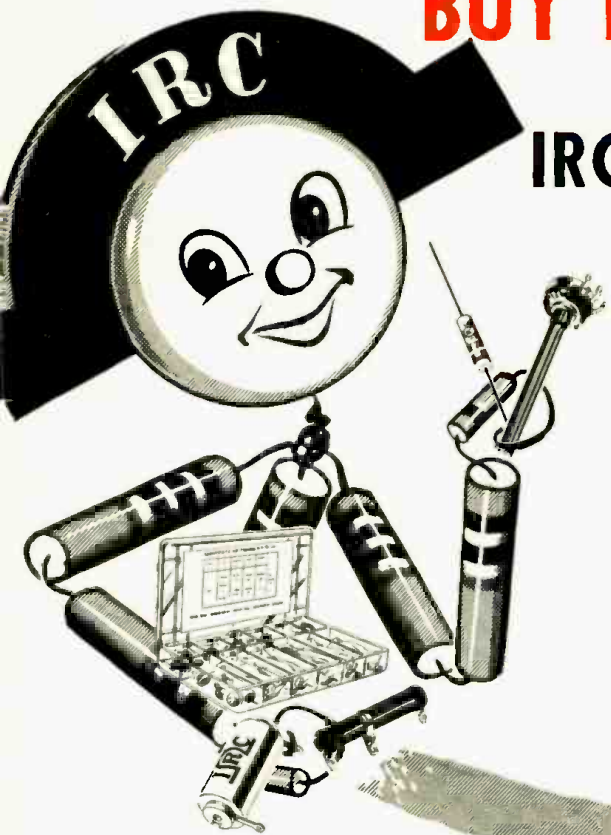
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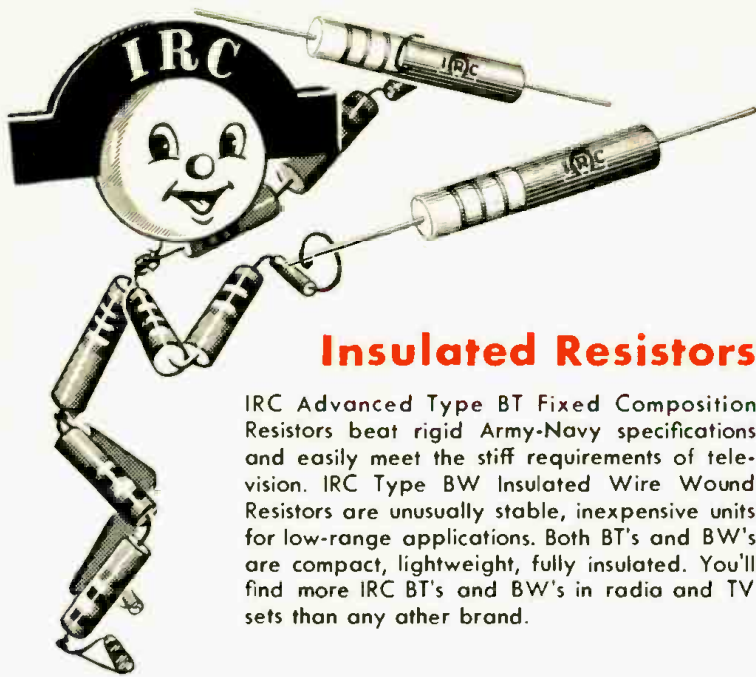
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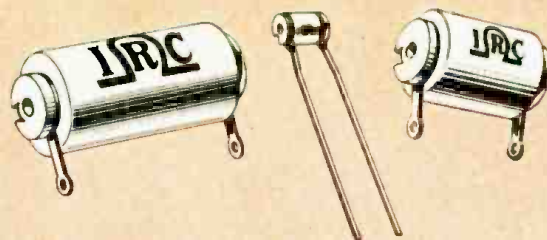
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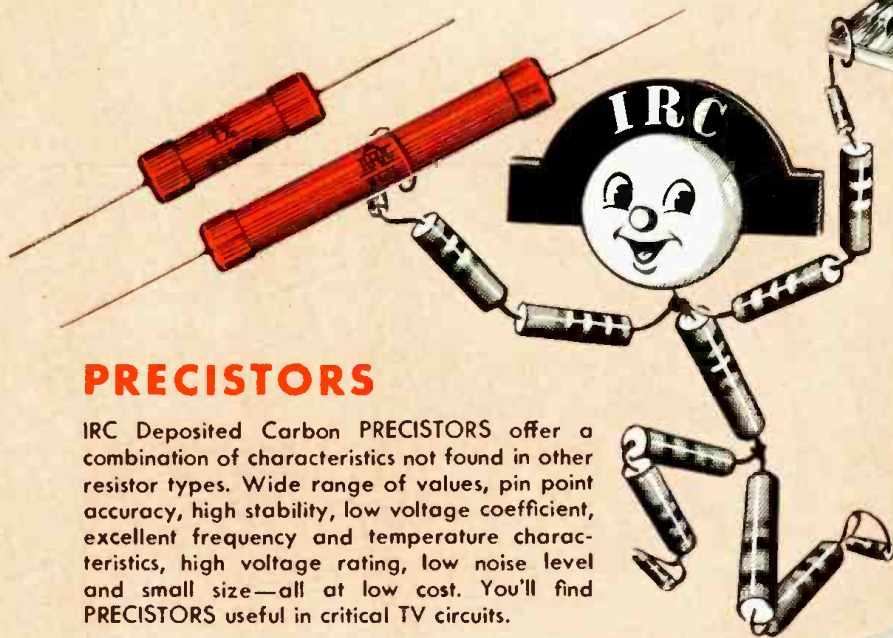
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These all-new, greatly improved IRC Precision Wire Wound Resistors far surpass critical Army-Navy specifications. New winding forms hold more wire for greater resistance. New winding technique eliminates shorted turns and winding strains. New insulation compound gives higher stability and freedom from noise—greater humidity resistance and longer life. New terminations provide greater strength in connections.



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MADE SIMPLE AND EASY WITH THE  
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1. A Flexible Probe 2. A Spotlight  
3. A Full-View, Eye-in-line Meter

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Makes Servicing and Maintenance A Cinch!
- No Need to Remove Chassis — Long Flexible Probe  
Reaches Hard-to-get-at Places.
- Less Shop Work — More On-the-Spot Service.
- No Need to Move Head To See Meter.
- Saves Time and Money.

**SIMPLE AND EASY TO USE.** Fasten the ground lead to Chassis.  
The light switch in the pistol grip handle can be switched  
on or off with one finger. . . . Illuminates area under test.  
The long test probe is flexible . . . bends and stays in  
position . . . gets around obstacles. A choice of three ranges  
in the trigger can easily be made with the index finger. The  
thumb can quickly switch from volts to ohms when needed.  
Ohms adjust is made with the large adjustable knob on  
the front.

Handsomely styled in a durable Plastic case.  
Overall Dimensions 5½" x 8" x 3".  
Weight 2 lbs. Available in 2 models as follows:

**Specifications — Model 3A**

• Ranges:  
0-10, 100, 1000 volts DC  
0-10, 100, 1000 volts AC  
R x 1, R x 10, R x 100 ohms.

• Meter:  
2% 1,000 ohms per volt.  
• Batteries:  
Four self-contained  
1½ V pen-lite cells

Net Price — **\$32.75**

**Specifications — Model 3B**

• Ranges:  
0-10, 100, 1000 volts DC  
0-10, 100, 1000 volts AC  
R x 1, R x 10, R x 100 ohms.

• Meter:  
2% 20,000 ohms per volt.  
• Batteries:  
Four self-contained  
1½ V pen-lite cells

Net Price — **\$35.50**

Use Handy Coupon to Order or Write For Full Details

IT'S NEW and SENSATIONAL...

**EBCO**

**DYNAMIC ANALYZER**

For Cathode Ray Tubes

CONVERTS YOUR VACUUM TUBE VOLTMETER INTO  
THE FINEST CRT TESTER THAT MONEY CAN BUY!

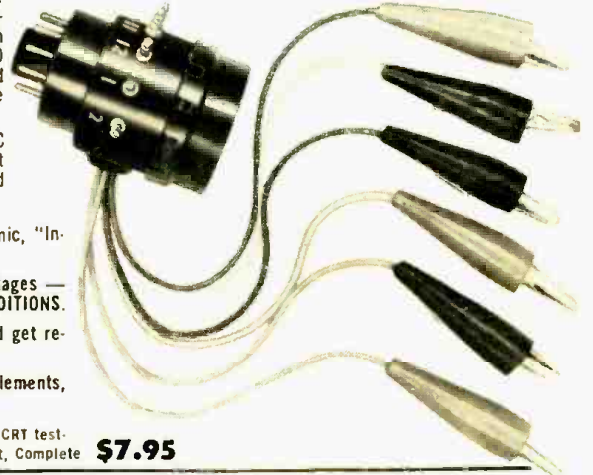
Pinpoint and eliminate elusive  
sources of trouble quickly, accurately,  
by combining your VTVM with the  
amazing new and efficient EBCO  
DYNAMIC ANALYZER. Easily attached  
to your VTVM for rapid, reliable  
readings.

It's DYNAMIC because EBCO DYNAMIC  
ANALYZER is the only instrument  
which checks BOTH the SET and  
TUBE during actual operation.

Now You Can Perform These Dynamic, "In-  
Operation" Tests:

1. Check accurately all socket voltages —  
UNDER ACTUAL OPERATING CONDITIONS.
2. Check emission of the tubes and get related  
emission reading.
3. Check picture tube for open elements,  
shorted elements and leakage.

FREE — Service Engineer's Manual for CRT testing  
with each instrument. Net, Complete **\$7.95**



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**EBCO**  
PICTURE TUBE  
**CHECKER-  
REACTIVATOR**

- CHECKS picture  
tubes without  
removal.
- REACTIVATES  
and RENEWS  
them for longer  
life.

Applied while tube is in set or still in shipping  
carton. Check picture tubes for shorts, cathode  
emission, leakage. Put new life into weak tubes  
by reactivation! A truly remarkable 2-in-1 servicing  
aid. Lightweight, portable. 110 volt, 60  
cycle. Factory guaranteed. Model 10.

Net **\$19.95**

**EBCO "LIFE EXTENDER"**



Energizes, renews and prolongs  
life of dim, worn-out tubes. Dual  
heat connections for extra long  
life. Suitable for all size picture  
tubes. Often saves the cost of a  
new tube. Automatically operated.  
Just plug in!

In lots of 3 . . . **\$2.95** each Single Units . . . **\$3.95** each

**EBCO CUSTOM QUALITY TV PICTURE  
TUBES AT MASS-  
PRODUCTION PRICES**

Highest quality, tested and fully  
guaranteed picture tubes. Liberal  
glass allowance on "old tube"  
for new tube basis. Write for  
price schedule.



**EBCO MULTIPLE CONNECTORS**



Bypass antenna problems. Attach  
two or more TV or FM sets to 1  
antenna with single connector.  
Plastic Case  
4¼" x 2¼" x 1½" D.  
2 Set Connector . **\$2.95** each

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Quantity	Price	Quantity	Price
..... EBCO DYNAMIC ANALYZER	@ \$7.95	..... EBCO MULTIPLE CONNECTORS	@ \$2.95
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*Revolutionary*



**CDP**

**COMPOUND  
DIFFRACTION  
PROJECTOR\***



**Public Address Loudspeaker System  
for perfect  
VOICE PENETRATION AND  
FULL RANGE MUSICASTING**

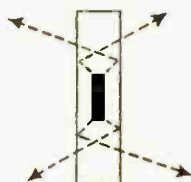
CDP is so advanced in concept... so efficient in performance... that conventional PA reentrant horns are now obsolete by comparison! The CDP COMPOUND DIFFRACTION PROJECTOR\* provides a loudspeaker system with peak-free response  $\pm 5$  db to 11,000 cps... delivers  $2\frac{1}{2}$  octaves more musical range than usual PA units of even larger size. Speech articulation index is at least 20% superior. Polar distribution pattern exceeds  $120^\circ$  at all frequencies up to 10,000 cps. Diffraction principle, high sensitivity and power handling assure much greater sound dispersion, penetration and coverage with fewer units and at far less cost. Greatly improves public address—in all types of applications—indoors and outdoors. *Get the amazing facts about CDP now!*

**WEATHER PROOF  
BLAST PROOF  
SPLASH PROOF**  
Drain holes permit subsequent operation after complete water immersion.

**INDESTRUCTIBLE**  
Molded of glass fibers for extra strength and improved acoustic properties.

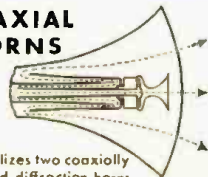
\*Patent Pending

**DIFFRACTION PRINCIPLE**

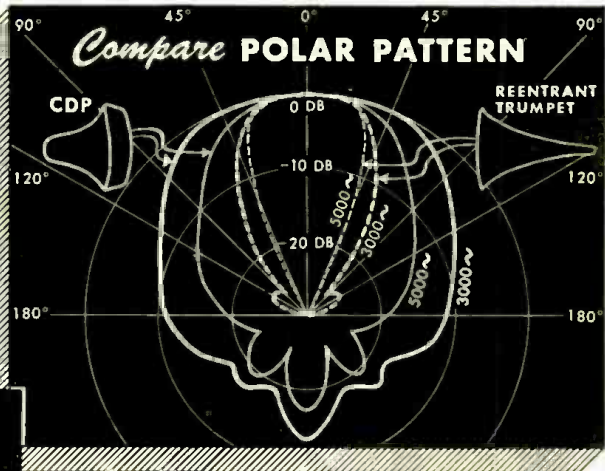


Uses the new acoustic application of optical slit diffraction for perfected smooth sound dispersion virtually independent of frequency.

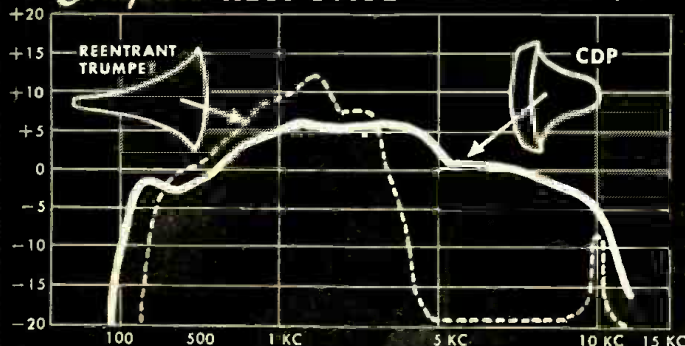
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CDP utilizes two coaxially mounted diffraction horns working from both sides of a single diaphragm. Each horn is designed for optimum air loading and reproduction within its own range.



**Compare RESPONSE & EFFICIENCY**



**Model 848 Compound Diffraction Projector\* Loudspeaker System**  
Conservatively rated at 25 watts. 16 ohms impedance. Finished in attractive gunmetal gray. Two mounting positions for hang-up bracket. Projectors can be installed horizontally, or vertically for augmented dispersion. Dimensions:  $10\frac{1}{2}$ " wide at mouth,  $20\frac{1}{2}$ " high at mouth, 20" deep over-all. Weight: Net 12 lbs., Shipping 15 lbs. List Price... **\$59.00**

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**Electro-Voice**

410 CARROLL STREET • BUCHANAN, MICHIGAN  
Export: 13 East 40th Street, New York 16, U.S.A. Cables: Arlab

Superior's New  
Model 76

# ALL-PURPOSE BRIDGE

IT'S A

- ✓ CONDENSER BRIDGE
- ✓ RESISTANCE BRIDGE
- ✓ SIGNAL TRACER
- ✓ TV ANTENNA TESTER



**SPECIFICATIONS:**

**CAPACITY BRIDGE SECTION**—4 Ranges: .00001 Microfarad to 1000 Microfarads. Will also locate shorts, and leakages up to 20 megohms. Measures the power factor of all condensers from .1 to 1000 Microfarads. (Power factor is the ability of a condenser to retain a charge and thereby filter efficiently.)

**RESISTANCE BRIDGE SECTION**—2 Ranges: 100 ohms to 5 megohms. Resistance can be measured without disconnecting capacitor connected across it. (Except, of course, when the R C combination is part of an R C bank.)

**SIGNAL TRACER SECTION**—With the use of the R.F. and A.F. Probes included with the Model 76, you can make stage gain measurements, locate signal loss in R.F. and Audio stages, localize faulty stages, locate distortion and hum, etc. Provision has been made for use of phones and meter if desired.

**TV ANTENNA TESTER SECTION**—Loss of sync., snow and instability are only a few of the faults which may be due to a break in the antenna, so why not check the TV antenna first? 2 Ranges: 2' to 200' for 72 ohm coax and 2' to 250' for 300 ohm ribbon.

Model 76 comes complete with all accessories including R.F. and A.F. Probes; Test Leads and operating instructions. Nothing else to buy.

**\$26<sup>95</sup>**

Superior's New  
Model 77

# VACUUM TUBE VOLTMETER

WITH NEW 6" FULL-VIEW METER!



**AS A DC VOLTMETER**—Will measure any voltage up to 1500 volts with negligible loading. Indispensable in receiver and Hi-Fi Amplifier servicing and a must for Black and White and color TV servicing where circuit loading cannot be tolerated.

**AS AN AC VOLTMETER**—Will quickly and simply measure RMS value of sine wave, and peak-to-peak value of complex wave. Pedestal voltages that determine the "black" level in TV receivers, sync pulses and saw tooth voltages are easily read.

**AS AN ELECTRONIC OHMMETER**—Because of its wide coverage of measurement in the resistance range (from .2 ohms to 1,000 megohms) the Model 77 will be your most frequently used resistance meter. Leaky capacitors show up glaringly when tested with the Model 77.

**SPECIFICATIONS**

**DC VOLTS**—0 to 3/15/75/150/300/750/1500 volts at 11 megohms input resistance.

**AC VOLTS (RMS)**—0 to 3/15/75/150/300/750/1500 volts.

**AC VOLTS (Peak to Peak)**—0 to 8/40/200/400/800/2000 volts.

**ELECTRONIC OHMMETER**—0 to 1000 ohms/10,000 ohms/100,000 ohms/1 megohm/10 megohms/100 megohms/1,000 megohms.

**DECIBELS**—-10 db to +18 db, +10 db to +38 db, +30 db to +58 db. All based on 0 db=0.06 watts (6 mw) into a 500 ohm line (1.73v).

**ZERO CENTER METER**—For discriminator alignment with full scale range of 0 to 1.5/7.5/37.5/75/150/375/750 volts at 11 megohms input resistance.

Model 77 comes complete with operating instructions, probe, test leads and carrying case. Operates on 110-120 volt 60 cycle. Only

**\$42<sup>50</sup>**

Superior's New  
Model 79

# SUPER- METER

WITH NEW 6" FULL-VIEW METER!



**A Combination VOLT-OHM MILLIAMMETER**  
• Plus CAPACITY, REACTANCE, INDUCTANCE AND DECIBEL MEASUREMENTS • Also Tests SELENIUM AND SILICON RECTIFIERS, SILICON AND GERMANIUM DIODES.

**SPECIFICATIONS**

- D.C. VOLTS—0 to 7.5/15/75/150/750/1,500.
- A.C. VOLTS—0 to 15/30/150/300/1,500/3,000.
- D.C. CURRENT—0 to 1.5/15/150 Ma. 0 to 1.5/15 Amperes.
- RESISTANCE—0 to 1,000/100,000 Ohms. 0 to 10 Megohms.
- CAPACITY—.001 to 1 Mfd. 1 to 50 Mfd.
- REACTANCE—50 to 2,500 Ohms, 2,500 Ohms to 2.5 Megohms.
- INDUCTANCE—.15 to 7 Henries, 7 to 7,000 Henries.
- DECIBELS—-6 to +18, +14 to +38, +34 to -58.

The following components are all tested for QUALITY at appropriate test potentials. Two separate BAD-GOOD scales on the meter are used for direct readings.

- All Electrolytic Condensers from 1 MFD to 1000 MFD.
- All Selenium Rectifiers.
- All Germanium Diodes.
- All Silicon Rectifiers.
- All Silicon Diodes.

Model 79 comes complete with operating instructions and test leads. Use it on the bench—use it on calls. A streamlined carrying case included at no extra charge accommodates the tester, instruction book and test leads. Only

**\$38<sup>50</sup>**

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

MOSS ELECTRONIC DISTRIBUTING CO., INC.  
Dept. D-494, 3849 Tenth Ave., New York 34, N. Y.

Please send me the units checked. I agree to pay down payment within 10 days and to pay the monthly balance as shown. It is understood there will be no finance or interest charges added. It is further understood that should I fail to make payment when due, the full unpaid balance shall become immediately due and payable.

- |   |                     |  |                     |
|---|---------------------|--|---------------------|
| <input type="checkbox"/> Model 82                             | Total Price \$36.50 | <input type="checkbox"/> Model 76                            | Total Price \$26.95 |
| \$6.50 within 10 days. Balance \$6.00 monthly for 5 months.   |                     | \$6.95 within 10 days. Balance \$5.00 monthly for 4 months.  |                     |
| <input type="checkbox"/> Model TW-11                          | Total Price \$47.50 | <input type="checkbox"/> Model 77                            | Total Price \$42.50 |
| \$11.50 within 10 days. Balance \$6.00 monthly for 6 months.  |                     | \$12.50 within 10 days. Balance \$6.00 monthly for 5 months. |                     |
| <input type="checkbox"/> Model TV-12                          | Total Price \$72.50 | <input type="checkbox"/> Model 79                            | Total Price \$38.50 |
| \$22.50 within 10 days. Balance \$10.00 monthly for 5 months. |                     | \$8.50 within 10 days. Balance \$6.00 monthly for 5 months.  |                     |

We invite you to try before you buy any of the models described on this and the preceding page. If after a 10 day trial you are completely satisfied and decide to keep the Tester, you need send us only the down payment and agree to pay the balance due at the monthly indicated rate.

## NO INTEREST OR FINANCE CHARGES ADDED!

If not completely satisfied, you are privileged to return the Tester to us, cancelling any further obligation.

**SEE OTHER SIDE!**

◀ **Cut out and mail TODAY!**

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All prices net, F.O.B., N.Y.C.

# 'SCOPES ARE "GOLD MINES"

... when you know how to use them fully on all types of service jobs



... AND THIS BOOK MAKES IT EASY TO LEARN ALL ABOUT THEM!

No question about it! The cathode ray oscilloscope is the handiest, most useful instrument in radio-TV servicing today. Servicemen who master it get the best jobs—make the most money—work lots faster—and are headed for even bigger things in the future!

## MODERN OSCILLOSCOPES AND THEIR USES

By Jacob H. Ruiters, Jr.  
of Allen B. DuMont Laboratories, Inc.  
326 pages. 370 illustrations. \$6.00

- ✓ When, where, why and exactly how to use them
- ✓ How to interpret patterns
- ✓ How to handle tough jobs easier and faster

Now the oscilloscope won't "stump" you—not when you have the clear explanations given by this famous book! It contains no involved mathematics—no puzzling and complicated discussions. Instead, it goes right to work explaining oscilloscopes fully and showing you exactly how to use them in lab work and on AM, FM and TV service work—from locating troubles to handling tough realignment jobs. Each operation is carefully explained including determining where and how to use the 'scope, making connections, adjusting circuit components, setting the controls and analyzing patterns fast and accurately. About 370 illustrations including pattern photos make things doubly clear.

No other type of specific service method training can mean so much to you in terms of efficiency and greater earning power! Send for it today. See for yourself how this book can help you—before you buy!

## READ IT 10 DAYS ... at our risk!

Dept. RN-92 RINEHART BOOKS, Inc.,  
Technical Division,  
232 Madison Ave., New York 16, N.Y.

Send MODERN OSCILLOSCOPES AND THEIR USES for 10-DAY EXAMINATION. If I decide to keep the book, I will then remit \$6.00 plus a few cents postage in full payment. If not, I will return book postpaid and owe you nothing.

Name: .....

Address: .....

City, Zone, State: .....

Employer's Name & Address: .....

OUTSIDE U.S.A.—Price \$6.50 cash only.  
Money back in 10 days if book is returned.

# Within the INDUSTRY

**SYDNEY JURIN** has been named national sales manager for radio and television receivers manufactured by *Majestic Radio & Television*, Division of *The Wilcox-Gay Corporation*.



He served in a similar capacity at *Pilot Radio Corporation* and *Tele-tone Radio Corporation* prior to joining the *Majestic Radio & Television Company*.

Mr. Jurin has just completed a seven-week survey trip during which he visited the in-between television markets which are expected to develop within the next year as soon as new stations are opened. He also investigated the various fringe area markets with a view to placing the current *Majestic* line which incorporates the "fringe area" switch.

**THE EXHIBITION COMMITTEE** of the German Radio Industry has announced that the "Great German Radio and Television Exhibition" which had originally been scheduled to take place in Dusseldorf August 22-31 has been postponed until February 27-March 8, 1953.

Since the North West German Radio will not be able to transmit television programs throughout Western Germany until the spring of 1953, the exhibition has been postponed to this date.

The program as originally announced (see page 110 of the July issue of *RADIO & TELEVISION NEWS*) will be carried out in its entirety during the newly-announced exhibition dates.

**GEORGE M. HAKIM** has been appointed director of advertising and sales promotion for *Belmont Radio Corporation*, Chicago manufacturer of *Raytheon* television and radio receivers.



He was formerly associated with the *Allen B. DuMont Laboratories, Inc.* in the capacity of advertising manager of the receiver division. Prior to entering the radio and television field, Mr. Hakim spent 15 years in advertising and sales promotion, including positions with several New York advertising agencies, handling many top national accounts.

**GLEN McDANIEL**, the Radio-Television Manufacturers Association's first full-time president, has resigned his post, effective October 1st of this year.

In making his announcement, Mr. McDaniel revealed that personal considerations which require his return to New York City were responsible for his resignation. He was elected to the post in February 1951.

The Association has greatly expanded its staff and services to members since Mr. McDaniel took office. Under his direction RTMA established a Statistical Department and broadened its statistical service to the industry. He has led the organization in promoting the interests of small manufacturers within the industry, especially in facilitating cooperation between small and large companies in meeting the responsibilities of the electronics industry in the national defense program.

No successor has been named as yet but the new chairman of the board of RTMA, A. D. Plamondon, Jr., has appointed a committee consisting of past presidents to make recommendations for a new president.

**PHILLIP J. WOOD** has been appointed merchandise and field sales manager for *Stewart-Warner Electric*, the radio and television division of *Stewart-Warner Corporation*.



Mr. Wood, who will make his headquarters in Chicago, will devote all of his time working with district managers, distributors, and distributor sales forces. He will also be responsible for merchandise and sales promotional activities of distributors.

He was formerly regional sales manager of the southern California and Arizona territories of the company. Ned Paine is replacing Mr. Wood in that capacity.

**GEORGE B. WAYSON** is the new sales manager for *Esquire Radio Corp.* of Brooklyn . . . The *Jeffers Electronics* and *Speer Resistor Divisions* of *Speer Carbon Company* has named **JOHN W. LOHNES** to the post of vice-president of sales . . . **M. A. DE MATTEO** has been placed in charge of jobber sales at *Astron Sales Corporation*, East Newark, New Jersey manufacturer of condensers and r.f. interference filters . . . *Westinghouse Television-Radio Division* has named **JAY M. ALLEN** to the post of manager of manufacturing and **RICARDO MUNIZ** as superintendent of manufacturing at the Sunbury, Pa. plant . . . **J. CALVIN AFFLECK** has been appointed advertising manager of the receiver division of *Allen B. DuMont Laboratories, Inc.* He will also con-



# Service Clinic!

Engineering information to help you better service Raytheon

## VERTICAL FRAME INTERLACING

**Vertical resolution** is determined by the number of horizontal scanning lines contained between the top and the bottom of the picture. The interlacing of two vertical frames by  $\frac{1}{2}$  horizontal scan-line spacing will double the resolution. This allows the use of a "flicker-free" vertical that will produce 525 horizontal scanning lines (262.5 lines without interlace).

Vertical frame interlacing requires the ver-

tical oscillator of the TV receiver to be "phase-locked" in frequency to that of the transmitted sync.

An **integrating network** is used to derive the vertical sync as shown in Figure 1 (1st frame) and Figure 3 (interlaced frame). A receiver vertical oscillator adjusted to a slightly lower frequency will be triggered into synchronization as the sync pulse (Figure 2 and 4) rises to the triggering level.

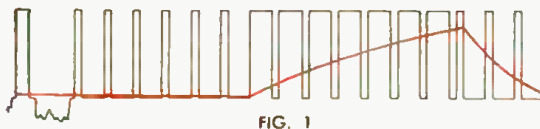


FIG. 1

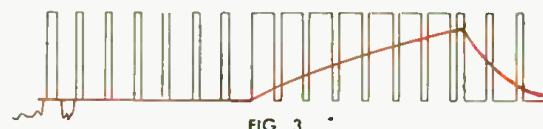


FIG. 3



FIG. 2



FIG. 4

**Pairing or the loss of interlace** will result when the alternate frames are of different time duration, even though the frequency may be exact for the combined frames. This is most commonly caused by receiver horizontal oscillator pulses coupling into the vertical oscillator. Thus causing the first field to trigger (point a Figure 2) at a different time than that of the second field (point b Figure 4). Deflection yoke inter-

winding coupling, chassis wiring lead dress, faulty integrating components or inadequate B filtering are the common causes for poor interlace.

It should not be necessary to adjust the vertical hold control for interlace reasons.

**Improved circuitry** such as this is one of many reasons why you can feel free to recommend Raytheon TV to a friend or customer.

© BELMONT RADIO CORP



**Dependably Built for Dependable Performance**

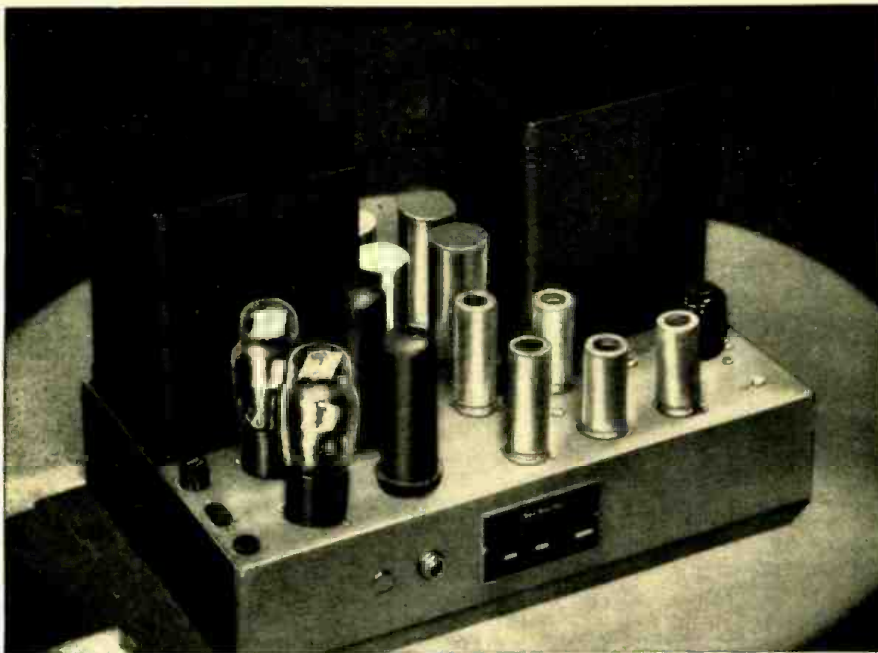


THE "CONTINENTAL" BERMUDA  
Model C-2113

Belmont Radio Corp., 5291 W. Dickens Ave., Chicago 39, Ill.  
Subsidiary of Raytheon Manufacturing Co.

September, 1952

27



ANNOUNCING THE SENSATIONAL

# FISHER

All-Triode Amplifier

AND

Master Audio Control

■ THE FISHER Laboratory Standard Amplifier is, beyond a shadow of a doubt, *the world's finest all-triode amplifier* — and yet moderately priced. FEATURES IN BRIEF: High output — less than ½ % harmonic distortion at 40 watts (.08% at 10 watts). Intermodulation distortion below 3/10% at 30 watts. Uniform response within .1 db, 20-20,000 cycles; 1 db, 5 to 100,000 cycles. Hum and noise better than 92 db below full output. Quality components, beautiful workmanship. ■ THE FISHER Master Audio Control can be used with *any* amplifier. Intermodulation distortion is virtually unmeasurable; complete, professional phonograph equalization settings and tone controls; genuine F-M loudness control; 5 inputs and 5 independent input level controls; cathode follower outputs. Self-powered.

Write for illustrated brochure and full specifications.

FISHER RADIO CORPORATION · 39 E. 47th ST., N.Y.



tinue his duties as sales promotion manager for the division . . . *Ultrasonic Corporation* of Cambridge, Mass. has appointed **WILLIAM M. PEASE** to the office of vice-president and director of engineering and **PAUL TRAVERS** to the post of chief engineer . . . **CLIFTON R. POTTER** has been appointed manager of commercial engineering for the electronic tube division of *Westinghouse Electric Corporation* at Elmira, New York . . . **STANLEY KRAMER** is the new chief applications engineer and **HERBERT FRIEDMAN** is the sales engineer for the newly-formed germanium products division of *Radio Receptor Co., Inc.* . . . **ROBERT H. DOLBEAR** has been named to the post of sales engineer for the instrument division of *Allen B. Du Mont Laboratories, Inc.* He was formerly field service engineer for the electronic division of the *Curtiss-Wright Corporation* . . . *Allied Radio Corporation* has made two new appointments of interest to the industry. **E. C. WHARFIELD** has been named coordinator for sales of high-fidelity equipment while **ZOLE CSOLKOVITS** is the new coordinator for sales of amateur equipment. Both men are widely-known hams and have been associated with *Allied* for many years.

\* \* \*

**J. A. MILLING** has joined *Howard W. Sams & Co., Inc.* of Indianapolis as executive vice-president and general manager of the firm.

He was formerly director of the Electronic Division of the National Production Authority in Washington. on leave from his position as operating vice-president of *RCA Service Co., Inc.* of New York.



In his new position he will be in charge of the firm's expansion program in behalf of "Photofact Publications" and allied enterprises in the electronics field.

Mr. Milling has been associated with the electronics industry for twenty-five years, the last twenty-two with *RCA*. He is widely known by dealers, service technicians, distributors, and manufacturers throughout the country.

\* \* \*

**BOGUE ELECTRIC MANUFACTURING COMPANY** is building a new plant on Pennsylvania Avenue in Paterson, N. J. The new facilities will provide 25,000 square feet of additional floor space . . . The **CROSLY DIVISION** has started limited production in its new building at Richmond, Indiana. Full production will not be attained until sometime next year . . . **RAD-TEL TUBE CO.** has moved to new and larger quarters at 115 Coit Street in Irvington, New Jersey . . . **THE LAPOINTE-PLASCOMOLD CORPORATION** has moved to a new plant at 155 West Main Street in Rockville, Connecticut. The new facilities will be used for the manufacture of the company's line of "Vee-D-X" an-

(Continued on page 88)



# NEW GENERAL ELECTRIC ALL-PURPOSE OSCILLOSCOPE

Versatile 5-Inch Model ST-2B Outperforms Competition  
in Laboratory and Industrial Applications

NO MATTER how broad the requirements of your laboratory, chances are you'll find most of them listed in the comparison chart below. Four well-known makes\* of conventional scopes are analyzed, feature by feature, against the General Electric ST-2B. *On every point*, the G-E unit is an investment in high-quality, long-term performance.

Write us for complete new bulletin ECL-4. *General Electric Company, Section 992, Electronics Park, Syracuse, New York.*

\*Names on request.

## SPECIFICATIONS

### FREQUENCY RESPONSE

#### Vertical Amplifier

DC—0 to 400 kc. +0, -20%, not more than 50% down at 700 kc.  
AC—10 cycles to 400 kc. +0, -20%, not more than 50% down at 700 kc.  
Probe—2 cycles to 400 kc. +0, -20%, not more than 50% down at 700 kc.  
Response independent of gain or attenuator setting.

#### Horizontal Amplifier

DC—0 to 400 kc. +0, -20%, not more than 50% at 700 kc.  
AC—10 cycles to 400 kc. +0, -20%, not more than 50% down at 700 kc.  
Response independent of gain or attenuator setting.

### SENSITIVITY

Vertical ..... AC—10 mv. rms/inch  
..... DC—28 mv. dc/inch  
Horizontal ..... AC—15 mv. rms/inch  
..... DC—42 mv. dc/inch  
Probe ..... 130 mv. rms/inch  
Deflection Plates Direct  
Vertical ..... 22 volts rms/inch  
Horizontal ..... 25 volts rms/inch

### SWEEP

Range—Triggered or recurrent—2 cycles to 30 kc (may be extended downwards by adding external capacity across panel jacks).  
Sync—±Internal, ±line and -Ext. (requires -.3 volts peak to peak for external sync).  
Sweep Expansion—At least 4 times tube diameter.

PHASE SHIFT—Negligible phase shift between amplifiers from 0 to 300 kc.

BLANKING—Z-axis blanking requires 20 volts peak to blank.

CALIBRATION—Seven voltages available by selector switch:  
.1, .3, 1, 10, 30, 100 and 300 volts peak to peak ±15%.

DIRECT CONNECTIONS TO DEFLECTION PLATES—Available through capacitors—internal positioning circuits still function.

AMBIENT TEMPERATURE RANGE—0° to 40° C.

POWER REQUIREMENTS—105-125 volts, 50/60 cycles power consumption approximately 120 watts. (By a simple wiring change, may be operated from 210-250 volt line.)

### TUBE COMPLEMENT

4—6BK7 Model 4ST2B1—5UP1  
1—5Y3GT Model 4ST2B2—5UP7  
4—5879 1—0A2 Model 4ST2B3—5UP11  
2—12AU7 1—884

### SIZE

Height—15¼ inches Width—10 inches  
Depth—17 inches Weight—45 pounds

## WHAT DO YOU LOOK FOR IN A SCOPE? STUDY THIS FACTUAL COMPARISON.

CHARACTERISTICS	G-E ST-2B	MFTR. B	MFTR. C	MFTR. D	MFTR. E
Sufficient band width for pulse work	Yes	Yes	Yes	Yes	No
High gain AC/DC amplifiers	Yes	Yes	No DC amplifier	No DC amplifier	Yes
Triggered sweep	Yes	No	No	No	Yes
Good stability	Yes	Yes	Yes	Poor	Yes—if tube selection is employed
Choice of cothode ray tube screen persistence	Yes	Cannot use long persistence C. R. tube	Yes	Cannot use long persistence C. R. tube	Yes
Low capacity probe	Yes	Yes	No	No	Yes
Direct connection to deflection plates	Yes	No	Yes	Yes	Yes
Identical vertical & horizontal amplifiers	Yes	Yes	No	No	No
Low microphonics	Yes	No	Yes	Yes	Yes
Z-axis modulation input jack	Yes	No	Yes	Yes	Yes
Convenient amplitude calibrator	Yes	Single Voltage only	Single Voltage only	Single Voltage only	Single Voltage only

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Everybody who has seen these completely new home music amplifiers has had a good word for them. We are proud to quote some of the things they had to say at the Chicago Show and Audio Fair.

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# Telephone Science Shares Its Knowledge



The **Bell Telephone Laboratories Series** of books is published by D. Van Nostrand Company. Other technical books by Laboratories authors have been published by John Wiley & Sons. Complete list of titles, authors and publishers may be obtained from Publication Dept., Bell Telephone Laboratories, New York 14.

**List of Subjects:** Speech and hearing, mathematics, transmission and switching circuits, networks and wave filters, quality control, transducers, servomechanisms, quartz crystals, capacitors, visible speech, earth conduction, radar, electron beams, microwaves, waveguides, traveling wave tubes, semiconductors, ferromagnetism.

In their work to improve your telephone service, Bell Laboratories make discoveries in many sciences. Much of this new knowledge is so basic that it contributes naturally to other fields. So Bell scientists and engineers publish their findings in professional magazines, and frequently they write books.

Most of these books are in the *Bell Telephone Laboratories Series*. Since the first volume was brought out in 1926, many of the books have be-

come standards . . . classics in their fields. Twenty-eight have been published and several more are in the making. They embody the discoveries and experience of one of the world's great research institutions.

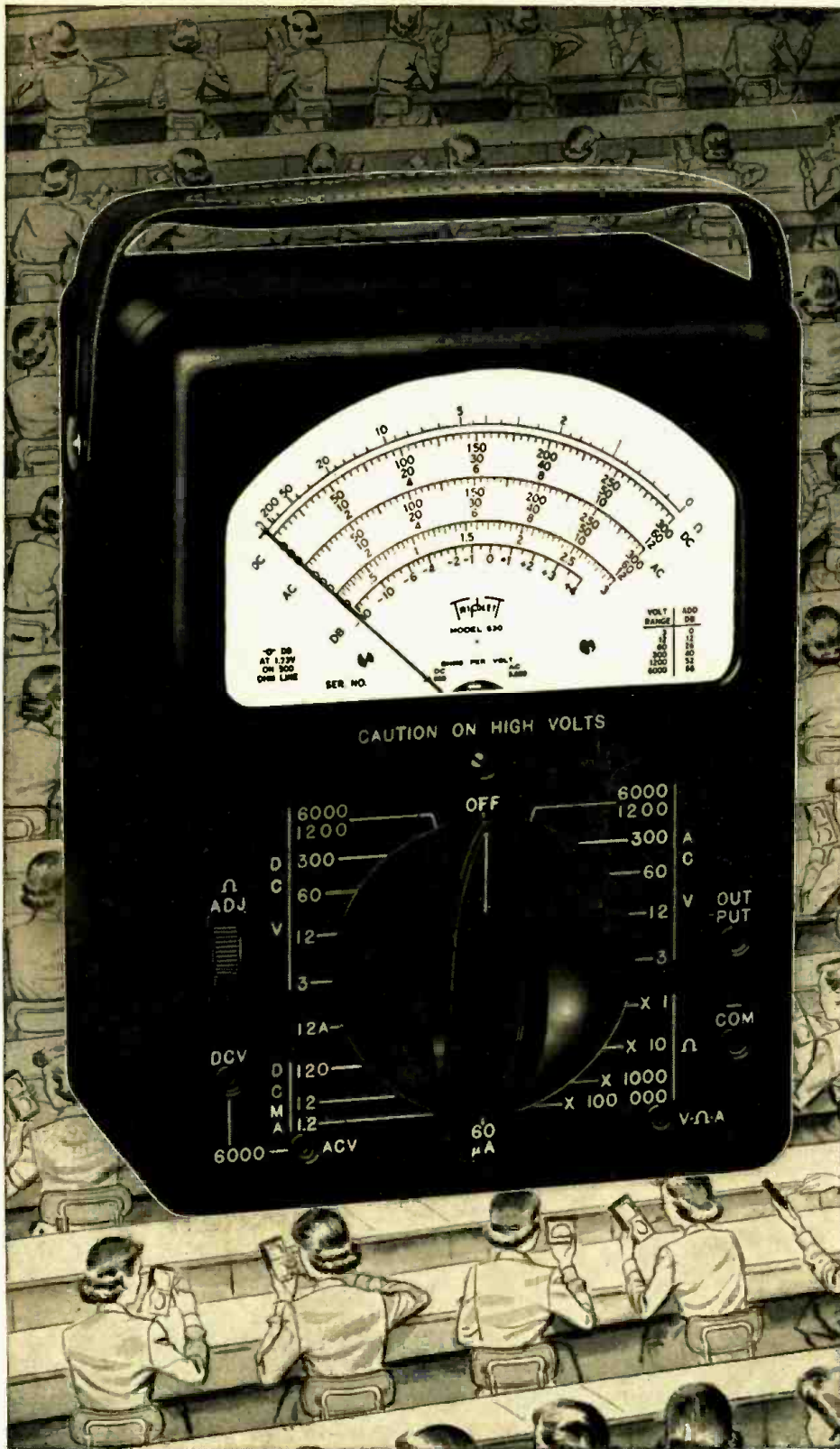
Bell scientists and engineers benefit greatly from the published findings of workers elsewhere; in return they make their own knowledge available to scientists and engineers all over the world.



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**RADIO & TELEVISION NEWS**



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# 630



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PRESIDENT

Because we build every major part of our instruments the quality is carefully controlled. For example, we know we have more torque driving our pointers because we designed and built the complete instrument. We know we have sustained dependance in the shafts and switch contacts of our test equipment for the same reason. Cycle tests for switches exceed several times the rigid requirements of the armed forces.

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In the CBS-Columbia design laboratories, Al Goldberg takes some important readings with the EICO Model 221 Vacuum Tube Voltmeter and Model 555 Multimeter, as Harry R. Ashley looks on.



Mr. Al Goldberg, Assistant Chief Engineer of CBS-Columbia and Harry R. Ashley, President of EICO, inspecting the use of the EICO Model 221 Vacuum Tube Voltmeter and Model HVP-1 High Voltage Probe at the Sweep Frequency Troubleshooting Position on the CBS-Columbia Television production lines.



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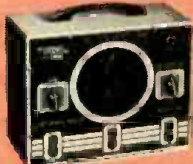
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A locally-controlled base station. Entire unit is housed in single cabinet.

Mobile radio in use at the B & O Railroad's coal pier in Baltimore, Maryland.



Two-way radio equipment installed in car.

# MOBILE RADIO

By  
**LEO G. SANDS**  
Bogue Railway Equipment Division

*Part 1. A survey of the field, including frequency allocations, types of equipment, and operation data.*

**M**OBILE radio has grown into a large and highly specialized industry with annual equipment sales running into several millions of dollars. The men who sell, design, and maintain mobile radio systems are specialists who must be familiar not only with equipment and propagation but with laws, traffic, material handling, and the operational character of a large number of different industries.

Mobile radio is the term applied to the art of communicating from a fixed point to one or more mobile units and between mobile units. A mobile unit may be an automobile, truck, motorcycle, train, boat, or other vehicle, or even a man on foot, outfitted with radio communications equipment.

Thousands of vehicles have been equipped with radio apparatus that permits two-way conversation between the vehicle and fixed points and/or other vehicles. As the economic value of rapid communication is fully recognized, more and more vehicles are being and will be equipped with mobile radio apparatus.

Perhaps the largest user of mobile radio is the taxicab industry where the proof of the value of radio communications is most easy to demonstrate. The amount of "dead mileage" that has been converted into profitable miles reaches an astronomical figure. Furthermore, the public receives better service because taxicabs need not return to their bases or specific telephone-equipped stands before being dispatched on new assignments.

The public safety services were early to recognize the value of mobile radio. Today, hardly a police organization in the country would attempt to operate without radio communications.

The railroads use mobile radio to direct the switching of locomotives and to provide direct and adequate communication between the head end and rear end of trains. Several railroads have extended mobile radio facilities to permit contact between dispatchers and wayside operators and trains along the main line. The *Erie Railroad*, for example, has radio facilities all the way from New York to Chicago.

Bus lines, truckers, and other common carriers employ mobile radio to provide direct contact with drivers

enroute. Manufacturers, contracting firms, and maintenance organizations utilize mobile radio to increase the efficiency of their operations. Pipe line operators and petroleum producers rely heavily on mobile radio to keep operations running smoothly.

The use of radio transmitters is licensed by the Federal Communications Commission. Licenses are issued to qualified applicants without charge. The operation of licensed radio stations is governed by the rules and regulations of the FCC.

Users of mobile radio are divided into several general classifications which include the Public Safety Radio Services, Land Transportation Radio Services, Industrial Radio Services,



Capt. Long of Bendix Plant Protection Force operates MRT-6 unit.

## Realistic Profit Margins

(Continued from page 64)

cut-rate drugs. Let's wise up! Any fool can sell a tube over the counter.

"Suppose all service shops were to sell tubes at a 65 per-cent mark-up over cost. In a competitive market for name-brand merchandise, this represents a good profit and is considered good business. But it is more important to look at what we gain.

"If tubes were available to customers locally at a 65 per-cent mark-up, the drugstores, hardware stores, and supermarkets would have to drop their prices to meet this competition. This would take away that beautiful 150 per-cent profit we have created for these operators to split between themselves and the stores and chop it down to a realistic 65 per-cent. After deducting the cost of amortizing the tube testers, the losses due to pilferage, etc., there would hardly be enough left after the split to cover the cost of shipping. As a result, the tubes and testers would disappear from the scene."

Other dealers have met the incursion of self-service tester competition head-on by making their own shops self-service centers. The more successful dealers who tried that approach went all out in promoting their self-service facilities. Their merchandising programs included store front modernization, redecoration of the shop interior to focus attention on the do-it-yourself facilities, and the addition of other products that set owners need for other home repairs.

There has not been, however, any widespread recognition in the service industry of the basic economic factors involved in the renewed trend toward do-it-yourself servicing. The challenge to service is that it must learn how to merchandise its facilities in a manner that will make the general public feel it is getting a full dollar of value for every dollar that is spent for electronic service.

More than 4000 bits of information can be stored on this five-inch-square "memory frame" being produced by RCA for a new high-speed electronic computer used by the Atomic Energy Commission. The frame is composed of thin strands of insulated copper wire and tiny ferrite cores, 83,000 of which would weigh just a pound.



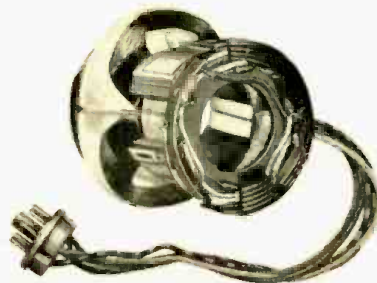
September, 1958



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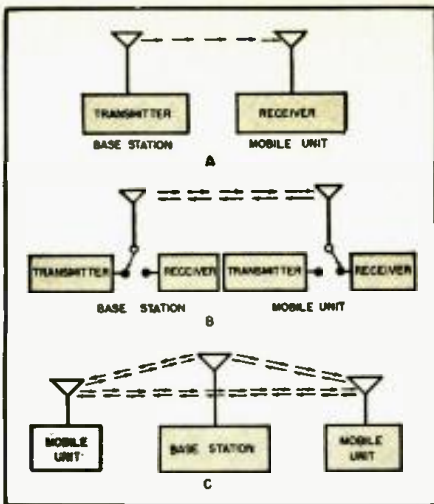


Each Merit yoke is  
100% LIVE TESTED

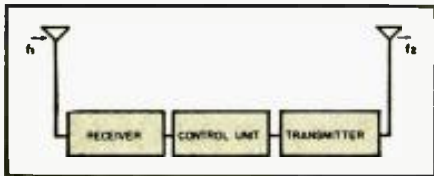


# COMPARE IT WITH MERIT

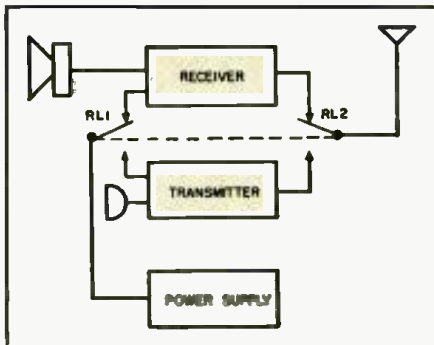
MERIT COIL AND TRANSFORMER CORP.  
MERIT PLAZA · HOLLYWOOD, FLORIDA



Three types of mobile radio communications systems. (A) One-way (base station to mobile unit—no talk-back), (B) Two-way communication. (C) Three-way system (base station with mobile units and communication between mobile units in the radio system.)



A typical relay station for mobile radio.

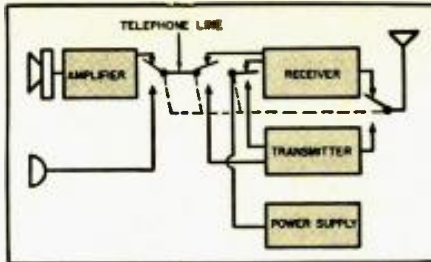
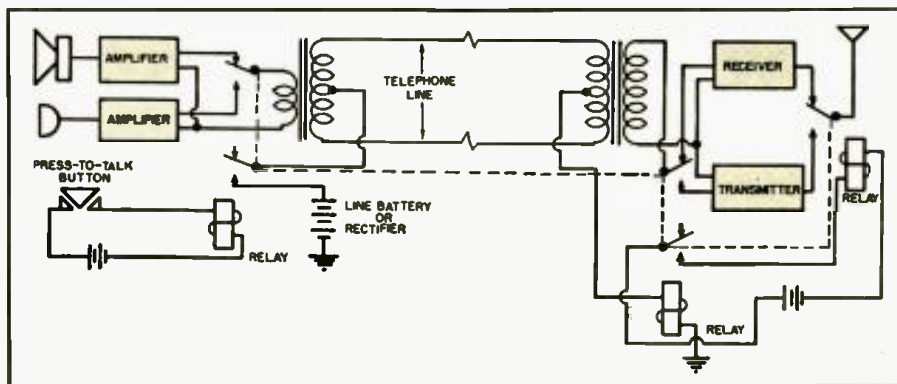


Functional block diagram of mobile unit or locally-controlled base station. RL<sub>1</sub> and RL<sub>2</sub> are relays actuated by the press-to-talk button on the receiver handset.

Domestic Public Radio Services, Maritime Radio Services, and the Citizens Radio Service.

Several segments of the radio spec-

A simplified diagram of a typical base station remote-control circuit.



Single line block diagram of a remotely-controlled base station. The relays are shown in their "Receive" positions.

trum have been set aside for the mobile radio services. The most popular bands are the 25 to 50 megacycle band, which was recently expanded from 30 to 40 megacycles, and the 152 to 162 megacycle band. The 450 to 460 megacycle band is getting considerable attention now that production-type equipment for this band is currently available.

Specific frequencies within a particular band are assigned and selected by an industry coordinating group. For example, a railroad applying for a radio station license will consult the Association of American Railroads as to what specific frequency should be assigned to that particular station. The Association of American Railroads, which acts as a clearing house for all of the railroads on the matter of frequency assignments, has developed an allocation plan which is intended to dole out channels in specific territories in a manner that will result in minimum interference for all concerned. Other industry groups have similar frequency coordinating groups which aid the FCC in assigning channels.

Mobile radio systems utilize several different types of stations, namely (a) mobile units, (b) base stations, (c) operational fixed stations, (d) portable stations, and (e) relay stations.

A one-way mobile radio system consists of a base station and one or more mobile units. The base station transmits only and the mobile units receive only, thus providing communication in one direction only. The base station may transmit intelligence to the mobile units, but the mobile units cannot answer back.

A two-way mobile radio system consists of a base station and one or more mobile units. The base station and

mobile units transmit and receive, thus providing two-way conversations between base station and mobile units.

A three-way mobile radio system is similar to the two-way system except that the mobile units may communicate with each other as well as with the base station. The term "three-way" is not necessarily universally accepted as it is the concoction of one or more equipment manufacturers. However, it does convey the desired meaning and is popularly used.

Other variations include mobile radio systems employing more than one base station which may communicate with each other as well as with mobile stations.

A mobile unit generally consists of a transmitter, receiver, power supply, antenna, loudspeaker, microphone, and associated control equipment. The transmitter, receiver, and power supply are often combined in one unit although separate units are available.

In the case of an automobile or truck, electric power for the operation of the radio equipment is generally derived from the vehicle's battery and generator system. The power supply unit of the mobile radio equipment converts this low voltage direct current to higher voltages for plate and bias power. The tube filaments are usually activated by vehicle battery power.

The antenna of the mobile unit may be mounted on the roof of the vehicle or on the bumper or other convenient spot, depending upon the frequency of operation and type of antenna. Roof mounted antennas utilize the metal roof as the ground plane of the antenna system.

The mobile unit is usually so arranged that the receiver is operative whenever the power is turned on. A squelch circuit prevents sound from emanating from the loudspeaker except when a signal of a certain level is picked up by the fixed-tuned receiver. The antenna is normally connected to the receiver through an antenna switching relay. When the operator of the mobile unit wishes to transmit, he picks up the microphone or telephone handset and presses the push-to-talk button when he speaks.

Pushing this button causes the antenna to be automatically switched from the receiver input to the transmitter output. Power is applied to the transmitter and the receiver is muted. Releasing the button restores the equipment to "receive" or "stand-by" service.

Special installations have been made on trains like the B&O "Royal Blue" and the Pennsylvania "Congressional" wherein two antennas are used and transmission and reception are carried on simultaneously to permit two-way conversations without using the press-to-talk technique. However, this type of installation was designed for public telephone service for use by persons without special training and is not generally used in private mobile communications systems.



Base stations are usually of two basic types, the locally-controlled station and the remotely-controlled station. Where local control is employed, the radio apparatus is located in the same room or building as the operator.

A remotely-controlled station is one which employs one or more remote control or dispatch points. The transmitter and receiver are located at a point separated from the operator. Remote control operation is often employed to permit taking advantage of an antenna location superior to that available at the site where the operator would be located.

For example, to attain ample communications range, the antenna and the transmitter and receiver may be located on the roof of a tall building. The operator, who may be located several miles away, controls the radio station with a remote control unit which is connected to the transmitter and receiver by a telephone line.

When telephone lines are not available for remote control purposes or cannot be justified economically, a radio link may be used for remote control of a base station.

Dispatch points are additional remote controls from which the base stations may be controlled. One of these points is designated as the remote control point. Here the operator in charge monitors all transmissions and has control of the base station, including facilities for disabling the other dispatch points. Multiple dispatch stations are sometimes used in railroad yards where several supervisors, located at different points, are afforded radio communications facilities.

Base stations differ from operational fixed stations in that *base station* is the designation for a radio station which communicates with mobile units. A fixed station is one which is used for communication with other fixed stations for point-to-point service.

A relay station, or repeater, is a radio station which receives signals from one or more stations and automatically retransmits the received intelligence to other stations. Relay stations are used for extending communications beyond the normal range of two adjacent stations.

A mobile relay station is used to extend the range of communications between mobile units. Signals from a mobile unit are picked up on one frequency and are retransmitted to other mobile units on a second frequency. This technique permits taking advantage of the greater antenna height of the relay station and can sometimes provide mobile-to-mobile communication over a range double that normally achieved between base station and mobile unit.

A base station or fixed station consists of a transmitter, receiver, and power supply plus antenna system and control equipment. As in mobile units, both transmitter and receiver are crystal-controlled and fixed-tuned to their assigned frequencies. Electric power is usually supplied from utility power mains.



Components comprising a single mobile radio unit. (A) The transmitter, receiver, and power supply. (B) Control unit for dash mounting—includes pilot lights, volume control, squelch control, and channel selector switch. (C) Loudspeaker. (D) Mounting bracket for speaker. (E) Microphone. (F) Microphone mounting clip. (G) Quarter-wave whip antenna for car-top mounting with flexible coaxial cable. (H) Multi-conductor cable to interconnect control unit and radio unit. (I) Wire for connecting hot side of battery to fuse. (J) Interference filter. (K) Fuse and mount. (L) Mounting brackets. (M) Loom for protecting cable from wear. (N) Screws and miscellaneous hardware. (O) Metering plug and cable for testing the operation of the entire unit.

Antennas used at base stations are generally mounted atop a mast or other support, usually as high as possible to achieve maximum range. The communications range when operating in the very-high-frequency (v.h.f.) and ultra-high-frequency (u.h.f.) portions of the radio spectrum is governed, to a great extent, by antenna height. As it is usually impractical to elevate mobile antennas to heights above a few feet, it is a general practice to achieve the maximum practicable range by installing the base station antenna as high as possible.

By the same token, the communications range may be controlled to a degree by adjusting the base station antenna. (Continued on page 100)



J. C. Fowler, telephone line-repair crew foreman for Colorado Interstate, uses a G-E two-way radio to advise the main office that emergency job has been completed and request instructions for the next job. Two-way radio speeds such emergency repairs and reduces time between calls.

General Electric two-way radio equipment, installed by the volunteer fire departments of Wayne County, New York, helps speed mutual aid and civil defense assignments. The county has formed a network of volunteer departments, coordinated from Lyons.

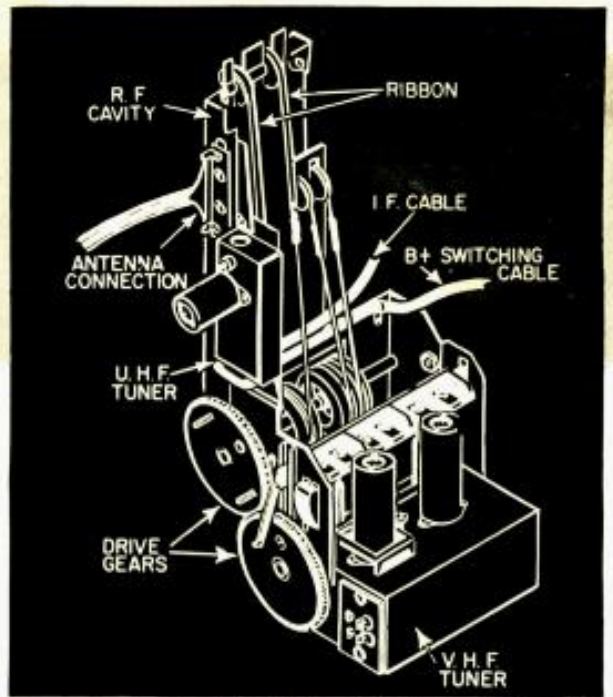


# A CONTINUOUS U.H.F. TUNER

By  
**KEN KLEIDON**  
Belmont Radio Corporation

SOME time ago the Federal Communications Commission allocated 70 new television channels, referred to as the ultra-high-frequency band or simply u.h.f., in a frequency range from 470 to 890 megacycles. This is a continuous frequency band, without skips as in the present v.h.f. band, and includes channel numbers ranging from 14 through 83. With the addition of the u.h.f. band 82 channels are now available for television. The u.h.f. band has the same transmission standards as the present v.h.f. band, namely, six megacycle bandwidth, horizontal scanning frequency of 15,750 cycles, etc. Therefore, all that will be necessary to receive u.h.f. transmissions on a v.h.f. receiver will be to install a u.h.f. tuner or converter. A u.h.f. converter is a device connected externally to the receiver which selects the u.h.f. station's video and sound carriers and converts them to a predetermined v.h.f. channel.

Fig. 1. Mechanical details on Raytheon's Model UHF-100 ultra-high-frequency tuner.



*Details on a single-conversion, continuous-type u.h.f. tuner that is easy to mount and adjust.*

A u.h.f. tuner is a device which is added to and is part of the v.h.f. receiver. The u.h.f. tuner selects the u.h.f. station's video and sound carriers and converts them to the receiver i.f. frequency if single conversion is employed or converts them to a lower frequency which is again converted to the i.f. frequency. The latter is known as "double conversion."

Since Raytheon uses a continuous tuner in its present v.h.f. receivers, it has designed a single-conversion, con-

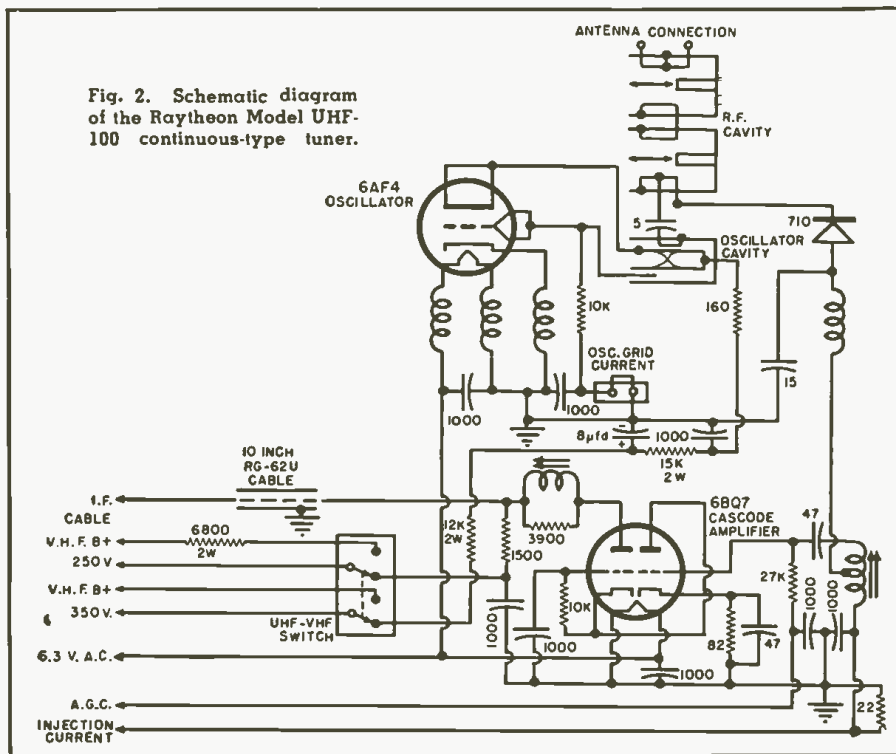
tinuous-type u.h.f. tuner which will mechanically mount directly over and on top of the v.h.f. tuner, as shown in Fig. 1. This is Raytheon's Model UHF-100 ultra-high-frequency tuner which will be available for mounting on any Raytheon television receiver which is equipped with a continuous-type tuner.

Installation of the u.h.f. tuner is fairly simple. All that will be required is to remove the chassis from the cabinet, mount a drive gear on the v.h.f. tuner and the u.h.f. tuner over the v.h.f. tuner with four mounting screws, connect the two cables to the under side of the chassis, make a few under chassis wiring modifications, and mount the u.h.f.-v.h.f. switch at the rear of the cabinet. The u.h.f.-v.h.f. switch is provided for switching to the desired u.h.f. or v.h.f. frequency range. Referring to Fig. 1, the cables shown (RG-62/U) are for signal coupling to the i.f. amplifier section and "B plus" voltage switching to either the u.h.f. or v.h.f. tuners. Signal points and filament leads are not switched. The u.h.f. tuner is coupled to the v.h.f. tuner by drive gears; this permits the receiver's owner to tune for both u.h.f. and v.h.f. with the same tuning knob. The u.h.f., when shipped from the factory, will be pre-aligned and ready for installation.

Referring to Fig. 2, it can be seen that the Raytheon u.h.f. tuner employs a double-tuned coaxial line or r.f. cavity preselector. The coaxial line or r.f. cavity arrangement has the advantages of high selectivity, low insertion losses, uniform bandwidth, and good shielding against oscillator radiation. The coaxial cavity is basically nothing more than a quarter-wave, shorted tuned stub. The electrical

(Continued on page 161)

Fig. 2. Schematic diagram of the Raytheon Model UHF-100 continuous-type tuner.



# PICTURE TUBE EMISSION TESTER AND REJUVENATOR

By  
**A. A. GOLDBERG**

**T**ELEVISION picture tubes eventually go bad. Some time or other we have appraised the huge mass of glass and wished for methods to bring back the tube's lost vigor. Having had this experience, the author set out to investigate picture tube rejuvenation.

As the tube ages, the image gradually loses brilliancy; the first one hundred hours of operation normally results in a 50% decrease in brightness. Later, the decrease tapers off to a gradual light loss for the balance of the tube life. This change is a normal phosphor characteristic.

Table 1 is a list of common troubles in cathode-ray tubes and their symptoms.

The list given in the table may seem discouraging—and it is. Only troubles 2, 3, and 4 appear to have possibilities of correction from outside the glass envelope. (How nice it would be to crawl inside the tube and solder the open grid.) Trouble 4, gassy tubes, can be attacked with the use of an r.f. bombarder to reflash the getter. The expense of a high-powered r.f. generator, however, makes this approach unattractive. This leaves troubles 2 and 3, no or weak emission. Immediately the old scheme of cathode rejuvenation comes to mind.

Fig. 1A shows the circuit used for picture tube cathode rejuvenation. An excessive heater voltage of 8.5 volts r.m.s. is applied which brings the cathode up to above normal operating temperatures. Simultaneously, a heavy cathode-control grid current is caused to flow which further increases the cathode temperature. The rare earth oxides then either boil to the surface or the topmost surface boils away exposing new emitting material.

Results were promising enough to encourage the author to build a practical model. A standard 4" x 4" x 2" steel box encloses the entire circuit. A duodecal socket is loosely mounted

on one side plate; this allows the socket to rotate and keeps the box upright irrespective of picture tube orientation. On the other removable plate is mounted an inexpensive moving-vane type 0-10 milliamperemeter. A .001  $\mu$ fd. paper or ceramic condenser is connected across the meter. This acts as a filter and prevents the meter pointer from vibrating due to the unidirectional 60-cycle ripple. The balance of the parts are mounted on the box proper.

The heater transformer is a standard 6.3 volt, 1.2 ampere unit rewound to deliver 8.5 volts. Make certain the low voltage is on top of the primary. Remove the laminations and unwind the secondary, keeping note of the number of turns. Rewind the secondary with slightly smaller wire and increase the turns by a factor of 1.35.

If it is so desired, the transformer can be omitted entirely and a resistance-type line cord substituted. (Fig. 1B) *Caution:* if the line-cord resistor is the only voltage dropping element

in the heater circuit, the tube heater will flash open. Protection is afforded by inserting a negative temperature coefficient resistor in series with the resistive line cord. The one used here is a 17 ohm unit, Model L5507-17  
(Continued on page 98)

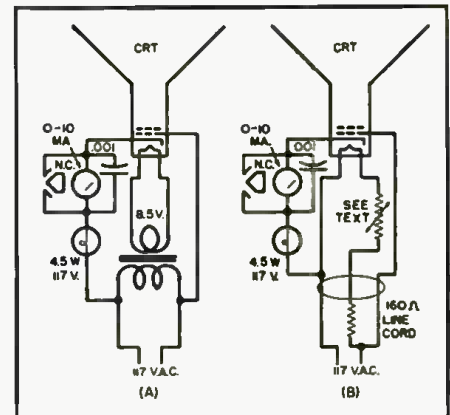


Fig. 1. Two versions of the tester circuit.

Table 1. Common faults encountered in cathode-ray tubes and their symptoms.

TROUBLE	SYMPTOM
1. Open heater	No raster
2. No cathode emission	No raster
3. Weak cathode emission	Weak picture with blooming
4. Gassy	Blooming and poor focus
5. Open grid	Raster but no video except some high frequency components. No control of brightness
6. High voltage breakdown	Intermittent flashing
7. Bent electron gun	Raster cannot easily be centered, shadowing troubles
8. Bad phosphor	Low light output
9. Enlarged electron gun apertures due to incorrect ion trap alignment	Poor focus

# THREE TUBES ON 2 METERS

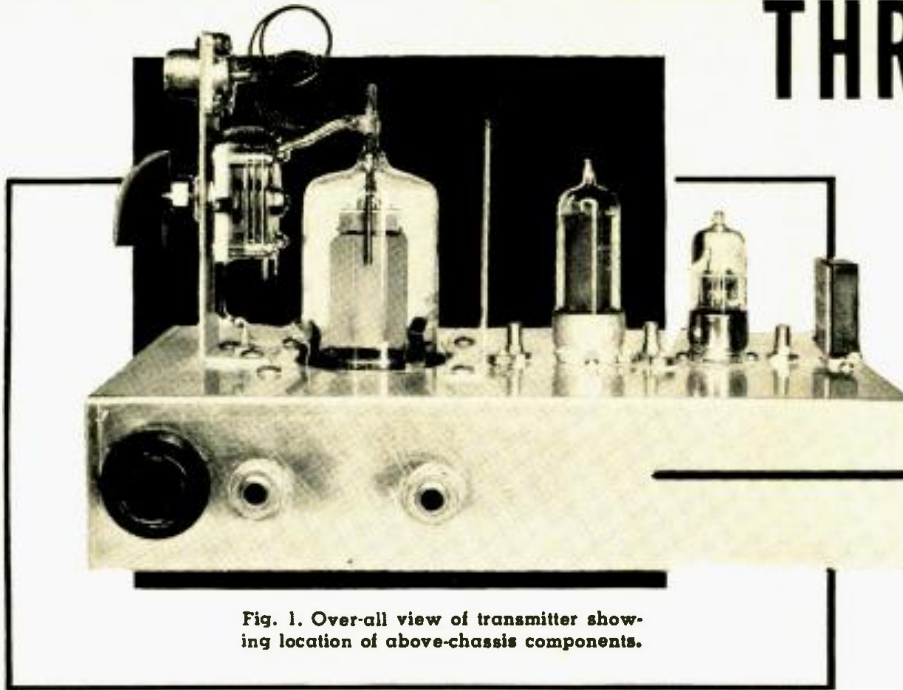


Fig. 1. Over-all view of transmitter showing location of above-chassis components.

By  
**MERRITT F. KIRCHHOFF, W2FAR\***  
and  
**DAVID D. BULKLEY, W2QJ†**

*Construction details on a simple, compact unit suitable for home station or emergency operation.*

THE varied activities of amateur radio require more and more radio equipment in the "shack." For many hams this poses a problem, inasmuch as many of us have a limited amount of space available for the installation of this type of apparatus. The trend, therefore, has been toward more compact units that utilize miniature tubes and components in simple straightforward circuits. Further, Civil Defense activities, which occupy such an important place in amateur radio, require equipment that is as reliable as it is easy to operate.

The two-meter transmitter described here was designed for practical home station operation in addition to its possible enlistment in emergency communication network operation should the need ever arise. The selection of miniature tubes for use in the exciter stages of the transmitter was not a difficult task, as modern tried-and-proven circuits are available for the tubes chosen. The question of the final amplifier tube, however, posed somewhat of a problem. A tube was needed which required very little drive power; one which would operate at reasonably low d.c. plate voltages, yet was of small physical size. Various types were considered and the *Amperex* type AX 9903 was finally selected for a number of reasons. A dual-beam tetrode, this tube has characteristics similar to those of the familiar 829B. However, the AX 9903 embodies features that surpass the 829B in many respects. It is smaller physically than the 829B yet it has an output capacity less than half that of the 829B. Other interelectrode capacities are correspondingly lower and the screen grid is

common to both halves of the tube which assures more stable operation at very high frequencies. In addition, the *Amperex* type AX 9903 has internal neutralizing condensers that are connected directly to the control grids, eliminating the bother of external neutralizing circuits.

Reference to Figs. 1 and 3 will show the efficient use of the space on the chassis. Although the transmitter is constructed on a standard aluminum chassis  $5\frac{1}{2}$  by  $9\frac{1}{2}$  by 2 inches, it might very readily be built on a smaller chassis without crowding components or making construction difficult.

The transmitter circuit consists of a 6J6, one section of which is used as a harmonic crystal oscillator/frequency tripler and the second section used as a frequency tripler. The output from this tube is fed to a type 5763 employed as a frequency doubler which drives the *Amperex* type AX 9903 push-pull final r.f. amplifier.

### Layout

Fig. 1 shows the general view of the top and the front of the chassis. The 6J6 harmonic crystal oscillator/frequency tripler is located at the right-hand side of the photograph, to the left of the crystal. In the approximate center of the chassis will be seen the type 5763 frequency doubler. This efficient pentode provides more than enough drive to excite the type AX 9903 to its left. The final amplifier tuning condenser with its coil are seen immediately to the left of the final amplifier tube, mounted on a small

bracket. In order to obtain short leads to the plate pins of the final amplifier tube, the final amplifier tuning condenser is mounted at right angles to the front of the chassis. If a front panel is contemplated, or if the transmitter is to be mounted in a cabinet of some sort, it would be a simple matter to mount a right-angle drive assembly on a second small bracket to permit tuning this condenser from the front panel.

The power supply plug is mounted on the front of the chassis at the extreme left-hand side of the photograph. The jack for metering the cathode circuit of the final r.f. amplifier is next in line, followed by the jack to meter the grid current to the final r.f. amplifier.

As operating in the two-meter amateur band seldom requires change of frequency, no meter was included in the circuit. This not only simplifies the circuit, but also adds to the economy of the design. Any test meter will provide the necessary means to adjust the transmitter when changing crystals. The final amplifier is metered in the cathode circuit. This is done so that it will not be necessary to have high voltage on the meter proper with its attendant danger of shock to the operator. If it is desired to read the plate current, it would be a simple matter to place  $J_2$  at the point indicated by "X" in the circuit diagram. However, care should be taken to provide adequate insulation between the meter body and the chassis or panel.

The exciter stages of the transmitter employ conventional coil and condenser circuits tuned by miniature variable condensers. However, no retuning should be required when shifting from one frequency to another within the band; only when shifting from the extreme low end of the band to the extreme high end of the band

\* Columbia Broadcasting System.  
† International Telephone and Telegraph Corporation.

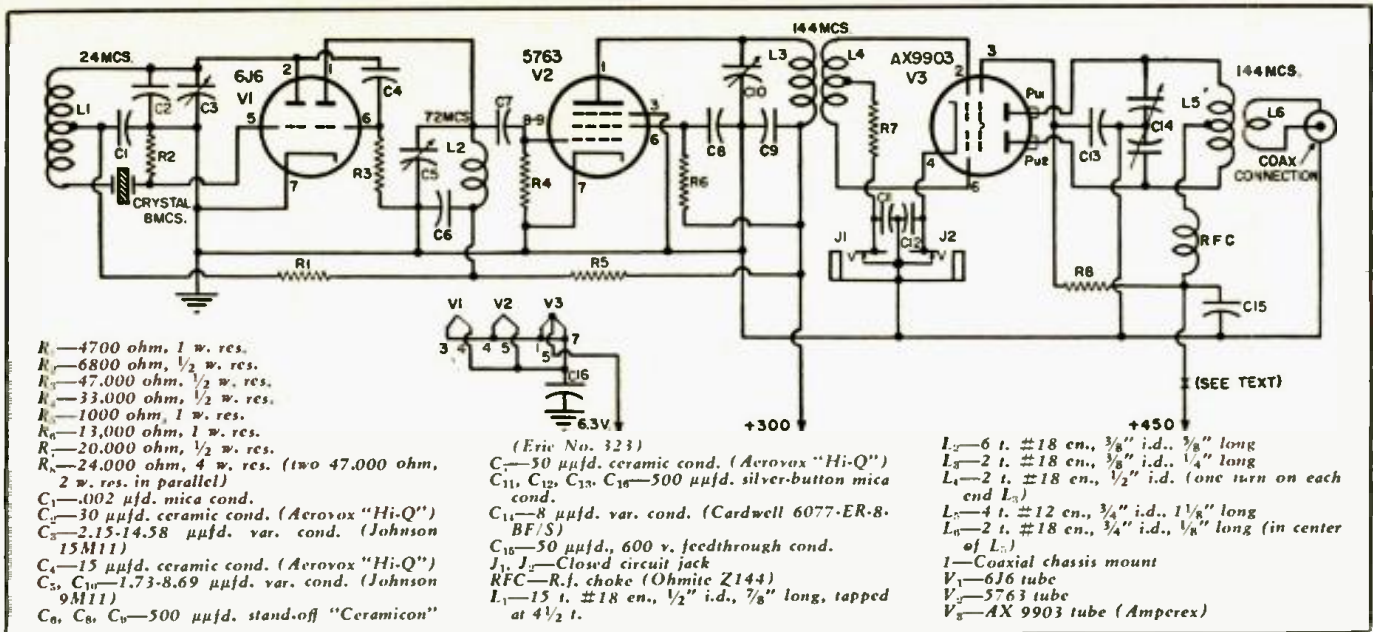


Fig. 2. Complete schematic diagram of the two-meter transmitter designed for either home station or emergency operation.

will it be necessary to retune any of these stages. The tuning shafts of the variable condensers may be seen in the photograph (Fig. 1), between the crystal and the 6J6, between the 6J6 and the 5763, and between the 5763 and the final amplifier shield. A butterfly-type tuning condenser is used in the final amplifier plate circuit in order to take advantage of the higher "Q" obtainable with this type of unit.

The underside of the chassis, Fig. 3, shows the accessible yet compact layout which assures short leads. The coils are self-supporting and are mounted directly into the circuit.

In constructing this transmitter, it will be found advantageous to carefully lay out the chassis as shown in Fig. 1. This is particularly true if the transmitter is to be built on a smaller chassis than that shown in the photograph.

Stand-off bypass condensers are specified at several places in the circuit. Referring to the photograph, it will be readily seen that these stand-offs make convenient tie-points for components in addition to performing their task in the circuit. Button-type condensers are used in the grid, cathode, screen grid, and filament bypass circuits of the final r.f. amplifier. These tiny components lend themselves admirably to application at these points in the circuit for they may be soldered directly to the tube pin connection and bypass directly to ground with no lead whatsoever necessary.

The bracket which mounts the final amplifier condenser and its coil was made from a piece of discarded aluminum chassis. However, it may easily be made from a strip of aluminum  $4\frac{3}{4}$  by 1 inch. A  $\frac{3}{4}$ -inch lip is bent on the bottom to permit mounting the bracket on the chassis. A coaxial fitting is mounted above the tuning condenser on this bracket, so that short leads may be used to connect the antenna

coupling coil ( $L_6$ ) to the antenna output.

No provision need be made for neutralization for, as stated previously, the type AX 9903 has small neutralizing condensers mounted within the tube envelope.

Care should be exercised when winding the coils; the exact dimensions as contained in the coil specifications should be used to insure that the proper frequency will be covered.

### Operation

Initial tuning operations should be carried out with a grid dip oscillator or an accurately-calibrated wavemeter embodying an r.f. indicating meter, to make certain that the correct harmonic is being used. Once tuned correctly, it is merely necessary to mark the settings of the various miniature tuning condensers to assure correct retuning with the aid of a small neon lamp, should it become necessary to peak up the exciter stages of the trans-

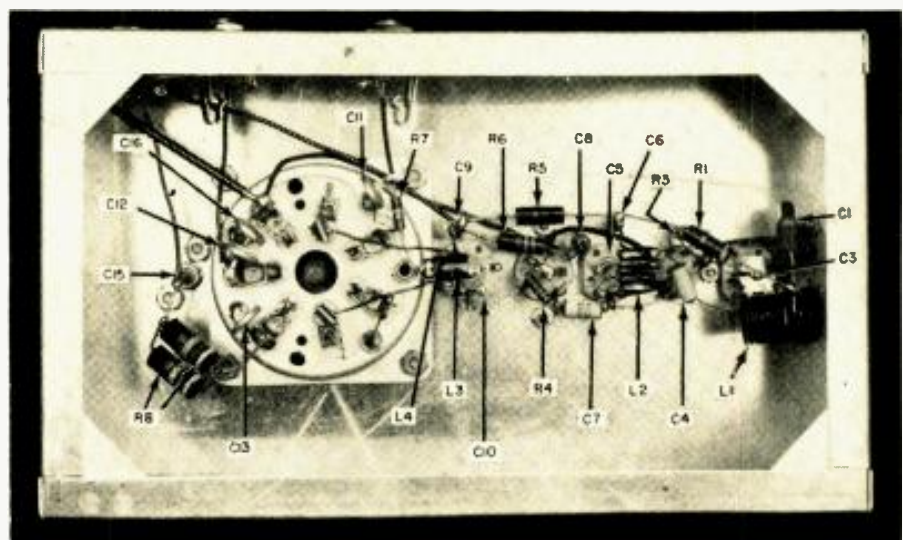
mitter due to making large frequency changes, etc.

Tuning of the preliminary stages of the transmitter should be accomplished with the plate voltage removed from the final amplifier tube to insure that the tube will not be damaged. A dummy load must always be used when tuning the type AX 9903 final r.f. amplifier to resonance to assure stable and safe operation of the tube as well as to avoid interfering with other stations on the air. The dummy load may consist of a 40 or 50 watt incandescent lamp connected to a coaxial plug and attached to the antenna output socket.

The appropriate crystal should be placed in the crystal socket and the plate voltage applied to the 6J6 and the 5763. With the grid dip oscillator or calibrated wavemeter tuned to 24 megacycles, place the pickup coil of the instrument close to  $L_1$ , which is the plate coil of the harmonic crystal oscillator section of the 6J6.  $C_3$  should be

(Continued on page 156)

Fig. 3. Under-chassis view of unit. The simplicity of the layout is evident here.



# TRENDS In Large Screen TV Circuits

By  
**E. P. MUELLER**

Instructor  
De Forest's Training, Inc.

*Details on some of the important circuit changes which have been made in late-model TV receivers.*

**P**ERHAPS the most important trend in the design of television receivers is the increased size of their direct-view screens. Starting with 7" and 10" cathode-ray tubes a few years ago, today 20" and 24" tubes are the most popular and 27" and 30" tubes have been introduced. The scarcity of copper has led to several interesting developments in the structure of the electron guns, eliminating the electromagnetic focus coil.

Basically, these new, larger tubes operate the same as the old, smaller types but, in practice, a number of circuit changes are necessary to provide larger picture tubes with the clarity and brilliance of the smaller sizes. In general, the new circuits and features are associated with the cathode-ray tube and can be divided into the following five classes: Second anode high voltage, sweep voltages, linearity, centering, and focus. Figs. 1, 2, and 3

are simplified diagrams of various horizontal deflection, high voltage systems found in some of the modern TV receivers.

## High Voltage

Picture tubes in the 20 to 24 inch group require an operating voltage of approximately 14 to 16 kv. for sharp pictures and a minimum of "blooming" (change of picture size as the brightness control is advanced). These higher voltages are secured mainly through the use of a flyback transformer having a higher step-up winding to the high voltage rectifier. Also, the pulse voltage supplied to the transformer by the horizontal amplifier tube or tubes is greater in order to deliver the required pulse to the rectifier.

## Sweep

Greater sweep currents are required through the yoke with the larger tubes. The higher anode voltage provides an electron beam which is more difficult to deflect and hence the magnetic flux produced in the yoke must be stronger.

Larger pulse voltages are generated in the horizontal oscillator and applied to the amplifier. The greater pulse at the amplifier plate is applied to the yoke through more efficient output transformers. Some of these transformers are designed so that the deflection yoke is in the primary circuit rather than connected to a secondary winding (Figs. 1 and 3). This system is known as "direct drive." Besides giving greater efficiency and more sweep, the linearity is more easily controlled, and "ringing" or halo effects are greatly reduced.

With a greater pulse delivered to the transformer, the boost voltage at the damper cathode is higher. In most sets, this voltage serves as a plate supply to both the horizontal and vertical amplifier and allows greater sweep currents. At the same time, the increased pulse requires more damping action and so several of the newer circuits incorporate two damper tubes connected in parallel. To attenuate Barkhausen oscillations, a suppressor choke coil or coils may be connected at the plate connections of the damper tube or tubes. See Fig. 1.

## Linearity

High sweep currents in the deflection coils make the over-all linearity more important. The reason is that small deviations, hardly noticeable in the smaller tubes, are objectionable to the viewer of large tube screens. Only minor modifications are apparent in

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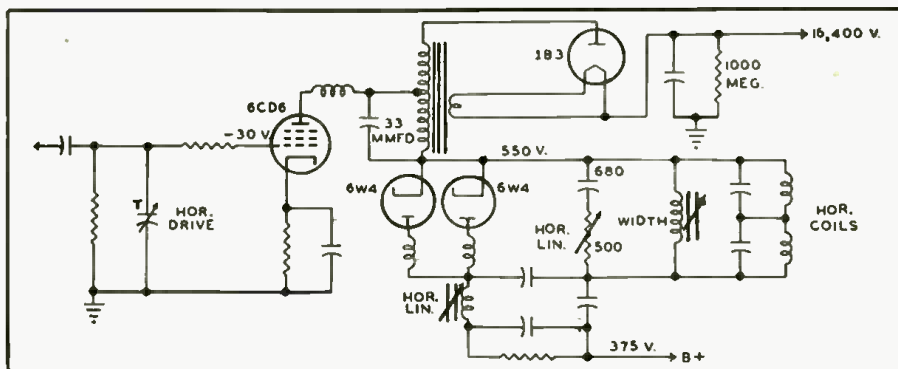
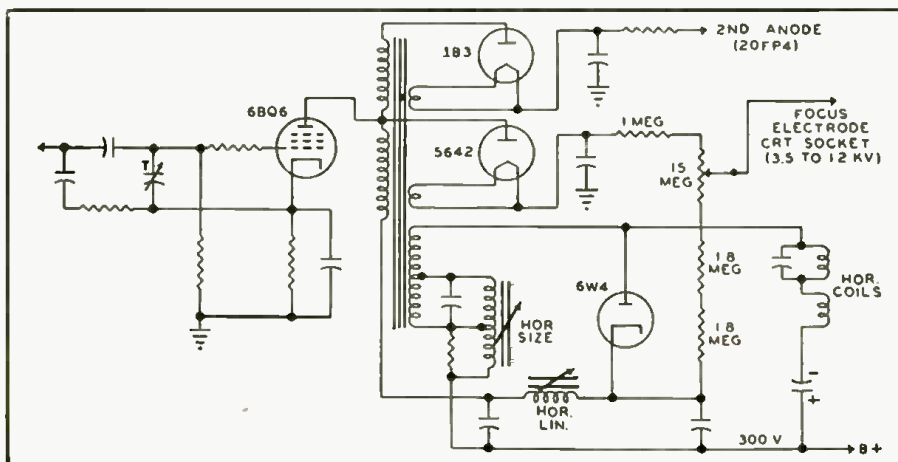


Fig. 1. Simplified high-voltage schematic of the RCA Model KCS68 21-inch chassis.

Fig. 2. The Zenith Model 21J20 high-voltage circuit. See text for circuit details.



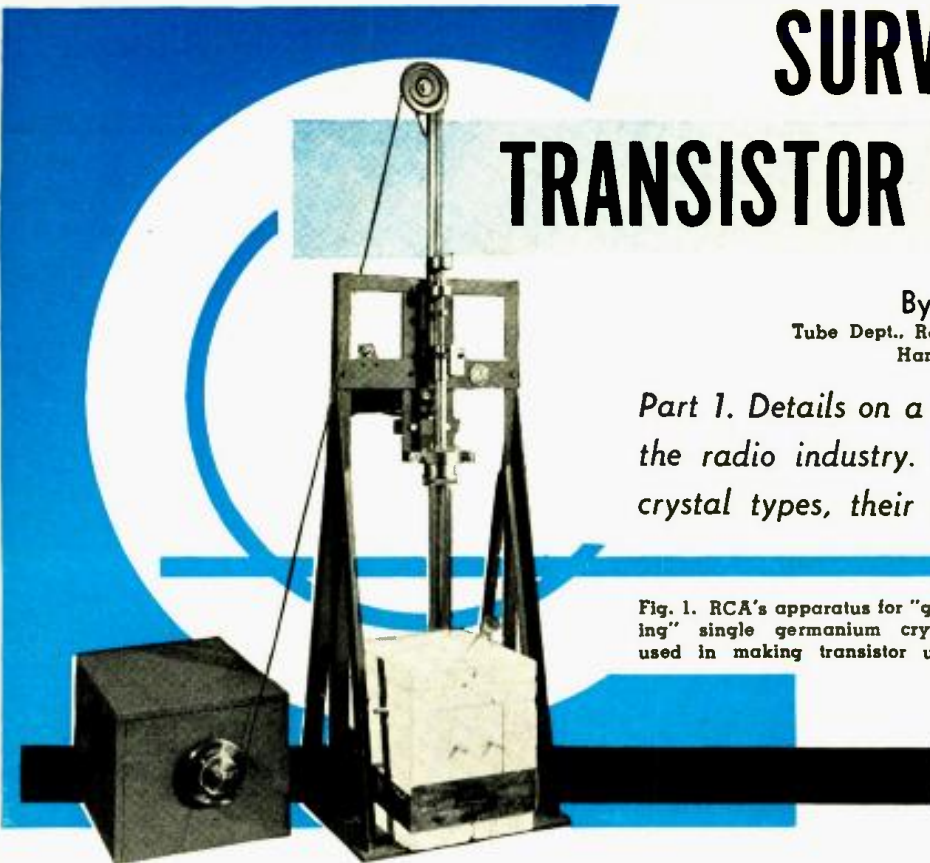
# SURVEY OF TRANSISTOR DEVELOPMENT

By **B. N. SLADE**

Tube Dept., Radio Corporation of America  
Harrison, New Jersey

*Part 1. Details on a component which may change the radio industry. This article covers the basic crystal types, their preparation, and fabrication.*

Fig. 1. RCA's apparatus for "growing" single germanium crystals used in making transistor units.



**A**S A RESULT of the progress made in the design and manufacture of the transistor, a germanium-crystal triode, this electronic device looms today as a desirable supplement to the electron tube in many applications. The development of the transistor may make possible new types of electronic equipment which will use not only transistors, but also electron tubes, and other electronic components in increasing quantities. In fact, the commercial application of transistors appears to be not too distant, although a considerable amount of time is probably still required before these units become commercially available on any sizable scale.

The intense interest in the transistor shown by electron-tube research and development engineers may be attributed to the fact that the transistor performs functions similar to those of triode-type electron tubes, although the mechanism of conduction is quite different. The transistor is of particular interest to equipment designers, who see many circuit possibilities in its characteristics. It is very small in size, and the power requirements for its operation are extremely low. When suitable circuits are developed, space and power requirements for complex electronic equipment may be simplified to a large degree by the use of transistors. Another promising feature is that the operating life of certain types of transistors shows indications of being very long, thus minimizing replacement problems. The physical ruggedness of the transistor offers other obvious advantages. In addition,

the transistor requires no "warm up" time but will operate instantaneously upon application of voltage to its electrodes.

The limitations of the present developmental transistors, however, must not be overlooked. Transistor characteristics vary with ambient temperature changes, the noise is high compared with that of electron tubes, and the power output is relatively low. Nevertheless, when the favorable characteristics of the transistor are weighed against its limitations, it appears that this device, even in its present developmental stage is destined for use in many applications. Further improvements in its characteristics undoubtedly will create new and expanding fields for its use. At the same time, the principles of semi-conduction in solids may be expected to play an increasing part in the development of many new electronic devices, of which the present transistor is but the first.

Two types of transistors, the point-contact type and the junction type, will be discussed in this series. The point-contact transistor will be discussed first, and at greater length, because the development of this device has reached a more advanced stage and more is known about its performance with respect to frequency of operation, life, and uniformity of characteristics. However, the junction transistor promises to be at least as important as the point-contact transistor in many applications.

The heart of the transistor is the germanium crystal. Germanium is a semi-conductor, a metallic-like sub-

stance having conductivity greater than that of an insulator but less than that of a conductor. Its resistance, in contrast with that of metals, decreases as its temperature is raised. Other types of semi-conductors, such as silicon, lead sulphide, and selenium, have been used in transistor work, but, to the present time, germanium has proved the most successful.

Germanium is known mostly for its use in point-contact diode rectifiers which have been available commercially for several years. These devices have achieved widespread use in many present-day applications.

In the United States germanium is obtained most frequently as a by-product of zinc mining. It has also been obtained in considerable quantities in Great Britain from flue dust residue. Manufacturers of germanium products receive this substance in the form of a germanium dioxide powder. The conversion of the dioxide into crystals for use in transistors involves some of the most important and critical processes in the manufacture of germanium devices. The electrical characteristics of the transistor are dependent to a considerable degree upon the characteristics of the germanium. The control of transistor characteristics to acceptable tolerances depends upon the uniformity of the germanium.

The resistivity of the germanium, an important factor in transistor operation, is dependent upon the presence in the germanium of minute quantities of certain impurities. If no impurities are present in the germanium crystal, no transistor action takes place. If too many impurity atoms are present, however, the germanium becomes too conductive and transistor action is adversely affected. The impurities which enhance the transistor operation should be present in the ratio of less than one atom to every 10,000,000 germanium atoms. Because of their exceedingly low concentration, it is quite difficult to detect the quantity of impurities present in the germanium crystal. Some of these

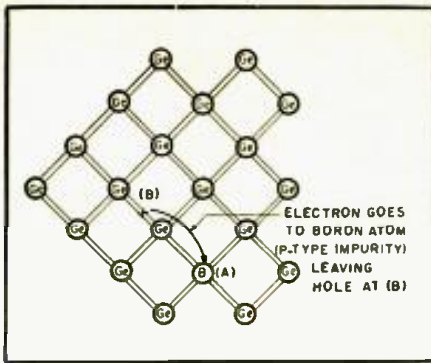


Fig. 2. The effect of "p"-type impurities on the conductivity of the germanium.

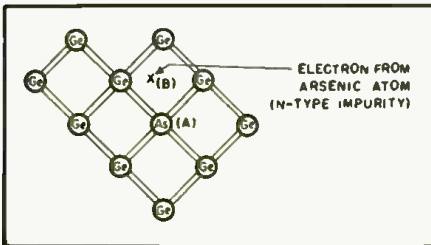


Fig. 3. The effect of "n"-type impurities on the conductivity of germanium crystals.

MATERIAL	RESISTIVITY (ohms per cm <sup>2</sup> )
Semi-conductor: Germanium	60
Insulator: Glass	$9 \times 10^{13}$
Mica	$9 \times 10^{15}$
Conductor: Copper	$1.7 \times 10^{-4}$
Platinum	$10 \times 10^{-4}$

Table 1. Resistivity of pure germanium, insulators, and conductors compared.

impurities are actually present in the germanium dioxide as it is delivered to the manufacturer. It is desirable, however, to remove as many impurities as possible by purification techniques so that controlled amounts of them may be added to obtain the desired values of resistivity.

The initial process in the conversion of germanium dioxide to the final crystals for transistor use is the reduction of the dioxide to a germanium metallic powder. This process is performed in a hydrogen atmosphere at a temperature of approximately 650 degrees Centigrade. The powder is then melted at a temperature of approximately 960

degrees Centigrade and is formed into ingots. After the ingots are formed, they may be subjected to one or more stages of purification. In one type of purification process, the germanium ingot is placed in a furnace in an inert-gas atmosphere, is melted, and then is progressively cooled from one end to the other. During this cooling process, impurities present in the germanium tend to concentrate at each end of the ingot. The inner portion of the ingot, therefore, has a higher purity than the ends where the impurities are concentrated. The low-purity ends of the ingot may be cut off and the process repeated if additional purification is needed.

The germanium ingot formed by these purification techniques is polycrystalline. Greater uniformity is obtained in a further process in which a single crystal is formed from this polycrystalline ingot. In this process the polycrystalline germanium is placed in a graphite pot and melted. A small single crystal of germanium is dipped into the surface of the melt, then withdrawn very slowly, pulling with it some molten germanium which solidifies on the crystal seed. The speed of withdrawal may be about 1/4 inch per minute. The temperature of the germanium is controlled very closely during the crystal "growing," with a permissible variation of no more than  $\pm 1$  degree Centigrade.

Fig. 1 is a photograph of a crystal-growing apparatus. Single crystals ranging in diameter from 0.050 inch to one inch and having lengths up to many inches have been formed using this method. Fig. 4 is a photograph of the part of a single crystal which subsequently is to be cut into pellets for assembly into transistors.

At the present time the price of the germanium dioxide powder is about 300 dollars per kilogram. The quantity of germanium used for each transistor, however, is very small (about 0.002 gram). The single crystal pictured in Fig. 4 can provide as many as 7000 pellets for as many transistors, and many single crystals of this size can be obtained from one kilogram of germanium dioxide. Although a portion of the germanium is scrapped during the processing from powder to final crystal form, much of this germanium may be reclaimed for further use.

The finished crystal specimen is

tested electrically to determine whether it has the proper impurity concentration, resistivity, and physical characteristics for use in transistors. The crystal is then sliced into wafers about 0.020 inch in thickness and diced into small pellets approximately 0.050 inch square. The pellets are chemically etched before the transistor is assembled to insure the absolute cleanliness of the crystal surface so necessary for good transistor operation.

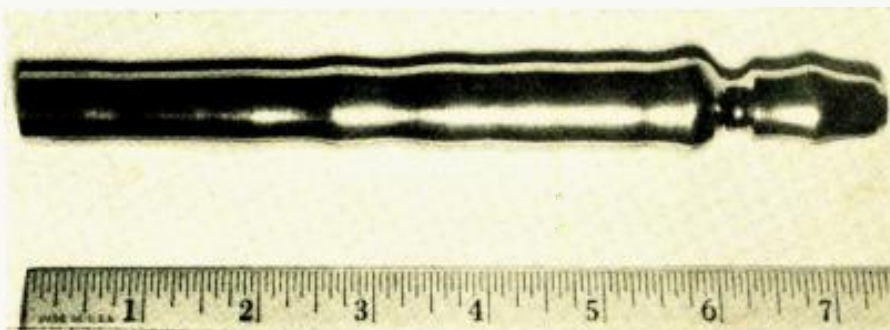
### Conductivity in Germanium

The germanium crystal is composed of millions of germanium atoms, each consisting of a positively charged nucleus and a number of negatively charged electrons. All but four of the electrons are tightly bound to the nucleus and cannot enter into chemical reactions with electrons of other atoms. The remaining four electrons, which are able to enter into chemical processes, are called valence electrons. In the pure germanium crystal, however, the atoms are arranged in such a fashion that the valence electrons are fixed in place and contribute only slightly to electrical conductivity. The resistivity, which is the reciprocal of conductivity, of the pure germanium, therefore, is higher than that of germanium containing impurities.

Fig. 5 is a photograph of a model of the atomic structure of a tiny portion of the germanium crystal. Each round ball represents the nucleus of an atom, and each bar connecting two nuclei represents two valence electrons, one from each of the two atoms joined by the bar. Each of the four valence electrons of an atom forms a bond with a valence electron from an adjacent atom. Electrons which are fixed in these electron-pair bonds cannot contribute to the conductivity of the crystal except under the influence of an applied force. This condition is similar to that existing in an insulator, where there are no conduction electrons and, consequently, there is little or no conductivity. If sufficient electrical or thermal energy is exerted on the germanium crystals, however, the forces holding the electrons in their bonds can be overcome, and a few electrons may be released from their bonds. Because of the release of electrons by thermal energy at room temperature, germanium does have some conductivity even in its pure state. The resistivity of pure germanium, a semi-conductor, is 60 ohms per centimeter cube at room temperature. The resistivity of insulators is much higher than that of semi-conductors; that of metal conductors is much lower. In a metal conductor, there are a large number of conduction electrons which are not bound in a fixed position but are free to flow throughout the metal, thus contributing to a very low resistivity. Table 1 gives a comparison of resistivities at room temperature of pure germanium, insulators, and conductors.

The normal conductivity of germanium must be increased to obtain

Fig. 4. A single germanium crystal grown in the crystal-growing apparatus (Fig. 1).





transistor operation. This additional conductivity is obtained by adding impurities to the crystal, as was mentioned previously. The impurities which may be present in germanium are of three types. Fig. 3 illustrates how one type of impurity can add conduction electrons to the crystal. If impurities having five valence electrons per atom are added, each impurity atom (A) takes the place of a germanium atom and four of the five valence electrons form bonds with four electrons of adjacent germanium atoms. The fifth electron (B) from the impurity atom is free to wander about the crystal and contributes to its conductivity in a manner similar to that of free electrons in a metallic conductor. As more impurity atoms of this type are added, the conductivity of the germanium increases and the resistivity decreases. Germanium having an excess of electrons due to the addition of such impurities is known as "n"-type germanium, that is, germanium having an excess of negative charges. "N"-type impurities are also known as "donor" impurities because they donate electrons to the crystal conductivity. Typical donor impurities are arsenic, antimony, and phosphorus.

Conduction in germanium may also be increased by adding a second type of impurity such as aluminum, boron, or indium. Fig. 2 illustrates how these impurities, known as "p"-type impurities, create a deficiency of electrons. If impurities having three valence electrons per atom are added, each impurity atom (A) takes the place of a germanium atom and its three valence electrons form electron-pair bonds with electrons of neighboring germanium atoms. In order to fit completely into the valence bond structure of the crystal, the impurity atom borrows an electron from an electron-pair bond from somewhere else in the crystal (B), thus leaving a net positive charge in the half-empty bond. This positive charge is known as a "hole"; these holes contribute to the conductivity of the crystal in much the same manner as electrons because they also can move from atom to atom. As more "p"-type impurities are added, more holes are formed and the conductivity of the crystal is increased. The main distinction between the two types of germanium is that the "n"-type has an excess of electrons while the "p"-type has an excess of holes. Both "n" and "p" types are used in transistors; in certain types of transistors both exist in different parts of the same crystal. The "n"-type germanium is used predominantly in the present point-contact transistors.

The third type of impurity includes those which do not have three or five valence electrons. These impurities, which are present in very small quantities, may not affect the conductivity of the germanium, but may disturb the crystal structure and adversely affect transistor properties.

The role which "p"-type and "n"-type impurities play in determining the re-

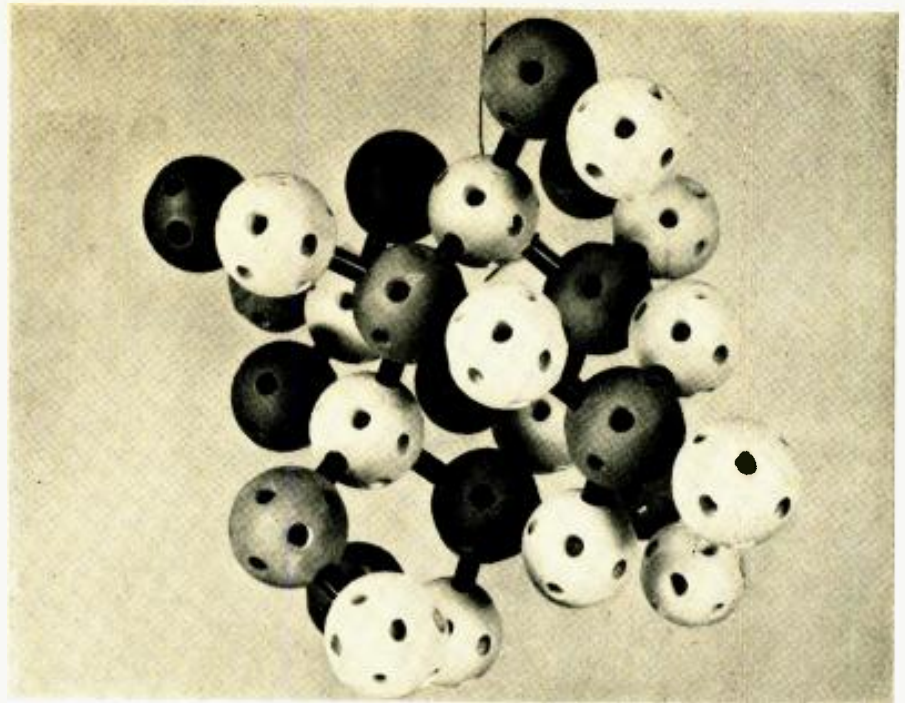


Fig. 5. A three-dimensional model of the atomic structure of germanium crystal.

sistivity of germanium may be appreciated by noting the change in resistivity which occurs with a change in the ratio of impurity atoms to germanium atoms. The density of germanium atoms in pure germanium is approximately  $4.5 \times 10^{23}$  atoms per cubic centimeter; there are approximately  $3.7 \times 10^{19}$  germanium atoms in the average pellet used for a transistor. If  $4.5 \times 10^{14}$  "n"-type impurity atoms are added to each cubic centimeter of pure germanium, or one impurity atom for every 100,000,000 germanium atoms, the resistivity of the germanium drops from 60 ohms per centimeter cube to approximately 3.8 ohm per centimeter cube, a value which is satisfactory for use in a point-contact transistor. If  $4.5 \times 10^{15}$  impurity atoms are added to the germanium, however, the resistivity drops to 0.38 ohms per centimeter cube, a value which is too low for transistor use. This example illustrates how critical are the quantities of impurities which must be added. The problem is further complicated by the fact that "p"-type impurities may be present in the germanium ingot when the "n"-type impurities are introduced, and the holes and electrons furnished by the two types of impurities may cancel each other out. If both types of impurities were present in equal amounts, the resistivity would be the same as if no impurities were present.

#### Fabrication Process

An appreciation of some of the unique characteristics of the transistor may be obtained from an examination of its construction. A photograph of an RCA developmental point-contact transistor is shown in Fig. 7. Fig. 6 is a diagram of its construction. This transistor consists essentially of two rectifying point electrodes which make contact with a small pellet of germa-

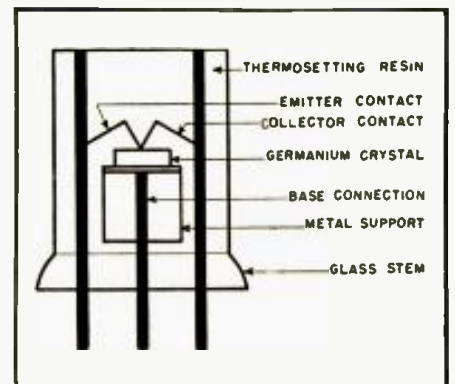
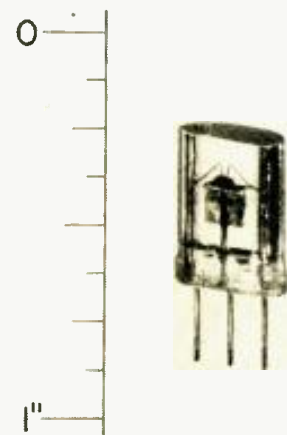


Fig. 6. Construction details of the RCA developmental point-contact transistor.

niun. These electrodes are known as the emitter and the collector. A third electrode, the base, is in low-resistance contact with the germanium crystal. The emitter, collector, and base form the three electrical connections to this germanium-crystal triode. The com-

(Continued on page 170)

Fig. 7. RCA's developmental transistor.





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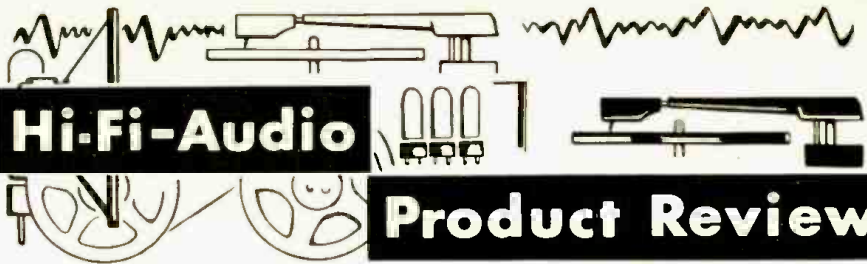
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Canada: Atlas Radio Corp., Ltd., Toronto, Ontario



**REAR-SEAT SPEAKER KIT**  
*Oxford Components, Inc., 556 W. Monroe St., Chicago 6, Ill. is now*



marketing a low-priced rear-seat speaker kit which has been trademarked the "Satellite."

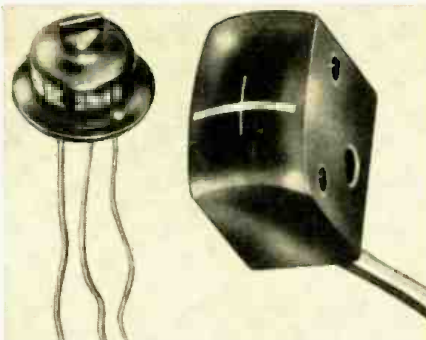
The kit comes individually boxed in a multi-colored container which is designed to be used as a display unit as well. The kit includes a 6" x 9" or 5" x 9" speaker of rugged construction, chrome-plated switch plate and grille, and three-position slide switch. The speaker kit comes complete with all mounting hardware.

The "Satellite" is a universal model which will fit all makes and models of cars.

**D.C. ERASE HEAD**

*Michigan Magnetics, Inc. of Vermontville, Mich. is now in production on a new d.c. erase head which provides 50 db erasure with 5.5 ma. of current through the coil.*

This head is currently being manufactured in a 20 mil track width configuration. A mating playback-record head will be available shortly. For



details on this unit, shown above beside a transistor for size comparison, write the manufacturer direct.

**"NEOPHONIC" UNIT**

*The Electronic Sales Corporation of America (TESCOA), 1820 W. Ganson St., Jackson, Mich. is now marketing a compact unit which is designed to pro-*

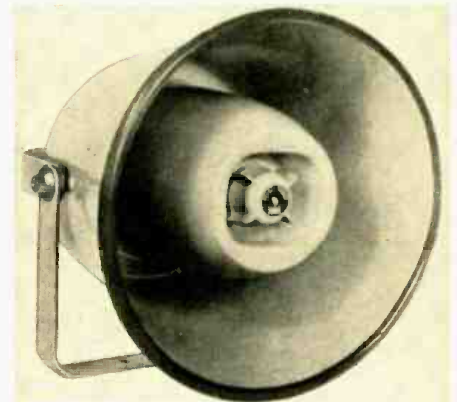
vide a stereo effect from a monaural program source when connected between two separate amplifiers and their associated speakers.

Trademarked the "Neophonic," the new device is designed to operate from a 12-watt (max.) amplifier. When connected into a hi-fi system as directed, the device allows the volume control on amplifier No. 1 to control the volume on both channels. Balancing is handled by the volume control on the second amplifier.

For additional details on this device, write the distributor direct.

**WEATHERPROOF SPEAKER**

*Atlas Sound Corporation, 1449 39th Street, Brooklyn 18, N. Y. is now*



marketing a rugged hi-fi weatherproof speaker for voice and music, as the "Coax-Projector" Model WT-6.

Two individual drivers and two individual horns, with built-in electronic crossover, are combined in a single weatherproof housing. The low frequencies are reproduced by a high efficiency woofer properly loaded with a folded exponential horn. The high frequencies are reproduced by a wide-angle tweeter completely protected against all climate and humidity conditions.

The unit will handle 15 watts and has a depth of 11" and a bell opening measuring 15". For full information, write the manufacturer.

**HARMAN-KARDON STEREO LINE**

*Harman-Kardon, 520 Main St., Westbury, N. Y. has announced a series of stereo units which will be available for the fall market.*

"The Duet" (Model T-224) is a stereo tuner with separate channels for the reception of AM and FM signals in stereo broadcasting. A jack in the rear makes the unit readily adaptable for multiplex reception. The companion stereo amplifier is being marketed as

# USING THE 6U8 IN A HIGH-QUALITY AUDIO SYSTEM



By  
**GEORGE ELLIS JONES, JR.**  
Instructor in Chemical Engr.  
The University of Pittsburgh

Fig. 1. Over-all view of the power amplifier and control unit which was designed around the new miniature, 9-pin 6U8 combination triode and pentode.

THE development of a miniature 9-pin envelope containing both a triode and a separate pentode has resulted in the design and construction of the power amplifier and control unit pictured in Fig. 1. This new tube, the type 6U8, is intended for local oscillator and mixer applications at radio frequencies. Here it provides a voltage gain pentode direct-coupled to a triode phase inverter. One tube thus includes the elements for driving an output stage comprising two 6L6 beam pentodes. The main amplifier schematic diagram is shown in Fig. 4. A potentiometer,  $R_{22}$ , in the cathode and grid circuits of the output stage serves to adjust the balance of the 6L6 plate currents. The output transformer selected by the author has well-balanced primary windings. When the balancing potentiometer is adjusted to obtain a zero reading on a d.c. voltmeter connected from one 6L6 plate to the other 6L6 plate, the plate currents are equal. There is no reason to believe that this adjustment is essential, and unless an output transformer with equal resistances in both primary halves is used, this handy scheme for balancing an output stage will not work. To eliminate the balancing circuit, connect the 6L6 grid coupling resistors ( $R_{21}$  and  $R_{22}$ ) to ground and connect the two cathode resistors ( $R_{23}$  and  $R_{24}$ ) together at both ends, grounding the junction opposite the cathodes.

The output transformer,  $T_1$ , used by the author is a "universal" type, a UTC LS-57. The primary should be connected for a 5000 ohm plate-to-plate impedance, while the secondary should be connected to match the voice coil impedance of the speaker used. To select the proper terminal, should you

*Construction details on a unique power amplifier and control unit whose circuit features the use of a recently-introduced 9-pin miniature tube.*

use a universal output transformer, you will have to refer to the manufacturer's instruction sheet.

The feedback circuit from the secondary of the output transformer to the input stage through resistor  $R_{11}$  is a very critical part of the design. There may be considerable variation depending, of course, on the secondary tap that is used. Actually you can use any of the secondary taps of the output transformer providing that the value of  $R_{11}$  is chosen accordingly. Should you use an output transformer having a single-winding secondary which matches the voice coil impedance, the feedback circuit will be

taken off of the same point as the speaker.

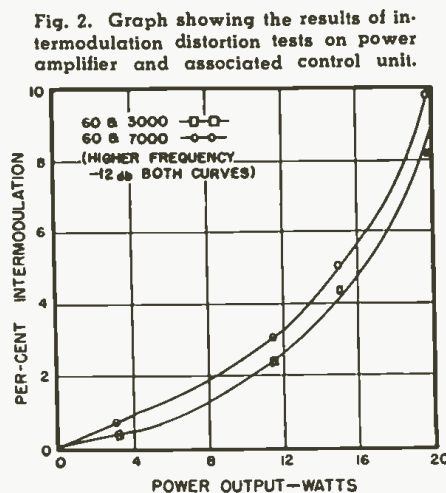
To determine the proper value for resistor  $R_{11}$  use the following formula:

$$R_{11} = 3600 \sqrt{\text{voice-coil impedance}}$$

If, like any feedback circuit, oscillation occurs reverse the plate connections of the output transformer.

The power transformer,  $T_2$ , as specified in the parts list of Fig. 4 is a little underrated for "B+" and overrated for the filament. This is not serious in this case. The transformer specified will work without any difficulty. The ideal power transformer would be one having the following ratings: 375-0-375 v. @ 165 ma; 5 v. @ 3 amps.; 6.3 v. @ 3 amps. In the author's unit the "B+" voltage of 280-290 at the input of the filter choke will give satisfactory operation.

The power amplifier is flat at 10 watts of output power from 50 to 15,000 cycles-per-second within plus or minus 1 decibel. At an output of one watt it is similarly flat from 10 to 100,000 cycles-per-second. A graph of an intermodulation distortion test is shown in Fig. 2. A low frequency signal of 60 cycles-per-second and either a 3000 or a 7000 cycle-per-second high frequency signal were combined at a relative level of four to one. Since harmonic distortion at equivalent power levels can be expected to run about one fourth of the intermodulation distortion, we may expect about 1.5% harmonic distortion at 15 watts



and about 3% harmonic distortion at 20 watts.

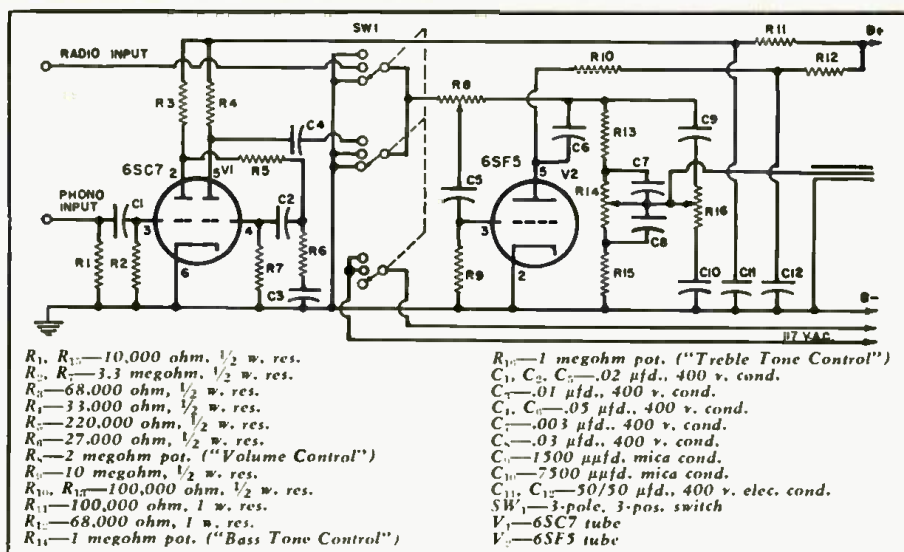
It is realized that much more power output could have been obtained had the output stage been operated class AB. However, by maintaining class A<sub>1</sub> operation the "notch effect" is avoided. This form of distortion is inherent in any transformer-coupled, push-pull stage operating class AB. High frequency transients which develop when either of the output tubes cuts off or again starts conducting produce spurious responses across the leakage reactance of the output transformer primary sections. This form of distortion can be reduced by special transformer design; however, an economical compromise is to accept the reduced power output and efficiency of class A<sub>1</sub> operation.

The control unit to be used with this amplifier combines a maximum of flexibility consistent with a minimum of tubes. As shown in the schematic diagram (Fig. 3), a *General Electric* type preamplifier for magnetic phonograph pickups has been used. Either this preamplifier's output or a radio tuner output, as chosen with the combination power switch and input selector, is fed to a voltage gain triode (V<sub>1</sub>). Volume control action is obtained from an adjustable negative feedback loop around this stage. This inverse voltage feedback serves two very useful purposes. First, any hum and noise generated in the stage is greatly reduced, especially since low level output is obtained by increasing the feedback. Second, the tone control sections which follow this stage look back at the low source impedance produced by the feedback action. The tone control sections provide independent boost or cut for both treble and bass frequencies. Since the output impedance of the tone control network at high frequencies is about 10,000 ohms, it is not essential to place a cathode follower between the control unit and the main amplifier. A four to six foot shielded microphone cable is quite feasible. The main amplifier can then be placed conveniently for heat dissipation while the control unit remains accessible to the user.

If the general layout indicated in the picture is followed a compact but easily constructed unit will result. Heater wiring is omitted on the schematic diagrams to emphasize essential circuit features. All the heaters are, as expected, connected in parallel, with the center tap going to the 6L6 cathodes. This arrangement, together with the parts layout and the fact that the cathodes of all low level stages are connected directly to a ground bus, provide a very low hum level for the entire unit.

While there are obviously better high fidelity setups, it is doubtful if greater flexibility could be achieved with fewer of those non-linear, distortion producing, but ever-present vacuum tubes.

Of course, the final quality test for



- R<sub>1</sub>, R<sub>11</sub>—10,000 ohm, 1/2 w. res.
- R<sub>2</sub>, R<sub>7</sub>—3.3 megohm, 1/2 w. res.
- R<sub>3</sub>—68,000 ohm, 1/2 w. res.
- R<sub>4</sub>—33,000 ohm, 1/2 w. res.
- R<sub>5</sub>—220,000 ohm, 1/2 w. res.
- R<sub>6</sub>—27,000 ohm, 1/2 w. res.
- R<sub>8</sub>—2 megohm pot. ("Volume Control")
- R<sub>9</sub>—10 megohm, 1/2 w. res.
- R<sub>10</sub>, R<sub>15</sub>—100,000 ohm, 1/2 w. res.
- R<sub>13</sub>—100,000 ohm, 1 w. res.
- R<sub>14</sub>—68,000 ohm, 1 w. res.
- R<sub>16</sub>—1 megohm pot. ("Bass Tone Control")
- R<sub>17</sub>—1 megohm pot. ("Treble Tone Control")
- C<sub>1</sub>, C<sub>2</sub>, C<sub>9</sub>—0.02 μfd., 400 v. cond.
- C<sub>3</sub>—0.01 μfd., 400 v. cond.
- C<sub>4</sub>, C<sub>10</sub>—0.05 μfd., 400 v. cond.
- C<sub>5</sub>—0.003 μfd., 400 v. cond.
- C<sub>6</sub>—0.03 μfd., 400 v. cond.
- C<sub>7</sub>—1500 μfd. mica cond.
- C<sub>8</sub>—7500 μfd. mica cond.
- C<sub>11</sub>, C<sub>12</sub>—50/50 μfd., 400 v. elec. cond.
- SW<sub>1</sub>—3-pole, 3-pos. switch
- V<sub>1</sub>—6SC7 tube
- V<sub>2</sub>—6SF5 tube

Fig. 3. Schematic of the control unit. A G-E type preamplifier is incorporated in the circuit for magnetic phono pickups. A tuner input is also provided in unit.

any high-fidelity amplifier system consists in listening to the sound you get out of the system. With a reasonably good loudspeaker (at least eight inches) having a power handling capacity in excess of 10 watts, and a frequency range of from 50 to about 12,000 cycles, this amplifier will faithfully reproduce all musical instruments from the bass viol to the triangle.

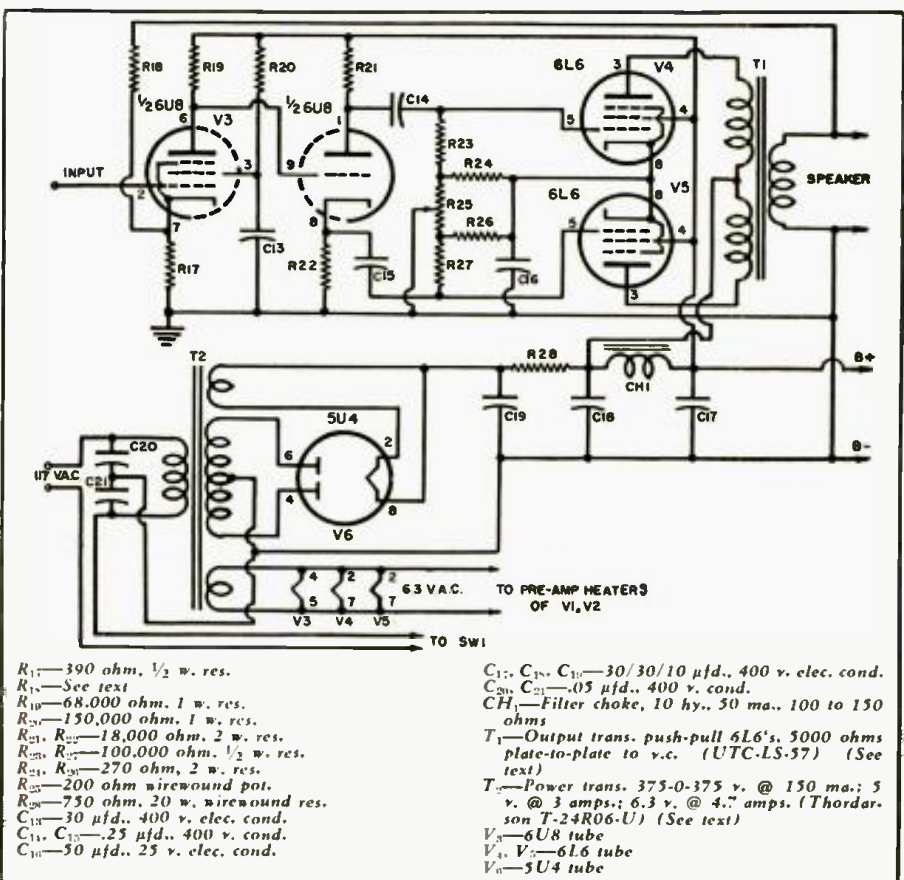
The use of a triode in the input stage of the control unit helps to keep the noise level down. Although the

first section of the 6U8 is a pentode, the small amount of noise it introduces is outweighed by the advantage of having direct coupling between it and the triode section, thereby eliminating a coupling condenser and thus decreasing the phase distortion of the control unit.

This amplifier is recommended to those who are interested in a unit with relatively low power consumption, ease of construction, and fidelity of reproduction.

—30—

Fig. 4. Complete schematic of the main amplifier unit used in the audio system.



- R<sub>17</sub>—390 ohm, 1/2 w. res.
- R<sub>18</sub>—See text
- R<sub>19</sub>—68,000 ohm, 1 w. res.
- R<sub>20</sub>—150,000 ohm, 1 w. res.
- R<sub>21</sub>, R<sub>22</sub>—18,000 ohm, 2 w. res.
- R<sub>23</sub>, R<sub>24</sub>—100,000 ohm, 1/2 w. res.
- R<sub>25</sub>, R<sub>26</sub>—270 ohm, 2 w. res.
- R<sub>27</sub>—200 ohm wirewound pot.
- R<sub>28</sub>—750 ohm, 20 w. wirewound res.
- C<sub>13</sub>—30 μfd., 400 v. elec. cond.
- C<sub>14</sub>, C<sub>15</sub>—0.25 μfd., 400 v. cond.
- C<sub>16</sub>—50 μfd., 25 v. elec. cond.
- C<sub>17</sub>, C<sub>18</sub>, C<sub>19</sub>—30/30/10 μfd., 400 v. elec. cond.
- C<sub>20</sub>, C<sub>21</sub>—0.05 μfd., 400 v. cond.
- CH<sub>1</sub>—Filter choke, 10 hy., 50 ma., 100 to 150 ohms
- T<sub>1</sub>—Output trans. push-pull 6L6's, 5000 ohms plate-to-plate to v.c. (UTC-LS-57) (See text)
- T<sub>2</sub>—Power trans. 375-0-375 v. @ 150 ma.; 5 v. @ 3 amps.; 6.3 v. @ 4.75 amps. (Thordarson T-24R06-U) (See text)
- V<sub>3</sub>—6U8 tube
- V<sub>4</sub>, V<sub>5</sub>—6L6 tube
- V<sub>6</sub>—5U4 tube

# UNIVERSAL DESIGN CURVES

## FOR TONE-CONTROL CIRCUITS

By

M. B. KNIGHT

RCA Victor Division, Harrison, N. J.

**T**HIS is the third article in this series on practical RC tone-control circuits. These articles describe simple circuit arrangements suitable for particular types of tone control and include frequency-response curves obtained with each circuit. The curves permit rapid evaluation of the ability of a circuit to fulfill specific design requirements. They also indicate the preferred potentiometer taper and facilitate the choice of component values.

The preceding articles and the author's article in the November 1951 issue presented universal design curves for several bass and treble tone-control circuits, some for boosting and some for attenuating. This article includes two variations of a bass tone-control circuit which can be adjusted to boost or to attenuate with a single control.

### Bass Boost and Attenuation

A circuit which is adjustable for either boosting or attenuating the bass is shown in Fig. 2 and its "constant-voltage generator" equivalent circuit in Fig. 5. This circuit is similar to the bass-boosting circuit discussed in the August article (shown in Figs. 1 and 2) and is identical analytically to the bass-attenuating circuit presented in the same article (shown in Figs. 7 and 8). When using the circuit of Fig. 2, it is usually advisable to use a medium- $\mu$  triode. The use of other types of tubes may result in relatively low values of load impedance and cause distortion.

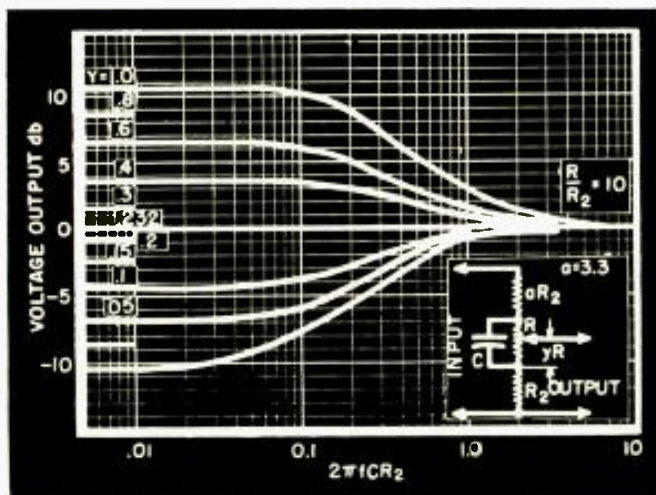


Fig. 2. Circuit for variable bass boost and attenuation.

Fig. 1. Design curve for circuit of Figs. 2 and 5 with  $R/R_2 = 10$  and  $\alpha = 3.3$ .

### Part 3. Two variations of a bass tone-control circuit which gives either boost or attenuation.

The universal design curves for this circuit are given in Figs. 1 and 3. These curves show one peculiar characteristic in that the boost and attenuation do not occur in quite the same frequency range. This characteristic may be desirable for designs in which the provision for bass attenuation is made solely to permit reduction of hum or of phono-motor rumble. The usual tone-control requirement, however, is for a fairly symmetrical boost and attenuation characteristic. The circuit of Figs. 2 and 5 can be modified to satisfy this requirement by inserting an additional condenser and rearranging the components, as shown in the equivalent circuit of Fig. 6. The relationship indicated between the values of the two condensers is essential in order to make it possible to adjust the control for flat frequency response. Three design curves for this modified circuit are given in Figs. 4, 7, and 8.

These circuits are considerably more complicated than those given in the previous articles of this series, and a difficulty arises from the presence of too many variables when we attempt to derive universal design curves. Fortunately, practical considerations make many assumptions possible in the derivations. For example, the relationship between the condensers in the circuit of Fig. 6 was selected to permit adjustment for flat response, as mentioned previously. Furthermore, the universal design curves were drawn for particular rela-

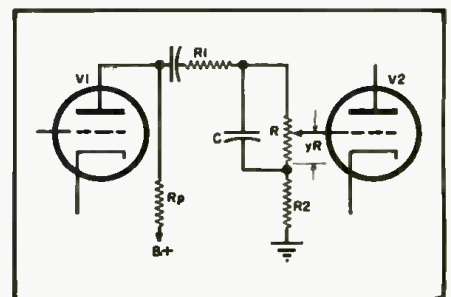
tionships of resistor values which yield approximately the same maximum boost and attenuation. For either circuit, the maximum boost and attenuation are exactly equal when the ratio between the potentiometer,  $R$ , and the resistor  $R_2$ , equals  $a^2 - 1$ . When this relationship is satisfied, the maximum boost or attenuation in db is equal to  $20 \log a$ .

The more analytically-minded reader may be interested to know that the circuits can be designed for any value of boost and any value of attenuation. The first step in such a design is to determine the proper ratio for  $R/R_2$ . The sum of the desired maximum boost in db and maximum attenuation in db (both considered as positive values) equals  $20 \log (1 + R/R_2)$ . When the ratio of  $R/R_2$  has been determined from this formula, the value of  $a$  may be found, using the relation that the attenuation in db (expressed as a positive number) is equal to:

$$20 \log \left[ 1 + \frac{R}{R_2} \left( \frac{1}{a+1} \right) \right]$$

We might mention at this point that flat response is obtained when the pot. is adjusted so that  $y$ , which denotes the setting of the tone control and is defined to mean the fraction of the total resistance of  $R$  included between the wiper of the pot. and the junction of  $C$  with  $R_2$ , is equal to  $1/(a+1)$ . This latter formula is correct irrespective of the relationships selected for the resistors.

It is not usually advisable to design the circuit to give more maximum boost than maximum attenuation, because such a design results in a needless sacrifice in gain. The boost ob-



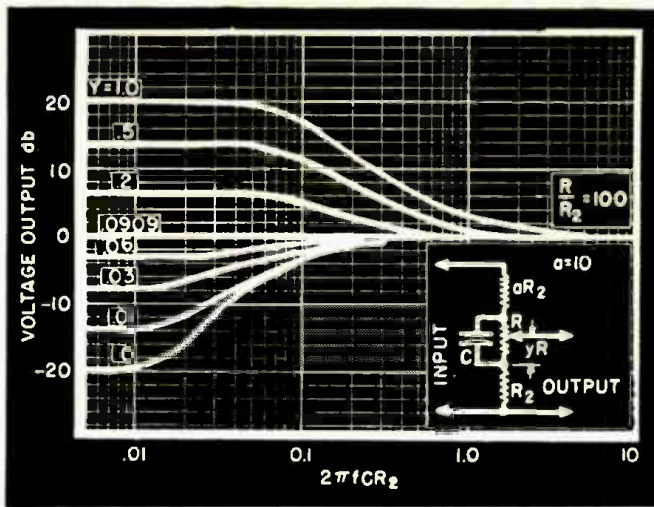


Fig. 3. Design curves for Figs. 2 and 5 with  $R/R_2 = 100$ ,  $\alpha = 10$ .

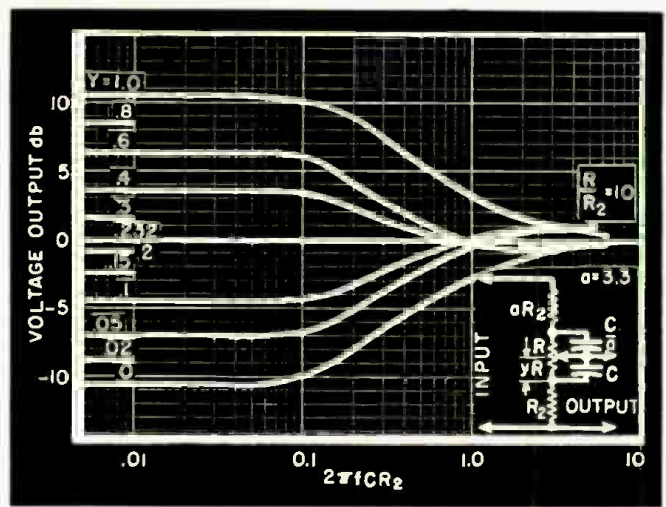


Fig. 4. Design curves for Fig. 6 with  $R/R_2 = 10$  and  $\alpha = 3.3$ .

tainable from these circuits never quite equals the loss in mid-frequency gain, but it is desirable to design the circuit so that the loss of gain is not excessive. In order to obtain maximum boost from the circuits, the ratio of  $R/R_2$  must be relatively large. Under these conditions the maximum attenuation is also large. The preferred method of limiting the attenuation is to add a fixed resistor in series with the potentiometer as shown in Fig. 9. The loss of mid-frequency gain in these circuits is equal to  $20 \log(1 + \alpha)$  (in db, as a positive value). The maximum boost can be determined from the formulas given previously.

### Sample Design

As an example of the use of the curves we may select a design problem that actually confronted us recently. A friend had a high-quality phonograph amplifier which had no tone controls. He wanted to add a bass adjustment and a treble-attenuating control. The amplifier used a 6J5 triode as the first stage and had just adequate gain for the pickup being used. We decided to replace the 6J5 with a 6SN7GT twin-triode, a change requiring no chassis alteration for another socket. The extra triode section provides both isola-

tion between the tone controls and the extra gain required to compensate for the loss in the bass tone control. The treble tone control was patterned after the circuit given in Part 1 of this series (Fig. 8A) and was placed in the plate circuit of the first triode section of the 6SN7GT.

It was decided that the bass tone control should supply about 20 db of boost, but that less attenuation would be required. The curves of Fig. 7 and the circuit of Fig. 9 were selected to meet the requirements of the design. Since potentiometer  $R$  should be large, one megohm was selected for its value. The value of resistor  $R_1$  was selected to limit the attenuation to about 14 db. In Fig. 7, the curve for  $y = 0.01$  levels off at 14 db of attenuation, so the value of  $R_2$  is equal to  $0.01 \times$  one megohm or 10,000 ohms. ( $R$  should properly be considered 1,010,000 ohms, but the correction is negligible in this case.) In Fig. 7, the ratio of  $R/R_2$  is 100; therefore,  $R_2$  is 10,000 ohms. If a value of 10 is used for  $\alpha$ , as shown in Fig. 7, the value of the resistor  $aR_2$  is 100,000 ohms. However, a value of 100,000 ohms was used for resistor  $R_1$  in Fig. 2, and calculations for the treble tone control (see Part 2, August issue) show that the source impedance of the

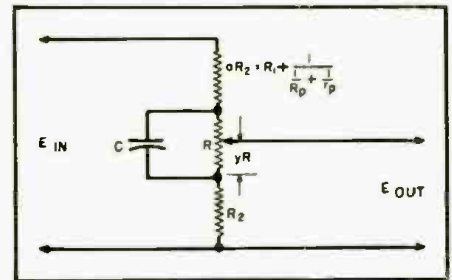


Fig. 5. Equivalent circuit for Fig. 2.

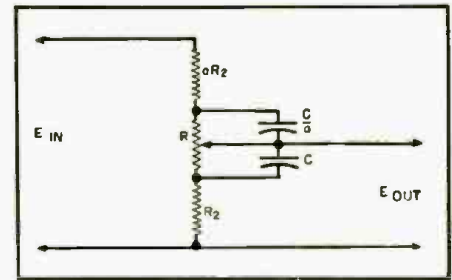


Fig. 6. Equivalent circuit for a variable tone control which provides both symmetrical bass attenuation and bass boost.

6SN7GT and its plate load resistor  $1/(1/r_p + 1/R_p)$  was about 10,000 ohms. Therefore,  $aR_2$  (which is equal to

(Continued on page 106)

Fig. 7. Design curves for Fig. 6 with  $R/R_2 = 100$  and  $\alpha = 10$ .

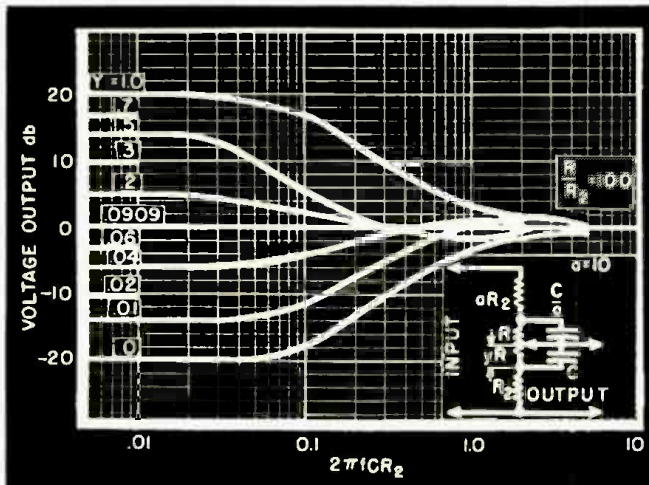
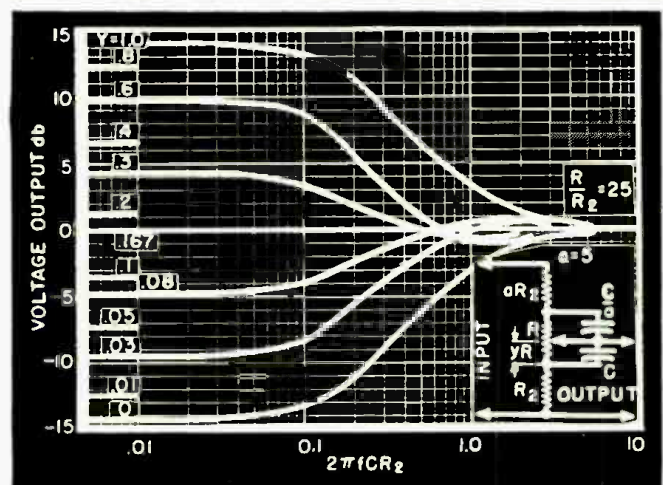


Fig. 8. Design curves for Fig. 6 with  $R/R_2 = 25$ ,  $\alpha = 5$ .



# T V CONVERSIONS FOR LARGE TUBES

By  
**WALTER H. BUCHSBAUM**  
Television Consultant,  
RADIO & TELEVISION NEWS

*When used with this month's "Data-Print", this article provides all of the necessary data to permit the technician to convert small screen sets to large-tube operation.*

**T**O REPLACE a 10-inch tube by a 12-inch picture tube requires no major electrical changes. In most cases a new, wide-sweep deflection yoke will be the only change required and often even that is not necessary. The bulk of conversion jobs deal with the substitution of 14-, 16-, 17-, 19- and 20-inch round and rectangular picture tubes for 10- and 12-inch ones. When such a conversion is contemplated, the job should be divided into two parts—the mechanical and the electrical conversion. The mechanical part involves changing the picture cut-out or mask, or installing the receiver in a new cabinet, mounting the tube on new or raised brackets, and extending all leads to suit the new arrangement.

The 10- and 12-inch picture tubes have deflection angles ranging from 52 to 57 degrees, while all rectangular and most large round picture tubes have deflection angles of from 60 to 70 de-

grees. In addition to a wider deflection angle, the larger tubes also require a higher second anode voltage. To obtain more sweep and a higher voltage, major changes must be made in the horizontal flyback section of the receiver. To obtain sufficient height, changes in the vertical sweep section may be required, and to obtain good focus a change in the focus device is also necessary.

## Picture Tube

Selecting a particular picture tube for a conversion job is often quite a problem. Size, availability, mounting, and circuit requirements all enter into it. The following things should be considered.

1. Cabinet fit. Is the tube to be mounted in the same cabinet? Can a larger cabinet be obtained? Maximum screen height and width. Maximum length. Check these physical dimen-

sions against the data given in "Data-Print" 4 appearing in the August issue of RADIO & TELEVISION NEWS.

2. Metal or glass. The metal envelope requires a special plastic mounting ring and apron.

3. Required high voltage. This will determine the electrical changes necessary and thus, to a major extent, the cost of the conversion.

4. Deflection angle and neck length. This determines the type of deflection yoke required.

5. Focusing. Magnetically focused tubes require either the 247-ohm type of coil or the 470-ohm type. Consult the "Data-Print" in last month's issue. Low voltage electrostatic tubes or self-focusing types are more expensive, but may save the price of a new focusing coil.

6. Ion trap. Avoid tubes that don't use ion traps since they are often subject to ion spots. Either a single or double magnet type trap is available.

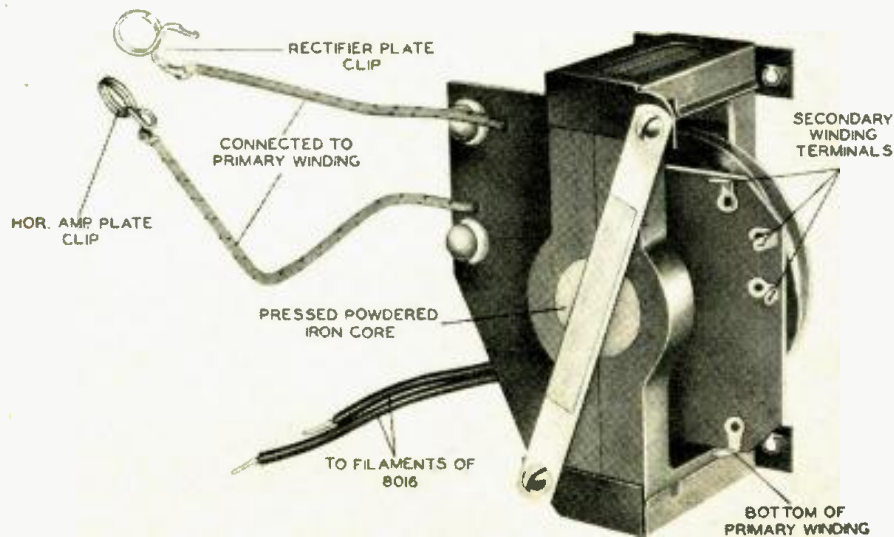
7. Screen. Screens are available in filterglass, etched, and cylindrical types to reduce glare. In each case the choice depends on price, availability, and individual preference. In general, the filterglass and etched types suffer from a slight loss in brightness over the clear types. Cylindrical face tubes are more subject to "pincushioning" or bulging than the other types.

8. Cost. The cost of the picture tube as well as the new conversion components increases by almost the same percentage as does the size. If a new cabinet is required the cost is still further increased.

9. Complexity of conversion. This depends on the type of receiver. If it already uses a flyback circuit and performs well, less work will be required. If more than ample vertical sweep is present before conversion, little difficulty can be expected in that section. In some cases, the picture tube voltages will be the same as those required

*(Continued on page 55)*

**Fig. 1. RCA's No. 211T5 horizontal flyback transformer. A transformer of this type is used in the conversion diagram (Circuit A) included on this month's "Data-Print."**





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Holds 137 tubes — plus all regular tools.

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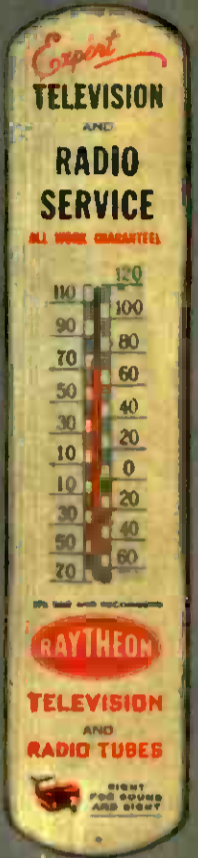
To help you increase your profits...  
To help you work more efficiently...



has made these useful  
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**AVAILABLE TO YOU!**



**SHOP JACKETS and COATS**  
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**DISPLAYS**  
Colorful displays that sell your service.



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It's chock full of these and many other useful shop aids and sales promotion items that are musts for every service dealer — imprinted stationery, job tags and record cards, ad mats, post cards, shipping labels, decals, etc. Some are free, others available at less than cost. Ask your Raytheon Tube Distributor for them or write for booklet to Department A



**RAYTHEON MANUFACTURING COMPANY**

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

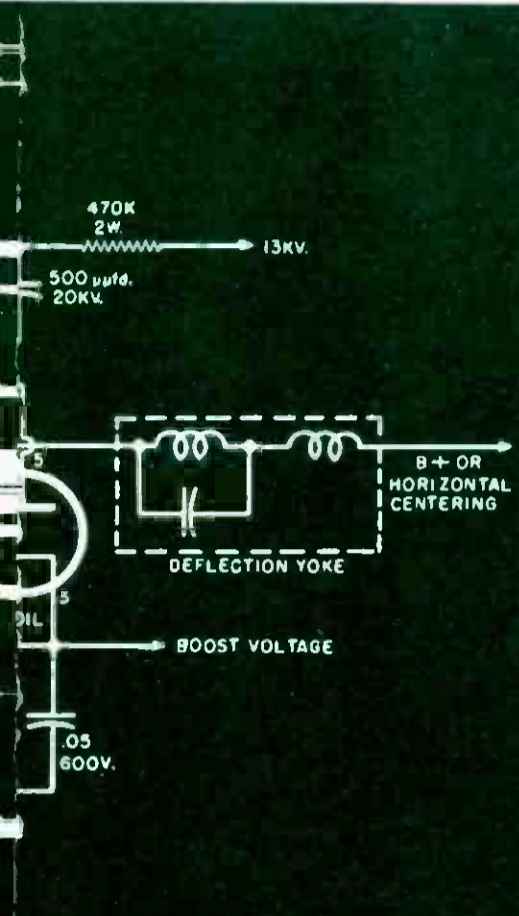
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# CONVERSION GUIDE

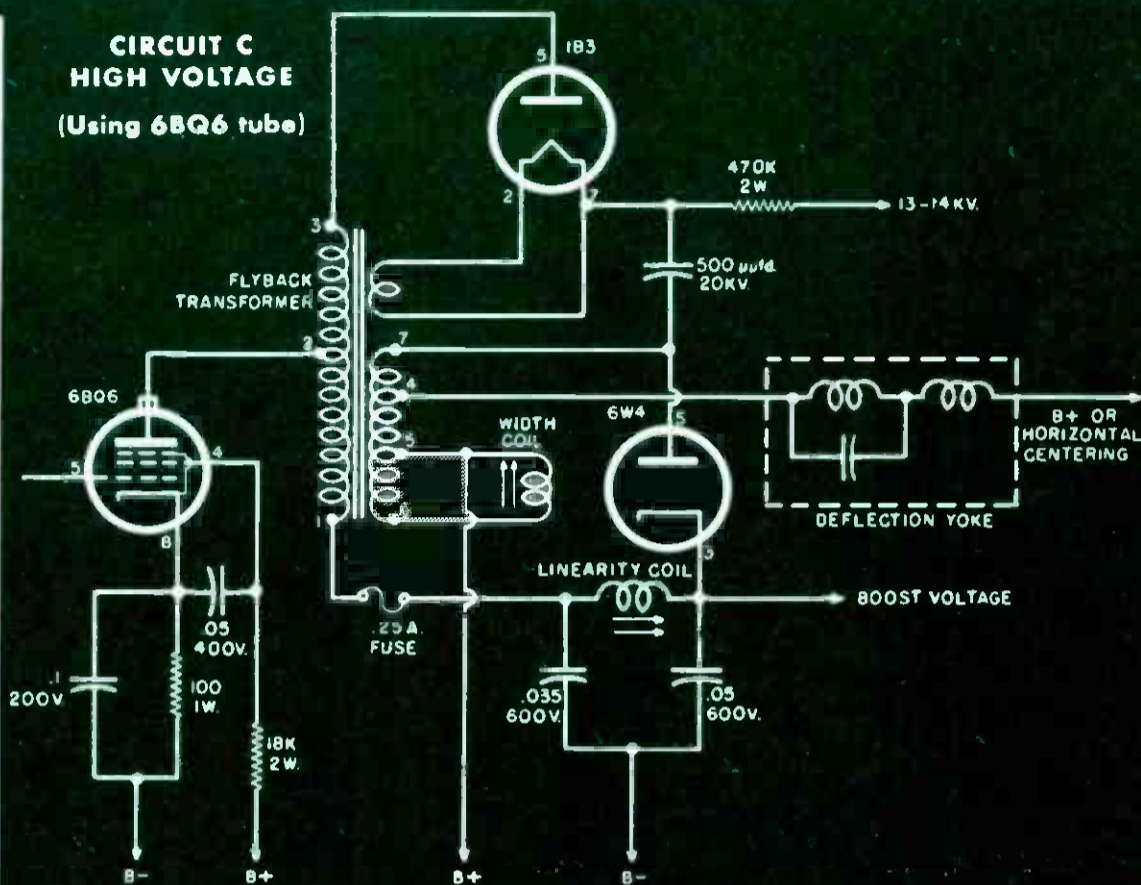


### DEFLECTION YOKE (60-70 degrees)

- Chicago TY-2 (8 mhy.)\*
- Chicago TY-3 (13 mhy.)\*
- Du Mont Y2A1 (10 mhy.)
- G-E RLD-024 (8 mhy.)
- G-E "Truefocus" (18 mhy.) short\*
- Merit MDF-70 (11 mhy.)\*
- RCA 211D2 \*
- Ram Electronics Y70F14 (14 mhy.)
- Stancor DY-7 (8 mhy.) short
- Stancor DY-8 (8 mhy.)\*
- Stancor DY-9 (13 mhy.)\*
- Triad Y12 (8 mhy.)\*
- Triad Y17 (13 mhy.)\*
- Triad Y10 (23 mhy.)\*

\*a winding for a.f.c. feedback pulse

### CIRCUIT C HIGH VOLTAGE (Using 6BQ6 tube)



### FLYBACK TRANSFORMER

- Du Mont H1A1
- Ram Electronics X032 (13 kv.)
- Ram Electronics X035 (14 kv.)
- Stancor A 8129

### LINEARITY COIL

- Du Mont L1A1
- Merit MWC-2
- RCA 201R3
- Ram Electronics 201R3
- Stanwyck S-958

### WIDTH COIL

- Du Mont W1A1
- Merit MWC-2
- RCA 201R1
- Ram Electronics 201R1
- Stanwyck S-957

### DEFLECTION YOKE (50-60 degrees)

- Merit MD-12 (8 mhy.)
- RCA 205D1 (8 mhy.)

### DEFLECTION YOKE (60-70 degrees)

- Chicago TY-2 (8 mhy.)\*
- Chicago TY-3 (13 mhy.)\*
- Du Mont Y2A1 (10 mhy.)
- G-E RLD-024 (8 mhy.)
- G-E "Truefocus" (18 mhy.) short\*
- Merit MDF-70 (11 mhy.)\*
- RCA 206D1 (10 mhy.)\*
- RCA 209D1 (10 mhy.)\*
- Ram Electronics Y70F14 (14 mhy.)
- Stancor DY-7 (8 mhy.) short
- Stancor DY-8 (8 mhy.)\*
- Stancor DY-9 (13 mhy.)\*
- Triad Y12 (8 mhy.)\*
- Triad Y17 (13 mhy.)\*
- Triad Y10 (23 mhy.)\*

\* Extra winding for keyed a.g.c.

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on the receiver

ge transformer,  
tain the proper  
ponents for each

circuits lists two  
roup is required  
ge picture tube

requiring an electromagnetic deflection angle between 50 and 60 degrees. Most large size tubes, however, have a deflection angle between 60 and 70 degrees (this is true of all rectangular tubes). Therefore, for most conversions, whether the previous tube used electrostatic or electromagnetic deflection, a new deflection yoke will have to be chosen from the "60 to 70 degree" group. Those with cosine windings provide more even deflection over the complete sweep. Short deflection yokes are for use with such short-necked tubes as the 16GP4, 16VP4, etc. The horizontal coil inductance is listed for each yoke—the higher the inductance, the wider the sweep. Choose the yoke which satisfies the sweep requirements of the tube chosen.

5. ION TRAPS. Be certain to use the ion trap (single or double) recommended for the new tube. In many cases, either one will work, but the recommended one will give better results.

6. FOCUS COILS. Most of the larger picture tubes using electromagnetic focus require the RTMA-JETEC #109 focus coil. If an old #106 coil does not focus the beam sufficiently, use a #109 type coil.

7. VERTICAL SWEEP. To increase the vertical sweep of the receiver (when necessary) it will be sufficient in most cases merely to substitute a new tube type for the vertical oscillator-output amplifier tube. Such tubes as the 6BL7, 12BH7, and 6V6 may be used in place of the 6SN7, 12AU7, and 6K6 types, respectively. When substitutions will not give the vertical sweep required, the plate voltage on the tube may be increased by lowering the value of the plate load resistor or using the boost voltage from the horizontal output transformer.

### FOCUS COILS

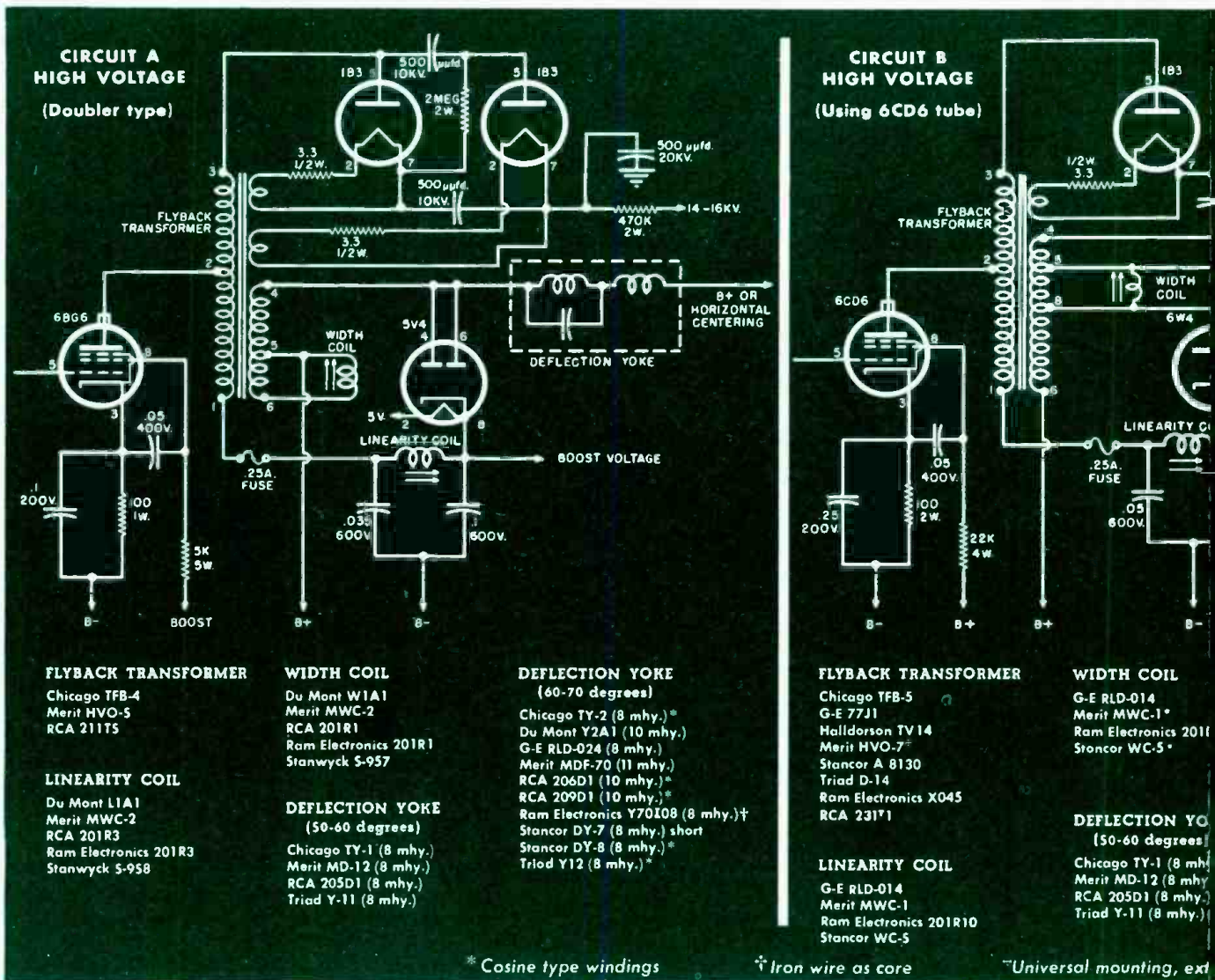
MANUFACTURER	RTMA-JETEC #106 (247 ohms)	RTMA-JETEC #109 (470 ohms)
Chicago	TC-1	TC-2
Merit	MF-1	MF-2
RCA	202D1	202D2
Stancor	FC10	—
Triad	B247	B470

DATA-PRINT #5

**RADIO &  
TELEVISION  
NEWS**

(Copyright 1952)

# TELEVISION CON



Converting a small picture-tube television receiver to use a larger picture tube involves two operations. One, the old cabinet and chassis must be changed mechanically—by using new brackets and straps, cutting a larger hole in the cabinet, mounting a new mask, etc.—to accommodate the new tube. Two, the circuit must be changed electrically to satisfy the operating requirements of the new, larger tube. This "Data-Print" gives the circuits and new component parts necessary to effect the electrical changes.

In general, picture tubes of the 14- to 21-inch class require a higher second anode voltage, greater horizontal and vertical sweep deflection, and a different focus coil than those required by smaller tubes. Sometimes a different ion trap is also required. In some cases, the high voltage available in the receiver will be sufficient to operate a larger picture tube and its associated components. For example, the 15AP4, 15CP4, 16HP4, and 16JP4 require a maximum voltage of 11 or 12 kv. for the second anode. This voltage is available in many 12-inch receivers and some 10-inch ones, so that the high voltage circuit need not be changed when converting these receivers to the above-mentioned tubes. However, this does not hold true for most conversions.

To convert any television receiver to higher voltage, Circuit A, B, or C, shown above, may be used. The high voltage obtainable from any of these circuits depends upon the "B+" voltage available in the receiver; the higher the "B+" voltage, the greater will be the high-voltage output. If the "B+" fed to each of the three circuits above is the same, Circuit A will give the highest second anode voltage. To convert a receiver to a higher second anode voltage and a larger picture tube, the following steps should be taken:

1. **HIGH VOLTAGE** Check the high voltage requirements of the tube to be installed. ("Data-Print" #4 may be consulted for this information.) Select a circuit which will supply the high voltage required by the tube. This should be the one that most nearly matches the circuit used in the receiver and the one that uses the most readily available components.

2. **FLYBACK TRANSFORMERS.** Refer to the table under the circuit chart and the flyback transformer to be used in that circuit. Any of the transformers listed may be used in that particular circuit—the one chosen depends on its availability and the buyer's preference. This same thing holds true for all other components listed in conjunction with the circuit. The mounting holes on the transformers in the same group are exactly alike, hence it would be wise to make certain, when selecting a high voltage conversion circuit, that the mounting holes on the conversion transformer will match those already drilled in the receiver chassis, otherwise new mounting holes may have to be drilled.

3. **LINEARITY AND WIDTH COILS.** After installing a new high-voltage circuit, it is usually necessary to install new linearity and width coils to obtain optimum impedance match for optimum circuit operation. The correct component for each circuit are listed under that circuit on this "Data-Print."

4. **DEFLECTION YOKES.** The component chart under each of the groups of deflection yokes. A yoke from the "50 to 60 degree" group should be used when a receiver with electrostatic deflection is converted to a larger picture tube.

# CONSTANT K TYPE LOW-PASS FILTER DESIGN

By SEIZO YAMASITA

*The constants of a "T" or "pi" type constant K low-pass filter may be determined rapidly with acceptable accuracy with the aid of this chart.*

**T**WO types of the constant  $K$  type low-pass filter are shown in Fig. 1. The equations for determining the constants of either type of filter are as follows:

$$L = R/\pi f_0$$

$$C = 1/\pi R f_0$$

where  $f_0$  is the cutoff frequency in cps and  $R$  is the image impedance in ohms.

The chart may be used to determine the constants to an acceptable degree of accuracy. If the desired cutoff frequency is above 100 kc., the chart may still be used. The desired value of  $f_0$  is divided by some multiple of ten to give a value which can be read on the chart. The values of  $L$  and  $C$  determined from the chart are then divided by the same multiple of 10 to give the correct values of  $L$  and  $C$ . For example, if

the  $f_0$  is 500 kc., the constants are determined from the chart for a value of 50 kc. and then the values of  $L$  and  $C$  are divided by 10.

If any two of the four variables  $L$ ,  $C$ ,  $f_0$  and  $R$  are known, the chart may be used to determine the other two.

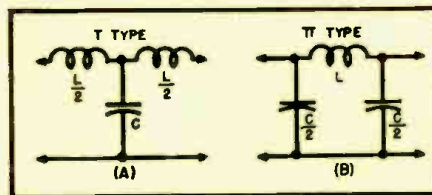
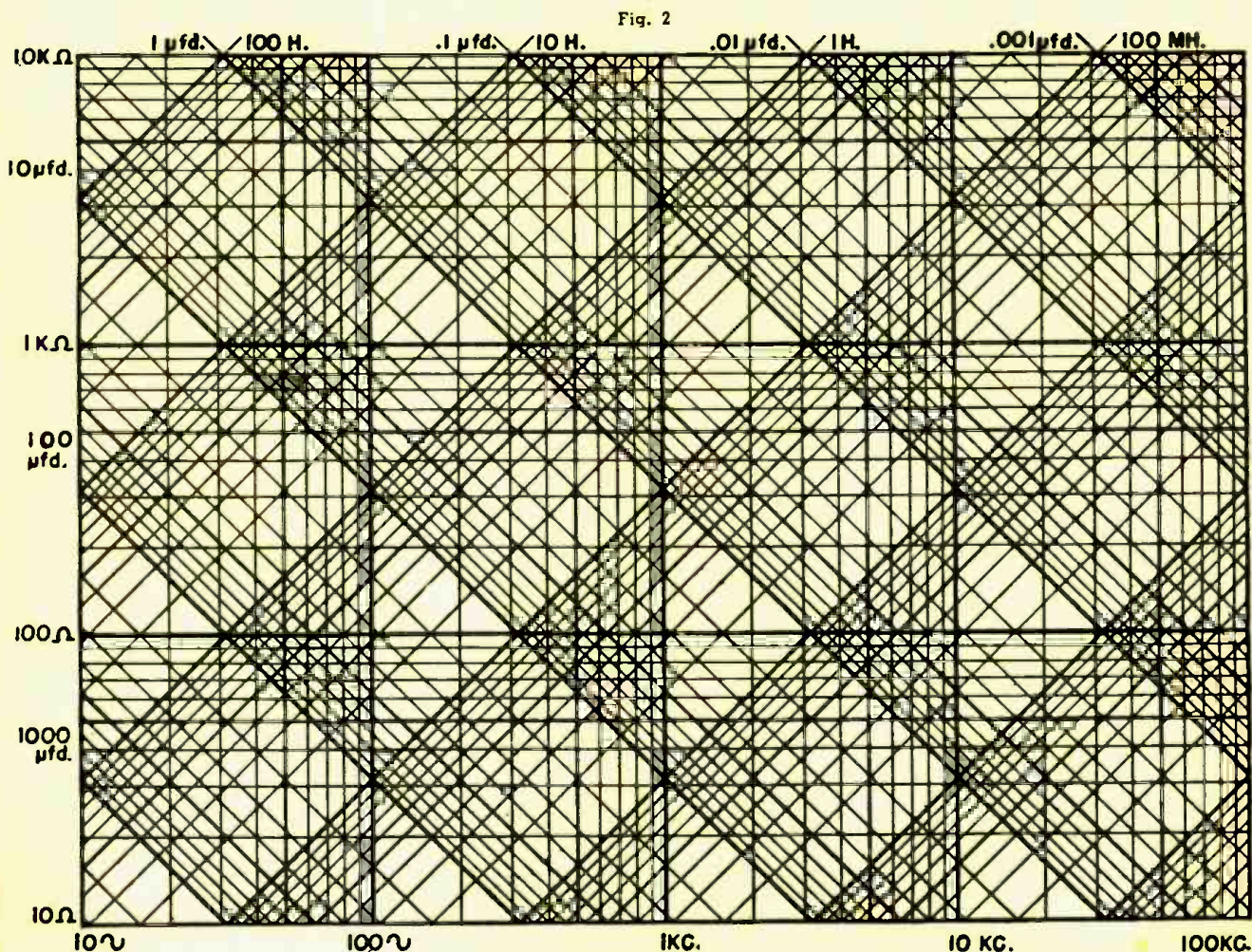


Fig. 1. (A) "T" type and (B) "pi" type constant K low-pass filter.



for the new tube. If it is necessary to change the high-voltage circuits, the "B plus" and filament voltages should be correct for the conversion circuit, with the "B plus" and filament voltages as high as possible. The higher the "B plus" voltage, the larger the picture tube that can be operated.

10. Tube reliability. Picture tubes are made by many manufacturers and it is often hard to decide on anything but a name brand. One important consideration for the technician is the type and length of guarantee that goes with a particular tube. Be sure to check this with your jobber before deciding on a tube.

### Horizontal Flyback Section

Most TV receivers use a flyback transformer to provide both the horizontal sweep signal and the high voltage for the picture tube. When a set is converted for use with a tube requiring either a higher anode voltage or more sweep power or both, the flyback section must be changed. Small screen receivers generally employ the earlier type flyback circuits which were less efficient in converting "B plus" power into sweep and high voltage. In such cases it is usually possible to get a higher voltage and more sweep from the "B plus" power already provided in the set simply by using high efficiency components. Changing the flyback transformer, deflection yoke, and sometimes the width and linearity coils requires some circuit changes. In some instances it is desirable to change the horizontal output amplifier to a different tube type in order to get more sweep with the same or less "B plus" power.

Although a wide variety of flyback circuits are used in new TV receivers, for conversion purposes only three types of circuits have proven practical and efficient. These three are shown in Circuits A, B, and C on the "Data-Print." Circuit A is the most commonly used schematic for converting 630 type receivers when a high-voltage doubler circuit is desired. Circuit B represents an entirely different scheme based on a high-efficiency flyback transformer and deflection yoke using ferrite instead of powdered iron as the core material. Originally developed by G-E, Circuit B uses the G-E type 77J1 or similar flyback transformer and requires different width and linearity coils than does Circuit A. The physical appearance and method of mounting the transformer are also completely different. Fig. 1 shows a typical flyback transformer of the type used in circuit A, while Fig. 2 (right) shows a transformer similar to the G-E type 77J1. In the latter, the core is not grounded and its efficiency depends partly on keeping the core and coil away from the chassis. The flyback transformer shown in Fig. 2 (left), is a compromise between the mounting and appearance of the Circuit A type transformer and the performance of the Circuit B transformer. Its circuit is shown as Circuit C on the "Data-

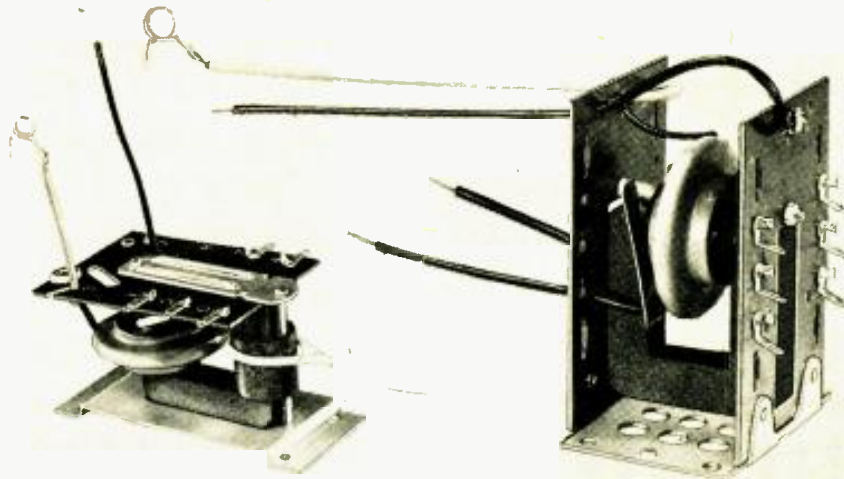


Fig. 2. (Left) RAM X030 horizontal transformer. A unit of this type is the prototype of the transformer used in Circuit C. (Right) A horizontal flyback transformer, made by RAM, patterned after the G-E Type 77J1 which was used as the model for Circuit B.

Print." This flyback mounts in the same holes and occupies the same amount of space as the RCA 211T5 and practically all of the other powdered iron core transformers. Its core is grounded and it operates with the same width and linearity coils (see Fig. 3) as the 211T5 and earlier powdered iron flybacks. The performance of this transformer is similar to the Circuit B transformer in that a single rectifier tube provides up to 13 kv. and a ferrite deflection yoke is required.

On comparing Circuits A, B, and C it will be noticed that three different horizontal output tubes are used for each. In practice it is possible to use other types than those shown. Many variations of these three basic circuits are possible, but the components indicated have proved most satisfactory in the greatest number of successful conversions. The "B plus" and "B minus" voltages represent the highest available in the set and will usually be the same as for the original sweep circuits. The point marked "Boost voltage" is the take-off point for the vertical sweep or the horizontal oscillator should these sections require more than the regular "B plus" voltage. In Circuit A the boost voltage will be approximately 20% higher than the voltage applied between "B minus" and "B plus." In Circuits B and C the boost may run as much as 30% higher than the applied voltage. Loading down the boost voltage by connecting the vertical output section to it will lower the voltage somewhat and will also affect the high voltage and sweep. In all instances it is best to use a decoupling

resistor between the boost voltage point and the circuit to which it is connected.

### Deflection Yokes

Each of the three circuits shown on the "Data-Print" operates satisfactorily only when used with the correct deflection yoke. There are three considerations which govern the selection of the correct yoke.

1. Deflection angle and length. The angle of deflection and the length of the yoke depend upon the picture tube type with which it is to be used. Most yokes made for a 70 degree angle tube come in short and medium length. The short yokes can be used for all tubes while the medium length yoke will fit most new tubes but will not work correctly on such short-necked tubes as the 16GP4. The short yoke is 2 $\frac{3}{8}$  inches long while the medium type is about 3 $\frac{1}{16}$  inch longer.

2. Inductance. Deflection yokes range in inductance from 8.3 mhy. to 30 mhy. for the horizontal coils. Typical values are 8.3, 10, 13, 18, and 30 mhy. The latter two inductances are usually used with circuits other than those presented here. A 30 mhy. yoke is not suitable for conversion work since it usually has a very low inductance in the vertical coils and this requires extensive changes in the vertical sweep section. Depending on yoke inductance, select the tap on the flyback secondary which will give the correct voltage. The available voltages can be determined from the specification sheet accompanying the part.

(Continued on page 150)

Fig. 3. The RAM 201R3 linearity coil (left) and 201R1 width coil (right).



"The Trio" (Model A-224). Its circuit incorporates a stereo preamp and two separate 12-watt power amplifiers on a single chassis. There are separate ganged treble and bass controls, a balance control, mode switch, speaker selector switch for local and remote speaker systems, contour control, tape output for recording applications, and a rumble filter.

The units are housed in matching enclosures with brushed copper escutcheons and black cages.

Other equipment in the stereo line includes a dual stereo preamp, two AM/FM monaural tuners for providing the second channel for those already



owning a monaural tuner, a stereo amplifier with dual 25-watt power channels, and a single unit which incorporates both an FM and AM stereo tuner and dual stereo preamps on a single chassis.

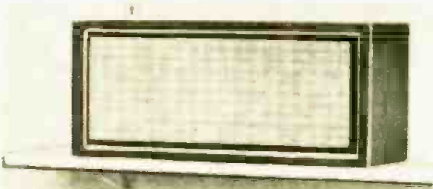
Complete details on any or all of these units are available from the manufacturer. A data sheet on the "Dual" and "Trio" models is available on request.

#### E-V "WOLVERINE" SERIES

*Electro-Voice, Inc.*, of Buchanan, Mich. is now offering a series of popular-priced components which is being marketed as the "Wolverine" line.

The line includes hi-fi speakers, enclosures, and mid-range and high-frequency kits. There are 8- and 12-inch coaxial speakers, three enclosures, a mid-range driver and crossover, and a high-frequency driver and crossover to allow the customer to expand to two- or three-way systems, now or in the future.

The enclosures are offered in along-the-wall, corner, and bookshelf models. Two of the complete systems can be



used for stereo applications at a price of many single systems, according to the company. The "Lindon," a bookshelf model, is shown in the photograph.

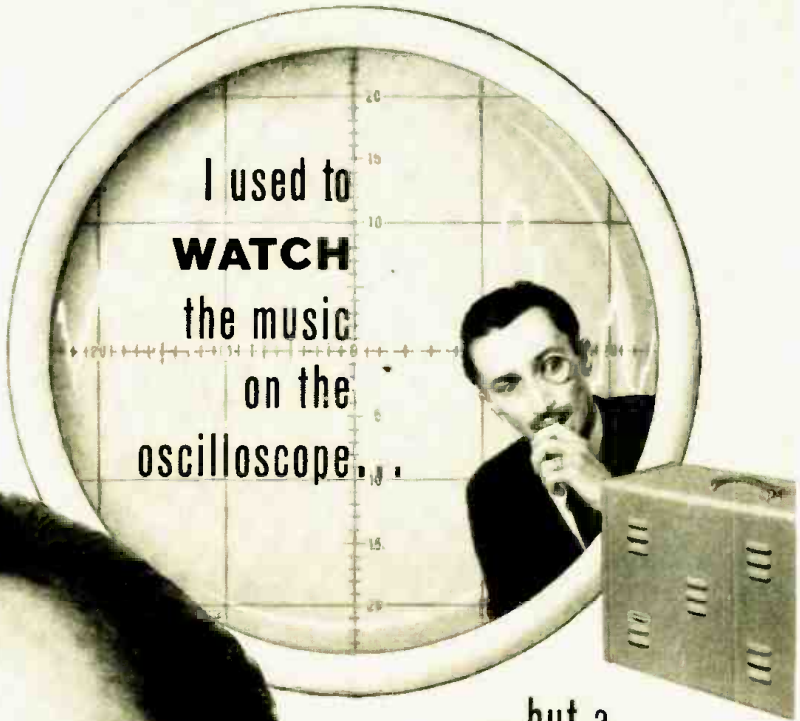
The company will supply a complete data sheet on the entire "Wolverine" line to those making a direct request.

#### "STEREO-PHASER SELECTOR"

*Vidair Electronics Mfg. Corp.* of Baldwin, N. Y. has recently added a stereo-phaser selector to its line of hi-fi and audio accessories.

September, 1958

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made me

**LISTEN!**

Every time I bought a record, I used to set up the calibrated microphone, connect the oscilloscope, start the music with bated breath, and—consumed with anxiety—I would keep my eyes glued to the screen of the cathode ray tube. If anything on the 'scope pattern looked suspicious (something always did), I would start checking tubes, voltages and crossover frequencies, and examine the record grooves under a microscope.

Then, at the house of a musician friend, I heard a NORELCO loudspeaker in a NORELCO enclosure. I was suddenly carried away by the sheer joy of listening! What lovely sound! Clean, tight bass; creamy smooth highs; crisply defined middles... the strings went la-lah-de-dah; the kettledrums went dum-de-dum... it was music!

I rushed out of my friend's house to the nearest hi-fi dealer, bought my own NORELCO speaker, took it right home with me... and I am a different person today. Man, just listen to that music!

(You can change your hi-fi life, too—just write to North American Philips Co., Inc., High Fidelity Products Division, 230 Duffy Avenue, Hicksville, Long Island, N. Y.)



NORELCO offers you a line of 5" to 12" high-fidelity speakers and acoustically engineered enclosures

# A FREQUENCY-COMPENSATED ATTENUATOR

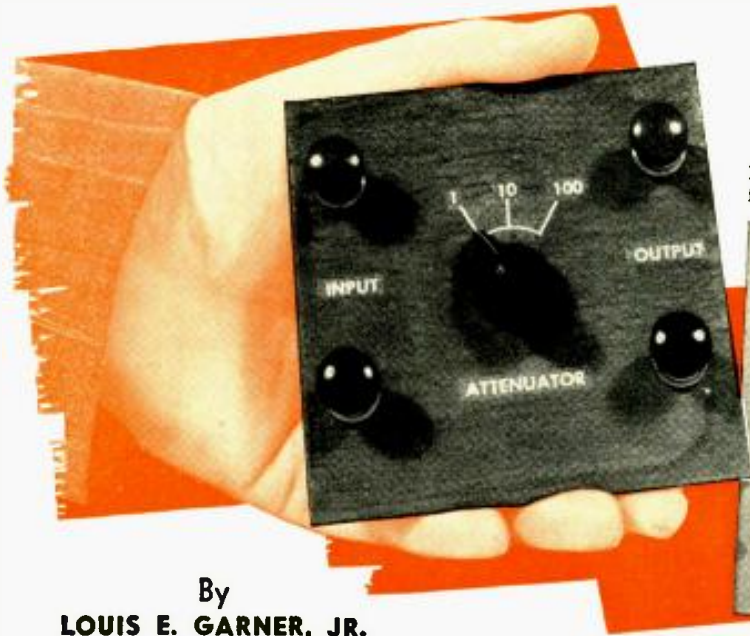


Fig. 1. Front and rear views of the frequency-compensated attenuator.



By  
**LOUIS E. GARNER, JR.**

*Unit is essentially flat from d.c. to 5 mc. and can be used as an accessory with meters, scopes, etc.*

**E**LECTRONIC lab technicians, engineers, experimenters, and service technicians sometimes find it necessary to apply a signal or voltage to an instrument which exceeds the maximum input rating of the device. The instrument may be a voltmeter, distortion meter, frequency measuring device, oscilloscope, or just a special amplifier.

Where d.c. is involved, the problem is simple—a multiplying resistor with a resistance of  $(n-1)$  times the input resistance of the device may be used in series with the input. See Fig. 3.  $R_1$  is the input resistance of the instrument and  $R_n$  is the multiplying resistor, “ $n$ ” is the multiplying factor. In such a case  $R_n$  and  $R_1$  form a simple voltage divider, with the voltage division proportional to their respective resistances.

Where a.c. signals are involved, on the other hand, the problem becomes more complex and more difficult to solve. If the input capacity of the instrument ( $C_1$  in Fig. 3) is negligible so that the reactance of the condenser is high compared to the resistances used, the same method may still be employed. In the majority of cases, unfortunately, the input capacity will be appreciable, particularly where a wide range of frequencies is considered.

In such a case  $R_n$  and  $C_1$  form a frequency-conscious voltage divider which increases the attenuation with frequency. This condition not only causes inaccuracy due to a changing multiplying factor at higher frequencies, but may also cause severe distortion of

complex waveforms. In this way  $R_n$  and  $C_1$  may be considered to form a low-pass filter or an integrating network.

However, these difficulties may be avoided by using a specially-designed frequency-compensated attenuator ahead of the instrument. Such an attenuator is shown in Fig. 1, while the schematic diagram is given in Fig. 2.

Any competent technician should be able to assemble, adjust, and calibrate the attenuator shown within two hours, using standard, easily available parts. Yet this attenuator is essentially flat from 0 cps (d.c.) to more than 5 megacycles (assuming reasonable care taken in assembly) when properly adjusted! In addition to providing multiplication factors of 1, 10, and 100, this attenuator actually reduces the *effective input capacity* of the instrument when used in the X10 and X100 positions.

The frequency-compensated attenuator is essentially a group of resistance and capacitance voltage dividers combined in such a manner that the same voltage division occurs for d.c. or low frequency a.c. as occurs for higher frequency a.c. Referring to Fig. 2, there are three positions of the attenuator switch,  $S_1$ , to consider.

In position X1, the *Input* and *Output* terminals are directly connected, and any signal applied to the *Input* appears across the *Output* without attenuation. Except for the very slight distributed wiring capacity, using the frequency-compensated attenuator in the X1 position is the same as connecting the

signal source directly to the input of the test instrument.

In position X10, the *Input* terminal is connected across a voltage divider consisting of  $R_1$  and  $R_2$  and condensers  $C_1$  and  $C_2$ . The *Output* terminal is connected to the junction of  $R_2$ ,  $C_1$ , and  $C_2$  so that only that portion of the signal appearing across  $R_2$  and  $C_2$  appears across the *Output* terminals of the attenuator (to be applied to the input of the instrument with which the attenuator is to be used).  $C_1$  is adjusted so that the ratio  $C_2:C_1$  equals the ratio  $R_1:R_2$ . In addition,  $C_2$  is large enough to “swamp” the input capacity of the instrument connected to the *Output* terminals of the attenuator.

The resulting combination forms a voltage-divider which is flat over extremely wide frequency ranges.

In the X100 position, the circuit operation is the same as that for the X10 position, except for the ratios involved.

When the attenuator is in either the X10 or X100 position, either  $C_1$  or  $C_2$ , respectively, is in series with the *Output* as far as the *Input* terminals of the attenuator are concerned. Since  $C_1$  and  $C_2$  are comparatively small, this action essentially reduces the input capacity of the instrument.

## Construction Hints

The entire attenuator circuit may be easily assembled to fit on a piece of sheet metal measuring four inches square, and so may be made to fit a standard 4" x 4" x 2" metal utility box. If the attenuator is placed in a separate shielded case or box, holes should be provided in the back so that condensers  $C_1$  and  $C_2$  may be adjusted after the construction is finished.

Only good quality condensers should be used for  $C_2$  and  $C_1$ —preferably silver micas or tubular ceramics. Heavy bus

bar should be used for making direct wiring connections and for the ground bus connecting the two "Ground" terminals.

Trimmer condensers  $C_1$  and  $C_2$  should be solidly mounted so they might be easily adjusted without shifting position.

Particular care should be taken, when wiring the unit, to keep distributed wiring capacities to ground to a minimum. In addition, care should be taken to keep the *Input* and *Output* leads and connections well separated.

Although the author used a single-gang d.p. 3-pos. selector switch, better results (flatter over a greater frequency range) may be obtained by using a two-gang switch. With the single-gang switch, the unit is flat over the range mentioned, but with a two-gang switch (permitting better layout) it is easily possible to obtain an attenuator flat to well over ten megacycles!

### Adjustment and Calibration

Once the wiring is completed and checked, the unit should be placed in its cover or box. Condensers  $C_1$  and  $C_2$  should now be adjusted. For this adjustment a square-wave generator and a wideband cathode-ray oscilloscope should be used.

Connect the attenuator between the output of the square-wave generator and the input of the CRO as shown in Fig. 4. Turn to the X1 position.

Adjust the square-wave generator to deliver a signal between 10 and 25 kc. Any frequency in this range is satisfactory, although a frequency of 15 kc. may be considered optimum.

Next, adjust the controls on the CRO until two or three complete cycles of the square-wave signal can be observed as in Fig. 5A. Adjust for reasonable amplitude using the vertical gain control of the CRO or the output control of the square-wave generator.

Switch the attenuator to the X10 position, readjusting the scope gain control or output control of the generator for reasonable deflection. If the signal appears as in Fig. 5A,  $C_1$  is properly adjusted and need not be touched.

If the leading edge of the square wave is rounded, as in Fig. 5B, condenser  $C_1$  must be adjusted for increased capacity. Do this carefully, using an insulated fiber alignment tool.

On the other hand, if the leading edge of the square wave is peaked, as in Fig. 5C, the capacity of  $C_1$  must be reduced. Again, take care when doing this, and use a fiber alignment tool.

To adjust condenser  $C_2$  for proper compensation, switch the attenuator to the X100 position and again carry out the procedure outlined above for adjusting  $C_1$ . With practice these compensating adjustments may be made quite rapidly.

If it is found to be impossible to adjust for a good square wave in the X10 or X100 positions, check the electrical sizes of  $C_1$ ,  $C_2$ ,  $C_3$ , and  $C_4$ , as well as the sizes of the resistors used.

The adjustments outlined are for

frequency compensation and do not appreciably affect the exact multiplication (or attenuation) obtained. If exact values of attenuation are desired, it may be necessary to "juggle" the electrical sizes of the resistors used until the desired attenuation is reached. With the values given, attenuations of 10 and 100 will be obtained (approximate only).

To check the calibration, leave the attenuator and other equipment connected as for the frequency compensation adjustment. Turn the sweep range control of the CRO to a higher frequency so that two parallel lines rather than a square-wave signal are observed on the screen of the CRO. See Fig. 5D.

Turn the graph scale of the CRO until the horizontal lines are exactly parallel with the two lines on the screen so that direct comparisons can be easily made.

With the attenuator in the X1 position, adjust the output of the square-wave generator and the vertical gain control of the CRO until exactly ten or twenty units of the graph scale appear between the two horizontal lines.

Now switch to the X10 position. The two lines should appear closer together on the screen of the CRO (Fig. 5E), with the exact separation depending on the preceding separation—either one or two units of the graph scale, respectively.

If the line separation is less,  $R_2$  should be increased in value. If more,  $R_2$  should be reduced in value.

Once the calibration in the X10 position is satisfactory, leave the attenuator set in this position and again readjust the vertical gain control of the CRO or output of the square-wave generator until the two horizontal lines appearing on the CRO screen are again separated by ten or twenty units. Now switch to the X100 position.

As before, the separation between the two lines should drop to either one or two units. If less,  $R_1$  should be increased in value, and, if more,  $R_1$  should be reduced.

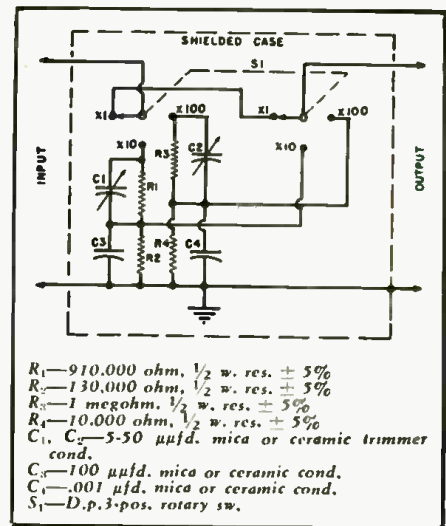


Fig. 2. Circuit diagram of the attenuator.

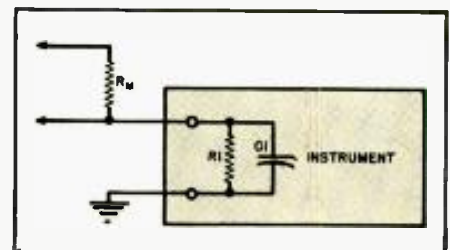


Fig. 3. Correct method of connecting unit.

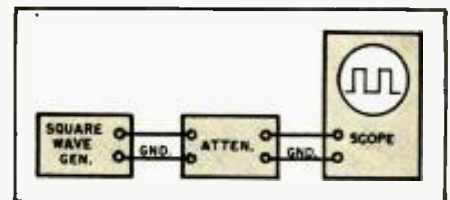


Fig. 4. Hookup for calibrating attenuator.

The frequency-compensated attenuator described may be used as a multiplier for almost any type of test instrument—voltmeters, distortion meters, cathode-ray oscilloscopes. frequency  
 (Continued on page 102)

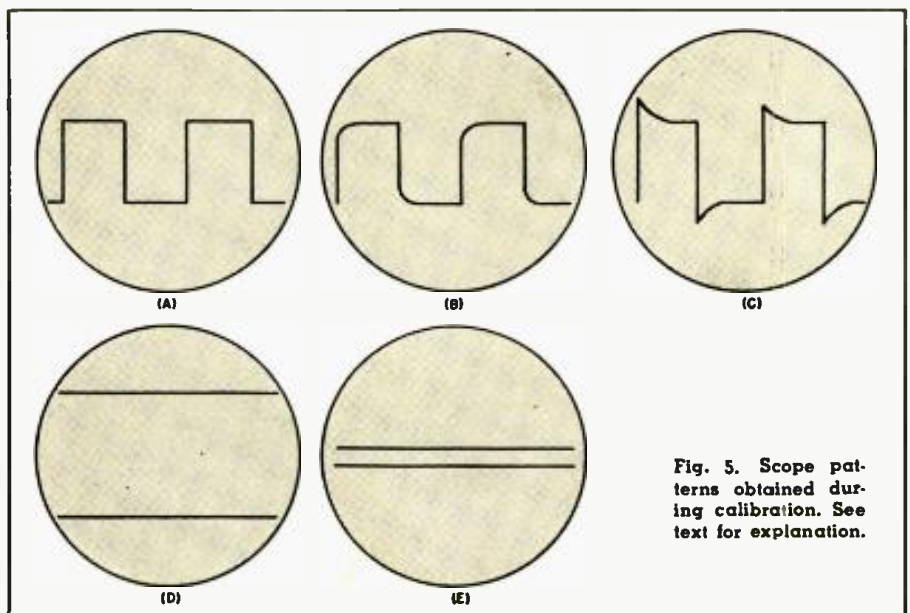


Fig. 5. Scope patterns obtained during calibration. See text for explanation.

# TV RECEIVING ANTENNA TESTING TECHNIQUES

By

I. POLLACK

Chief Eng., JFD Manufacturing Company, Inc.



The author, with Hazeltine engineer, points to shielded down-lead connecting antenna to lab instruments.

*Months of painstaking research go into each antenna model before it is put on the market.*

**A**NY antenna which is to be used for the reception of television signals must, if its performance data is to be complete and honest, be subjected to the most exacting tests available to electronic research. Recognizing this, officials of the *JFD Manufacturing Company, Inc.* when drawing up rough plans for a new 10-element yagi antenna, enlisted the services of *The Hazeltine Corporation* to study the potentialities of such an antenna.

First considerations were, of course, impedance, directivity, and gain, these not being listed, necessarily, in order of their importance. To achieve the best possible transfer of power to the load (the receiver), the antenna and receiver impedances must match. The second factor, directivity, when good, cuts down the antenna's response to spurious signals and noise. Gain is of obvious importance in DX reception.

Interestingly enough, prior to actual testing, it was carefully noted that gain and directivity, in such parasitic arrays as this yagi, are mutually dependent factors. Various combinations of both reflector-director lengths and spacing between elements will favor either maximum gain or maximum front-to-back ratio. However, both of these qualities cannot be obtained concomitantly.

In order to accurately test this 10-element yagi for gain, a reference level had to be employed. A half-wave folded dipole was selected by the development engineers for this purpose.

To convert the relative gain of an antenna, with reference to a dipole, to absolute gain, about 1.75 db must be added. This figure represents the gain of a dipole relative to a hypothetical non-directional antenna.

The first test antenna, the *JFD 10Y7* (a 10-element yagi cut to Channel 7), was set up for study under actual field conditions by the research

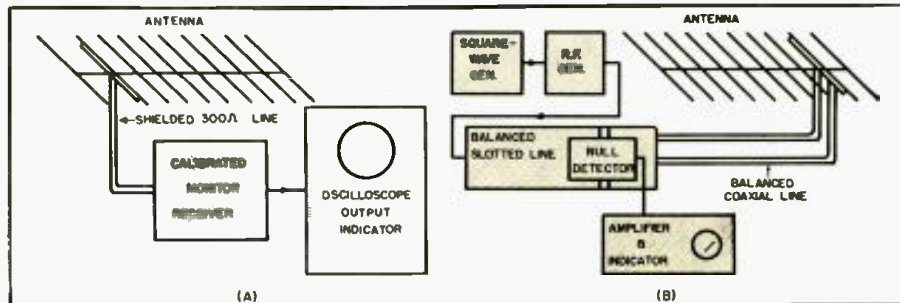
men. It was fixed on a mast in a position where optimum gain, when receiving signals transmitted from the Empire State Building's tower, could be expected. Using balanced, shielded 300-ohm twin-lead wire, the antenna (comprised of one collector, one reflector, and eight director elements of aluminum, mounted on a seamless aluminum cross-boom) was connected to a special calibrated monitor receiver.

This monitor receiver was, in turn, tuned to the channel being tested. It recorded the antenna's output voltage. When this had been noted by the engineers, the tuned reference dipole was substituted for the test antenna, being fixed in precisely the same position the yagi had held, to avoid the slightest error. Following this, the output voltage of the tuned dipole was fed to the monitor receiver, to which it had been hooked. This output voltage was noted and the ratio between this figure and that of the test antenna was recorded and converted into decibels. This gave the test antenna's db gain figure in relation to the tuned dipole. (To obtain the absolute gain, a purely hypothetical figure, add 1.75 to the relative gain in decibels.)

According to the measurements, the gain for both the single and stacked versions of the test antenna approached the mathematically calculated theoretical limit. The gain of the single array was 9½ db while the gain of the stacked array was a full 12 db. The use of a balanced line step-up transformer, in the stacked 10Y7, made available to the down lead 2½ db of the theoretical limit of 3 db gain afforded by stacking the bays.

(Continued on page 166)

(A) Simplified breakdown of the circuit employed in testing the JFD "Baline" 10-element yagi for gain and directivity. (B) In examining the unit for impedance, a square-wave modulated signal was used. In other studies, signals transmitted from Channel 7 in New York, via the Empire State Building tower, were used.





# AN UNUSUAL HIGH-VOLTAGE GENERATOR



Duplicating one of the principles of the new generator can be done by using a steatite condenser, 1000 volt electrostatic meter, and a 67½ volt "B" battery.



By E. N. KAUFMAN

*Details on a new type electrostatic generator capable of providing 50,000 v. d.c. at 4 ma.*

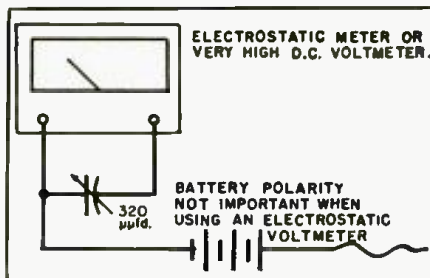
TWO FRENCH scientists, N. J. Felici and R. Morel, have developed a new type of electrostatic high voltage generator that promises to be of importance in many fields of science and engineering because of its small dimensions, light weight, and mechanical simplicity and ruggedness. A generator with an output of 4 milliamperes direct current at 50,000 volts (200 watts) is entirely contained, including the driving motor, in a pressurized cylinder 2½ feet long and 1½ feet in diameter. The efficiency is rated at 80%. Generators developing 25,000 watts at 200,000 volts d.c. are at present under test.

Calculations indicate that a generator with a 1,000,000 volt output can be built. The principle is simple and fairly well-known. If a variable condenser while in the closed position has an electrical potential placed upon it and then the condenser is rotated to minimum capacity the voltage will rise based on the ratio of maximum to minimum capacity. When the condenser rotor is part way out of the stator and the potential on the rotor has risen to the desired voltage the rotor is connected to the output load and the charge is drawn off at a rate determined by the load and the rotation speed. The actual generator has a succession of multi-pole rotor and stator plates that can be arranged in relative phase so as to give a direct current output requiring very little smoothing. In order to keep the output voltage constant under varying load conditions a voltage regulator system should be

used. Either a spark gap, thyrite resistor, or corona voltage regulator tube will suffice.

It was probably noted by most readers that without some method of commutation the output would be, effectively, a sine wave. Thus the generator is capable of an a.c. output as well as d.c. This effect can be demonstrated quite easily by taking any amateur

**Electrostatic generator test arrangement.** The meter used with a 67½ volt battery should have a range of from 500 to 1000 volts. All leads in this circuit must be kept short or leakage resistance may drain off the charge. In operating this circuit, do not use a switch in applying potential to the condenser rotor as leakage resistance of the switch will drain circuit. Touch lead momentarily to condenser rotor then rotate condenser to minimum capacity. Note: If electrostatic voltmeter has the condenser attached across the terminals as shown, the minimum to maximum capacity possible will be reduced. Use the largest generator condenser possible. The generator leakage resistance must be high to prevent the charge from leaking off so it is advisable to use a condenser supported by steatite — rotor to stator.

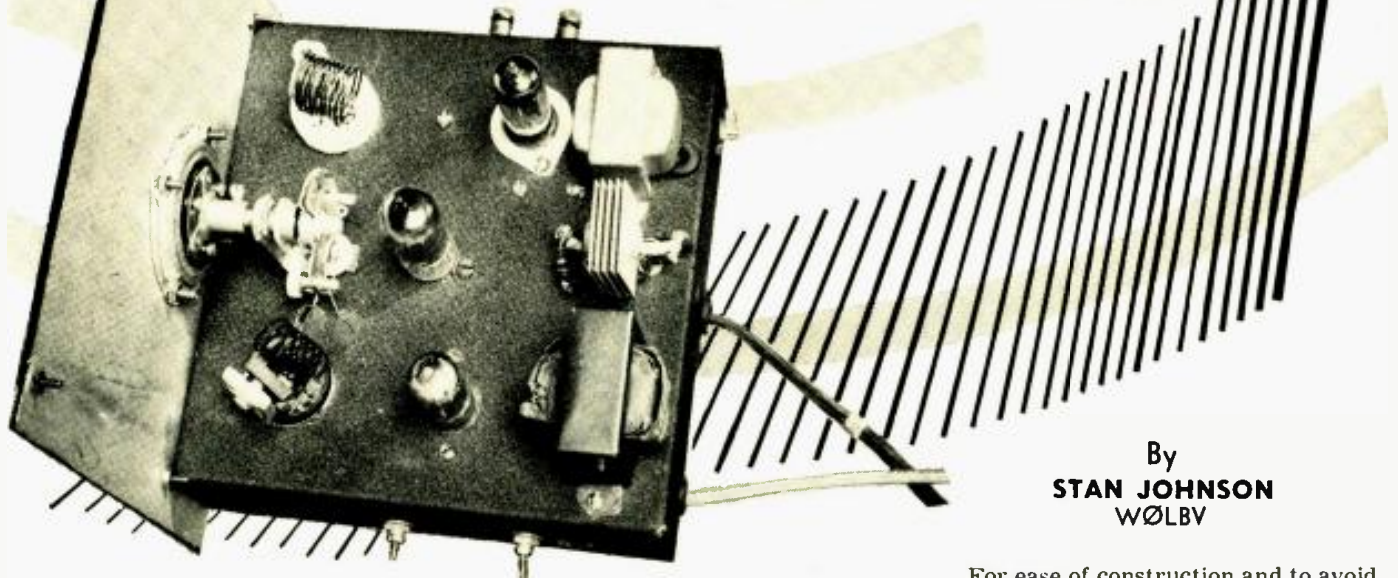


radio condenser with steatite separators, such as a *Hammarlund* MC-325-M (320  $\mu$ fd.), a 1000 volt electrostatic meter, and a 67½ volt "B" battery. With the condenser at maximum capacity the battery leads are placed momentarily across the condenser. Then the condenser is rotated to minimum capacity. The voltage on the condenser will rise to about 400 volts. With an electrostatic voltmeter as the only load considerable time will pass before the charge leaks off.

In the actual generator the exciting voltage is supplied by another rotary electrostatic generator of exactly the same type which, however, need only be of small size. The output brush of the small exciter generator is connected to the stator of the large generator; and the exciter generator stator to the output of the large generator (rotor). The system is self starting as soon as rotation occurs. The cause of the self starting is believed to be the presence of residual electrostatic charges. The voltage in the exciter and generator build up at a rate depending upon the external load. Depending upon the initial residual charge the generator may start either positive or negative. A heavy external disturbance may reverse the polarity during rotation. Inserting a small rectifier in the exciter circuit will cause positive starting polarity and operation. Either hand drive or motor drive can be used. The fluctuations in hand drive speed are reflected in output power and not in output voltage.

These generators should find many applications such as power supplies for x-ray machines, diffraction apparatus, particle accelerators, electrostatic dust precipitators, and nuclear instrumentation. An adaptation of this generator has been used for the ignition systems of automobiles. Another design uses a hand driven model for electrostatic precipitation of insecticide dusts on plant foliage. From these varied applications it can be seen that these generators can be used for many different purposes only limited by the mind of the engineer. Further information on these generators can be obtained from "Annales de l' Universite de Grenoble," *Sec. Sci. Math. et Phys.* Vol. 23 (1947) written in French or from an Office of Naval Research report ORNL-61-50 which is unclassified and written in English.

# CONVERTER RECEIVES BOTH PHONE AND C.W.



Top view of converter chassis. The 10 meter coils are in place. Notice how the trimmer condensers and 50  $\mu$ fd. silver mica condenser are mounted on plug-in form.

By  
**STAN JOHNSON**  
WØLBV

*A unit which transforms any a.c.-d.c. midget into a full-fledged "communications" receiver. Ideal for the Novice or as standby unit for Old Timer.*

**A** CONVERTER capable of receiving both phone and code—and of such a design that it is entirely self-powered and hence can be used with any radio, including a.c.-d.c. midgets—is an extremely useful set even for an Old Timer to own, since it provides a low-cost "second" set to use when the regular communication receiver is on the blink or too heavy to take along on a trip. And for the Novice with a lean pocketbook, the set is just about what the doctor ordered: for less than one-half the price of even the cheapest "store bought" communication set, it will transform an ordinary broadcast band set into a short-wave receiver with high over-all sensitivity—enough sensitivity to give many a \$100-plus set a run for its money.

The set was designed primarily for two bands—the 80 meter band (including the Novice band) and the 10 meter phone band. With minor modification (see coil data) the set will tune the 11 meter Novice band and, of course, with suitable coils, will tune *any* ham band between 10 meters and 160 meters.

The unit is self-powered, having a built-in a.c.-d.c. power supply. This makes it possible to use the converter with a set without having to "steal" voltage from the set itself—a procedure which gets a bit "sticky" in the case of a.c.-d.c. sets, which invariably

have series-connected heaters and hence provide no easy method of supplying heater voltage.

The receiver uses a 6BA7 converter (mixer) tube as the initial r.f. tube. This tube was chosen because it is an excellent mixer and virtually eliminates "pulling" effects and injection troubles, both of which can be pretty difficult to handle if not much test equipment is available.

The 6BA7 is a "hot" tube and in many cases it, alone, will provide sufficient output to "convert" the set to which it is attached into an acceptable short-wave receiver. However, for conservative design, an i.f. stage was added. This greatly increases over-all gain and insures that the converter will work with *any* set, even the very low priced a.c.-d.c. midgets which do not boast an i.f. stage of their own.

To make the set complete, it includes something which is rare indeed in converters—a beat frequency oscillator. This oscillator provides the "beat" necessary for the reception of code on the 80 meter Novice and other code bands.

The power supply section of the receiver requires no tube because it uses a selenium rectifier. If you have any misgivings about an a.c.-d.c. power supply for a unit of this type—forget them. With the filter network shown, the hum level is very, very low.

For ease of construction and to avoid "ganging" troubles, which can give even an old hand a bad time, the tuning arrangement is such that ganging is unnecessary. This is accomplished by using the oscillator section for main tuning, then simply "peaking" with a knob on the front panel which is connected to the tuning condenser across the mixer coil. One setting of the "peaking" knob will hold for a considerable range of frequencies for example, the entire Novice band.

The converter is built up on a standard 7 by 7 inch chassis with a front panel which measures 7 by 8½ inches. The chassis can be either aluminum or steel, since no connections are soldered to it.

Looking at the top of the chassis, the 6.3 volt filament transformer is in the bottom right-hand corner. Next to it is the selenium rectifier, then the filter choke. The last-named is perhaps a luxury but probably worth its modest cost in order to insure hum-free operation.

The tube closest to the rear is the beat frequency oscillator tube. Slightly forward and on the other side is the 6BD6 i.f. stage. Then, in the center, directly behind the tuning condenser, is the 6BA7 converter tube.

The tubes all use miniature tube sockets—and the writer likes the new zip-in "ethylon-A" type developed for TV sets. These mount easily in ¼" holes drilled or punched into the chassis.

Mounting the two variable condensers is a bit tricky in that *both* must be insulated from the chassis. This is necessary because of the a.c.-d.c. circuit, otherwise the chassis would be "hot" with 117 volts and dangerous to the user. Exactly how you will go about mounting the condensers will

**RADIO & TELEVISION NEWS**

depend upon the design of the condensers you buy. In the model illustrated, the condenser above the chassis was insulated by mounting it on a small piece of clear plastic. The condenser below the chassis happened to be of a type in which the mounting bracket is insulated from the metal parts of the condenser, so mounting is easy. There isn't too much space for the latter condenser, so pick a small one.

The two antenna binding posts are likewise insulated from the chassis, this being accomplished by using small pieces of clear plastic on either side of the metal, with the machine screw mounting the binding post running through holes in the plastic. Of course, the hole drilled into the chassis is much larger than the screw—so that the plastic insulates the machine screw from the chassis.

Wiring of the set is straightforward, although there are a couple of things to watch. First of all, all wiring is "above ground" as far as voltage is concerned, an important safety feature. This does make wiring a bit more difficult, though, than the common method of tying everything normally grounded to convenient spots on the chassis. Instead, all of the grounds are made to a heavy, bare wire lead running along the center of the set. The end of this lead is grounded to the chassis *only* through  $C_{17}$ , as shown in the diagram. Pick a good condenser for this one as it provides the isolation between the chassis and the 117-volt power line.

The rest of the wiring is point-to-point, keeping leads short. Notice that where the two leads from the variable condenser "dive" through the chassis large holes are drilled, so that the leads go through with plenty of "air" on both sides. This is important both for good insulation and in order to insure that the r.f. stays on the wire instead of using the surface of the chassis as a roundabout way to reach the coil.

The two i.f. coils are mounted along one side of the chassis so that they are easy to adjust from the outside. These coils are slug-tuned and easy to adjust. The b.f.o. coil is similarly slug-tuned. It may be a coil like the i.f. coil (with 40 turns removed and a 30 turn tickler coil added) or, as was done in the original set, a slug-tuned antenna coil of the standard broadcast-band variety was modified: the smaller of the two windings being removed completely, and 40 turns peeled off the larger winding. Then a 30-turn "tickler" was "scramble-wound" about a quarter of an inch away on the same form. In mounting this coil the writer ran into a peculiar kind of trouble—the b.f.o. would not oscillate until the coil form was mounted on a strip of polystyrene. The *Cambridge Thermionic* slug-tuned coils can be mounted directly on the chassis, however.

The r.f. coils of the set are home-made and easy to build. For 80 meters, both coils are wound on standard forms. The only unusual thing is the trimmer condenser, which is mounted

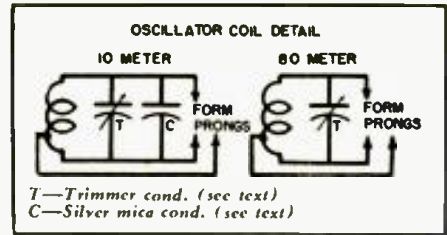
on stiff wire leads, soldered to the proper prongs and then anchored in place with a couple of drops of china cement between the ends of the trimmer and the sides of the coil form.

The 10-11 meter coil is a bit more unusual. In this case, a coil form (4-prong) is sawed off with a hacksaw to provide a base for the coil. The mixer coil is self-supporting, consisting of 10 turns of number 18 enameled wire,  $\frac{3}{4}$ " inside diameter, spaced to occupy  $\frac{1}{2}$  inch. The smaller oscillator coil is also self-supporting, and consists of 7 turns of number 18 enameled wire, spaced to occupy  $\frac{3}{4}$  inch, and  $\frac{1}{2}$ " inside diameter. Duplicate this coil exactly, as its dimensions are fairly critical.

You are now ready to try the converter and the first thing to do is to select a suitable set to use with it. The better this set, the better the over-all performance of the system. However, the converter *can* be used, and with surprisingly good results, even with a midget.

Let's assume that the set chosen is an extremely simple midget, like the "Hopalong Cassidy" *Arvin* shown in the photographs. This set has no i.f. stage at all. Antenna pick-up is provided by a flexible wire attached to the set.

Because we want as little pick-up by the set as possible except for the signal provided by the converter, the



Details for wiring the oscillator coils.

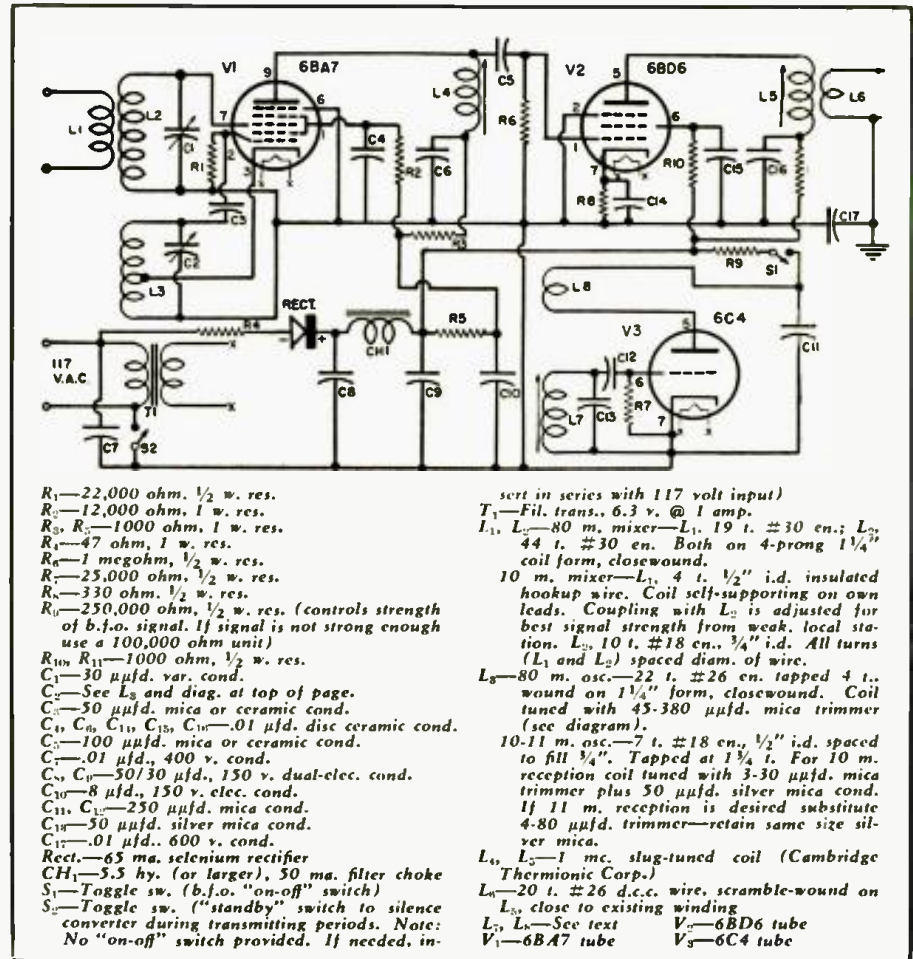
"antenna" wire on the set is coiled up and kept close to the set. The end of this wire (or the "antenna" clip on most sets) is connected to the flexible coax lead from the converter. The inner lead of the coax is, of course, the "hot" lead carrying the signal.

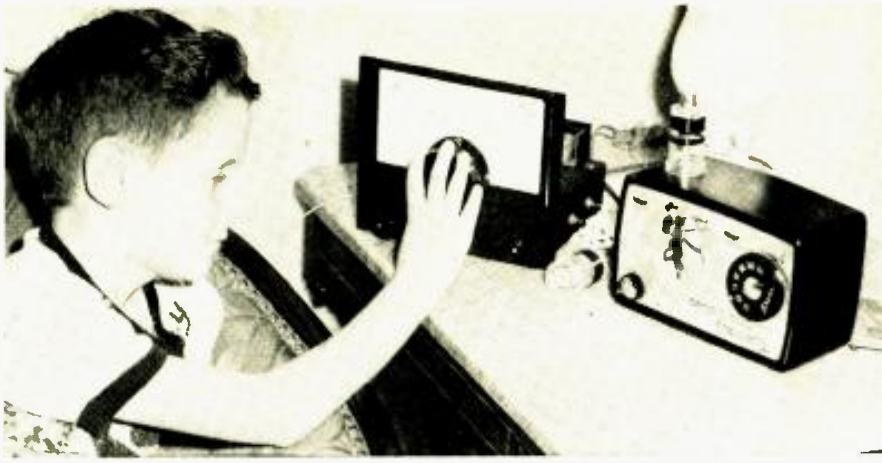
Next, the little *Arvin* is tuned to approximately 1650 kilocycles, or any clear spot *above* the standard broadcast band. (The tuning condenser in the set should be almost all the way open.) The idea is to get as high a frequency as possible for the converter and still not tune in some station which will interfere with the output of the converter.

Since no "ground" terminal is provided on the midget, we simply ignore the "ground" (braid) connection of the flexible coax. Actually, of course, a ground is simulated by the power line connected to both the radio and to the converter.

Next, plug in all of the tubes (ex-

Complete circuit diagram of converter unit to be used with an a.c.-d.c. midget.





While this picture was being made, the converter pulled in Guam on an antenna which consisted of an 8-foot wire tossed behind the davenport.

cept the 6C4) and switch on both the converter and the midget set. When both are warmed up, adjust the slug-tuned i.f. coil at the rear of the chassis by turning the screw so that it is as far out of the coil as possible.

Now, listen to the speaker, and slowly turn the screw on the i.f. coil closest to the front panel until a "hiss" is heard. Next peak both coils on the "hiss" (you'll probably find that the rear coil was close to being right to begin with) and when this has been done the simple i.f. stage is "lined up."

An antenna (which may be a 60 foot or longer wire) and a ground should be connected to the two posts on the converter. (If a two-wire feeder is used, it goes, of course, to the two terminals and the ground connection is omitted.)

With this antenna you are ready to get the set working on 80 meters, where it is easy to "hit the band."

First, set the main tuning dial at about half way on the scale. Then with an alignment tool tune the set screw

in the trimmer condenser on the coil very slowly. You should hear a lot of signals. As you tune, eventually you should pick up the amateur 75-meter phone band. This band is full of strong signals and you can identify it by hearing hams calling "CQ 75 meters."

Adjust the trimmer until this band (the low frequency end of it) falls at about 50 on the dial. This will insure that the nearby Novice band will tune from approximately 30 to 40 on the dial, the exact spot depending upon the type of variable condenser used, etc.

Now, tune in the station wanted by means of the main tuning dial. Finally, "peak" the signal, using the knob on the front. As mentioned previously, one setting of this knob will hold over quite a range of frequencies.

With the coils "perking" on 80 meters, the next step is to get the 10-meter coils in operation. At this point it is a good idea to make certain that there is someone on the band—10 meters can be quiet as a tomb—so, if

practical, give a nearby ham friend a ring on the phone and ask if there are some strong signals coming through.

You may want to do some touching up later and, if so, keep this in mind: the greater the capacity used on the trimmer (the further the screw is in the condenser) the more the 10 meter band is spread across the dial. But at any rate, just as on 80 meters, "find" the band by adjusting this trimmer. Then "peak" with the mixer tuning condenser.

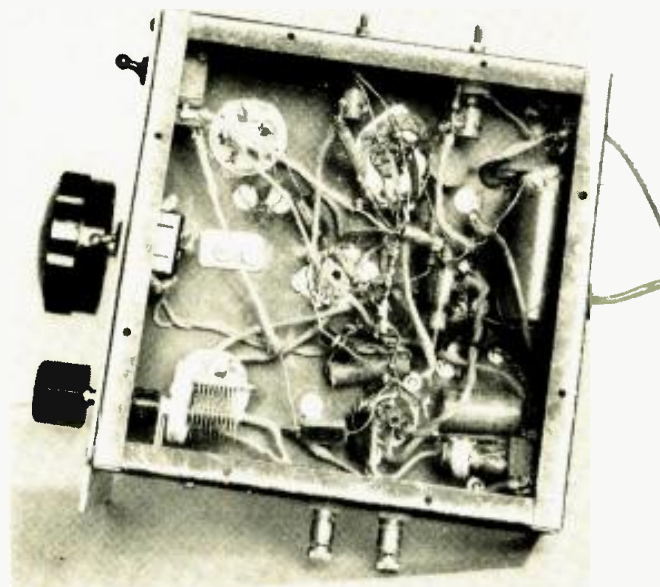
So much for reception of phone signals—now for code. Plug in the 6C4 and throw the b.f.o. switch on the panel so that the b.f.o. is on. Now tune in a signal and adjust the slug in the b.f.o. coil until a whistle is heard. Then you are all set for code reception.

With a set like the little *Arvin* you don't need to worry much about a.v.c. action and reception of code signals will be satisfactory. However, with larger sets having active a.v.c. systems a very minor modification of the set is desirable, since the b.f.o. in the converter acts like any other signal and depresses the a.v.c., reducing the over-all sensitivity. The answer is to provide a switch for shorting out the a.v.c. section in the set with which the converter is used. If you will study over the a.v.c. layouts and also receiver circuits in any of the amateur handbooks you will see how to do this.

What can you receive with a converter of this type? That will depend upon a lot of things, including the set with which the converter is used and the available antenna. However, the over-all sensitivity should be fairly high with almost any set. For example, the writer hooked up the set, connected an 8 foot wire to one antenna post on the converter and grounded the other post to the chassis, tossed the wire behind the couch, and got the converter working.

-30-

Under chassis view of converter. The power supply wiring is kept to the rear of the chassis wherever possible. The i.f. coils may be seen at the top, the antenna posts on the bottom.



Front panel view. Controls include the variable condenser across mixer coil, standby switch, and b.f.o. "on-off" switch. Main tuning is accomplished by large vernier dial in the center.



# AN ANTENNA TUNING UNIT

By  
**HAL BUMBAUGH**  
W6HI

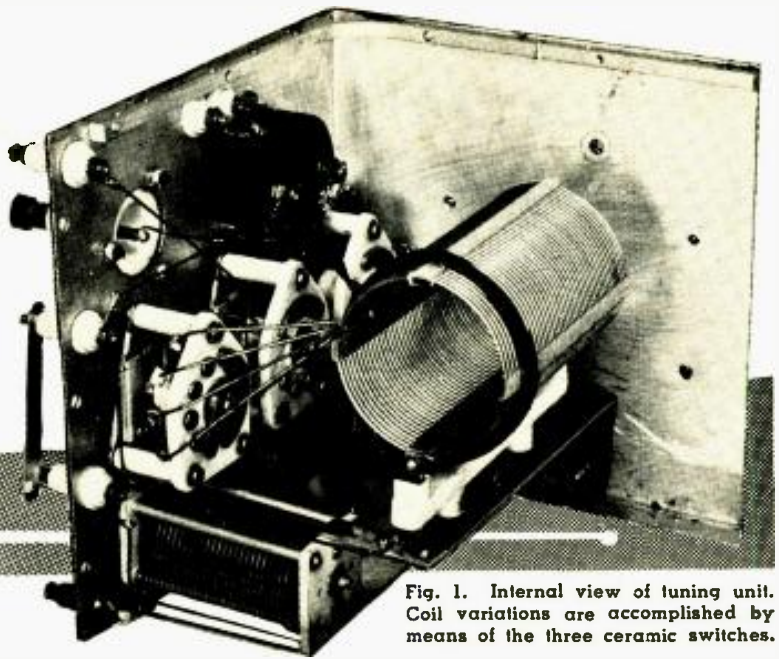


Fig. 1. Internal view of tuning unit. Coil variations are accomplished by means of the three ceramic switches.

**M**ANY an otherwise excellent transmitter renders mediocre service because the antenna to which it is hooked does not represent optimum loading conditions for the transmitter. The result is that the radiated signal power represents but a small proportion of the potentially available power.

There are, of course, conditions under which a radiating system will not put out the energy it should, even if properly matched to the transmitter, but this is generally representative of conditions over which the operator has little control, such as having to resonate six feet of wire to a transmitter working on 75 meters, etc. However, it may be said with certainty that if resonance is established between the transmitter and the antenna under such a condition, all has been done that lies within the power of the operator.

For the ordinary conditions under which emergency antennas of almost any type and physical dimensions or haywire antennas strung up at a portable location must be used, any device which will insure a match between the transmitter and the radiating system will pay off handsomely in increased signal strength and efficiency.

With the idea of building up a gadget that would accomplish a match between a transmitter and almost any piece of wire or any type of configuration, and which could be connected to the transmitter in several different ways, a matching unit was purchased on the surplus market for a little over a dollar—and promptly wrecked—not because it wasn't good, but because it was conventional and the gadget we had in mind was to be anything but that!

All the parts, except the variometer, were used, and with the addition of three small condensers and a 2-ampere meter from the surplus market we built the instrument shown in Fig. 3.

Fig. 2 is the wiring diagram and it will be seen that the arrangement

*A correct antenna match can increase radiated signal without increasing transmitter power.*

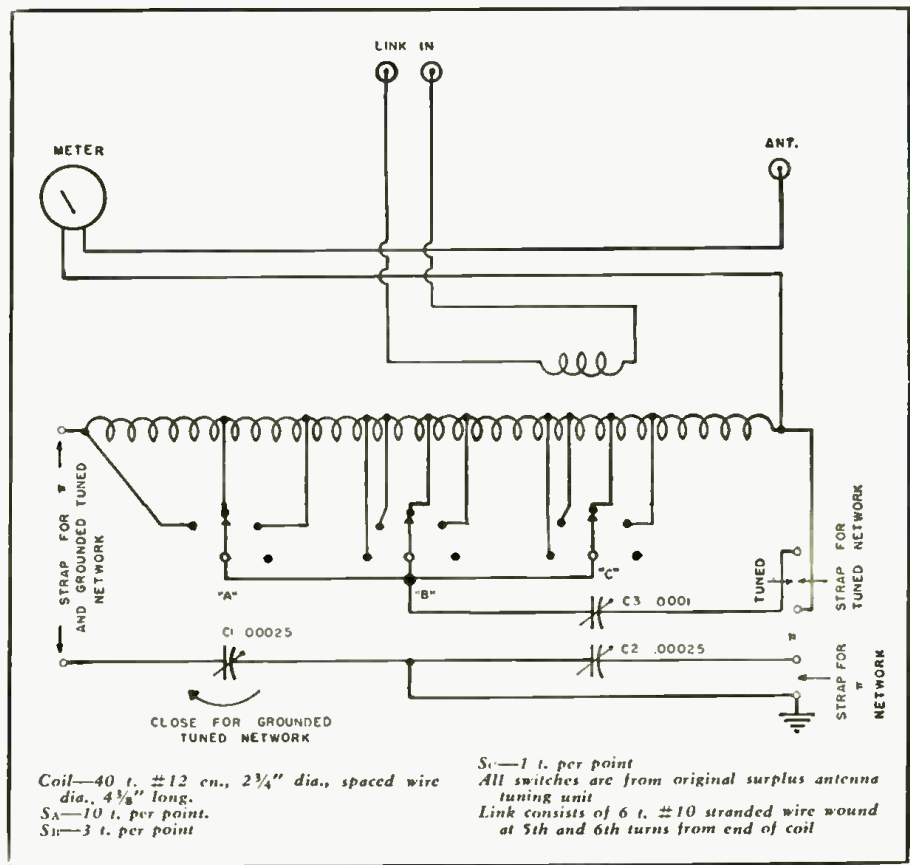
functions either as a tuned circuit, grounded or ungrounded, for feeding half-wave antennas, etc., or as a pi network to match random lengths of wire or other radiators to the transmitter.

The two pi-network condensers  $C_1$

and  $C_2$  are each 250  $\mu\text{mf}$ d. while the tuned circuit condenser is 100  $\mu\text{mf}$ d.

Attention is called to the left-hand condenser associated with the pi network in the diagram. This condenser has the tip of one rotor blade bent over  
(Continued on page 169)

Fig. 2. Wiring diagram. The unit functions as a grounded or ungrounded tuned circuit.



# A Low-Capacity INSTRUMENT PROBE

By  
E. G. LOUIS

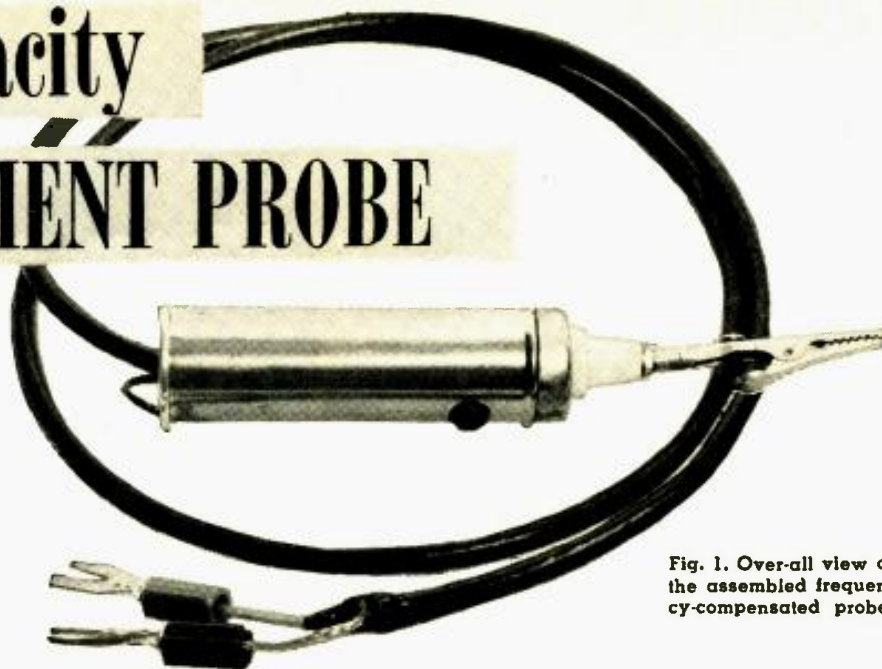


Fig. 1. Over-all view of the assembled frequency-compensated probe.

**M**ANY electronic test instruments, though possessing a comparatively high input resistance have, at the same time, a moderate-to-high input capacity. While this, ordinarily, is not a disadvantage when the instrument is used in low impedance circuits or to check signals of narrow bandwidth, severe waveform distortion, with resulting inaccuracy of measurement, may result when the instrument is used either in high impedance circuits or to check signals of broad bandwidth. A steep double pulse, as shown in Fig. 4A, may become distorted as shown in Fig. 4B when the instrument is connected to the circuit under test. Not only is the waveshape severely distorted, but the peak amplitude is reduced. If used in high-frequency circuits, an instrument having high input capacity may cause severe detuning and loss of gain.

The input capacity of a test instrument is made up, generally, of distributed wiring capacities, while the input resistance may be the grid resistance of a tube, the total resistance of a tapped voltage divider, or the resistance of an input potentiometer. In Fig. 2A, we may refer to the input capacity as  $C_i$  and the input resistance as  $R_i$ . The instrument may be a v.t.v.m., a CRO, a frequency meter, or similar test device.

To minimize the effects of high input capacity, the technician or engineer will generally connect an "isolating" resistor in series with the "hot" input lead of the instrument, as shown in Fig. 2B. In some cases a small capacity condenser will be used instead of a series resistor. The resistor is shown as  $R_s$  in Fig. 2B. If a small condenser is used instead, it may be represented as  $C_c$  in Fig. 2B.

Either expedient may give satisfactory results, provided signals of a single frequency and approaching a sine wave in form are being checked, and provided the voltage division action which occurs between the series resistor (or condenser) and the input impedance of the instrument is taken into account when interpreting results.

*This easy-to-build probe can be used with any scope, v. t. v. m., frequency meter, or other similar types of test equipment.*

However, where complex signals exist, either method will result in more severe, rather than less, distortion and inaccuracy.

Should  $R_s$  be used alone, this series resistance will form an integration or low-pass filter network in conjunction with  $C_i$ , causing severe attenuation at higher frequencies and considerable rounding of sharp wavefronts.

On the other hand, if a series condenser,  $C_c$ , should be used alone, and its impedance is high compared to the input resistance of the instrument,  $R_i$ , these two components may well form a differentiation or high-pass filter network. Such a circuit will cause excessive "peaking" of complex signals and severe attenuation at lower frequencies.

To overcome the difficulties encountered when either a series resistance or capacitance is used alone, a combination of the two may be employed to form a frequency-compensated low-capacity test probe. The schematic diagram of such a probe is given in Fig. 3, while the assembled instrument is shown in Fig. 1.

## Circuit Description

The low-capacity probe consists simply of a resistor and condenser con-

nected in parallel and mounted in a shielded container, with a shielded coaxial lead between the probe and the test instrument with which the probe is used. The capacity of the shielded lead is added to the input capacity of the test instrument,  $C_i$ , and this is compensated for by the probe itself. Although this precludes the "ideal" in reduction of input capacity, it is a mandatory step if the effects of body capacity and stray coupling are to be eliminated.

Basically,  $C_c$  (Fig. 3) and  $C_i$  (input capacity of the instrument plus the capacity of the coaxial lead to the probe) form a simple capacitive voltage divider which is shunted by a resistive voltage divider made up of probe resistance  $R_s$  and the instrument input resistance  $R_i$ . Thus, the low-capacity probe acts to reduce or attenuate the input signal as well as to reduce the input capacity of the test instrument. However, this attenuation may be easily calculated, and, more important, is constant for all input frequencies. In addition, the low-capacity probe does not change the waveshape of the signal, so that the signal applied to the input of the test instrument, though smaller in amplitude, is an exact replica of the signal applied to the input of the probe.

In addition to reducing the input capacity of the test instrument, the use of the low-capacity probe also increases the input resistance, providing a true "high impedance" input.

The reduction of input capacity and increase in input resistance are directly proportional to the degree of attenuation. As an example, if the test instrument alone has an input resistance of 1 megohm and an input capacity of 50  $\mu\text{fd.}$ , the use of a low-

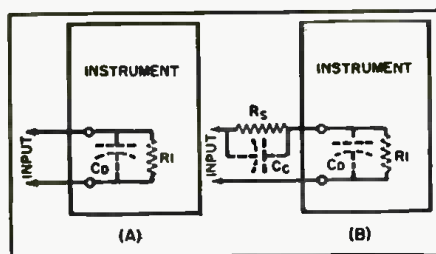


Fig. 2.

capacity probe giving an attenuation of 10:1 permits an input resistance of 10 megohms with an input capacity of only 5  $\mu\text{fd}$ .

### Construction Hints

Condenser  $C_1$  may be a 3-30  $\mu\text{fd}$ . or 5-50  $\mu\text{fd}$ . mica or ceramic trimmer. The exact size is not important as an adjustment will be made after the probe is assembled. Resistor  $R_2$  may be either a  $\frac{1}{2}$  w. or 1 w. non-inductive (carbon) resistor. The size is determined by the input resistance of the instrument with which the probe is to be used and the reduction in input capacity desired. It may be determined by using the following formula:

$$R_2 = R_1 (C_b/C_1)$$

where  $R_1$  is the input resistance of the instrument,  $C_b$  is the input capacity of the instrument, plus the capacity of the coaxial lead, and  $C_1$  is the desired input capacity.

As an example, let us suppose that two feet of a coaxial cable having a capacity of 10  $\mu\text{fd}$ .-per-foot is used between the probe and the instrument, and that the instrument has an input capacity of 25  $\mu\text{fd}$ ., with an input resistance of 1 megohm.  $C_b$  becomes  $2 \times 10$  plus 25, or 45  $\mu\text{fd}$ .

If the input capacity desired is 5  $\mu\text{fd}$ ., then  $R_2$  becomes:

$$R_2 = R_1 (45/5) = 1(9) = 9 \text{ megohms.}$$

The degree of attenuation achieved with the probe may be determined by using another simple formula:

$$\text{Attenuation Ratio} = (C_b + C_1)/C_1, \text{ or}$$

$$\text{Attenuation Ratio} = (R_2 + R_1)/R_1.$$

In the example given, the attenuation ratio becomes 10:1.

From this it can be seen that a coaxial cable having low distributed capacity must be used, and that the length should be kept as short as practicable if maximum reduction in capacity together with a minimum degree of attenuation is to be achieved. Often, however, it is necessary to make a compromise between attenuation and desired input capacity.

The shielded housing for the probe

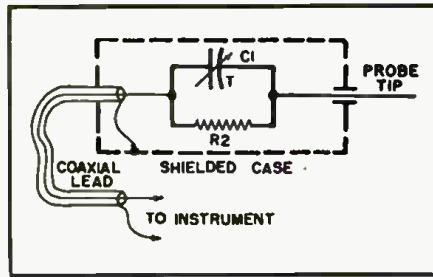


Fig. 3.

( $C_1$  and  $R_2$ ) may be a metal tube or box. A hole should be provided in the side of the case so that  $C_1$  may be adjusted with a small screwdriver or alignment tool after the probe is assembled.

In the model shown in Fig. 1, an old bouillon cube box was used for the case. A cylindrical metal pill box could also be used. Printing and paint may be removed by using solvent, steel wool, cheese cloth, and liberal quantities of elbow grease.

If a suitable trimmer condenser is not available for use as  $C_1$ , a small fixed mica or ceramic condenser may be used instead, shunted by two pieces of insulated wire twisted to form a "gimmick" condenser whose value can be easily varied (either by reducing the length of the wires or changing the "tightness" of the twist).

### Adjustment and Calibration

After construction of the probe unit is completed, connect the coaxial lead from the probe to the input terminals of a CRO. Shunt the input terminals of the CRO with sufficient additional capacity and resistance to simulate the input capacity and resistance of the instrument with which the probe is to be used. If it is intended to use the probe with the CRO, do not use any additional resistance or capacity.

Connect the probe tip to the output terminal of a square-wave generator and run a ground lead between the square-wave generator and the CRO.

Adjust the square-wave generator to deliver a signal having a pulse repetition rate of from 15,000 to 75,000 pps. The exact frequency is not im-

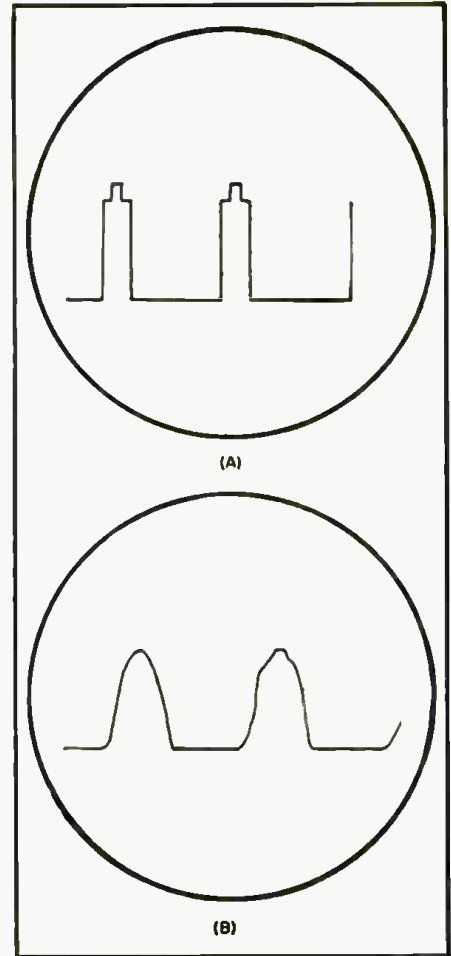


Fig. 4.

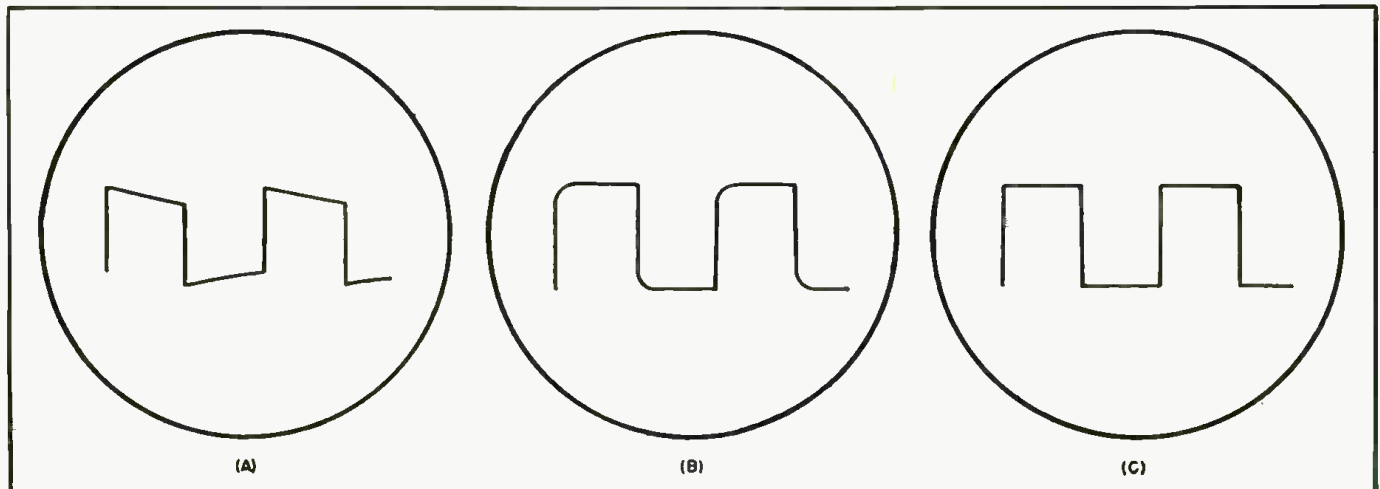
portant. Adjust the CRO controls until two or three complete cycles of the square wave can be observed.

Should the square-wave signal appearing on the screen of the CRO be peaked, as shown in Fig. 5A, the capacity of  $C_1$  must be reduced. Use an insulated alignment tool for this adjustment.

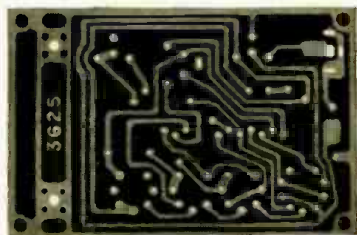
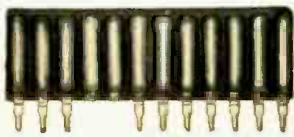
If the square-wave signal is badly rounded, as shown in Fig. 5B, the capacity of  $C_1$  must be increased. Again, an insulated alignment tool must be used.

(Continued on page 168)

Fig. 5.



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The Model SP-5 was designed to simplify phasing each speaker in a multiple speaker installation. In addition, it will perform the following functions: switch monaural and stereo signals into the same amplifiers and speakers; switch broadcast stereo and stereo tape or disc signals into the same amplifiers and speakers; and switch broadcast stereo, stereo tape or disc and monaural signals into the same amplifiers and speakers.

The unit plate is gold embossed brass for mounting on the hi-fi panel. It comes complete with matching hardware and installation instructions.

### STEREO TAPE DECK

Webster Electric Co. of Racine, Wis. has just introduced a new stereo tape deck which was developed for the "do-it-yourself" enthusiast as well as for audiophiles who wish to modernize their present hi-fi setups.

The "Ekotape 340" is controlled by means of two knobs. With accessories, the unit can record or play back stereo as well as monaural program material. The circuit features the company's special "monomatic" central control which eliminates tape loops. The "on-off" switch and speed control have been



combined to neutralize the drive mechanism when the machine is turned off.

The company is also offering a companion stereo record-playback preamp for use with the new tape deck. It provides a tone and volume control center, with knobs and meters for each channel.

For full specifications on the deck and its preamp, write direct to the manufacturer.

### "KNIGHT-KIT" 18-WATT AMPLIFIER

Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill. has just released a new 18-watt amplifier in its "Knight-Kit" line.

Featuring the use of an exclusive printed-circuit switch and two printed circuit boards, construction is greatly simplified for kit builders since most of the complex wiring is already completed.

Employing RCA's new 6973 audio output tubes, the amplifier delivers a full 18 watts output at only .5 per-cent distortion. Hum level is better than 60 db below rated output and frequency response at 18 watts is  $\pm 1$  db from 20 to 30,000 cps.

Eight inputs are provided on the amplifier for every possible signal source, including NARTB-equalized tape head input. A total of seven record equalization settings are offered plus tape head

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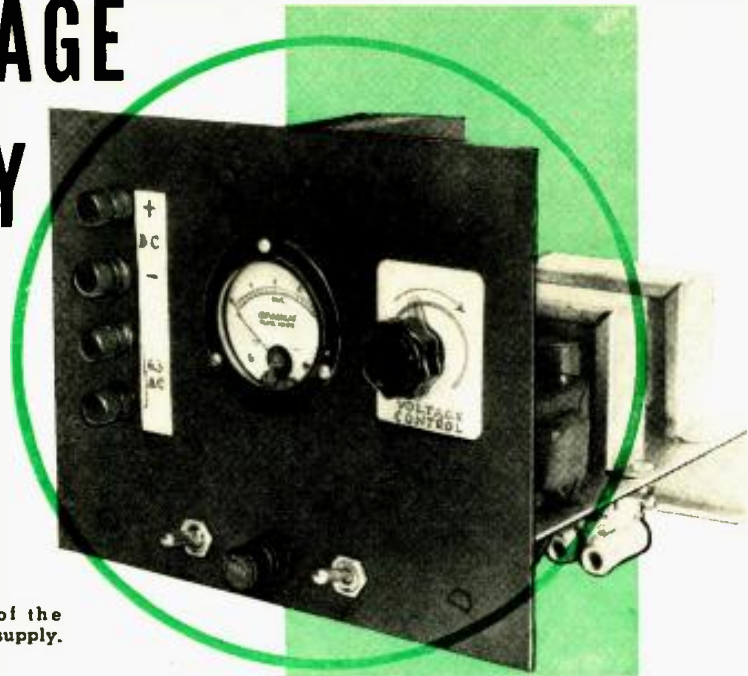


# A VARIABLE-VOLTAGE POWER SUPPLY

By  
RICHARD GRAHAM

**A** VARIABLE-voltage power supply is one of those basic pieces of equipment which every experimenter and ham can use to good advantage. Such a device needs no introduction or build-up concerning its utility. However, for reasons of economy, time, and perhaps a little ignorance, the author has struggled along for years putting resistors in series with a 400-volt supply to get the desired voltage drop to a piece of equipment under test. The net result of all this is a box of charred and burned resistors whose value, both monetary and ohmic, is dubious! This needn't have happened since a variable-voltage power supply can be built both easily and economically. The power supply described is capable of delivering any voltage up to 650 volts d.c. at any current up to 100 ma. and the cost is actually only pennies more than the equivalent fixed voltage power supply. Except for the 2D21 thyratrons which can be purchased for approximately three dollars for the pair, most of the

Over-all view of the variable-voltage supply.



*Build this handy service unit which uses a pair of 2D21 thyratrons to control the output voltage.*

components will probably be found in the junk box.

The use of these small thyratrons for the dual purpose of control and rectification is undoubtedly the most economical and efficient method of obtaining a varying voltage output. This fact has long been known in industry where thyratrons, and their big brothers—ignitrons, have been used for years in applications requiring an easily-controllable output current or voltage.

There are two other general methods of obtaining a variable voltage, namely, through the use of a variable transformer such as a Variac and the series-tube method. The former is a very convenient and efficient method;

however, its cost is rather high. The latter method, which uses a tube in series with the high voltage to drop the voltage according to the bias on the tube, has the disadvantages of high cost, increased complexity, and inefficiency.

This leads us back to the grid-controlled gas tube or thyatron. As a gas tube it has all the advantages of the gas rectifiers such as the 83, 816, and 866. Its low internal drop provides better regulation, higher efficiency, and a higher current-carrying capacity for a given tube size. The 2D21 has a glass envelope the same size as the seven-pin miniature 6J6 or 6AU6 tubes.

The 2D21 thyatron used in this power supply is classified as a gas tetrode, however the functions performed by the grids in this tube have no counterpart in the tetrode vacuum tube. For example, the second grid, commonly known as the screen grid in a vacuum tube, is called the shield grid in a gas tube. This element actually surrounds the cathode and plate and, in the 2D21, looks very similar to the plate construction in the ordinary vacuum tube. The shield grid is connected directly to the cathode so that the electrons collected by the shield can return to the cathode without affecting the control grid.

The control grid in the gas tube does not have the ability to control the plate current as in a vacuum tube. Instead the control grid determines, according to its voltage, the plate voltage at which the tube will suddenly conduct. Once the tube is set into conduction the plate current is determined solely by the external

Fig. 1. (A) The a.c. applied to plate of 2D21. (B) Grid voltage. (C) Waveform across one of 2D21's. (D) Waveform from cathode-to-ground.

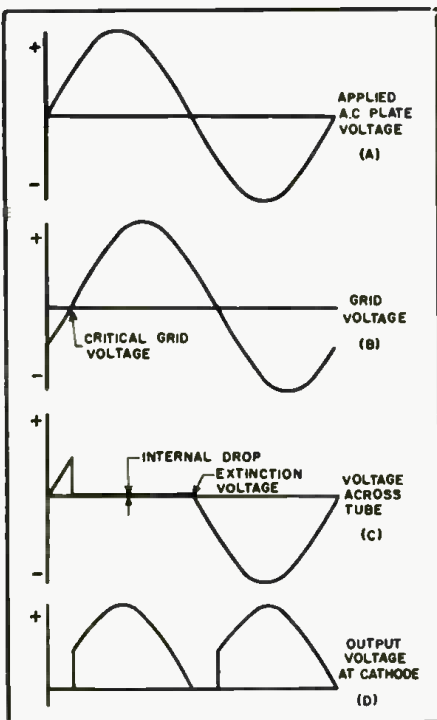


Fig. 2. Comparison of a rectifier fully conducting and one partially conducting and their respective direct-current levels.

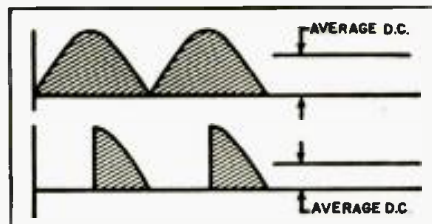
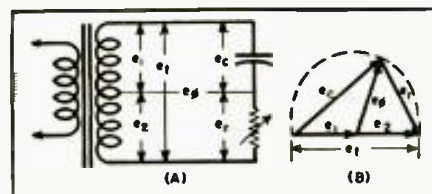


Fig. 3. (A) Basic circuit of the phase shifter. (B) Vector diagram of phase shifter.



load and the plate voltage. The grid loses all control. Thus the tube acts as a switch or, more exactly, like a high speed relay. If a.c. is applied to the plates as in rectifier service, then conduction through the tube must cease when the plate voltage drops to zero and goes through the negative half of the cycle. Thus, control is restored to the grid on the positive portion of the next half cycle; control in this case meaning the ability to determine whether the tube conducts fully or not at all. There is no "in between" with gas tubes.

By varying the point on the applied a.c. plate voltage cycle at which the grid voltage causes conduction, the average d.c. voltage at the thyatron cathode can be varied. This can be more clearly seen by studying Fig. 1. The a.c. applied to the plate of the 2D21 is shown in Fig. 1A. The grid voltage is shown in Fig. 1B. Note that the grid voltage is actually a sine wave, the same as applied to the plate, but the phase is different. Using the plate voltage as a reference, the grid voltage is depicted as lagging. If we assume that the tube will fire at zero grid volts, then by keeping the grid negative until it is desired to fire the tube, we can control the amount of time during the plate-voltage cycle that the tube will conduct. The grid can be kept negative until the desired time by simply shifting the phase of the grid signal in relation to the plate voltage. By varying the phase relationship of the grid and plate voltages from 0° (when both are in-phase) to 180° (when grid and plate voltages are in exact opposite phase) the point along the a.c. plate voltage at which the tube will conduct can also be varied. This basically is what is done in the power supply described. Fig. 1C shows the waveform across one of the 2D21's (from plate to cath-

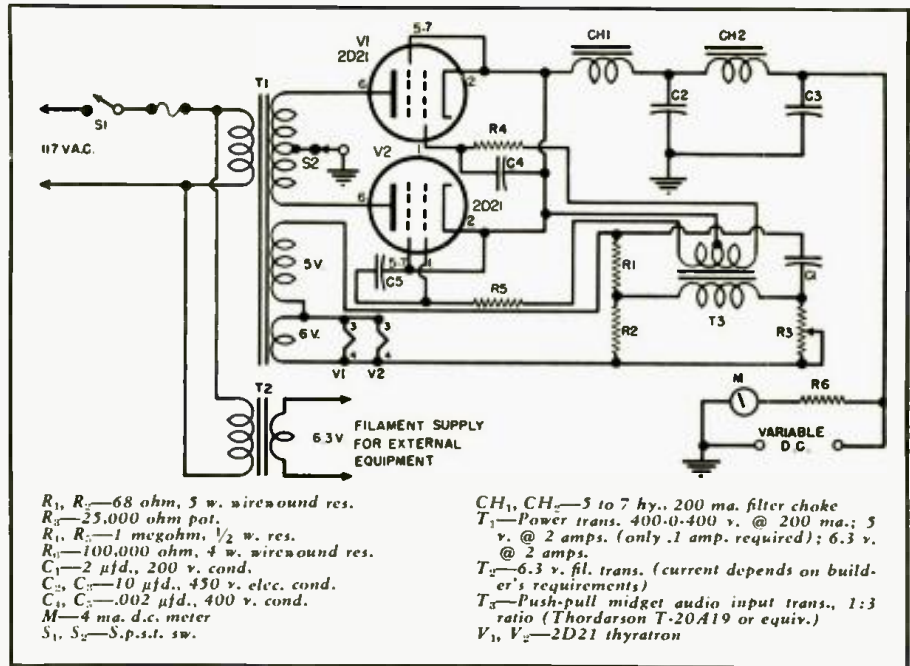


Fig. 4. Complete circuit diagram and parts list covering the variable-voltage supply.

ode). Here we see that the plate voltage rises across the tube, i.e., it is not conducting, until the tube is fired. The plate voltage then drops to a very low value, as determined by its internal resistance. Fig. 1D depicts the waveform from cathode to ground at the 2D21's. This waveform is the result of two thyratrons in a full-wave circuit, therefore the frequency of the d.c. pulses is twice that of the a.c. voltage applied to the plates. The average d.c. is proportional to the area of these "pulses" over a cycle. A comparison of a rectifier fully conducting and one only partially conducting and their respective average d.c. levels is shown in Fig. 2.

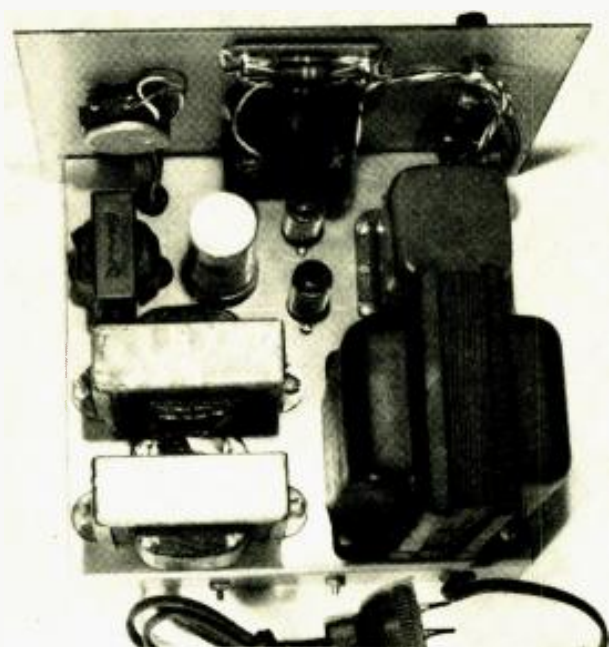
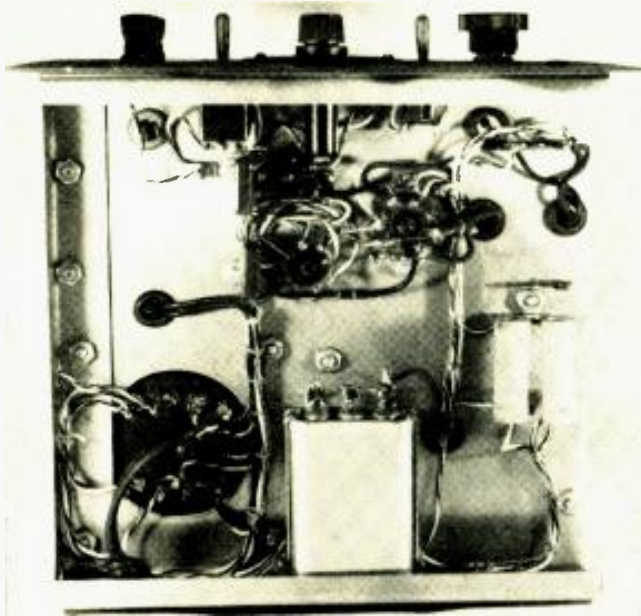
The method of phase shifting the

voltage on the grids of the 2D21's is not basically new, however it is still quite unique. The basic circuit of the phase shifter is shown in Fig. 3A. The transformer is center-tapped, therefore  $e_1$  equals  $e_2$  and  $e_1 + e_2 = e_r$ . The voltage  $e_r$  is also impressed across the capacitance and resistance in series, thus vectorially  $e_r = e_c + e_r$ . Since  $e_c$  is 90° out-of-phase with  $e_r$ , the vector diagram shown in Fig. 3B can be drawn. The variable-phase voltage  $e_d$  is then the voltage appearing between the center-tap of the transformer and the junction of the resistor and condenser. This is shown in Fig. 3B. Thus by varying the resistor in this circuit, any angle of phase shift from 0° up to

(Continued on page 120)

Bottom view of the home-built variable-voltage power supply.

Top view shows the uncrowded chassis layout of power supply.



# A TWO-STATION INTERCOM

By  
J. P. WENTWORTH

*Build this handy two-way "conversational" system for your home. No push-to-talk switch is needed.*

**A**N intercommunication system has proved itself a valuable addition to many homes. It is a great convenience, for instance, for the housewife to be able to answer the doorbell, "eavesdrop" on the nursery, or talk with her husband in the garage or workshop, without leaving the kitchen. The utility of an intercom would be greatly increased, however, if the inconvenient push-to-talk switch could be eliminated, and the instrument made "conversational," i.e., of such nature that one merely talked or listened, without having to perform any manual operation.

A basic two-station intercom circuit is shown in Fig. 1. A signal picked up by speaker A is amplified by  $V_{1A}$  and  $V_{2A}$ , and is radiated by speaker B; while sound picked up by speaker B is radiated by speaker A, after amplification by  $V_{1B}$  and  $V_{2A}$ . The only trouble with this circuit is that it won't work. The signal fed into the amplifier by speaker A will not stop at speaker B, but will continue through  $V_{1B}$  and  $V_{2A}$ , causing the system to oscillate.

Some means, then, must be provided to prevent the signal from traveling completely around the circuit and causing regeneration. This could be accomplished, of course, by including a switch in the output of each station, to complete the circuit only when a transmission is being made, but this would bring us right back to the push-to-talk switch that we are trying to eliminate. However, we can accomplish the same thing by letting the signal perform the switching function automatically, as in the circuit shown in Fig. 4.

Before analyzing this circuit, let us consider one other factor which will affect the performance of the system. It will be noticed in Fig. 1 that when the speaker is used as a microphone, it is working into a load consisting of the dynamic plate resistance of  $V_2$  in parallel with the grid resistor of the following stage. Whereas the loading due to the tube will be negligible if a pentode or beam-tetrode output tube is used, a triode will load the circuit quite heavily. Moreover, there will be a heavy d.c. current drawn through

the primary of the output transformer, regardless of the type of output tube used, and the efficiency of the transformer will be somewhat lowered. For these reasons, it would be well to interrupt the current in the output tube when the speaker is being used as a microphone.

The circuit shown in Fig. 4 operates as follows. Normally,  $V_1$  is conducting, with a 3-volt bias between grid and cathode, as established by the voltage divider,  $R_1$ - $R_2$ . Since the correct value of  $R_1$  which will provide this bias will depend on the magnitude of the voltage supplied by the negative rectifier, and since this voltage will vary, due to tolerances in  $R_{10}$ ,  $C_1$ , and  $C_2$ , the value of  $R_1$  can best be selected by trial. If desired, a 500-ohm rheostat may be used and adjusted to provide a 3-volt bias.

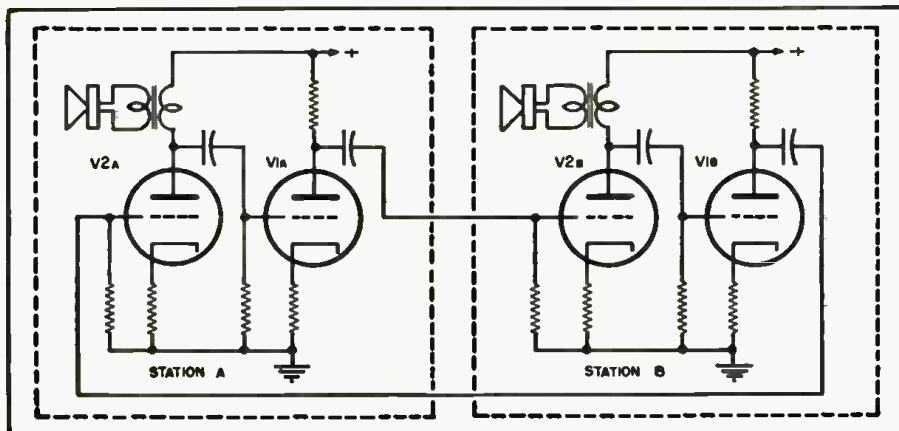
With  $V_1$  conducting, the voltage at its plate and hence the grid bias voltage of  $V_2$ , will be several volts negative with respect to ground.  $V_2$ , therefore, will be cut off and the plate resistance of  $V_2$  will not load the speaker, which is now functioning as a microphone. The network composed of  $R_2$  and  $C_2$  keeps the signal at the plate of  $V_1$  from causing  $V_2$  to conduct intermittently.

When a strong signal arrives at the station, the diodes of  $V_1$  rectify the signal, charging  $C_1$  in such a direction as to cut off  $V_1$ , thereby preventing the signal from passing through the station and out onto the line. At the same time, the plate of  $V_1$  rises to ground potential, and  $V_2$  is allowed to conduct, delivering the incoming signal to the speaker.

To insure privacy, the muting switch  $S_2$  may be incorporated to disable the outgoing circuit until it is desired to make a transmission. It is worth noting, however, that the use of this switch is optional. Once the switch has been thrown, it does not require continual manipulation, as in the case of the conventional push-to-talk switch. Since no volume control is provided in the grid circuit of  $V_1$ , a limiting resistor  $R_3$  is included to prevent blocking on signal peaks.

The initial cathode bias on  $V_1$  will establish a threshold voltage which

Fig. 1. Basic circuit of a two-station intercom without the push-to-talk switch. The unit as it stands now without a switch would, of course, be regenerative, causing oscillation. The author has used this fundamental circuit as the basis of his two-station intercom unit (Fig. 4) without a push-to-talk button. The problem of oscillation has been completely eliminated in the final version of the circuit.



must be exceeded before the diodes will rectify. This feature prevents operation of the circuit on hum or noise pickup on the input line. A fraction of a second time delay is introduced in incoming signals by the time required to discharge  $C_2$  through  $R_2$ , while a small delay is introduced in outgoing signals by the combination,  $C_1$ ,  $R_1$ , and  $R_3$ . For this reason, the time constants of these circuits should be kept fairly low, although the  $R_2$ - $C_2$  filter must have a long enough time constant to be effective in smoothing the lowest frequencies passed by the amplifier.

If desired, greater sensitivity can be obtained through the use of a push-pull output transformer, as shown in Fig. 2. The "B+" tap should be connected to the plate of the output tube, while one of the plate leads should be connected to "B+", and the other plate lead should be connected to  $C_1$ . This arrangement will provide a gain of about 6 db over the circuit shown in Fig. 4.

Since the power line is used as a return for the signal, care must be taken to use the same power line for "B-" at both stations. Of course, normal precautions should be taken not to ground the chassis, as in the case of any a.c.-d.c. equipment.

The condenser-resistor combination  $C_1$ - $R_1$  serves to isolate the chassis from the power line, but it still is advisable not to have any exposed metal parts on the completed unit with which a person, particularly a child, might come in contact. The insulation between the chassis and the common "B-" lead can easily deteriorate with age and humidity, leading to a severe shock hazard. Make sure that electrolytic condenser cans are insulated from the metal chassis. The complete unit can be mounted in a wooden cabinet, or may be built-in at a suitable location in the kitchen, basement, or wherever the stations are to be located.

If one of the units is used to "answer" the front or back doorbell, the chassis may be placed inside the house and only the speaker mounted outside, assuming that it is adequately protected from the weather. If possible, it should be located at about the height of a normal person's head, or perhaps a little higher. Sometimes a small speaker can be incorporated with the porch light. The leads to the speaker must be kept as short as possible and should be well-insulated, since they are not only at "B+" potential but are effectively at line potential, being isolated only by an electrolytic condenser,  $C_6$ .

A more convenient, if somewhat more complicated, circuit is shown in Fig. 3A. With the filaments wired as shown in this circuit, it is possible to turn both stations either on or off by throwing the switch at either station. Since there is no pilot-light tap in the 25Z6 filament, a type NE-45 light may be used as a pilot light, connected between the cathode of the rectifier tube and the "B-" bus. This light will

glow only after the filaments have heated and the intercom is ready for operation. By using a double-pole, double-throw switch, as shown in Fig. 3B, one can eliminate the need for properly orienting the power plugs, since the proper polarity is automatically selected when power is applied.

Although the output impedance of each station is fairly low, it may be found that a cathode-follower output stage is needed, if the distance between stations is great. In this case, the 6SR7 can be replaced by two 6ST7's with filaments in parallel, or the 12SR7 can be replaced by two 6ST7's with filaments in series. The circuit parameters shown in Fig. 4 would remain the same, while a cathode resistor of about 10,000 ohms would be suitable for the cathode follower.

For those who wish to experiment further, it is probable that an alternate circuit could be devised, using relays to perform the switching functions, instead of biasing the triode to cut-off.

Whether the reader builds the comparatively simple unit shown in Fig. 4 or incorporates all of the suggested refinements, this system will repay the builder many times over in added convenience and the saving of time and steps. Two-story houses or homes with basement work areas are "naturals" for this type of installation as countless trips up and down stairways can be eliminated by the strategic placement of such intercoms.

-30-

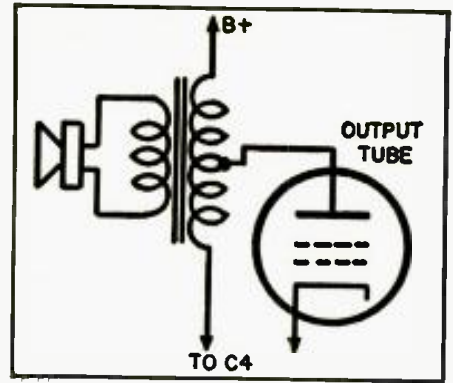


Fig. 2. Circuit using a push-pull output transformer to provide more sensitivity.

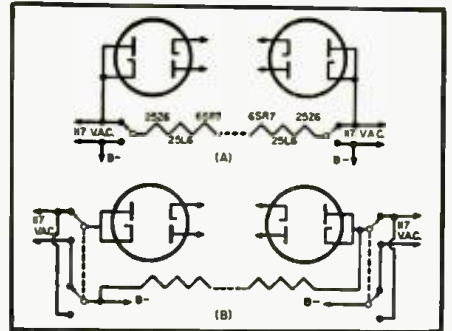
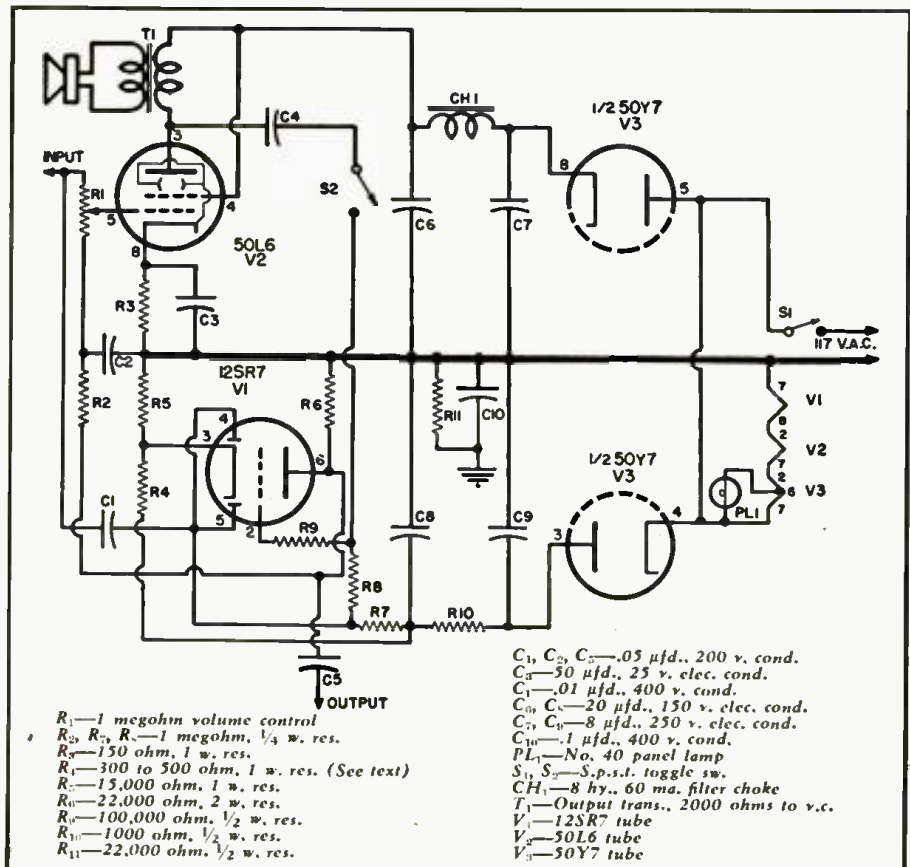


Fig. 3. Optional switching circuits for the two-station system. (A) A more elaborate system than that shown in Fig. 4 which permits both stations to be turned on or off by throwing a switch at either station. (B) Use of a double-pole, double-throw switch eliminates the need for properly orienting the power plug.

Fig. 4. Complete schematic diagram and parts list for the home-built intercom. Two of these units will be required to set up a two-way "conversational" system.



# MAC'S RADIO SERVICE SHOP

By JOHN T. FRYE



## WEATHER AND FRINGE RECEPTION

SINCE Barney was a little late this September morning, he had hoped that Mac, his boss, would also be slow about getting down to work; but he had no such luck. When the boy stepped inside the shop, the first thing he saw was Mac poring over a map spread out on the service bench.

"Planning a vacation?" Barney asked brightly, hoping to divert attention from the clock.

"Not exactly," Mac said slowly as he glanced at his wrist watch. "In fact, I am thinking about taking my vacation as you do yours in the form of a half hour or so chopped off the front end of every working day."

"It won't happen again," Barney mumbled as he buttoned his shop coat collar around the tide of crimson that swelled up through his neck and spread over his freckled face; "but what kind of a funny map is that?"

"It's a daily weather map prepared by the U. S. Weather Bureau at a subscription price of sixty cents a month. I ordered it from the Superintendent of Documents, Government Printing Office, Washington, D. C. As you can see, this main map gives you the weather observations taken at hundreds of reporting stations all over the United States at 1:30 a.m. (EST). Each station gives such things as barometric pressure, temperature, dew-point, wind direction and force, precipitation, and types of clouds overhead, if any. In addition, fronts are shown, the movement of low centers are indicated, and high pressure areas are revealed. If you want to know how the weather is developing, the smaller map in the upper left-hand corner shows the position of lows and highs and fronts twelve hours before. Directly below this is another

small map that is called a '700-Millibar Constant Pressure Chart.' It reveals weather conditions in the upper reaches of the atmosphere. The small map at the bottom center shows the highest and lowest temperatures recorded for the preceding twenty-four hour period at about 175 stations distributed over the country. To the right of this is still another map showing the precipitation areas and the amount of precipitation that fell during the same period. Complete instructions for reading the weather maps are given on the back."

"You going into the weather forecasting business?"

"No, but I decided about six months ago that I was going to try and discover if there was any predictable connection between weather conditions and TV reception in this ultra-fringe area. In addition to studying these maps, I have also been keeping a diary in which I record the pressure indicated by my own barometer, the temperature, whether or not there is cloud cover, other general remarks on the weather, and finally the quality of TV reception on that date. If the picture is sharp, distinct, free of snow, and cannot be shaken by ignition interference, I call it *good*. If it is occasionally blurred by snow but never actually disappears or loses sync, I call it *fair*. If it entirely disappears in the snow at times, or if the voice disappears, or if the picture rolls, I mark it *poor*. When the weather map is received, the kind of reception for that particular date is marked on the margin of the map. Then I study these maps and try to draw some general conclusions."

"Go on; let me see you draw one right now," Barney urged.

"Not so fast," Mac said with a grin. "The first thing I did was to disprove to my own satisfaction some of the theories I have heard propounded about TV reception. For instance, some people say reception is good when the barometer is high; others, when it is low. Well, I have recorded very good reception when the barometer stood at 29.26 inches and again when it was at 30.4. I have also had poor reception over a range of 29.6 to 30.5 inches. Excellent pictures have been received when the weather was cold and clear as a bell and again when it was muggy and pouring down rain—and *vice versa*."

"Then you decided that there is no connection between barometer readings, etc., and TV reception."

"I did not say that. I do contend, though, that the relation is not a simple one like, 'The higher the barometer reads, the better reception will be.'"

"No," Barney said with a sigh, "nothing, but *nothing*, connected with radio or TV is ever that simple."

"It *does* seem that way sometimes," Mac said with a sympathetic chuckle. "At any rate, I wrote the Weather Bureau and asked for some information about weather factors affecting TV signals. Mr. Harry Wexler, Chief of the Scientific Services Division, gave me some excellent pointers and recommended some books and periodicals for further reading. After wading through these, I am beginning to get a faint glimmer of what to look for in my weather maps."

"Let's not make a production out of this," Barney said impatiently; "what do you look for?"

"First, let's review a little," Mac suggested. "You should know from your ham background that the layer of atmosphere upward to a height of six miles from the surface of the earth is called the *troposphere*. Under standard conditions the temperature drops about 3.5 degrees for every 1000 feet you go upward until a temperature of  $-58^{\circ}$  F. is reached at the top. It is in this troposphere that weather phenomena take place; and as I'll explain later, conditions in the troposphere have the most to do with TV reception."

"The next layer of atmosphere, from six to fifty miles above the earth, is called the *stratosphere*. The temperature throughout this layer is approximately  $-58^{\circ}$ . It is believed that the stratosphere has very little effect on television reception."

"Finally, extending from 50 to 190 miles above the earth is the *ionosphere*, consisting of stratified layers of gases ionized by the action of the sun. These layers, of various densities and thicknesses, tend to bend downward any radio waves entering them at an angle from below. The more dense the layer and the longer the wavelength of the signal, the greater is the bending; and in the case of the lower radio frequencies, the ionosphere returns most of them to earth. High frequency TV signals, though, are returned in strength

(Continued on page 158)



# International

# SHORT-WAVE

Compiled by KENNETH R. BOORD



IT IS a pleasure to dedicate the September issue of the *ISW DEPARTMENT* to *Radio-Omroep Nieuw-Guinea* (*Radio Hollandia*), at Hollandia, Dutch New Guinea. Thanks go to David A. Dary, Kansas, who secured this interesting story exclusively for us from D. Van Os, Director of Programs at the station. The piece was written by Claude Belloni, an assistant to Mr. Van Os.

"In the crystal-blue waters of the Pacific, stretching out vastly in front of the biggest island in the world, there is a tiny coral island which belongs to the western part of New Guinea—Biak. It is the birthplace of a broadcasting station.

"Every U.S. flier, marine, or soldier who fought the bloody war in the Pacific from the beginning will recall the island of Biak. Well-situated as it was for the grasshopping Allied warfare technique, it fitted nicely into the chain of stepping stones which ultimately ended in front of Japan. Here on Biak, U.S. forces built on tiny coral-polyps huge bomber runways from where the Japanese were pounded and driven back. It was one white pattern of 'endless' airstrips bordered and used by thousands of planes.

"On this island, too, *Radio-Omroep Nieuw-Guinea* was born. She was not named 'R.O.N.G.' then—just YDZ. And her studio was just a tiny shack, left behind by U.S. Forces, from where two radio amateurs—sergeants-major in the Netherlands Army—began to broadcast short musical programs with a 350-watt output transmitter.

"Then, toward the end of 1950, it became clear that something should be done about the oncoming and important conference between the Dutch and Indonesian governments about the western part of New Guinea, which was claimed by the latter. Often not too friendly propaganda was heard over the *Indonesian Radio* concerning this matter. One of the chief purposes for installing a 'real' broadcasting station was to compensate for this propaganda from the *Republik Indonesia Serikat Radio* and give Dutch New Guinea the exact information about the conference.

"Thus, in September, the Biak amateur station was moved to Hollandia, capital city of Dutch New Guinea, and YDZ became government-controlled. *Radio-Omroep Nieuw-Guinea* was the new name—since by now she had grown up to become an adolescent.

"However, although there was plenty of space, there still was the question of where to build a studio. Finally, on Sentani airstrip at the foot of 7000-ft. Cyclop Mountain, a place was found suitable for this purpose. There was a concrete foundation, though with storage building on top. Huge piles of empty gasoline drums were stacked up there and had to be removed. And they were—one by one, and by hand only!

"And so, without much material but with much will to succeed, *Radio-Omroep Nieuw-Guinea* was created; in New Guinean style, of course, no big studios with beautiful interiors and up-to-date equipment—just 'soft-board blades,' cement, and a zinc-plate roof on top did the job.

"Still other difficulties were—and are—to be dealt with: The very poorly-equipped disc-library (of only 1000 second-hand records) needs new material desperately, technical equipment, and so on. One of the main difficulties is the long way to Holland, because nothing can be obtained in New Guinea itself.

"With population increasing, however, and interest in this forgotten country mounting, it is urgent that 'R.O.N.G.' should grow, too. That's why—toward the end of this year—*Radio-Omroep Nieuw-Guinea* will be

(Note: Unless otherwise indicated, all time is expressed in American EST; add 5 hours for GCT. "News" refers to newscasts in the English language. In order to avoid confusion, the 24 hour clock has been used in designating the times of broadcasts. The hours from midnight until noon are shown as 0000 to 1200 while from 1 p.m. to midnight are shown as 1300 to 2400.) The symbol "V" following a listed frequency indicates "varying." The station may operate either above or below the frequency given. "A" means frequency is approximate.

moved to Hollandia harbor where a new studio is to be built for her, and a new 3-kw. transmitter will replace the weak 350-watt job which is now in use. Then, as is sincerely hoped, there will be modern broadcasting service in a land where no more than ten years ago the Papuan population still lived in 'the stone age.'"

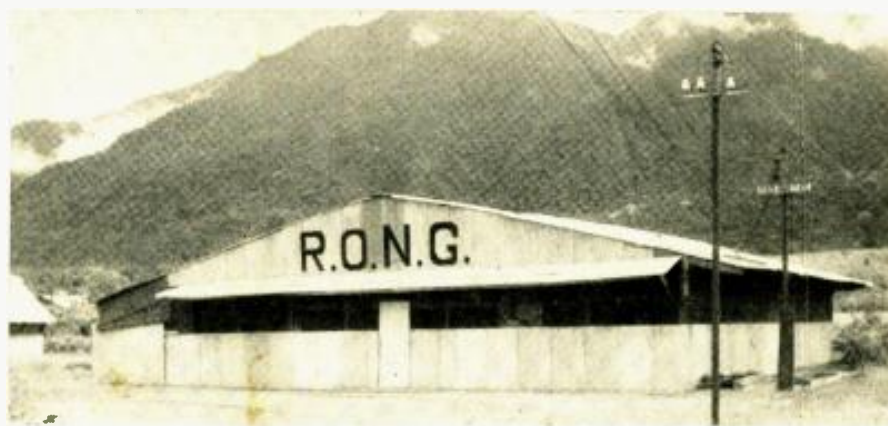
Additional information about *Radio-Omroep Nieuw-Guinea* from "World Radio Handbook" includes this: R.O.-N.G. is a division of the Government Information Service for the benefit of Dutch and native inhabitants of the western half of the island. Announcement is "Hier Radio-Omroep Nieuw-Guinea te Hollandia." Verification is by letter; program schedule is sent to overseas listeners free on request. Future plans call for extension of power and broadcasting hours with special programs to Indonesia and Holland. Opens with the "Washington Post March" and closes with the Dutch national anthem.

When this was compiled, R.O.N.G. was operating on 7.126 around 0415-0705A; overseas sources report the station soon will test on approximately 6.000.

If anyone has some good (not necessarily new) recordings (made at 78, 33, or 45 rpm), to donate to a worthwhile cause, please mail them direct to *Radio-Omroep Nieuw-Guinea*, Hollandia, Netherlands New Guinea. Your cooperation will be appreciated.—K. R. B.

New Guinea long has been known as the "second largest" island in the world, but more recently laid claim to  
(Continued on page 114)

A broadcast service in an old land is provided by *Radio-Omroep Nieuw-Guinea*, located at the foot of 7000 ft. Cyclop Mountain, near Hollandia, Dutch New Guinea.



# A REMOTELY-CONTROLLED

# AM TUNER

By

**C. RICHARD ELLIS**

Government Engineering  
General Electric Company

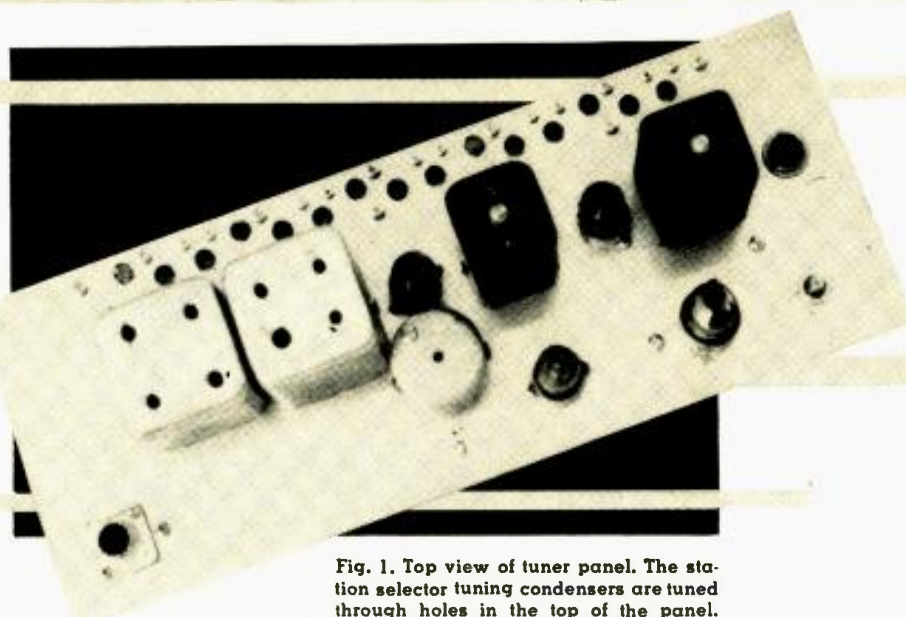


Fig. 1. Top view of tuner panel. The station selector tuning condensers are tuned through holes in the top of the panel.

*Five relays are used to permit the remote selection of five different stations. This same idea can be expanded to provide operation of other type units.*

**A** CUSTOM installation of radio, phonograph, and television equipment may be desired by a prospective customer because he appreciates the finer quality reception such an installation can give him. However, there may not be space available in his living room for the necessary audio amplifier, AM, FM and TV tuners, speaker enclosure, record player, and power supplies that a complete system demands. In the small apartment, probably the only solution is to limit the amount of equipment and to conceal it in expensive furniture which blends with the balance of the room's furnishings. Where basement or attic space is available, however, it may be more convenient to the owner to have only the speaker, TV screen, and record player in the living room, and place the rest of the equipment in a remote location.

The audio amplifier can be remotely located by running the inputs to it through low-impedance lines. The power supply can be placed near the amplifier and controlled by wiring to the living room. The tuners present a more difficult problem, and this article describes a solution for the AM case.

Continuous tuning of the remote receiver would perhaps be the ultimate to be desired. Some sort of motor tuning and repeat back indication would be necessary, leading eventually to a selsyn system. Since there are rarely more than a few AM and FM stations in any one locality, continuous tuning is an unnecessary luxury.

Several objectives were established for the AM tuner before construction began: It should receive five stations, remotely selected by means of relays, and it should be designed primarily for selectivity, with less resulting interference than broadband operation would give. It should be a superhet to reduce relay switching problems, and finally, it should be small physically.

### The Circuit

A schematic of the tuner built to meet the above objectives is shown in Fig. 3. To minimize hum problems in the detector and first audio stage, d.c. relays should be used. In addition, d.c. relays have less contact chatter than a.c. relays, and when the contacts are in the r.f. portion of the circuit, as these are, chatter cannot be tolerated. It is possible to obtain low capacity d.c. relays designed for use in r.f. circuits, and at some surplus stores, five such relays might be obtained. None was available to the author, however, so the relays shown in Fig. 2, mounted on the shelf, were used. They are small d.c. relays with a coil resistance of 10,000 ohms. Originally, the relays were double-pole, double-throw, but with a soldering iron and hack saw they were converted to double-pole, single-throw. The two contacts cut off were then bolted on the relay so that the final version was a triple-pole, single-throw unit. The three movable contacts are grounded on each relay, and the three fixed con-

tacts are connected to the three condensers, which tune each station, by bus wire, as can be seen in Fig. 2.

The variable condensers,  $C_1$  to  $C_{15}$ , are ceramic trimmer types having capacities of 7 to 45  $\mu\text{fd.}$  each. Three are used for each channel, one tuning the antenna coil, one tuning the mixer grid coil, and one tuning the oscillator coil. These coils are all standard broadcast band coils. The oscillator coil is of the tapped type for use with the 6SA7 or 6BE6 tubes. The tuning condensers are mounted on stand-offs along the top of the panel and are screwdriver adjusted through holes in the panel. Since these condensers have a maximum capacity of only 45  $\mu\text{fd.}$ , they will tune the broadcast band only from 1600 to 1000 kc. The tuner described here receives three stations in this range. The other two stations for which it is set up are between 500 and 700 kc. and this range is covered by placing 200  $\mu\text{fd.}$  fixed mica condensers across the 7 to 45  $\mu\text{fd.}$  variables. The range between 700 and 1000 kc. can be covered by placing 100  $\mu\text{fd.}$  fixed micas across the ceramics. These are not shown in Fig. 3.

No r.f. amplifier tube is used, because of the oscillation troubles arising when it is attempted to tune an r.f. stage with common relays. Instead, the same coils are used as in a normal r.f. amplifier stage, but condenser  $C_{10}$  is substituted for the r.f. tube. No gain is obtained in this way, but selectivity and image rejection are improved.

Referring to Fig. 1, the antenna and mixer grid coils are in the square aluminum cans on the left. The mixer tube is just to the right of these cans. Directly below the mixer tube is the oscillator coil, housed in a round aluminum can. To the right of the mixer

is the i.f. input transformer, the i.f. amplifier tube, and the i.f. output transformer. The transformers are iron-cored, and give high gain and selectivity.

The detector circuit, involving the 12AU7 located at the lower right in Fig. 1, is somewhat unusual. The circuit was suggested by Builder<sup>1</sup> and uses positive feedback of the audio modulation to reduce detector distortion. The audio is taken from the detector across  $R_{16}$ , Fig. 3, and the a.v.c. voltage from the junction of  $R_9$  and  $C_{26}$ . Listening tests indicate that this circuit works satisfactorily. No distortion measurements were made, however, and the constructor may desire to simplify this circuit by using the standard diode detector.

The final tube,  $V_4$ , is a 6AS6 dual control grid pentode located just below the i.f. input transformer in Fig. 1. Audio is fed from  $R_{16}$  in the detector circuit to one grid of  $V_4$  in the normal manner, and the amplified audio is taken off across  $R_{16}$  and fed to the audio amplifier. The other control grid of  $V_4$  is used to provide remote audio gain control. A d.c. voltage of from 0 to -10 volts is applied to this grid by varying a potentiometer at the speaker location. When this voltage is zero,  $V_4$  acts as a straight-through audio am-

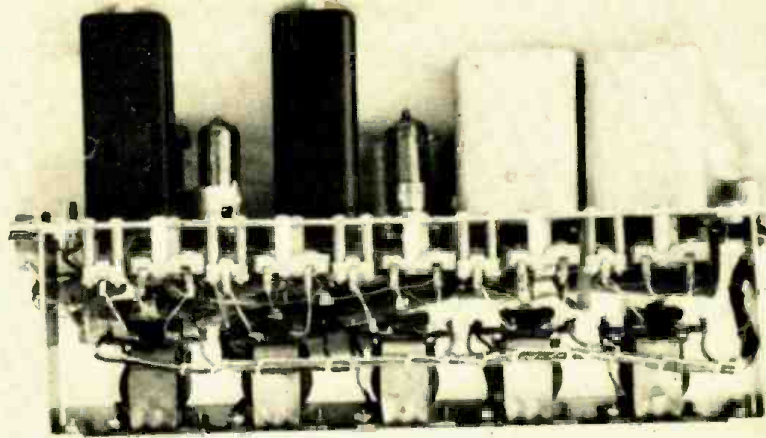


Fig. 2. Side view of AM remote tuner. Note the five station selector relays at bottom.

plifier and the speaker volume depends on the setting of  $R_{16}$ . As the grid voltage of  $V_4$  is made more negative by turning the remote potentiometer, the gain of  $V_4$  decreases until, with -10 volts, it is almost cut off, and passes very little audio signal. Thus, the audio gain is controlled remotely by a d.c. control lead which can be any reasonable length. The audio output jack is located just to the right of the i.f. output transformer in Fig. 1. The tuner audio is cabled from this jack

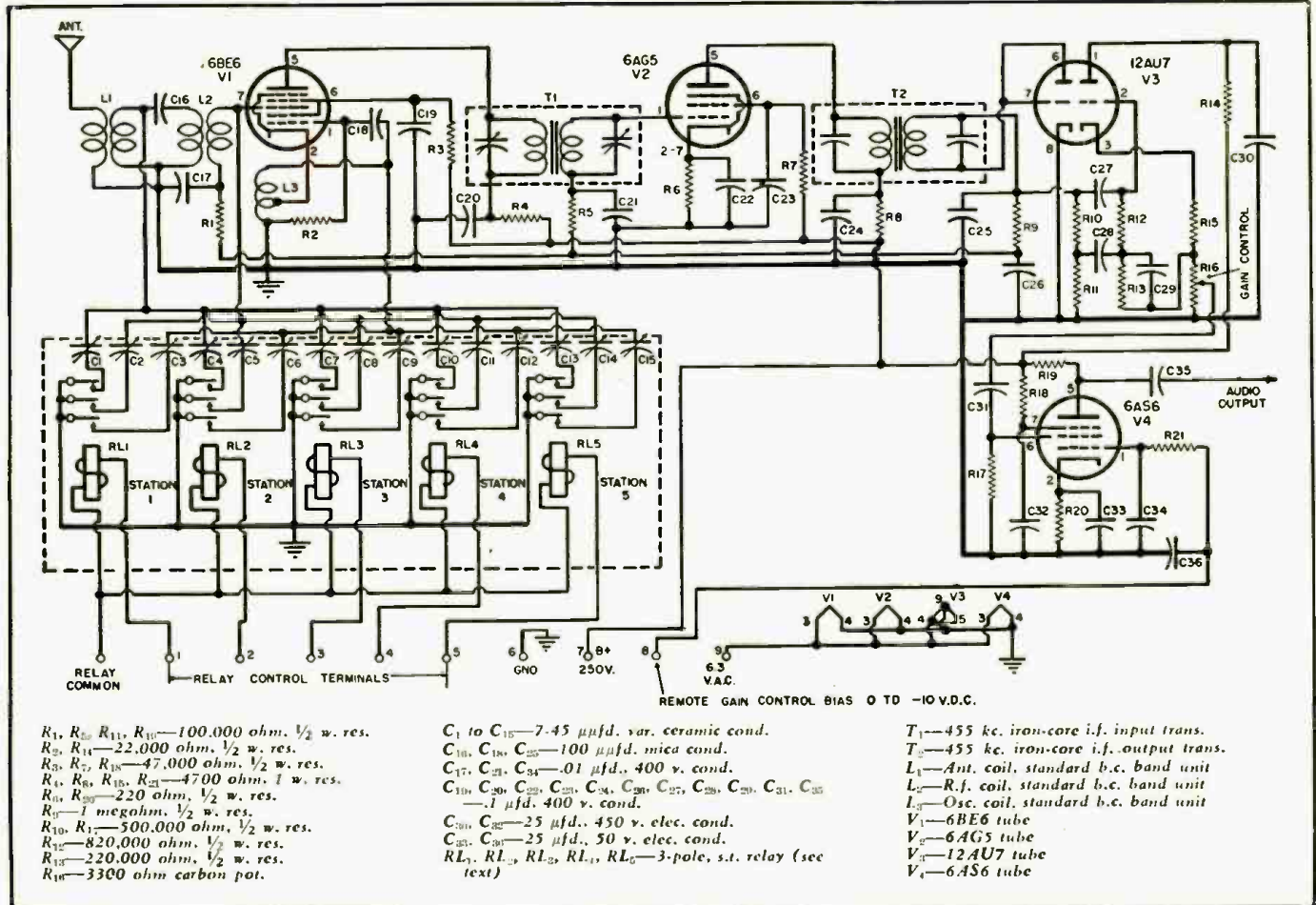
to the audio amplifier. Other circuit details are shown in Fig. 3.

### Control System

In Fig. 4 is shown the simplest method of controlling the tuner from a remote location. The control panel is only large enough to mount a single-deck, five-position wafer switch, an "on-off" toggle switch, and the audio gain control potentiometer. This potentiometer receives -10 volts d.c. from the power supply to vary the bias on  $V_4$ ,

<sup>1</sup> Builder, Geoffrey: "The Application of Modulation-Frequency Feedback to Signal Detectors," Proceedings of the IRE, March, 1946.

Fig. 3. Complete schematic diagram and parts list covering the remote control circuit and the AM tuner with which it is used.





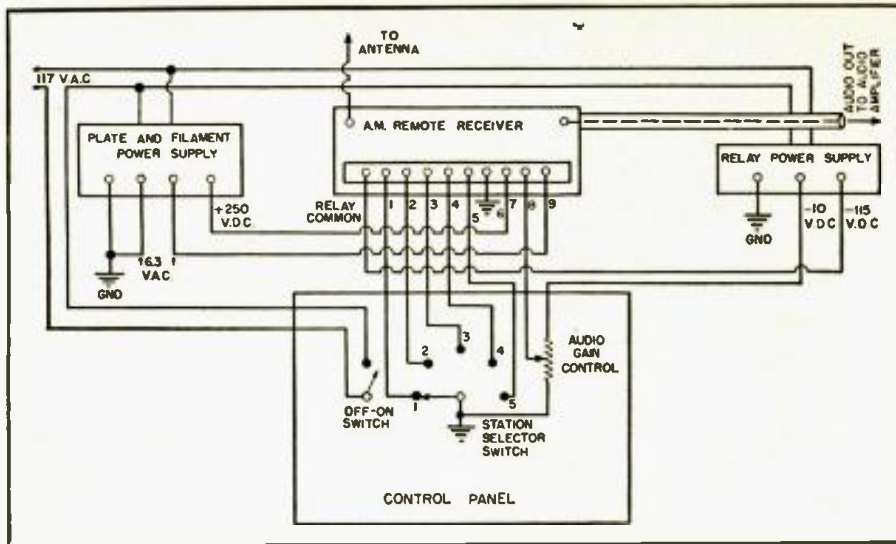


Fig. 4. Method for interconnecting the receiver, power supplies, and control panel.

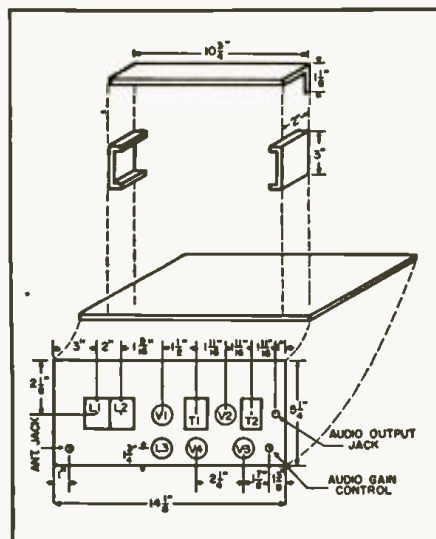


Fig. 5. Exploded view of chassis and front panel dimensions. Material is 1/16" thick.

as previously discussed. The relay power supply furnishes 117 volts d.c. to the control panel station selector wafer switch. The relays all have one terminal wired in common and connected to -117 volts d.c. The plus side of the relay power sup-

ply is grounded, and the arm on the station selector switch is also grounded. Turning this switch then places, in turn, 117 volts d.c. on the desired relay, and the desired station is selected. There are other methods of control using fewer connecting wires, such as the stepping switch system, but they are more complicated. The toggle "on-off" switch supplies 117 volts a.c. to the power supplies.

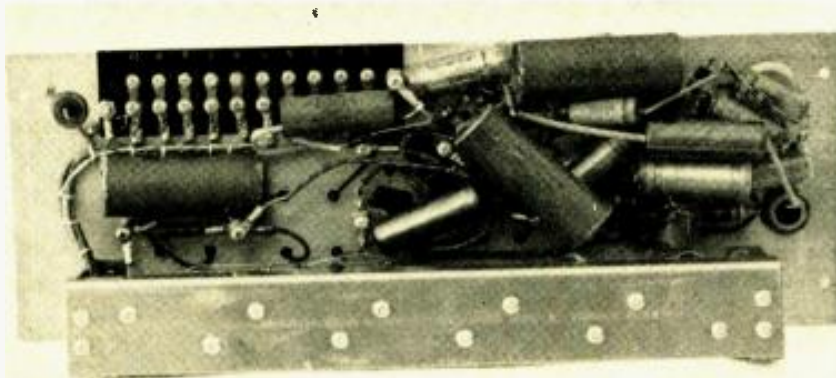
#### Power Supplies

The tuner plate power supply is of the conventional full wave rectifier type, and also provides the necessary a.c. filament voltages. The relay supply uses a selenium disc rectifier in a bridge circuit to provide both the relay power and the negative voltage for the remote audio gain control.

#### Construction

A front panel component dimension plan of the tuner and an exploded view of the four pieces making up the complete tuner chassis are shown in Fig. 5. All pieces are 1/16 inch aluminum. Steel or brass would also be suitable. The dimensions given for the front panel apply if standard 2-inch shield cans are used for the antenna and

Fig. 6. Rear view of the AM remote tuner chassis. Point-to-point wiring is used throughout the construction to maintain shortest possible leads.



mixer grid coils and if regular 1 3/8 inch square i.f. transformers are used. The brackets and relay shelf may vary in a particular construction depending on the type of relays used. The same applies to the holes drilled along the top of the front panel through which the condensers are tuned, in that the hole diameter and spacing depend on the type of variable condenser used.

#### Wiring

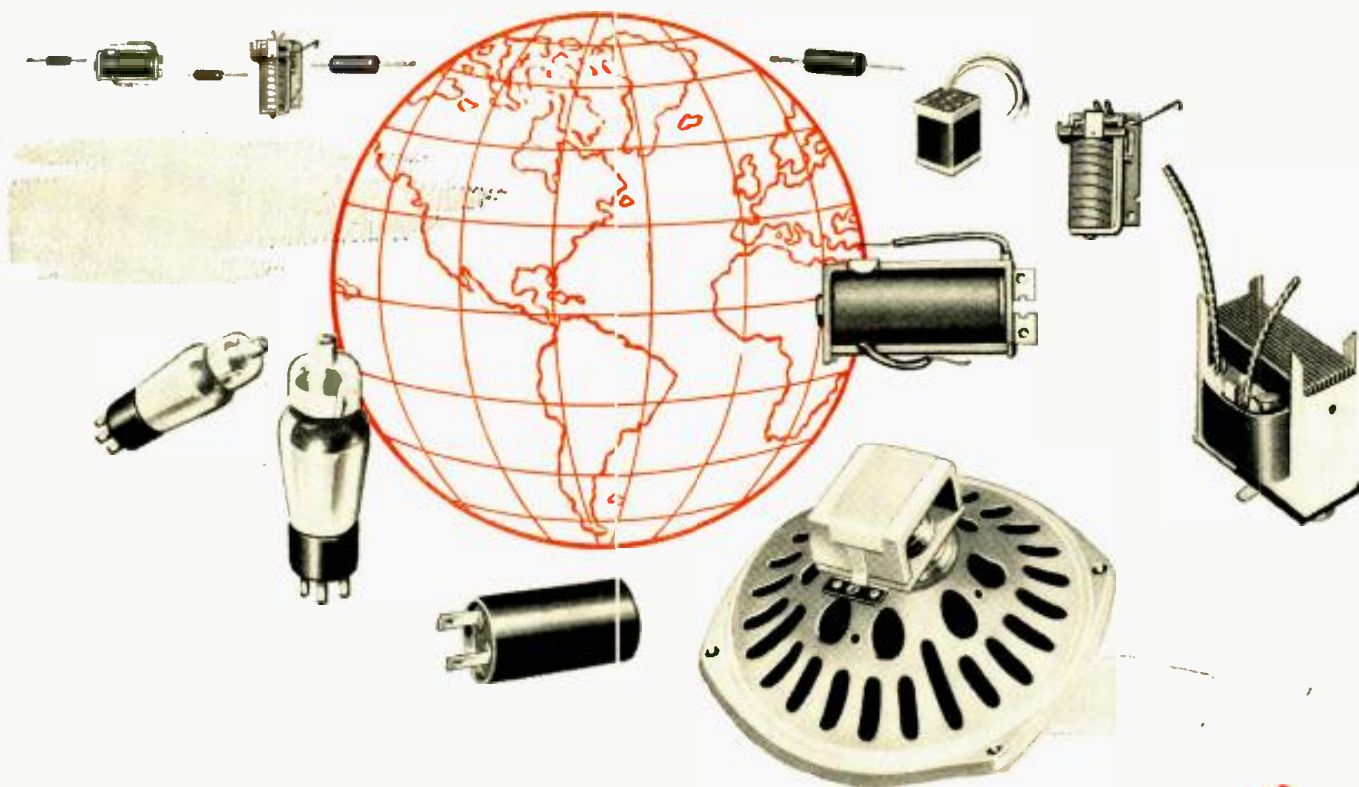
A rear view of the tuner is shown in Fig. 6. Point-to-point "layer" wiring was used to maintain short leads and save time in wiring. The only care exercised in wiring was to keep the bus wires connecting the variable condensers an inch or so from the other components in the circuit. No oscillation or feedback was encountered. All connecting wires were brought out to the terminal board shown in the upper left of Fig. 6. A jack was placed to the left of this board for the antenna connection.

#### Operation

After the tuner is wired and connected to the power supplies and the audio amplifier, it is ready for alignment. First, tune up the i.f. transformers with a signal generator. Then connect the antenna and turn the selector switch on the control panel to position 1. It would normally be desired to receive the lowest frequency broadcast station on this position, and the highest on position 5 of the switch. Tune the oscillator condenser associated with relay 1 until the desired station is heard, and then tune the antenna and mixer grid tuning condenser connected to the same relay for maximum volume and minimum interference. Then throw the station switch to operate relay number 2 and repeat this tuning process for the next higher frequency broadcast station. Continue the process for the other three stations. Now, with zero voltage on terminal 8, the remote audio gain terminal, adjust  $R_{10}$  to give the maximum desired audio volume from the speaker. The remote audio gain control will then decrease this volume to the desired level for particular listening conditions.

#### Conclusion

The tuner, audio amplifier, and power supplies can be rack mounted in an out-of-the-way place and the owner will then have an excellent AM radio system together with high fidelity audio, and use no more of the living room space than is occupied by the speaker, record player, and control panel. In the future, an FM tuner and possibly even a TV tuner can be added to the same rack, while still having only the speaker, record player, and TV screen in the living room. In addition to the space saved in the living room, the author finds that such a remote control system is a source of fascination to most guests and a source of pride to the owner.



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Ordinary radio parts? Not at all! You see, these automobile radio parts—like thousands of others bearing the Delco Radio name—are of uniform high quality.

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#### THINGS TO REMEMBER ABOUT DELCO RADIO SERVICE PARTS

1. Offer largest market for original-equipment replacement parts.
2. Made in the world's largest factory devoted exclusively to automobile radios.
3. Designed by one of the largest and most forward-looking engineering groups devoted exclusively to automotive radio.

### DELCO RADIO PARTS

A GENERAL MOTORS PRODUCT  A UNITED MOTORS LINE 

**DISTRIBUTED BY WHOLESALERS EVERYWHERE**

## DELCO RADIO

DIVISION OF GENERAL MOTORS CORPORATION  
KOKOMO, INDIANA

**Save on Hi-Fi, Ham Radio,  
other Electronics Devices by  
using Easy-to-Assemble Kits!**



**New ELECTRONICS KITS Guide  
and Directory on Sale Soon!**

NOW—for the first time—you can get a 160-page guide that tells you all you need to know about putting together kits for your own hi-fi set, electronics laboratory, short-wave receiver, electronics accessories for car and boat, photo-electric eyes, pocket radios—and dozens of other electronics devices!

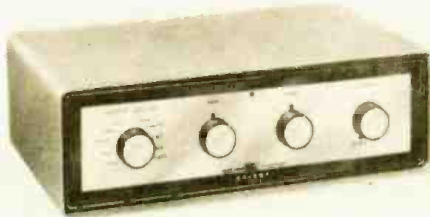
The new ELECTRONICS KITS is a windfall of valuable information—with 30 construction articles and 640 illustrations. PLUS a complete Directory listing all available electronics kits, including specifications, prices, and manufacturer's names.

This big, new builder's guide and directory to ELECTRONICS KITS goes on sale in October. Reserve your copy now at your newsstand or radio parts store—only \$1.00.

**ZIFF-DAVIS PUBLISHING CO.**  
434 So. Wabash Ave., Chicago 5, Ill.

equalization. Other controls include separate bass and treble tone controls and "on-off-volume."

The metal case housing is styled in French gray and ebony black and



measures 4" high, 13" wide, and 8" deep. The kit comes complete with case, all parts, wire, solder, tubes, and "step-and-check" assembly instructions.

**CROSSOVER NETWORK**

The Electronics Division of *Van Norman Industries, Inc.*, 186 Granite St., Manchester, N. H. has developed and is marketing a new crossover which is designed to be used with separate bass and treble amplifiers in a hi-fi system. The Model XO-1000 divides the frequency spectrum to eliminate noise and hum.

The crossover point is at 800 cps, dividing the spectrum into two regions most compatible with the characteristics of modern electromagnetic and electrostatic speakers.

The "Vantron" crossover is tubeless, simple to install and to use. The outputs are connected directly to the  
*(Continued on page 126)*

**CONVERT  
YOUR TAPE RECORDER TO  
STEREO**



**PLAYBACK AMPLIFIER**

Here's just the amplifier for that "second" stereo sound channel. The Nortronic PL-100 Playback Amplifier is a compact high quality 3-watt amplifier with ample gain to match any phono cartridge or high impedance magnetic tape head. Variable equalization includes NARTB and RIAA standards. **Audiophile Net \$39.50.**



**RECORDING AMPLIFIER**

The Nortronic RA-100 Recording Amplifier supplies any magnetic recording head with audio power, bias voltage, and also power for an erase head. It has NARTB equalization, record-level meter, and monitoring jack. Two RA-100's are ideal for stereo recording. **Audiophile Net \$49.50.**

Nortronic stereo accessories are available from your dealer, or write for information. (Canadian Representative: Active Radio & TV Ltd., 58 Spadina Ave., Toronto, Canada.)

**THE NORTRONICS COMPANY, INC.**  
1017 S. Sixth Street Minneapolis 4, Minnesota



New Autospeed Changer



ASR-433 Stereo Amplifier—Selected for display at the Vienna International Fall Fair



THE NEW STROMBERG-CARLSON COMPONENTS

**integrity in music**

Integrity in Music, as applied to high fidelity components, means reproduction which adds nothing to, or takes nothing from, the original performance.

Our choice of this slogan is no accident. Just as your purchase of a component system is not a casual investment, our attitude toward the manufacture of components is very serious. Each piece of gear must reflect the highest possible achievement of engineering, production, and musical skill. Yes, musical skill—because the guiding minds of the Stromberg-Carlson component group are those of electronic and acoustic engineers with extensive musical training.

The musical sound of our new components was the final critical test before they were made available to you.

We will be glad to submit our specifications to your critical judgment.

*"There is nothing finer than a Stromberg-Carlson"*

**STROMBERG-CARLSON SC | GD**  
A DIVISION OF GENERAL DYNAMICS CORPORATION  
1477 N. Goodman St. • Rochester 3, N. Y.  
Electronic and communications products for home, industry and defense...

See your dealer or write to us for full data on our complete new line of Amplifiers, Speakers, Speaker Systems, Enclosures and Program Sources.

# What's New in Radio

For additional information on any of the items described herein, readers are asked to write direct to the manufacturer. By mentioning RADIO & TELEVISION NEWS, the page, and the issue number, delay will be avoided.

## TRANSFORMER LINE

Utilizing new design techniques based on ferrite magnetic cores and tetrafluoroethylene insulation, *Sierra Electronic Corporation* of 813 Brittan Avenue, San Carlos, California has re-



cently introduced a line of transformers for specialized applications.

The line, which includes grid-driving transformers, push-pull output transformers, line-balancing transformers, etc., is designed to be used in cases where r.f. circuitry requires impedance matching over a wide impedance and/or frequency range or where r.f. or audio applications require electrostatic shielding between windings, extremely high voltages, or especially small dimensions.

Complete data on the line is now available from the company.

## FISHER AMPLIFIER

The *Fisher Radio Corporation*, 41 East 47th Street, New York, N. Y., is currently marketing a new amplifier which has been designated as the Model 50-A.

The new unit features a high output with less than 5% harmonic distortion at 40 watts (.05% at 5 watts; .08% at 10 watts; and .25% at 40



watts). Frequency response is uniform within  $\pm .1$  db from 20 to 20,000 cycles and within 1 db from 5 to 100,000 cycles. The power output is constant

within 1 db at 40 watts, 15 to 50,000 cycles. Hum and noise are better than 92 db below full output. Internal impedance is .53 ohm at the 16 ohm tap, producing a damping factor of 31. Efficiency is said to be in excess of 55% at full output compared to the 25% to 30% of typical class A circuits.

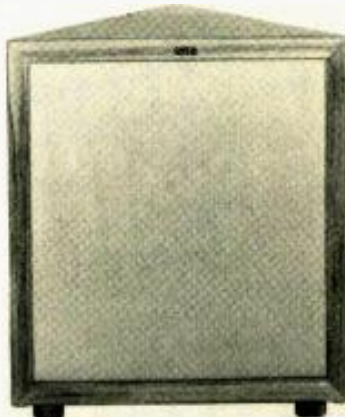
The amplifier has nine tubes. A jack is provided in the output tube circuit to measure the plate current. There is also a separate and accessible bias control to adjust the plate current on the output tubes.

The chassis is constructed of 16 gauge steel and includes a bottom plate. The unit measures 8"x14½"x9".

## "SUPER HORN"

*Gately Development Laboratory*, P.O. Box No. 2, Clifton Heights, Pa. has recently announced a new speaker enclosure, the "Super Horn."

The new line of enclosures features a non-resonant speaker baffle for the



accurate reproduction of both high and low frequencies. Cabinets incorporating the "Super Horn" principle are available for direct radiating 12- and 15-inch speakers in either blonde or mahogany finishes.

A data sheet which provides full details on this enclosure line is available upon request.

## FREQUENCY METER

*Lampkin Laboratories, Inc.* of Bradenton, Florida, is currently introducing a new micrometer frequency meter, the Type 105-B.

The new instrument measures center frequency deviation on any number of FM or AM transmitters, throughout a continuous range of frequencies from .1 mc. to 175 mc.

A stage of audio amplification and a function selector switch provide greatly increased sensitivity when measuring the frequency of v.h.f. transmitters; higher output for feed-

ing into v.h.f. receivers for alignment purposes; and a strong headphone signal when calibrating against the internal crystal standard, permitting settings to better than 1 part in a million.

A data sheet giving complete specifications on the Type 105-B is now available on request.

## REGULATED SUPPLY

A continuously variable 0-325 volt electronically regulated d.c. power supply has been developed by the *Perkin*



*Engineering Corporation* of 345 Kansas Street, El Segundo, California.

The new unit, the Model M30, has a d.c. current rating of 150 ma. and is also equipped with a low-voltage a.c. output of 6.3 volts at 6 amps.

Voltage regulation is within 1/2% for voltages between 30 and 325 volts from no-load to full-load and the ripple is less than 2 mv. The unit has two 3" rectangular meters and is housed in a blue-gray wrinkle cabinet.

## R.F. CHOKES

A regular production line of miniature r.f. chokes has been announced by *Condor Radio Mfg. Co.*, 116 N. Montezuma Street, Prescott, Arizona.

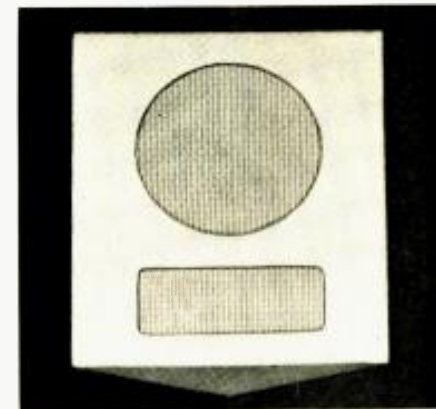
Believed to be the smallest standard-catalogue chokes on the market, they range in inductance from .25 to 100 microhenrys. They are labeled and insulated for 500 volts.

The company will supply any additional details that are required.

## SPEAKER BAFFLE

A new bass-reflex speaker baffle for corner mounting is the latest unit to be added to the *Argos Products Co.* line of enclosures.

Available in either mahogany or blonde leatherette, the new baffle fea-

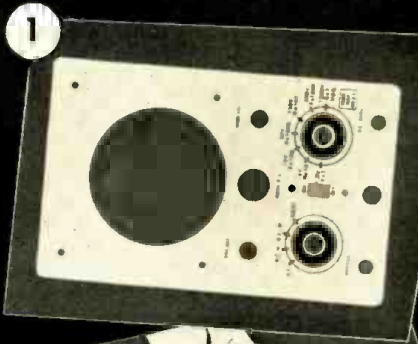


tures 3/8" wood sides and back plus 1/2" cellufoam acoustic lining to assure resonant tone.

(Continued on page 108)

RADIO & TELEVISION NEWS

# Check these ADVANTAGES FOUND Only in HEATHKITS



- ✓ **1. Baked Enamel Lifetime Finish Panels** — Oven baked finishes for maximum durability and freedom from marks, scratches and discoloration. Panels that can really take service shop and laboratory abuse.
- ✓ **2. Save Money** — You save all expensive factory wiring costs when you build your own. And, direct factory to customer sales eliminate all middle man profits. You can have a complete Heathkit laboratory or service shop for what one or two pieces of ready built equipment cost.
- ✓ **3. Modern Styling** — New "fitted panels" and formed cabinets with rounded corners present a smart, professional appearance. Dignified appearance for prestige.
- ✓ **4. Quality Components Used Throughout** — Heathkits use well known, time and quality tested components such as Simpson, Chicago Transformer, Wilkor, Allen-Bradley, Altec-Lansing, Centralab, Cinch, Oak, Grigsby-Allison, Mallory and many others.
- ✓ **5. Extensive Factory Facilities** — Shearing, punching, forming, spot welding, etc. is done right in our own plant — controlled production for highest quality and less cost to you.
- ✓ **6. Extensive and careful engineering** — A staff of engineers working in a modern, well equipped laboratory carefully develop Heathkits according to highest engineering practices. Your assurance of accurate, up to the minute instruments.
- ✓ **7. Complete Kits** — All the parts are right in the kit — you get all tubes, controls, transformers, meters — everything — no other components to buy. And no cutting, punching, or painting necessary — it's all done for you. Heathkits go together easily and smoothly.
- ✓ **8. Only Complete Line** — Over 30 kits available — Heathkits form the only complete line of kit-form test equipment on the market. Kits for hams, engineers, service men, schools and audio enthusiasts.
- ✓ **9. Detailed, Complete Instruction Manuals** — Comprehensive manuals tell you exactly how to build your Heathkit. Manuals contain easy-to-follow instructions, clear, large pictorials, schematic, detail drawings, etc. They make construction easy, fun, and educational.

Nine New Heathkits This Year!

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The **HEATH COMPANY**

... BENTON HARBOR 15, MICHIGAN

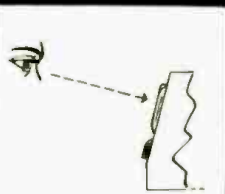
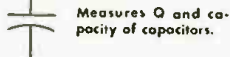
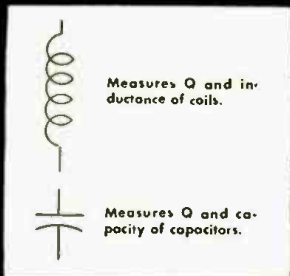
# NEW Heathkit "Q" METER KIT

• A HIGH QUALITY Q METER AT LOW COST.

MODEL QM-1

SHIPPING  
WT. 12 LBS.

**\$39<sup>50</sup>**



• First Q METER within the price range of all.

• Read Q's of 0-500 directly on calibrated scale.

• Stable oscillator supplies R.F. frequencies of 150 kc to 18 megacycles.

• Calibrated capacitor with range of 40 mmf to 450 mmf with vernier of  $\pm 3$  mmf.

• Simple, easy operation.

• Can be used to measure small inductances or capacitors.

• Measures Q of condensers, RF resistance and distributed capacity of coils.

• Measures capacity by substitution, capacity by resonance, inductance by resonance.

• Slanted panel for convenient operation.

Another outstanding example of progressive HEATHKIT engineering. Now a highly desirable Q METER within the price range of all laboratories, schools and experimenters. No longer is it necessary to deny yourself the many measurement advantages offered by this instrument.

Use the new HEATHKIT Q METER for the following simple basic measurements: capacity by substitution, capacity by resonance, inductance by resonance and Q at the OPERATING frequency all can be read on the calibrated scales. The method used to obtain information regarding the Q of condensers, RF resistance, distributed capacity in coils, etc., is only slightly more involved. In the HEATHKIT Q METER, the generated RF signal is coupled through a cathode follower and injected across a low impedance condenser which is included in the resonant circuit under test. Large  $4\frac{1}{2}$ " 50 microampere Simpson meter reads Q directly. The resonating condenser and vernier condenser are calibrated in mmf for substitution method capacity tests. The resonating condenser is also calibrated in effective capacity for resonance tests. The inductance calibration serves for rapid determination of the approximate inductance of a coil. The HEATHKIT Q METER has a generator frequency range of 150 kc to 18 megacycles. Vernier capacity covers  $\pm 3$  mmf and the resonating condenser is calibrated from 40 mmf to 450 mmf actual capacity or 40 mmf to 350 mmf effective capacity. Meter reads Q directly up to 250. Higher and lower full scale readings can be obtained by varying the injection voltage levels.

The entire kit consists of 12AT7, 6AL5, 6C4, OD3 and 6X5 tubes, 50 microampere Simpson meter, power transformer, cabinet and all other parts necessary for construction as well as instructions for assembling, testing and operation of the completed instrument.

## Heathkit DECADE RESISTANCE KIT

The HEATHKIT DECADE RESISTANCE KIT is widely used by schools, experimenters and laboratories because of the extremely wide resistance range offered and the useful, dependable service provided. The DECADE consists of 5 rotary 2 deck ceramic wafer switches with silver plated contacts and twenty 1% precision resistors in a circuit which provides the resistance range of 1 ohm to 99,999 ohms in 1 ohm steps. The HEATHKIT DECADE RESISTANCE KIT is simple to construct and is housed in a beautiful polished birch cabinet with an attractive panel. The DECADE will furnish years of accurate trouble-free service.

Individual decade sections of above can be purchased separately for special applications.



MODEL DR-1  
SHIPPING  
WT. 4 LBS.

**\$19.50**

## NEW Heathkit DECADE CONDENSER KIT

Extremely useful in all experimental and design work such as determination of condenser values for: compensating networks, filters, bridge impedances, tuned circuits, etc. Uses all precision silver mica condensers within  $\pm 1\%$  accuracy. Values run in three decades from 100 MMFD to 0.111 MFD in steps of 100 MMFD. Smooth acting, positive detent, highest quality ceramic wafer switches make all capacitor values easy to set up and keep losses to a minimum. Low loss dielectric terminal board mounts on outside of panel for easy cleaning. Heathkit binding posts accommodate a wide variety of test leads. Comes complete with all parts, including polished birch cabinet.

Individual decade sections of above can be purchased separately.



MODEL DC-1  
SHIPPING  
WT. 4 LBS.

**\$16<sup>50</sup>**

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The **HEATH COMPANY**

... BENTON HARBOR 15, MICHIGAN

# NEW *Heathkit* OSCILLOSCOPE KIT

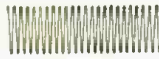
• NEW WIDE BAND VERTICAL AMPLIFIER  $\pm 2$  DB 10 CYCLES TO 1 MC.



Direct plate connections for modulation tests.



Displays TV sync pulses correctly.



Useful to 5 mc.



Good square wave response at 100 kc.

MODEL O-8

SHIPPING  
WT. 29 LBS.

**\$43.50**



- New wider band vertical amplifier  $\pm 2$  db from 10 cycles to 1 megacycle useful to over 5 megacycles.

- High sensitivity in vertical amplifier. .025 volts RMS per inch deflection.

- New 3 step input attenuator input ranges X1, X10, X100.

- New 5CP1 intensifier type tube for greater brilliance.

- Terminal board and rear cabinet opening provisions for direct connections to deflecting plates.

- Newly styled formed and ventilated aluminum cabinet.

- Wide band sweep generator, 15 cycles to over 100 kc. Will synchronize with 5 megacycle signal.

- 10 tube circuit featuring push pull operation of vertical and horizontal amplifiers.

- Internal synchronization on either positive or negative peaks.

- Reproduces faithfully the front and back porches of TV sync pulses. Excellent square wave reproduction to over 100 kc.

- Optional Intensifier kit available for 2200 volt operation.

Proudly announcing the new 1953 HEATHKIT Model O-8 OSCILLOSCOPE featuring the finest performance ever offered in this extremely popular kit instrument. Improved wider band vertical amplifier featuring a new 3-step input attenuator affording smooth control of the excellent .025 volts per inch vertical sensitivity. Possibility of overloading the vertical input circuit is minimized. Greater band width in the vertical channel is a decided advantage to TV service men. Permits clear observation of all TV sync pulse detail and excellent square wave reproduction over 100 kc. 5CP1 intensifier type CR tube provides a brilliant trace with normal accelerating voltages. A handsome, ventilated cabinet with smooth rounded corners and a snug fitting drawn panel adds to the smartly styled professional appearance. Longer life is assured through cooler instrument operation. Push pull output stages in both vertical and horizontal amplifiers for balanced deflection of the spot. All of the many fine features of the previous model have been retained. Rear cabinet access to terminal board for direct connection to CR plates. The entire kit of all 10 tubes, parts, cabinet and panel as well as detailed construction manual for assembly and operation of the instrument included.

**INTENSIFIER KIT:** For extreme trace brilliance in special applications such as photography, group demonstrations or operation in brightly lighted areas an optional Intensifier kit providing 2200 volt operation of the CR tube is available. Kit includes high voltage filter condenser, high voltage selenium rectifier, etc. \$7.50.

*Heathkit*

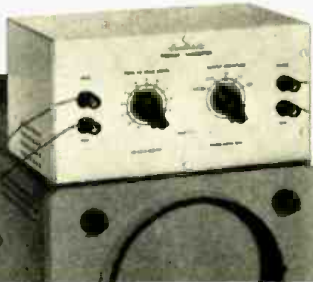
SCOPE DEMODULATOR PROBE KIT



No. 337  
SHIP. WT. 1 LB.  
**\$4.50**

Trouble shooting or aligning TV, RF, IF and video stages requires demodulation of high frequency signals before Oscilloscope observation. The HEATHKIT SCOPE DEMODULATOR PROBE KIT was specifically developed for this application. Kit consists of a probe housing, crystal diode detector circuit, shielded cable and spade lugs. Assembly is simple and the probe will quickly prove its usefulness as an Oscilloscope accessory.

## NEW *Heathkit* VOLTAGE CALIBRATOR KIT



MODEL VC-1  
SHIPPING  
WT. 5 LBS.  
**\$9.50**

Use the Heathkit Voltage Calibrator with your oscilloscope to measure peak-to-peak TV complex waveshapes. TV manufacturer's specifications indicate correct peak-to-peak voltages and this kit will permit making these important measurements.

A big help to engineers in circuit work. Makes peak-to-peak voltage measurements of complex waveshapes of all kinds. Flat topped semi-square wave output of calibrator assures fast and easy measurement of any voltage between .01 and 100V peak-to-peak.

The Voltage Calibrator can remain connected to your oscilloscope at all times for instant use. "Signal" position connects signal under study directly through calibrator and into scope input circuit for direct observation. Eliminates transferring leads from calibrator. A wonderful scope accessory.

## *Heathkit* ELECTRONIC SWITCH KIT



MODEL S-2  
SHIPPING  
WT. 11 LBS.

**\$19.50**

A few dollars spent for this accessory will increase the usefulness of a scope immeasurably. An electronic switch will open up a whole new field of scope applications for you. The S-2 allows TWO SIGNALS to be observed at the SAME TIME — this important feature allows you to immediately spot phase shift, clipping, distortion, etc. The two signals under observation can be superimposed or separated for individual study. Each signal input has an individual gain control for properly adjusting scope trace patterns. Has both coarse and fine frequency controls for adjusting switching time. Multivibrator switching frequency is from less than 10 cps to over 2000 cps in three overlapping ranges. Kit comes complete including 5 tubes, power transformer, all controls, instruction manual, etc. Every scope owner should have one!

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*The* **HEATH COMPANY**

... BENTON HARBOR 15, MICHIGAN

*Heathkit*  
VACUUM TUBE

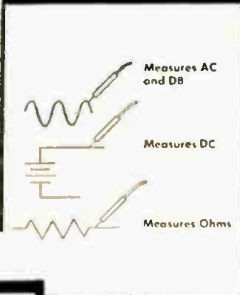
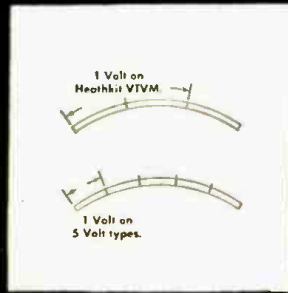
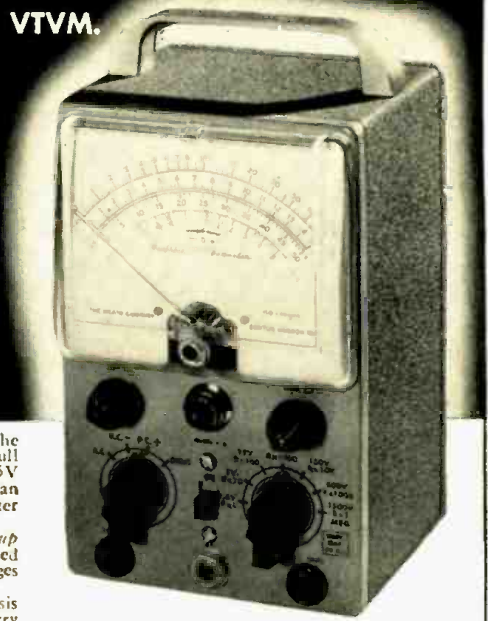
# VOLTMETER KIT

• NEW 1½ VOLT RANGE ON 1953 VTVM.

MODEL V-6

SHIPPING  
WT., 7 LBS.

\$2450



- New 1½ volt low range gives over 2" of scale per volt instead of less than ¾" found on 5 volt range type.

- Increased accuracy due to expanded scales.

- New 1500 volt DC high range gives 50% greater coverage.

- Seven ranges in all. 1½, 5, 15, 50, 150, 500 and 1500 volts DC (1000 volts maximum AC only).

- Provides proper service ranges 150 volts for AC DC work and 500 volts for AC type service.

- High input impedance, 11 megohms minimizes circuit loading.

- Variety of accessory probe kits available.

- 1% precision resistors in multiplier circuits.

- 200 microampere Simpson meter.

- Center scale zero adjust.

- Transformer operated.

- Test leads included.

- New cabinet styling.

- Large, clearly marked meter scales indicate ohms, AC volts, DC volts and DB.

The 1953 Heathkit V-6 VTVM has improved ranges! The lowest range has been moved way down to 1.5V full scale. This gives 3½" of actual scale length for the 1.5V covered — that's 2½ inches per volt!! Now you can make your low level measurements faster and with greater accuracy.

And the upper range has been moved up. Readings up to 1500V DC can be readily made with new, improved VTVM — plus readings up to 1000V on AC. Higher ranges for extended use.

New vertical chassis mounting gives added chassis space for really easy wiring — no tight corners to worry about. Uses only highest quality components throughout.

Simpson 200 microampere meter movement combined with 1% precision resistors in multiplier circuit insure highly accurate and dependable readings.

AC and DC voltage ranges are 0-1.5V-5V-15V-50V-150V-500V-1500V. (1000V max. reading on AC) — a total of seven ranges for convenient, accurate readings. Instrument also measures resistance from .1 ohm to over 1 billion ohms in seven handy ranges of RX1, X10, X100, X1000, X10K, X1 Meg., — all convenient multiples of 10 with no skips. Has Db scale in red for easy identification.

New panel has tough baked on enamel finish for freedom from scratches and maximum durability. Modern styled, formed, compact cabinet with rounded edges and crackle finish is truly handsome.

Comprehensive, detailed instruction manual with step-by-step instructions, figures, pictorials, etc. makes assembly a cinch.

Be sure and look over the special accessory VTVM probes below — for added usefulness.

**Heathkit R. F. PROBE KIT**  
SHIP. WT. 1 LBS. **\$5.50**  
No. 309  
Extends RF range of HEATHKIT 11 megohm VTVM to 250 megacycles ± 10%.

**Heathkit 30,000 V. D.C. PROBE KIT**  
SHIP. WT. 2 LBS. **\$5.50**  
No. 336  
Provides DC multiplication factor of 100 for any 11 megohm VTVM.

**Heathkit PEAK TO PEAK VOLTAGE PROBE KIT**  
SHIP. WT. 2 LBS. **\$6.50**  
No. 338  
Reads on DC scale of any 11 megohm VTVM 5 kc to 5 megacycle range.

## NEW Heathkit BATTERY TESTER KIT

The new Heathkit Battery Tester measures all types of dry batteries between 1½ volts and 150 volts under actual load conditions. Readings are made directly on a three-color GOOD-WEAK-REPLACE scale that your customers can readily understand. Operation is extremely simple and merely requires that the leads be connected to the battery under test. Only one control to adjust in addition to a panel switch for A or B battery types.

The Heathkit Battery Tester features compact assembly. An accurate meter movement and wire wound control mount in the portable, rugged plastic case.

Use the BT-1 to check portable radio batteries, hearing aid batteries, lantern batteries and photo flash gun batteries.

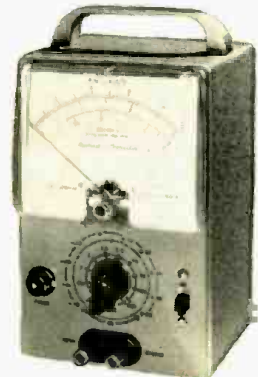


MODEL BT-1  
SHIPPING  
WT. 3 LBS.

**\$750**

## Heathkit AC VACUUM TUBE VOLTMETER KIT

A new AC VTVM that makes possible those sensitive AC measurements required by laboratories, audio enthusiasts and experimenters. Ten full scale ranges of .01, .03, .1, .3, 1, 3, 10, 30, 100 and 300 volts RMS. 10 DB ranges from -52 to +52 DB. Frequency response within 1 DB from 20 cycles to 50 kc. Simpson 200 microampere meter with large plainly marked meter scales. Precision multiplier resistors. Two amplifier stages using miniature tubes. A unique bridge rectifier meter circuit and a clean layout of parts. Order the AV-2 today and become acquainted with the interesting possibilities offered by this instrument.



MODEL AV-2  
SHIPPING  
WT. 5 LBS.

**\$2950**

EXCLUSIVE AGENT  
ROCKE INTERNATIONAL CORP.  
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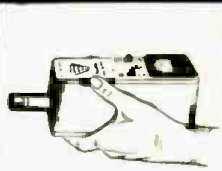
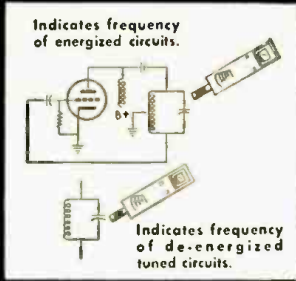
The **HEATH COMPANY**

... BENTON HARBOR 15, MICHIGAN



# NEW *Heathkit* GRID DIP METER KIT

• CONVENIENT ONE HAND OPERATION.



Complete unit easily held and operated with one hand.

MODEL GD-1

SHIPPING  
WT. 4 LBS.

**\$19<sup>50</sup>**



- New GRID DIP METER with assembled calibrated coils.
- Uses quality Simpson 500 microampere meter.
- One hand operation, extremely compact, Only 2½" wide by 3" high by 7" long.
- Variable meter sensitivity control.
- Uses newest type 6AF4 high frequency triode in a Colpitts oscillator circuit.
- Continuous coverage from 2 megacycles to over 250 megacycles in 6 ranges.
- Head phone monitoring jack.
- AC power transformer operated for maximum safety.

Here is the GRID DIP METER KIT you have been asking for. This new HEATHKIT instrument is compact, highly sensitive and easy to use. Housed in a handsome formed aluminum cabinet—rounded corners—durable oven baked finish on panel and cabinet. The entire instrument can be easily held and operated in one hand, tuning accomplished with the thumb wheel drive. This excellent design feature leaves the other hand entirely free for making circuit adjustments. The instrument with many applications — with oscillator energized, use it for finding the resonant frequency of tuned circuits, locating parasitics, determining characteristics of filter circuits, roughly tuning transmitter stages with power off, and neutralizing transmitters. Useful in TV and radio repair work for alignment of traps, filters, IF stages, peaking and compensation networks within the 2 to 250 megacycle range. With the oscillator not energized, the instrument acts as an absorption wave meter and indicates the frequency of radiating power sources. Locates spurious oscillations, as a relative indication of power in various transmitter stages, etc. Phone jack permits monitoring of AM transmitter for determination of radiated hum, audio quality, etc. (Head phones not included). Complete kit includes plug-in coils, tube, all necessary parts and detailed assembly and instruction manual.

## *Heathkit* IMPEDANCE BRIDGE KIT



MODEL IB-1B  
SHIPPING  
WT. 15 LBS.

**\$69<sup>50</sup>**

The HEATHKIT IMPEDANCE BRIDGE is especially useful in educational training programs, industrial laboratories and for experimental work. Use it for measuring AC and DC resistance value of resistors.

determination of condenser capacitance and dissipation factor, finding coil inductance and storage factor, electrical measurements work, etc. Quality components: GR 1000 cycle hummer, GR main control, Mallory ceramic wafer silver plated contact switches, ½% precision resistors, etc. The basic circuit is a self powered, 4 arm bridge. Choice of Wheatstone, Capacitance comparison, Maxwell or Hay bridge circuits. Resistance from 10 milliohm to 10 megohm. Capacitance 10 mmf to 100 mfd. Inductance 10 microhenry to 100 henries. Dissipation factor .002 to 1. Storage factor (Q) 1 to 1000. The IMPEDANCE BRIDGE has provisions for external generator use for measurement at other than the 1000 cycle level. Take the guess work out of electrical measurements. The HEATHKIT IMPEDANCE BRIDGE mounted in a beautiful polished birch cabinet with large easy reading panel calibrations will furnish years of accurate, trouble free measurement service.

## *Heathkit* HANDITESTER KIT

The HEATHKIT Model M-1 HANDITESTER fulfills requirements for a portable volt ohm milliammeter. This kit features precision 1% resistors, 3 deck switch for trouble free mounting of parts, specially designed battery bracket, smooth acting ohms adjust control, beautiful molded bakelite case and a 400 microampere meter movement. 5 convenient AC and DC voltage ranges as follows: 10 - 30 - 300 - 1000 - 5000 volts. Ohms ranges 0 - 3000 and 0 - 300,000. DC milliammeter ranges 0 - 10 milliamperes and 0 - 100 milliamperes. The instrument is easily assembled from complete instructions and pictorial diagrams. Test leads are included. Carry the HEATHKIT M-1 HANDITESTER in your tool box at all times for those simple jobs and eliminate that extra trip for additional testing equipment.



MODEL M-1  
SHIPPING  
WT. 3 LBS.

**\$13<sup>50</sup>**

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY (16)  
CABLE APRAS-N.Y.

*The* **HEATH COMPANY**

... BENTON HARBOR 15, MICHIGAN

NEW  
*Heathkit*

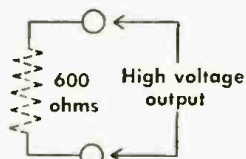
# AUDIO GENERATOR KIT

• RANGE EXTENDED TO 1 MEGACYCLE

MODEL AG-8

SHIPPING  
WT. 16 LBS.

**\$29.50**



Low impedance output  
High voltage output



Sine wave output  
from 20 cycles to 1  
megacycle.

- Improved design — new low price.
- Frequency coverage in five ranges from 20 cycles per second to 1 megacycle.
- Response flat 1 DB from 20 cycles to 400 kilocycles. Down 3 DB at 600 kilocycles. Down only 8 DB at 1 megacycle.
- Five calibrated output voltage ranges, continuously variable 1 mv, 10 mv, 100 mv, 1 v, 10 v.
- Low impedance output circuit. 600 ohms.
- Distortion less than .4 of 1% from 100 cycles per second through the audible range.
- New HEATHKIT universal type binding posts.
- Durable infra-red baked enamel panel.
- Transformer operated for safe operation.
- Sturdy, ventilated steel cabinet.

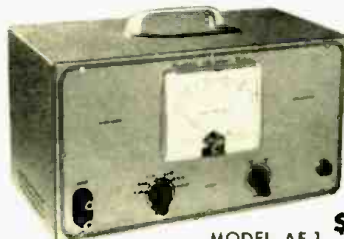
A new Audio Generator with features heretofore found in only the most expensive generators. Such features as complete coverage from 20 cycles to 1 Mc — response flat  $\pm 1$  db from 20 cycles to 400 Kc, down 3 db at 600 Kc and down only 8 db at 1 Mc.

And it has calibrated output . . . Calibrated continuously variable and step attenuator output controls allow you to easily set calibrated output voltage. Moreover, distortion is less than .4 of 1% from 100 cps through the audible range.

Oscillator section consists of a two stage resistance coupled amplifier (6SJ7 and 6AK6) utilizing both positive and negative feedback for oscillator operation and reduction of distortion. Oscillator section drives a cathode follower output power amplifier (6AK6) which isolates the oscillator from variations in load and presents a low impedance output (600 Ohms). Power supply is transformer operated and utilizes 6X5 rectifier with 2 sections of RC filtering.

An unbeatable dollar value — for here is an audio generator with wide frequency coverage, excellent frequency response, stepped and continuously variable calibrated output, high signal level, low impedance output, and low inherent distortion.

## *Heathkit* AUDIO FREQUENCY METER KIT



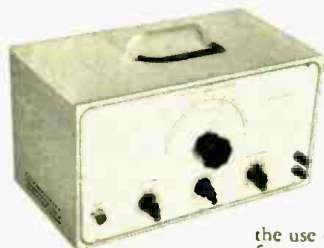
MODEL AF-1

SHIPPING  
WT. 15 LBS.

**\$34.50**

The HEATHKIT AUDIO FREQUENCY METER provides a simple and easy way to check unknown audio frequencies from 10 cycles to 100 kc between 3 and 300 volts RMS. The instrument features 7 ranges for accuracy and wide coverage. The meter itself has a quality 200 microampere Simpson movement and large clearly marked scales. The AUDIO FREQUENCY METER is transformer operated and features a voltage regulator tube to maintain constant plate voltage on the second stage. Kit supplied complete with all necessary construction material and a detailed construction manual.

## NEW *Heathkit* AUDIO OSCILLATOR KIT



MODEL AO-1  
SHIPPING  
WT. 14 LBS.

**\$24.50**

A new Audio Oscillator with both sine and square wave coverage from 20 to 20,000 cycles . . . An instrument designed to completely fulfill the needs of the audio engineer and enthusiast — Has numerous advantages such as high level output (up to 10V obtainable across the entire range), distortion less than .6%, and low impedance output.

Special design features include the use of a thermistor in the second amplifier stage for keeping the output essentially flat across the entire range.

A cathode coupled clipper circuit produces good, clean, square waves with rise time of only 2 microseconds. Oscillator section uses 1% precision resistors in range multiplier circuit for greatest accuracy.

You'll like the operation of this fine new kit.

## *Heathkit* SQUARE WAVE GENERATOR KIT



MODEL SQ-1  
SHIPPING  
WT. 14 LBS.

**\$29.50**

The HEATHKIT SQUARE WAVE GENERATOR is an excellent square wave frequency source with wide range coverage from 10 cycles to 100 kc continuously variable. This feature makes it useful for TV and wide band amplifier work as well as audio experimentation. The output voltage is continuously variable between 0 and 20 volts. The circuitry consists of a multivibrator stage, a clipping and squaring stage and a cathode follower low impedance output stage. The power supply is transformer operated and utilizes a full wave rectifier circuit with two sections of filtering. Another excellent HEATHKIT value at this remarkable low price. Kit includes all necessary construction material as well as complete instruction manual for assembly and operation.

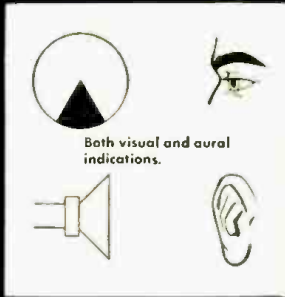
EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY (16)  
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The **HEATH COMPANY**

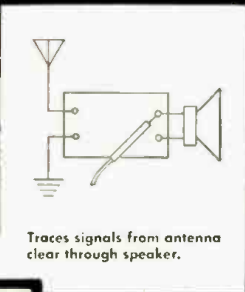
... BENTON HARBOR 15, MICHIGAN

# NEW *Heathkit* SIGNAL TRACER KIT

• NEW NOISE LOCATOR AND WATTMETER CIRCUITS.



Both visual and aural indications.



Traces signals from antenna clear through speaker.

MODEL T-3

SHIPPING WT. 8 LBS.

**\$22<sup>50</sup>**



- Permits visual signal observation as well as aural operation.
- Two separate input channels.
- Tremendous RF channel sensitivity. Adequate for actual signal detection at receiver input.
- Separate high gain RF and low gain audio channels.
- A unique and useful noise locator circuit.
- Built-in calibrated wattmeter.
- Two separate shielded probes for RF and audio application.
- Additional test leads supplied.
- Substitution test speaker and output transformer eliminates necessity for speaker removal in service work.
- Utility amplifier. Check record changers, tuners, microphones, instrument pickups, etc.
- VTVM and Scope panel terminals.
- 5 tube transformer operated circuit.

The new HEATHKIT VISUAL AURAL SIGNAL TRACER represents one of the most convenient and useful instruments the service man can use in AM, FM and TV service work. The electron ray beam indicator constantly monitors both input channels for visual observation of the signal. Now, see and hear the signal level for easier estimation of signal strength and gain per stage in a receiver circuit. Separate high gain channel and special shielded demodulator probe for RF circuit work. Low gain channel for audio circuit investigation and for use as a noise locator. In this feature, approximately 200 volts DC is applied to a suspected circuit component and the action of the voltage in the component can be seen and heard to determine satisfactory operation. This feature alone will prove tremendously helpful in locating the source of objectionable noises in coils, transformers, resistors, cold solder joints, controls, etc. A convenient wattmeter permits rapid preliminary check for voltage distribution circuit breakdown as well as transformer failures. Use the T-3 as a universal test speaker and substitution transformer and save service time by eliminating the necessity for speaker removal on every service call. Additional service uses are: as a utility amplifier for checking the output of record changers, tuners, microphones, instrument pickups, etc. Separate panel terminals permit utilization of other shop equipment such as your Oscilloscope or VTVM. Entire kit supplied complete with 5 tubes, all necessary construction material along with a detailed step by step instruction manual for the assembly and operation of the instrument.

## NEW *Heathkit* CONDENSER CHECKER KIT



MODEL C-3  
SHIPPING WT. 7 LBS.

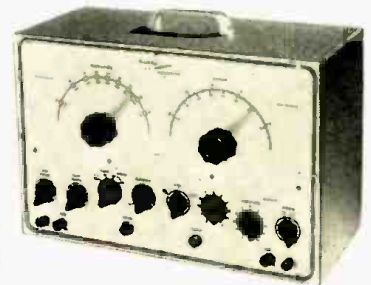
**\$19<sup>50</sup>**

Announcing the new improved Model C-3 HEATHKIT CONDENSER housed in a new smartly styled professional appearing cabinet featuring rounded corners and snug fitting drawn panel. Adequate provisions for ventilation insures longer instrument life through cooler operation. Use the C-3 to accurately measure those unknown condenser and resistor values. All readings of condensers and resistors are read directly on the calibrated scales. Range of condenser measurements is from .00001 mfd to 1000 mfd. Calibrated resistance measurements can be made from 100 ohms to 5 megohms. A leakage test with a choice of 5 DC polarizing voltages will quickly indicate condenser operating quality under actual voltage load conditions. The spring return leakage test switch automatically discharges the condenser under test and eliminates shock hazard. An electron ray beam indicator tube is used in a new leakage test circuit for added sensitivity. The instrument is transformer operated for safety and will prove an extremely welcome addition to your shop equipment. The kit is furnished complete with all necessary parts, test leads and includes a step by step detailed construction manual for assembly and operation.

## *Heathkit* TV ALIGNMENT GENERATOR KIT

MODEL TS-2  
SHIPPING WT. 20 LBS.

**\$39<sup>50</sup>**



Here is an excellent TV ALIGNMENT GENERATOR designed to do TV service work quickly, easily and properly. The Model TS-2 when used in conjunction with an Oscilloscope provides a means of correctly aligning TV receivers. The instrument furnishes a frequency modulated signal covering in 2 bands the range of 10 to 90 megacycles and 150 to 230 megacycles. An absorption type frequency marker covers from 20 to 75 megacycles in 2 ranges; therefore you have a simple, convenient means of checking IF's independent of oscillator calibration. Sweep width is variable from 0 to 12 megacycles. Other excellent features are horizontal sweep voltage controlled with a phasing control — both step and continuously variable attenuation for setting the output signal to the desired level — a convenient stand by switch — and blanking for establishing a single trace with a base reference level. Make your work easier, save time and repair with confidence. Order your HEATHKIT TV ALIGNMENT GENERATOR now.

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
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CABLE: AR248-N.Y.

*The* **HEATH COMPANY**

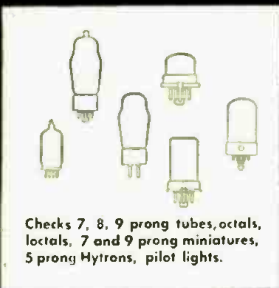
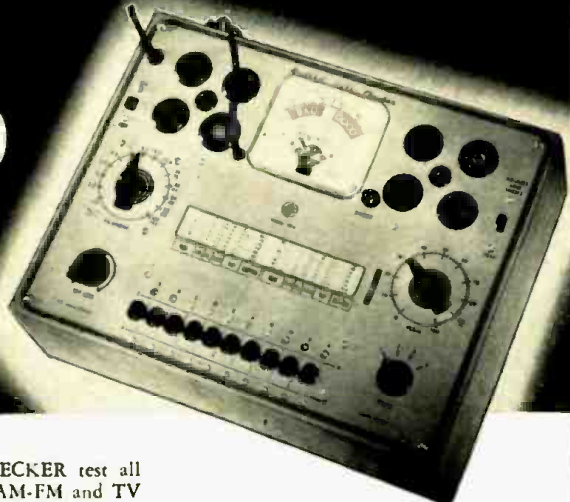
... BENTON HARBOR 15, MICHIGAN

# Heathkit TUBE CHECKER KIT

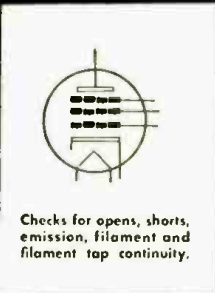
MODEL TC-1

SHIPPING  
WT. 12 LBS.

**\$29.50**



Checks 7, 8, 9 prong tubes, octals, locals, 7 and 9 prong miniatures, 5 prong Hytrons, pilot lights.



Checks for opens, shorts, emission, filament and filament tap continuity.

- Beautiful counter type birch cabinet.

- 4½" Simpson 3 color meter.

- Simplified setup procedure.

- Built-in gear driven roll chart.

- Checks emission, shorted elements, open elements and continuity.

- Complete protection against obsolescence.

- Sockets for every modern tube.

- Blank for new types.

- Individual element switches.

- Contact type pilot light test socket.

- Line adjust control.

With the HEATHKIT TC-1 TUBE CHECKER test all types of tubes commonly encountered in AM-FM and TV receiver circuits. Test setup procedure is simplified, rapid and flexible. Tube quality is read directly on a beautiful 4½" Simpson three color BAD-? - GOOD scale that your customers can readily understand. Panel sockets accommodate 4, 5, 6 and 7 prong tubes, octals, locals, 7 and 9 prong miniatures, 5 prong Hytrons, a blank socket for new tubes and a contact type socket for quick checking of pilot lights. Built-in gear driven roll chart for instant reference. Neon short indicator, individual three position lever switch for each tube element, spring return test switch, line set control to compensate for supply voltage variations. At this low price, no service man need be without the advantages offered by the HEATHKIT TUBE CHECKER.

## Heathkit TV PICTURE TUBE TEST ADAPTER

Use your HEATHKIT TUBE CHECKER with this new TV TEST ADAPTER to determine picture tube quality. Check for emission and shorts, independent of TV power supply. Consists of standard 12 pin TV tube socket, 4 feet of cable, octal socket connector and data sheet. Quickly prove TV picture tube condition to yourself and your customer.



No. 355  
Ship. Wt. **\$4.50**  
1 lb.

## Heathkit RESISTANCE SUBSTITUTION BOX KIT



MODEL RS-1  
SHIPPING  
WT. 3 LBS.

**\$5.50**

NEW HEATHKIT RESISTANCE SUBSTITUTION BOX KIT provides switch selection of any single one of 36 RTMA 1 watt 10% standard value resistors, ranging from 15 ohms to 10 megohms. This coverage available in 2 ranges in decades of 15, 22, 33, 47, 68 and 100. Housed in rugged plastic cabinet featuring new HEATHKIT universal type binding posts. The entire kit priced less than the retail value of the resistors alone.

## Heathkit BATTERY ELIMINATOR KIT

A clean 6 volt d-c supply source is definitely required for successful automobile radio servicing. Has a continuously variable d-c output from 0 to 8 volts. It can be safely operated at a steady 10 ampere level and will deliver up to 15 amperes for intermittent periods. The voltage output terminals are completely isolated from the chassis to accommodate additional service applications such as supplying bias voltages or d-c substitution voltages for battery operated tube filament circuits.

The output of the Battery Eliminator is constantly monitored by a d-c voltmeter and a d-c ammeter. The circuit features an automatic overload relay of self resetting type. For additional protection, a panel mounting fuse is provided. Build this kit in a few hours and pocket a substantial savings.



MODEL BE-3  
SHIPPING  
WT. 20 LBS.

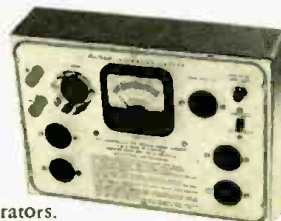
**\$24.50**

## Heathkit VIBRATOR TESTER KIT

Repair time is valuable, and the Heathkit Vibrator Tester will save you hours of work. Instantly tells the condition of the vibrator under test — and the check is thorough and complete. Checks vibrator for proper starting, and the easy-to-read meter indicates the quality of output on large BAD-GOOD scales. Tests both interrupter and selfrectifier types of vibrators. Five different sockets for checking hundreds of vibrators.

Operates from any battery eliminator capable of delivering continuously variable voltage from 4-6V at 4 amps. The Heathkit BE-3 Battery Eliminator is ideal for operating this kit.

Faulty vibrators can be spotted within seconds and you're free to go on to other service jobs.



MODEL VT-1  
SHIPPING  
WT. 7 LBS.

**\$14.50**

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NEW YORK CITY 16  
CALL AREA 5-Y

The **HEATH COMPANY**

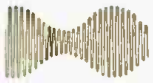
... BENTON HARBOR 15, MICHIGAN

# Heathkit SIGNAL GENERATOR KIT

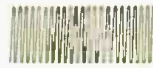
MODEL SG-7

SHIPPING  
WT. 7 LBS.

**\$19.50**



Modulated or unmodulated RF output.



400 cycle sine wave output.

- Step attenuated RF output.
- 6 to 1 vernier dial ratio.
- Turret mounted coil sub-assembly.
- Pre-calibrated and adjusted coils.
- Hartley RF oscillator circuit.
- Colpitts oscillator 400 cycle sine wave output.
- Modulated or unmodulated RF output.
- Frequency coverage on fundamentals 160 kc to 50 megacycles in five ranges. 51 megacycles to 150 megacycles on calibrated harmonics.
- RF output in excess of 100,000 microvolts.
- Audio output 1 1/2 to 2 volts.
- AC transformer operated.
- Professionally styled cabinet.
- Infra red baked enamel panel.

The new HEATHKIT Model SG-7 SIGNAL GENERATOR easily fulfills requirements for a controllable, modulated or unmodulated source of variable frequency. A convenient 400 cycle sine wave output is available for audio work. All RF oscillator coils are precision wound and adjusted to calibration before shipment thereby assuring maximum accuracy. The coils, band switch and tuning condenser all mount as a turret assembly so as to offer the advantage of short wiring leads and easy mounting of parts. The RF output circuit is of the low impedance type obtained by the use of cathode coupling to the output jacks. The level of RF output is varied by means of the RF step and RF output control. Use the HEATHKIT SG-7 as an RF signal source modulated or unmodulated for radio repair, laboratory work, experimental testing, 400 cycle sine wave audio testing, checking RF stages, alignment of both AM and FM IF stages, marker generator for TV alignment, etc. The kit is transformer operated and utilizes miniature tubes for ease in handling high frequency. Panel jacks and a convenient switching system permit either external or internal modulation. The entire kit is supplied complete with tubes and all necessary material as well as a detailed step by step instruction manual for the assembly and operation of the instrument.

## Heathkit INTERMODULATION ANALYZER KIT



MODEL IM-1  
SHIPPING WT.  
18 LBS.

**\$39.50**

The HEATHKIT MODEL IM-1 is an extremely versatile instrument specifically designed for measuring the degree of interaction between two

signals caused by a specific piece of apparatus, or a chain of equipment. It is primarily intended for tests of audio equipment but may be used in other applications such as making tests of microphones, records, recording equipment, phonograph pickups and loud speakers. Use it for checking tape or disc recordings, as a sensitive AC voltmeter, as a high pass noise meter for adjusting tape bias, cutting needle pitch or other applications. High and low test frequency source, intermodulation section, power supply and AC voltmeter all in one complete unit. Percent intermodulation is directly read on three calibrated ranges. 30%, 10% and 3% full scale. Both 4 to 1 and 1 to 1 ratios of low to high frequencies easily set up. At this low kit price YOU can enjoy the benefits of Intermodulation analysis for accurate audio interpretations.

## Heathkit LABORATORY REGULATED POWER SUPPLY KIT



MODEL PS-2  
SHIPPING  
WT. 20 LBS.

**\$29.50**

New HEATHKIT LABORATORY POWER SUPPLY provides continuously variable regulated DC voltage output

from 160 volts to 400 volts depending on load. Panel terminals supply separate 6.3 V. AC supply at 4 amperes for filament circuits. A 3 1/2" plastic cased panel mounted meter provides accurate metered output for either voltage or current measurements. Exceptionally low ripple content of .012% admirably qualifies the HEATHKIT LABORATORY POWER SUPPLY for high gain audio applications. Ideal for laboratory work requiring a reference voltage for meter calibration or for plotting tube characteristics. In service work, it can be used as a separate variable voltage supply to determine the desirable operating voltage in a specific circuit. Use it as a DC substitution voltage in trouble shooting TV circuits exhibiting symptoms of extraneous undesirable components in plate supply circuits. Entire kit, including all 5 tubes now available at this low price.

SOLE AGENT  
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The **HEATH COMPANY**

... BENTON HARBOR 15, MICHIGAN

True  
High-  
Fidelity  
*in the  
most  
dramatic  
setting...*

See your local radio-  
television service dealer.



**OXFORD**  
Components, Inc.

Subsidiary of Oxford Electric Corp  
556 West Monroe Street

Chicago 6, Illinois

Illustrated literature  
available upon request.

## OXFORD 3-WAY SPEAKER SYSTEMS and BASS REFLEX CABINETS

Enhance the beauty and comfort of your room while you enhance the sound of your high fidelity. Every room will sparkle with these OXFORD cabinets whether for stereo or in a setting with just one cabinet. Here is double-duty design . . . cabinets can be used for horizontal or vertical positioning . . . with use of tapered legs or runners which are both supplied. Available with or without OXFORD 3W20 3-way speaker systems, to give you the best sound reproduction.

Cabinet Model No.	Audiophile Net
BR-1M Red Mahogany	\$111.00
BR-1C Cherry	117.00
BR-1B Blonde Oak	117.00
Complete 3 way speaker system for above cabinets Model 3W20	\$ 39.00

F.O.B. Factory



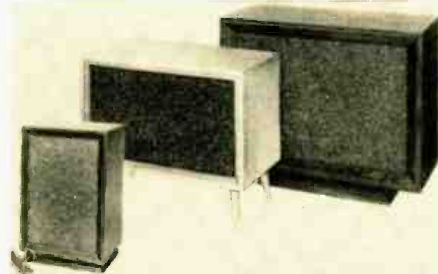
woofer and tweeter main amplifiers, the input to the preamplifier. Simple adjustment of the bass and treble controls can then be made to achieve aural balance.

For complete specifications, write the manufacturer direct.

### NEW NORELCO SPEAKERS

North American Philips Company, Inc. 230 Duffy Ave., Hicksville, N. Y. has a new line of enclosures on the market that feature a removable base which permits the cabinets to be placed horizontally or vertically to fit in with any room arrangement or decor.

While primarily designed for use with the firm's speakers, the FRS enclosures work equally well with most other speakers. The enclosures are of the



ducted-port type and each model is decorator styled in a choice of walnut, blonde, or mahogany. All cabinets are lined with sound absorptive materials for correct damping.

The Models FRS I and FRS III come with a removable base while the Model FRS II is supplied with legs. The Model I is designed to handle 12" speakers while the Model II comes with an insert baffle for 8" speakers and will handle both 8" and 12" units.

Further information on any or all of these enclosures is available from the High Fidelity Products Division of the company.

### "POW-R-CHECK" METER

The Electronics Division of Van Norman Industries, Inc., 186 Granite St., Manchester, N. H. is now offering a power output meter designed especially for the hi-fi enthusiast.

The "Vantron" Model PC-1000 monitors power output while reproducing music or speech on a precision logarithmic scale which makes  $\frac{1}{10}$ th watt as readable as a 10-watt indication. It incorporates an accurate db scale suitable for use with a standard tone-modulated phonograph record to check such intrinsic sound values as treble and bass control positions, flat over-all operation, loudness-control frequency response, relative speaker system efficiency, and response of the phono cartridge.

### TAPE CONVERSION KITS

The Nortronics Co., Inc., 1011 S. Sixth St., Minneapolis 4, Minn. has announced the availability of two new stereo kits for the conversion of existing tape recorders to stereo.

The Model SK-100 allows reproduction of standard half-track, 2-channel stereo tapes on present tape recorders

## STEREO or MONAURAL



## DYNAKIT

PROVIDES COMPLETE  
FLEXIBILITY AND  
CONTROL AT LOWEST COST

### The Dynakit

#### PREAMPLIFIER

- ★ Lowest Distortion and Noise
- ★ Easiest Assembly Using Pre-Assembled Printed Circuit
- ★ Handsome Styling — Selected For Display at Brussels World's Fair
- ★ Only \$34.95 net.

### The Dynakit

#### STEREO CONTROL

- ★ Adds Complete Stereo Control To Two Preamps Without Noise or Distortion
- ★ Unique Blend Control Fills In "Hole In Middle"
- ★ Level, Balance, Loudness, Channel Reverse, and Dual Tape Monitor Controls
- ★ Only \$12.95 Net

Descriptive literature available on request

**DYNACO, INC.**, 617 No. 41st St., Phila. 4, Pa. 25 Warren St., New York, N.Y.

Export Division

# Heathkit WILLIAMSON TYPE AMPLIFIER KIT

The HEATHKIT WILLIAMSON TYPE AMPLIFIER performance has been verified on the basis of critical listening tests and laboratory measurements by both music lovers and audio experts. Use this outstanding amplifier as the heart of your audio system for the fine musical reproduction that is the goal of every audio enthusiast. A new Peerless output transformer with additional primary taps permits ultra linear type circuitry, affording a peak power output of well over 20 watts. Quality of reproduction is instantly apparent and measurements actually bear out the superb performance. Frequency response  $\pm 1$ DB from 10 cycles to 100 kc allows reproduction of the highs and lows with equal crispness and clarity. Harmonic and intermodulation distortion both less than  $\frac{1}{2}$  of 1% at 5 watts eliminate the harsh unpleasant qualities which contribute to listening fatigue.

The HEATHKIT PREAMPLIFIER (available separately or in combination with the amplifier kit) features inputs for magnetic or low level cartridges, crystal pickups and tuners, turnover control for LP or 78 type records, individual bass and treble tone controls each providing up to 15 DB of boost or attenuation. Special notched shafts on preamplifier controls and switches adaptable to custom installation. The preamplifier can be mounted in any position and a liberal length of connecting cable is supplied. No radio experience is required to construct this amplifier. All punching, forming or drilling has already been done. The complete kit includes all necessary parts as well as a detailed step by step construction manual with pictorial diagrams to greatly simplify the construction.



## Heathkit FM TUNER KIT



MODEL FM-2  
SHIPPING  
WT. 9 LBS.

**\$22<sup>50</sup>**

The HEATHKIT MODEL FM-2 TUNER specifically designed for simplified kit construction features a preassembled and adjusted tuning unit. Three double tuned IF transformers and a discriminator transformer are used in an 8 tube circuit. Smooth tuning is obtained through a 9 to 1 ratio vernier drive using a calibrated six inch slide rule type dial. The usual frequency coverage of 88 to 108 megacycles is provided. Experience the thrill of building your own FM tuner. Operate it through your amplifier or radio and enjoy all the advantages of true FM reception. Transformer operated power supply to simplify connections to all types of audio systems. The kit is supplied complete with all 8 tubes and necessary material required for construction. A complete instruction manual simplifies assembly and operation.

### PRICES OF VARIOUS COMBINATIONS

WA-A1 Amplifier kit — Combination 1 — (Main amplifier and Power Supply) complete with WA-P1 Preamplifier kit.

Total Shipping Weight 39 lbs. (Shipped Express only) **\$69<sup>50</sup>**

WA-A1 Amplifier kit only — Combination 4 — (Main Amplifier and Power Supply). Less WA-P1 Preamplifier.

Total Shipping Weight 29 lbs. (Shipped Express only) Price **\$49.75**

WA-P1 Preamplifier kit only. (less power supply) Tubes included.

Total Shipping Weight 7 lbs. (Shipped Exp. or P.P.) Price **\$19.75**

PLEASE BE SURE TO STATE COMBINATION NUMBER WHEN ORDERING.

## Heathkit ECONOMY 6 WATT AMPLIFIER KIT



MODEL A-7  
SHIPPING  
WT. 10 LBS.

**\$14<sup>50</sup>**

The HEATHKIT Model A-7 amplifier features beam power, push pull output with frequency response flat  $\pm 1\frac{1}{2}$ DB from 20 to 20,000 cycles. Separate volume, bass and treble controls. Two input circuits, output impedances of 4, 8, and 15 ohms. Peak power output rated at full 6 watts. High quality components, simplified layout, attractive gray finished chassis, break off type adjustable length control shafts and attractive lettered control panel.

THE MODEL A7A amplifier incorporates a preamplifier stage with special compensated network to provide the necessary voltage gain for operation with variable reluctance or low output level phono cartridges. Excellent gain for microphone operation in a moderate powered sound system.....**\$16.50**

## Heathkit HIGH FIDELITY 20 WATT AMPLIFIER KIT

The HEATHKIT MODEL A-8 amplifier kit was designed to deliver high fidelity performance with adequate power output at moderate cost. The frequency response is within  $\pm 1$  DB from 20 to 20,000 cycles. Distortion at 3 DB below maximum power output at 1000 cycles is only .8%. The amplifier features a Chicago power transformer in a drawn steel case and a Peerless output transformer with output impedances of 4, 8, and 16 ohms available. Separate bass and treble tone controls permit wide range of tonal adjustment to meet the requirements of the most discerning listener. The amplifier uses a 6SJ7 voltage amplifier, a 6SN7 amplifier and phase splitter and two 6L6's in push pull output and a 5U4G rectifier. Two input jacks for either crystal or tuner operation. The kit includes all necessary material as well as a detailed step by step construction manual.



MODEL A-8  
SHIPPING WT. 19 LBS.

**\$33<sup>50</sup>**

MODEL A8-A features an added 6SJ7 stage (preamplifier) for operating from a variable reluctance cartridge or other low output level phono pickups. Can also be used with a microphone. A 3 position panel switch affords the desired input service. ....**\$35.50**

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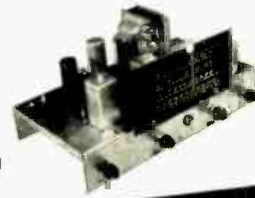
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3 ranges, continuous coverage 550 kc to over 20 megacycles, shipping wt. 11 lbs.

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Two excellent radio receiver kits featuring clean design and open layout for simplified construction. Satisfy that urge to build your own radio receiver and select the model which meets your requirements. Both receivers feature continuously variable tone control, a radio phono switch and phono input and an AC receptacle for the phono motor. A six inch calibrated slide rule type dial with a 9 to 1 ratio vernier dial drive insures easy tuning.

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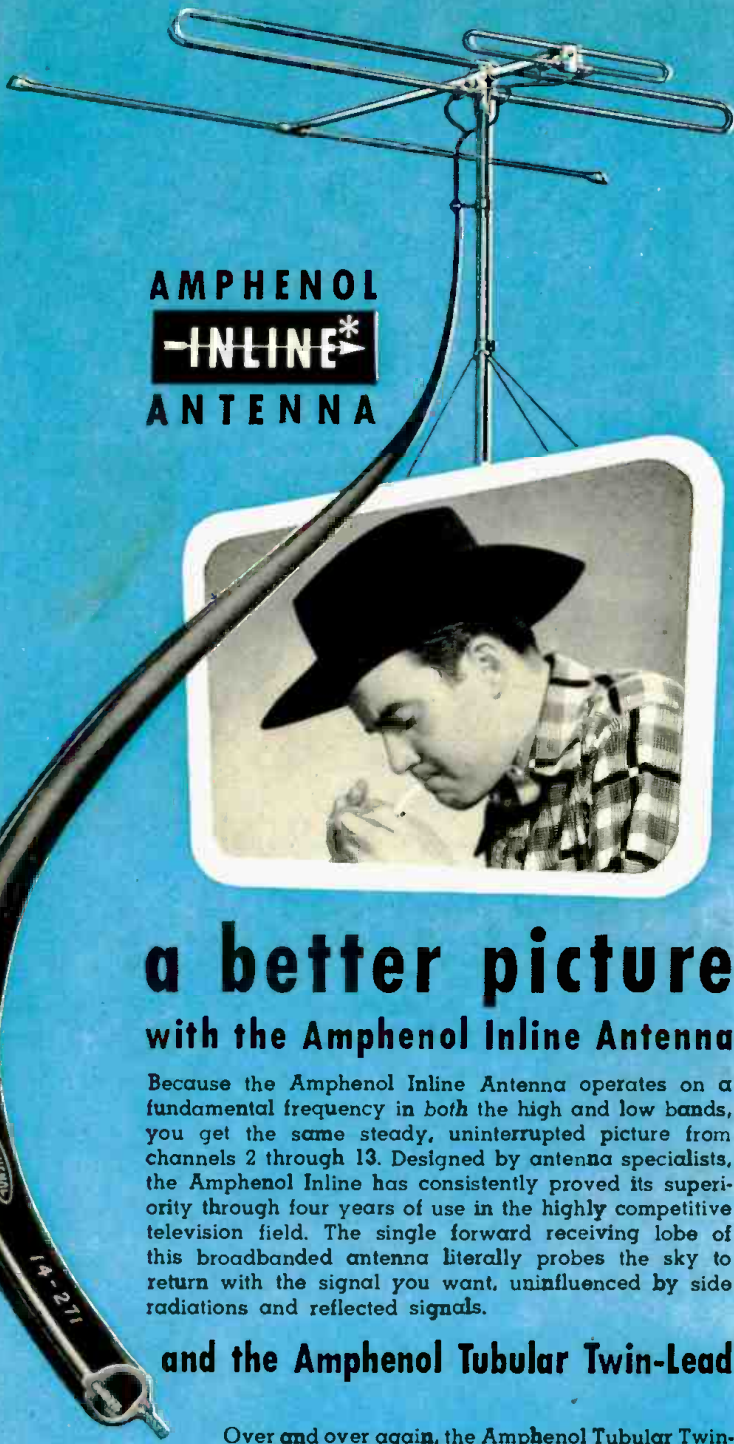
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Because the Amphenol Inline Antenna operates on a fundamental frequency in both the high and low bands, you get the same steady, uninterrupted picture from channels 2 through 13. Designed by antenna specialists, the Amphenol Inline has consistently proved its superiority through four years of use in the highly competitive television field. The single forward receiving lobe of this broadbanded antenna literally probes the sky to return with the signal you want, uninfluenced by side radiations and reflected signals.

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Over and over again, the Amphenol Tubular Twin-Lead has been established as the one satisfactory answer to the need for an economical TV lead-in for use in those trouble areas where conventional twin-lead cannot be used. The tubular construction of high grade polyethylene provides a protected area, using air as the dielectric, between the conductors. This provides low-loss and constant impedance at all times, unaffected by any exterior condition.

**This book contains . . .**

a complete, yet condensed evaluation of the various types of antennas on the market today, graphs and illustrations clarifying their various characteristics, and information on the use of rotators, lightning arrestors, etc. Obtain your free copy from your Authorized Amphenol Distributor.



**AMERICAN PHENOLIC CORPORATION**  
1830 SOUTH 54TH AVENUE • CHICAGO 30, ILLINOIS

**Within the Industry**  
(Continued from page 28)

tennas and accessories . . . **ZENITH RADIO CORPORATION** has opened a new manufacturing plant at 1500 North Kostner Avenue in Chicago. The new factory will be used to produce speakers, coils, transformers, and other radio-television components in addition to hearing aids and government defense materials . . . **FURST ELECTRONICS** has moved its plant and general offices to new and larger quarters at 3322 West Lawrence Avenue, Chicago 25, Illinois . . . The rectifier division of **SARKES TARZIAN, INC.** has added approximately 3000 square feet to its present facilities for research and engineering work . . . **RMS** has acquired a new plant at 2016 Bronxdale Avenue, New York 60, New York which will provide approximately 45,000 square feet of space for the firm's production of electronic products. The antenna division will remain at West Farms Road in the Bronx and the company's former plant building and general offices will be retained as a warehouse . . . **RAYTHEON MANUFACTURING COMPANY** recently dedicated a new building on Seyon Street in Waltham, Mass. The plant, which will be used by the research division in carrying on a major portion of the company's transistor program, will also be utilized for engineering and manufacturing activities by the company's equipment divisions.

**ROBERT A. PENFIELD** is the new advertising manager for the radio and television picture tube division, electronics, parts, and tungsten and chemical divisions of *Sylvania Electric Products Inc.*

He joined the company in March, 1947, as editor of "Sylvania News." In July, 1951, he was named advertising supervisor of the company's tube divisions in New York.



Mr. Penfield is the chairman of the Exhibitors' Advisory Committee for the 1953 annual convention of the Institute of Radio Engineers which will be held in New York City.

**RAYTHEON MANUFACTURING COMPANY** has set up a new international division to handle its rapidly-expanding foreign business. Ray C. Ellis will head the new organization . . .

**THE GABRIEL COMPANY** has established a new division, **THE GABRIEL LABORATORIES**, which will serve as the research and development center for all of the company's divisions . . . A new firm of manufacturers representatives and sales consultants specializing in electronic accounts has been organized under the name of **ADOLPH L. GROSS ASSOCIATES, INC.** Principals in the firm are Adolph L. Gross and Robert Hertzberg. Offices are at 45 West 45th Street, New York 36, New York . . .

**TENNA-TRAILER COMPANY** has undergone complete reorganization of both personnel and production facilities. The factory and offices have been moved to Pontiac, Illinois. Kenneth B. Price is now the sole owner and president of the firm . . . **FAIRCHILD CAMERA AND INSTRUMENT CORPORATION** has set up a new division which will be devoted to the development and manufacture of precision potentiometers.

**MACDONALD GOODWIN** has been appointed sales manager of government and export sales for the *Bogue Electric Manufacturing Company* of Paterson, New Jersey.

He will also serve as manager of the company's Washington office. Prior to joining *Bogue*, Mr. Goodwin was the Washington representative for the *Bendix Radio Division* and has also been associated with the *Arnold Company* of Richmond, Va. and the *Link Radio Corporation*. From 1946 to 1949 he was vice-president and general sales manager of *Continental Electric Company*.



Mr. Goodwin will maintain offices at 2430 Pennsylvania Avenue, N.W. in Washington.



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A G-E FIELD CLINIC LIKE THIS!**

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# NEW G-E DYNAMIC ANALYZER HELPS SOLVE YOUR TOUGHEST TV SERVICE PROBLEMS

★ When 20 crack service teams hit the road this month from Electronics Park, General Electric television headquarters, they'll be packing profit information for you. Be sure to take advantage of their clinics scheduled for your area.

Equipped with the new Dynamic Analyzer, these technicians will demonstrate quick, simple ways to diagnose TV troubles and correct them. They will answer your questions on circuits, picture tubes, components, replacement parts. Attendance at these clinics will prepare you for profitable follow-up on service requirements this fall and next year.

Get in touch with the TV service manager at your G-E distributor now. Tell him to sign you up for the first clinic that hits town. It'll be worth your while!

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**GET THESE SERVICE NOTES—**

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● Just printed—this 30-page illustrated bulletin lists complete RF and IF alignment details, circuit analyses, trouble shooting, replacement parts list—for latest G-E Stratopower receivers. Mail coupon below for your copy.



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Rush my copy of your new Stratopower Chassis service notes.

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10 watt audio. Low distortion. Freq. response plus or minus .5 db, 20 to 20,000 cps. 4 channels. Radio, phono, crystal, magnetic. Vol., bass, and treble controls. Complete with tubes and output transformer.

CRAFTSMEN C-500 ..... \$ 99.50  
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**3-Speed 12" Turntable**  
**REK-O-KUT**

Induction type motor, designed for smooth, vibration free operation. Instantaneous speed changes without stopping turntable or removing disc ..... **\$54.95**



**Hi-Magnetic! Hi Fidelity!**  
**CARTRIDGES**

GE RPX-050 with dual reversible sapphire stylus ..... \$ 8.37  
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GE RPX-042 (less stylus) ..... 4.25  
GE RPX-045 Professional type (less stylus) ..... 6.87  
GE RPX-047 Broadcast type (less stylus) ..... 9.27  
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**Three-Speed, Automatic**  
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Model RC-80 ..... **\$42.30**

Model MB mtg. board ..... \$2.50  
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Fully automatic with automatic stop. Plays all size records, all 3 speeds. Min. cabinet space required: 15 1/2" long 13 1/2" wide, 5 3/4" clearance above and 3 1/2" clearance below top of motor board. Less cartridge.

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GE S120ID  
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Craftsman AM-FM ..... \$131.80  
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Address Orders to Dept. RN-9  
Write for Free FYI Bulletin

**WHOLESALE**  
RADIO PARTS CO., Inc.  
311 W. Baltimore St.  
**BALTIMORE 1, MD.**

**Large Screen TV**

(Continued from page 42)

most schematic diagrams but changes in part values and construction have been necessary.

**Centering**

Raster positioning in electrostatic focus tubes is readily accomplished by a permanent magnetic device located directly behind the yoke. Two ring magnets, which can be rotated independently, are used. By lining up the two magnets, maximum displacement is obtained. When the magnets are positioned 180 degrees apart, their fields cancel and minimum displacement results.

**Focus**

For tubes using standard electromagnetic focusing the circuits are essentially the same as those for 16" and 17" tubes.

Three types of electrostatic focus tubes are being used. These are classified by the voltage applied to the focusing electrode.

The first of these tubes is the high voltage electrostatic focus type which requires, on the focusing electrode, a voltage of about one-fifth the second anode high voltage. A separate rectifier is usually incorporated and operated in the same manner as the high-voltage rectifier. A separate filament winding is added to the flyback transformer and the pulse at the plate of the horizontal amplifier becomes the plate supply. A voltage divider, including a focus pot., is added to the filtered output. See Fig. 2.

The second type tube uses low voltage electrostatic focus and does not require any special source. Usually a high resistance pot. is connected to the boost supply. In both the high and low voltage electrostatic type tubes the focus adjustment is not critical since it is very broad in its action.

The third and newest type to be developed is the automatic electrostatic focus type tube. The focus element is connected internally to the first anode or the cathode through a resistor.

Irrespective of their gun structures, these large tubes require the usual ion trap. The "distributed winding" or "cosine" type yoke is required to give full deflection with good focus over the entire screen.

Fig. 1 is a simplified circuit of part of an RCA 21" chassis. The horizontal coils of the yoke are in series with part of the high voltage transformer primary and, in the main part, constitute the plate "load" for the 6CD6 horizontal amplifier tube. This arrangement is known as "direct drive." The yoke impedance is high when compared with present types.

The parallel damper tubes are required for the peak current which is present when the tubes are conducting. The 1.5 microhenry chokes in the plate circuits are Barkhausen oscillation suppressors and are mounted at the plate terminal of each tube socket. (Other sets may use a single suppressor choke common to both tubes.) The usual parasitic suppressor resistor at the 6CD6 plate has been replaced by a small choke which serves the same purpose but is probably more effective.

The width control, connected across the entire horizontal section of the yoke, operates in the same manner as in conventional circuits of the past in that it absorbs energy from the circuit to reduce the scanning current in the horizontal coils.

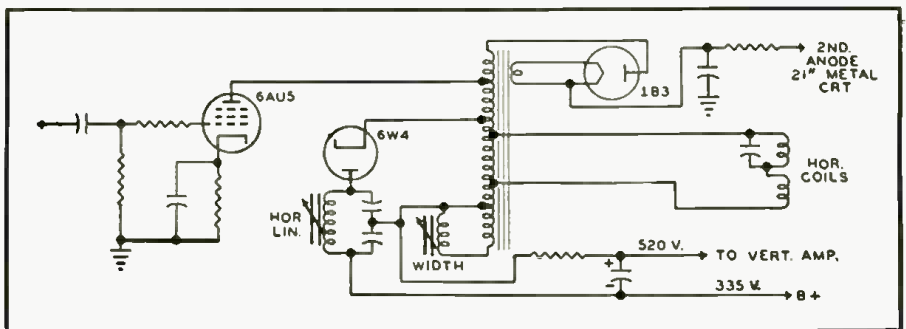
While two linearity controls are shown, later models do not have the resistive control parallel to the yoke winding. Basically, this control changes the circuit impedance and hence the waveform of the sweep current. It has been found that adequate control of the linearity can be obtained with the regular linearity control in series with the dampers.

The 33  $\mu$ fd. condenser in parallel with part of the high voltage transformer "tunes" the transformer and increases the picture width. By controlling the flyback time the high voltage pulse is reduced. With reduced high voltage there will be greater deflection of the scanning beam.

The 1000 megohm resistor from the 1B3 filament to the chassis allows the high voltage condenser to discharge when the set is turned off. This keeps the spot from lingering on the picture tube which, in time, can cause an ion burn. In addition, the metal cone of the picture tube ceases to be "hot" and a hazard to the technician.

Fig. 2 is a partial schematic of a late-model Zenith chassis. The circuits are approximately the same as previous models except that the voltage present at the plate of the horizontal amplifier is rectified and the fil-

Fig. 3. High-voltage schematic of the Hallicrafters Model 21393 21-inch receiver.



tered output is available for use at the focusing electrode.

Fig. 3 is a circuit diagram of the latest *Hallicrafters'* horizontal sweep circuit. The various components are connected to taps on the transformer primary winding rather than to a secondary winding. Other than this, the circuit closely resembles those found in the smaller screen receivers.

#### New CR Tubes

New tubes for the larger screen receivers include the 20CP4, 20DP4, 21AP4, 21EP4, 22AP4, and 24AP4 for conventional magnetic focus applications; the 17FP4, 17GP4, 20FP4, 20GP4 for high voltage electrostatic focus receivers; 17HP4, 17TP4, 20HP4, 24BP4, and 27QP4 for low voltage electrostatic focus sets; and 16ACP4, 17KP4, 17RP4, 17SP4, 20JP4, 21KP4, and 21LP4 for the automatic electrostatic focus receivers.

-30-

#### INTERNATIONAL TV

**A** WEEK-LONG series of television programs from Paris has been seen by British viewers by means of an international hookup between Paris and London.

Transmitted by means of microwave links at 5 points in France and two towers between the British coast and London, the programs included Paris street scenes and coverage of traditional Bastille Day ceremonies.

The problem of converting from the French 819-line system to the British 405-line image was solved by means of a special BBC converter.

-30-

#### ECONOMICAL CORDS

By ARTHUR TRAUFFER

**A** FOUR-FT. length of ordinary POSJ electric lamp cord retrieved from the scrap box will provide a satisfactory cord for that surplus single earphone unit, as shown in the photo. Various single earphone units are available at bargain prices; some have cords and some do not, and for experimental purposes or children's crystal sets a piece of scrap POSJ is entirely satisfactory.

Solder a pair of phone tips to one end of the cord, and solder a pair of tips, soldering lugs, or spade lugs on the other end, depending on the type of phone unit. For small phone units, such as shown in the photo, it's better to use small lightweight soft rubber-covered POSJ such as made for small table lamps, as these cords are more flexible.

-30-

Make a pair of lightweight headphone cords.



You headphone users have always known just what you want—flat response, high sensitivity, low distortion, rugged construction, lightweight, comfortable design. Now for the first time, all of these features are combined in a single headphone designed around the exclusive BIMORPH CRYSTAL\* drive element. These outstanding, new headphones result from Brush pioneering and experience in acoustics and electronics.

- Exceptionally flat frequency response
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- Sensitivity is approximately 6.3 dynes/cm<sup>2</sup>/volt at 1000 cps.
- Exclusive METALSEAL CRYSTAL\* for protection against high humidity
- Impedance of 100,000 ohms at 1000 cps.
- No transformer required
- Multiple installations are readily made

Available from your local radio parts jobber in three styles: Double headset, Single headset and Lorgnette style.



Brush Microphones—Superior Brush crystal microphones are available in five models. See them at your dealer.

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# TELEVISION FRONT ENDS on SALE at McGEE—STANDARD COIL, RCA, SARKES-TARZIAN

## STANDARD COIL CASCADE TUNER \$19.95

The Cascade Circuit of the Standard Tuner offers a new development of this famous TV front end assembly which affords a 2-to-1 improvement in gain and a 55% to 50% reduction of noise over the pentode tuner. Other advances include: easy conversion to CIP reception by interchange of channel indicators; increased sensitivity for TV sets in fringe areas; elimination of booster tube; and a high profit item for the serviceman as a replacement unit. Brand new factory cartoned. Series TV-2000 TV tuner, compl. with tubes 61K7 or 61Q7 and a G36. Seldom price, \$19.95 ea.



## THE ORIGINAL STANDARD COIL TV TUNER \$12.95 ANOTHER McGEE SCOOP

Five millions of this 12-channel Standard Coil tuner now in use. The popular model with clip-in channel indicators and concentric fine tuning shaft. You save over 50%. Price includes tubes. Stock No. 81-0477 \$12.95 each; 2 for \$23.00. Choice of 2 1/2" or 3 1/2" length insulated shaft. Used on Emerson Model 6501, 655, etc. Filaments connected in series (12 volts) and shunted .5 amp drain for AC-DC TV sets. Priced with tubes 6AG5 or 6BE6 and G46. Stock No. 81-048 \$13.95 each; 2 for \$27.00. Available with either 3 1/2" or 5" shaft length. Filaments are in parallel for 0.3 volts AC operation. Price includes tubes 6AG5 or 6BE6 and G46. Note: Both tuners have IF coil attached for intercarrer sets. For sets with separate sound we suggest using the converter coil on the following furnished with each tuner.) Bakelite channel selector knob with embossed channel markings, 59c extra.

## GENERAL INST. T.V. TUNER \$7.95

This popular General Instrument TV tuner has been used on thousands of late model TV sets. It has built-in fine tuning and 12 channel selector control. This tuner differs from other tuners in that it is built around a tuning condenser instead of a coil switching arrangement. A converter coil is not mounted on this tuner. Priced complete with 3-6J6 tubes. Shipping wt., 3 lbs. Stock No. G1-W73, with tubes. Net price, \$7.95. Specify shaft length desired, either 1 3/4" or 7". \$2.95 SPECIAL. G1-12. Same as above G1 Tuner only less tubes and in repairable condition. 1 3/4" and 7" shafts available.

## 3-TUBE SARKES-TARZIAN T.V. TUNER \$9.95

This popular Sarkes-Tarzian Type 3 tuner is widely used, 13 channel rotary type switch with individually tuned coils. Price is complete with diagram and three tubes: 6C4 osc., 6BH6 I.F. and 6AG5 mixer. Regular factory cost is twice our price. Each unit is wired ready to hook up to a video and sound IF strip. May be used with either inter-carrier or separate sound IF circuits. Has built-in converter coil built in the frequency control. Sarkes-Tarzian T.V. tuner, with 3 tubes. Net price, \$9.95 each. Specify shaft length, either 2 1/2" or 4 3/4".

## RCA 201E1 T.V. TUNER \$7.95

Terrific buy on this RCA tuner. We have a limited quantity of the famous original 201E1, 13 channel completely wired and tested TV front end tuners. Ready to connect to your TV video I.F. strip. Offered at a sacrifice. Price was \$44.00. Now only \$7.95 each, with tubes. Each tuner in good condition but has been repaired. Stock No. RCA-13P. TV front end tuner. Converter coil type for separate sound as used in the famous 5 chassis. Complete with 3-6J6 tubes. \$7.95. Specify shaft length desired, either 2" or 4".

## WIRED VIDEO I.F. STRIP \$3.95

This wired video I.F. strip is a perfect replacement for several model Crosley TV sets, such as Model No. 11-442MU, 11-443MU and many others. Only 9 tubes are required. 2 6AU6, 1st and 2nd video, 6AL5 video detector and either 6AG5 or 6BE6 I.F. and 4th video, 1st I.F. 22.9 mc, 2nd 26.55 mc, 3rd, 22.2 mc, 4th 24 mc. This strip has dozens of resistors, ceramic capacitors and slug-tuned I.F. coils. Ideal for set builders, or perfect to rob parts from any TV servicing. Stock No. CR-51P. \$3.95 each. Kit of 5 tubes for this I.F. strip, \$3.50 extra.

## SARKES-TARZIAN 12 CHANNEL TV TUNER \$9.95

Type 4, Sarkes-Tarzian 12 channel TV tuner. Requires 2 6AG5 or 2 6BE6's and a 12AT7. Has 3 1/2" diameter shaft, 2 3/4" long. Screwdriver slot fine tuning adjustment. It differs from other tuners in that it has no concentric fine tuning shaft over the channel selector shaft. Very fine for experimental use, building field strength meters, etc. Sarkes-Tarzian T.V. tuner less tubes. \$2.95. Set of 3 tubes for this tuner, \$1.80 extra.

## T.V. RADIO NEWS SPECIAL \$9.95

3 Flyback and 3 Deflection Yokes for \$9.95. You get 3 deflection yokes, 2-70" yokes, and 1-55" yoke, and 3 horizontal flyback transformers, General Electric 14-000 volt ceramic core 70" and 1 early model Philco. The G.E. flyback cost regularly more than our price for the complete deal. Stock No. 33YK. ship. weight, 5 lbs. Radio News Special, only \$9.95.

## T.V. COMPONENT DEAL #CGE \$12.95

Here is a terrific TV parts deal for those who repair TV or for the builder and experimenter. You get a Meissner 12-channel TV tuner, Crosley 5-tube video I.F. strip, a 14KV G.E. horizontal output transformer, plus a standard 4-wire vertical output transformer, plus 70" cosine deflection yoke (no tubes included). It's worth \$20.00. Our sale price, only \$12.95.

## MEISSNER TV TUNER WITH 3-6J6 \$5.95

Meissner 12-channel television tuner. Ready wired and with 3-6J6 tubes. A 12-channel rotary switch type with separate coils for each channel. Built-in fine tuning and channel control. Ideal for builders, experimenters. Stock No. 13-7024. Sale price, \$5.95 each, with tubes.

# COMPLETE RADIO, TELEVISION AND AMPLIFIER KITS AT MCGEE

## 3-WAY PORTABLE KIT \$15.95

A New '52 Model New 1952 Model 3-way personal portable radio kit. Operates on 110 volts AC-DC or 67.5 B plus 1 1/2 volt self-contained batteries. Leatherette covered case size, 5 1/2 x 2 1/2 x 3 1/8". Receives broadcast 550 to 1050 KC. A conventional 2-gang superhet circuit with 456 KC iron core IF's. Incorporates the new super gain week loop antenna. All plated chassis. Lab. approved circuit—matched parts. Price includes all parts, tubes, diagram, 12 inch PM speaker. A factory quality kit. Stock No. PN-4T, shipping weight 7 lbs. The complete kit, less batteries, \$15.95. 67.5V, B, \$1.99; 1 1/2V, A, .39c extra.

## \$7.95

Build Your Own Phono-Mike Broadcaster Kit Model DE-6R. With this simple kit, you can build a 3-tube phono oscillator that also has a mike input. Will broadcast over any radio, within your home, (about 75 feet from 1000 to 1500 kc. Input for crystal mike or crystal phono pickup. Fader control fades from mike to record. Ideal for a home P.A. system, baby sitter and home entertainers. A complete kit of parts including tubes. Kit Model DE-6R. Net price, \$7.95. DE-6RWT, wired and tested, only \$9.95. Crystal mike and desk stand, \$4.95 extra. Concealed microphone unit, only 1 1/2" in diameter and 1 1/2" thick. Specify hidden mike when ordering. Stock, T-001. Net, \$3.95 extra.

## 8-Tube Hi-Fi Amplifier Kit \$29.95

A complete kit, including tubes: 3-7E5, 2-27F7, 2-6AX1 plus rectifier diodes, and photos. Inputs for radio tuner and any kind of phono pickup, crystal or G.E. variable reluctance and either crystal or dynamic mike. Output matches 8 ohm voice coil. Twin electronic bass and treble tone controls with range selection switch. Tone juke box quality with heavy bass response or brilliant symphonic range. Response to 20,000 cps. 8 tube all-triode amplifier kit, complete with tubes. Shipping weight 25 lbs. Model 7X5. Net \$29.95.

## 10-Watt Hi-Fi Amplifier Kit \$14.95

A complete kit of parts including 2A3, 12A5, 2-50L6, plus rectifier, diagram and instructions to build a high fidelity 10 watt audio amplifier with tone control and treble boost. Inputs for radio tuner, crystal and crystal phono pickup. Output matched 8 ohms. Response from 50 to 15,000 cps. Chassis ready punched. Ventilated cover. Straight forward circuit with 4 1/2" diodes and 2-50L6 tubes in push-pull. Size, 5 1/2" x 10" x 5 1/2" high. Model AP-10R. ship. wt. 8 lbs. Sale price \$14.95.

## 10-TUBE RADIO KIT \$29.95

10 tube broadcast radio chassis 14 KV G.E. e.o.t. and photos. Inputs for radio tuner and any kind of phono pickup, crystal or G.E. variable reluctance and either crystal or dynamic mike. Output matches 8 ohm voice coil. Twin electronic bass and treble tone controls with range selection switch. Tone juke box quality with heavy bass response or brilliant symphonic range. Response to 20,000 cps. 10 tube all-triode amplifier kit, complete with tubes. Shipping weight 18 lbs. Net \$29.95.

## 17, 20" T.V. Kit \$59.95 Less Tubes

A complete kit of parts to build an AC transformer operated television (also for use with a 17", 17" or 20" rectangular picture tube. The 12 channel Sarkes-Tarzian tuner and I.F. strip, as is the 4 tube video I.F. strip. Circuit is of the conventional design. Do not buy this unless you understand television. It is difficult to wire. We furnish schematic. Kit model WI-20. Ship. wt. 40 lbs. less all tubes. Net \$59.95. Kit of 20 tubes, less picture tube \$16.95. 17HP4A, \$19.95. 20HP4, \$25.00.

## 6-TUBE 2-BAND KIT \$14.95

Popular 2-band kit for schools and colleges for training. 6 tube AC-DC band radio kit with plastic cabinet. Receives broadcast and 6 to 18 mc. shortwave. Full 2 gang superhet with 9" speaker and slide rule dial. A complete kit with tubes: 12SK7, 12SK4, 12SK7, 12SQ7, 3-1L6 and 3-5Z5. Diagram and instructions. Factory quality. Cabinet size 13 1/2" x 7 1/2" x 5 1/2". Shipping weight 12 lbs. Model ME-2. Net \$14.95.

## 5-TUBE AC-DC KIT \$12.95

Model RS-5. A 5 tube AC-DC straight broadcast kit, housed in the same cabinet as ME-2 above. Complete with tubes. Shipping weight 10 lbs., Net \$12.95.

## AG POWERED BROADCAST TUNER KIT \$12.95

A self-powered, 3-gang superhet tuner kit with R.F. stage. This complete kit is furnished with diagram, photos and tubes. 6AU6 I.F. 6BE6 oscillator R.F. 6AU6 I.F. 6BE6, 6A15 diode. AVC, plus rectifier. Connect to any audio amplifier. Ideal for use with our S-2020, TM-16 or 7x7 amplifier kits. Chassis size 8 1/2" x 4 1/2" x 4 1/2". Shipping weight 7 lbs. Broadcast tuner kit Model BT-38X. Net price, \$12.95.

## GENUINE STANDARD COIL T.V. BOOSTER \$11.95

Not Surplus, But Right From the Factory Latest Model B-51 Standard Coil Television Booster. McGee makes another lucky purchase and as usual, passes the saving on to you. The famous Model B-51 Channel Standard Coil TV booster, which lists for \$35.00, is offered to you for only \$11.95 each. Brand new, factory cartoned and fully guaranteed. This top quality silver stage booster utilizes printed high frequency circuits, for improved performance on all channels. Uses 6AK5 tube. Average gain, 6 to 7 volts on low channels and 5 or 6 on high channels. No distorting of picture or sound. Has extremely low noise factor. Continuous one-knob tuning and channel selector control switch for on-off and by-passing 300 ohm lead-in to set. Modern design, dark brown plastic cabinet, 8" x 4 1/4" x 4 1/2". Made for 110 volt, 60 cycle AC operation. Shipping weight 5 lbs. Model B-51. Sale price, \$11.95 each, or buy 2 for only \$22.00.

## MCMURDO SILVER BOOSTER \$10.95

Sensational value. Continuously variable inductance type tuner, from channel 2, including the FM band, through channel 13. This booster is self powered for 110 volts AC operation. Incorporates a G6E tube. Input for 300 ohm TV line and 300 ohm output to the TV set. Single knob tuning. Attractive plastic case. McMurdo-Silver Super Sonic TV-13M booster. Stock No. GII-011. Shipping weight 5 lbs. McGee's terrific sale price, \$10.95 each, two for \$20.00.

## 1952 MODEL ASTATIC \$19.10

New Astatic "Scanar" TV booster with improvements to match the newer model TV receivers. Minimum noise with maximum gain. Balanced circuit with 6BE6 and 61Q7. Input and output for both 72 and 300 ohm. Mahogany finished metal cabinet 6 1/8" x 4 1/2" high. Model CT-1. Net price \$19.10.

## 1952 MODEL REGENCY \$19.10

New Regency DB-520 TV booster with exclusive circuit stabilizer and newly designed cabinet only 4 1/2" x 4 1/2" x 4 1/2". Improved circuit with push-pull G6E is equal to the best cascade circuit and has higher gain. Matched 72 or 300 ohm. Net price \$19.10.

## SALE OF 14-17-20-INCH CONVERSION 20-INCH CONVERSION KIT \$37.95

Our 20" conversion kit includes a 6-month guaranteed 20HP4, 20" rectangular blackface tube, plus a 14,000 volt G.E. built high voltage flyback transformer, plus a matched 70" cosine yoke, plus a 20" rectangular gold trimmed plexiglas mask and suggested diagram. The picture tube is the latest electro-static focus type that requires no focus coil. Shipped via express or truck only. Ship. weight, 40 lbs. Stock No. 20-MP4. Net price, \$37.95.

## 14-INCH CONVERSION KIT \$19.95

Our 14" conversion kit includes an RCA 14-000 volt G.E. built flyback, tube plus a 14" plexiglas gold trimmed mask. Offered at the very low price of only \$19.95. Suggested diagram furnished. Ship. weight, 20 lbs. Via express or truck only. Stock No. RC-14X. Net price, \$19.95.

## 17-INCH CONVERSION KIT \$29.95

Our 17" conversion kit includes a 6-month guaranteed 17HP4 rectangular picture tube, plus a G.E. built 14,000 volt flyback, plus a matched 70" cosine yoke, plus a 17" plexiglas gold trimmed mask, and suggested diagram. The 17HP4 is the latest electro-static focus type that requires no focus coil. Shipped via express or truck only. Stock No. 17-MP4. Net price, \$29.95.

## TERRIFIC FLUORESCENT FIXTURE SALE

IS YOUR SERVICE DEPT. PROPERLY LIGHTED? SAVE 50% ON THIS 4-LIGHT FIXTURE \$12.95, TWO FOR \$25.00 WITH LAMPS

TOP ILLUSTRATION—This is the finest variety in a fluorescent fixture that we have ever offered. Constructed of heavy galvanized metal with lustrous white enamel finish. Furnished with four universal electric 30" x 30" watt white fluorescent lamps. Fixture may be mounted next to the ceiling or suspended on chains. These fixtures are beautifully constructed. Use them over your service bench, in your display room or in your office. Brand new factory packed for your protection. We bought it truck loads and are passing our bargain on to you. Why pay more than this to modernize your shop. Shipping weight 26 lbs., each. Shipped via Express, Rail Freight or Truck only. Stock No. MK-450 fixture complete, Net \$12.95; 2 for \$25.00.

Bottom Illustration  
Deluxe Model No. MK-40X, same as No. MK-430 described above with the exception that it has translucent glass over the lamps to diffuse the light. CEILING CANOPY. These fixtures sold for up to \$10.00. Weight 33 lbs. Net price \$14.95; 2 for \$28.00.

Canopy for suspending either of the above fluorescent fixtures 30" from the ceiling. For use where it isn't advisable to mount fixture flush or suspend it on chains. Canopy kit is complete with stamped metal box cover with hardware for mounting in any outlet box and 2-10" lengths of 3/8" white enameled tubing. Ship. wt. 6 lbs. Fixture canopy kit, No. 1-40, \$1.95.

McGEE RADIO COMPANY. Prices F.O.B. M.C. Bond 25% Deposit with Order. Balance Sent C.O.D. With Parcel Post Orders, Include Postage. TELEPHONE VICTOR 9045. WRITE FOR FLYER 1422 GRAND AVE., KANSAS CITY, MISSOURI. RADIO & TELEVISION NEWS

# AMPLIFIERS—CHANGERS—FM-AM CHASSIS ON SALE AT MCGEE

## ESPEY 12-TUBE FM-AM CHASSIS, \$64.50

- ★ BUILT-IN PRE-AMP FOR G.E. VARIABLE RELUCTANCE PICK-UP
- ★ WIDE RANGE AUDIO
- ★ WHY NOT ORDER WITH A COAXIAL SPEAKER AND A RECORD CHANGER? SEE OUR SPECIAL OFFERING

McGee's new 1952 model 12-tube FM-AM chassis. Latest design with phono inputs for all types of record players, crystal or G.E. variable reluctance. Receives standard broadcast 534 to 1700 kc and FM 88 to 108 mc. Wide range audio response (push-pull 6V6 output) and bass boost tone control. Loop antenna for broadcast and 300 ohm line type. FM antenna may be stapled in cabinet. Attractive light-colored dial. Chassis size, 11 1/2" x 9" high and 9" deep. Complete with tubes: 6BE6, 6BA6, 6BA7, 6SH7, 6AL5, 6SQ7, 6SQ7, 12A7T, 2-6XGT and 513GT rectifier. Shipping weight 20 lbs. Stock No. 70-N. Espey 12-tube FM-AM chassis. Sale price, \$64.50, less speaker. Output matches voice coil of our 12" or 15" coaxial speakers.

- |   |  |   |
|---|--|---|
| <b>ESPEY DEAL (1), \$104.95</b><br>Espey 7-6 chassis complete with 12" coaxial PM speaker (CU-14) and M-150 G.E. 3-speed changer equipped with a G.E. turnabout variable reluctance cartridge. A better home music system than ordinarily available. Espey Deal #1. Sale price \$104.95. With 15" coaxial PM speaker (CU-15) instead of CU-14. \$10.00 extra. | <b>ESPEY DEAL (2), \$118.95</b><br>Espey 7-6 chassis complete with 15" coaxial PM speaker (CU-15) and the English Garrard 3-speed changer equipped with a G.E. variable reluctance turnabout cartridge. Our best home music system. Espey Deal #2. Sale price \$118.95. With 15" coaxial PM speaker (CU-15) instead of CU-14. \$10.00 extra. | <b>ESPEY DEAL (3) \$138.95</b><br>Espey 7-6 chassis complete with THREED 12" coaxial PM speakers (CU-14) (these three 12" coaxial speakers give a cone area equal to an 18" speaker) and a Garrard 3-speed changer with G.E. variable reluctance turnabout cartridge. Espey Deal #3. Sale price \$138.95. |
|---|--|---|

## CAPEHART CABINET, \$79.95 BLANK OR CUT TO FIT ESPEY CHASSIS

Buy this cabinet with Espey chassis and the 3M changer listed above and have a fine radio-phonograph combination for less than the value of the cabinet alone. This beautiful cabinet was intended for a Capehart \$800.00 combination. It is the finest possible furniture quality cabinet—shipped in two pieces, 40" wide and 21" front to back. Hinged top lifts in two sections. 25 1/2" lid covers the changer compartment and 14 1/2" is the width of the radio-phonograph compartment. The cabinet is furnished blank. Radio panel is shipped ready cut to fit the 7-C Espey chassis. Radio is cut to hold 2-12" speakers. Made of top quality mahogany. Shipped via truck, rail or express only. Shipping wt., 140 lbs. Stock No. C-173, with panel cut to fit Espey 7-C, \$79.95. Stock No. B-17311, with blank changer and radio panel, \$79.95. 2-12" 32 cps. Alnico PM speakers for use in this cabinet for only \$15.00 (\$7.50 each).

## MCGEE'S \$62.50 LIST 15" COAXIAL SPEAKER, \$24.95 21 OZ. ALNICO V MAGNET—5" TWEETER



This is the finest 15" coaxial PM speaker value we have ever offered. New 1952 production of a famous manufacturer of fine speakers. The 15" speaker has a 2 1/2 oz. Alnico V magnet; equal to 35 oz. of the Alnico I type magnet. The cone is free floating, of one piece construction. Will reproduce low frequencies down to 20 cps. The 5" tweeter is coaxially suspended and has a ridged cone to reproduce only the high frequencies. It will respond up to 17,500 cps. The high pass filter is concealed under the pot cover, leaving only two wires to connect both the tweeter and woofer to any 8 ohm output transformer of a radio or high fidelity music lover's amplifier. Shipping weight 13 lbs. Net price \$24.95; 2 for \$47.95.

## 12" JENSEN PM, \$15.95

Another McGee Scoop! Jensen Concert 12", 14 1/2 oz. Alnico V magnet PM speaker, 8 ohm voice coil. Will take 25 watt input. You save dollars on the speaker. Just 100 to sell. Shipping weight 8 lbs. Stock No. J-12P. Sale price \$15.95; 2 for \$30.00.

## 12" COAXIAL SPEAKER, \$12.95

McGee offers the new 1952 model 12" coaxial speaker for less than ever. Quality you would find in your finest sets if you were a 4-4 average. Shipping weight 8 lbs. Response from 30 to 17,500 cps. Stock No. CU-14Y. Sale price \$12.95 each; 2 for \$25.00.

## 3-SPEED CHANGERS ON SALE AT MCGEE

**WEBSTER CHICAGO MODEL 100-2 ONLY \$26.95**  
 For the first time we offer the world famous Webster-Chicago model 100-2. Features a newly designed spindle, that drops the records flat, is cushioned to the turntable. Pickup arm, set down automatically after the last record plays. Plays all records automatically, 33 1/3, 78 and 45 rpm. New balanced tone arm with Electro-Voice Will reproduce low frequency down to 20 cps. Ordinarily cost over \$37.00. McGee offers them for only \$26.95 each. Base size 12"x12 3/4". Shipping weight 14 lbs.

**V.M. 3-SPEED MODEL 406 \$22.95**  
 VM model 406, deluxe 3 speed automatic record changer. Plays them all. Intermixes records of the same speed. Equipped with a flip-over crystal pickup with twin needles. Base size, 12 1/2"x12 3/4". Shipping weight, 2 lbs. Stock No. V-406. Sale price \$22.95.

## TERRIFIC COMBINATION CABINET SALE

**39.95** Modern design walnut combination Radio-Phono cabinet. Size, 32" wide, 35 1/2" high and 20" deep. Offered to you at less than it cost the large Radio-TV factory for that it was made for. Upper left door swings down to open changer compartment, 14 1/2" x 11 1/2" high. Changer pull-out hardware is included. Radio compartment is 11 1/2" x 15" high, has blank panel and hinged door. Record storage compartment is 11 1/2" x 14" high. Baffle will take a 12" speaker. Polished mahogany finish with brass hardware and matching grill cloth. Stock No. A-320, shipping weight 60 lbs. Net price, \$39.95. 12" coaxial PM speaker, \$12.95, extra, when purchased with cabinet.

## CAPEHART CABINET FOR 1000 SET—ONLY \$99.95

**99.95** Beautiful, finest quality walnut combination radio-phonograph cabinet, 42" high, 42" wide and 22" deep. McGee's Capehart's finest cabinet, selling for \$90.00 and up. Cabinet cost manufacturer over \$200.00. Has highly polished matched walnut panels. Made of 2 1/2" material. Top panel is solid stock. This cabinet weighs approximately 175 lbs. The changer, radio and speaker grill all have hinged doors. Radio compartment on right hand side is 12" high and 11 1/2" wide. Made to mount chassis vertically. Changer compartment is 14" high by 20 1/2" wide. Large enough to hold any record changer or recorder mechanism. Front 10" of top over the changer compartment is hinged to fold back for easy access to the changer. Both radio and changer compartments come with urethane turnabout variable reluctance cartridge. Baffle is cut for a 12" speaker and the speaker coil is completely enclosed. Shipping weight, 275 lbs. Stock No. C-275 Capehart combination cabinet. Net price \$99.95. See EC-173, when ordering, whether you want Walnut or Mahogany.

Note: This cabinet has a very large record changer compartment. It is suggested that you obtain a selective record changer from a juke box operator and make a selective radio-phonograph combination.

## 50-WATT BOOSTER AMPLIFIER—\$39.95



**25-Watt Horn \$28.95**  
 A sensational value, 50 watt booster amplifier with push-pull parallel 6L6 output tubes. Connect to your present amplifier as a booster or use with the PR-2X Pre-amp to add the use of 2 mikes and one low level input. The booster amplifier has one input jack and with 1 volt input gives 50 watts of audio. Booster has a 6 lb. potted case high fidelity output transformer, a Alnico speaker with 48-10 ohm voice coil, also 60 ohm and 250 ohm taps. Booster has a 225 mill power supply with 504 rectifier. Price includes tubes: 4 6L6, 7N7 and 504. The two variable controls are for master volume control and bass boost tone control. Size 8 x 6 1/2 x 14 1/2. Stock No. PA-55N. Shipping weight 25 lbs. Sale price \$39.95 ea.

**2-MIKE PRE-AMP.**  
 Pre-amplifier plugs in directly to the PA-55N Booster amplifier. It enables use of 2 Crystal or Dynamic Mikes plus one low level input. Furnished with 4 foot cables and plugs for remote control of the 55 watt Booster Amplifier. Small chassis size 5 x 3 1/4 x 4 3/4. Stock No. PR-2X, with tubes 7F7 and 7N7. Net price \$12.95 ea.

**25-WATT HORN**  
 25-Watt Driver and 3 1/2-foot air column re-entrant Trumpet. The standard type trumpet and driver you see the most. Drivers are 100% weatherproof, horn is spun aluminum, offered to you at a considerable savings. Stock No. MA-33. Shipping weight 20 lbs. Net price \$28.95.

## 25-WATT 6-110 VOLT MOBILE AMPLIFIER, \$115.95 REGULAR \$190.00 LIST—1952 MODEL 25-WATT TRUMPETS AND DRIVER \$28.95 EACH EXTRA

25 watt Mobile Amplifier has built-in phono unit, illuminated control panel, separate volume controls for microphone and phono and tone control. Power output 25 watts at less than 5% distortion. Peak power 38 watts. Frequency response: Plus or minus 5 db. 30 to 15,000 cps. Overall gain: 30 dB. Pronounced channel, 15 db. phono channel, 52 db. Hum level: 60 db. below rated output. One microphone and one phono input. Input impedance: 10 meg. microphone channel, 15 meg. phono channel. Controls: Microphone volume, phono volume, tone with AC switch, standby switch and constant voltage tap. Operates on 117 volts 60 cycles AC or 6 volts DC operation. Tubes: 7B1, 6E5, 6SN7GT, 2-6XGT. Overall size, 11 1/2" deep, 10 high and 10 1/2 wide. Shipping weight, 40 lbs. Stock No. 2370, 25 watt 6-110 volt amplifier. Net price, \$115.95.

Use either 2, 3, or 4 of our MA-33, 25 watt trumpet and driver combinations, pictured at top of this page. Net price, \$28.95 each; or any combination of PM speakers and baffles shown below. Asiatic JT-311 crystal mike and desk stand, \$9.95 extra.

## TERRIFIC VALUES IN SPEAKERS AND BAFFLES

**8" PM AND LEATHER-ETTE BAFFLE, \$4.95**  
 LOTS OF 10, \$47.50

**12" PM AND WALNUT BAFFLE, \$9.95**  
 LOTS OF 3, \$8.95

The finest Leatherette Baffle we have ever offered. New self-supporting plastic grill material. Baffle is covered tan with matching grill. Offered with a good heavy duty 8" Alnico V PM speaker with 3.2 ohm voice coil. Stock No. 818. Speaker and Baffle, \$4.95 ea.; lots of 10, \$47.50.

8" Baffle only, Stock No. 818-B, \$2.29 ea.; 10 for \$19.95.

The finest built 12" Walnut and 10" speaker wall baffle we know of. Factory cost of the famous juke box manufacturer exceeds \$8.00. We offer with 12" PM for little more. You pay only \$9.95 in single lots, or \$8.95 in 3 lots for both 12" Quam Alnico V Microphonic volume voice coil and the beautiful wall baffle. 12" Speaker Baffle combination, Stock No. BS-12Q, \$9.95 ea.; lots of 3, \$8.95 ea. 12" Baffle only, =REG-12, \$4.95 each.

## MIKES AND STANDS

4D-T, high impedance dynamic mike with 12 feet of cable. Sale price, \$10.95. 35 to 64" chrome floor stand for mike, \$5.88.

**McGee's Super High Fidelity Best Value in U. S. A.**  
**OUTPUT TRANS. \$7.95**  
 20-20,000 CPS.

Model A-403 High fidelity output transformer, 4-8-16-30-60 or 810 for an output, when our A-403 is available at \$7.95. Impedance, 6000 ohms plate to plate (for PP 616 or 6Y6), 100% feedback winding, 4-8-15-250 and 500 ohm secondary. Housed in a potted case. Net weight 6 lbs. Recommended for all amplifiers up to 34 watts.

## 38-WATT WIDE RANGE AMPLIFIER

WITH PUSH PULL PARALLEL 6L6S—FOR USE WITH RADIO TUNER OR RECORD CHANGER

★ TWIN TONE CONTROLS FOR REMOTE OPERATION

38 watt amplifier for use with phono pickup or radio tuner. 1 volt input produces 38 watts. Features 3-6L6 tubes in push-pull parallel. Heavy potted 50 watt capacity output transformer with taps 4-8-16-30-60 and 810. Wide range audio continuously variable bass and treble tone controls and gain control on a remote control with 3-foot cable so that the amplifier can be conveniently located. One half of the dual triode input is left unswitched, so that 38 watts of clean push-pull gain for a microphone or a G.E. variable reluctance phono pickup if desired. Chassis size 12"x18". Remote control 23 1/2" x 7 1/2". Shipping weight, 30 lbs. Model No. RA-638, complete with 4-6L6, 3-6SN7, and 2-6W4GT tubes. Sale price, \$49.95.

## G.I. 3-SPEED CHANGER WITH G.E. \$22.95

VARIABLE RELUCTANCE TURN-ABOUT CARTRIDGE

Another tremendous McGee Scoop! Brand new General Instrument 3-speed automatic record changers. Complete with RPX-650 G.E. variable reluctance cartridge with turn-about stylus. Plays all 3 speeds automatically; 7 1/2", 10" or 12" records. Has reject button. Repeats last record. Base size, 12"x12 3/4". Shipping weight 14 lbs. Stock No. 700-GI. Scoop price, \$22.95.

G.I. 3-speed changer same as above, but with Webster flip-over twin needle cartridge. Stock No. GI-700. Sale price, \$20.95 each.

Prices F.O.B. K.C. Send 25% Deposit with Order. Balance Sent C.O.D. With Parcel Post Orders, Include Postage TELEPHONE VICTOR 9045. WRITE FOR FLYER 1422 GRAND AVE., KANSAS CITY, MISSOURI



Tung-Sol "Quality Control" recognizes but one standard. All Tung-Sol Tubes meet the highest original equipment requirements of leading radio and tv set manufacturers! Use Reliable Tung-Sol Tubes.

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**TUNG-SOL MAKES:**

All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes.



**TUNG-SOL**  
RADIO, TV TUBES, DIAL LAMPS

Here's a real lively "stopper" to attract attention to your place of business and emphasize the quality of your service. Colorful—bright red and two shades of blue. 15 inches high. Your jobber salesman will tell you how to get one.

# BIAS BOX FOR TV ALIGNMENT

By FRANCIS R. BARLETT

*Details on a compact test unit which uses rectified filament voltage to provide bias.*

TO PREVENT overload and to set up near-normal operating points for television r.f.-i.f. stages during alignment, a fixed a.g.c. bias source is needed. Aside from the requirement of periodic battery replacement there are certain mechanical difficulties in the conventional dry cell bias set-up. To provide a source of bias relatively independent of electrical or mechanical maintenance the bias box described here was devised.

Fig. 1 shows how we may use the filament voltage of the receiver itself. The 6AL5 is wired in a voltage doubler rectifier circuit to deliver a negative d.c. voltage nearly two and one half times the r.m.s. input. This will be adequate for most applications. The RC filter removes all objectionable a.c. ripple. From the 6.3 volt filament circuit up to 15 volts d.c. can be obtained.

Current is limited by the ratings of the 6AL5 as well as by the 5000 ohm filter resistor. However, this is relatively unimportant as the a.g.c. bus normally has high resistance to ground. With as low as a 40,000 ohm load the output voltage will be very close to the no-load value.

Many circuit configurations could be used. The one illustrated here is simple, requiring only a few inexpensive parts and has proven quite satisfactory in practice.

Construction details are not given as the layout is not critical and will

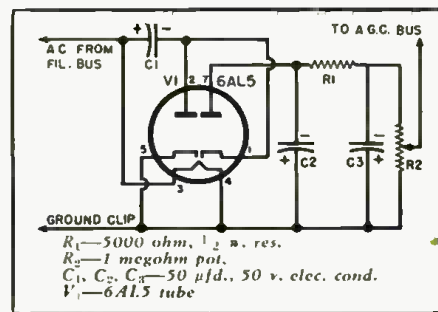


Fig. 1. Circuit of TV alignment bias box.

suggest itself to the builder, depending on what is on hand. If the unit is made small and compact, it will be readily portable and will occupy less valuable bench space.

To use, simply clip the ground lead to the TV chassis, the a.c. input lead to a hot filament pin, and the bias lead to the a.g.c. bus. Remove normal a.g.c. by any practical means. Adjust the voltage divider potentiometer for desired bias as read on a high impedance voltmeter and proceed with alignment.

Do not overlook other possible uses of the bias box. There are many applications in radio and TV troubleshooting as well as for the experimenter. It will suit any purpose calling for a low d.c. voltage where current requirements are small.

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## LUNAR REFLECTIONS

FOR the first time, a radio message has been transmitted by lunar reflection during a recent cooperative experiment conducted by the National Bureau of Standards and the Collins Radio Company.

Ultra-high-frequency signals that had been reflected from the moon were received by the NBS field station at Sterling, Va., after having been transmitted from Cedar Rapids, Iowa.

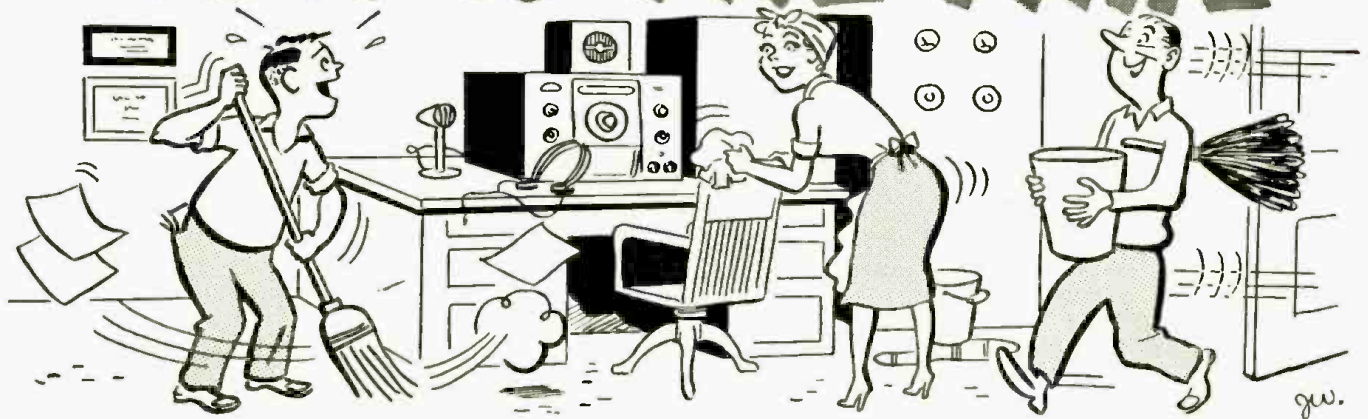
Although radio waves had been reflected from the moon before, they were usually received at or near the point of origin. In the NBS-Collins Radio experiment, the signals were transmitted so as to be received at the site 775 miles from the transmitter after reflection from the moon. The operating frequency was 418 megacycles, generated by a 20 kw. transmitter. Because the transmitting antenna in Cedar Rapids was a fixed structure, lunar reflection could be accomplished only while the disc of the moon was in the

beam of radio energy (approximately one-half hour). The antenna at Sterling could be rotated and turned in the direction of maximum signal strength.

Reflection of the signals apparently began as soon as the leading edge of the lunar disc entered the radio beam. As the moon moved across the radio beam, the received signal strength increased. About 10 minutes after the initial contact, the signal strength reached its highest value. The operators in Cedar Rapids then hand-keyed the signal in Morse Code and transmitted the historic message "What hath God wrought." The intensity remained at this maximum level for another ten minutes and then began to decrease as the moon passed out of the radio beam. The greatest signal strength received was about one-millionth as strong as the signal received by most commercial television receivers.

—30—

# NOW IS THE TIME



## Yep, time to get ready for fall DX . . .

Clean house of all that old, outdated equipment and replace at a tremendous saving with a "SURPRISE" Trade-In deal. As always, the newest and best is available here and bigger-than-ever bargains are yours when you take advantage of the one and only "SURPRISE" Trade-In allowance on your used (factory built) test and communication equipment. So get your trade-in deal working today. Wire, write, phone or use the handy coupon below.



**NATIONAL 183D**  
Less speaker. Only \$369.50.  
Matching Speaker, \$16.00.



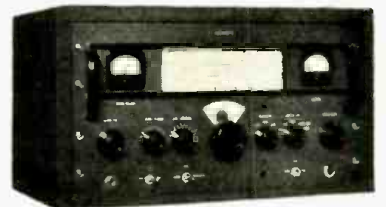
**THE NEW NATIONAL HRO-60T**  
Less speaker. Only \$483.50.  
Matching Speaker, \$16.00.



**COLLINS 75A-2 RECEIVER**  
Less speaker. Only \$420.00.  
Matching Speaker, \$20.00.



**THE NEW VIKING II 100-WATT PHONE-CW TRANSMITTER KIT.** Features effective TVI suppression. Kit complete with tubes. Only \$279.50.



**COLLINS 32V-3 TRANSMITTER**  
Only \$775.00.



**HALLICRAFTERS S-76**  
Less speaker.  
Only \$169.50.



**HALLICRAFTERS SX-71**  
Less speaker.  
Only \$199.50.

HALLICRAFTERS R-46 SPEAKER, \$19.95.

All prices f. o. b. St. Louis • Phone CHestnut 1125

**Walter Ashe**  
**RADIO CO.**  
1125 PINE ST. • ST. LOUIS 1 . MO.

### FREE CATALOG!

RN-9-52

WALTER ASHE RADIO COMPANY  
1125 Pine Street, St. Louis 1, Missouri

Rush "Surprise" Trade-in-offer on my \_\_\_\_\_

for \_\_\_\_\_  
(show make and model No. of new equipment desired)

Place my name on your mailing list to receive latest catalog.

Name \_\_\_\_\_

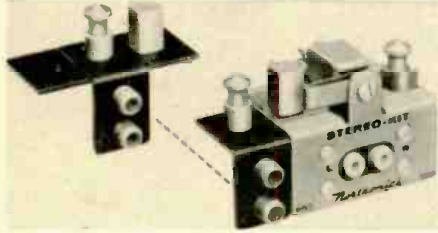
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City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Send  
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today



of the monaural variety while the Model SK-50 provides for the newer quarter-track, 4-channel tapes. Either



unit may be used for the playback of monaural tapes. Both units come completely assembled and wired.

Both of the "Stereo-Kits" contain a factory aligned TLD magnetic head. Erase-Kits for either of the heads are available as the Model EK-100 (2-channel) and Model EK-50 (4-track) at extra charge.

The manufacturer will supply additional details on these kits on request.

#### STEREO DISC CONVERSION

Electrovox Co., Inc., 60 Franklin St., Orange, N. J. is now offering its "Walco" all-purpose stereo conversion kit for present mass-market phonographs.

The kit comes with a four-watt push-pull auxiliary amplifier for the stereo



channel, two tone controls, a separate auxiliary loudspeaker in a specially baffled cabinet, and a four-wire ceramic stereo pickup cartridge which readily adapts to most existing tone arms and replaces the monaural cartridge used in the conventional record player.

#### AUDIO SYSTEM ANALYZER

Winston Electronics, Inc., 4312 Main St., Philadelphia 27, Pa. is now in pro-



duction on a portable audio system analyzer which is being marketed as the "Win-Tronix Model 800."

The instrument is designed for testing and servicing all hi-fi, stereo, and other audio systems. It incorporates the functions of six instruments, including an audio v.t.v.m., audio signal generator, audio output wattmeter with speaker loads, IM distortion

September, 1958

**Garrard models change. Garrard ideals do not. Meaningful new features are added. Time-proven features are carefully retained. Gadgets, for the sake of gadgetry, are sternly rejected. The all-important fact to remember is that thirty-five years of experience in designing, testing, and building fine record players, guide us in offering you the present Garrard models.**

# Garrard

**WORLD'S FINEST  
RECORD PLAYING  
EQUIPMENT**



There's a Garrard for every high fidelity system

Fully Wired for Stereo and Monaural Records

For Information Write: GARRARD SALES CORPORATION, Dept. GM-48, PORT WASHINGTON, N. Y.



**Model 301 PROFESSIONAL TRANSCRIPTION TURNTABLE**  
Each speed variable!  
Each unit with its own performance test report. \$69.00



**Model RC98 4-SPEED SUPER AUTO-MANUAL CHANGER**  
Continuous + or - variable control on all speeds. \$67.50



**Model TPA/10 TRANSCRIPTION TONE ARM**  
—Professional performance, jewel-like construction and exceptional versatility. \$24.50



**Model RC8 3-SPEED DELUXE AUTO-MANUAL CHANGER**  
Exclusive pusher platform protects your records. \$54.50



**Model T Mark II 4-SPEED MANUAL PLAYER**  
A superior unit for quality budget systems. \$32.50



**Model 121 II INTERNIX AUTO-MANUAL CHANGER**  
Fine performance with economy and compactness. \$42.50

### Wholesale Only SELLING

Receivers, Transmitters, Radar, Special Purpose Tubes, Relays, Meters, Switches, Connectors, Rectifiers, Transformers, Motors & Generators, Wiring Cable, Instruments and All Electronic Components.

### RADIO & ELECTRONIC SURPLUS

14000 BRUSH STREET  
Detroit 3, Mich. TO 9-3403

New Isotronic Training Method

## LEARN TV REPAIR IN ONE SHORT WEEK!

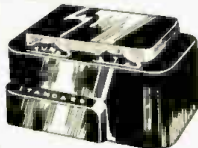
Now, after 5 year's research—a streamlined training system that obsoletes all others! In just 7 days you may earn \$150 weekly, without paying up to \$250 for training, studying long months! Developed by electronic scientists in cooperation with major TV mfr's., the new Isotronic method is the most practical ever devised! For conclusive proof, write for details and FREE SAMPLE LESSON. Use it on your own set or a friend's—repair it—convince yourself you can make big money immediately in your own TV business! Hurry—Free Lesson supply limited. Write: Electronic Engineering Co., Dept. B-269 1038 So. La Brea, Los Angeles 19, Calif.

# YOU DON'T NEED 20-20 VISION TO SEE OLSON'S BUYS IN TELEVISION

## BIG VALUE STANDARD COIL TV BOOSTER

★ Latest Model ★ Brand New  
★ Reg. List Price \$30.00  
★ While they last. Model No. 8-51.

**\$10<sup>95</sup>**  
Ea.



Just connect one of these Standard TV Boosters to your receiver and get brighter, snappier pictures and less "snow" and interference. Easy to attach. Works on all TV sets. An amazing deal—you can cash in—save money—order today. Tunes all 12 channels. Uses a 6AK5 tube and a selenium rectifier. Complete. Operates on 115 V. A.C. Shpg. wt. 6 lbs.

## NEW! REGENCY DB-520 TV BOOSTER



**\$19<sup>11</sup>**

STOCK NO. RA-103

Latest model. Highly stable. More powerful than old model. Exclusive! New circuit stabilizer—gives maximum stability and picture boost on all 12 TV channels. Incorporates push-pull triode in balanced circuit for high gain. Off-on switch controls both booster and TV set. Perfect tracking accuracy. Improves both picture and sound for real TV enjoyment. Has separate inputs for 12 and 300 ohm lines. Beautiful cabinet. U.L. approved. Complete with 6J6 tube and instructions. Shpg. wt. 3 1/2 lbs.



## COMPLETE TV ANTENNA

Stock No. AU-23  
**\$8<sup>99</sup>**  
Complete Set

A complete stacked array. Made by a famous manufacturer whose name and brand is on every factory sealed carton. Look what you get: 2 Six-element conical dials. 1 pair "Q" bars. 2 Five-foot mast sections. 60 ft. 300 ohm twin line. 5 Standoff insulators. 1 mounting base. 1 guy ring. 1 clamp. hardware. Elements are highest quality aluminum. Reg. list price is \$31.95. Shpg. wt. 15 lbs. Express only.

## OPEN WIRE TV LINE ★ Use in Place of 300 Ohm Line

Ideal for fringe area installations. Not affected by moisture or sun. Made of #18 copperweld wire with genuine polystyrene insulators spaced 6" apart. Tensile strength 400 lbs.



Stock No. W-78.  
100 ft. coil. Shpg. wt. 4 lbs. **\$4<sup>66</sup>**

Stock No. W-79.  
250 ft. coil. Shpg. wt. 9 lbs. **\$10<sup>95</sup>**



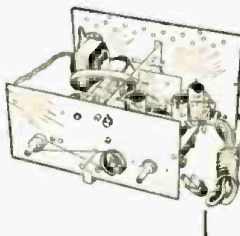
**Don't Throw Away Old Picture Tubes**  
You can get excellent pictures on old dim kinescopes for an additional 50 to 3200 hours by simply attaching the new Perma-Power TV Tube "Rejuvenator". Fully automatic. Just plug into back of old TV Tube. Not a gadget. Laboratory tested and approved. Regular retail price \$2.75. Order yours now. Make big money selling TV "Rejuvenators" to your friends and customers. Shpg. wt. 3 lbs. Stock No. T-98. **\$5.73**

# OLSON'S GREATEST TV BARGAIN

## MASTER REMOTE CONTROL

ORIG. \$49.95

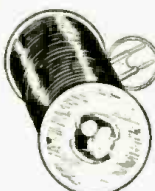
**\$5<sup>95</sup>**  
EACH



ONLY Stock No. RA-106

Olson couldn't pass up this tremendous deal and now it's passed on to you at one of the biggest price cuts ever offered. This Remote Control Unit was designed to enable TV viewers to change their sets from one channel to another, as well as adjust sound and picture from any place in room. Unit does not work with every set so that's why the manufacturer offered us this bargain. It may or may not work on your set, but it's worth more for the parts alone. Unit is complete with attractive metal cabinet 18 3/4" wide, 5 1/4" high, 7 3/4" deep, 3 bar knobs, jeweled panel lamp, AC cord and plug, selenium rectifier, coils, transformer, ceramic condensers, band switch and 3 tubes (6AK6, 6AH4, 6BC5). Parts alone have hundreds of uses. Cabinet ideal for custom installations. Original factory sealed cartons with complete instructions. Shpg. wt. 8 lbs.

## 300 OHM TWIN LINE LEAD-IN AVAILABLE IN 3 LENGTHS



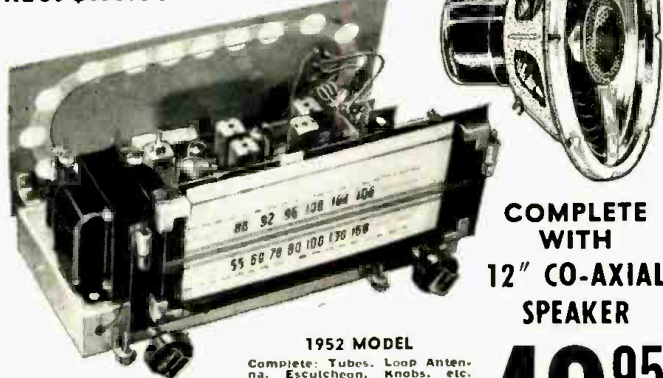
100 Ft. SPOOL	500 Ft. SPOOL	1000 Ft. SPOOL
Lots of 10. <b>\$1<sup>99</sup></b> EACH	Lots of 2... <b>\$6<sup>75</sup></b> EACH	Lots of 2... <b>\$12<sup>50</sup></b> EACH
Single, ea. \$2.99	Single, ea. \$6.95	Single, ea. \$12.95
Stock No. W-73	Stock No. W-102	Stock No. W-99
Shpg. wt. ea. 2 lbs.	Shpg. wt. ea. 6 lbs.	Shpg. wt. ea. 12 lbs.

FINEST QUALITY

This is a real buy. We cannot continue this offer much longer—so stock up now—below jobbers price. Twin Line is highly efficient, weather resistant—genuine Polyethylene dielectric. Low loss—for use in all TV and FM installations.

# SPECIAL PURCHASE SCOOP! MANUFACTURER'S CLOSEOUT MAJESTIC 8 TUBE AM-FM RADIO CHASSIS

REG. \$110.00



COMPLETE WITH 12" CO-AXIAL SPEAKER

1952 MODEL  
Complete: Tubes, Loop Antenna, Escutcheon, Knobs, etc.

## COMBINATION DEAL!

BOTH FOR ONLY

**\$49<sup>95</sup>**

DEAL RA-5268

This is one of the biggest deals we've ever offered. So big most buyers couldn't come up with the cash. Olson completed the deal and is passing this terrific bargain on to you. Naturally when our present stock is gone, we can't duplicate this offer. Olson never gave you a greater value. Order your outfit today. Speaker is guaranteed to outperform any speaker in its price class. Equipped with two "High Concentration" Alnico 5 magnets and a high frequency aluminum section delivers bass, inner "J" tweeter section delivers treble tones, giving you "living tone." 8 ohm impedance.

Radio is not a kit or a tuner. It's a real high-powered AM-FM Radio Chassis that will pull in distant stations with amazing volume and brilliance of tone. Makes a perfect custom installation in existing cabinets, book-cases, walls, etc. Servicemen and Experimenters: Make money installing these for friends and customers. The circuit is modern and employs 8 tubes: 12AT7, 6BD6, 2-6BA6, 6AL5, 6AV6, 6V6 and 5Y3. The entire R. F. assembly and the 4-section tuning condenser is rubber mounted. Tuned R. F. stage plus two I. F. stages give this set terrific FM sensitivity. Separate FM oscillator tube for extreme stability, and close R. F. and mixer circuits plus radio detector assure noise free, high fidelity FM reception. Two modern dual knobs control on-off, volume and tone plus AM-FM, phone switch. Equipped with two panel lamps and extra lit dial. Phone input socket and AC receptacle at rear of chassis. Chassis size 13" wide, 7 1/2" deep, 7 1/4" high. Cut out in cabinet requires 8x3 1/4". Output impedance 8 ohms operates on 110-125V AC, 60 cycles. Shpg. wt. 20 lbs. In factory sealed cartons.

## PHONO PRE-AMPLIFIER



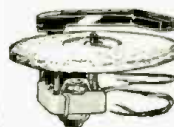
No. RA-101  
**\$8<sup>95</sup>**

For use with G.E. and other low level magnetic pickups. Can be attached to any radio or amplifier. Built on aluminum chassis, finest workmanship throughout. Ample bass boost provided. Operates on 115 volt AC. Size 4 1/4" x 2 1/4" x 3 1/4". Complete with 12AX7 tube. Shpg. wt. 2 lbs.

## MOTOR and ARM

A BIG VALUE

**\$3<sup>99</sup>**



STOCK NO. RA-91

COMBINATION OFFER  
You get an Alliance Rm Drive 78 RPM Phono Motor with turntable PLUS a 14" tip Arm with high Output Cartridge. Shpg. wt. 6 lbs.

## 12" Magnavox Speaker and Baffle Close-Out

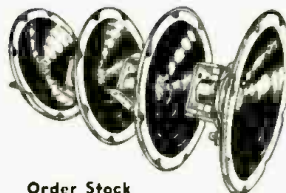


Stock No. AS-66  
Get both for only **\$7<sup>95</sup>**  
In lots of 4 set for \$29.95. One set for \$8.95.

You get Magnavox's fine 12" PM speaker with Alnico 6 magnet. (Same as you'll find in those expensive Magnavox Super-Radio-Phono Combinations.) Power output 8 watts. Voice coil fully dust-proofed. Impedance 6-8 ohms. In addition you get a walnut Speaker Baffle to bring out the full rich, rounded tones of the Magnavox Speaker. Baffle may be mounted on a wall or it will stand on a table. Here's the ideal combination for extension speakers for porches or other rooms. Can be connected to any radio or amplifier. Order 3 or more sets and install them in restaurants, auditoriums, halls, etc.

## ORDER THIS BARGAIN TODAY!

### 5" ALNICO 5 PM SPEAKERS



**1c SPEAKER SALE**

- Thousands have been sold by Olson for \$1.79
- We must make room in our warehouse

Buy 3 and get the 4th for only **1c**

- Order Motor No. S-169
- 1st Speaker. \$1.79
  - 2nd Speaker. 1.79
  - 3rd Speaker. 1.79
  - 4th Speaker. .01
- All For **\$5<sup>38</sup>**

At 1c Olson will sell plenty of 5" PM Speakers. No one else would dare make this offer. But our new fall merchandise is coming in any day now and we need ROOM. Buy 3 speakers at our bargain price of \$1.79 each and get the fourth speaker for only 1c. Order 6 speakers at \$1.79 each and get 2 speakers for only 2c additional. Remember, for every 3 speakers you buy, an additional speaker is only 1c. Don't miss this offer. It CANNOT be repeated when sold out. Every speaker is brand new in original factory cartons. Full 5" diameter. Dustproofed inside and out. Alnico 5 magnet. Voice coil 3.2 ohms. The perfect speaker for extension speakers, auto sets, AC-DC radios and intercoms. Shpg. wt. per speaker 1 lb.

USE HANDY ORDER BLANK ON NEXT PAGE



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RADIO & TELEVISION NEWS

# MAIL YOUR ORDER TODAY—OLSON WILL RUSH IT RIGHT AWAY!

## BIG BARGAINS IN SOUND EQUIPMENT

### CRYSTAL MIKES



Astatic high output crystal mike for PA systems and recorders. Equipped with handle base and 7' shielded cable. Shpg. wt. 5 lbs. **M-67, each \$5.95**

**M-66**, same but with on-off switch built into handle **\$6.95**

### TELEPHONE PICKUP



Stock No. M-80

**\$4.50**

Record or amplify both sides of a telephone conversation. No connection to telephone necessary. Just lay pick-up under any cradle type phone and connect lead to hi-impedance input of any disc, wire or tape recorder or any amplifier. Operates by induction.

### PHONO AMPLIFIER

Stock No. RA-19

**\$3.98**  
Less Tubes

A real high efficiency tube amplifier of modern design. Connect to any crystal phono arm and speaker. Has volume and tone controls 7" x 3 1/2" x 2". Shpg. wt. 2 lbs. **SEE LISTING FOR AMPLIFIER**  
**SEY OF TUBES FOR AMPLIFIER**  
12507, 50LG, 35Z5.  
No. AS-22 **\$2.64**

## BUILD YOUR OWN RECORD PLAYER

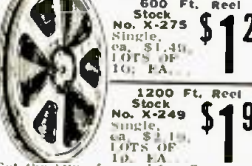
### SINGLE SPEED MODEL

This fine kit contains a 78 RPM rim drive motor with velvet finish turntable, crystal pickup arm, all purpose needle, 4" PAI speaker, matching output transformer, 2 tube AC-DC amplifier and a set of tubes (25W4 & 50H5). Shpg. wt. 8 lbs. **Stock No. AS-52 \$8.95**

### DELUXE 3-SPEED MODEL

Like above except kit has 3 speed phono motor to play all 33 1/3, 45 and 78 RPM discs. Shpg. wt. 8 lbs. **Stock No. AS-53 \$11.95**

### PLASTIC RECORDING TAPE



600 Ft. Reel  
Stock No. X-275  
Single, ea. \$1.39  
60's of 10, 10, EA. **\$1.29**

1200 Ft. Reel  
Stock No. X-249  
Single, ea. \$2.19  
Lots of 10, 10, EA. **\$1.99**

Get the buy of your life. Save up to 64% on high quality RECORDING TAPE. A large manufacturer had to sell his inventory and he unloaded the whole deal. Olson now offers you this high grade recording tape at prices which defy competition. Standard 1 1/2" wide. Frequency response 50 to 8,000 cps. Plastic reel included with each.

**PRICES SLASHED ON EMPTY PLASTIC REELS**  
Finest Clear Plastic—Will Not Warp  
7" Diameter—1200' Size  
No. X-251  
Single, ea. 49c.  
**LOTS OF TEN, EA. \$3.9c**  
5" Diameter—600' Size  
**LOTS OF TEN, EA. \$2.9c**  
No. X-250 Single, ea. 39c.

### VM 2-SPEED AUTOMATIC RECORD CHANGER



**\$1.99**  
EACH  
Stock No. RA-99

- \* Changes All 33 1/3 and 78 RPM Discs
- \* Internixes 10" and 12" Discs
- \* Stops After Last Record
- \* Jam Proof \*

**★ 100% Guaranteed**  
Built for RCA. Factory sealed cartons. Worth \$45.00 List.

Now you can take advantage of this deal that Olson ran across. Incorporates the latest design to play the records in most demand, 33 1/3 and 78. Records may even be intermixed on the spindle. Will hold twelve 10" or twelve 12" discs in one loading. Records slide down the center shaft with utmost precision. Low pressure tone arm is equipped with an RCA turn-over cartridge and two permanent needles. Shuts off after last record. Has reject button also. Size 12" x 13". Operates on 115 volts AC, 60 cycles. Shpg. wt. 15 lbs.

### PRESTO—Call Intercom

The Modern Electronic Communication System



Stock No. RA-96.  
Olson Special Price for  
Master Station, Substation  
and 50 ft. of cable only

**\$1.983**

price is \$17.50. You get the master station, substation and 50 ft. of 3 conductor cable. Complete with tubes. Shpg. wt. 8 lbs.

### NOTICE—RADIO MANUFACTURERS

Olson Radio has established a tremendous market among radio servicemen, amateurs, universities and industrial all over America as well as principal foreign countries. Our famous rapid mailing service is the talk of the trade.

If you have any good, clean surplus radio material which you wish to dispose of, contact Olson at once. We can use Radios, amplifiers, condensers, chassis, phono motors, pickup arms, volume controls, test equipment, speakers. In fact any radio or electronic part or piece of equipment. Here is your opportunity to turn idle inventory into cash. Write, wire or call Olson, the popular name in radio.

**SEND FOR OLSON'S BRAND NEW BARGAIN CATALOG. GET NATIONALLY FAMOUS RADIO PARTS AND SUPPLIES AT BIG DISCOUNTS**

### CLEVELAND, OHIO

2020 Euclid Ave.

If you live in or near Cleveland visit our store, get these and many more bargains.

### CHICAGO, ILLINOIS

623 W. Randolph Street

If you live in or near Chicago visit our store, get these and many more bargains.

OLSON HAS OVER 150,000 SATISFIED CUSTOMERS

## 10 WATT HI-FI PUSH-PULL AMPLIFIER



**\$32.95**  
with Tubes

Stock No. RA-102

Bombshell Value! It's unbelievable. A full 10 watt Hi-Fi Amplifier, completely assembled and ready to play. Has built-in PRE-AMP for G.I. and similar types of magnetic pickups. 3 inputs: 1 crystal phone, 1 magnetic phono, 1 radio. 1 mike. 4 Controls: Bass, Treble, Volume, Photo-radio Switch. Output Impedances 4, 8, 16 ohms. Total power output 17 watts.

Order this amplifier today and see what brilliant, realistic tone it will deliver. Supply is limited. Everyone in factory sealed carton. You couldn't buy the parts alone for this price. Remember this is a full size amplifier, transformer operated, not an AC-DC job. Frequency response 20 to 20,000 cps at less than 1/2% of 1% distortion. Tubes: 6X4, 6SL7, 1-6SC7, 6AV6, 1-6X4. Complete with tubes. Size 12" x 10" x 5 1/2". Shpg. wt. 15 lbs. Can be used with any phono or speaker but you should take advantage of the combination deal offered below.

- Bass & Treble Boost.
- Inputs for crystal & magnetic pickups, radio tuner and crystal mike.
- Aluminum Chassis.

### 12" CO-AXIAL SPEAKER



**\$12.95**

Stock No. S-168

Our new 1952 Model. Guaranteed to outperform any speaker in its price class. Equipped with two "high content" drivers the bass while the inner 3" tweeter speaker section delivers the treble tones. Together they give you "living" sound. This speaker is unconditionally guaranteed to satisfy even the most critical user or Olson has a bill to refund your money. Only two wires to connect to any radio or amplifier. Voice coil impedance 8 ohms. Frequency response 30 to 17,500 cps. Shpg. wt. 10 lbs.

### FAMOUS 3-SPEED AUTOMATIC RECORD CHANGER



**\$19.99**

Stock No. RA-69

Completely automatic—one of the most famous brands in changers. Every one in original factory packing. 100% guaranteed to please or money back. It's one of Olson's most sensational bargains. The changer has a reject lever and a control for selecting 33 1/3, 45 or 78 RPM speeds. Plays 7", 10" and 12" records. Equipped with a crystal cartridge and a long life needle. Records drop gently and smoothly—just like velvet. Operates on 115 volts, 60 cycles AC. Base 12x12x5 1/2". Above plate and 3 1/2" below. Shpg. wt. 15 lbs. Limited quantity. When these are gone—no more.

## SPECIAL COMBINATION DEAL!

# GET ALL 3!

**\$63.95**  
Stock No. AS-62

11- FI AMPLIFIER  
12" CO-AXIAL SPEAKER  
3-SPEED RECORD CHANGER

Order this matched outfit today. You get the 10-watt Hi-Fi Amplifier PLUS the 12" Co-Axial Speaker, PLUS the 3-Speed Automatic Record Changer, all as described above. Can be built into any cabinet or bookcase—giving you a complete record playing outfit of which you can be proud. Shpg. wt. 35 lbs.



**THIS COSTS YOU NOTHING**  
**NOT A RED CENT**

Just to get the ball rolling and to get your order coming our way Olson is going to send you a handy all-rubber RADIO TUBE PULLER. Made of soft rubber. Easily pulls from stubborn sockets, all regular glass tubes, metal tubes and 7 and 8 miniatures. Protects you from burns, shocks, and more. All you need do is to make up an order for \$1.00 or more from Olson's ad—use handy order blank below. We will ship your order at once (Olson's service is famous from Coast to Coast) and include the RADIO TUBE PULLER—FREE.

## IT'S EASY TO ORDER FROM OLSON'S

How to order: Order directly from this ad. For convenience use this order blank. Fill in columns below with quantity desired, stock number, description and price. You may send remittance with order (include enough for postage or parcel post shipment), or if you prefer SEND NO MONEY. Olson will ship C.O.D. and you may pay mail or expressman for merchandise and postage.

### MONEY BACK GUARANTEE:

Everything you order from Olson is guaranteed as advertised. If you are not more than satisfied, you may return merchandise for cash refund.

**MAIL TO: OLSON RADIO WAREHOUSE**

**275 E. MARKET ST., AKRON 8, OHIO**

**WE SHIP SAME DAY WE GET YOUR ORDER**

Please Minimum Order \$3.00

QUANTITY	STOCK NUMBER	DESCRIPTION	PRICE EACH	TOTAL
NAME _____			TOTAL _____	
ADDRESS _____			ADD POSTAGE _____	
CITY _____ ZONE _____ STATE _____			TOTAL AMOUNT _____	



**OLSON RADIO WAREHOUSE • 275 E. Market St., Akron 8, Ohio**

# how to enjoy NEW REALISM from your records or radio!



Shown are the McIntosh 50W-2 amplifier and AE2A remote controller. Your dealer can help you make them a part of your present system or guide you in the selection of related components. WRITE TODAY, for free booklets and name of nearest dealer.

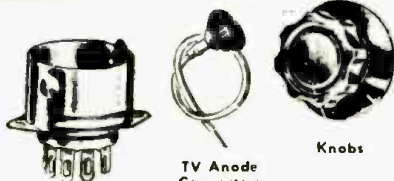
... from patient years of laboratory research has come a basically new audio amplifier—the McIntosh 50W-2. To you, this means new heights of enjoyment—magnificent realism of the music you treasure, on records or tape. And the versatile McIntosh brings "living presence"—a new naturalness of sound to your present radio or TV set.

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T-12	4 Pole induction	-40DB	78-33 1/3	\$84.95
T-43	4 Pole induction	-40DB	45-33 1/3	\$84.95

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EXPORT DIVISION: 458 Broadway, New York City, U. S. A.  
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## Emission Tester (Continued from page 39)

manufactured by the *Keystone Carbon Co.*

It is not necessary to remove the picture tube from the receiver when operating the rejuvenator. With the set de-energized, remove the tube socket and plug in the rejuvenator in its place. Energize the rejuvenator and allow about 15 seconds for the heater to reach operating temperature. If the tube emission is good, the 4 1/2 watt bulb will glow at about half brightness. If the bulb remains dark, depress the meter button and note the cathode current. Allow the tube to "cook" if the meter reads zero or low. As the tube emission improves, the meter creeps upward and the operator can take heart. Release the button as soon as the meter current reaches the upper limit and use the bulb as a visual indicator. The bulb serves two purposes, (a) protective, (b) upper current indicator.

The meter could be dispensed with entirely but one important operating advantage is lost; at low emission the operator has no way of knowing whether the tube is being helped. As long as the meter needle creeps upward, one does not mind allowing the tube to "cook" for an hour or more.

The author and others tested the rejuvenator over a period of time. Results varied, gassy tubes remained gassy but the true low emission ones were helped. Some of the improved tubes lasted only a short time but others gave long life.

It was interesting to note that those who belittled the rejuvenator during the tests were the ones most reluctant to part with it when their phase of the tests were concluded.

## EMERGENCY REPLACEMENT

By WILLIAM CREVISTON

IN many TV sets using a 6AS7G damper tube, it is possible to substitute the cheaper and more readily available 6W4 without any wiring change. The only bad effect is a slight degradation in horizontal linearity which is often hardly noticeable. The base connections for the two types are compared in the table below.

The heater connections are the same; the plate connection for the 6W4 is the same as one plate of the 6AS7; the cathode for the 6W4 is the same as one cathode of the 6AS7; and all other pins on the 6W4 are blank.

Pin connections for the 6AS7G and 6W4 tubes.

Pin	6AS7G	6W4
1	GT <sub>1</sub>	NC
2	PT <sub>1</sub>	NC
3	KT <sub>1</sub>	K
4	GT <sub>2</sub>	NC
5	PT <sub>2</sub>	P
6	KT <sub>2</sub>	NC
7	H	H
8	H	H

# UHF VHF

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The "TROMBONE" is but one of the excitingly new WARD\*Signaline Antennas; here are four more of them:



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September, 1952



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Model "BJ" 6 Volts, 1-12.5 Amps, \$37.50



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Nearest Source  
or Write

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up to  
15 Amperes

ELECTRO PRODUCTS LABORATORIES  
4501-Rf North Ravenswood Ave., Chicago 40, Ill.  
In Canada ATLAS RADIO CORP., LTD., TORONTO

## Mobile Radio

(Continued from page 37)

tenna height up or down to extend or reduce the range as desired. Where maximum range is not required, lower antenna heights will confine transmissions to a more limited area and there is less chance of causing interference to other services.

The 25 to 50 megacycle band offers advantages to those requiring considerable communications range as in state police radio networks. Normally, this band permits communicating over maximum distances of 30 to 50 miles although greater ranges are common. Skip transmissions are encountered on this band, particularly at the low frequency end of the band. Through careful allocation of frequencies, the interference caused by skip transmissions can be minimized. This skip characteristic causes such problems as a New England base station interfering with mobile units in Texas. These skips, which occur irregularly and not necessarily often, are caused by tropospheric changes.

The 152 to 162 megacycle band is widely used for communications within a radius of 15 miles. Greater range is afforded when the base station antenna location is particularly favorable. The principal advantages of this band are its excellent reflection characteristics which extend communications into canyons, under bridges, etc., limited and controllable range because of line-of-sight characteristics, and the fact that extremely reliable communication can be provided with low power transmitters.

Although the 450 to 460 megacycle band has been available on a developmental basis to potential users for over three years, it was not until production type equipment was made available this year that this excellent band began to receive the attention it deserves.

Several 450 to 460 megacycle band mobile radio systems have been installed during the past year. Reports indicate that this band has much to offer because of the almost total absence of noise and its excellent propagation characteristics.

Because of the high frequency, the length of a 450 to 460 megacycle band antenna is but a few inches. At lower frequencies, it was impractical to build stacked omni-directional high-gain antenna arrays for mobile installations because of overhead clearance limitations. At 450 megacycles, stacked antenna arrays for mobile applications should be feasible.

Before experience proved otherwise, it was commonly considered that the communications range attainable in the 450 to 460 megacycle band would be inferior to that of the 152 to 160 megacycle band. It has been demonstrated that the 450 megacycle band, in some respects, offers advantages over the 152 megacycle band.

Tests revealed that excellent communications between base stations and mobile units operating at 450 megacycles could be maintained at some points where under the same conditions communication at 152 megacycles was impossible, erratic, or poor. This does not mean that the maximum range is greater. Instead, it demonstrates the very excellent reflection characteristics of 450 megacycle radio signals.

At the present time, equipment for the 450 megacycle band is more expensive than equipment for the 25 megacycle and 152 megacycle bands. Furthermore, it is somewhat more complex and few persons have had experience with it.

The right to use the ether for communications is licensed. This right or privilege has not been open to everyone and rightly so because uncontrolled use of the ether would surely lead to bedlam.

A radio service dealer, for example, cannot obtain a license under existing rules to operate a private mobile radio system in either of the above two bands. He can, however, obtain communications service from a common-carrier such as a telephone company providing mobile radio service or radio dispatching service if either or both are available in his community.

He can obtain a license to operate radio transmitters in the Citizens Radio Band which is located near the 450 megacycle mobile radio band. He can use standard 450 megacycle mobile radio equipment tunable to the Citizens Radio Band in his cars and trucks and regular 450 megacycle base station equipment operated in the same manner as in regular mobile radio services. Naturally the equipment must have type approval of the FCC.

The Citizens Radio Band is a part of the radio spectrum reserved for John Q. Public. It is not necessarily reserved for the housewife who wishes to keep in touch with her husband by means of a portable purse-size radio.

Instead, the Citizens Radio Band affords the radio service dealer, the grocer, the diaper delivery man, the department store, the stock broker, and others not eligible for licensing on other bands the right to operate private radio communications systems.

The Citizens Radio Band has been virtually dormant because of the lack of suitable equipment. Many laboratories have worked on the development of practical portable radio-communicators that could be sold at mass appeal prices. However, none has appeared on the market at a price that would attract large volume business.

Now that 450 megacycle mobile radio equipment is commercially available, the Citizens Radio Service has become a reality.

In subsequent articles on mobile radio, of which this is the first of a series, license applications, equipment, typical installations, and sales and service will be discussed.

(To be continued)

RADIO & TELEVISION NEWS

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Handsome round cornered molded bakelite case 3 1/4" x 5 1/2" x 2 1/4" complete with all test leads and instructions

Measures: \* Voltage \* Decibels  
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\* Current \* Inductance  
\* Reactance

Specifications: D.C. Volts: 0-7.5/75/150/1,000/1,500 Volts. A.C. Volts: 0.15/150/300/1,500/3,000 Volts. Resistance: 0-10,000/100,000 ohms. 0-10 Megohms. D.C. Current: 0-7.5/75 Ma. 0-7.5 amps. Capacity: .001 Mfd. - 2 Mfd. 1 Mfd. - 20 Mfd. Electrolytic Leakage: Reads quality of electrolytics at 150 Volt test potential. Decibels: -10 Db to +18 Db. + 10 Db. to + 38 Db. + 38 Db. to + 58 Db. Reactance: 15 ohms-25 K ohms 15 K ohms-2.5 Megohms. Inductance: .5 Henry-50 Henrys 30 Henrys-10 K Henrys. Plus Good-Bad scale for checking the quality of electrolytic condensers.

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### Superior's New Model 670-A **SUPER-METER**

**A COMBINATION VOLT-OHM MILLIAMMETER PLUS CAPACITY REACTANCE INDUCTANCE AND DECIBEL MEASUREMENTS**



The Model 670-A comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 6 1/4" x 9 1/2" x 4 1/2".

**SPECIFICATIONS:**  
D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500/7,500 Volts.  
A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts.  
OUTPUT VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts.  
D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5/15 Amperes.  
RESISTANCE: 0 to 1,000/100,000 Ohms 0 to 10 Megohms  
CAPACITY: .001 to 1 Mfd. 1 to 50 Mfd. (Quality test for electrolytics)  
REACTANCE: 50 to 2,500 Ohms, 2,500 Ohms to 2.5 Megohms  
INDUCTANCE: .15 to 7 Henrys 7 to 7,000 Henrys  
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**ADDED FEATURE:**  
The Model 670-A includes a special GOOD-BAD scale for checking the quality of electrolytic condensers at a test potential of 150 Volts.

### New Model 200 AM and FM **SIGNAL GENERATOR**

Provides complete coverage for A.M.-F.M. and TV alignment



\* Tubes used: One 954 as oscillator; one 954 as modulated buffer amplifier; T-2 as modulator; 7193 as rectifier.

The Model 200 comes complete with output cable and operating instructions

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Power Supply: 105-125 Volt 60 Cycles. Power Consumption: 20 Watts. Channels: 2-5 on panel, 7-13 by harmonics. Horizontal lines: 4 to 12 (Variable). Vertical lines: 12 (Fixed). Vertical sweep output: 60 cycles. Horizontal sweep output: 1.5-750 Cycles.

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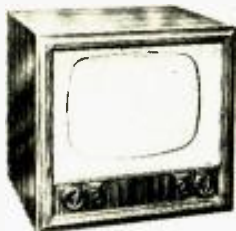
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6AC7	6BQ7	6G5	12BH7
6AG5	6C4	6G6	12SA7
	6CB6	6G7	12SK7
		6X5	12SN7
			12TQ7
			14A7
			14B6
			25BQ6
			25L6
			25W4
			25Z6
			35L6
			35W4
			35Z5
			50A5
			50B5
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**F-C Attenuator**  
(Continued from page 57)

meters, amplifiers, etc. It may be assembled and used as a separate instrument or may be permanently wired in as part of the instrument. In either case, care should be taken to provide adequate shielding.

Certain general precautions should be followed when using the attenuator, however. First, since 1/2 watt resistors and 600 volt condensers are used, if extremely high voltages are to be applied to the Input, substitute 1 watt or 2 watt resistors and higher voltage condensers of the same electrical value, making any readjustments necessary for frequency compensation and calibration. Also take this into account in the layout and wiring.

The attenuator may be used equally well in a.c. or d.c. circuits. If both a.c. and d.c. are present, however (as in the plate circuit of a tube), and it is desired to consider the a.c. component only, suitable d.c. blocking condensers should be connected in series with the Input or Output terminals (or both).

Since the input resistance of the attenuator is approximately 1 megohm, best results are obtained if the instrument with which the attenuator is used has a similar high input impedance. In any case the input impedance of the instrument should not be so low as to appreciably affect the size of R<sub>2</sub> or R<sub>3</sub>, when shunted across these resistors. Otherwise, the degree of attenuation may be changed.

If an attenuation other than 10 or 100 is desired, an extra switch position may be used. The two resistors in the voltage divider are chosen with values having a ratio approximating the degree of attenuation chosen, and the condensers are chosen with an inverse ratio. At least one of the condensers should be made variable for proper compensation.

-30-

**SERVICE TIP**

By MILTON M. SCHUMAN

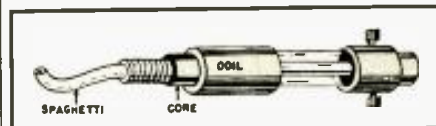
WHEN replacing a conventional loop antenna with a "Ferri-Loopstick," body capacity often makes it difficult to align the core.

A good way to get around this difficulty is to put some dope on a length of spaghetti and run it in the hole in the core (see Fig. 1). When the dope is dry you can move the core in and out without the detuning effect of body capacity.

Put a thin layer of dope on the core before sliding it into the coil, set it at the best point and then when the dope is dry, cut the spaghetti off close to the core.

-30-

Fig. 1





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"I have had a half dozen or so offers since I mailed some fifty of the two hundred employment applications your school forwarded me. I accepted a position with the Civil Aeronautics Administration as a Maintenance Technician. Thank you very much for the fine cooperation and help your organization has given me in finding a job in the radio field."

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#### GETS PUBLIC UTILITIES JOB

"I have secured the position of Radio Technician with the Toledo Edison Company. I want to thank you once more. The help you gave me was much more than would ordinarily be expected—both in obtaining my license and in finding employment." Norman W. Stokes, Jr., Rt. 11, Box 612, Toledo 7, O.

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Telegram from Chief Engineer, Broadcast Station, Pennsylvania: "Immediate opening for engineer. Automobile and First Phone a must. If graduate available, please forward name and address."  
Letter from Chief Engineer, Broadcast Station, Montana: "Immediate opening for Engineer-Announcer. Basic salary \$42.50... real future for

right man."  
Letter from Chief Engineer, Broadcast Station, Tennessee: "Have opening for operators. If you have men, please have them contact us."  
These are just a few examples of the job offers that come to our office periodically. Some licensed radio men filled each of these jobs; it might have been you!

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Clifford E. Vogt, Box 1016, Dania, Fla.	1st Phone	20
Francis X. Foerch, 38 Beucier Pl., Bergenfield, N. J.	1st Phone	38
S/Sgt. Ben H. Davis, 317 N. Roosevelt, Lebanon, Ill.	1st Phone	28
Francis X. Foerch, 38 Beucier Pl., Bergenfield, N. J.	1st Phone	38

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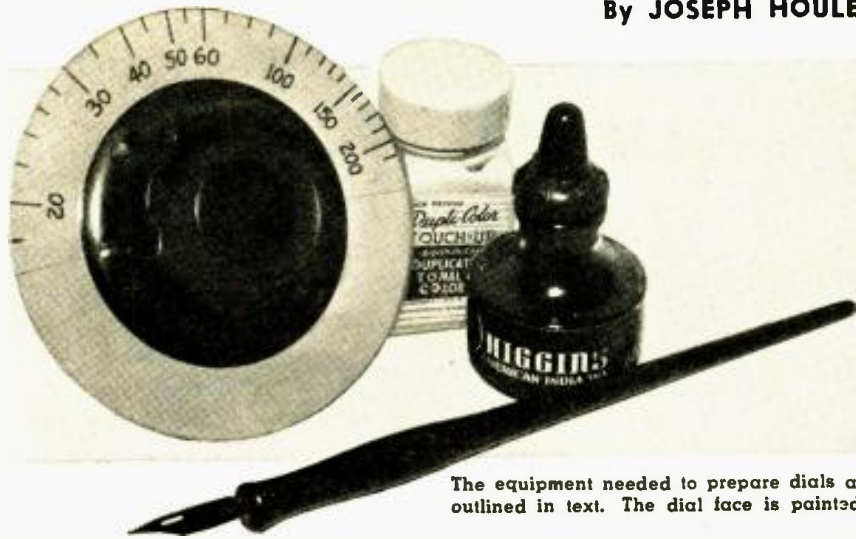
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# CALIBRATING PLAIN DIALS

By JOSEPH HOULE



The equipment needed to prepare dials as outlined in text. The dial face is painted.

*Some practical hints for the home constructor on the preparation of instrument dial faces.*

**O**SCILLATORS, wavemeters, and a host of other home-made instruments need direct-reading dials to realize their full utility. The only available type of dial that is designed for hand-calibration is of the elaborate vernier variety, such as the *National* ACN, which requires a large panel cut-out and considerable other metal work for installation. The space and complication involved is disproportionately great for use on a small instrument.

What is needed is a plain dial with a surface specially prepared to take markings in ink or pencil. The writer has tried cementing a paper scale to a standard dial, but ordinary cements all come loose after a year or two. Cementing a paper or cardboard scale to a crackle-finished panel is inadvisable, too. Either the glue comes loose, or the cement dissolves the paint, and the whole mess slowly soaks through the paper, producing a mottled effect. Eventually, both things happen.

## Painted Surface

A very successful solution is to cover the surface of the dial with a light-colored paint. Let the paint dry for a day or two, then do the lettering and graduations with India ink.

The completed dial may be coated with clear lacquer to protect the ink, but this is usually necessary only if the instrument is to receive hard use.

A *National* Type O or similar dial responds very well to this treatment. Remove the Bakelite knob, paint the back of the metal dial plate, and let it dry thoroughly. Reassemble the knob to the plate, put the dial on the instrument, and mark the calibration lightly with pencil. Then remove the dial, take

off the knob, and mark the graduation lines in with a ruling pen and straight-edge, using India ink. Then apply the numbers. Use very little ink in the pen. If it is too full, it is likely to run and smear. Mistakes can often be corrected by wiping off the wet ink, if it is done immediately. If worst comes to worst, the dial can be repainted and the job started over.

If the ink tends to gather in little droplets, it is due to a greasy surface. The remedy is a little alcohol or carbon tet, wiped on with a very clean rag. The writer hasn't had this trouble on painted surfaces, however; such difficulties occur more often when one is trying to mark tube sockets with India ink on a plated metal chassis.

The writer has used grey floor enamel, flat white house paint, and automobile touch-up enamel with equal success. Flat white is the only variety that will take pencil marks well. The small bottles of touch-up auto enamel that come in various colors are particularly satisfactory. A light buff or gray can be selected to harmonize with the cabinet, and the paint is quick-drying and of very good quality.

While the procedure outlined may seem to be time-consuming, the job could easily be started at the same time construction of a unit is begun so that by the time the equipment was built, a dial face worthy of the unit would be ready to attach, giving a "custom-built" look to your work.

The dial in the photo, shown with the main materials used in the calibration, was made from a 4-inch Lucite disc and a large knob found in a surplus collection. This particular dial is being used on a resistance-tuned audio oscillator.

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IF Transformers, 1600 KC Double Slug	.79 ea.
MD-7 Modulator for ARC 5, All tubes	.95 ea.
ARC-5 Xmtr, Tuning Cond., #5032	1.49 ea.
ARC-5 Xmtr, M.O. Trimmer #4990	1.29 ea.
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FT-55-2	7.2V/21.5A, 6.5V/6.85A, 5V/6A, 5V/3A		3.75
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### AUDIO CATALOGUES

#### TAPE HANDBOOK

*Robins Industries Corp.*, 36-27 Prince St., Flushing 54, N. Y. has just issued a 24-page handbook for the professional and amateur tape recorderist.

Entitled "Tape Editing and Splicing" and written by N. M. Haynes, the book outlines ways of getting more use and enjoyment from a tape recorder. The text covers splicing techniques, geometry of the splice, splice detection, localization, editing procedures, spliceless editing, etc. Line drawings and actual photographs of the material under discussion help to clarify the proper procedures.

The material included in this handy little volume was excerpted from the author's volume "Elements of Magnetic Tape Recording," published last year by *Prentice-Hall*.

For those who want a pocket-sized reference manual on tape splicing and editing, this little booklet would appear to be a bargain at 25 cents a copy from the company.

#### SELECTING STEREO EQUIPMENT

A useful guide to the selection and placement of stereo sound equipment has been issued by *Electro-Voice, Inc.* of Buchanan, Michigan as a service to audiophiles and music enthusiasts.

Written in easy-to-understand form, the booklet outlines five factors requisite for listening satisfaction, explains the principles of stereo reception from various sound sources, discusses the placement of speakers for maximum enjoyment, stereo discs and their reproduction, connecting and matching amplifiers, etc.

Equipment made by the company is used as examples but the principles involved are universal. Copies of this brochure are available from the manufacturer.

#### ENDLESS-LOOP RECORDER DATA

*Amplifier Corp. of America*, 398 Broadway, New York 13, N. Y. has

issued a four-page folder which describes in some detail its "Magne-loop" series of continuous-loop magnetic tape recorder-reproducers.

The brochure describes features of 21 basic models which are available in single- or dual-speeds as well as in single-, dual- and triple-channels. Recording characteristics are tabulated for easy reference. A complete variety of playback modes are suggested and made available to accommodate specialized uses and technical applications. Mechanical and electrical features are fully covered.

#### ASA TAPE STANDARDS

The American Standards Association, 70 E. 45th St., New York 17, N. Y. has copies of the new international standard on the interchangeability of magnetic tape recordings available for \$2.40 each.

Recommended by the International Electrotechnical Commission (IEC) the standard is entitled "Recommendations for Magnetic Tape Recording and Reproducing Systems: Dimensions and Characteristics." The recommended standard applies to non-perforated magnetic tape and equipment used for sound recordings and sound reproduction in both professional and domestic applications. Among the specifications established are the mechanical and electrical requirements of recording and sound reproducing equipment, nominal tape speed and tolerance, position of the active surface of the tape, position and dimension of the magnetic sound track, and spools.

The IEC standards are not mandatory but are the recommendations to the 34 member countries.

#### AMERICAN MICROPHONE CATALOGUE

*American Microphone Manufacturing Company*, 412 S. Wyman St., Rockford, Ill. has issued a new 16-page catalogue which describes in detail its full line of microphones, handsets, phono cartridges and arms, mobile equipment, and accessories.

Available without charge on request. Catalogue 58 includes photographs, specification charts, and sound distribution patterns on each microphone as well as physical specifications and performance data on other items in the line.

Radio Shack Corporation of Boston takes no stock in "recession rumors" for it has just announced an expansion program which will add 80,000 square feet of warehouse, office, and mail order facilities; created 50 new jobs; opened a second store in Boston; and increased its advertising and promotion budget. The new building, located at 730 Commonwealth Ave. in uptown Boston, brings to a total of 131,000 square feet the space occupied by this Boston-New Haven distributor.



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## Design Curves (Continued from page 49)

$R_1 + 1/(1/r_p + 1/R_p)$  was actually about 110,000 ohms, and the true value of  $a$  was approximately 11. The gain of the second section of the 6SN7GT adequately compensated for the 20 db loss in the tone control, and the overall gain of the amplifier was practically unchanged.

Our friend seemed to like music with plenty of bass so we set the abscissa

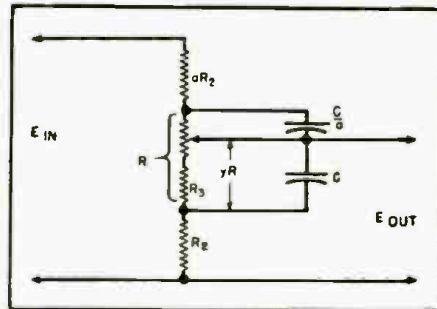


Fig. 9. Circuit for bass boost and attenuation with a fixed resistor in series with the potentiometer to limit the attenuation.

value of 0.05 equal to 50 cycles. The curve for  $y = 1.0$  indicates that 19 db of boost could be obtained at 50 cycles and that there would be 3 db of boost at 1000 cycles. Because our value of  $a$  was more nearly 11 than 10, we would get slightly more boost. The value of  $C$  was determined as follows:

$$2\pi fCR_2 = 0.05$$

$$C = \frac{0.05}{2\pi fR_2} = \frac{0.05}{2\pi (50) (10^4)}$$

$$C = 1.59 \times 10^{-8}$$

$$C = 0.0159 \text{ microfarad}$$

The 0.016-microfarad capacitance was made up from 0.01- and 0.006-microfarad condensers in parallel. The

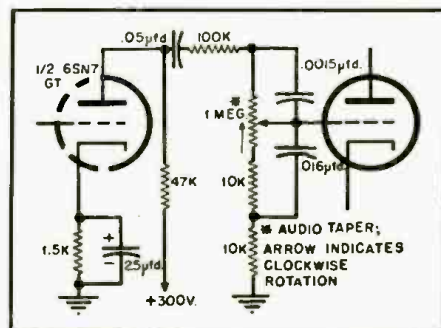


Fig. 10. Circuit for bass boost and attenuation which is capable of providing 19 db of boost at a frequency of 50 cycles.

condenser  $C/a$  would then be 0.0015 microfarad, or approximately one-eleventh of  $C$ . An audio taper pot. was used, wired for increasing boost with clockwise rotation. The complete bass circuit is shown in Fig. 10.

(To be continued)

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ONE-YEAR GUARANTEE

12½" (Black or White)	Glass 16" Round (Black)	\$22.50	\$24.50
Glass 14" Rectangular (Blk.)	Glass 16" Rectangular (Blk.)	\$23.50	\$24.50
17" Rectangular (Blk.)		\$24.50	
19" Round (Blk.)		\$34.50	
20" Rectangular (Blk.)		\$34.50	
21" Rectangular (Blk.)		\$36.50	
24" Metal		\$67.25	

Console cabinet of beautiful design made of the finest veneers and good finish. Size 39" high x 24" wide x 22¾" deep. Finished in mahogany or walnut. Cut for 630 chassis with 12" speaker; will take either 16, 17, or 20" tube. (Please Specify Size.)

Price including mask and excise tax \$43.95  
Extra for glass \$2.75

For the various other cabinets in our large selection we will furnish photos and other NECESSARY INFORMATION, ON REQUEST.

## TELEVISION COMPONENT SPECIALS

"Faster Than Hotcakes!"

That's how these original 13-channel RCA Tuners are selling. Uses 3-6J6 tubes. Sold as is, less tubes, only **\$3.95**

## NEW STANDARD COIL CASCODE TUNER

The tuner that will give you stronger, better and clearer reception. Uses 1-6J6 and 1-6BK7 Intercarrier **\$19.95**

New—DuMont Tru Focus Conversion Kit	
Convert your old set for even focus over entire screen.	
DuMont 70° Yoke, Model Y2A1—distributed winding	\$6.57
DuMont 70° Flyback Transformer Model H1A1	\$6.57
DuMont Linearity Control— for above units	\$0.75
DuMont Width Coil— for above units	\$0.75

## AUTOMOBILE RADIOS

Custom-Built for any of the following 1949-1950-1951-1952 automobiles—Dodge, Plymouth, Chevrolet, Hudson, Studebaker, Henry J. and Ford. Every Radio is a powerfully built, 6 tube superhet with R.F. Stage and 3 gang condenser. Each radio is Custom Built and can be mounted in the dashboard within 4 minutes. Your price including aerial \$38.47 ea.

All Merchandise Subject to Prior Sale. All Prices Subject to change without Notice.

WRITE FOR COMPLETE CATALOG N-7

## EDLIE ELECTRONICS INC.

154 Greenwich St. New York 6, New York

## What's New in Radio

(Continued from page 76)

The Model CB-8 is designed to accommodate 8" speakers while the CB-12 will house 12" units.

For full details write the company's sales office at 4753 N. Broadway, Chicago 40, Illinois.

### AUDIO TRANSFORMERS

Standard Transformer Corporation, 3580 Elston Ave., Chicago 18, has introduced two new line-to-v.c. transformers for 70.7 volt line audio distribution systems.

The A-8102 is for 8/4/2/1/5 watts while the A-8103 is for 16/8/4/2/1/5 watts. Both operate into load impedances of 4, 8, or 16 ohms.

Details are available on request.

### PLASTIC COATING

A clear acrylic plastic coating, packaged in a self-spraying container, has been developed by *Tru-Pine Company* of 7638 Vincennes Avenue, Chicago.

Tradenamed "Sprayway," the coating is quick drying and provides a flexible and durable finish that resists oils, alcohol, grease, acids, water, and dirt. It can be used to provide protection for electrical parts, terminals, and wiring.

This new spray has high dielectric properties, adds life to old, cracked, and deteriorated insulation and helps prevent leakage and short circuiting.

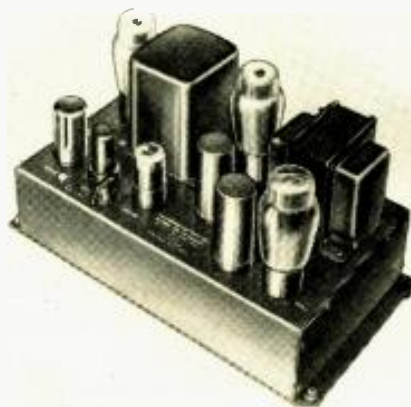
### 15-WATT AMPLIFIER

*The Sargent-Rayment Co.*, 212 9th Street, Oakland 7, California is currently marketing a 15-watt amplifier-preamp, the SR88.

Designed for custom installation

work, the unit is for use in conjunction with any high quality tuner which does not provide a properly compensated phono preamp.

Specifications on the SR88 include harmonic distortion (at 15 watts) of .32 per-cent at 400 cps, with maximum distortion not more than .5 per-cent at any frequency from 30 cycles to 15,000 cycles; frequency response  $\pm .2$  db from 20 to 20,000 cycles; a hum-free magnetic phono preamp with adequate



gain for low-level reluctance cartridges; and 26 db of inverse feedback.

A specification sheet covering this new unit will be forwarded on request.

### HIGH-VOLTAGE SUPPLY

*Spellman Television Co., Inc.*, 3029 Webster Avenue, Bronx, New York has introduced a new high-voltage power supply unit which has been especially designed for laboratory work.

The Model LAB-30 is a continuously variable 1 to 30 kv. regulated d.c. power supply with regulation of ½ of 1% at 1 ma. Up to 2 ma. may be drawn from 20 kv. down. This 16-tube

## DICK TRACY'S RADIO COMES TO LIFE

THE first experimental, working model of "Dick Tracy's" famous wristwatch radio has been presented to Chester Gould, creator of the comic strip detective, by Western Electric Company's Allentown plant.

The radio, made possible by the invention of transistors, was designed and produced as an after-hours experiment by a couple of W-E engineers.

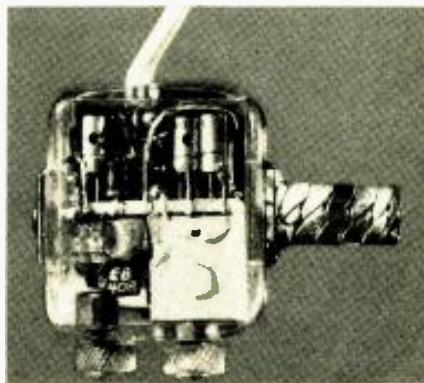
Weighing only a few ounces, the radio measures only 1½" long by 2" wide by ¾" thick. Using a fine wire antenna worn inside the coat, it is possible to receive radio stations a hundred miles away under favorable atmospheric conditions. A small loudspeaker is worn on the coat lapel.

There are two small knobs on the side of the case, one tunes in stations by means of a two-gang variable condenser while the second knob controls volume. Only two tiny hearing aid batteries are required to operate the set since the use of transistors eliminates the need for an "A" battery. One junction-type transistor is used for the r.f. stage to amplify the incoming signal. Three cartridge-type transistors are employed in the set—one acts as a regenerative detector while the other two are a.f. amplifiers. All the other components

including transformers and fixed condensers are of miniature design to fit the tiny plastic case.

Although this radio was built as an experiment only and will not be manufactured as a standard item by Western Electric, it does serve to demonstrate the potential for transistors. —30—

Western Electric's version of "Dick Tracy's" wristwatch radio. The set also includes a hearing aid loudspeaker, a battery container, and an antenna worn around body.



RADIO & TELEVISION NEWS

# Fast Fit for the Job at Hand . . .



## MALLORY MIDGETROL®

Round-Shaft Volume Controls

### START FAST . . . FINISH FAST . . .

- Because of the wide and easy adaptability of Mallory Midgetrols, it's easy to stock—or get fast from your distributor—just what you need to do your job.
- Round tubular shaft designed and built for fast, easy and accurate cutting.
- Factory-tested AC switch may be attached instantly without disassembling control.
- Speedy adaptability to both split-knurl and flatted type knobs.

### CUSTOMER-PLEASING RESULTS . . .

- Longer lasting resistance elements even in extremes of temperature and humidity.
- Better and more accurate taper curves resulting from precision processing methods.
- No pigtail connections to break—thanks to Mallory's exclusive sliding contact that gives EXTRA quiet operation.
- Minimum wobble with Mallory exclusive two-point shaft suspension.



So Versatile are Mallory Midgetrols—both standard and dual—that they reduce by 40% the cost of inventory needed to service the 10 most popular makes of radio and TV sets.

**Make Sure!  
Make it Mallory!**

Every Mallory Midgetrol is packed with two shaft ends to make it easy for you to use either split-knurl or flatted type knobs. The Mallory Midgetrol line, in addition to round shaft standard controls, includes dual concentric controls that offer fast, easy assembly in five steps *without* special tools. Front and rear sections are factory assembled and inspected. AC switch attachment is easy.

P. R. MALLORY & CO., Inc.  
**MALLORY**  
CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS  
• RECTIFIERS • VIBRAPACK® POWER SUPPLIES • FILTERS  
\*Reg. U.S. Pat. Off.  
**APPROVED PRECISION PRODUCTS**  
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA



# DON'T MISS THESE BARGAINS

## G.E. RELAY CONTROL

(Ideal for Model Controls, Etc.)

Contains a sigma bridge, 5,000 ohm, relay, (trips at less than 2 MA), high impedance choke, bimetal strip, neon pilot and many useful parts. The sensitive relay alone worth much more than the total low price of. . . . . **\$1.25** each, 10 for **\$9.90**

## WESTINGHOUSE OIL CONDENSER

10 M.F.D.—1000 VDC (Marked 440 VAC)—A terrific bargain at. . . . . **\$1.95** each

## HIGH CAPACITY CONDENSER

50 M.F.D. 600 VDC, oil filled, only. . . **\$4.99** each

## POWER TRANSFORMER BARGAINS

(110 V, 60 cycle primary)

800 volts CT @ 250 MA, 6.3V @ 10 amps, 5V @ 4 amps, 100V bias winding **\$4.95**

## FILTER CHOKE BARGAIN

Fully cased 5 Henry 200 M.A., removed from TV Equipment guaranteed. . . . **.95** each

## FILTER CONDENSER BARGAIN

8x8 M.F.D. 600 vdc oil compound filled. STW, but scratched. Only **.98** each

## SCOPE TRANSFORMER BARGAIN

2500 V @ 3 ma, 2.5 V @ 2 A, 6.3 V @ .6 amp. Removed from TV equipment. Guaranteed electrically. Terrific value @ **\$1.49**

## SENSITIVE RELAY

O'arsonval moving coil type, mounted in meter case. Adj. 700 microamps to 1 ma. Made by Triplett. ea. **\$5.75**

## PANEL METERS

NEW GOV'T SURPLUS  
\*Special Scale

### 2" METERS

0-10 MA. AC. . . . . **\$2.95**  
0-4 AMP RF . . . . . **2.95**

### 3" METERS

0-2 MA . . . . . **4.50**  
0-2.5 AMP RF . . . . . **5.95**  
0-200 MA . . . . . **1.95**  
0-100 VDC (1 MA) . . . . . **5.95**  
0-200 VDC (1 MA) . . . . . **5.95**  
0-250 VDC (1 MA) . . . . . **5.95**

### FILTER CHOKES

6 Hy 90 MA. . . . . **\$0.79**  
5 Hy 250 MA. . . . . **1.95**  
6 Hy 500 MA. . . . . **4.95**

### PIGTAIL MICAS

RMF: 5, 20, 50, 60, 100, 250, 300, 400, 500, 750, 800, 1000, 2000, 3000, 4000, 5000, 6000, 10000. . . . . **\$0.09** ea.

### BAKELITE CASED MICAS

RMFD VDC	Price	MFO VDC	Price
.001 600	\$.18	.024 1500	\$0.65
.002 600	.24	.033 1500	.75
.01 600	.26	.02 2 KV	.90
.02 600	.26	.005 2500	.95
.01 1 KV	.45	.004 2500	.45
.002 1200	.35	.0001 5 KV	.70

## MICROAMMETERS

### 3" METERS

0-200 UA . . . . . **6.95**  
0-500 UA . . . . . **5.95**

### 4" METERS

0-200 UA . . . . . **6.95**  
0-50 UA . . . . . **12.95**

## GE KV METER

0-15 KV DC, 3 1/2" SQ. Bakelite case, 500 UA movement, includes 30 Meg. 1 1/2% Ext. multiplier. . . . . **\$12.75** ea.

## 2" GE Voltmeter

0-30 Volts DC Aircraft type B-60 . . . . . **\$1.95** ea.

## OIL CONDENSERS

3.75 mfd 650 vdc **\$2.45**  
15 mfd 1000 vdc **4.95**  
1 mfd 1500 vdc **.89**  
1 mfd 2500 vdc **1.75**  
1 mfd 3600 vdc **1.95**  
-1 mfd 7500 vdc **1.95**  
.02 20,000 vdc **9.95**

## Non-Inductive Resistors

Ohms: 500, 12.500 100 watts. . . . . **\$0.75**

## BLEEDER RESISTOR

100,000 ohm  
150 watt vitreous enamel resistor. . . . . **.59** each

## WIRE WOUND RESISTORS

5 watt ohms: 25-50-84-200-2500 . . . . . **\$0.09** ea.  
10 watt ohms: 25-40-1325-2K-4K . . . . . **.15** ea.  
20 watt ohms: 150-300-750-1K-1.5K, 2.5K-2.7K-10K-20K . . . . . **.20** ea.  
30 watt ohms: 100-2500-5300-18K . . . . . **.22** ea.

## ADJUSTABLE SLIDER RESISTORS

20 Watt: 1, 5, 300 ohms. . . . . **\$0.25**  
75 Watt: 100, 150, 200 ohms. . . . . **.39**

**PEAK ELECTRONICS CO.**  
378 Great Neck Rd., Great Neck, New York  
Phone Great Neck 2-0082

unit is of the r.f. type consisting of a separate oscillator and buffer feeding the power oscillator into a doubler rectifier. Regulation is accomplished through feedback into a d.c. amplifier plus simultaneous output control of



the buffer. The unit is available in both rack and bench models.

## SPEAKER ENCLOSURE

R-J Audio Products, Inc., 164 Duane Street, New York 13, New York has announced that production is now underway on its R-J enclosure which was introduced to the public at the Audio Fair in New York.

The enclosure is designed to be used with any loudspeaker. The line will be available, without the speaker, in models to accommodate 8", 12", and 15" speakers.

A data sheet on the new enclosure and a listing of the parts distributors and sound dealers who are carrying the unit are now available on request.

## NEW AMPLIFIER

Newcomb Audio Products Co., 6821 Lexington Avenue, Hollywood 38, California has introduced a new amplifier which has been designated as the "Classic 25."

According to the company, every practical operational feature developed in 15 years of electronic research has been incorporated in this new unit. Frequency response extends from



below 10 to over 100,000 cycles. The newly-developed "Audio-balance" feature permits anyone to achieve perfect balance of the output tubes in seconds. A special "Adjusta-panel" extends the control shafts instantly for easy cabinet mounting through the panel if desired.

Six inputs are provided for radio, TV, tape recorder, crystal pickup, and two magnetic pickups. A "Fletcher-Munson" compensated volume control maintains perfect aural balance, according to the company. A crossover

selector simplifies the attainment of correct playback response, including foreign and domestic crossovers, and the new AES standard.

## CERAMIC CONDENSERS

A line of disc-type ceramic condensers is currently available from Allen-Bradley Company of Milwaukee, Wisconsin, manufacturers of fixed and adjustable molded resistors.

The new line ranges from .001 to .01  $\mu$ fd. The basic element of these new units is a ceramic disc of high-K dielectric which is molded and sintered at the company's plant. A deposit of silver paste is then applied to the face of the disc and heat treated to reduce the paste to metallic silver.

Leads are soldered to the silver surfaces and the entire unit is insulated with phenolic resin. The condenser is then wax impregnated to resist moisture. All of the manufacturing processes on this new line are performed and controlled by the company from whom complete details on these units may be obtained.

## AUDIO GENERATOR

Electronic Instrument Co., Inc., 84 Withers Street, Brooklyn 11, New York has announced the addition of a



new sine- and square-wave audio generator to its line of kits and wired instruments.

The new "Eico" Model 377 provides complete sine-wave coverage from 20 to 200,000 cycles in four individually-calibrated ranges; complete square-wave coverage from 60 to 10,000 cycles (5% overshoot at 10 kc.), read on the same scales as sine wave; a four-gang tuning condenser; response of 1.5 db from 60 cycles to 150 kc.; and distortion of only 1% of the rated output.

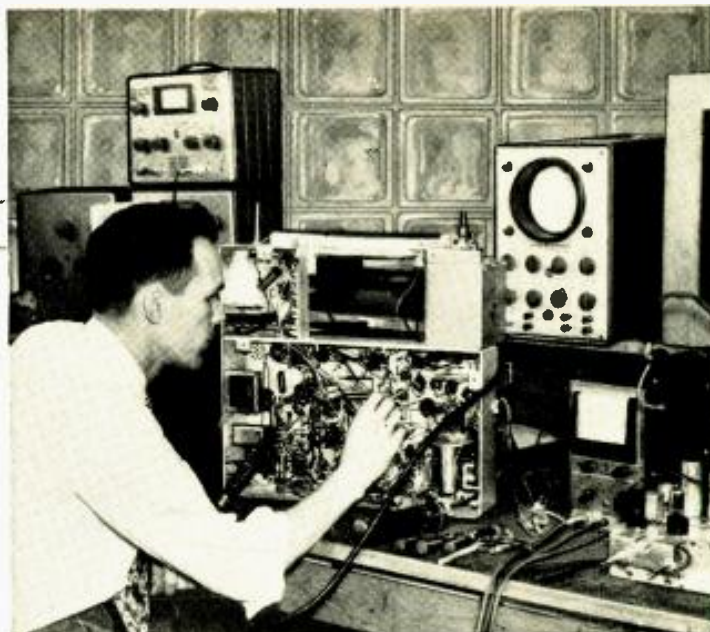
The instrument is housed in a rugged steel case which measures 11 1/2" x 7 1/2". In kit form the unit has been designated as the Model 377-K. Information on the Model 377 as well as other instruments in the company's line is available.

## V.H.F. TRANSISTORS

Engineers at Radio Corporation of America have reported a significant advance in transistor research which, for the first time, points the way to v.h.f. applications in television, FM radio, and point-to-point radio communications.

Several developmental point-contact transistors have been made to oscillate

# Here's your Opportunity



## to prepare for a good job or a business of your own in TV SERVICING

**There are today more good jobs** open in TV Servicing than there are trained and experienced men to fill them. Yes, thousands of opportunities exist now for good-pay jobs offering employment security for years and years to come. Thousands of TV Servicing jobs are going begging. Do you want one of them?

Experts agree, that because of the critical shortage of trained and experienced TV Servicemen, and the tremendous future growth of the industry, no vocational field today offers more opportunities than TV Servicing.

### The Big New Industry with a Great Future

Television is just in the beginning stages of its big industrial boom. Look at these amazing facts:

- Lifting the freeze on new TV stations will open many new TV areas and will improve the coverage of existing areas. The result will be an enormous demand for TV receivers.

- Within a few years over 1000 TV stations will be telecasting compared with 108 TV stations now on the air.

- Nearly one-half of all families living within the present TV areas do not yet own TV receivers.

- The new trans-continental video network plus better and more interesting programs plus larger viewing screens and color TV will increase the installation of new receivers, will induce present owners of 12-inch and smaller size viewing screens to buy newer model receivers.

- The power increases of many existing stations and improved reception range of current receivers will result in receivers being installed and serviced in the fringe areas of present stations.

- Under the FCC proposal, over 70 per cent of all communities will be served by UHF channels exclusively. This means TV servicemen must know UHF receivers before the new UHF stations in their area are opened.

- No one yet knows how great the industrial TV market will be.

### RCA Institutes Home Study Course prepares you for a Career in TV Servicing

The addition of the RCA Institutes TV Service Training to your present radio-electronics experience will qualify you to step out and grasp the golden opportunities that now exist in television—America's fastest growing industry.

Learn at home—in your spare time—while you study the practical *how-to-do-it* techniques with *how-it-works* information. Easy-to-read and easy-to-understand lessons under the supervision of RCA engineers and experienced instructors quickly train you to qualify for the many good jobs now waiting for trained TV servicemen. Don't pass up this lifetime opportunity for financial security and a bright future in TV. Learn TV Servicing from RCA—pioneers and leaders in radio, television and electronic developments.

RCA Institutes conducts a resident school in New York City offering day and evening courses in Radio and TV Servicing, Radio Code and Radio Operating, Radio Broadcasting, Advanced Technology. Write for free catalog on resident courses.

## Send for FREE BOOKLET

Mail the coupon—today. Get complete information on the RCA INSTITUTES Home Study Course in Television Servicing. Booklet gives you a general outline of the course by units. See how this practical home study course trains you quickly, easily. Mail coupon in envelope or paste on postal card.

### MAIL COUPON NOW!

RCA INSTITUTES, INC., Home Study Department RN-952  
350 West Fourth Street, New York 14, N. Y.

Without obligation on my part, please send me copy of booklet "RCA INSTITUTES Home Study Course in TELEVISION SERVICING." (No salesman will call.)

Name \_\_\_\_\_  
(please print)  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



**RCA INSTITUTES, INC.**  
A SERVICE OF RADIO CORPORATION of AMERICA  
350 WEST FOURTH STREET, NEW YORK 14, N.Y.

*New*  
**WILLIAMSON  
TYPE**

## Heathkit AMPLIFIER KIT

**AMPLIFIER Features**

- First Williamson Type Amplifier supplied with matching preamplifier
- Uses Altec Lansing Peerless output transformer.
- Practically distortionless—harmonic and intermodulation distortion both less than 1/2 of 1% at 5 watts output.
- Frequency response ± 1 db from 10 cycles to 100 kc.
- Output impedance 4, 8, or 16 ohms.

The new Heathkit Williamson Type Amplifier kit is the best obtainable in amplifiers today—the choice of the really discerning listener. You can hear the difference and measurements actually bear out the superb performance. Frequency response ± 1 db from 10 cycles to 100 kc allow you to hear the highs and lows with equal crispness and clarity. Harmonic and intermodulation distortion both less than 1/2 of 1% at 5 watts output eliminate the harsh and unpleasant qualities which contribute to listening fatigue.

The circuit is similar to the one published in *Audín Engineering Magazine* for November, 1949, and is considered by engineers throughout the audio field as one of the best ever developed. The Main Amplifier (which may be purchased separately) consists of a 6SN7 voltage amplifier and phase splitter using a 6SN7, a driver stage using a 6SN7, and a push-pull output stage using a pair of 807 tubes. The output transformer is manufactured by the Peerless Division of Altec Lansing and is built to their highest standards. Output impedances of 4, 8, and 16 ohms are available. The power supply uses a separate chassis with husky Chicago Transformer power transformer and choke, and 700V Malfory filters for long hum-free operation. A 5V4G rectifier is used.

The main amplifier and power supply are each on a chassis measuring 7" high by 5 1/2" wide by 11" long.

**PREAMPLIFIER AND TONE CONTROL UNIT KIT**

The preamplifier kit consists of: a 12AX7 (or 12AY7) dual triode first amplifier stage with a turn-over control for LP or 78 record types, and a 12AU7 amplifier stage with individual bass and treble tone controls which each provide up to 15db of boost or attenuation. A switch on panel selects either magnetic, crystal, or tuner inputs. Preamplifier also is well suited to custom installations—it will operate in either vertical or horizontal position, and special notched shafts of the controls and switches allow a variety of shaft lengths to be selected. Dimensions: 2 1/4" high by 10 1/4" wide by 7 1/4" deep.

**WRITE FOR Free CATALOG**

*The*  
**HEATH COMPANY**  
BENTON HARBOR 15,  
MICHIGAN

*You SAVE BY  
ORDERING DIRECT*

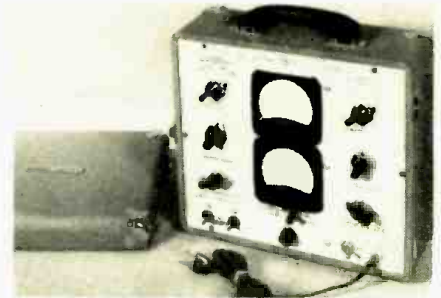
at frequencies well up in the 100-to-200 mc. band and one reached a record high frequency of 225 mc. The highest frequency value previously reported has been 50 mc.

The new developmental transistors are the result of RCA's continuing research program in the field.

### TEST INSTRUMENT

A germanium diode checker for use in laboratories, quality control departments, service shops, and wherever a need exists for checking the static characteristics of diodes has been announced by *General Electric Company*.

In addition to its primary function, the unit may also be used for general resistance checking, as an accurately



WA-A1 Amplifier kit—Combination 1—(Main Amplifier and Power Supply) complete with WA-PI Preamplifier kit. Total Ship. Wgt., 34 lbs. (Shipped Express only)..... **\$69.50**

WA-A1 Amplifier kit only—Combination 4—(Main Amplifier and Power Supply). Less WA-PI Preamplifier. Total Ship. Wgt., 29 lbs. (Shipped Express only)..... **\$49.75**

WA-PI Preamplifier Kit only. (less power supply) (Tubes included). Total Ship. Wgt., 7 lbs. (Shipped Express or Parcel Post)..... **\$19.75**

metered power supply, for forming electrolytics, and checking d.c. leakage current.

The new unit, the Type ST-12-A, has test clips for diodes having leads and for those with pins on each end. Should the test clips be shorted on any range, the circuit is designed to prevent instrument damage.

A 3-inch voltmeter and a 3-inch current meter permit voltage and current to be metered simultaneously. All voltage ranges are continuously variable. The unit measures 10" x 11" x 6" and weighs about 8 pounds.

Further information is available from Dept. N-12, Inquiry Section, Advertising Division, Electronics Park, Syracuse, New York.

### AUDIO INPUT SYSTEM

*Pickering and Company, Incorporated*, Oceanside, Long Island, New York is now offering a new audio input system, the Model 410.

This equalizer-preamp unit is designed to serve as an audio control center. It has three input channels—



two for high-level audio signals and one for magnetic type pickups. The pickup channel provides 40 db gain at 1000 cycles and 6 db-per-octave of bass boost below the low frequency turnover.

Used with a high quality power am-

**NEW!**

**JCT  
Meta-Cur**

An extra hand for Radio and Television Technicians

- PRECISION VOLT-OHM-METER IN GUN FORM.
- ILLUMINATES AREA UNDER TEST.
- FLEXIBLE PROBE FOR REACHING TEST AREAS.
- METER READING AND TEST POINT VISIBLE IN ONE GLANCE.
- ALL WORK POSSIBLE WITH ONE HAND.
- TRIGGER RANGE SELECTOR

- Makes Service More Efficient
- Increases Profits • Fully Guaranteed

Ideal For:

- TV TECHNICIANS
- SOUND TECHNICIANS
- BROADCAST ENGINEERS
- MAINTENANCE TECHNICIANS
- HAMS
- EXPERIMENTERS

Available at your nearest parts jobber.

Model 3A 1,000 ohms/volt, including probe and ground lead - **\$32.75**

Model 3B 20,000 ohms/volt, including probe and ground lead - **\$35.50**



**JERSEY CITY TECHNICAL  
LABORATORY**

860 Bergen Ave. Jersey City 6, N. J.

### NOW AVAILABLE!

FOR NON-PRIORITY USERS

### GERMANIUM SEMI-CONDUCTORS

TRIODES, DIODES,  
PHOTODIODES & RELAYS

HERE IS A POPULAR EXAMPLE



Actual Size DCT-7

Operating power gain (db)	17
Power output (milliwatts)	25
Input imp. (ohms)	800
Output imp. (ohms)	24,000
Max collector (V.D.C.)	45
Max emitter signal (V.D.C.)	+4
D.C. emitter current (ma)	0.4
Max collector current (ma D.C.)	2

**\$2<sup>95</sup>**

Shipped postpaid—  
anywhere in U. S. A.

PLUS FREE DATA SHEETS ON 35 OTHER TYPES.

SPECIAL DISCOUNTS TO MFRS. AND PARTS  
JOBBER

Order Direct from This Advertisement  
Send Check or M.O.—No C.O.D.'s, Please

**G. L. ELECTRONICS**  
905 S. Vermont Ave. Los Angeles 6, Calif.

Long Life—Low Maintenance  
No Comebacks with the

*New* **300 OHM  
TRANSMISSION CABLE**  
by **BELDEN**



To You,  
Belden's Golden Anniversary  
Means  
—product performance that  
can come only from a "know-  
how" that has grown through  
actual service since the  
inception of Radio.

—an ability to co-oper-  
ate in pioneering new  
wires to meet or antici-  
pate industry's grow-  
ing needs.

In the years that  
follow

This Belden  
Program Is—

— TO BE  
CONTINUED



No. 8230



**COPPER-  
SHEATHED  
20-GAUGE**

**STRANDED STEEL WIRE**

**Brown Polyethylene—Resists Weather and Oxidation**

The new Belden Weldohm, 300-ohm Transmission Cable is the greatest advancement in television installation since television began.

Reducing TV lead-in conductor breakage to a minimum is easy. The new Belden Weldohm Cable has overcome the breakage point by 162%, that's 1½ times the strength of pure copper wire.

In actual test, Belden Weldohm Cable will withstand 254% more whipping or severe flexing than the average installation of 300-ohm copper lead-in wire.

There is no difference in the electrical characteristics between an all-copper conductor and the Belden Weldohm copper-coated steel wire. The web is 72 mils of 100% virgin polyethylene.

Replace with Belden Weldohm or make your next new installation with Weldohm and avoid expensive loss of time and labor.

Specify Belden—Weldohm Transmission Cable.

Belden Manufacturing Co., 4681 W. Van Buren St.  
Chicago 44, Illinois

**Belden**  
*Radio* **WIRE**

plifier, the controls provide complete flexibility for volume and tone balance. It is self-powered, operates from a 117 volt a.c. line, and may be installed by means of a few simple tools. Three a.c. outlets on the rear of the chassis are controlled by the a.c. switch on the panel, permitting this unit to be used as a master power control for the other components of the system.

Technical specifications on the Model 410 are available from the company.

#### GERMANIUM DIODES

Hytron Radio & Electronics Co., a division of Columbia Broadcasting System, Inc., Salem, Massachusetts is currently in production on a line of germanium diodes.

Presently available are the Types 1N48, 1N51, 1N52, 1N63, 1N64, 1N65, 1N69, 1N70, 1N75, and 1N81. The Types 1N69, 1N70, and 1N81 will be supplied to conform to the applicable JAN-1A testing specifications.

These new 'CBS-Hytron' germanium diodes are "humidity-proof," encased in impregnating wax, and surrounded by a glass-filled plastic. Compact dimensions follow closely those specified by JAN-1A. The germanium wafer is not plated but directly soldered to the base, thus eliminating flaking.

Inquiries regarding these production units as well as special types available on order will be welcomed by the company.

-50-

## International Short-Wave

(Continued from page 71)

being the world's "largest" island. The area of Dutch New Guinea is 151,789 square miles and the estimated population (1951) is 1,018,000. Of the entire population—which is steadily growing—only 321,000 live under Dutch rule. Only a few of the inhabitants are Europeans or Eurasians. The capital city, Hollandia, in 1951 had an estimated population of 32,059. By January 1951 there were 524 village schools with 26,285 pupils; care was being taken to avoid any harm due to a sudden impact of Western civilization on a primitive society. Opening up the interior of the country and its modest agricultural resources through road-building has met with great difficulties because of the excessive rainfall—101 inches annually. Pending agricultural development, the "foreign" population must depend largely on imported food. The territory is practically undeveloped except for the extreme western coastal portion. Commerce and industry in Dutch New Guinea are almost unknown, although some oil and mineral industries are being introduced now. The people generally live in a very wild state. At least until a few years ago—and perhaps yet—head-hunting and cannibalism were all too prevalent.



Seventy-five persons can be seated in this modest studio of Radio-Omroep Nieuw-Guinea, located near Hollandia, capital city of Dutch New Guinea. More modern broadcasting facilities are now under construction for this land where not more than ten years ago natives lived "in the stone age."

Some of the natives are somewhat nomadic, others entirely so. Since they live largely on sago—which is obtainable everywhere in large quantities with a minimum amount of labor—there is no incentive to work except to hunt a few animals and to fish. The only lucrative employment followed is to hunt the Bird of Paradise; collect the wild nutmeg, the mace of which is much esteemed and marketed especially in Makassar, Celebes, Indonesia, or to prepare copra. Men and women go about almost entirely naked. There are headmen of villages but they have little power. The people of the coastal areas are often at war with the people of the scrub lands in the interior and there is en-



TV ANTENNA CONNECTOR CLIP: Clothes pin type... 1.5¢ price: 50¢. YOUR COST ONLY... Ea. 22¢  
LOTS OF 25. VERY SPECIAL... \$4.75  
OPEN WIRE TV LINE: Copperweld ±14. Ideal for fringe areas: 100 ft. ... \$ 4.95  
250 ft. SPECIAL!... 11.50

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**TUBES! NAME BRANDS! 100% GUARANTEED!**  
024A ..... \$0.59 6BC6 ..... \$1.89  
1B3 ..... .89 6AU6 ..... .59  
5U4 ..... .59 6CH ..... .79  
6W4 ..... .59 1N2A ..... .93  
50L4 ..... .59 12AT7 ..... .63  
50A5 ..... .83 12BA6 ..... .69  
35W4 ..... .49 12IF6 ..... .69

AC-DC ANTENNA LOOP BACKS.....29¢

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Standard replacement. Priced to SAVE the serviceman and builder REAL MONEY! For 16"-19" tubes.

500-ohm: male stud mounting..... 98¢  
500-ohm: 3-angle brackets.....  
370-ohm: side angle brackets..... each

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With switches, 10,000, 250,000, 500,000 ohms. 1 meg., 2 meg. Each ONLY.....49¢  
In lots of 10. Each ONLY.....44¢

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Major brand names. Most popular types at LOWEST PRICE! Ea. ONLY ..... 89¢

#### STOCK UP ON THESE SENSATIONAL BUYS!

15" P.M. Utah Speaker. Heavy pot. \$14.95  
Super Sonic TV Booster..... 8.95  
15" P.M. Utah Co-ax Speaker.... 21.95  
70 Degree Cosine Yoke with Network and Leads..... 3.95

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R. C. A. 6BG6 & 1B3 windings. \$1.49



G.E. 14 Kv. \$1.89

Standard Replacement

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100 ..... \$ 2.19  
500 ..... 10.00  
1,000 ..... 17.50

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3AG Extractor type. Mounts 2" behind panel. Easy to mount. THIS MONTH SPECIAL.....Ea. 15¢

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De luxe assortment of 40 receiver type knobs in 11 different styles! Match any cabinet styles. Serviceman or set builder—THIS IS FOR YOU!  
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##### FRESH STOCK

20 MFD 150V.....39¢ 8 MFD 450V.....49¢  
40/40 MFD 150V.....69¢ 16 MFD 450V.....59¢  
50/30 MFD 150V.....69¢ 30 MFD 450V.....69¢

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.01-600V.....\$0.12 .001-600V.....\$0.10  
.02-600V......12 .002-600V......10  
.05-600V......16 .005-600V......10  
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EACH ONLY.....27¢  
10 for .....3¢

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6L6 ..... Ea. 59¢  
6V6 ..... Ea. 49¢

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Most popular types for replacement and new construction!



4-inch PM.....\$1.39 10-inch PM.....\$2.99  
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16AP4. Ea. 1 yr. Guar.

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6 V. VIBRATOR (Onk) ..... \$1.29  
MIDGET IF REPAIR. 450 Kc. .... .49  
PLASTIC RECORDING TAPE: Red oxide. 600 ft. \$1.35;  
WESTINGHOUSE DIAL LIGHTS: 100 to the box. #44, #46, #47, #52, #51 Dial Lights..... 4.29  
PC-81 PRINTED CIRCUIT CENTRALAB..... \$ 0.39  
DUAL TV VOLUME CONTROL. With switch..... .39  
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In lots of 6. Ea. .... 2.99  
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1200 ft. .... 2.10  
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807 TUBES. NEW. SPECIAL..... 1.89  
ASTATIC CRYSTAL MIKE with base, off-on switch ..... 6.95

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mity between these and the mountain folk.

Our best wishes for the future go to *Radio-Omroep Nieuw-Guinea* at Hollandia, Dutch New Guinea, located on the western end of that far-off Pacific island that now lays claim to the title of "largest island in the world!"

#### Radio Club Notes

*Japan*—Kenro Wada, co-editor for the Japanese Short-Wave Club, Kitagobancho 48, Sendai, Japan, says the club has started a monthly house organ which will carry DX news and information in *English*. The club will welcome members from anywhere in the world. Details can be had direct from Mr. Wada.

#### This Month's Schedules

*Albania*—ZAA, 7.850, Tirana, still has news 1615-1630 in parallel with 6.560A. (Pearce, England)

*Angola*—*Radio Clube de Angola*, 11.862A, Luanda, still noted weekdays to 1730 closedown when plays "A Portuguesa." (Pearce, England) Sunday close is 1530. (Stark, Texas) Pearce notes CR6RB, 9.165, Benguela, at 1300 with recordings and to 1400 sign-off (on Sundays may run to after 1430). "DX-Radio," Sweden, says CR6RG, 7.070, and CR6RI, 4.977, Dundo. *Radio Diamang*, are heard in Sweden 1400-1530.

*Argentina*—Richmond, N. Y., comments that LRA, 17.720, Buenos Aires, has had an improved signal lately afternoons and early evenings (*English* runs now 1700-1930). Still noted over LRU, 15.29, with *English* for western North America 2300-0100. (Alcock, Ky.; Bellington, N. Y.) LRA is now using 9.69, replacing 15.345, for the all-Spanish session around 1900-0100.

*Austria*—Blue Danube Network, 9.617, Salzburg, noted with news 0400, 0600. (Pearce, England)

*Australia*—VLA 15, 15.200, Melbourne, noted a recent Sunday with DX session 0035 in beam to western North America; VLB9, 9.58, noted 0115. (Hoffman, N. Y.) VLM4, 4.917, Brisbane, heard with ABC news 1500, then train information, Queensland State news, and early morning music 1510; news 1545. (Pearce, England) A new outlet for *Radio Australia* is VLC7, 7.220, which opens 0615 and runs to after 0900, beamed to South and Southeast Asia; is fair level in Eastern USA.

*Balearic Islands*—Mahon, 7.545, is noted in Sweden around 1430.

*Bechuanaland*—ZNB, Mafeking, sent QSL card for report of last February on the 8.230 channel but did not enclose schedule. (Pearce, England)

*Belgian Congo*—Bishop, Ohio, and Niblack, Ind., note OTM2, 9.38A, with French identification 0115 and signing off 0130A. Usually opens around 0000. *Radio Sweden* says OTH, 9.210, *Radio Congo Belge*, is heard in Sweden 1320.

*Bolivia*—CP38, "La Cruz del Sur" ("The Southern Cross"), 9.505, sent this schedule—Sundays 0655-0815, 1100-1600; weekdays, 0555-0730, 0930-1245, 1755-2115. (Casey, Ky.)

September, 1952

# NEW!

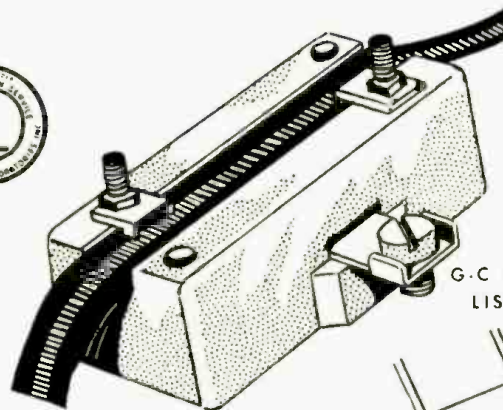
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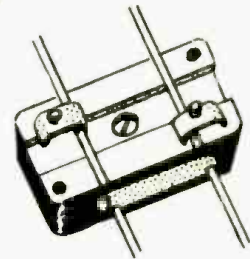
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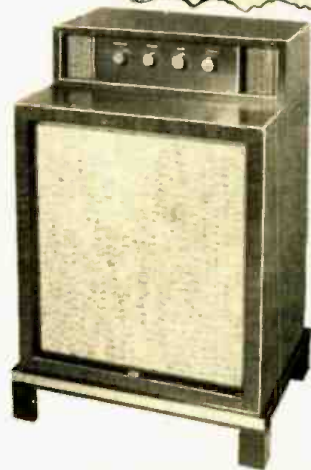
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Table listing electronic components (e.g., 100M MFJ variable rugged construction, 5 mil 330 VAC) and their prices.

**115V FILAMENT TRANSFORMERS 60 CY**

Table listing filament transformers with specifications like VCT 10A, 10 KV Insulation, and prices.

**115V POWER SUPPLY KITS 60 CY**

Table listing power supply kits (A, B, C, D) with specifications like 660VCT 95 Ma, 6.3V 3A, 5V 2A, and prices.

**115V POWER TRANSFORMERS 60 CY**

Table listing power transformers with specifications like 5R V Half Wave, 3A, and prices.

**CHOKES**

Table listing chokes with specifications like 6 HY 50 MA, 9 HY 95 MA, and prices.

**METER BARGAINS**

Table listing meters with specifications like RD 0-20 ua dc, SQ 0-50 ua dc, and prices.

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**SINGLE REFLECTOR CONICALS**

Table listing single reflector conical antennas (e.g., 1259-Single Bay, 1256-Single Bay) and their prices.



**FIVE ELEMENT YAGI BEAMS**

Table listing five element Yagi beam antennas (e.g., 2002 to 2006-any to channel, 1236-Single Bay Twin-V) and their prices.

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Advertisement for M-G 30 Amplifier. Includes a cartoon character holding a sign 'THE PEOPLE'S CHOICE', a photo of the amplifier, and a list of features: 30 watts output, 4 inputs, bass and treble controls, etc.

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In spite of the fact that M-G equipment sells for far less than some others its performance, its tone, its volume, its watts-per-dollar value have sound critics agasp. Nowhere can you find so much amplifier performance at the price. Truly it's the people's choice!

Distributors who have tested M-G Amplifiers in their own sound rooms... compared M-G with others selling for much more... have replaced other amplifier lines with M-G and they're making more sales than ever before.

**FREE Catalog**

Advertisement for Don McGoohan, Inc. featuring a photo of an M-G amplifier and text: 'Catalog 200 shows the entire line of M-G Sound Equipment. Write for it today. DON McGOOHAN, INC. 3700 W. ROOSEVELT RD., CHICAGO 24, ILL.'

Brazil—PRB22, 9.505, Sao Paulo's Radio Record, signs on at varied times between 0500-0505. (Kary, Pa.) ZYK2, 15.145, noted in Portuguese 0715, fair to good level; ZYC9; 15.370, Radio Tupi, heard with Portuguese 1800-2100 when is "buried" in CWQRM. (Saylor, Va.) PRA8, 6.0153 (measured recently at 1730 when had good level), noted in Portuguese. PRL7, 6.1467, noted here at 1850 recently with music; announced "Radio Nacional" at 1900. (Oskey, N. J.) PRK9, 15.185, Belo Horizonte, noted 1725 with relay of "Agencis Nacional." Had QRM from London, 15.180 (Catch, England) Niblack, Ind., says he believes the program in English "from the Midnight Room of the Copabana Palace Hotel" at 2145 over PRL7, 9.720, Rio de Janeiro, is a regular Sunday evening feature; it is sponsored by a commercial airline.

British New Guinea—VLT9, 9.520, Port Moresby, picked up 0115-0300 sign-off; at times has strong level in Virginia; station announcement 0230. VLT7, 7.28, noted with ABC news 0600, fair level. (Saylor)

Bulgaria—Radio Sofia, 6.070, 7.671, noted in English for British Isles 1500-1515 and 1600-1630. (Pearce, England) Has English for North America 2000-2030, 2300-2315 over 15.330.

Canada—CBRX, 6.160, Vancouver, B. C., noted 0015-0030. (Niblack, Ind.) Widely reported at good level is the CBC's new outlet CKEX, 11.090, scheduled for relay to Canadian Forces in Europe on Sundays only at 0720-0905 in parallel with CKLX, 15.090.

Canary Islands—EARAB, 7.500V, was recently measured on 7.515, another day on 7.502 around 7.502, but later was found back on 7.515. (Oskey, N. J.)

Cape Verde Island—Praia, 7.114A, noted from tune-in 1630 to 1700 when closed with clock striking, then "A Portuguesa." (Pearce, England) Recently was measured 7.1147 at 1650. (Oskey, N. J.)

Ceylon—The Commercial Service of Radio Ceylon noted on 15.120 at 0215; closed down 0230. (Pearce, England) This one opens 2045 and relays BBC news from London 2100. (Balbi, Calif.) Strong level most days in West Virginia.

Chile—CE960, 9.593A, Santiago, noted recently at fair level when tuned 2125 but with light CWQRM. (Hord, Ind.)

China—A Chinese station found as high as 11.712 heard mornings around 0500-0530 and later may be Radio Peking's listed 11.690 channel. (Ferguson, N. C., others) Peking has English 0400-0430 on 6.100, 9.040, 10.260, 11.690, 15.060, 15.170; 0830-0900, 1730-1800 on 11.690, 15.060. (Radio Sweden) Mukden, 7.677, Manchuria, was heard briefly 0530; female announcer in Chinese to 0533, then music; had strong heterodyne from TTY carrier just below which soon obliterated Mukden. (Kary, Pa.)

Colombia—HJKJ, 6.160, Bogota, noted at strong level 2200-2300. (Tarr,





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DEPT. 8, Chicago 22, Ill.**

Washington State) HJFW, 5.020, Manizales, noted 2327-2345; all-Spanish. (Patterson, Ga.) HJCT, 6.200, Bogota, heard 2252 with preview in Spanish of next day's program, then signed 2300 with Colombian national anthem. (Casey, Ky.)

*Costa Rica*—TIHH verified from Radioemisora Athenea, Calle 2a, Avenidas 8 y 10 (or Apartado 2208), San Jose, Costa Rica; frequency (which varies) was listed 11.972. (Kary, Pa.)

*Cuba*—COJK, 8.665, Camaguey, heard 2003-2055; all-Spanish. (Patterson, Ga.) COCY, 11.725A, Havana, uses both Spanish and *English* for daily sign-off 0030. (Niblack, Ind.)

*Curacao*—PJC2, 5.017A, noted with commercial in *English* 1925 recently. (Niblack, Ind.)

*Cyprus*—ZJM6, 6.970, "Asharq al Adna," Limassol, is heard in Sweden 1300 and again 2200. (GDX-aren, Sweden)

*Czechoslovakia*—"Voice of Peace," Prague, noted on 11.84 in *English* 0715-0741. Heard signing on 1400 in *English* on 9.504. (Pearce, England) Has *English* for North America 1930-2000 on 9.55; remainder of the evening (1820-0100) takes relay of *Radio Moscow's* beam in *English* to North America. (Saylor, Va.; Gaylord, Washington State; others)

*Denmark*—Copenhagen, 15.165, noted opening in Danish 0900; *English* 0950; announced was broadcasting Tues., Sat. 0900-1000 to India, Malaya, and the Far East. (Peace, England) OZF, 9.52, has nice signal in the 2030-2130 and 2200-2300 sessions for North America; still asks for reports. (Mast, N. Y.)

*Dominican Republic*—"La Voz Dominicana" now seems to have an *English* session around 2100-2110 on 9.735, 5.970. (Casey, Ky., others) Also noted over the 11.94 harmonic (of 5.970). (Niblack, Ind.) HI1A, 4.980, *Radio Caribe*, Santiago de Los Caballeros, noted 1939-2000; severe QRM from WWV; all-Spanish. (Patterson, Ga.)

*Ecuador*—HCJB, Quito, has replaced 12.455 (10 kw.) with 11.915 which has strong level but much QRM and CWQRM. The 9.743A outlet is noted by Pearce, England, in *English* for Australia-New Zealand 0130-0300; strong level.

*Radio Manta*, HC4EB, measured 6.8699, noted 2145-2232 sign-off with Spanish songs to guitar accompaniment and Latin American dance music; good signal but through heavy CWQRM (Rastorfer, N. Y.)

*Egypt*—Cairo, 7.865A, noted with native music 1715 and signing off 1800 with national anthem. (Pearce, England)

*Ethiopia*—*Radio Addis Ababa*, ETAA, 15.047A, still noted from 1130-1303 in Amharic; no *English*. (Pearce, England)

*Finland*—OIX4, 15.190, Helsinki, still noted opening 2200 to North America; following a preview in *Finish*, has short newscast in *English*. (Ferguson, N. C., others) This one noted in Oregon from 2330-2400 close-

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down, using Swedish. (Annala) Heard on this channel 0700 with news in Finnish, news in *English* 0715-0729, news in French 0750; also uses 9.55, 17.80. (Pearce, England)

**France**—According to latest schedules from Paris, *English* is used to Britain 0315-0330 on 7.240, 6.145, and 1500-1600 on 6.200. (Kary, Pa.) Paris. 7.105, noted signing off with "La Marseillaise" 1556. (Pearce, England)

**French Equatorial Africa**—Radio Brazzaville, 11.970, usually has good signal from before 1700 to 1800 or later; news 1745. (West, Virginia) Has *English* daily 0015, 0515, 1100, 1315, 1650, 1745; principal channels are 9.440, 11.970. (Kelting, N. Y.) Heard on *measured* 15.605 at good level when tuned 0610; identified in French 0615. (Ferguson, N. C.)

**French West Africa**—Radio Dakar was recently heard on 9.71A at 0250-0300 sign-off in French. (Patterson, Ga.)

**Germany**—Hamburg, 11.795, signs on Sundays (in German) at 2359 Saturday *EST*; weekdays at 2300; noted in German at 2330 (Bellington, N. Y.)

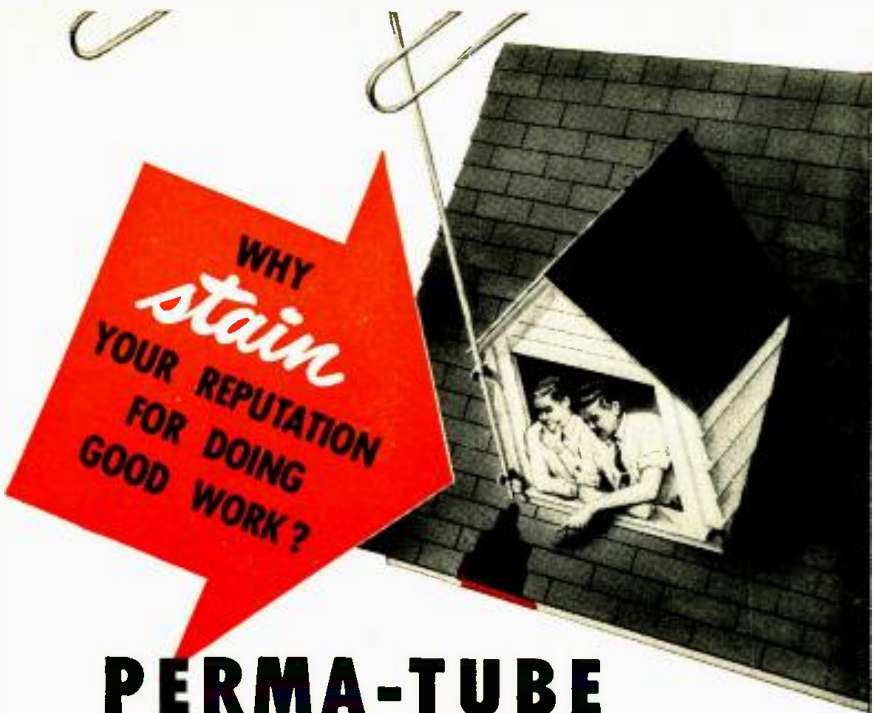
RIAS, 6.005, Berlin, heard with dance music when tuned 1715; news in German 1800; also noted 0100 with music; daily at 1645 has program "America auf Berlin"; Frankfurt, 6.190, noted 0930 with American program in German, dance music from 1000; also noted 0300 with church service; at 1330 with news in German; Leipzig, 9.730V, noted 1654 with dance music; news in German 1800; heard another day 0100 with news in German, then program details in German, followed by orchestral recordings. Munich, 6.160, tuned 0900 when had a children's ("Kinderfolk") program; Stuttgart, 6.030, heard 0830 with children's program; heard also 0100 with news in German, music at 0115. "Hier ist Deutschlandsender, Berlin (Deutsche Demokratische Republik)", 6.115 and 7.150, noted with call 0100, then music; news in German 0130. (Pearce, England)

**Greece**—Athens, 9.607, is noted 1430 with *English* news, commentary; French 1445. (Pearce, England) Is currently using 11.718A instead of 9.607 for the North American daily session 2000-2100; *English* news around 2035.

**Guatemala**—TGWA usually has *English* program now 2230-2300 on 9.760, but some nights has been noted on 15.170 instead. (Ferguson, N. C.; Bellington, N. Y., others) TGWB, 6.180A, heard at good level 2300 with announcement in *English* by woman, announcement in Spanish by man. (Tarr, Washington State) TGNA, 9.668, has strong signal with *English* 2200-2230. (Wright, Texas) Still noted at fine level on parallel 11 85; on Wednesdays has Mailbag session when schedule is extended 2230-2300A. (Hoffman, N. Y.) Has Spanish programs 0730-0900, 1730-2200 over 5.952. (Casey, Ky.) TGTQ, 6.283, *Radio International*, announced an *English* period recently for Mon.-Fri. at 2030. (Stark, Texas)

Haiti—4VEII, Cap-Haitien, operated

September, 1952



# PERMA-TUBE

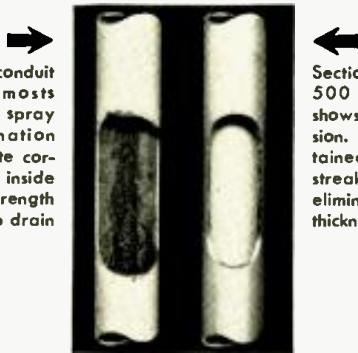
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by the East and West Indies Bible Mission, has returned to the air; noted by Ferguson, N. C., on *measured* 9.634 at 0650; at 0740 a woman identified and asked for reports. QRA is Box 1, Cap-Haitien, Haiti; formerly used 9.710 at 0600-2030.

Latest *measured* channel of the "wanderer," 4VRW, is 9.988 (moved from 9.9636); when checked 1640 had terrific CWQRM. (Oskay, N. J.) This one noted in Maryland when tuned 1100, 1400, and 2145. (Cleveland) 4VM, 6.005, heard with station announcements in French and *English* at 2131 just before leaving with a march.

*Holland—Radio Nederland*, 9.59 and 11.73, noted with *English* to North America 2130-2210. (West, Virginia) PCJ, 15.22, noted recently 0550-0610 in Dutch, good level in N. C. (Ferguson) The 9.59 outlet is good level in West Virginia when opens *English* session 1630.

*Honduras—HRA*, 9.047, *measured* here 1950 when had music; found parallel on 5.920; was inactive for a while and moved here from 9.0295. (Oskay, N. J.) HRQ, 6.124, San Pedro Sula, has been coming in with strong signal around 2200; mentions call frequently.

*India—AIR* noted to Europe in *English* 1345-1445 on 9.560 (some QRM), announcing 7.24, 6.080 as parallel; news 1350. (Pearce, England)

AIR current schedules from Delhi are to East and Southeast Asia—1930-2000, 15.29, 11.85; 2030-2200, 17.74, 15.16; 0600-0815, 17.74, 15.19; 0830-0945, 15.19, 11.78. To Central Europe and United Kingdom—0230-0330, 17.705, 15.16; 0345-0415, 17.85, 15.16; 1000-1030, 11.78, 7.125. To East, South-east Africa and Mauritius—2300-0010, 15.13, 11.87; 1045-1215, 9.55, 7.125. To Burma—1945-1955, 9.72, 7.17; 0615-0700, 17.85, 15.16. To China—0430-0545 (to 0530 on Sat., Sun.), 17.85, 15.16; 0530-0630 (Sat., Sun. *only*), 17.85, 15.16. To Indonesia—1745-1800, 11.79, 9.55; 0700-0730, 17.85, 15.16. To Fiji—0200-0320, 21.70, 15.19. To West Indies—1830-1930, 15.29, 11.85, 9.72, 7.17. To Pakistan—2245-2320, 11.71, 9.63, 7.125, 5.96; 0745-0815, 5.99, 4.94; 0615-0915, 7.17; 0945-1000, 7.17, 4.94. To Afghanistan and Adjacent Areas—2215-2230, 7.125, 5.96; 0845-0930, 4.94. To Afghanistan—0030-0130 (Fri. *only*), 9.67, 7.17; 1130-1230, 7.17, 5.98, 4.94, 3.945. To Persia, Afghanistan—1230-1330, 7.17, 5.98, 4.94, 4.87. To Saudi-Arabia, Egypt, Lebanon, Syria, North Africa, Trans-Jordan, Sudan—2315-0015, 11.76, 9.72; 1230-1455, 7.125, 5.96. To Europe and United Kingdom—1345-1445, 11.79, 9.565, 7.24, 6.085. News in *English* is scheduled 1400-1410, 11.79, 9.565, 7.24, 6.085; 1930-1940, 11.85, 15.29; 2310-2320, 15.13, 11.87; 0300-0310, 17.705, 15.16; 0830-0840, 15.19, 11.78; 1045-1055, 9.55, 7.125.

*Indo-China (Vietnam)—Frost*, Denmark, says *Radio France-Asie*, 9.750A, Saigon, opens 1730 with French Anthem and then has *English* news for Europe; fair level and in the clear. Hawthorne, Australia, notes RFA on

(Continued on page 141)

## Variable Power Supply (Continued from page 67)

180° can be obtained. Actually, in practice, the shift never quite makes the 180°. With the values of 2  $\mu$ fd. and 25,000 ohms, as shown in Fig. 4, a shift of 0° to approximately 175° can be effected.

Adapting the basic circuit shown in Fig. 3A for use in the power supply, we find it necessary to connect the 5 volt and 6.3 volt windings in series (phase adding) to obtain approximately 11 volts. This insures the fact that the grid voltage will be well below the firing voltage until the proper time. It also stabilizes the output voltage against line voltage fluctuations by making the grid voltage rise rapidly from a highly negative voltage to the firing voltage. The effect of a center-tapped transformer is obtained by two series resistors hooked across the two series windings as shown. Since the plate voltages applied to the 2D21's are 180° apart, it becomes necessary to feed the variable phase voltage into a push-pull audio input transformer to obtain the 180° phase shift required for each grid. Thus the voltages applied to each grid are 180° apart and lagging the applied plate voltage by an angle determined by the setting of the phase potentiometer, *R*. Grid resistors are inserted in series with the control grids to limit the grid current to a safe value after the tube fires.

The filter section of the power supply is quite conventional. No attempt was made at "design" since no load conditions are known and also because the input wave shape to the filter can vary from the usual half sine waves to any jagged part of this waveform. For control reasons we want the power supply filter to act much like a perfect choke input filter in which the input choke inductance is infinite. Under these conditions the tube will conduct whenever the plate is positive. Control can then be effected by manually setting the amount of the cycle during which the tube will conduct with the phase shifter. Thus it is desired to make the input choke as large as possible. A 7 henry, 200 ma. choke was used satisfactorily in this unit. If a condenser input filter is used, no control will be possible.

After the unit is constructed, it may be necessary to reverse the leads to the grids or from the series filaments on the power transformer in order to obtain a lagging phase relationship between the grid and plate voltages. No control will be possible if the grid voltage leads the plate voltage.

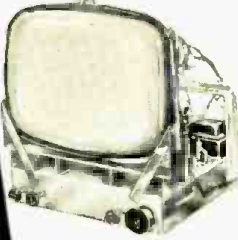
An arrangement similar to this could be employed with the larger size thyratrons for use in transmitters and other high power applications. Tubes such as the RCA 5557 mercury vapor triode could be used. This tube is similar in current carrying respects to the 866.

—30—

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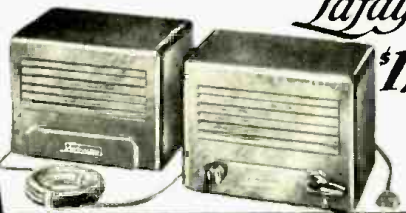
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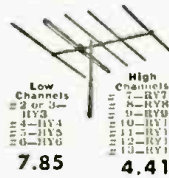
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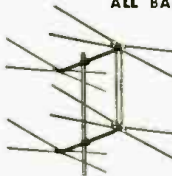
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A-RV10  
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A-RV12  
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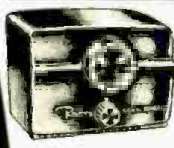
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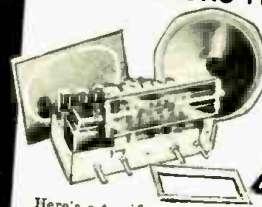
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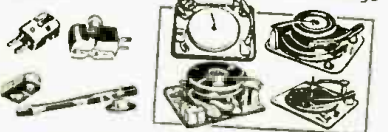
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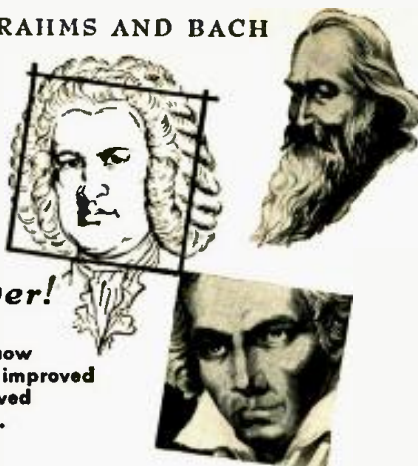
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Spot Radio News  
(Continued from page 18)

since their requirements constitute such a major factor in over-all production. In one of the frankest discussions of the problem, before the annual meeting of RTMA, Lieut. Colonel William F. Starr, of the Electronics Production Resources Agency, revealed that except for certain special types of receiving tubes, there is sufficient capacity now existent to meet current military procurement. However, he said, the capacity to produce the reliable-type miniature tubes is critical and the military will probably seek expansions in this field through private financing, government funding, and the placement of military orders, which was described as pump-priming. It was then pointed out that there are two factors which will undoubtedly influence tube production in case of war: available manpower and the supply of metals such as nickel and tungsten.

Noting that the shortage of receiving tubes that does exist is not due to a lack of facilities, but rather a lack of know-how, the production expert said that this condition exists because so many tubes are of recent design and never have been mass produced. However, he declared, these trouble spots are constantly changing and are usually of short duration.

The power tube field, the Colonel emphasized, does not represent an attractive picture, for here shortages do exist among three classes: hydrogen thyratrons, magnetrons, and klystrons. Reporting that the production of high-powered and tunable magnetrons has not kept pace with military requirements, in spite of the fact that the military services have already expanded the magnetron facilities of ten companies, the government rep added that even more expansions will be necessary.

Describing the critical klystron situation, Colonel Starr said that much of the equipment using the small ruggedized klystrons is now in the development stage. Because of this, it was said, it is extremely difficult to determine realistic requirements. However, the tubes are important and programs are under way to increase klystron facilities. As the projects which are under development approach the procurement stage, the Colonel declared, action will be initiated to expand the industry to meet the new requirements.

To facilitate coordinated tube production, an assignment-of-responsibility program has been introduced. According to Washington, this program was developed to eliminate the over-expansion of the same segment of industry by the various services and to provide industry with a contact point for each tube category where all facility expansion contracts will be negotiated. At present, the Army's re-

responsibility revolves about flat-press subminiatures and hydrogen thyratrons. The Navy has seven tubes to worry about: button-stem subminiatures, glass and GT tubes, metal tubes, miniatures, phototubes, power (including vacuum and mercury vapor rectifiers), and ultra-high power and transmitting tubes. To the Air Force has been given responsibility for eight categories: acorn, cathode-ray, gas switching klystrons, magnetrons, pool cathode strobotrons, flash tubes, and thyratrons with the exception of hydrogen thyratrons.

Summarizing the present military problems, Colonel Starr said that the military has established a procedure which will determine on a periodic basis the government's tube requirements and industrial capacity. From an evaluation of these factors, he continued, a program will be developed and continuously reviewed to insure that industry will be capable of meeting military tube requirements.

**IN RECOGNITION OF FCC** Chairman Paul Walker's participation in the recent "Voice of Democracy" contest, a special luncheon was held in Washington to honor him. Among the guests were Judge Bolitha Laws, chief judge, U.S. District Court for the District of Columbia; Judge Justin Miller, NARTB board chairman and general counsel; Rep. William S. Hill of Colorado; Rep. E. L. Forrester of Georgia; Leeman Anderson, secretary to Senator Richard Russell of Georgia; and Allen M. Woodall, president of WDAK, who served as host.

Shortly after his appearance at the luncheon, Walker attended the fifth annual radio and television institute meeting at the Pennsylvania State College and presented some extremely interesting views on the current allocations situation.

Reviewing the importance of TV and schooling, the Commission's headman

said that in due time the TV screen will be as much a standard fixture in the classrooms as the blackboard. "As has been so aptly said, television is the electronic blackboard of the future," he added.

In his opinion, our goal should be a large-screen TV receiving set in every one of our one-million classrooms within range of a TV station. "The question is not, *can* our schools afford television," Walker said, "but can they afford not to employ it."

Commenting on the flood of applications that has reached the Commission's desk, the government's chief air patrolman said that the TV boom is on, and many educational institutions have joined the parade of applicants.

RTMA has expanded its statistical service to the industry to include a nationwide monthly compilation of the movement of radio and television receivers at the retail level, including dealers' sales and inventories. The new survey will provide data by regions, by screen sizes, and by radio receiver types. Results of the first monthly survey will be made available to manufacturers and dealers in September.

**THE RADIO AMATEUR CIVIL EMERGENCY** service, proposed by the Commission at the beginning of the year and subsequently submitted to radio specialists for discussion, has won the general approval of over twenty state, country, and civil defense organizations, including the Association of Police Communications Officers, the Federal Civil Defense Administration, and the ARRL. As a result, this all-important service has been officially approved and is now ready to serve our country as a robust communications link. The sponsors of this vital CD agent merit a resounding round of applause for their vision and sound planning. L.W.



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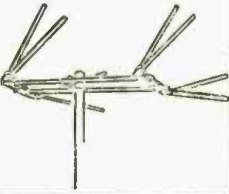
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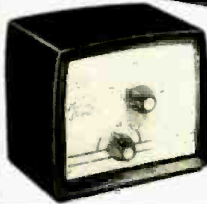


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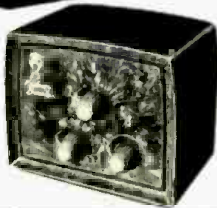
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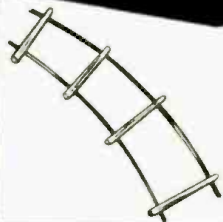
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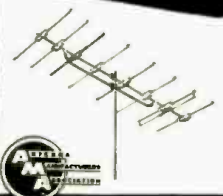
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# RADIO-TV Service Industry News

AS REPORTED BY THE  
TELEVISION TECHNICIANS LECTURE BUREAU

ONE of our most familiar axioms is the succinct statement that "A chain is no stronger than its weakest link." And as we travel about the country talking to service operators, distributors, manufacturers, and the buyers of service—the general public—we are continually picking up first-hand information about concrete examples of the "weak links" in the independent servicing business. These are the men who are hurting their fellow service technicians because of their ignorance of what their labor and technical skill is worth. We are constantly amazed at how often service technicians practically *give away* their time, talents, and hard-won technical experience even when customers do not expect it from them.

The experience of a friend in dealing with a radio service technician typifies a practice that is common to many men in the radio service business. This service technician drove to the customer's ranch home, located some eight miles from the little town where he lives, to check an inoperative radio set. He checked the tubes and found the trouble to be a dead tube. He charged *one dollar and fifty cents* (\$1.50) for the job which included the new tube, his time, transportation, and know-how! In other words, he placed a value of only about fifty cents on ninety minutes of his time, his knowledge, and the cost of

his transportation for sixteen miles!

Did he leave a highly satisfied customer through giving this philanthropic service? Listen to what his customer had to say and judge for yourself:

"I was surprised when he only charged a dollar and a half," she said. "At that price I couldn't see how he could pay for his gas and the upkeep on his car to drive out to the ranch and still have anything left in payment for his time.

"I wouldn't let him work on my radio if something really bad was wrong with it, or my wire recorder," she continued. "A man who will work so cheaply can't possibly know much about it."

The unfortunate effect of practices such as these is that the men who ignorantly give away their time and expert knowledge for a mere pittance are apt to set the level of "price expectancy" in the communities where they operate. A customer recites such an experience to friends. When one of these friends calls in a service technician to repair a set and he charges legitimately for what his time, material, know-how, and business operating expenses are worth, the friend would say she was "gypped." These practices, so common in radio servicing, were largely responsible for keeping the business of servicing radios on a mere subsistence level.

The expense involved in setting up a

Industry and political leaders who participated in the service mass meeting attended by 700 southeastern Michigan television sales, service, and management personnel. Pictured here (from left to right): H. W. Gilmore, Harry Gensler, Harold Chase (president of TSA), Governor G. Mennen Williams, Herman Rosen (president of RTTM), G. K. O'Brien, Louis Wolfgang (TSA director), and Al Weiss.





# TV SERVICING is easier than you think

How many times have you asked yourself this question: "What can I do to make my servicing job easier?" Chances are you ask it every time you get a "stickler" in the shop. But have you ever stopped to consider that *all* your servicing . . . from the real headaches to the simplest repair . . . can be easier than you ever thought possible if you GET THE COMPLETE SERVICING INFORMATION ON A RECEIVER BEFORE YOU START TO REPAIR IT. Let's take a closer look to see why. *All* servicing data must originally come from the receiver manufacturer. He made the product, so he knows all about it. His information is not based on a single receiver but on hundreds, which are sampled. If you are using this kind of information, servicing is easy; but if you are using abridged data — information which does not originate with the set manufacturer — you do *not* have all the data required to do easy — permanent — prestige-building servicing.

Here's a typical example: For Stewart-Warner model 9122-A the set manufacturer prepared the equivalent of 35 pages (8½ x 11") of servicing data. The complete data is published in Rider TV Manuals Vol. 8 and in Rider TV Tek-File pack 12. The reason was that the production runs covered seven different codings (from A to G) plus 16 important changes in the receivers. Some of these changes were made to eliminate such actions as component resonance in the I-F system . . . horizontal sync instability . . . and the possibility of arcing in the high voltage system. Other changes were in tubes and parts. But *all* of the changes are vitally important to you when you're faced with a repair on this Stewart-Warner model. This is only one case in thousands of why it is absolutely necessary for you to have the complete, official, manufacturer-prepared servicing information for every set you repair.

There are two ways for you to get complete, official, factory prepared servicing information. One way is to write the set manufacturer directly. However, this takes time when you

need it most: While the customer's set is in the shop. So the easy way is to buy this data in complete published form. This means Rider Servicing Data! For 22 years Rider Servicing information has been the only publishing source for factory authorized and prepared servicing information: Exactly as issued by the manufacturer who made the set . . . organized into indexed, easy-to-follow style. In Rider Servicing Data you get all of the manufacturer's troubleshooting test patterns . . . schematics of all his productions . . . stage by stage alignment curves . . . clear, enlarged chassis views . . . the manufacturer's circuit changes . . . circuit explanations . . . voltage data, disassembly information and much, much more. For example: Rider Servicing Data has shown scope waveforms in TV receivers ever since the first TV receiver was made!

And Rider Servicing Data now has these important new features: manufacturers' trouble cures and guaranteed replacement parts listings. The manufacturers' trouble cures are standard (3 x 5") index cards, called Rider Handies, containing vital manufacturer-issued permanent trouble cures plus production changes. Each Handy is identified with a manufacturer and receiver model. With Rider Handies you save countless hours of diagnosis and repair time . . . because Handies contain the data you *must* have to make permanent repairs on many receivers. The replacement parts listings are included in the latest Rider Servicing Data. All these replacement parts must meet the physical and electrical performance ratings of the original equipment.

To meet your individual requirements, Rider TV Servicing Data comes in two forms. The Manual form; volumes covering the complete data on receivers manufactured during a certain period, and Tek-File form; separate packs containing complete data for specific models.

The TV Manual form has nine volumes covering more than 4,200 models of television receivers. Each vol-

ume has over 2,000 (8½ x 11") pages of servicing data with an index covering the contents of all volumes. Each volume is attractively bound in a permanent hard cover. The Manual form is ideal for shop use and as a permanent reference.

The Tek-File form now covers more than 2,200 models. Each Tek-File pack contains complete data for several of the most popular models . . . the ones you are called to work on every day. (Contents are clearly marked on the cover of each pack.) These models are bound in handy, standard file folders for easy home and shop use. In each Tek-File pack you get a special coupon. 15 of these coupons plus a small handling charge entitles you to a permanent, hard-cover manual binder for Tek-File shelf use. Or if you prefer, each coupon is worth five cents toward the purchase of any Rider book. Note: Get your free Tek-File indexes covering the contents of all packs at your jobber's. If he doesn't have them, write us.

For the complete servicing facts on *radio*, get Rider Radio Manuals. In 22 volumes Rider Radio Manuals give you the complete, factory-authorized, official AM, FM radio servicing data for receivers manufactured over the past 22 years! Plus complete data on auto radios, record changers, tuners and recorders. Everything is organized and indexed to make radio servicing easy.

## DON'T BE SWITCHED

Remember, Rider Manuals and Tek-Files are the *only* source for complete published servicing data. If your jobber doesn't have them, DON'T BE SWITCHED! If he doesn't have Rider Manuals, write to us . . . we'll tell you where to get them. If he doesn't have Rider Tek-Files, write to us . . . we'll fill your order directly. (Please include your jobber's name.) Why not prove to yourself that Rider Servicing Data really makes servicing easy. Try one Rider TV Tek-File pack *at our risk!* Try a pack for the next receiver you repair . . . if you don't agree that it makes your servicing easier than anything you've ever used RETURN THE PACK TO US WITHIN SEVEN DAYS AND WE'LL SEND YOU A FULL REFUND! So act now . . . you have absolutely nothing to lose! John F. Rider, Publisher, Inc., 480 Canal Street, New York 13, N. Y. West Coast Office: 4216-20 W. Jefferson Blvd., Los Angeles, California.



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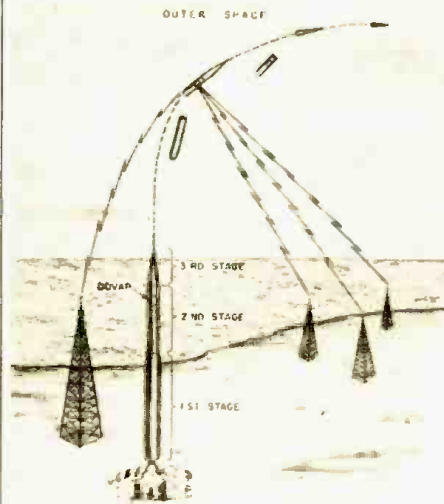
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# ROCKET-RIDER RADIO

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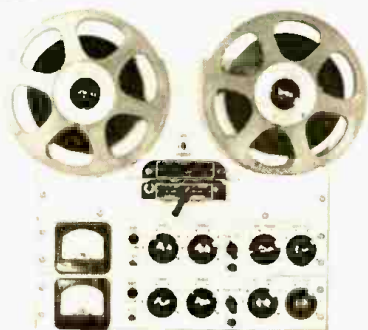
**A** RUGGED two-way radio about the size of a loaf of bread will play a part in the launching of the Navy's second Vanguard satellite. The self-contained unit, known as DOVAP (Doppler, Velocity, and Position), is produced by *International Telephone and Telegraph Corp.*

The 10-pound radio will send back continuous information to U. S. scientists on the performance of the first and second stages of the Vanguard missile. Powered by tiny wet cells, DOVAP defines the trajectory and velocity of the two stages during flight and relays vital information on fuel consumption, electrical power, and atmospheric conditions.

Before dropping to earth inside its second-stage carrier, the radio signals that the third-stage rocket and satellite are riding parallel to the earth and ready to orbit. This information is obtained through use of the Doppler principle. Comparison of radio signals transmitted to the missile and retransmitted by DOVAP to three ground stations provide coded data which is translated by high-speed computers to confirm the success or failure of a satellite launching.

The Vanguard DOVAP has been used successfully in high-altitude research studies by IGY scientists at Fort Churchill, Canada, and it will be used later this year at Guam for high-altitude IGY wind experiments. —30—

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television service business has forced men who have gone into TV servicing as a business to realistically consider all of their costs of doing business. It is one thing for any individual to be content to worry along eeking out an existence as a "service technician" in a one-man radio business. It is quite another to put ten thousand dollars or more on the line for equipment and supplies to start a business and then to have to meet a payroll every week. The television servicing activity must be operated as a business enterprise or it will fold up.

### TSA of Detroit

The Television Service Association of Detroit is one of the several associations of service businessmen that have developed dynamic programs for establishing TV servicing as a respectable, profitable business activity in their local areas. Headed by Hal Chase, president of Chase Television Service of Detroit, TSA has been carrying out one of the most effective campaigns ever originated and conducted by a service association. They are assisting responsible service businessmen in other Michigan cities to create aggressive service associations. They have also been sponsoring a very effective program for the practical training of technicians in how to handle their immediate service problems efficiently.

An important development in the Michigan plan is that they have been able to get the whole-hearted cooperation of set distributors in practically every area where they conduct their two-day clinics. The importance of this phase of their program is in that it conserves the time of technicians in learning the individual characteristics of all new TV models sold by all established manufacturers in a given area.

The plan works this way:

When a two-day clinic is scheduled for a Michigan city, the association arranges for sufficient space to allow each set distributor to have a booth to display his latest TV models. Each distributor contributes a proportionate share of the costs. In addition to this display area, rooms are rented for holding lectures on subjects important to the technicians in the area where the clinic is being held. The set distributors have qualified service personnel in attendance at their chassis exhibits at all times. This enables every technician who attends the clinic to get first-hand instruction on alignment and servicing procedures recommended by the manufacturer on every TV model that he may be called upon to align or adjust in his local area.

The importance of this plan in conserving the time of technicians is immediately evident to everyone engaged in the television servicing business. One of the growing problems of service executives and their technical staffs is in keeping up with set changes and developments from the mass of technical literature that is being produced.

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1LC5	.79	6BN6	1.09	12ABGT	.49
1LD5	.69	6BQ6GT	.79	12AT6	.49
1LW5	.89	6BQ7	1.49	12AT7	.79
1M5GT	.69	6CA	.49	12A6	.49
1R5	.59	6CSGT	.49	12AU7	.59
1S5	.49	6C6	.49	12AV6	.59
1T4	.59	6CB6	.49	12AV7	.69
1U4	.49	6CD6G	1.49	12AX4GT	.69
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3LF4	.99	6J7	.49	12BD6	.59
3Q4	.49	6KG6T	.59	12BE6	.49
3Q5GT	1.09	6L6G	1.19	12BH7	.99
3S4	.59	6L6GA	1.19	12J5GT	.59
3V4	.49	6S4	.49	12SA7GT	.79
5U4G	.59	6S6GT	.89	12SK7GT	.69
5V4G	.89	6SA7GT	.69	12SQ7GT	.99
5X4G	.59	6SC7	.99	12SQ7GT	.69
5Y3GT	.49	6S6T	.89	12S8GT	.79
5Y4G	.69	6S7GT	.69	14A7	.99
6AB4	.69	6SN7GT	.49	14B6	.79
6AC7M	1.09	6SL7GT	.69	14Q7	.99
6AG5	.69	6S7GT	.59	15B6G	1.29
6AG7M	1.19	6S7GT	.59	15T5	.99
6AN6	1.29	6SR7	.69	25BQ6GT	.79
6AK5	.89	6T8	.79	25L6GT	.59
6AL5	.49	6U4GT	.59	25W4GT	.49
6AQ5	.49	6U5	.69	25Z5	.49
6AQ6	.69	6U8	.89	25Z6GT	.69
6AR5	.59	6V3	1.59	35B5	.59
6AR6	2.49	6V6GT	.49	35C5	.59
6AS5	.69	6W4GT	.49	35L6GT	.79
6AT6	.49	6W6GT	.79	35W4	.49
6AU6	.49	6X4	.49	35Y4	.69
6AV6	.49	6X5GT	.49	35Z5GT	.69
6AW6	1.09	6Y6G	.79	50B5	.59
6AX4GT	.69	7A4	.69	50C5	.59
6AX5GT	.79	7A8	.89	50L6GT	.59
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While the lecture programs that are being presented by the individual set manufacturers and test equipment manufacturers are excellent, they demand too many evenings from technicians who are interested in the business only because of the pay they receive for the work they do—and not for “love” of the business.

By presenting the combined programs of all manufacturers in two-day clinics of this kind the industry benefits from the attendance of practically all working service technicians in the area where the clinic is given. As an example, it was estimated that more than 600 technicians attended a one-day, afternoon and evening, clinic presented by the Grand Rapids Service Association and their local set distributors. This is about four times the normal attendance at lectures in this area given by the individual manufacturers.

### TSA Mass Meeting

To keep both political and business attention focused on the problems of TV servicing and to build recognition for TV servicing as a legitimate business activity, the Detroit Television Service Association conducted a number of programs during the first half of the year which they backed with extensive publicity.

The last of these programs before the summer season “took over,” was a mass meeting in Detroit at which talks were given by such outstanding personalities as Governor Williams of Michigan; Nathaniel Goldstick, corporation counsel and city government representative; Horace W. Gilmore, chief enforcement officer for the OPS in Michigan; and Gerald K. O'Brien, prosecuting attorney.

The agenda of the meeting included talks on: television licensing ordinances; joint committee policing activities; public relations and education; TV manufacturers' contributions to TV service personnel; and a “futuristic” program for the TV service occupation.

### Groups Lauded for Efforts

Both the TSA of Michigan and the Association of Radio-Television Technicians of Michigan were complimented by the speakers for their untiring efforts to create a healthy business atmosphere in the TV service business in Michigan.

Horace W. Gilmore, OPS district enforcement director, explained the need for controls and also discussed the three types of prosecution for criminal violators. “The cooperation of TSA members and other honest dealers and service men is badly needed,” he said.

Gerald K. O'Brien, Wayne County's chief prosecuting attorney, read some case histories of complaints against unethical television sales and service companies. He credited TSA and the press with drastically reducing the number of such complaints. “There's plenty of business for all honest deal-

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## NEWS

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ers," he said, "but you must educate the public to deal only with such reputable businessmen."

Harry Gensler, representative of the General Electric Supply Corporation, told his audience that television was the fastest growing industry in the nation's history. "Customer satisfaction is the most important element for all of us whether we are manufacturers, jobbers, dealers, or servicemen," he said.

Herman Rosen, president of RTTM, detailed the purposes and objectives of his organization. "So far we've been able to keep TV servicing strong enough to eliminate the need for licensing," he said. "But the public must learn that television requires extensive training and high degrees of skill just as do other professions."

Hearty congratulations were expressed by Michigan's governor, G. Mennen Williams, who urged those present to cooperate with one another and to police their own industry. "Raise your level of service, go forward with your present organization (TSA) and prosper," was the advice given by the governor.

Approximately 700 people attended this mass meeting.

### RTMA Program

In its report released at the annual RTMA convention, the Association's Service Committee outlined the plan it has submitted to the Executive Set Committee of the RTMA for improving set servicing practices.

The basic principle of the plan is to encourage set distributors to organize the major segments of the industry into local and regional groups for the purpose of carrying out specific programs within these territories. The recommended programs are:

1. Inform the public on facts about TV service.
2. Recommend, sponsor, and support TV service training programs in vocational and trade schools for the purpose of "up-grading" the skills of present service technicians.
3. Sponsor codes of ethics for service technicians.

The report further states that "The RTMA proposes to supply informational material for local and regional use such as: 1. Consumer Education Aids, and 2. Technicians' training programs.

Of these several objectives, the one which would make the best immediate contribution to improving the conditions of the TV service industry is that of enlisting the interest of set distributors in cooperating in the development of programs and clinics for the independent service businessmen and their technical employees in all local areas. The success of the JERCS program in Philadelphia, which has been credited by the Better Business Bureau for reducing consumer complaints on TV service in that area "by better than 85%", and the TSA program in Michigan, indicates what can be accomplished through the con-

# USE OF THE AIR-COUPLER

## FAS

Although it is nearly two years since the first announcement of the Fowler-Allison-Sleeper system of bass reinforcement, the number of reports from people who have made such installations, and the enthusiasm for FAS performance has increased steadily.

Heart of the FAS system, of course, is the now famous Dual Air-Coupler, identical with the original design, but with built-in columns which smooth out the bass response to the satisfaction of the most critical music listeners and audiophiles.

As a result, thousands of hi-fi enthusiasts have reported:

1. That the Dual Air-Coupler reproduces lower frequencies than they thought could be recorded on phonograph records or tape,
2. That balance between treble and bass eliminates unnaturally shrill effects, due to the extended bass reproduction provided by the Air-Coupler, and
3. Full, proportional bass response is obtained at any volume level down to audibility, without the use of treble or bass controls.

Now, in the September-October Issue of HIGH-FIDELITY Magazine, information on a new project completed by the same team will be released. This has to do with crossover networks. The original FAS system called for an 8-ohm woofer, an 8-ohm intermediate speaker, and a 25-ohm tweeter, with crossover frequencies at 350 and 1,100 cycles.

However, many hi-fi enthusiasts wanted to use other crossover frequencies, or other speaker impedances, or to operate the Air-Coupler with a single dual speaker. But when they tackled the mathematics of the networks, they ran into trouble. Different formulas gave different values, or came out with designs that did not deliver the performance of which the FAS system is capable.

To do away with all such uncertainties,

a complete set of diagrams and component values has been worked out, from which the correct circuit can be found, as well as the values of standard inductors and capacitors, to use in the network for:

1. Any combination of impedances for a 3-speaker or 2-speaker FAS audio system, and
2. A wide selection of crossover frequencies.

These direct-reading diagrams and tables of values eliminate all mathematics and all guesswork, and make it possible to try different combinations in the FAS system with the assurance that maximum possible performance will be obtained from the selected speakers and crossover frequencies. This information will be found in the September-October Issue of HIGH-FIDELITY Magazine, out September 15.

## FAS-2

The suggestion that performance of the FAS system can be improved will come as a surprise to the great number of people who are now using installations of the original design. Nevertheless, further progress has been made which is so basic that the new system is identified as FAS-2.

The same Air-Coupler and the same speakers can be used for the FAS-2, but there are radical changes in the amplifier section of the system, and crossover networks are eliminated entirely. It should be explained that the FAS-2 is more expensive, and to non-critical listeners the extra cost may not seem justified.

However, the super-critical audiophile who wants the very last bit of realism from his system will say: "Here is a system that really does everything!"

And that is literally true of the FAS-2. It is completely versatile not only in its per-

formance on various types of music, but in the freedom of choice it permits as to your particular selection from the various available amplifiers and speakers. There is no uncertainty as to networks, since they are not used. Also, and this point is stressed because it is a basic FAS feature, no tone controls are employed.

Complete information on the FAS-2, together with detailed photographs and diagrams, will appear in the November-December Issue of HIGH-FIDELITY Magazine, out November 1.

## Audio Show

You are cordially invited to see and hear the FAS system at the HIGH-FIDELITY exhibit at the Audio Show, Hotel New Yorker, New York City, October 29 to November 1. If you would like to play your own test records on the FAS installation, you are welcome to do so. That is the best way to judge FAS performance.

## High-Fidelity

This Magazine, now published every other month, is devoted exclusively to wide-range reproduction from FM, records, and tape. Articles by leading authorities describe in non-technical language the operation and use of new equipment, the latest ideas in custom installations, and all the most interesting activities in the hi-fi field. There is also a 24-page section of record reviews and information on recorded music.

HIGH-FIDELITY is a large-size magazine, profusely illustrated, and printed on fine paper. If you are not already a subscriber, by all means order your subscription without delay. When you receive your first issue, if you are not completely satisfied, the entire amount of your remittance will be refunded.

# High Fidelity

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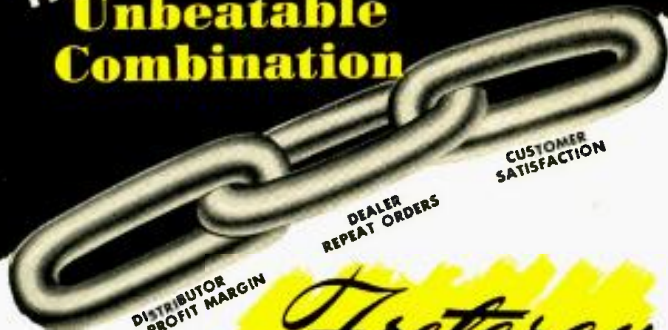
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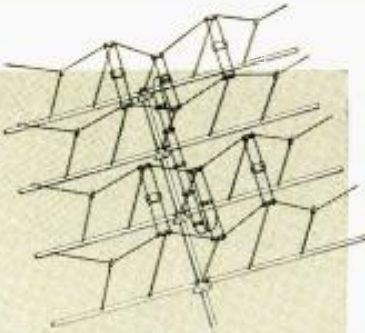
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certed efforts of all industry elements in helping to up-grade the activity of TV servicing as a legitimate business operation.

### More Retailers in TV Service?

Close observers of the gradual shifting of the radio sales pattern to accommodate the individual requirements of television are convinced that the maintenance and servicing of TV sets will eventually produce a larger dollar volume of business than the sale of new sets. In the past, appliance and radio dealers have not, as a class, been very much interested in "worrying" with servicing departments as a part of their own retail business. They have been content to "farm out" their customer service to competent independent service operators.

This "farming out" led to some very unhealthy practices in the days when service contracts were sold by the dealer on every possible TV set. Some dealers "chiseled" an extra "profit" for themselves by placing their contracts with the TV technicians who were foolish enough to handle contract service for less money than the established contract service prices. In the end, this practice hurt the dealers who used it for it invariably led to an inferior grade of service and dissatisfied customers.

On the other hand, a number of radio and appliance dealers set up their own complete TV installation and service departments when they started to sell TV sets. Since this type of retailing business is usually capably managed, these dealers conducted their service departments on the basis of sound business principles and they made money out of them.

Heading up the soundly aggressive program that is being carried out by NARDA (National Appliance & Radio-TV Dealers Association) are two retailers whose TV service departments have been very successful business operations. Mort Farr of Upper Darby, Pa. and Harry Price, Jr. of Norfolk, Va. have been able to show their fellow members of NARDA that a complete and efficiently-operated service department is a valuable and profitable adjunct to an appliance and radio-television retail sales business.

Discussions that revolved around the details of managing a service department were very popular and well-attended at the NARDA mid-year meetings in Chicago. This Association has pioneered some of the industry's best "self-help" programs, such as their CTIS plan for helping set owners to recognize legitimate service businesses and the very important (to retailers) "Cost-of-Doing-Business" survey.

### Philco's Program

Members of the "Philco Factory-Supervised Service" organization were given the opportunity to use a service selling program that follows the successful "maintenance check-up" plan that is used widely in the automobile

repair business. The striking 5½" x 8½" cards had an appealing lead line that read "Get Your TV Set in Top Shape for Convention Viewing!" The card was suitable for use as a mailing piece or for door-to-door distribution.

Under the offer "Here's Our Money Saving Pre-Convention Offer—A Complete 10 Point Tune-Up for ONLY... \$7.95," the following services were listed:

1. Make physical check of antenna, transmission line, and connections for mechanical condition and electrical efficiency.
2. Make mechanical check of chassis component parts for signs of electrical breakdown.
3. Adjust all rear chassis controls to assure maximum picture linearity.
4. Adjust receiver focus for maximum brilliance and sharpness.
5. Check picture to assure maximum height and width with good linearity.
6. Check range of all front controls.
7. Adjust fine tuning range for maximum picture and sound quality.
8. Adjust horizontal hold system for maximum horizontal steadiness.
9. Clean safety glass and face of picture tube.
10. Furnish written report of inspection and general operative condition of set.

When interviewed by your editor several members of the Philco Factory-Supervised Service plan reported that they had gotten excellent results from the distribution of these cards.

Service is a commodity that can be sold and the successful TV service businesses of the future will be those that have "service sales" departments to sell their product—service—just as the retailer must sell his appliances and TV sets.

## SOCKET ADAPTER

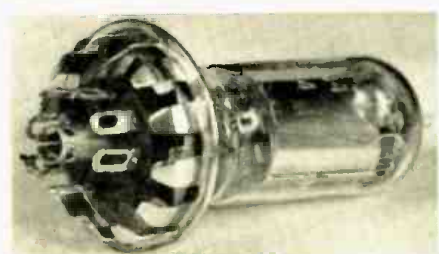
By B. W. WELZ

**WHEN** replacing large-sized tubes in older receivers with miniature tubes, the problem often arises on how to cover the socket hole so that a miniature tube's socket can be mounted on it.

In some cases this problem can be easily solved by using a snap-hole plug in the socket hole. These plugs can be drilled and miniature sockets mounted on them. Placed in a socket hole, with a few drops of solder on three or four of the prongs to insure a firm hold, they make a neat appearance.

One-inch snap-hole plugs which will fit a number of socket holes are available from Allied Radio Corporation, Chicago.

Snap-hole plug to fill in chassis cutouts when changing over to miniature-type tubes.



September, 1952



**AN/ARC-5**  
**R-28/ARC-5 RECEIVER 100-156 MC.** \$49.50  
 With tubes. Like New.  
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**R57 GLIDE PATH RECEIVER.**  
**BC-638-A FREQUENCY METER.**  
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**ID6/APN-4 LORAN INDICATOR.**  
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**RT34/APS-13 TRAIL-WARNING TRANSCIEVER.** 420 MC.  
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<b>BC-496 2-POSITION RECEIVER CONTROL BOX</b>		2.95
<b>BC-459</b> Less tubes	12.95	14.95
<b>BC-455 6-9 MC RECEIVER.</b> With tubes	9.95	14.95
Less tubes		7.95

	Used	New
<b>BC-453</b> With tubes	\$19.95	
Less tubes	14.95	
<b>MC-211 90° ANGLE COUPLING UNIT</b>		\$0.95
<b>FT-234 MOUNTING RACK</b> for single transmitter	2.95	3.50
<b>FT-226 MOUNTING RACK</b> for 2 Command Units		3.95
<b>FT-221 MOUNTING PLATE</b> for FT-220		1.50
<b>FT-220 MOUNTING RACK</b> for 3 receivers		2.25
<b>FT-225 MOUNTING PLATE</b> for BC-456		2.25
<b>BC-456 MODULATOR.</b> For SCR-274..		4.50

### Monthly Specials!

**RT-34/APS-13 420 MC. TRANSCIEVER** with 5 stages of 30 MC. IF amplifier strip. Less tubes. RF cable set. With dynamotor. \$12.95

**2 TRANSMITTERS**  
**BC-457 (4-5.3 MC)** and **BC-458 (5-3.7 MC).** Command transmitters. Submount just in. Limited quantity. Less tubes and xtals. (Good cond.) EACH \$1.95 PER SET \$9.50

### ANTENNA MOTOR

Switching motor with 6 co-axial connectors. 24 vdc motor, fully shielded. Ideal for TV antenna installation. New \$3.95

### MOTOR

24 VDC. Series wound, reversible, with clutch. Turns 11,000 RPM, geared to 1,100 RPM. Complete with junction box, 2 adjustable limit switches. Excellent condition. \$9.95

### REVERSIBLE MOTOR

**RL-42 24 VDC.** With antenna reel and clutch. USED \$4.50  
 NEW 6.75

### ARC-4 TRANSCIEVER

140-144 MC. Complete with control box, tubes, 12/24 VDC dynamotor with schematic. This is a special reduction for this month only. \$32.50  
 Like new \$40.00  
 MT 101 ARC-4, New \$4.50

### Miscellaneous Specials!

- T-32—DESK STAND MICROPHONE.** Good used condition. \$ 2.75
- HS-18—HEADSET.** 8,000 ohms. New. 2.45
- HS-30—HEADSET.** Featherweight type, low impedance. New, \$2.49. Used. 1.49
- HS-38—HEADSET.** Used, excel. condition. \$1.49. New. 3.50
- HS-23—HEADSET.** High imp. New, \$4.95. HS-33—HEADSET. Low imp. New. 6.95
- CD-307—EXT. COIL** for HS-23-33. New, 95c. LIP MIKE. Navy Type, new. .98
- EXTENSION COIL** and **SWITCH ASSEMBLY** for lip and throat mikes. New. .98
- RS-36—MIKE.** New, \$4.95. **RS-38—MIKE.** Used. 1.75
- TU-6—TUNING UNIT.** (3-4.5 MC) for BC-375 and BC-191. Used. 2.95
- PE-125—AX POWER SUPPLY** for BC-223 Xmt. 12/24 VDC input. New. 14.95

### CATHODE RAY TUBES

<b>3FP7</b> \$ 1.95	<b>5FP7</b> \$1.95	<b>4AP10</b> 95c
<b>5CP1</b> 4.50	<b>5BP1</b> 3.95	<b>16P4</b> \$19.95
<b>16DP4</b> 19.95	<b>5BP4</b> 3.95	All these carry a 90-day guarantee!

- TU-17—TUNING UNIT (2-3 MC.)** for BC-223 Transmitter. Used. 2.95
- TU-25—TUNING UNIT (3.5-5.2 MC)** for BC-223 Xmt. Used. 2.95
- I-70—'S' TUNING METER.** New, \$2.50. **IN-4A—L/R TUNING METER.** Used. 3.95
- FL-8—RANGE FILTER.** \$1.95 **FL-5—RANGE FILTER.** 1.25
- WOBLATOR:** See Page 43, Dec. '51 RADIO NEWS \$5.95. **TS-13—HAND SET TELEPHONE.** New 7.75
- BC-709—INTERPHONE AMPLIFIER.** Battery operated, light wt. Complete with tubes, shock mount and Instruction Manual. New 3.95
- BC-1023—75 MC. MARKER BEACON RECEIVER.** Complete with tubes, mtg. rack. New 10.95
- MS-116-117-118—VHF ANTENNA SECTIONS.** New. Price Upon Request.
- FIELD TELEPHONE EE-8** Complete. Brand new. Special 27.50
- T-26—SWITCHBOARD TYPE MICROPHONE.** With PL unit. Complete with chest plate, switch and straps. New 2.75

### MC-217

**LOOP MOTOR AND AUTOSYN TRANSMITTER ASSEMBLY.** Complete with instructions for matching to I-82 Indicator. Used, excellent condition. Only \$12.50

### COMBO

**BC-624 VHF RECEIVER.** Freq. range 100-156 MC. Less tubes & crystals. With conversion dope. Used, good cond. \$19.95  
**BC-625 VHF TRANSMITTER.** Freq. range 100-156 MC. Less tubes & crystals. with conversion dope. Used, good condition. \$12.95  
**BOTH TRANSMITTER & RECEIVER.** \$29.95  
 Per Set

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## MANUFACTURERS' LITERATURE

Readers are asked to write directly to the manufacturer for the literature. By mentioning **RADIO & TELEVISION NEWS**, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

### TV HARDWARE

A 12-page catalogue which lists television antennas, mounts, hardware, and accessories has just been issued by *IE Manufacturing*, 325 North Hoyne Avenue, Chicago 12, Illinois.

Included in this two-color catalogue are chimney mounting units, wall mounts, antenna hardware, stand-offs, rigging hardware, nuts and bolts, antenna masts, guy wire, antennas, and miscellaneous hardware.

Copies of Catalogue 10 are available for the asking. Address your request direct to the company.

### EICO CATALOGUE

*Electronic Instrument Co., Inc.*, 84 Withers Street, Brooklyn 11, New York has just published a new catalogue which covers all the 22 kits and 25 wired instruments which now comprise the "EICO" line.

This 1952 catalogue contains large illustrations, complete descriptions, technical specifications, prices, and recommended applications of all v.t.v.-m.'s, oscilloscopes, sweep generators, signal generators, tube testers, v-o-m's, battery eliminators, high voltage probes, r.f. probes, and crystals made by the company.

### REPLACEMENT PARTS

A revised and up-to-date edition of the company's replacement parts catalogue, C-608, is now available from *Sprague Products Company*, 51 Marshall Street, North Adams, Massachusetts.

This 20-page booklet contains complete listings on all the standard stock condensers and "Koolohm" resistors manufactured by the company, including data on its line of plate and disc ceramics rated up to 6000 volts and its "doorknob" ceramics rated at 20,000 volts.

### NEW TV TUBE DATA

A new, enlarged third edition of its "Television Receiver Tube Complement Book" has been released by the Radio Tube Division of *Sylvania Electric Products Inc.*, Emporium, Pa. This newest edition lists receiving and picture tube types required for nearly 4000 different models of television sets now in home use.

Television receivers are listed alphabetically by manufacturers to provide convenient reference for technicians when checking tube types required for a specific model and chassis. The total number of tubes required for each chassis is also given.

The book is cross-indexed to associate trade names with manufactur-

ers' names in the simplest possible way. This cross indexing was included to save technicians time on house calls by permitting them to carry the correct replacement tubes with them.

This 120-page, 5½" x 8½" book is wire-bound and may be carried in the service kit or in the glove compartment of the truck. Copies are available either from the company's tube distributors or direct from the Advertising Department of the company. The price is seventy-five cents a copy.

### TV ACCESSORIES

The complete line of television antennas, kits, and accessories manufactured by *Insuline Corporation of America*, 36-02 35th Avenue, Long Island City, New York, is described in a new 12-page catalogue recently released by the firm.

Copies of Catalogue No. T-752 will be forwarded to those making their requests to B. L. Cahn, general sales manager of the company, at the above address.

### E-V CONDENSED CATALOGUE

*Electro-Voice, Inc.* of Buchanan, Michigan has issued a condensed catalogue which illustrates and describes its line of equipment.

Catalogue No. 113 carries information on the company's microphones, phono cartridges, speakers, drivers, horns, crossovers, folded corner horn enclosures, 2-, 3-, and 4-way speaker systems, television boosters, and TV distribution systems.

Copies of this new catalogue are available without charge from the company.

### VARIABLE RESISTORS

Complete details on 167 types of military variable resistors available for immediate delivery from stock are listed in the new Stock Sheet No. 162 recently released by *Chicago Telephone Supply Corporation* of Elkhart, Indiana.

Included in the new listing are JAN-R-94 and JAN-R-19 types as well as non-JAN controls. Many of the variable resistors listed are designed for use in military equipment subject to extreme temperature and humidity ranges. Six key controls are illustrated and dimensional drawings of five shaft types are given.

### SPEAKER DATA

*Oxford Electric Corporation*, 3911 South Michigan Avenue, Chicago, Illinois has announced the availability of a new catalogue which contains complete information on its line of speak-

**RADIO & TELEVISION NEWS**

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Limited Time Only!

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Very BEST BRANDS  
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**All TUBES** are guaranteed  
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0Z4G .65	5U4G .49	6BC5 .59	6L6G 95c	6X4 49c	7Z4 .95	12Z3 .95	46 89c
1A5GT .65	5V4G .87	6BC7 .79	6L6GA	6X5GT 49c	12A7 1.15	14A7 .89	47 89c
1A7 .59	5W4 49c	6BD5GT .89	6L7 .69	6Y6G .69	12A8 .59	14AF7 .93	50A5 .89
1B3GT .69	5W4GT 49c	6BE6 .49	6N6G 1.40	7A4 .59	12AH7 1.45	14B6 .59	50B5 59c
1B5 .65	5X4G .65	6BF5 .59	6N7GT 69c	7A5 .89	12AL5 54c	14B8 89c	50CS 59c
1C7G 29c	5Y3GT .45	6BF6 .59	6P5GT 69c	7A6 .69	12AT6 .49	14C5 1.07	50C6G 1.04
1E7 .69	5Y4G .54	6BG6G 1.49	6Q7GT .49	7A7 .49	12AT7 .89	14C7 .98	50L6 .49
1H5GT .49	5X4G 81c	6BH6 59c	6R7GT .69	7A8 .73	12AU6 .59	14F7 .89	50X6 .79
1J5GT .69	5Z3 81c	6BJ6 59c	6S4 .49	7B4 .73	12AU7 .65	14F8 1.30	50Y6 .59
1L4 .59	6A3 1.15	6BL7 .79	6S7GT 1.15	7B5 .73	12AV6 .49	19BG6G 1.49	70L7 .89
1LA4 .59	6A7 1.21	6BN6 .89	6S8GT .69	7B6 .73	12AV7 .89	19T8 .89	71A .87
1LA6 1.19	6A8GT .59	6BQ6GT .85	6SA7GT .59	7B7 .73	12AW6 .95	20 1.40	75 59c
1LCS .69	6AB7 1.15	6BQ7 1.49	6SC7 .59	7B8 .73	12AX7 .69	24A .59	77 59c
1LCS6 1.19	6AC5GT 89c	6C4 .49	6SD7GT .99	7C4 1.30	12BA6 .49	25AC5GT 1.04	78 1.10
1LD5 .95	6AC7 89c	6C5GT 59c	6SF5 .49	7C5 .69	12BA7 .69	25BQ6GT 1.15	80 .45
1LE5 1.19	6AG5 .69	6C6 59c	6SF5GT .49	7C6 73c	12BE6 49c	25L6GT .49	83 1.45
1LM4 1.19	6AG7 .89	6C8G 1.15	6SH7 .59	7C7 .69	12BF6 49c	25W4GT .59	85 .79
1LNS 1.19	6AH6 1.40	6CB6 .59	6SH7GT .59	7E6 .59	12BH7 .69	25X5 1.04	117L7 1.40
1N5GT .59	6AK5 .89	6CD6G 1.49	6SJ7 49c	7E7 .69	12C8 1.15	25Z6GT .59	117N7 .89
1P5GT 69c	6AK6 1.08	6D6 .59	6SJ7GT 49c	7F7 .89	12F5GT 65c	32L7GT 1.15	117P7 1.40
1Q5GT 69c	6AL5 59c	6D8G 1.15	6SK7GT 49c	7F8 1.47	12H6 .59	35A5 .99	117Z3 .49
1R5 59c	6AQ5 59c	6E5 .59	6SL7GT .69	7G7 .69	12J5GT .54	35B5 59c	117Z6 .69
1S5 59c	6AQ6 .81	6F5GT 49c	6SN7GT .59	7H7 .59	12K7GT .59	35C5 59c	807 1.55
1T4 59c	6AR5 .74	6F6GT 49c	6SQ7 49c	7J7 .69	12Q7GT .49	35L6 .49	813 8.95
1U4 59c	6AT6 .49	6F8G 1.15	6SQ7GT 49c	7K7 1.07	12SA7GT .59	35W4 .45	1294 29c
1U5 .49	6AS5 .90	6G6G .95	6SR7GT .49	7L7 .69	12SC7 .59	35Y4 99c	1299 29c
1X2A .69	6AU5GT .69	6H6GT .49	6SS7 .72	7N7 59c	12SF5GT 59c	35Z3 99c	1619 .45
2A3 1.15	6AU6 49c	6J5GT .49	6T7G 1.15	7Q7 59c	12SF7 59c	35Z4 .49	1629 .29
2A5 .79	6AV6 49c	6J6 1.04	6T8 .89	7R7 .89	12SH7GT .59	35Z5 .45	2050 2.00
3LF4 1.19	6B4G 1.44	6J7G .59	6U5 .59	7S7 1.07	16S7GT .49	35Z6G .95	2051 1.15
3Q4 .59	6B5 1.44	6J8G 1.15	6U6GT 59c	7V7 .69	12SK7GT .59	35.51 .79	2051 1.15
3Q5GT 1.08	6B6G .79	6K5GT .69	6U7G 59c	7W7 1.07	12SL7GT .69	41 .72	7193 .87
3S4 59c	6B8GT 1.15	6K6GT .49	6V6GT 59c	7X6 .89	12SN7GT .99	42 .59	VT51 29c
3V4 59c	6BA6 .49	6K7GT .59		7X7 .69	12SQ7 49c	43 72c	VT52 29c

### TUBE KITS

**BEST BRANDS AT BEST PRICES**

3Q4, 1T4, 1R5, 1S5. List Value \$8.00. Tube Kit only	\$1.98
3S4, 1T4, 1S5, 1R5. List Value \$7.80. 4 Tube Kit	\$1.98
1U4, 3S4, 1S5, 1R5. List Value \$7.80. All Four Tubes for	\$1.98
3V4, 1R5, 1S5, 1T4. List Value \$7.80. All for	\$1.98
117Z3, 1U5, 3V4, 1R5, 1T4. AC-DC Portable Kit. All for	\$2.49
12AT6, 12BA6, 12BE6, 35W4, 50B5. 5 Tubes for	\$2.59
50L6GT 3.5Z5GT, 12SQ7GT, 12SK7G, 12SA7G. 5 Tubes for	\$3.22

### Fringe Area DOUBLE "V" TV ANTENNA KIT

High Gain, Best Pictures Possible . . . complete with 300 ohm line, insulators, guy wire, hardware, full size antenna with double length 9 ft. mast

**\$6.95**  
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12" Coaxial PM Speakers \$12.95 ea.  
High fidelity with high pass filter attached. 20 watt; 40-17500 cps. response; 8 ohm VC.

**SPECIAL PRICE**

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15-Inch	\$1495	21-Inch	\$2095

### Finest TV CHASSIS

Complete with all tubes, including 12 1/2" picture tube

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20-20 mfd	39c	8-8 mfd	39c
30-30 mfd	39c	10-10 mfd	39c
40-40 mfd	49c	20-20 mfd	49c
50-30 mfd	49c	30-30 mfd	49c
50-50 mfd	49c	40-40 mfd	59c
80-40 mfd	69c		

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1T4	.55	6BE6	.46	12BE6	.48	183GT	.63	6B4G	.95	6SJ7	.47
1T5	.64	6B6GG	1.49	12BH7	.63	1N5GT	.55	6BA7	.69	6SL7GT	.65
1X7A	.63	6B06GT	.90	12SA7GT	.50	1R5	.54	6BF5	.55	6SR7	.38
3000T	.40	6CB6	.53	12S17GT	.47	1S4	.63	6BH6	.40	6SS7	.48
50A6	.40	6J5GT	.40	12SK7GT	.50	1S5	.45	6BJ6	.50	6T8	.35
5Y3G	.28	6J6	.63	12SN7GT	.55	1U4	.55	6BN6	.21	12A07	.52
6A4S	.53	6K6GT	.39	12SQ7GT	.45	1U5	.45	6C4	.39	12S7G	.52
6AK5	.95	6SA7	.45	18B6GG	1.39	3A5	1.06	6C5	.51	19T8	.35
6AL5	.40	6SN7GT	1.2	21AV5GT	.83	3A4	.84	6CD6G	.65	25Z6GT	.41
6AD5	.46	6SQ7GT	.45	28B06GT	.90	35A	.57	4D6	.65	117N7GT	1.09
6AR5	.35	6V6GT	.51	216GT	.47	3V4	.58	4E5	.68	117P7GT	1.09
6AS5	.48	6W4GT	.49	35B5	.47	5T4	1.08	4F5	.48	117Z3	.42
6AT6	.36	6W6GT	.50	35C5	.47	5V4G	.73	6F6GT	.48	17BP4	19.50
6AH6	.41	6X4	.35	35L6GT	.47	6AB4	.46	6H6	.48	20CP4	24.50
6AV5GT	.87	6X5GT	.35	35W4	.31	6AG7	.80	6L95	.31		
6AW6	.36	12AL5	.48	35Z5GT	.30	6AG7	.84	6S4	.41		
6BA6	.43	12AT6	.40	50B5	.47	6AH6	.75	6SC7	.41		
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**Compare the Size**  
World's smallest tape recorder, only 11½ x 8½ x 5½ in.

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Yes, a playback pre-amplifier actually built-in.

**Net Price: \$225**

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ers (electrodynamic and permanent magnet) for auto, p.a., intercom, outdoor, radio, television, and portable applications.

Data on the company's new "Hi-Fidelity" speakers is also included along with illustrations of the various speakers covered in the catalogue.

**CONNECTOR BULLETIN**

A completely revised bulletin covering its line of audio-type connectors has just been issued by *Cannon Electric Company* of Los Angeles.

Designated as Bulletin No. PO-4-1952, this 32-page booklet describes in detail new and improved connector types for microphone, p.a., and low-level sound applications. Included are the company's Type Series P, O, X, XK, XL, BRS, BG, and UA.

Copies of this new publication are available on request from the Advertising Department of the company, P.O. Box 75, Lincoln Heights Station, Los Angeles 31, California.

**PHONO NEEDLE DATA**

*Jensen Industries, Inc.*, 329 S. Wood Street, Chicago 12, Illinois has published a comprehensive phonograph needle catalogue which gives complete information on every known type of needle replacement.

This 16-page brochure is cross referenced according to the phonograph manufacturer (including 1952 data), cartridge manufacturer, and competitive needle sources. Information is also supplied on the company's magnetic recording tape.

Copies of Catalogue No. 52 are available from parts distributors or from the company direct.

**OHMITE LINE**

A new catalogue which describes the company's line of resistors, rheostats, tap switches, and chokes has been issued by *Ohmite Manufacturing Company*, 4876 West Flournoy Street, Chicago 44, Illinois.

This new 20-page, two-color catalogue illustrates and provides complete data on the company's products which are stocked by distributors. Included is information on the company's vitreous-enameled rheostats, composition potentiometers and resistors, wire-wound resistors, tap switches, r.f. plate chokes, and power line chokes. Data on *Ohmite's* resistor line is also included.

Copies of the new Stock Catalogue No. 24 are now available from the company on request.

**TRIAD CATALOGUES**

*Triad Transformer Manufacturing Co.*, P.O. Box 17813, Los Angeles 34, California is currently offering copies of two new catalogues to the trade.

Catalogue TR-52 lists more than 450 items along with specifications and prices. Included in this publication are details on the company's "HS" transformers, audio transformers, 400-cycle power transformers, miniature units, toroids, and general purpose transformers for radio and television

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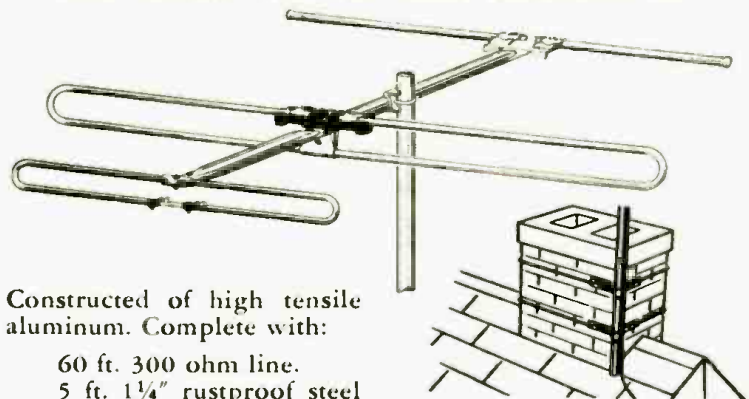
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replacement work. Geophysical transformers and amplifier kits are also described.

The second catalogue, TV-52, features replacement items for 77 different makes of radio and television receivers. The publication contains a complete and separate listing of all replacement transformers together with specifications and prices. Typical cases and types are fully illustrated.

## ELECTRONIC COMPONENTS

A new, 16-page catalogue of electronic components has recently been issued by *Switchcraft, Inc.*, 1328 N. Halsted Street, Chicago 22, Illinois.

The new publication includes many additions to the company's line of components as well as items of special interest to the industry, i.e., adapters, shielded jacks, microphone connectors, switches, and cable assemblies.

Please specify Catalogue S-52.

## DISTRIBUTORS' CATALOGUE

*P. R. Mallory & Co., Inc.*, Indianapolis 6, Indiana has recently released a 60-page catalogue to distributors and service technicians.

Two versions of this catalogue are available. The catalogue for the service technician has the colored price sheets bound within the catalogue itself. A complete table of contents is also included to permit the rapid determination of the part required.

The distributors' catalogue is

punched for easy insertion in standard binders. Special interleaf price pages list both the list prices and recommended dealer net prices on pages adjoining listings and descriptions of products. New price sheets will be issued in case of price changes and can be easily inserted.

## CONDENSER CATALOGUE

*The Hammarlund Manufacturing Company, Inc.*, 460 West 34th Street, New York 1, New York has issued a comprehensive catalogue covering its line of standard variable air condensers.

The catalogue gives complete specifications on the company's Types BFC, APC, MAPC, HF, HFD, HFA, HFBD, MC, MCD, RMC, NZ-10, and VU condensers as well as data on Type FC and FNC couplings and information on the company's custom engineered units.

## TRANSFORMER CATALOGUE

*Crest Laboratories, Inc.*, Whitehall Building, Far Rockaway, New York now has available for distribution copies of a new eight-page catalogue which describes its line of hermetically-sealed transformers.

Complete technical specifications are given on the line of miniature, sub-miniature, and micro-miniature transformers.

Copies of this catalogue are available on letterhead request.

## COLOR-CODED METER READINGS

By JOSEPH ZELLE

Technical Staff, Station WERE

IN THE average AM-FM transmitting plant, the radio operator has to keep track of some 60 to 70 meters. If there is also a TV installation, the additional video and audio transmitters may easily raise the total number of meters to 150. While generally all these meters are made to read in the middle portion of their scales, it is almost next to impossible for an operator to remember the required readings of each meter, especially if he is in a hurry.

One way to provide a ready reference for each meter to be read at a glance, is to paint a thin line or bar on the glass of the meter, directly over the needle at its normal setting. Then, in the case of certain kinds of trouble which do not necessarily knock the transmitter off the air, the operator can notice any abnormal deviations at once. The troublesome circuit is thus quickly localized.

These markers become automatic indicators of departure from the original or correct meter settings as tubes and parts age. When these departures become quite noticeable, it will be time to check the circuits or retune them. Furthermore, some breakdowns or tube failures can be anticipated. In such instances, the radio operator will be pre-conditioned to get to the seat of the trouble.

Another advantage applies to meters which operate over a certain range, as is the case of the r.f. output. By drawing two lines, indicating the minimum and maximum values permitted for legal broadcast operation, the operator

has a couple of markers which serve as a constant and instant check of his output tolerance.

Let us say, though, that a single meter is used with a selector switch. Here the required readings could be color coded with the position on the switch. For example, in Position 1, a red dot on the selector would correspond to a red line or dot on the meter. In Position 2, a blue dot on the selector would correspond to a blue line or dot on the meter, etc.

Color coding could be extended to all the meters. Instead of lines and bars, moreover, dots might be dabbed in color at the spearhead of the needle. Too many colors would become confusing and defeat the purpose of the device. By resorting to three basic colors, the operator would readily associate them with critical circuits. Most operators probably would agree that the r.f. plate current and "C" bias indications are the most essential. Therefore, a color code as follows might be employed: red would indicate plate currents, light blue would be "C" bias, yellow the r.f., black the filaments, etc.

When circuits have been retuned or tubes replaced causing the meter readings to change, the new readings or ranges could be painted on the glass after the old marks had been removed.

These markers are an added convenience for the operators. They produce increased efficiency in transmitters as well as transmissions. Besides, it takes so little time to paint the markers and it costs so little, too.

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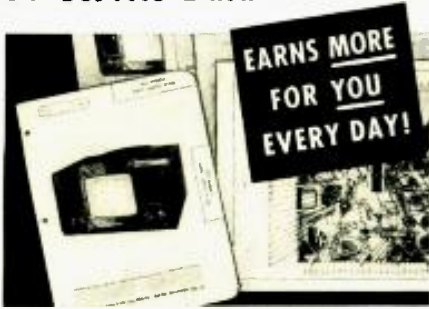
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## Technical BOOKS

"APPLICATION OF THE ELECTRONIC VALVE IN RADIO RECEIVERS AND AMPLIFIERS" by Dr. B. G. Dammers, et al. Published by Philips Gloeilampenfabrieken, Eindhoven, Netherlands. 425 pages. Price \$7.75. Available in the United States from Elsevier Press Inc., 402 Lovett Blvd., Houston 6, Texas. Volume 2.

This is the second volume of a projected three-part series on the use of vacuum tubes in audio and radio applications.

Like the first volume of this trilogy, the present text is a meticulous inquiry into the functioning of vacuum tubes when used for audio frequency amplification, in the output stages of receivers and amplifiers, and in several types of power supply circuits.

The broad category dealing with a.f. amplification has been subdivided into sections which cover a.f. amplifying circuits, phase inverters and splitters, frequency response of an a.f. stage, the design of a.f. transformers, and a discussion of non-linear distortion.

The use of tubes in output stages has been broken down by classes of operation (A, B, and AB) and a comparison of the different types of operation using triodes and pentodes. The final section on the power supply provides data on filament supplies, rectifying circuits, design calculation of high-tension rectifiers, and circuits for stabilizing such a supply.

This book is written at the engineering level and includes all of the formulas and circuit data needed by the design engineer. The text material is completely illustrated with circuit diagrams, graphs, and tabular material.

"RADIOTELEPHONE LICENSE MANUAL" by Woodrow Smith. Published by Editors and Engineers Limited, Santa Barbara, California. 197 pages. Price \$3.75.

This study-aid covers the first four elements of the FCC examinations for radiotelephone licenses.

This manual is not intended to replace text books on the technical aspects but merely serves as a review and as a guide to the type of material that candidates can expect to encounter in the tests.

The book is divided into separate sections covering the four elements and is concluded with six appendices containing essential data on such subjects as useful formulas, FCC publications, Laws and Regulations, "Q" signals, miscellaneous abbreviations, and standard procedure for applying artificial respiration.

In conformance with standard procedures followed in FCC examinations, the suggested answers given in conjunction with the various questions are brief and to the point. Technical explanations have been eliminated and

the student who requires further clarification of the subject matter should consult standard textbooks.

"ANTENNAS: THEORY AND PRACTICE" by Sergei A. Schelkunoff and Harald T. Friis. Published by John Wiley & Sons, Inc., New York. 608 pages. Price \$10.00.

This comprehensive work has been written by two members of The Bell Telephone Laboratories' staff and deals with various types of antennas for a wide range of frequencies.

The book contains nineteen chapters and ten appendices and covers such phases of the problem as the physical principles of radiation; Maxwell's equations; plane waves; spherical waves; directive radiation; directivity and effective area; waves over ground; antenna current; impedance, reciprocity, equivalence; small antennas; self-resonant antennas; the general theory of linear antennas; impedance of dipoles; rhombic antennas; linear antenna systems; horns; slot antennas; reflectors; and lenses.

The appendices cover characteristic impedances of transmission lines; patterns of continuous arrays; radiation resistance and gain of cylindrical antennas; space factors of uniform linear arrays; gain of "pine-tree" antennas, horns, lenses; mutual impedance of parallel antennas as seen at the input terminals; constants of a medium; and a summary of Maxwell's equations for the propagation of electromagnetic waves.

The text is written at a college level and presupposes a thorough working knowledge of applied mathematics and physics. A series of problems appears at the end of each chapter to enable the student to check his grasp of the subject matter.

Since all of the material included in this text is fundamental, persons concerned with the design and/or production of all types of antennas should have a copy of this comprehensive work.

"AN INTRODUCTION TO ACOUSTICS" by Robert H. Randall. Published by Addison-Wesley Press, Inc., Cambridge, Mass. 330 pages. Price \$6.50.

This text is designed for the advanced physics student and the audio engineer. A year of college physics and a year of calculus are minimum prerequisites for an understanding of the subject matter.

The book is divided into twelve chapters, four appendices, a listing of symbols, references, and answers to the chapter problems. The author presents an introductory chapter and then discusses such subjects as the fundamental particle vibration theory, plane waves in air, waves in three dimensions, interference patterns, acoustic impedance and the behavior of horns, longitudinal waves in different gases and in liquids and solids, stationary waves and vibrating sources, the reflection and absorption of sound waves,



# way out yonder in the fringe areas...

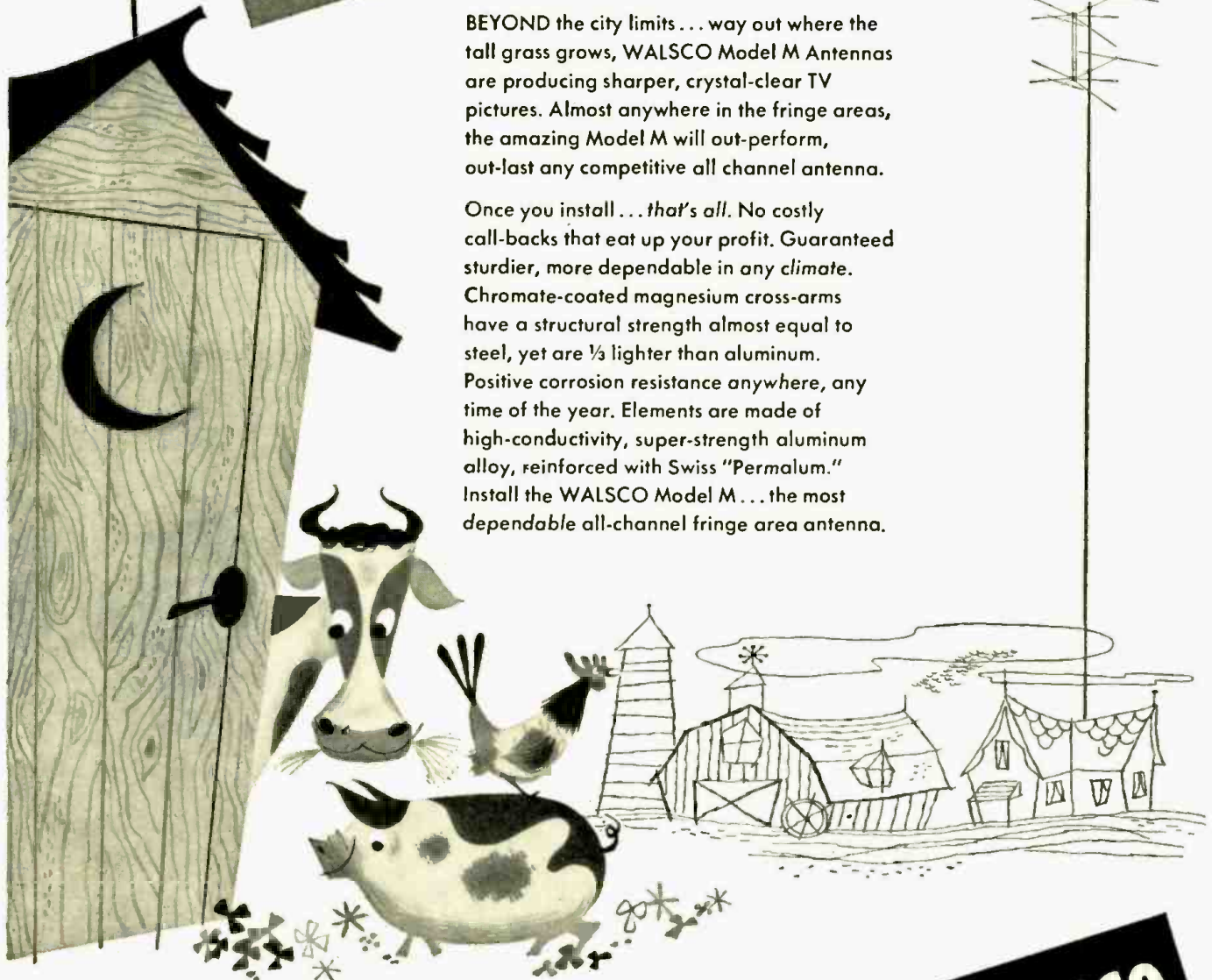


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- Eliminates or minimizes "snow"
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CPD	Diathermy
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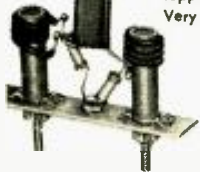
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for Professional Installations and where Interference is intense.

Precision-engineered. Incorporate a dual set of coils and condensers center-tapped to ground for greater efficiency. Very easy to install and balance.

Model	Interference Rejected
SW-10	10 meter band
SW-20	20 meter band
DT	Diathermy
FM	FM

List **\$2.75** each



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speech and hearing, sound measurements and experimental acoustics, the reproduction of sound, and miscellaneous applied acoustics. The appendices contain related mathematical formulas for acoustical computations.

As a text book or reference manual this book should provide a worthwhile bridge between the more elementary texts and the highly mathematical engineering treatises currently available.

\* \* \*

**"THE SATURDAY REVIEW HOME BOOK OF RECORDED MUSIC AND SOUND REPRODUCTION"** by E. T. Canby, C. G. Burke, and I. Kolodin. Published by *Prentice-Hall, Inc.*, New York. 299 pages. Price \$4.50.

Here is a non-technical discussion of a technical subject which has captured the fancy of a large segment of the lay public. Acknowledging the fact that "high-fidelity" is no longer the exclusive prerogative of the audio engineer, the authors of this text have prepared a thoroughly readable handbook for those whose interest in sound reproduction is aesthetic rather than technical.

The book itself is divided into three parts, each written by one of the authors. The first section covers the phonograph record itself, a little of its history, how it is manufactured, how the master is recorded, and other interesting and informative details.

The second section deals with the equipment used to reproduce the records. Written by C. G. Burke, this part of the book covers the type of home equipment available in the various price ranges, testing such equipment, how to set up such a system in the home, and a host of other material for the audio enthusiast.

The third part of the book is written by Irving Kolodin, editor of the Recording Section in the "Saturday Review." His contribution, entitled "Learning to Listen and Listening to Learn" is a primer of recorded music. He points out the things that the listener should look for in his recordings and then provides a basic list of recordings that should be in any well-rounded classical and semi-classical record library.

The music lover and the high-fidelity fan should find much of interest in this compact and fact-filled handbook.

-30-

## TRI-STATE HAMFEST

**THE** Tri-State Amateur Radio Society of Evansville, Ind., will hold its annual hamfest on Sunday, Sept. 14th. The hamfest, which has grown in popularity and scope, will be held at the Seryl Picnic Grounds, southeast of Evansville.

A transmitter on 29.6 mc. will guide mobiles to the area and signs will be posted at highway junctions.

While refreshments will be available, those attending are asked to provide their own lunches. Numerous contests are scheduled with the c.w.-phone ball game being the main event.

Registration fee is \$1.00 at the grounds.

-30-



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RADIO & TELEVISION NEWS

**International Short-Wave**  
(Continued from page 120)

6.115 to 0610 daily; opens again 0615 on 9.750A. (Radio Australia) The 9.750A channel (sometimes as high as 9.770A) is noted to after 0800. (Stark. Texas, others) Pearce. England. notes the 9.750A channel with English for Europe 1730. and announcing next news in English for 1830 over 7.230; says at times seems as high as 9.755A but announces 9.750.

"Voice of Vietnam," 9.62. Saigon. is audible in Pa. some days around 0530-0600: best day to try is Sunday when Radio New Zealand leaves this channel 0500. (Kary)

**Iran—Radio Teheran**, EPB, 15.100. is currently scheduled 0845 Arabic. 0915 Urdu. 1330 Turkish. 1430 German. 1445 French. 1500 English. 1515 Russian; has recordings between talks or news sessions. (Pearce. England)

**Iraq—HNQ**, 11.724. Baghdad, was noted recently in Arabic 0000-0100 sign-off, fair level in Virginia. (Saylor)

**Ireland (Eire)—"Short-Wave Listener,"** London. says Radio Eireann has daily news broadcasts 1230-1250 on 15.120 and 1610-1630 on 9.595. (Catch. England) However. ISWC, London. lists the 9.595 transmission for 1710-1730.

**Italy—Rome**, 11.810. noted 1605-1855 in various European languages; heard beginning English period for North America 1900 on 11.905. (West, Virginia) Heard at good level on 17.800 at 1100-1145 in English for South Africa. (Pearce, England) Has news 1100-1115 on 15.120; considerable QRM. (Kary. Pa.) Noted with news 1245-1300 on 15.400. then talk to 1320. (Sutton, Ohio)

**Italian Somaliland—Radio Mogadishu**, near 7.385. noted around 1215 tune-in to 1300 closedown; news in Italian 1225A. In verifying. listed schedule of 0530-0615 Italian; 0915-1015. 1100-1200 Somali. and 1200-1300 Italian; power was given as 300 watts and channel as 7.420 (but is still near 7.385). (Pearce. England)

**Jamaica—Radio Jamaica**, 4.950. now opens 0600 with "Church in the Wildwood." (Cushen. N. Z.) Recently was noted on 4.950 instead of 3.360 at 2200; Sunday sign-on on 4.950 appears to be an hour later than weekdays—0700. (Stark. Texas)

**Japan—JKII**, 7.257. Yamata, fair to good around 0430-0500. (Saylor, Texas)

**Radio Japan**, 9.675. noted at nice level in British Columbia around 1000-1030 despite CWQRM. (Brooke) The 11.705 outlet has been heard rather regularly of late in its 0900-1000 beam to Philippines-Indonesia; good level in Washington State. (Gaylord) Noted on 7.180 with English 0600-0615 or later. (Waller. Hawaii) AFRS, 4.860. is good level 0600-0800; plays many American recordings. (Tarr, Washington State)

**Kashmir—Radio Kashmir**, Srinagar. has dropped 3.335; schedule is now

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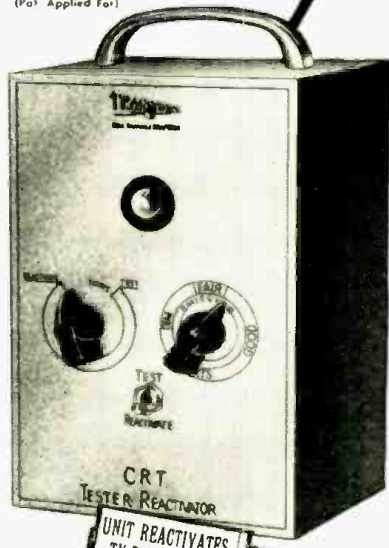
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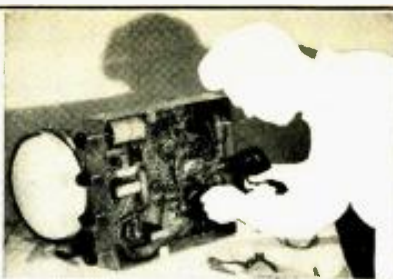
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2130-2330, 0630-1200 on 4.860, and 0100-0230 on 6.110. (WRH)

**Kenya Colony**—Nairobi, 4.855, noted with BBC news relay 1300; usually has "local" news 1315; heard closing 1500 (Sundays 1400). (Pearce, England)

**Lebanon**—Beirut, 8.036A, has extended its schedule to 1630. (Radio Sweden)

**Liberia**—ELBC, 6.028A, Monrovia, is again being heard with weak signal in Eastern U.S.A., much QRM, during the last 15 minutes or so of its daily transmission which concludes 1845.

**Luxembourg**—Radio Luxembourg is now scheduled on 15.350 at 0600-0800 on Sun., Thur., Sat., other days 0600-0815; uses various European languages. English is used over 6.090 daily from 1300 or earlier to 1800 (Sun. to 1830). (Radio Sweden)

**Madagascar**—Radio Tananarive, 3.205, is fair level in N. Z. at 1230. ("The Radio Amateur," London)

**Malaya**—A station opening 0630 on 7.120 is probably BFEB, Singapore; has French 0700. (Stark, Texas) BFEB heard opening 0400 on 15.435. (Pearce, England) Heard on 9.690 at fair level 0515-0530. (Kary, Pa.)

**Mexico**—XEUW, 6.020. Vera Cruz, is good level around 2200; XEKW, 6.030. Morelia, is also good 2200. (Tarr, Washington State) XESC, 15.205, heard well in Spanish 1340. (Mast, N. Y.) XEXE has news in Spanish weekdays 2245-2300 over 6.065 in parallel with 11.900; XEBT, 9.625, is heard signing on 0900; XETW, 6.042A, is noted 2030-2130 with English programs. (Casey, Ky.)

**Monaco**—Radio Monte Carlo, 6.035, noted 1735-1740 with program details by woman in French to 1738 when had station identification and signed off with dance music and chimes. (Rodger, Scotland) Good on 9.785 at 0200 with musical program in French. (Saylor, Va.) Noted on that channel 1700 with news in French. (Hord, Ind.)

**Mozambique**—CR7BG, Lourenco Marques, was recently noted as high as 9.860A, fine level with the Portuguese session 0000-0100; still uses "William Tell" opening. (Saylor, Va.) This one usually is lower—around 9.795. (Bellington, N. Y.) CR7BU, 4.825A, noted 1530 tune-in to 1600 sign-off with "Good Night Song" and "A Portuguesa"; uses English. (Pearce, England) Heard in English over 9.760A daily to 1648 closedown.

**Nepal**—"DX-Radio." Sweden, says Nepal is now on 11.910 at 1000-1127; has news in Nepali and English.

**New Caledonia**—Radio Noumea, 6.035, was noted recently in French from 0445 tune-in to 0528 sign-off with fair level; identified as "Ici Noumea, La Voix de La France dans le Pacifique." (Kary, Pa.)

**New Zealand**—ZL2, 9.540, Wellington, noted recently 0600 with news. (Ferguson, N. C.) ZL10, 15.22, heard leaving air 2357 to resume on ZL8, 9.620; good level on West Coast; ZL2, 9.54, and ZL8, 9.620, heard in parallel at 0622 recently when signed off abruptly. (Harris, Calif.)

Nicaragua—YNBH, 6.549.2, noted 1940 in Spanish; did not move to 6.015 as reported recently by European sources. (Oskay, N. J.)

Norway—Oslo, 11.735, is good level 2000-2100; identifies in *English* as "Radio Norway." (West, Virginia) LLN, 17.825, noted Sundays with "Norway This week" (*English* news) 1201; ended 1220; also audible over LLM, 15.175, LLK, 11.850. (Pearce, England)

Outer Mongolia—Ulan-Bator, 6.518, noted 0530, weak level. (Oskay, N. J.)

Pakistan—Radio Pakistan is now heard near 17.735 with news 0330-0340, also noted another day with news for East Bengal 0210; heard with slow-speed news 1210-1230 on 7.010; has news 1015-1050 near 11.845; still tests 1430-1515 to Turkey and 1515-1600 to Britain on 9.848 and 11.914, and to Indonesia 0630-0715 on 17.835, 15.270. (Pearce, England)

Paraguay—ZPA1, 6.275, heard signing off 2131 with Paraguay national anthem. (Harris, Calif.)

Peru—OAX4R, 15.146A, Lima, noted at good level recently 2125 and still in Spanish at 2238 tune-out. (Ferguson, N. C.) This one may have some *English* irregularly. Lima has at times used 9.535 instead of 9.562, but more recently was noted back on its listed (9.562) outlet mornings to 0815 or later. (Stark, Texas) Is good some days on 9.562 with all-Spanish programs around 2000. (Gaylord, Washington State)

Philippines—Some days, DZH8, 15.300, Manila, is audible after Paris, 15.295, leaves the air 0645; has religious programs; usually is unreadable by 0730; uses *English*. DZH7, 9.725A, Manila, was noted recently 0500-0530 with religious broadcast. (Kary, Pa.)

Poland—Warsaw has added another period—1800-1830—to its North American "evening" schedule on 11.815. (Kary, Pa.) Heard on 11.74 for Europe opening 1515 in Spanish; French 1530-1600, then Spanish again; *English* 1615. (Bellington, N. Y.) Noted on 11.845 with *English* for Europe 1545-1615 sign-off. (Kary, Pa., Bellington, N. Y.) Heard at 1230-1300 with *English* news, commentaries, request program on 9.525, 7.155; should also be on 11.935 which was not heard; the *English* period 1545-1615 on 11.845 is also carried on 9.555, 7.145 (Pearce, England)

Portugal—Lishon noted to 1830 on 9.74; heard on 11.962 at 0800 carrying a program different from that on the 15.125 channel. (Pearce, England) CSA38, 6.360, Lisbon, good signal from around 1600-1900 sign-off; has music and talks in Portuguese. (Saylor, Va.) Niblack, Ind., notes the 15.125 channel closing down 1300. Bellington, N. Y., recently heard *Radio Free Europe*, 9.607, at 0158 tune-in with music by chorus; identified in Hungarian at 0200; strong level.

Sao Tome—CR5SB, 17.6775, noted Sundays 0700-0800; closes with "A Portuguesa." CR5SC, 4.8075, heard 1450 with talk in Portuguese; signed-

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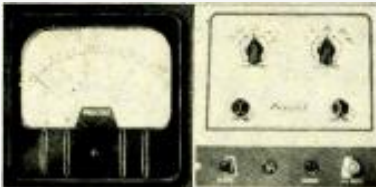
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off 1600 with "A Portuguesa." (Pearce, England)

**Saudi-Arabia**—Bellington, N. Y., recently noted Djeddah, 11.75, opening 2312, preceded by eight-note interval tune; uses Arabic; has bad QRM from London, same channel. The 11.75 outlet had been inactive for some time.

**South Korea**—Cushen, N. Z., reports HLKA, Pusan, heard on 4.785, 7.935A around 0700. Noted by Waller, Hawaii, at 0500 on 7.935A at excellent level, when announced simply as "HLKA, Korea."

**Spain**—Radio Nacional de Espana, 15.635, Madrid, noted signing off 1152. (Ferguson, N. C.) Is usually excellent on 9.363 in English for North America 1800-1840, then goes into Spanish for Latin America. (West, Virginia) "La Voz de la Falange." 7.380, Madrid, signs on with the Falangist March; noted with recordings recently 1700. (Pearce, England) EAJ9, 7.021, Malaga, noted 1615 with all-Spanish session. (Saylor, Va.) Radio Juventud, Cadiz, sent QSL card which listed frequency as 7.200. (Tonsi, Wisc.)

**Sweden**—Radio Sweden, 11.88, now seems to have news daily 2130, in addition to other regularly scheduled periods. (Bellington, N. Y.) Heard on 15.155 with English for South America 0600; repeats for North America 0700. (Pearce, England) Heard on 11.880, 11.705 with English for North America 1900, good level in Virginia.

(Saylor) Good Signal 2300 to western North America in English on 11.705. (Gaylord, Washington State)

**Switzerland**—The United Nations Information Centre, Geneva, broadcasts Mon.-Fri. on 6.672 with English 1330, French 1345. (ISWC, London) Berne noted signing on in English for Southeast Asia 0745 over 11.865, 15.305, 17.784 (best on 11.865).

**Syria**—Damascus, announcing "Huna Damas," is noted by Pearce, England, with Arabic music and vocalists from tune-in 1630 to 1700 sign-off. The 11.913 channel still has French 1530-1630 and English 1630-1730 close-down.

**Tahiti**—Radio Tahiti, 6.135 and 6.980, Papeete, signs off 0130 with "La Marseillaise." Is best level on 6.980 although the channel has severe CWQRM. (Cushen, N. Z.) The 6.135 outlet is best signal in Calif. around 0000-0100. (Balbi)

**Taiwan**—Taipeh, 7.133A, noted at good level 0530; news 0600, followed by session in French. (Saylor, Va.) Noted with native program on 11.735 at 0510-0520 recently. (Ferguson, N. C.) "The Voice of Free China, Radio Station BEC," is heard over BED4, 11.920, with news 1320; commentary in English 1335; has Russian 1303 (jammed). (Pearce, England)

**Tanganyika**—The Department of Social Development, Box 1649, Dar es Salaam, is broadcasting on 1250 kc.,

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**T**he split-load phase inverter, such as is used in Williamson-type audio amplifiers, can be simplified by leaving out the cathode bypass condenser and changing one connection to give an increase in gain and no bad effects on its other characteristics.

Fig. 1 shows a complete circuit so modified. The first half of a 6SN7 serves as a straight voltage amplifier, direct-coupled to the grid of the second half which performs the inversion. The cathode resistor of the first triode section is omitted, and the low side of the cathode load of the inverter triode is tied to the first cathode. The gain from input to either side of the inverter output is 21. Gain with the 470 ohm resistor bypassed is 14. Unbypassed, as in original circuit, the gain is only 7.

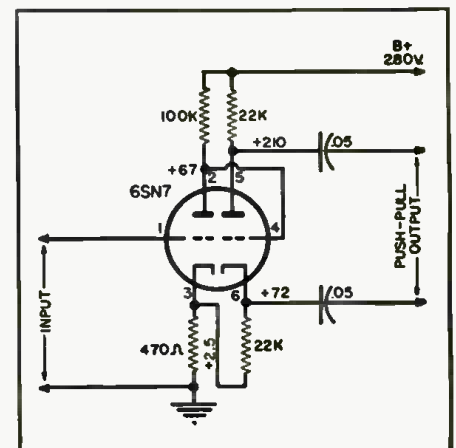
Maximum output per side is about 30 volts. The trick connection has no measurable effect on this factor, nor on balance or bandwidth.

The increase in gain comes from a slight degree of positive feedback which obtains from the coupling of the two cathodes together. This type of circuit scheme is sometimes used in miniaturized equipment to eliminate the bulk of a condenser. The feedback is proportional to the current in the inverter load resistors. Such positive current feedback has the property of reducing the output impedance of an amplifier. The effect in this case is beneficial but slight, tending to improve the impedance balance. The output impedance of a split-load inverter is high on the plate side, and low on the cathode side due to the cathode degeneration in the

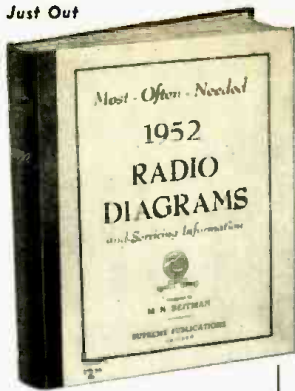
tube. Without the positive current feedback, the measured output impedances were 22,000 ohms to the plate and 1800 ohms to the cathode. With the positive feedback added, these changed to 20,000 and 2500 respectively.

Frequency response is down 1 db at 50 kc. on the plate side, and 1 db at 150 kc. on the cathode side, measured with a low impedance signal source. Phase shift between the two outputs begins to be noticeable on a scope at 10 kc., but is only about 5 degrees at 20 kc.

Fig. 1. Simplified phase inverter circuit which provides 50% more gain while eliminating bypass condenser. There is no change in balance or bandwidth with circuit.



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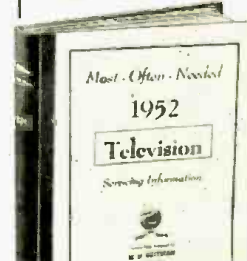
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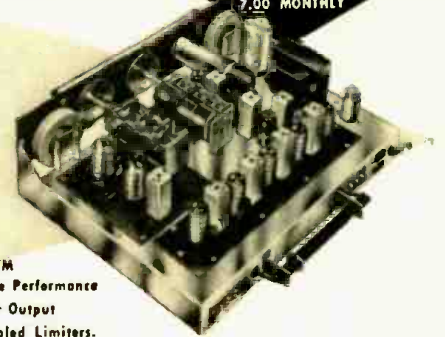
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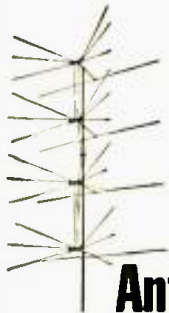
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*Tangier*—"Dux Radio, Stockholm," noted over *Radio Africa*, 7.126, with Swedish session 1635-1705 on Tue., Thur. *Radio International*, 6.110, noted opening 1500 in French; also uses Spanish. (Pearce, England)

*Thailand (Siam)*—Reception of Bangkok varies considerably in Australia; at times is good during Overseas Transmission 0500-0627 on 11.910 and 6.240; the transmitter on measured 7.105 is good from 0627 when used for the Home Service (in Thai) relay; an interval signal is used 0627-0630 and the Thai national anthem is then heard with a brief announcement in Thai, then in *English* says "This is the National Broadcasting Station of Thailand at Bangkok"; lists frequencies as operating in the 48-, 41-, 25-, and 19-m. bands; when transmitting the Overseas program 0500-0627, announces as "The Overseas Broadcasting Station of Thailand." (Hutchins, Radio Australia)

*Trans-Jordan*—Ramallah is currently noted on 6.990A from 1200-1430 sign-off; news in Arabic 1400. (GDX-aren, Sweden)

*Trinidad*—VP4RD, 9.625, Port of Spain, heard 0555 with recordings, commercials, time checks. (Ferguson, N. C.) Has news 0545. (Kary, Pa.)

*Turkey*—*Radio Ankara* is using measured 15.160 instead of 15.165 this year for *English* to British Isles around 1600-1645. (Ferguson, N. C., others) TAP, 9.465, is heard in parallel, but at poor level in Ohio. (Sutton) These continue in Turkish 1645-1700 closedown. (Rodgers, Scotland; Golden, Mass., others) TAV, 17.820, noted to Far East in *English* 0730-0815. (Pearce, England)

*Uruguay*—Montevideo, 11.835, noted signing off 2200 in Spanish at weak level. (Cleveland, Md.)

*USI (Indonesia)*—YDJ2, 7.098A, Jogjakarta, is fairly good in parallel with YDJ, 5.060; takes relay from Djakarta 0630, 0730, Bukittinggi, Sumatra, YDM2, 5.030A, also takes news from Djakarta. (Dilg, Calif.)

The station heard early mornings on 11.089A is YDR2, Ambon, in the Moluccas; at times this one relays news in Dutch from Makassar, Celebes, and from Djakarta. (Dilg, Calif.) Probably closes down 0930.

"Voice of Indonesia," Djakarta, noted in *English* around 0945 on announced 11.77, poor level in Washington State. (Gaylord)

*USSR*—West Virginia, reports Moscow on 11.805A with *English* 1650-1700. Is heard by Ferguson, N. C., in *English* on 15.36, 15.18 when tuned recently 0435, good level.

As a part of its North American "evening" transmission, *Radio Moscow* recently started a period in the Ukrainian language (originating in Kiev) at 2030-2100 over 9.67, 11.830, 15.180 (other frequencies carry *English* throughout the 1820-0100 schedule).

Petropavlovsk, 15.100, is heard with



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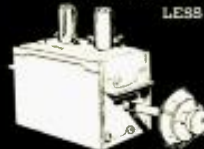


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fair level to 1000 sign-off with programs in a Chinese dialect; suffers some QRM. (Kary, Pa.) Radio Moscow is noted with English on 7.340 to 1800 sign-off; probably is beamed to Europe.

Venezuela—YVNC, 9.639A, Coro, noted recently 0730 in Spanish. (Stark, Texas)

Yemen—Allocated channels for a 25-kw. transmitter of the Ministry of Posts, Telegraphs, and Telephones in Sanaa are 5.985, 9.705, 11.905. (WRH)

Yugoslavia—Radio Yugoslavia, 9.505A, Belgrade, still has English 1645-1700. (Pearce, England) Also 1100-1115, at times with good level in Pa. (Kary)

Press Time Flashes

VRO6, 6.005, Suva, Fiji, was used recently during yacht races with a relay over VPD83, 17.680; programs were taken from ZJV, medium-wave. (N. Z. DX Times, others)

"The Radio Amateur," London, says Pan-American Radio, Tangier, is now on 7.285 to 1805 closedown.

"Voice of Vietnam," Saigon, Indo-China, has been noted on a new channel of 7.29A with English 0845-0900 sign-off in parallel with 9.62; formerly was on 7.095. (Balbi, Calif.) The new 7.29A outlet is heard in native session around 0600 by Eastern U.S.A. DX-ers.

More recently, Radio Peking's 25-m. outlet has been on approximately 11.725; has news 0830; the 15.06V channel is inaudible at that time while 9.04, 10.20, and 10.26 carry Chinese. (Balbi, Calif.)

Warsaw, Poland, sent QSL card and new schedule for English to British Isles—1230-1300, 9.525, 7.155, 11.935; 1315-1345, 11.740, 7.145, 9.555; 1350-1420, 9.525, 7.155, 11.935, 5.973; 1545-1615, 9.600, 7.175, 11.845, 6.115; 1615-1645, 11.740, 7.145, 9.555. (Pearce, England)

Radio Free Asia has news 0845; 6.11, Manila, is fair; 11.94A, Manila, is weak; 9.49, Guam, is quite poor. (Balbi, Calif.)

Cairo, 9.715, sent a letter asking for reports on this channel during the daily 1345-1700 schedule; heard 1400 with clock striking 9 p.m., then news; some days continues in English, other days takes French. (Pearce, England)

Radio Tirana, ZAA, Albania, sent this schedule for its 7.850A and 6.560A outlets—Italian 1315; French 1345; Italian 1515; English 1615; music 1550-1615 (Wed., French-English; Thur., Italian). (Pearce, England)

Casey, Ky., and Pearce, England, have received this new schedule from Copenhagen, Denmark—test broadcast for Greenland (daily) 1900-2000, 9.520; to North America daily 2030-2130, 2200-2300, 9.520; Tues., Thur., Sat. for Australia-Far East, 0400-0500, 15.180; Tues., Thur., Sat. for India, Malaya, Far East, 0900-1000, 15.165; program for Danish Ships in European waters, Tues., Thur., Sat., 1200-1220, 9.520; Home Service daily 1240-1615, 7.260; for South America, Mon., Wed., Fri., 1730-1830, 9.520; for Faroe Islands on

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All brand New, 100 Watts CW, or MCW, emission. Operates from 110 V., 60 Cycle, easily converted to 80 Cycle operation. Low frequency range, 300 KC. to 600 KC. High frequency 3.000 KC. to 18,000 KC. using an E.C.O. We furnish complete conversion data with each transmitter. Complete with \$59.95

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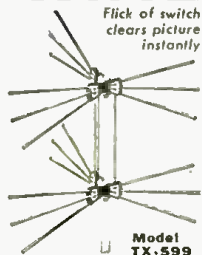
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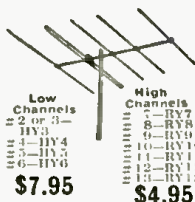
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When this was compiled, *Radio Free Asia* had begun to shift its operations from San Francisco, Calif., to Manila, Philippines. A team of four radio experts had left for Manila to plan and direct programming from that point. By this time, broadcasting hours may have been increased. When this was written, schedule was 0700-0900 over 6.110, 11.940, Manila, and 9.490. Guam. Dilg, Calif., notes the Guam outlet is a commercial outlet with a call at 0920 sign-off that sounds like KUJZ (may be prewar call KU4G).

At the time this was written, the International Goodwill Station was in the process of moving from Leopoldville, Belgian Congo, to Brussels, Belgium, where two new high-powered (100 kw.) transmitters may be in use by now. QRA in Brussels is The Belgian National Broadcasting Service (Service Mondial), P.O. Box 26, Brussels, Belgium. OTC, Leopoldville, will continue to be utilized for relay for programs to North and South America.

New QRA for *Radio Quitandinha* is International Division, Radio Quitandinha, Caixa Postal 5292, Rio de Janeiro, Brazil; Flavio Serrano, long a monitor for the ISW DEPARTMENT, is now chief of the International Division of this station; says all reports, old or new, will be answered although it will take several months to do so, but that the SWL's do not need to repeat an out-dated report in order to get the QSL card now available. (WRH)

The University of Istanbul, Turkey, operates a transmitter on 7.300 at 1000-1045; a station of the Technical University of Istanbul is on 7.100 on Mon., Wed., Fri., 0700-0700 and other days 1330-1500; *Radio Izmir*, Smyrna, broadcasts on 6.383 now at 0800-1430.

Forecasts over WWV, Bureau of Standards, Washington, D. C., are now given twice each hour—19 1/2 and 49 1/2 minutes past the hour on 2.5, 5.0, 10.0, 15.0, 20.0, 25.0. Letters used are still "N," "U," and "W" to signify the radio propagation conditions are "normal," "unsettled," or "disturbed," respectively. A digit is now forecast to show the expected quality of transmitting conditions on the N.B.S.-C.R.P.L. scale of 1 (impossible) to 9 (excellent). The digit forecast indicates these propagation conditions—1—impossible (W); 2—very poor (W); 3—poor (W); 4—fair to poor (W); 5—fair (U); 6—fair to good (N); 7—good (N); 8—very good (N), and 9—excellent (N). (Oskey, N. J.)

Miers, Germany, says that plans are being made for Western Germany to resume international broadcasts just as soon as the German treaty is ratified; will at first use German, later French and English, possibly other languages.

According to a recent verification, *Radio Jornal do Commercio*, Recife,

Pernambuco, Brazil, uses 9.565 at 0455-1105 and 1300-2120; 11.825 at 1600-2120, and 15.145 at 0455-1300. "Brazil Calling" (English) is radiated Mon.-Sat. on 9.565 at 2005-2030, and on 11.825 at 1935-2000; Sundays on 9.565 at 1625 and on 11.825 at 1605. (Radio Sweden)

CR7IB, Beira, Mozambique, is operating on 7.199 with 0.3 kw. weekdays 0430-0630, 1100-1500; Sun. 0400-0700, 1100-1500; news in Portuguese 0500, 1300. (WR11)

According to WRH, ZNB, Mafeking, Bechuanaland, is now using 7.895 weekdays 0600-0700, 1200-1430; Sun. 1300-1430; is 0.5 kw.; says a 0.2 kw. transmitter will shortly operate on 5.900 (ZNB's old channel of some years ago). WRH says RIAS, Berlin, is operating 24 hours daily now, but that the s.w. outlet on 6.005 is on the air only 0400-0245.

*Radio Sweden* reports the "DUX" transmissions in Swedish over *Radio Africa*, 7.126, Tangier, are now Tuesdays 1500-1530 and Thursdays 1530-1600.

At press time, Kary, Pa., had just received confirmation from "La Voix du Vietnam," Saigon, Indo-China (Vietnam), that the 7.090 channel has been replaced by 7.288. Officials listed English sessions for 0800-0830 in 7.288 ("Disc Jockey Time"), and 0830-0900 on 9.500 and 7.288 (music, commentary, and news); sign off is 0900.

Bellington, N. Y., more recently noted *Radio Athens*, 11.718A, opening in Greek 1900.

The director of *Radio Nacional de Espana*, Madrid, has informed Casco, Ky., that the monthly program bulletin has ceased to be published for the time being, but that a list of frequencies and hours on the air will be sent free on request.

A new Colombian seems to be *Radio Neiva* on 4.852; signs off 2302; has had QRM. (Stark, Texas)

**Acknowledgement**

Monitor certificates for 1952-53 have been mailed to "active" monitors; I will be happy to send a certificate to anyone else, anywhere in the world, free on request to Kenneth R. Boord, 948 Stewartstown Road, Morgantown, West Virginia, U.S.A. Thanks for the fine reports—and good listening!—  
K.R.B.



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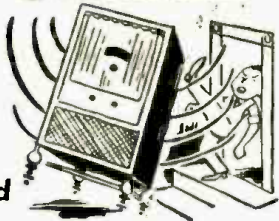
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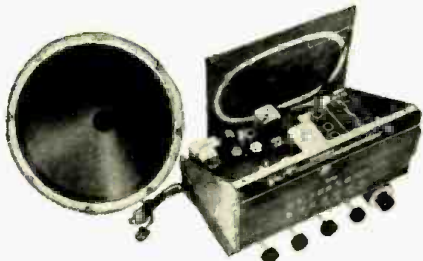
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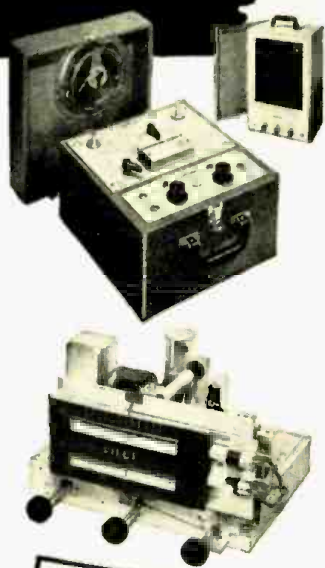
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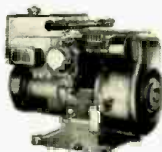
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## TV Conversions (Continued from page 55)

3. Core material. Deflection yokes have core pieces which can consist of either powdered iron, iron wire, or ferrite. For Circuits B and C the ferrite core type is the most efficient although some of the better iron wire types can also be used. In practice it will be found that most of the new 70 degree yokes have ferrite cores.

A fourth consideration concerns the method of winding the yoke. There are now available various "anastigmatic" or "cosine" yokes which help to maintain even focus over the entire picture. Even focus is a great advantage, but many of these yokes introduce nonlinearities at the sides of the picture which are called "bulging" or "pin-cushioning." These faults can sometimes be overcome by placing small magnets near the tube. In general, good focus is obtained, even with these special yokes, only when the anode voltage is sufficiently high and the focus coil is set correctly.

### Vertical Sweep Section

Many small screen receivers have a vertical sweep section which has sufficient reserve power to deflect the new, large picture tubes. Unless the sweep is barely sufficient for the small tube it is best to try the new picture tube first before modifying the vertical section.

To increase the vertical sweep in receivers using a single 6SN7 as the oscillator and output amplifier tube, simply substitute a new type 6BL7 in the same socket. This tube is designed to replace the 6SN7 for wide angle picture tubes without circuit changes.

If a single 12AU7 is used in the vertical circuit, the height can be increased simply by substituting a 12BH7 in the same socket. (This will work only in receivers with parallel-connected filaments.) Where a 6K6 is used, try substituting a 6V6 or, if the pentode is triode connected, rewire the tube socket and return the screen grid to a well filtered "B plus" point (150-250 volts).

If tube substitution is not possible or does not give enough height, connect the "B plus" side of the vertical height control to the boost voltage. If the height is still insufficient it may be necessary to connect the "B plus" side of the vertical output transformer to the boost voltage. For this connection use a 5000-ohm, 2-watt resistor and a 10 μfd., 600-volt condenser as a decoupling filter. This will reduce the high voltage and width slightly.

### Focus, Ion Trap

Most picture tubes larger than 14 inches (rectangular) require more focus flux than the smaller tubes. The simplest change in most receivers will be to substitute a new focus coil in place of the one used for 10- or 12-inch picture tubes. This new coil (RTMA

#109) is larger and has a round steel case. Its d.c. resistance is approximately 470 ohms. If focus cannot be obtained, reverse the connection.

Receivers using a combination EM-PM focus coil may require a new coil of this type or else a full PM focus ring, such as the *Quam* QF2 "Focalizer," can be used. New nonmagnetic brackets will be needed to mount such units.

Practically all new, large screen tubes use either a single or double magnet ion trap. If the old receiver uses an electromagnetic ion trap (two coils) leave it in the circuit, but mount a new PM ion trap on the picture tube neck. Be sure to ascertain which type of ion trap is recommended for the new tube, because on some tubes both double or single magnet traps will work, but only one will give sharp pictures.

### Troubleshooting Conversions

**Corona or arcing:** Because of the higher voltage the old high-voltage section may now have corona or even arcover. To avoid this, leave all high-voltage connections smooth. Clean all insulating surfaces with carbon-tet and, if necessary, paint the entire HV rectifier socket with glyptol, polystyrene coil dope, or similar preparation. Dress all leads carefully to avoid arcing. Coating grounded parts near the high-voltage points with glyptol etc. or cementing insulation material between such points also helps. If no corona ring is used on the high-voltage socket, connect all unused tube pins together with #20 bare wire (or even larger) and leave smooth well-soldered connections.

**Insufficient width:** In Circuits A and C it is possible to increase the width by shunting a .05  $\mu$ fd. condenser across the width coil. Increasing the driving voltage on the grid of the output amplifier will increase both the width and high voltage on all three circuits. Reducing the value of the screen resistor will also help in all three cases. The screen voltage on the 6BG6 or 6CD6 can be increased to about 300 volts while on the 6BQ6 no more than 150 volts can be applied to the screen. If other tube types are used the tube manual should be consulted for maximum screen voltage. The total cathode current is indicative of the correct operation of the output amplifier and if, as shown here, a 100-ohm resistor is used, the cathode current can be quickly determined by measuring the voltage across this resistor. For a 6CD6 this voltage should not exceed 12 volts, representing 120 ma. The 6BG6 should not draw more than 100 ma. and the 6BQ6 no more than 85 ma. If current appears excessive, measure the grid bias. This bias, measured from grid to cathode, should range from 20 to 40 volts. Increasing the driving signal will increase the bias.

In many cases with circuits such as B and C it is possible to get better width and linearity by connecting the yoke to a higher tap on the secondary winding.

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# NEW TV PRODUCTS on the Market

## "PICTURE TUBE SAVER"

Television Communications Industries, 222 N. Wells Street, Chicago, Illinois is currently marketing a new "picture tube saver" which is said to improve contrast and restore brilliance of old tubes.

The "Stay-Brite" unit works automatically. Five positions permit increasing filament voltage to prolong the useful life of all tubes for a year or more. The installation of the unit requires no wiring or outside connections and this one unit will fit all sizes of picture tubes.

Full details on this unit are available from the company.

## TV "WALL-THRU"

Mosley Electronics, 2125 Lackland Road, Overland, Missouri is offering a new weatherproof TV or FM lead-in wall entrance to the trade.

Known as the "Wall-Thru," the new unit can be quickly installed in any wall up to 13" thick. The unit consists of precision molded polystyrene inside and outside wall plates combined with a sturdy 14" extruded polystyrene tube, 3/4" o.d. Both wall plates are designed to accommodate either standard flat 300-ohm line or RG-59/U coaxial cable and are readily adapted for use with tubular type 300-ohm line.

For extra convenience, the new "Wall-Thru" is designed so that a Mosley universal TV lead-in socket



may be mounted directly on the inside plate if desired. This provides a neat, solderless, and low-loss plug-in connection of the TV set to the lead-in when mated with the company's transmission line plug.

## COAXIAL CABLE

The Plastoid Corporation, 42-61 24th Street, Long Island City, New York has announced the availability of a new radiation-proof coaxial cable which has been especially engineered for community TV installations.

The cable was developed to overcome the loss of signal strength usually encountered in community systems due to the length of the cable run. The new product also provides higher-

than-average tensile strength to take care of the mechanical problems of the long runs.

Full details on this new radiation-proof cable are available from the company on request.

## "GLOW-RING"

Pioneer Electronics Corp. of Santa Monica, California has recently introduced a new feature in connection with its picture tube line which is said to speed the work of television picture tube adjustment by indicating to the



operator when the correct ion deflection has been obtained.

Called the ion trap "Glow-Ring" indicator and located a few inches from the base of the tube, the device consists of a narrow encircling band of luminous material applied to the neck of the tube during manufacture.

When the ion trap is incorrectly adjusted, the "Glow-Ring" emits a soft green light which dies out when the trap is rotated to the exact setting.

## ION TRAP

Heppner Manufacturing Company of Round Lake, Illinois, has announced the availability of a new low-priced slip-on ion trap of simplified construction.

Each Model T-312 trap is stabilized and tested on special equipment designed by the company for that specific purpose. Installation time is 2 or 3 seconds. While the smooth metal-to-glass contact permits easy adjustment the unit stays in position without wobble or shift during shipment of the complete TV set.

The Model T-312 weighs just 3/5 ounce so that the neck of the tube is not damaged. The gauss readings range from 25 to 60.

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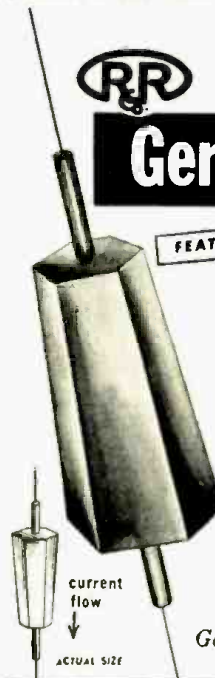
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### "KENMAST"

The Tenna-Trailer Company of 321 N. Plum Street in Pontiac, Illinois has developed a new, easily-transported, easily-installed, low-cost telescoping mast which has been tradenamed "Kennmast."

The new mast can be handled by one man and weighs only 75 pounds. It can be easily installed by mounting it on a standoff bracket with two lag screws on the side of the building. The mast is then raised, the ground spikes are driven into the base plate, the unit cranked up to its full 50-foot height, and the guy wires are tied off. Adjustment of the tension on the guy wires by means of the handcrank completes the installation.

The "Kennmast" is constructed of square tubing which the company claims insures strength and rigidity.

Additional information on this new unit is obtainable from the factory on request.

### BALLAST RESISTORS

Clarostat Mfg. Co., Inc. of Dover, New Hampshire has designed a new TV ballast unit which may be plugged in between the TV receiver and the electric receptacle.

The new unit is intended for use in areas where the line voltage tends to increase up to 140 volts. The unit operates on the ballast principle so that as the voltage increases the resistance increases giving an increased drop across the resistance and lowering the voltage to the receiver.

At 110 volts and under, the voltage drop is negligible but with increases up to 140 volts, the voltage applied to the television set will not normally increase much above 115 volts, depending, of course, on the load applied.

The units are so designed that they can be plugged into one another or two or more can be operated in series to obtain a greater voltage drop. Currently, the ballasts are available in two types, the Type TVA for 200 to 300 watt loads and the Type TVB for 300 to 375 watt loads.

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RADIO & TELEVISION NEWS

New York has announced the availability of four new accessories for television installation—a thermal switch, a two-set coupler, a local-distance switch, and a four-channel switch.

The RMS thermal switch, Model TH-SW, permits the automatic operation of lamps, rotor, booster, and similar devices through operation of the TV receiver. In addition to this convenience, neatness of wiring arrange-



ment and protection against operation of the electrical units overnight are other advantages claimed by the manufacturer. The switch is compact and mounts easily to the wall. A spare outlet is provided for the independent operation of other electrical devices.

Additional details on the thermal switch and complete information on the other three units in the new accessory line are available from the company direct.

#### "ULTRA Q-TEE"

The LaPointe-Plascomold Corp. of 155 West Main Street, Rockville, Conn. has announced a new antenna development, the "Ultra Q-Tee."

This new Vee-D-X unit incorporates a special six-section printed circuit band reject filter. A portion of the v.h.f. antenna (the v.h.f. high channel director) is used as a reflector throughout the range of 470-890 mc. The ultra-high-frequency "V" is the first element of the total antenna, with the critical angle and length chosen so that no interaction exists between the v.h.f. and u.h.f. sections.

The six-section filter is located on the antenna boom between the common u.h.f. and v.h.f. transmission line feed points. At v.h.f. the "Q-Tee" operates as an independent antenna through the short-circuit action (off resonance) of the u.h.f. filters placed in series with each side of the transmission line. At u.h.f. these filters are off resonance, and voltage is allowed to reach the line without attenuation. The v.h.f. section is effectively isolated by the high series impedance of the u.h.f. filter sections in the same range so that no interaction can occur between the ranges of 54-88, 174-216, and 470-890 mc.

-30-

September, 1952

# Speaking of Brand New!



"300"  
Broadcast  
List Price...\$125.00

"315"  
General Purpose  
List Price...\$75.00

Here Are the NEW



Hi-Fidelity Slender Series

Bi-Directional Gradient' Microphones!

● These microphones outperform all other "slender" microphones—because of their advanced acoustical, electrical and mechanical features. Both models permit greater performer freedom (performers can stand at a 73% greater distance from the microphone!) The "300" and "315" will pick up voice and music from front and back—yet discriminate against unwanted noises from the sides. They reduce reverberation and the pickup of distracting random noises by 66%!

● Model "300" Broadcast is specially designed to meet the exacting requirements of TV, radio broadcasting, and recording. It has a special "Grayje" subdued, non-reflecting finish that blends into the background, gives the spotlight to the performer. Has a "Voice-Music" switch for perfect reproduction of the soloist working at close range, or for the distant instruments of the orchestra. Special vibration-isolation unit eliminates "handling" noises and the pickup of floor vibrations. Model "315" General Purpose is similar in size, design and technical features to the Model "300." It is finished in rich, soft chrome—ideal for those public address applications where its streamlined design and beauty lend prestige to any setting in which it is used.

IMPEDANCE TABLE	OUTPUT LEVEL
L—35-50 ohms	58.7 db below 1 Milliwatt per 10 microbar signal
M—150-250 ohms	59.5 db below 1 Milliwatt per 10 microbar signal
H—High	57.0 db below 1 volt per microbar

Shure Patents Pending

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155

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For Stereo & Monaural Reproduction



LA-90



RC121/II



SK-58



GE GC-7



CAB-16

COMPONENTS	
Lafayette LA-90 28-Watt Stereo Amplifier	72.50
Garrard RC121/II Changer	41.65
Lafayette PK-111 Wood Base	3.95
GE GC-7 Stereo Magnetic Cartridge	23.47
2-Lafayette SK-58 Coaxial 12" Speakers	59.00
<b>Total Reg. Price</b>	<b>200.57</b>

ONLY 16.75 DOWN — 12.00 MONTHLY

A superb phono music system brought to you by Lafayette to help you get started in stereo. Heart of the system is the new Lafayette LA-90 with 14 watts per channel and with all the inputs necessary for a complete stereo control center. Other fine components of the system are the famous new Garrard RC121/II 4-speed automatic record changer ready to accept stereo cartridges, the Lafayette PK-111 wood base for changer, of fine selected woods; the new GE GC-7 stereo/monaural variable reluctance cartridge with 0.7 mil genuine GE diamond stylus; and 2 of the unbeatable, for performance-value, Lafayette SK-58 12" coaxial speakers with built-in crossover network and brilliance level control. Supplied complete with cables, connectors, and easy-to-install instructions. Shpg. wt., 66 lbs.

HF-374 Stereo Phono System, with mahogany or blonde wood changer base (please specify) Net 167.50  
 HF-375 Same as HF-374 but with 2-Lafayette CAB-16 mahogany or walnut or CAB-17 blonde Resonator-type speaker enclosures (specify which) Net 222.50

## LAFAYETTE STEREO FM/AM-PHONO MUSIC SYSTEM

Same as HF-374 above but with new Lafayette stereo Model LT-99 FM/AM Tuner.

MF-376 Stereo FM/AM-Phono System Net 237.00  
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# NEW! LAFAYETTE 30-WATT STEREO AMPLIFIER

Superlative Features and Low Cost make it easy to GO STEREO NOW!



LA-90 72.50

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- 28 WATTS MONAURALLY WITH 1 OR 2 SPEAKER SYSTEMS
- 14 WATTS PER STEREO CHANNEL
- SPEAKER PHASING SWITCH
- 3.5 MILLIVOLTS SENSITIVITY FOR TAPE HEAD OR PHONO CARTRIDGE
- 20-20,000 CPS RESPONSE

A new, versatile stereo control center preamplifier-amplifier whose excellent performance and low cost make it easy to start enjoying stereo sound right now! Power output is 14 watts per channel for stereo, or—by placing the Stereo-Monaural Switch in "Monaural" position and connecting the output transformer taps in parallel—28 watts are available to drive a single speaker system monaurally; or—each individual amplifier output may be connected to a separate speaker system for 28-watts total monaural output with the amplifier used as either an electronic crossover, feeding

low frequencies to 1 speaker system and highs to the other, or to create a pseudo-stereophonic effect with monaural program material. Response is 20-20,000 cps; distortion is below 1½% at 12 watts; hum is 75 db below full output, either channel; output taps are 8, 16, and 32 ohms (4, 8 or 16 ohms when strapped together); controls include 6-position selector switch (Aux, Ceramic or Crystal, Tuner, LP-RIAA, POP, Tape Head), Balance Channel A, Balance Channel B, Master Level, Treble A and Treble B (dual concentric), Bass A and Bass B (dual concentric), Channel Reverse Switch, Stereo-Monaural Switch, Tape Monitor Switch, Speaker Phasing Switch. Inputs include dual Tuner, Crystal/Ceramic, Mag. Phono, Tape Head, Tape Monitor Output. Tubes are 4-12AX7, 4-EL84, 2-EZ80 Rectifiers. Size is 4-11/16" h x 14-9/16" w x 9-1/4" d. Shpg. wt., 22 lbs. LAFAYETTE LA-90 Stereo Amplifier Net 72.50

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FLEXIBLE DESIGN! LOW BUDGET PRICE! INSTALL STEREO NOW!



LT-99 72.50

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- FM MULTIPLEX RECEPTION (REQUIRES DECODER)
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- ARMSTRONG FM CIRCUIT
- AUTOMATIC FREQUENCY CONTROL

An excellent unit with many outstanding features whose low cost and high degree of flexibility combine to make it practicable to enjoy stereo FM/AM broadcasts NOW without fear of obsolescence. The Lafayette LT-99 Stereo Tuner may be used for standard AM or FM (monaural) or for FM-AM stereo listening. Or, you can use it as a 2-channel receiver and feed FM to one room and AM to another at the same time. Outputs are provided for stereo or monaural tape recording directly off the air. Styling is modern and designed to please the style-conscious modern young homemaker.

Circuitry is of the Armstrong FM type, with limiter and discriminator; sensitivity is 3 microvolts (on FM) for 20 db quieting, 75 microvolts loop sensitivity on AM; frequency response is, for FM, 20-20,000 cps ± 1 db, and for AM 20-5,000 cps ± 2 db; output voltages are: FM—2½ volts for 100% modulation, AM—1 volt average. Output jacks include AM-FM Monaural, AM Stereo, AM Tape Recording, FM Tape/Multiplex. Controls include Stereo-Monaural switch, Selector Switch (AM, FM-AFC, FM, Off), AM Tuning, FM Tuning, Multiplex-Tape switch. Built-in FM and AM antennas. Tubes are 6BE6, 2-6BA6, 6U8, 12AT7, 6AU6, 6AL5, diode AM detector, selenium rectifier. For 105-120 volts, 50/60 cps AC. Size 8-1/2" d x 13-5/16" x 4-1/4" h. Shpg. wt., 16½ lbs.

LAFAYETTE LT-99 Stereo Tuner Net 72.50

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## 2-Meter Transmitter

(Continued from page 41)

carefully tuned while watching the r.f. meter on the test instrument for evidence of operation at the desired frequency. It is advisable to listen for the 24 megacycle signal on a communications receiver, to make certain that the frequency of this stage is being controlled by the crystal. When the signal is indicated on the r.f. meter and is heard in the receiver, the crystal should be grasped between the thumb and forefinger. If the frequency shifts or shows signs of instability, as evidenced while listening to the receiver, it is reasonably certain that the stage is self-oscillating. The tap on the coil  $L_1$  should be shifted one turn closer to the "cold" end of the coil (closer to the crystal). This simple operation will eliminate this condition.

We may proceed to the next stage of the transmitter, the frequency tripler section of the 6J6. The grid-dip oscillator or wavemeter should be tuned to 72 megacycles and the pickup coil of the test instrument held close to  $L_2$  while tuning  $C_3$  for an indication on the r.f. meter. When this point is found, the 5763 frequency doubler may be resonated by plugging a test meter with a 0-10 milliamperere scale in jack  $J_1$  and tuning  $C_{10}$  for a maximum reading on the meter. The coupling between  $L_3$  and  $L_4$  should then be adjusted to provide a meter reading of slightly more than 5 milliamperes. After tuning the final amplifier, this current reading should be checked again and the coupling between  $L_5$  and  $L_1$  adjusted until the proper reading is obtained.

The final r.f. amplifier may now be

resonated. Apply high voltage to the stage and insert a test meter with a 0-200 milliamperere scale into jack  $J_2$  and tune  $C_{11}$  for a minimum or dip as indicated on the meter.

After the transmitter has been properly resonated, the antenna may be connected to the antenna output coaxial fitting.  $L_6$  should be adjusted so that the transmitter will load up to 150 milliamperes.

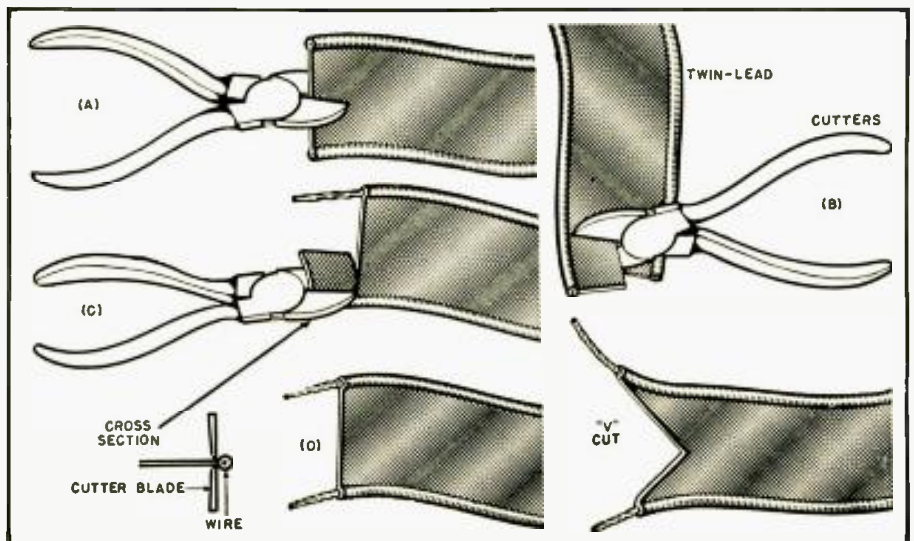
When tuning for the maximum output in an r.f. amplifier stage employing a beam power tetrode such as the type AX 9903, with the meter circuit in the cathode of the tube, it will be found that the minimum or "dip" indicating resonance will be less pronounced as the antenna load is increased. This is due to the fact that the meter indicates the screen grid and the control grid current in addition to the plate current. Therefore, when resonance is approached the screen current increases making the dip less pronounced.

The transmitter just described is designed for operation in conjunction with any standard AM modulator providing 50 watts of audio power; all circuit constants and operating voltages and currents, as set forth in the circuit diagram and in the text, are for AM phone operation.

If the transmitter is to be used for FM operation or is to be used to drive a high power stage, up to 600 volts of plate voltage may be applied to the tube with 200 milliamperes of plate current. Under these conditions only 2 milliamperes of grid current is required for the final amplifier tube. However, it will be necessary to replace the final amplifier grid bias resistor ( $R_7$ ) with one that will provide 80 volts of grid bias.

-30-

From Hugh Lineback comes a practical suggestion on a quick and neat method of stripping the end of twin-lead transmission line. Diagonal cutting pliers are used, thus avoiding the greatest danger of peeling the wire with a knife—that of nicking the strands which might break later. In step A make a split with the cutters; step B, with the point of cutters against wire, cut crossways at bottom of split (for both wires); step C, cutters grip plastic and tear it from wire (don't squeeze hard enough to cut); and step D is a "V" cut in the plastic which gives flexibility for fitting terminals.



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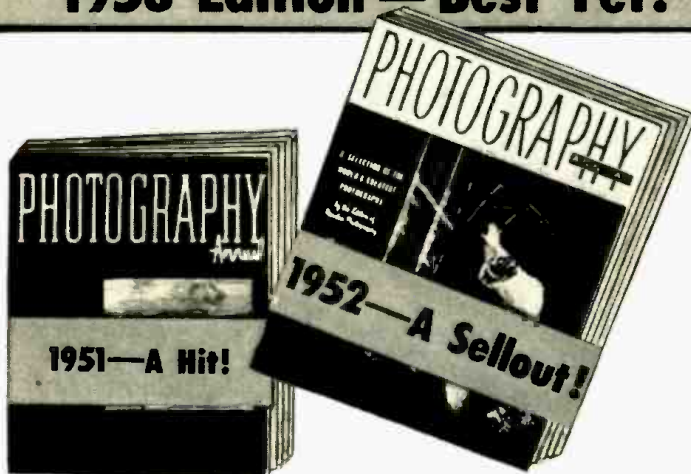


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The Motorless Directronic's Amazing 360° Reception Pattern Shown Below.

AX-509 Directronic. As shown, \$16.95

In the city or in an ultra-fringe area, the Directronic will outperform ordinary antennas. Only the Motorless 360° Directronic TV Antenna offers "around the room" reception WITHOUT distortion. Clarity of picture will amaze. It's so bright, so sharply defined. Extremely durable construction assures long service. AX-509 "Service-man's Array" contains Hi-Tec molded insulator of extremely high tensile strength. 18 hi-tensile aluminum alloy elements. 1 set of connecting stubs (3). Universal U-Clamps for mounts to 1 1/2" Directronic Beam Selector. 1 1/2" Feat. of Tri-X Cable. 1 Stacked array per carton.



AX-59 Directronic 9 Element Single **\$10.35**

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### Rocket YAGI 8 Element TV Antenna Super Reception in Fringe Areas



This sensational Super Fringe Yagi Antenna outperforms all other types. Never before has an antenna produced such clear, sharp, steady pictures, ghosts and interference are kept at a minimum due to the directive single channel pattern. Maximum signal strength is obtained. Sturdy construction assures trouble-free operation even in worst weather. Pre-assembled for quick rig installation. Fast swing elements into position and tightened wing nuts. Exclusive design mast clamp prevents antenna turning or canting under any conditions. Has molded insulator for greatest strength. 8 elements include 4 directors, one folded dipole, one reflector. Matches 300 ohm impedance. Shipped less mast.

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# National Electronics OF CLEVELAND THE HOUSE OF TV VALUES

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## Mac's Service Shop (Continued from page 70)

only rarely. Experiments carried on by the Collins Radio Company and the National Bureau of Standards last May upset previous beliefs that under ordinary conditions no v.h.f. signals were returned from this region, since the experiments showed that weak signals were returned continuously. I expect to know more about these experiments a little later, but the summary report explaining 'A new kind of radio propagation observable over long distances' has not yet been cleared for release. Mr. Rosen of the Technical Reports Section of the U. S. Department of Commerce warns me that many of the writers who have published material on these experiments have drawn erroneous conclusions; so I guess we will just have to wait until the report is released.

"During the months of May, June, and July ionized 'clouds' form in the lowest layer of the ionosphere, called the E Layer; and if one of these clouds drifts into just the right position above the TV station and the receiving position, freak reception often results, especially on the lower channels, over distances of several hundred miles for a few hours at a time. Again, under conditions of intense ionization, such as occur at the peak of the sunspot cycle, the upper layers of the ionosphere occasionally are able to return signals from the lower TV channels and produce some exceptional DX.

"While on the subject of freak reception, two other causes are worth noting. One is the condition of intense ionization of an area 50 to 500 miles above the earth that accompanies a display of the aurora or northern lights. When the aurora is visible, TV signals will often be returned from this ionized area, and reception will be effected over unusually great distances. Unfortunately, aurora-reflected signals undergo such rapid changes in strength that the picture is usually too distorted by the rapid flutter to be enjoyed. The final cause of freak reception is the meteor trail. A meteor passing through the atmosphere ionizes the air in its wake, and TV signals will be returned from this ionized space in a sudden burst of signal strength of only a few seconds' duration.

"All of these cases have nothing to do with the ordinary day-in-and-day-out brand of fringe-area reception in which we are interested; but before we can draw any conclusions about how conditions inside the troposphere affect reception, we must know about some conditions outside this region that also may affect television signals. Otherwise, if we try to explain everything that happens purely in terms of tropospheric conditions, we are bound to become confused."

"I'm already confused," Barney confessed.

"Now let's consider a TV signal mov-



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ing out into the troposphere from a transmitter. In the standard moist atmosphere, the velocity of the signal will increase at a uniform rate with altitude. This means that if we consider a wavefront moving out roughly parallel to the earth's surface, the upper portion of this signal will be moving faster than the lower part, and this will put a kind of 'English' on the signal that will curve it downward on an arc that has a curvature roughly 1/6 that of the globe. This fact accounts for the condition in which radio line-of-sight is roughly 15% greater than geometrical line-of-sight. 'Diffraction' extends this radio line-of-sight still farther. It is the tendency of a signal to curve around an opaque object into the shadow area. In this case the earth itself is the opaque object. The diffractive process decreases rapidly as the wavelength becomes shorter; and this explains, in part anyway, why the lower channels reach out into the fringe areas better than the higher ones do."

"But all this has nothing to do with the weather," Barney complained.

"We're coming to that right now," Mac assured him. "The first fact to keep in mind is that when a TV signal ranging up through the troposphere encounters either warmer or drier air, it is bent downward much more sharply than is the case in a standard atmosphere. You remember that under standard conditions the temperature drops about 3.5 degrees for every 1000 feet of altitude; so obviously something must upset this condition if the signal is to encounter warmer air above the earth. Several conditions can produce such an upset: For example during a summer day the earth is warmed by the sun. After the sun sets, this heat is lost rapidly in the form of radiation, and the air nearest the earth is cooled more rapidly than the air above it. The result is a 'temperature inversion' that often makes TV reception good up to distances of 150 miles. Another case is when the sun warms the upper reaches of the atmosphere without falling on the earth. This accounts for the excellent reception often obtained just at sunrise and sunset. Still another case is that of warm dry air from land blowing across a body of water, such as a lake. The warm air rises, while the air near the water is cooled by the water and is more moist.

"Frontal action also produces thermal inversions. The spiral action of winds moving counter-clockwise into low pressure areas and clockwise out of high pressure areas move great masses of cold air down from Canada and bring up warm air from Mexico and the Gulf. For example, when a low-pressure storm approaches us here in the Great Lakes region from out of the west—and the procession of lows and highs across the United States is always in the general direction of west to east—the swirling counter-clockwise winds first sweep up warm air from the south. When this light warm air encounters the cooler, heavier air

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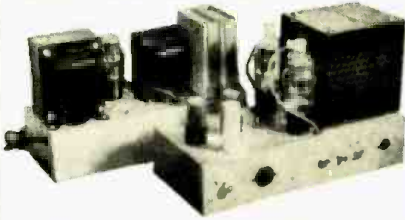
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about us, it rises up over that cool air as though it were climbing the slope of a mountain. The line on the earth's surface where the advancing warm air first meets the cold air is called a 'warm front,' and when it is advancing toward us from a comparatively short distance, we can be reasonably sure we have a thermal inversion overhead.

"After the low center has passed, the north and northwest winds will be bringing down cold air from Canada; and this advancing cold air will slide under the warm air and lift it up the way you slide a knife under a piece of pie. As soon as a cold front has passed us, the chances are excellent that we have a thermal inversion overhead. Whether or not these frontal passages will bring good TV reception depends upon whether or not the inversion area is at the proper height and in the proper position to bend the signal from a TV transmitter down to our particular location. Another consideration lies in the fact that a frontal-produced thermal inversion usually results in the moisture content of the warm air aloft being greater than that of the colder air below, which means that the moisture factor and the temperature factor are working against each other. When the warm air is from Mexico rather than from the Gulf, the approach of a warm front is much more likely to produce good TV reception, for then the air above is both warm and dry.

"Still another form of inversion is produced by what is known as a 'subsidence of air.' As you know, air moves upward from a low center, and there is a general downward movement of air in a high center to counteract this. When a large parcel of air is rapidly lowered, the temperature of that air rises about 5.5 degrees F. for every 1000 foot loss of elevation. When you place this figure alongside the normal 3.5° drop in temperature for every 1000 foot increase in elevation, you can see subsiding air will acquire a temperature considerably above that of the air below it; furthermore, the relative humidity of this warming air is greatly decreased, and a subsidence of air seldom persists clear to the ground. The end result of all this is a thermal inversion that is excellent for returning TV signals to the earth. I think the frequency of these subsidence inversions, although they do not invariably occur in every high, account for the belief that a high barometer means good TV reception."

"How about fog? I often get excellent reception on a foggy night."

"A fog means the air at ground level is moisture-saturated, doesn't it? Then the air above would be drier. And didn't we say that a change from moist air to dry air would tend to return a rising TV signal back to earth?"

"It was a dumb question," Barney admitted; "but let me see if I have the rest of it straight: the thing to look for on weather maps are conditions that will place a layer of warm dry air on top of a layer of cold, moist air

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somewhere between me and the TV station. A close study of the passage of warm and cold fronts should help do this, and I can also be on the alert when in the middle of a pronounced high, for then a subsidence of air is likely to produce good TV signals."

"That's about the essence of it, although it sounds darned meager when you put it that way. However, matching weather maps and TV reception makes a very interesting hobby and one that becomes more fascinating as you go along. After you have got the hang of weather maps from studying those put out by the Weather Bureau, you can usually get all the information you need from daily maps published in newspapers or from those shown on TV weather programs. Don't forget, though, if you encounter some good reception that simply cannot be explained by what you see on the map, it may be the ionosphere or the aurora or a meteor trail trying to mess you up!

-30-

### U.H.F. Tuner (Continued from page 38)

length of the cavities is varied by a ribbon which is attached to the dial cord and pulley arrangement, as shown in Fig. 1. In effect, tuning is accomplished in much the same way as varying the length of a tuned stub changes the frequency to which it is resonant. The dial cord is of a special material which is not affected by temperature or moisture and is locked to the pulleys which eliminates the possibility of slippage. Tracking screws are provided in the cavities to obtain uniform bandwidth and sensitivity. The tracking screws vary the capacity between the ribbon and the cavity wall and thus lengthen or shorten the electrical length of the ribbon. The oscillator tube used is a 6AF4 which is similar to the 6F4. The oscillator cavity consists of a quarter wave shorted parallel wire transmission line arrangement. It differs from the r.f. cavities in that a shorting bar is used to vary the electrical length of the cavity. This method provides very stable operation.

Inductive or link coupling is employed between the antenna, r.f. cavities, and the oscillator to transfer the signal between stages. The arrangement of link coupling gives maximum selectivity and constant bandwidth over the entire u.h.f. band. The signal from the output coupling link is mixed and detected by a Raytheon CK-710 crystal detector and then applied to the tuned input of the cascade amplifier. A 6BQ7 tube is used in the cascade pre-i.f. amplifier which is tuned to a center frequency of 25 mc. and has the features of low noise and broad bandwidth. The signal is amplified by the cascade amplifier and then coupled to the i.f. amplifier section in the receiver through 10 inches of RG-62/U coaxial cable.

The u.h.f. tuner maintains a fairly constant antenna input impedance of

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MODEL 83



MODEL 81



MODEL 82-3H

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300 ohms, has an over-all bandwidth of 6 to 8 megacycles, and has an oscillator injection current ratio of approximately 2 to 1. As can be seen from Fig. 2, the only amplification of the signal takes place in the cascade amplifier. The signal is not amplified in the r.f. cavities, therefore the sensitivity of the receiver on u.h.f. will not quite equal that of the present v.h.f. tuners. A receiver equipped with a u.h.f. tuner will have an over-all sensitivity of approximately 150  $\mu$ v.

Servicewise this tuner contains a convenient check point for measuring the oscillator grid current to determine whether the oscillator is functioning, as shown in Fig. 2, and provisions for measuring the oscillator injection current with a Simpson Model 260 type multimeter (100 microamp scale) to check both the crystal detector and the oscillator. In addition, an opening is provided for coupling to the center tap of the input grid coil for aligning the cascade amplifier.

This continuous u.h.f. tuner has quite a number of advantages over other types of tuners and converters. Since it is a continuous-type tuner it has less mechanical noise, it is self correcting for oscillator drift and, by proper tuning, interference can be minimized. The u.h.f. tuner will mount directly over the v.h.f. tuner and will be a permanent part of the receiver. Because of its design, only one tuning knob is required for both u.h.f. and v.h.f. It is a separate tuner independent of the v.h.f. tuner and does not use v.h.f. tubes or components for u.h.f. It employs the separate type of circuitry which u.h.f. demands. The tuner makes use of single conversion which has an advantage over double conversion in that double conversion is susceptible to three spectra of noise and interference whereas single conversion has only two. Because it is a continuous tuner it is capable of full u.h.f. coverage and will receive any and all of the available u.h.f. channels. It does not depend upon a plug-in strip where a v.h.f. channel is unused and is capable of receiving the high end of the u.h.f. band where a strip-type arrangement may not operate satisfactorily. —30—



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THIS month's tapes were played back through a new *Concertone* network recorder and a *Craftsmen C-500* amplifier. The speaker used was an *RCA 515S2* in an infinite baffle constructed of 3/4" knotty pine and fully treated with a lining of 1" "Ultralite" insulation.

The equipment was originally adjusted using test tapes and discs of known dynamic range and fidelity and the reviews, in all instances, are based on a known standard.

### Tapes of the Month

#### A-V #105 (MUSICAL VARIETIES)

Moonglow—Everything I Love—To Each His Own—Sleep—Dream a Little Dream of Me—Sweetheart of All My Dreams—All Through the Day—Soft Lights and Sweet Music—By a Waterfall—Smiles.

(Available in 7.5" single-track; 7.5" double-track; or 3.75" double-track)

Stock music of the type so popular with cocktail lounge crowds, for drive-in theater intermissions, and other spots where "incidental" or "fill" music is required. If you've ever read the labels on a 16" transcription from one of the numerous stock-music libraries you've noted the fictitious names of the recording artists imprinted thereon. Actually, those artists are some of the top names in the music business working under pseudonyms to avoid contractual difficulties over part-time work. Some of the names they assume are amusing, tongue-in-the-cheek plays on their real and easily-recognized names. The point is that these recordings are, performance-wise, top-notch. This critic is grateful to A-V for sparing us these coy fabrications and has simply omitted any reference to the artists.

The music on this reel is performed by small ensembles—and performed well, too. Such groupings as two clarinets, a softly-exercised accordion, and bowed bass are mighty easy listening. One bad point, however. This reel has at least three different ensembles performing. Some of the segues, such as between the first and second selections which change from predominant reeds to strong strings, are rather disturbing. A more intelligent and tasteful assembly job is called for here.

#### A-V #301 (MOMENTS IN MUSIC)

In the Blue of the Evening—Do I Love You—Valse Bluette—Just Let Me Look At You—A Pretty Girl Is Like a Melody—Shepherd King Overture (Mozart)—Eine Kleine Nachtmusik Excerpts—Plaisir D'Amour (Martini).

(Available in 7.5" single-track; 7.5" double-track; or 3.75" double-track)

The 100 Series in A-V's catalogue is called "Musical Varieties." The 300 Series is called "Moments in Music." What we are wondering is how does the person who assembles these reels

September, 1952

### SCR 625 Famous Army Mine-Detector

For Prospectors, Miners, Oil Companies, Plumbers, etc.

This unit is being offered now at a considerable reduction in price. Recently advertised at \$79.50 it is now available in the same brand new wrappings in suitcase style carrying case (less batteries) at **\$59.50** WHILE THEY LAST! Used, like new, \$39.50

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HS-33 Low Impedance Headset, exc.	\$2.95	new	\$4.95
HS-23 Headset, used	\$2.95	new	\$4.95
CD-307 Ext. cord for HS 23-33, like new	1.29		
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Lip Mike—Navy Type, New	.98		
Extension Cord and Switch Assembly for lip and throat Mikes, New	.98		
CW 49505 High Impedance headset complete with leather headband and rubber cushions, Used	\$1.95		
RS-38, Microphone, new	\$4.95		
TS 10 sound powered HAND SET, used, ea.	5.95		
HS-38, exc.	\$1.95	new	2.29
HS-30, miniature headset, new	2.49		
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HB-7 Headband, used, exc	1.25		

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BC-496, 2 position Rec. Control Box		1.95
MC-215 Mechanical Drive Shaft, per length		2.45
BC-450 3 Receiver Remote Control	1.29	2.95
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BC-442 Antenna Relay, less condensers—used, as is	1.29	

BC 604 FM Transmitter—20-27 mc. 10 Channel crystal controlled push-button, excellent for conversion to 10 and 11 meters, small quantity on hand, in good used condition, less dynamotor, some missing side covers, etc.—otherwise complete, including tubes **\$7.95**  
Like new . . . \$12.95

RT 34 APS 13 Transceiver used as a tail warning radar on 415 MC. Containing a 30MC IF Strip and various other parts, these units have been stripped of RF sections and all tubes but are an excellent buy if only for parts and IF Strip. Used . . . \$4.95

### WOBUlator

See page 43—December "Radio News" \$5.95 ea.

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decide whether a particular selection is for Series 100 or Series 300. The same groups are heard, playing the same faultless, stolid tempos and rhythms in both series.

This reel had a particularly unpleasant treble. It seemed to whine with *glissando* violins and a *bawling* piano. It might afford pleasure to the tone-deaf or entertainment for the aged. Its "Moments in Music" are very dull ones.

The listener to this one is in for a "reel" surprise about half-way through when, suddenly, Mozart is spashed at him in a sudden burst of a furiously-rendered "Overture To The Shepherd King." Too much incongruity for us.

### A-V #607

Chorale in A Minor (Franck)—Blessed Are Ye Faithful Souls (Brahms)—Chorale in B Minor (Franck).

Robert Owen, Organist  
(Available in 7.5" single-track; 7.5" double-track; or 3.75" double-track)

Who is Robert Owen? Well you may ask. We'd never heard of him either until we received this reel of tape for review. A telephone call to *A-V Tape Libraries* brought us the following biographical and recording notes.

"Robert Owen, one of the nation's outstanding young organists, is a graduate of the Oberlin Conservatory of Music, and a student of Arthur Poister and Carl Weinrich. He has been organist and choirmaster of the Christ Church in Bronxville, New York, for the past nine years and was, until recently, Dean of the Westchester Chapter of the American Guild of Organists. In 1948 Robert Owen was selected to take charge of the music of the American Cathedral in Paris. On his return to America, he was invited by E. Power Biggs to play one of the major recitals at the national convention of the Guild of Organists held in Boston. His recitals have been highly acclaimed by the public and music critics. He has been devoting his time to the extensive music program of the Christ Church and to private teaching."

This critic admires the talent of this Robert Owen, organist. His performance is moving and as compelling as we have heard. He demands and achieves great swelling chords from the rich, warm, lusty throat of his instrument. The recording quality of this particular reel is one of the best we've heard from the A-V catalogue—good clean sound with no over-emphasis at any part of the spectrum. We recommend it highly.

### A-V #1006 (CONCERT HALL)

Part 1. Sinfonia Concertante for Oboe, Clarinet, Horn, Bassoon, and Orchestra in E Flat Major (Mozart)

Part 2. Symphony No. 41 ("Jupiter") in C (Mozart)

Austrian State Symphony,  
Kurt Woss, conductor

(Available in 7.5" single-track; 7.5" double-track; or 3.75" double-track)

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like itself the Austrian State Symphony can sound as we go from one reel of its music to another. On this reel it runs the entire gamut of good and bad likenesses.

At the very opening of Part 1 the sound is excellent, making one lift one's eyebrows and settle back to what appears to be a reel of good sound, live acoustics, and well-placed microphone pickups. However, after about seven minutes of listening, the eyebrows' lift becomes an arch because the sound has changed from live to almost dead and back and forth again. This might have been caused by a re-recording engineer with a heavy hand for equalization which can change acoustics somewhat by altering the harmonic relationships and timbre of the instruments.

**A-V #1008 (CONCERT HALL)**

Part 1. Symphony No. 5 in E Minor, Opus 64 (Tchaikovsky)

Austrian Symphony Orchestra,  
Kurt Woss, conductor

Part 2. Symphony No. 5 (Concluded)

Capriccio Espagnol (Rimsky-Korsakoff)  
Austrian Symphony Orchestra,  
Ernest Melich, conductor

(Available in 7.5" single-track; 7.5" double-track; or 3.75" double-track)

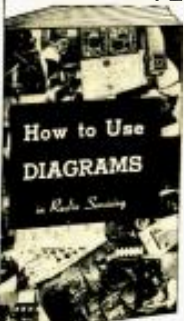
This is a bad one—one of the worst. From the very beginning through to the very end it is bad. We listened to it shortly after auditioning the "Robert Owen" reel and this probably made the contrasting qualities all the more pronounced. The performance is horribly full of wince-producing "clinkers," especially during the many soft string passages. Obviously poorly rehearsed and economically-produced. With the wonders of magnetic tape as an original recording medium available, there is no excuse other than economy for allowing "clinker" passages to stay in the final tape.

Technically, this tape is a queer one. It lacks bass, is over-brilliant to the point of being shrill, and has some distortion which sounds much like an overloaded microphone preamplifier. However, suddenly the tape quality cleaned up at the very last portion of the "Capriccio Espagnol."

-30-

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1L6	.43	6AQ6	.37	6GG6	.52	7N7	.47	25Z6GT	.37
1LC5	.51	6AR5	.37	6H6GT	.41	7X7	.70	25W4	.56
1N5	.46	6AS5	.50	6J5GT	.37	7Y4	.34	26	.45
1P5	.57	6AT6	.37	6J6	.52	12AL5	.37	27	.39
1Q5	.58	6AU6	.38	6J7G	.43	12AT6	.37	32L7	.85
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1T5	.53	6B5	.64	6L6	.64	12AV6	.39	35W4	.37
1U4	.45	6BA6	.39	6Q7	.45	12AV7	.59	35Z4	.39
1U5	.39	6BA7	.57	6S4	.38	12AX4	.48	35Z5GT	.37
1X2	.63	6BC5	.44	6S8	.53	12AX7	.48	36	.60
2A3	.70	6BC7	.71	6SA7GT	.43	12AZ7	.69	41	.42
3A4	.45	6BD5GT	.59	6SD7GT	.41	12BA6	.38	42	.42
3E5	.46	6BD6	.45	6SG7GT	.41	12BA7	.46	43	.55
3Q4	.48	6BE6	.39	6SH7	.73	12BD6	.45	45	.55
3Q5GT	.49	6BF5	.41	6S17GT	.41	12BE6	.39	50B5	.39
3S4	.46	6BF6	.37	6SK7GT	.41	12BF6	.39	50C5	.39
3V4	.47	6BG6G	.94	6SL7G1	.48	12BH7	.63	50G6	.59
5U4G	.40	6BH6	.46	6SN7GT	.52	12K7GT	.46	50L6GT	.41
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By BERT WHYTE

I AM writing this about three weeks before I leave for Chicago to attend the convention of the National Association of Music Merchants. As I have noted in these pages before, this is the place where the stereo disc gets more or less "officially" launched. Quite obviously, after that time, stereo discs will be the subject of reviews and given the same attention as their monaural counterparts.

As most readers are aware, there have been a trickle of stereo discs from a number of the small independents and I have managed to get my hands on a few of the stereo discs that will be issued by the major labels. I have not reviewed them, for a number of reasons. First and foremost, I don't feel that what I hear can be classed as representative of the type of stereo disc sound that will be offered after the NAMM convention. This is not necessarily meant in a derogatory sense. In fact, I would go so far as to say that some of these present recordings, being virtually "hand-made," with a lot of time and patience lavished on them, may sound much better than the run-of-the-mill production stuff. It is also true that I have heard some incredibly poor material passed off as stereo discs.

Out of the convention will undoubtedly emerge a median level of the quality we can expect from a stereo disc, as well as outstanding individual quality discs. My own feeling as regards reviews of stereo discs is that, whenever possible, the stereo disc should be compared to its monaural disc and stereo tape counterparts. At least, this type of review should be used until all the "bugs" have been ironed out of stereo discs and they have reached a certain uniform level of acceptable quality. Of course, if the stereo disc never had any previous issue as a monaural record or a stereo tape, this would have to be an exception. Maybe I'm all wet, in this thinking, but I feel there is a need for the comparative review approach in the early stages of the stereo disc. Your comments on this question would be welcome and I'll go along with the majority on how stereo discs should be reviewed.

### FALLA

**MASTER PETER'S PUPPET SHOW  
CONCERTO FOR HARPSICHORD**  
Robert Veyron-Lacroix, harpsichordist.  
National Orchestra of Spain conducted  
by Aaulfo Argenta. London LL1739.  
Price \$4.98.

Here are two of Manuel de Falla's lesser-known works that deserve a wider public. "Master Peter's Puppet Show" is unusual in form, in scoring, and in presentation. There are three principal characters calling for a soprano, tenor, and baritone. The singing required of them is very different and off-beat in his score. Falla gives specific instructions about how the roles are to be sung and

they are particularly directed not to "be too musical, or lyrical, or theatrical." If this sounds like the result would be awful, I assure you that it isn't. The usage is unique and you have to hear it for yourself, rather than trust to a description.

As with most Falla works, it is very colorfully scored with much use of percussion. This is apparent right from the opening bars with the roll of tympani and the rattle of snares. Throughout the score the sound is very clean with especially notable brass. Transients in all respects are quite free from distortion. Argenta's performance is absolutely masterful and true to the idiom. He realizes much more of the essential feeling of the work than do any of the other conductors in the competing versions.

The "Concerto for Harpsichord" is also most unusual. A prime reason is, of course, that the harpsichord is rarely used in modern works. Falla nods his head towards classical form and structure in this work, but all the rest is quite original and the harpsichord is used in ways that I'm sure the classicists never did! There is plenty of rhythmic drive in the score and the general flavor of the work still smacks of the Iberian school. Fine recording here, too, with the harpsichord miked quite close and with a subsequently "larger-than-life" sound, which is perfectly legitimate here. All-in-all, I found this a most rewarding musical experience.

### PROKOFIEV

**ROMEO AND JULIET BALET  
(EXCERPTS)**

New York Philharmonic conducted by  
Dimitri Mitropoulos. Columbia ML5267.  
Price \$3.98.

If ever a piece of ballet music was recorded in all conceivable formats to satisfy almost any taste, it is Prokofiev's "Romeo and Juliet." Depending on your liking of the work and how much you want to hear of it, it can be found on LP as a complete ballet or in the form of single, double, or triple suites. What's more, there are even multiple recordings of each of the forms. Mitropoulos draws on the first two suites for his material, selecting nine scenes which he has arranged more to the letter of the dramatic action of Shakespeare and less to the musical ideas of Prokofiev. Far from being odd sounding, these juxtapositions blend together quite logically and are certainly enjoyable to hear.

Mitropoulos' reading here brings out the colorful scoring and brilliantly shows off the orchestral palette. His pace is a bit faster than most and although his handling of the slower sections is most evocative, he can't

The opinions expressed in this column are those of the reviewer and do not necessarily reflect the views or opinions of the editors or the publishers of this magazine.

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## Antenna Testing

(Continued from page 58)

As has been mentioned, direct signals from a New York station were employed. This approach was preferred not only because it simulated actual consumer operation, but also because incidental difficulties arise when a special signal is generated for gain and directivity testing purposes. These include distortions of the radiated field because of the radiating equipment's proximity to the transmitter, with attendant reflections, etc.

The directivity patterns of the yagi were also determined by receiving signals from a New York City station. The test antenna was mounted in a selected position on the Hazeltine lab roof (simulating free space), and fixed to a mast capable of revolving around a full 360° traverse. It was then connected by balanced, shielded 300-ohm lead-in wire to the monitor receiver.

The need for the 360° traverse was indicated by the fact that it is the only means by which a really full pattern can be obtained. Sometimes, yagi directivity tests are conducted over a 180° area and then charted over the full azimuth by "dopping" the half circle graph. This results in the perfect-looking graph so often seen. Its remarkable symmetry, however, is rarely accurate.

The calibrated monitor receiver was again tuned to the test channel and the antenna rotated. Every 10 degrees, the output was noted. Since the signal was undisturbed and in relatively free space, the recorded figures could be accepted as final. For additional assurance, however, the shielded transmission line passed through a finely-balanced antenna transformer at the receiver in order to eliminate unbalanced pick-up on the antenna's

transmission line which might have obscured its true directivity pattern. After the full 360° traverse had been covered, the patterns shown in Figs. 1A and 1B were obtained. Front-to-back ratios for the single bay and stacked arrays are, in order, 3 1/2 to 1 (or 10.8 db) and 4 to 1 (or 12 db).

Since testing the antenna impedance of balanced systems with an unbalanced slotted line (characteristic impedance 50 ohms) caused confusion and generally produced inconsistent answers, it was decided to build new and better apparatus for such studies.

This device consists of a balanced slotted line with a characteristic impedance of 104 ohms. During these tests, two shielded coaxial cables with the same characteristic impedance were used to connect the balanced slotted line to the yagi.

A square-wave modulated r.f. signal was then fed to the end of the balanced slotted line. When the line was shorted at the antenna terminals, a null was detected. Following this, the line was opened, the antenna connected to it, and another null detected. The

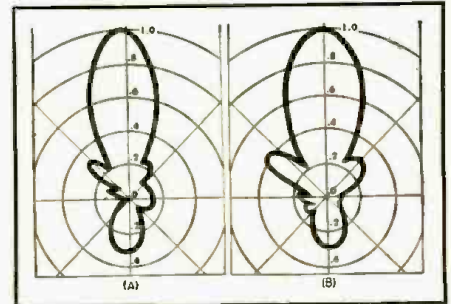
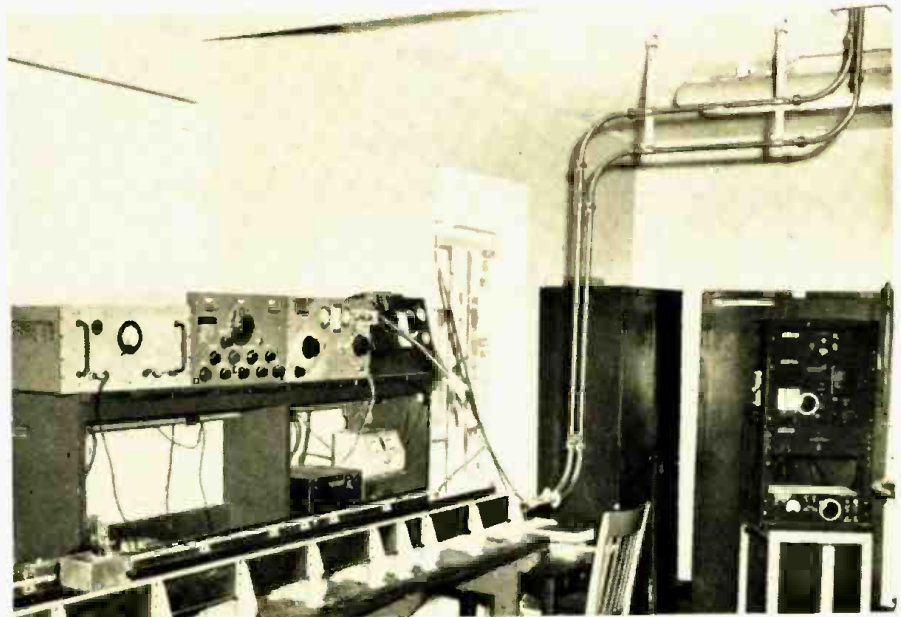


Fig. 1. (A) Directivity pattern of JFD Model 10Y7 single high-band yagi cut for Channel 7. The gain is 9.5 db with respect to the folded dipole with both antennas working into matched loads. (B) Directivity pattern of JFD Model 10Y7S stacked high-band yagi cut for Channel 7. Gain is 12 db under almost the same conditions as (A).

Laboratory set-up at Hazeltine showing calibrated monitor receiver, balanced slotted line, shielded coax running from antenna mounted on the roof, and other test gear.



distance between the two was charted on a special hemisphere chart and, using this, the impedance and standing wave ratio of the yagi could be read.

This hemisphere chart, designed by *Hazeltine* in the form of a nomograph, translated the measured data into actual impedance.

For impedance studies of the two-bay arrays, special balanced-line matching transformers were designed. Of course, they played an important part in gain research too, as has been discussed.

However, for the two-bay impedance inquiry, engineers proceeded from one basic characteristic of transmission lines: the characteristic impedance of transmission lines is dependent on the ratio of the spacing of the lines to the diameter of the wire. It was concluded that a pair of quarter-wave matching transformers made of #6 gauge wire (aluminum) and spaced three inches apart will have a surge impedance of 600 ohms. Placing two of these in parallel at the take-off point gives the desired 300-ohm impedance to match that of the set.

The design and tests of *balanced-line*, impedance-matched 10-element yagis have since been completed for all v.h.f. channels and one for both Channels 4 and 5. In each case, engineers who worked on the project have proved to themselves the effective application of balanced line testing.

-30-

### METER CASES

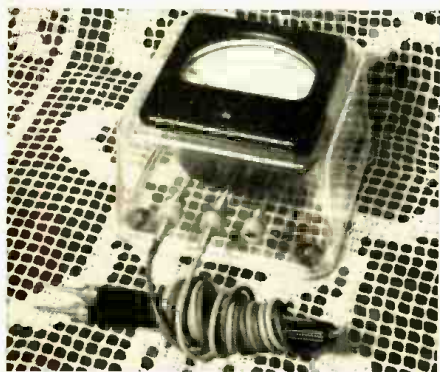
By ARTHUR TRAUFFER

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-30-

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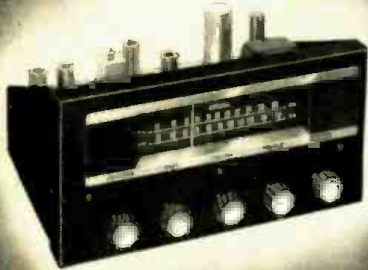
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### Instrument Probe (Continued from page 65)

Finally, with  $C_1$  properly adjusted, a "perfect" square wave will be observed on the screen of the CRO, as shown in Fig. 5C.

It is mandatory, of course, that the CRO used for adjustment be capable of reproducing the square-wave signal used without distortion. If in doubt as to the capabilities of your instrument, check the appearance of the square-wave signal on the CRO without the probe in place before attempting adjustment of  $C_1$ .

After  $C_1$  has been properly adjusted, using the procedure outlined above, the attenuation obtained may be checked by using a sine-wave signal.

First, connect a sine-wave signal generator (a 400-cycle signal is satisfactory) directly to the input of the CRO. Adjust the output control of the signal generator and the vertical gain control of the CRO until an arbitrary deflection is obtained on the screen of the CRO (using the transparent graph screen as a guide). A deflection of 10 squares is generally used by the author.

Next, without changing the output of the signal generator or the gain control of the CRO, remove the direct connections between the signal generator and the CRO, using the probe instead. The deflection obtained will be reduced, with the ratio of deflections being equal to the attenuation obtained with the probe.

As an example, if 10 squares are obtained with the probe out of the circuit, and only two squares deflection with the probe in place, the attenuation is 5:1. If one square is obtained with the probe in place, the attenuation is 10:1.

If reasonable care is taken in construction and adjustment, it is possible to construct a probe which will provide a low capacity input and which will be essentially "flat" in frequency response from d.c. to better than 10 or 15 megacycles. The probe must be adjusted for the instrument with which it is to be used and can be used with other instruments only if readjusted (unless the input capacity and input resistance of the other instruments are equal to those of the instrument for which the probe is adjusted).

The basic procedure described may be used for designing and building a probe for use with any test instrument, whether a CRO, a v.t.v.m., a signal tracer, a distortion meter, or a frequency measuring device.

Since the number of parts necessary for construction is held to a minimum, and since construction and adjustment time together will seldom exceed an hour or two, the experimenter or technician may find it advisable to build low-capacity test probes for each of his test instruments. The instrument for which the

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probe is intended, the attenuation obtained, and the input capacity and resistance may be marked directly on the probe case for ease of identification.

If the input capacity and resistance of a particular instrument are not known, this data can generally be obtained from the manufacturer, by reference to the schematic diagram, or by direct measurement. When measuring the input resistance of an instrument, make sure any d.c. blocking condensers used in series with the input are shorted out. —30—

**Antenna Tuning Unit**  
(Continued from page 63)

so that when in the fully meshed position, it shorts the condenser out of the circuit and provides a ground return when the equipment is used in a grounded-tuned circuit arrangement.

The coil is another surplus item which was obtained for the price of a good cigar. It is a *Barker & Williamson* TA type having a diameter of 2 3/4 inches and comprising 40 turns of wire spaced the wire diameter.

Inductance in the circuit is determined by the setting of the three ceramic switches originally in the surplus unit. Two of these switches must have an open position and since they did not come that way, an additional notch was filed in the detent plate to provide this position.

One other addition is a surplus 0-2 ampere r.f. meter (thermocouple type) also from the surplus market. These are excellent meters and the one used here was made by *Triplet* and bears

the identification marking KS 8788. Link coupling is normally provided for the tuned circuit set-up although capacity coupling may also be used if desired.

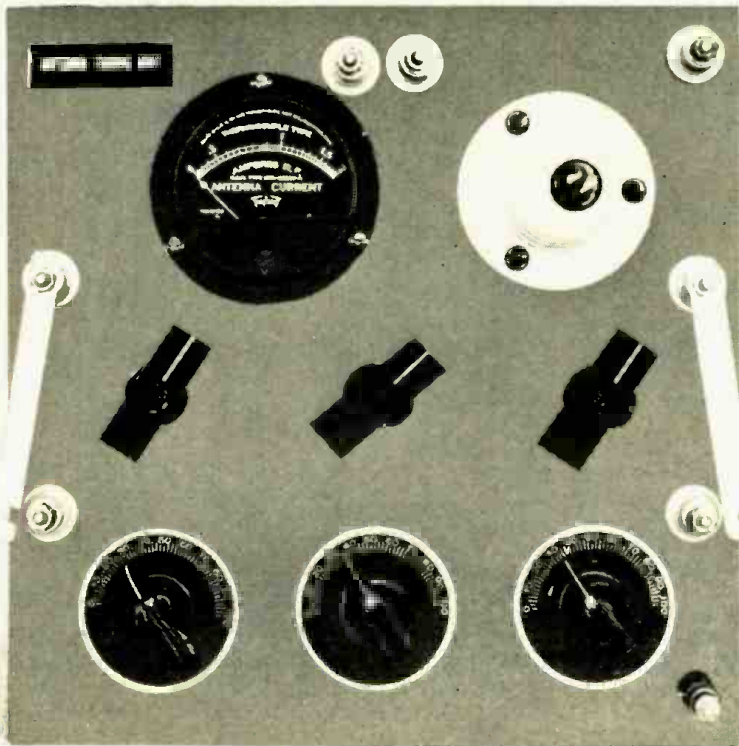
Since the original case was much too long for our purpose, part of it was trimmed off with a hacksaw to make a case 8" x 8", x 8". All controls were mounted on one face of the box.

Provision was made for strapping between binding posts on the front panel for the various modes of connection and this is shown in Fig. 2. The straps may also be seen in the photograph of Fig. 3.

Fig. 1 is a view of the inside arrangement. The link coupling is shown going to the end of the coil where one turn at a time is selected by the ceramic switch. The other two switches select progressively larger amounts of inductance per step as shown.

In Fig. 3, the two binding posts on the top edge of the panel are for link input when using the gadget as a tuned-circuit device. If condenser input is desired instead it may be brought to the upper of the two binding posts on the left-hand edge of the panel. The large insulator is for the antenna connection. The three ceramic binding posts on the right-hand edge of the panel are for strapping as per the diagram. Next are the knobs for the three ceramic switches. Below them are the condenser controls, the two outside ones for the pi network, when used, and the center one for the tuned circuit, when used. In the extreme lower right-hand corner is the binding post for the ground connection. The stand-off insulator to which the antenna connection is made may be seen just to the right of the r.f. meter. —30—

Fig. 3. Front view of antenna tuning unit. Surplus parts were used in construction.



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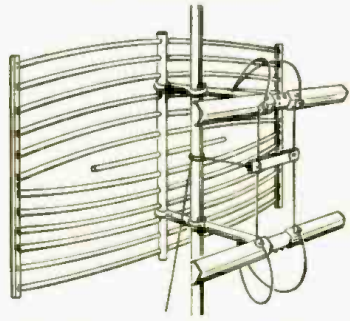
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**Transistor Development**  
(Continued from page 45)

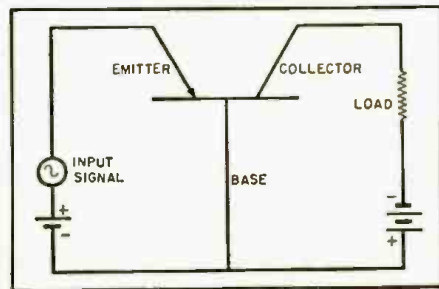
plete assembly is then embedded in a thermosetting plastic to provide ruggedness and freedom from atmospheric contaminants. The final process, and one of the most important, in transistor fabrication is electrical forming. In this process, relatively large surges of current are passed through the collector to the base. The importance of "electrical forming" will be explained shortly.

**Point-Contact Rectification**

Before the operation of the transistor in specific circuits is covered, it is important to discuss briefly the current rectification obtained when the metal point electrode makes contact with the germanium-crystal surface. When this contact occurs, a nonlinear relationship exists between a voltage applied to and the current flowing through the point of contact. A so-called "barrier" to the flow of current will be present or absent depending upon the polarity of the voltage applied to the metal point. For instance, if a metal point contacts the surface of an "n"-type germanium, the barrier will be absent and a large forward current will flow if the metal point is biased positively with respect to the crystal. If the point is biased negatively with respect to the crystal, the barrier will be present and only a small reverse current will flow. If the germanium is a "p"-type, the forward current will flow when the point is biased negatively with respect to the crystal. One explanation of this barrier is that it is a very thin layer at the surface of the crystal which acts as an insulating layer. If the germanium resistivity is too low, this insulating barrier at the surface does not exist because of the large number of current carriers present both in the interior and on the surface of the germanium, and poor rectification results.

Fig. 8 is a diagram of a transistor amplifier circuit utilizing the "n"-type transistor. In this circuit the collector is biased negatively with respect to the base. The emitter, also shown in Fig. 8, is biased positively with respect to the base. If we first assume that no voltage is applied to the emitter, the collector will draw approximately 0.5 milliamperes if a negative voltage of 25 volts is applied to the

Fig. 8. Transistor amplifier circuit.



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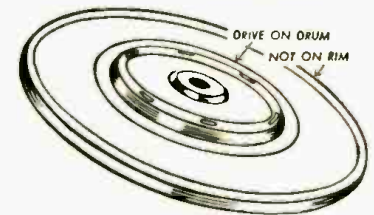
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collector contact. Then, if a positive voltage is applied to the emitter contact, electrons will be drawn into the emitter and a flow of holes from the emitter will be attracted to the negative field of the collector, thereby increasing the collector current appreciably. Now, with both the emitter and collector drawing current, a small signal voltage is applied to the transistor as indicated in the circuit diagram. As the applied voltage swings positive, the emitter current will increase, thereby increasing the collector current by supplying additional holes. On the negative swing of the signal voltage, the collector current will decrease. If the assumption is made that every unit of hole current which leaves the emitter reaches the collector, it follows that a small change in emitter current will result in an equivalent change in collector current, producing a current amplification factor of one. The current amplification factor is defined as the ratio of the change in collector current to a change in emitter current when the collector voltage is maintained constant. A very significant characteristic of the transistor, however, is that this current amplification factor may actually be two or greater. Factors greater than unity are made possible by the electrical "forming" process previously described. One explanation of the results of this process is that a space charge of holes is formed around the collector point. It appears that this positive charge increases the electron flow from the metal collector to the germanium and accounts for the increased current amplification.<sup>1</sup>

The transistor amplifies not only input current, but also power. Because the emitter is biased in the forward direction, only a small impedance to the flow of current exists; therefore, the input impedance of the transistor is fairly low, on the order of 500 ohms. The collector, on the other hand, is biased in the reverse direction; it offers a higher impedance, therefore, to the flow of current. The collector resistance comprises the greatest portion of the output impedance of the transistor. The load resistance, to provide a proper impedance match, must be fairly high, on the order of 10,000 to 20,000 ohms. With the input signal applied to the transistor at a low impedance and the output taken from a high impedance, power amplification results.

In the "p"-type transistor, electrons are emitted from a negatively biased emitter and are collected at a positively biased collector. In general, the "p"-type transistor<sup>2</sup> has characteristics similar to the "n"-type unit, except that in operation all battery polarities are reversed. This type need not be discussed in detail here.

(To be continued)

- Shockley, W.; "Electrons and Holes in Semiconductors," D. Van Nostrand, 1950
- Fleming, W. G. and Scaff, J. H.; "The P-Germanium Transistor," Proceedings of the I.R.E., Vol. 38, pages 1151-1154, October, 1950

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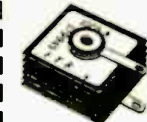
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2E26	3.15	217C	8.49	921	.95	ZH3200	145.00	6H6	.72	12K7GT	.72
2E30	2.45	227A/5C27	4.59	921	1.10	0A2	1.15	6H6	.85	12K7GT	.72
2E31A	2.95	300B	3.69	927	1.25	0A4G	1.15	6H6	.85	12K7GT	.72
2E31B	7.75	250R	21.95	931A	4.50	0B2	1.39	6F6	.85	14A4	.89
2E32	24.50	250TH	17.95	934	.25	0Z4	.45	6F6	.85	14A4	.85
2E33	67.50	300TL	17.95	934	.25	0A1	.65	6F7	.85	14F7	.82
2E34	29.95	28D4	2.25	945	.75	1A2	3.95	6G6	.95	14F7	.85
2E31	27.50	274A	5.50	946	.35	1A4P	.75	6G6G	.95	14F8	.85
2E32	27.50	274B	2.95	957	.39	1A6GT	.85	6H10	.65	14F8	.85
2E33	27.50	300B	3.69	968	.69	1A7	.85	6H10	.65	14F8	.85
2E34	27.50	300A	2.69	974	3.95	1A7GT	.85	6H10	.65	14F8	.85
2E36	110.00	294A	3.95	991 NF10	3.95	1A8	.69	6H10	.65	14F8	.85
2E37	11.95	300B	3.69	1008	4.35	1B1	.69	6H10	.65	14F8	.85
2E38	11.95	300TH	8.95	1013	.79	1B1/8016	.79	6H10	.65	14F8	.85
2E39	44.50	104TL	8.95	1014	2.49	1B1/25S	.82	6H10	.65	14F8	.85
2E40	39.50	305A	3.95	1015	2.45	1B1GT	.82	6H10	.65	14F8	.85
2E41	39.50	307A	4.45	1019	.24	1C0GT	.75	6H10	.65	14F8	.85
2E42	24.50	310A	5.95	1022	2.45	1C0	.69	6H10	.65	14F8	.85
2E43	34.95	310A	5.95	1022	2.45	1C0	.69	6H10	.65	14F8	.85
2E44	21.50	323A/B	23.95	1025	.35	1H6GT	.69	6H10	.65	14F8	.85
2E45B	32.50	327A/5C17	4.75	1026	.35	1H7	.65	6H10	.65	14F8	.85
2E46	32.50	327A	4.75	1026	.35	1H6GT	.69	6H10	.65	14F8	.85
2E47	44.50	351A	11.95	1030	.75	1H6GT	.69	6H10	.65	14F8	.85
2E49	47.50	350A	6.45	1031	1.75	1E7G	.95	6H10	.65	14F8	.85
2K25	28.75	350B	6.45	1032	1.75	1E7G	.95	6H10	.65	14F8	.85
2K28	32.50	371A	.95	1034	.75	1G4	.65	6H10	.65	14F8	.85
2K29	32.50	371B	.95	1038	.75	1G6GT	.65	6H10	.65	14F8	.85
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quite match the dramatic power and warm expressive beauty of the Stokowski version.

Soundwise this is one of the best *Columbias* in some time. The recording is moderately close-up and favored with fine spacious acoustic balance, making for crisp orchestral detail with a fine sense of "liveness." Strings throughout were very bright but avoided any stridency, winds were smoothly balanced against rather weighty and imperious brass. Percussion was sharp and accurate but would have been better with more impact. Dynamics were fairly wide and, all-in-all, little distortion was in evidence. This is probably the best recorded of the "shorter" suite versions of the ballet.

**DEBUSSY  
THREE NOCTURNES  
LA MER**

Concertgebouw Orchestra of Amsterdam conducted by Eduard Van Beinum. Epic LC3464. Price \$3.98.

What can one say about the umpteenth performance on disc of these well-worn works? Has this version something which makes it more desirable than all the rest? Well, without laboring the point, we can say that this is a good, expressive job of conducting, which flaunts no mannerisms and hews to the line on tempi. It is better than most available versions, not as good as the Paray and Toscanini readings.

One big point that may weigh heavily with some is that the orchestra is absolutely superb, a really virtuoso group that certainly is as good or better than any in Europe. The strings and woodwinds here are really luscious. Soundwise this is well and cleanly recorded, with fairly wide dynamics and reasonably spacious acoustics. In sum, a pleasant disc, representative of the works involved, but not of such overpowering excellence as to usurp one's affection for several other versions.

**JOHN SEBASTIAN PLAYS BACH**

John Sebastian, harmonica; Paul Ulanowsky, pianist. Columbia ML5264. Price \$3.98.

Musical purists can stop right here, the very thought of a Bach sonata for piano and flute being transcribed for harmonica is enough to make them turn green. For others of a more inquiring nature, they will find that Mr. Sebastian is indeed a virtuoso of the harmonica and his transcriptions are all done in the very best of taste. I can't say that I personally care for the odd sound of the harmonica in what is ordinarily the flute part, but I must admit that Sebastian plays with real musicianship and after a while the sound sort of grows on you.

Ulanowsky furnishes particularly perceptive accompaniment to Sebastian and the whole has been very cleanly recorded, quite close-up, affording a proper and intimate sound with plenty of presence. Offbeat to be sure, but for anyone afflicted by musical ennui, perhaps it's just the ticket.

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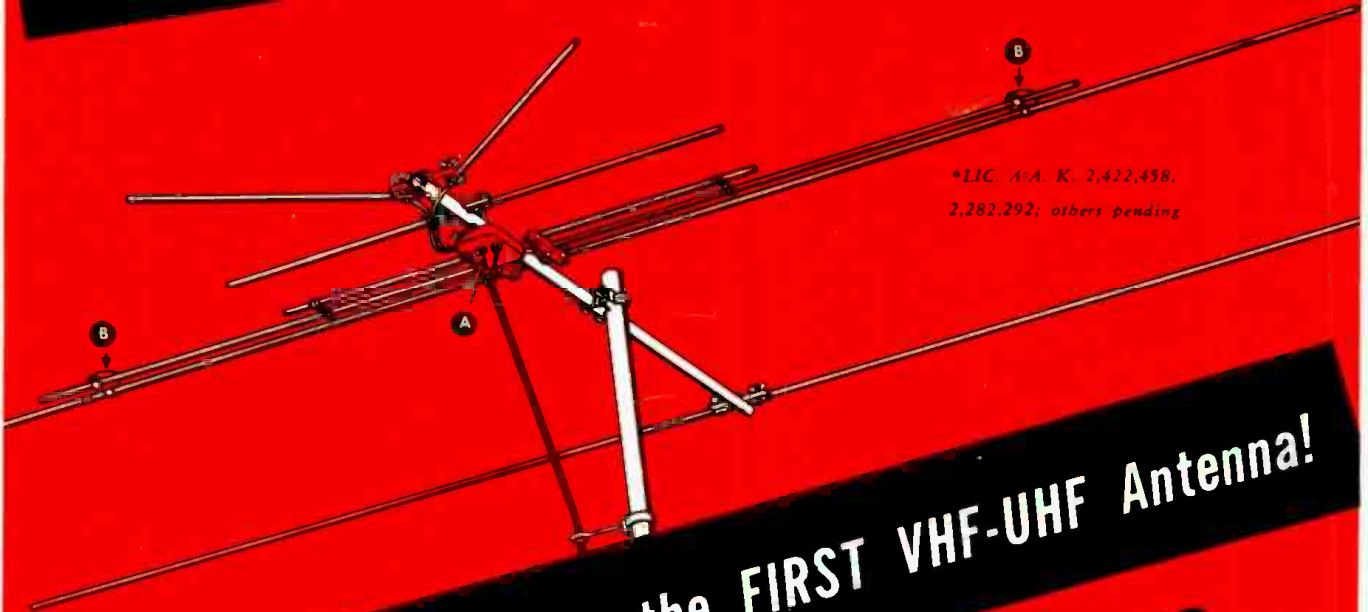
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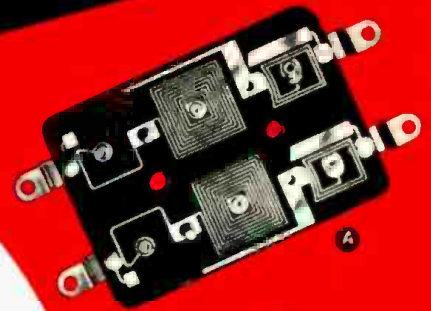
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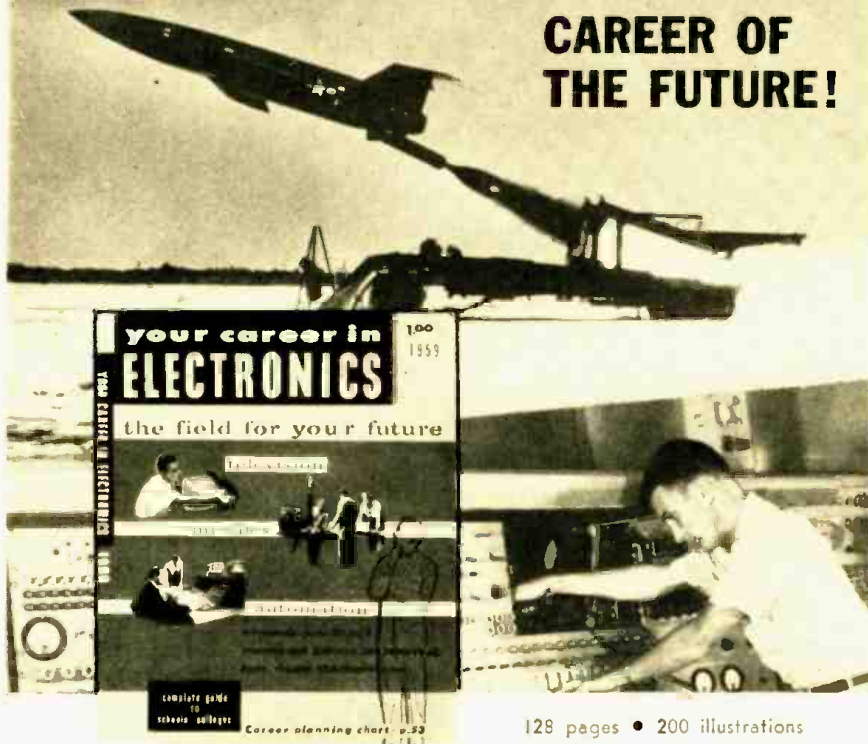
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is a rare individual who can resist its blandishments. The recording is of course that well-known and seemingly impossible blend of spotlighted ultra-sharp orchestral detail with rounded spacious acoustics which justly earns *Mercury's* soubriquet, "Living Presence." In every aspect of orchestral writing and color, this is recorded to bright-faceted perfection. The strings are smooth and edgeless and yet can zing and zip incisively when the score demands. The brass is awesome in its huge brazen liveness and weight, the woodwind so beloved by Copland are a pristine pure-toned delight. The percussion is simply staggering. The tympani and especially the bass drum in "El Salon Mexico," are among the biggest and loudest ever recorded. I guarantee you that through a big speaker driven by plenty of watts at a good room-filling level, the impact of that drum is almost frightening! And it's all nice and clean too, not lost in a sea of mud. I don't know whether it's the combination of music and ball and recording technique, but this is the best *Mercury* recording in a long time and I urge any who are interested in exciting sound and music not to miss hearing this outstanding disc.

### THE WEAVERS AT HOME Vanguard VRS9024. Price \$4.98.

The ubiquitous Weavers are here again, as ingratiating as ever in a program of folk tunes of very wide origin and musical content. This is a group that most people either like with a vehement passion or detest with equal gusto. I freely admit I have never been much "taken" with the folk idiom, but this is one bunch that gets my vote for their sincerity and charm and downright solid musicianship. *Vanguard*, as usual, furnishes the group with bright, clean, well-balanced recording.

### GEMINIAN!

### CONCERTI GROSSI (OPUS 7) I Musici. Epic LC3467. Price \$3.98.

This is another in *Epic's* series of "Monumenta Italicae Musicae" and is, in every respect, equal to the fine quality of its predecessors. Admittedly, this is not music with a universal appeal, but to those who appreciate the similar writings of Corelli and Vivaldi, this will furnish much enjoyment. The *I Musici* is, as always, a splendid ensemble which plays with such dedicated musicianship as is rarely found these days. Under their expert urgings, these five concerti grossi are vibrantly fresh in melodic invention and revealing of rich harmonic structure.

This recording is quite high level and the over-all musical effect rather on the "big" side . . . perhaps a shade too much for a chamber-type work. The recording is close-up with just enough acoustic liveness to give depth and roundness to the sound. String sound is for the most part quite smooth and really quite opulent. For my taste I thought there was a trifle too much resonance in the bass line and sharper definition here would have been quite beneficial.

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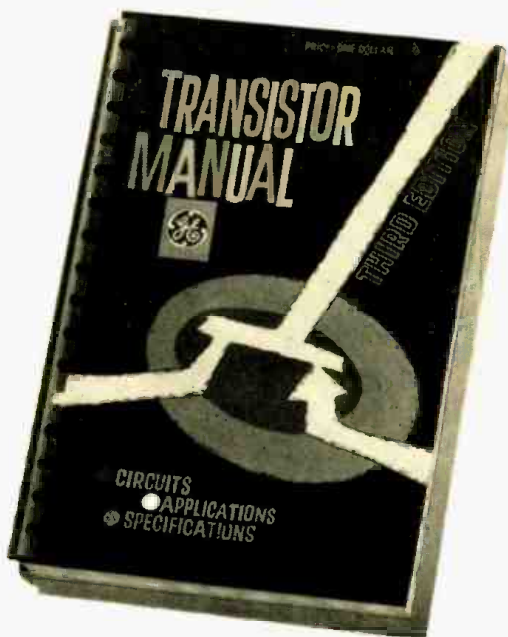
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| Hi-Fi Circuits             | Silicon Controlled Rectifier  |
| Radio Circuits             | Power Supply Circuits         |
| Unijunction Circuits       | Specifications                |

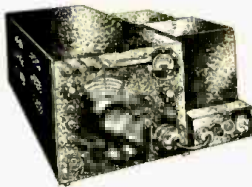
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Here, however, he is in good form furnishing bright sympathetic accompaniments, somewhat briskly paced for the soloists. The Haydn piece has always been one of the supreme tests of trumpet virtuosity which Longinotti impresses upon us.

The flutist does very well in his piece and as a whole the Mozart is the best conducted of the three works on this disc. The horn player is proficient and fluent, but I fail to detect much warmth or expression in his effort. Soundwise this is exceptional for the brilliant exposition of the trumpet and the smooth clarity of the flute, all neatly balanced with the orchestra. Wide dynamics and very quiet surfaces are plus virtues of an enjoyable disc.

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Friedrich Gulda, pianist. London LL-1785. Price \$4.98.**

Friedrich Gulda continues to buck the almighty competition of Gieseking and Casadesu in his review of the Debussy and Ravel piano literature. More often than not he is quite successful and in this instance more so. With Debussy he tackles "Reflections on the Water" and "Pour le Piano" among others and outside of a slight percussive hardness to his tone, he leaves little to be desired in terms of expressive dynamics and phrasing.

With Ravel he essays the "Sonatine" and "Valses Nobles et Sentimentales." In the "Valses" he reveals an exquisite fluency and grace coupled with considerable warmth and, with his slightly elevated tempi, the work is a complete delight. The artist is greatly aided by the sharp, pristine cleanness of the piano, recorded fairly close-up for a fine sense of intimacy with just a hair of reverb to lend presence.

-30-

### 25-Watt Amplifier (Continued from page 65)

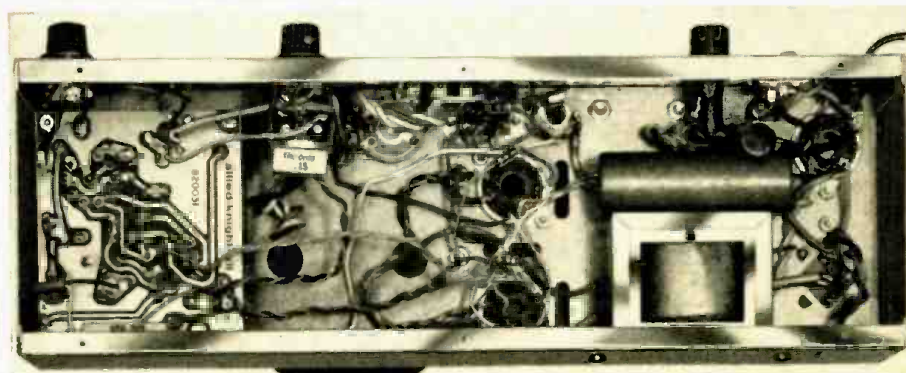
to a standard procedure. The results obtained from this power amplifier were extremely gratifying in that it was proved without a doubt that the quality is of the best and certainly worthy of being called a hi-fi component. The results obtained were as follows:

Sensitivity: .4 volt r.m.s. input for maximum 25-watt power output.

Hum and Noise (down from 2 watts): -78 db with open input circuit and -82.5 db with input circuit shorted.

Frequency Response: 8 to 45,000 cps. ± 1 db at the 2-watt output level. For maximum rated power output, frequency performance is 13 to 32,000 cps, ± 1 db.

Under-chassis view shows position of various components and printed circuit board.



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0B2	5AZ4	6BC7	6N7	7N7	19AU4GT
0Z4	5BR7	6BC8	6Q7	7Q7	198G6C
1A5CT	5BR8	6BD6	6S4	7Y4	19J6
1A7CT	5BQ7	6BE6	658GT	7Z4	19T8
1C5GT	5C8B	6BF5	65A7	12A8	24A
1M4C	5J6	6BF6	65B7Y	12AB5	25AV5
1M5GT	5U4G	6BF6G	65C7	12A85	25AX4
1L4	5U4GA	6BH6	65F5	12A95	25BQ6
1L6	5U4GB	6BJ6	65F7	12AT6	25DN6
1N5GT	5U8	6BK5	65H7	12AT7	25L6GT
1Q5GT	5V4C	6BK7	65J7	12AU6	25W4GT
1R5	5V6GT	6BK7GT	65K7	12AV5	25Z5
1S5	5Y3GT	6BN6	65L7CT	12AV6	25Z6
1T4	5Y4G	6BN6G	65N7GT	12AV7	35A5
1T5GT	6A7	6BQ6GT	65O7	12AX7	35B5
1U4	6A8	6BQ7	65R7	12AX7	35C5
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1X2	6AC7	6BY5C	65U7	12BA6	35Y4
2A3	6AC7	6BY6	65V7	12B7	35Z4GT
2A7	6AF4	6BZ6	65W7	12BD6	35Z5GT
2AF4	6AG5	6C4	65X7	12BE6	39/44
3AL5	6AG7	6C5	65Y7	12BF6	37
3AL5	6AH4GT	6C6	65Z7	12BF7	42
3AU6	6AH5	6C85	65A7	12BH5	43
3AV6	6AK5	6C86	65B7	12BK5	45
3BC5	6AL5	6CD6G	65C7	12BQ6	50A5
3BE6	6AM8	6CF6	65D7	12BR7	50B5
3BN6	6AN8	6CG7	65E7	12BV7	50C5
3BY6	6AQ5	6CL6	65F7	12BY7	50C6
3BZ6	6AQ6	6CM6	65G7	12CA5	50L6GT
3C86	6AQ7CT	6CM7	65H7	12CF5	50X6
3CF6	6AR5	6CN7	65J7	12J5	50Y6
3C56	6A55	6CS6	65K7	12K7	56
3DT6	6A57C	6CUS	65L7	12L6	57
3LF4	6AT6	6CU6	65M7	12M7	58
3Q4	6AT8	6D6	65N7	12N7	71A
3Q5GT	6AU4CT	6DE6	65O7	12P7	75
3S4	6AUSGT	6DT6	65P7	12Q7	76
3V4	6AU6	6E5	65Q7	12R7	77
4BC8	6AU8	6F8	65R7	12S7	78
4BQ7A	6AV5GT	6H6	65S7	12T7	80
4BZ7	6AV6	6J4	65T7	12U7	84/6Z4
5AM8	6AW8	6J5	65U7	12V6GT	117L7GT
5AN8	6AX4GT	6J6	65V7	12W6GT	117N7GT
5AQ5	6AX5CT	6J7	65W7	12X4	117P7GT
5AS8	6B4C	6K7	65X7	12Z3	117Z3
5AT8	6B5	6K7	65Y7	14A7/12B7	117Z6
5AU4	6B6	6K7	65Z7	14B6	
5AV8	6BA6	6K7	65A7	14Q7	
5AW4	6BA7	6L6	65B7		



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**T**HE INFLUENCE of service-association house organs in shaping and crystallizing the opinions of dealers on basic issues has been growing steadily. Through the interchange of their publications and editorial copy, house-organ editors are bringing to the attention of their readers the thoughts and opinions of dealers in many sections of the country. The result is a steady firming up of programs designed to put the activity on a more solid foundation.

The latest formal house organ to make its bow was launched recently by the newly formed Television Service Association of Delaware Valley. A monthly publication titled "TSA News" it is edited by Ray Fink with Charles Knoell, TSADV publicity chairman, as its associate editor. The official address of the new magazine is % Ray Fink, Editor "TSA News," 7819 Rugby Street, Philadelphia 50, Pa. Ray H. Cherrill, 6321 Frankford Ave., Philadelphia, Pa., is president of TSADV.

Another recent addition to the growing ranks of association publications is the "Service Dealers Bulletin" published by the members of the Radio & Television Service Dealers Association of Durham, N. C. The "Bulletin," which will be issued on a monthly basis, is edited by Garland E. Hoke with Norman Schultz as assistant editor.

The Durham association is noted for its sponsorship of an electronic technician training program under the plan available through state educational institutions with the cooperation of the apprenticeship training section of the U. S. Department of Labor. Subsequently an advanced black-and-white TV service school was added to the original apprenticeship program. Diplomas were recently issued to ten Durham dealers and technicians who completed the advanced course in black-and-white TV servicing.

Charles S. McBroom of *Mac's TV Service*, is president of the Durham association. The business address of the organization is P. O. Box 222, East Durham, N. C.

An outstanding "veteran" in the way of association house organs is the "ARTSD News," the official publication of the Associated Radio-Television Service Dealers of Columbus, Ohio. Now in its fifteenth year of consecutive monthly publication, the "News" carries local and national service items in a breezy, concise, informative style. It is edited and published by John P. Graham who is proud of his membership in the Radio's Old Timers Club, which signifies a minimum of twenty years active participation in the radio industry. The business address of the

"ARTSD News" is 2552 North High Street, Columbus, Ohio.

The Columbus association also claims to be the first business organization of service dealers. It was formed back in the radio days when service associations were primarily technical groups. ARTSD sponsors several types of social and business events that are held annually and which serve to maintain a high level of interest among members. Their regular, quarterly meetings with parts distributors, which have been carried out since the inception of the association, have created a spirit of distributor-dealer cooperation in the Columbus area that has been very beneficial to both groups.

### "Veteran" Elected

In Philadelphia, another "old timer" in the ranks of service associations recently elected a 50-year service-industry veteran to serve as its president for the coming year. Richard Devaney, owner of the *Radio Electric Service Co.*, was the unanimous choice of the members of the Philadelphia Radio Servicemen's Association to head their organization. Devaney, who is observing his fiftieth year in the electronics industry, has been active in PRSMA affairs for a number of years. He served previously as a member of the Board of Directors and as a vice-president of the organization.

Other officers elected by the PRSMA membership include William Poole, vice-president; Al Gribben, recording secretary; C. P. Elliott, corresponding secretary; and William Humes, treasurer.

In Savannah, Georgia, a group of service dealers recently formed the Savannah TV and Radio Dealers Association in a move to stabilize the service activity in that area. Information about this new association may be obtained from W. L. Parktee, president of the association. % *Downey's Inc.*, 2503 Waters Ave., Savannah, Georgia.

### NATESA Award

The National Alliance of Television and Electronic Service Associations has presented an award to *CBS-Hytron* for "outstanding service in creating better customer relations." The award was presented by Frank Moch, executive director of NATESA, to A. L. Chapman, *CBS-Hytron* president.

### Starting an Association?

Dealers who are interested in forming either a service dealer or technicians' association may obtain a complete package of organizational material from the National Alliance of

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## \$45.00 Per Hundred

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0Z4	3AU6	5W4GT	6BF5	6S8GT	7F8	12SA7	35/51
1A5GT	3AV6	5X4G	6BG6G	6SA7	7G7	12S7	35A5
1A7GT	3BA6	5X8	6BH6	6SB7Y	7H7	12S17	35B5
1B3GT	3BC5	5Y3GT	6BH8	6SC7	7J7	12SK7	35C5
1C5GT	3BE6	5Y4G	6BJ6	6SF5	7K7	12SN7GT	35L6GT
1C6	3BN6	5Z3	6BK5	6SF76SG7	7L7	12SQ7	35W4
1C7	3BU8	5Z4	6BK7	6SH7	7N7	12SR7	35Y4
1H4G	3BY6	6A8	6BL7GT	6S17	7Q7	12V6GT	35Z4GT
1H5GT	3BZ6	6A8A	6BN6	6SK7	7R7	12W6GT	35Z5GT
1L6	3C2	6AC7	6BQ6GT	6SL7GT	7S7	12X4	# 37
1LA4	3C86	6AF4	6BQ7	6SN7GT	7V7	12Z3	# 39/44
1LA6	3CF6	6AG5	6BR8	6SQ7	7W7	14A7	# 41
1LB4	3C56	6AG7	6BS8	6SR7	7X6	14AF7	# 42
1LC5	3D16	6AH4GT	6BY5G	6T4	7X7	14B6	# 43
1LC6	3Q4	6AH6	6BZ6	6T8	7Y4	14F7	# 45
1LH4	3Q5GT	6AK5	6BZ7	6U4GT	7Z4	14F8	# 47
1LNS	3S4	6AK6	6C4	6U5	8AW8	14H7	50A5
1NSGT	3V4	6AL5	6C5	6U8	12A8	14N7	50B5
1PSGT	4B8C	6AL7GT	6C85	6V3	12AB5	14Q7	50C5
1Q5GT	4BQ7A	6AM8	6CB6	6V6GT	12AQ5	14S7	50C6G
1R5	4B5B	6AN8	6CD6G	6W4GT	12AT6	17AX4GT	50L6GT
1S5	4BUB	6AQ5	6CF6	6W6GT	12A77	17DQ6	50Y6
1T4	4BZ7	6AQ6	6CG7	6X4	12AU6	19AU4	50Y7
1T5GT	4C86	6AQ7GT	6CG8	6X5GT	12AU7	19B6G6	# 57
1U4	5AM8	6AR5	6CH8	6XB	12AV6	19C8	# 58
1U5	5AN8	6AS5	6C16	6Y6G	12AV7	1916	# 80
1V	5AQ5	6AS8	6CM6	7A4	12AX4GT	19T8	# 81
1V2	5AS8	6AT6	6CM7	7A5	12AX7	19X8	117L7GT
1X2	5AT8	6AU4GT	6CN7	7A6	12AZ7	25AC5	117N7GT
2A3	5AV8	6AUSGT	6CU6	7A7	12B4	25AV5GT	117P7GT
2A5	5AW4	6AU6	6DG6	7A8	12BA6	25AX4GT	117Z3
2A7	5AZ4	6AU8	6DQ6	7B4	12B6	25BK5	117Z4GT
2AF4A	5BK7	6AV5GT	6DT6	7B5	12BF6	25BQ6	117Z6GT
2B7	5BR8	6AV6	6E5	7B6	12BH7	25CD6G	807
2BN4	5BQ7	6AW8	6H6	7B7	12BK5	25C6	9002
2D21	5BZ7	6AX4GT	6J4	7B8	12BQ6	25L6GT	9003
2E5	5CG8	6AX5GT	6J5	7C4	12BR7	25W4GT	9006
2X2A	5J6	6AZ8	6J6	7C5	12CA5	25Z5	
3A2	5T8	6BA6	6K6GT	7C6	12CU6	25Z6	
3A3	5U8	6BC5	6K7	7C7	12DQ6	# 77	
3A4	5U4G	6BC8	6L6	7E6	12J5	# 30	
3A5	5V4G	6BD6	6L7	7E7	12L6GT	# 31	

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- Send me full details on your FREE File Cabinet offer and EASY-BUY Plan.  
 I'm a Service Technician:  full time;  part time

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Shop Name: .....

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City..... Zone..... State.....

Television and Electronic Service Associations. Included in this package is information about how to organize a formal association, suggested articles of incorporation, bylaws, formation of committees, etc. This may be obtained by writing to NATESA headquarters, 5908 South Troy Street, Chicago 29, Ill.

### Service Story Folder

A new pocket-size folder, "TV Service Safety Hints," is being made available by P. R. Mallory & Co. to be used by service technicians and dealers in promoting a better understanding of their role with customers. A series of cartoons dramatize the dangers of amateur "doctoring" of TV ailments in a light style. The set owner is told, "Don't do it yourself—call on us!" There is space for imprinting the dealer's name. The folders are available in quantity to individual dealers and associations from Mallory distributors at \$1.00 per 100, or by writing to Distributor Division, P. R. Mallory & Co., Inc., Indianapolis 6, Indiana.

### Two-Way Mobile News

Service dealers looking for diversification and alert to the sturdy growth of two-way mobile radio equipment can get started in this field by making contact with those manufacturers of such equipment who are interested in working through independents rather than their own organizations. Putting in a bid for dealer interest, Kaar Engineering Corp. is marketing a line of "packaged" merchandise in this field to minimize the problems of system engineering. Interested dealers should address inquiries to Frank A. Genochio, Kaar Engineering Corp., 2995 Middlefield Road, Palo Alto, Calif.

### Licensing News

In Waterloo, Iowa, the City Council was recently urged by local service dealers to take the lead in establishing regulations and a licensing code for television technicians.

Ulwin W. Davis, president of the Waterloo Radio-Television Service Dealers Association, presented the association's petition for a licensing code to the City Council. Mr. Davis said that, while Waterloo residents have been fortunate in not being preyed upon by unscrupulous technicians, he felt there is a need now for a protective measure to guard against an incursion of incompetents.

In Des Moines, a proposed licensing measure was indefinitely tabled by a majority vote of the City Council of that city. In reporting on this development, which was aggressively opposed by the Association of Independent Servicemen of Iowa, Frank Arnold, editor of the "AITS Scope," said:

"The burden of government regulation of our business is already heavy enough. That there remains much to be accomplished by the service industry is evident, but licensing is not the cure-all that it has been reported to be.

"The only way the serviceman of this city can increase his stature in the pub-

## MODELS—AIRCRAFT—ETC. TO AN NICKEL—CADMIUM

COMPACT  
**\$1.95**  
POSTPAID

### STORAGE BATTERIES

Long life, indefinite storage, low internal resistance, hi-charge and recharge rates.



Now Surplus Government cells as used in guided missiles, yours for a fraction of the original cost. Each cell produces approx. 1.2-1.5 volts at discharge rates up to 40 or more Amps. Order postpaid these alkaline sintered plate cells to make batteries to your specs, or order complete batteries as listed.

#### ALL POSTPAID

1.5V	1 cell	\$ 1.95
6 V	5 cell	7.95
12 V	10 cell	14.95
24 V	20 cell	24.95

Cell size 6" H x 2" W x 1/2" T. Wt. 7 oz. ea.

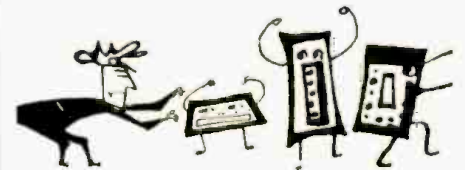
Uses non-corrosive potassium hydroxide electrolyte—negligible loss during lifetime service. ORDER TODAY!

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Indianapolis 25, Indiana

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OR PARTS!

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RADIO & TV NEWS

lic eye is by the service he performs. It is the responsibility of the serviceman to maintain a high standard in the service he renders. That the standards have been and are being maintained is an established fact. Not one complaint has been received by our grievance committee since our members' names were filed with the Better Business Bureau. I can say 'well done' and I am proud of that record."

In Toledo, Ohio, a committee appointed by the city administration to look for new sources of revenue came up with the bright idea of taxing TV services. Their recommendation was to levy an annual tax of \$30.00 on Repairmasters (service dealers) and \$3.00 per year for servicemen.

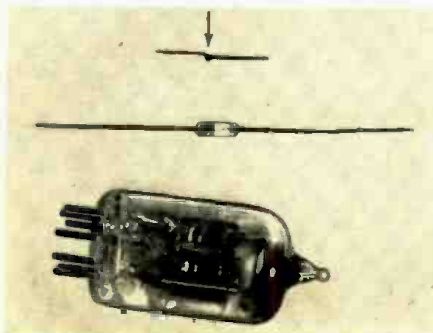
On the heels of its successful convention, the Radio & Television Technicians Guild of Florida, Inc., inaugurated an expanded program to enlarge its membership and to intensify its efforts to develop better customer relations. As its first step, the association engaged George S. Miller, a professional trade association executive and public relations counsel, to serve as its executive director. In this post, he succeeds Shan Desjardins, who handled this activity for two years and requested help in administering the affairs of the Guild. The mailing address of the RTTG of Florida will continue to be 119 N.W. 12th Ave., Miami 36, Fla.

#### Advanced Training

Evening instruction for upgrading the practicing TV technician will be given for the sixth straight year at the endowed, non-profit New York Trade School, 310 E. 67th St., New York City. Paul B. Zbar, head of the Electronics Dept., urges early registration for this industry-sponsored course, as class size will be limited. The course begins on the evening of September 18, 1958, and will run for 16 weeks. Entrants must have had at least 3 years full-time experience as TV technicians or 1 year experience in addition to a basic, approved TV course.

-30-

Successful development of the world's smallest hermetically sealed diode, tinier than a pinhead was announced by Pacific Semiconductors, Inc. A new glassification process makes the new electronic "tiny tin" possible by eliminating the conventional diode package. Photo shows the new diode (top) contrasted with conventionally packaged glass diode (center) and subminiature 6AL5 duo-diode tube.



September, 1958

A must  
for TV and  
radio  
service  
technicians



with built-in MAGNASTAT  
temperature control

... automatically maintains correct soldering temperature



**MODEL TC-40**—40 watts.  
Controlled lower temperature for  
printed circuits, etc.

**\$8 00**  
list price



**MODEL TC-60**—60 watts.  
Controlled temperature for light  
to medium electrical soldering.

**\$9 00**  
list price

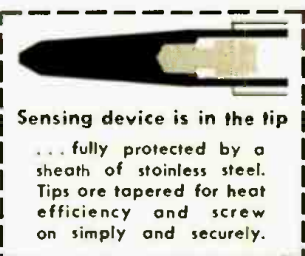


**MODEL TC-120**—120 watts.  
Controlled temperature for me-  
dium to heavy electrical soldering.

**\$10 50**  
list price

Here's another "first" from Weller, long time leader in the soldering field. New soldering irons with built-in MAGNASTAT temperature control for more reliable soldered connections. Never any overheating. Proper soldering temperature automatically remains constant. Plus these other exclusive features:

- Saves current when idling
- Reaches full heat quickly
- Approximately 1/2 the weight of uncontrolled irons
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- All structural parts are stainless steel
- Card plugs into handle
- Guaranteed against defects in material and workmanship



Sensing device is in the tip  
... fully protected by a  
sheath of stainless steel.  
Tips are tapered for heat  
efficiency and screw  
on simply and securely.

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The specs are the proof...now your best buy in ham equipment is **EICO**



**New** 90-WATT CW TRANSMITTER #720  
KIT \$79.95 WIRED \$119.95

Conservative, highly efficient design plus stability, safety, and excellent parts quality. Covers 80 thru 40, 20, 15, 11, 10 meters (popular operating bands) with one knob band-switching. 6146 final amplifier for full "clean" 90W input, protected by clamper tube circuit. 6CL6 Colpitts oscillator, 6AQ5 clamper, 6AQ5 buffer-multiplier, GZ34 rectifier. "Novice limit" calibration on meter keeps novice inside the FCC-required 75W limit. No shock hazard at key. Wide range, hi-efficiency pi-network matches antennas 50 to 1000 ohms, minimizes harmonics. EXT plate modulation terminals for AM phone modulation with 65W input. Excellent as basic exciter to drive a power amplifier stage to maximum allowable input of 1KW. Very effective TVI suppression. Ingenious new "low silhouette" design for complete shielding and "living room" attractiveness. Finest quality, conservatively rated parts, copper-plated chassis, ceramic switch insulation. 5" H, 15" W, 9 1/2" D.



**NEW UNIVERSAL MODULATOR-DRIVER** #730  
KIT \$49.95 WIRED \$79.95 Cover E-5 \$4.50

Superb, truly versatile modulator at low cost. Can deliver 50 watts of undistorted audio signal for phone operation, more than sufficient to modulate 100% the EICO #720 CW Transmitter or any xmitter whose RF amplifier has a plate input power of up to 100W. Multi-match output xmr matches most loads between 500-10,000 ohms. Unique over-modulation indicator permits easy monitoring, precludes need for plate meter. Low level speech clipping and filtering with peak speech frequency range circuitry. Low distortion feedback circuit, premium quality audio power pentodes, indirectly heated rectifier filament. Balance & bias adjust controls. Inputs for crystal or dynamic mikes, phone patch, etc. Excellent deluxe driver for high-power class B modulation. ECC83/12AX7 speech amplifier, 6AL5 speech clipper, 6AN8 amplifier driver, 2-EL34/6CA7 power output, EM84 over-modulation indicator, GZ34 rectifier. Finest quality, conservatively rated parts, copper-plated chassis. 6" H, 14" W, 8" D.

**NEW GRID DIP METER** #710  
KIT \$29.95 WIRED \$49.95 including complete set of coils for full band coverage.

Exceptionally versatile. Basically a VFO with micro-ammeter in grid; determines freq. of other osc. or tuned circuits; sens. control & phone jack facilitate "zero beat" listening. Excellent absorption wave meter. Ham uses: pre-tuning & neutralizing xmitters, power indication, locating parasitic osc., antenna adj., correcting TVI, de-bugging with xmitter power off, determining C.L.Q. Servicing uses: alignment of filters, IF's; as sig. or marker gen. Easy to hold & thumb-tune with 1 hand. Continuous 400 kc - 250 mc coverage in 7 ranges, pre-wound 0.5% accurate coils. 500 ua meter movement. 6AF4(A) or 6T4 Colpitts osc. Xmfr-operated sel. rect. 2 1/4" H, 2 3/4" W, 6 7/8" L. Satin deep-etched aluminum panel; grey wrinkle steel case.

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Show me HOW TO SAVE 50% on 60 models of top-quality equipment (in box I have checked here:  HAM GEAR  HI-FI  TEST INSTRUMENTS. Send **FREE** literature and name of EICO dealer.

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CITY \_\_\_\_\_ STATE \_\_\_\_\_

See EICO's Hi-Fi and Test Equipment ads on Pages 35 and 36.

# Electronic Crossword

By JOHN J. GILL

THIS puzzle may prove to be a "fooler" as there are several unusual definitions and a number of obscure words which you will have to work around if your vocabulary of "exotic words" is rusty. Don't feel too discouraged if you don't get it the first time—the answer appears on page 166 if you want to peek!

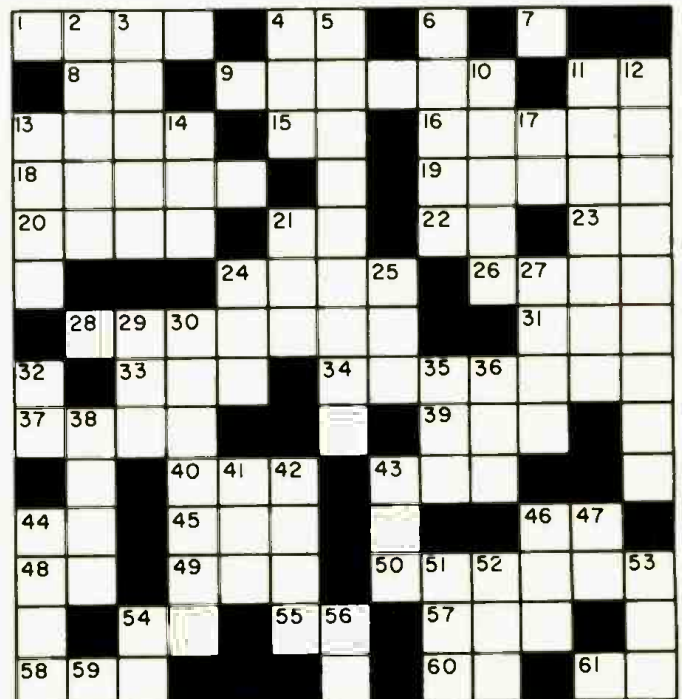
## ACROSS

1. 1/746th of 1 hp.
4. Lower than r.f. (abbr.).
7. 1000 (abbr.).
8. French article.
9. Voltage on an electrolytic causes it to be \_\_\_\_\_
11. TV frequency band (abbr.).
13. Used in drills.
15. Pilot light (abbr.).
16. Maurice isn't here (slang).
18. Si, Jah, Oui.
19. Borer.
20. Chew.
21. Tube characteristic.
22. Spanish agreement.
23. Telemetering (abbr.).
24. Demeanor.
26. Oriental nurse.
28. Insects and radio sets have one.
31. Time gone by.
33. Unit of work.
34. TV band assignment.
37. Against.
39. Regret.
40. German electrician.
43. Deed.
44. 2π FL.
45. Two (comb. form).
46. Electronic test set.
48. 1050 (Roman style).
49. Electric driving force.
50. Tube book.
54. Estados Unidos (Eng. abbr.).
55. Gallic (abbr.).
57. As opposed to "min."
58. Voltage dropper (abbr.).

60. Amplifier output stage (abbr.).
61. 1/6.28fc.

## DOWN

2. Twiddle the trimmers.
3. Four (comb. form).
4. Charged particle.
5. Cycles per unit of time.
6. Affords.
10. Andrea \_\_\_\_\_
11. E.M.F.
12. Resonator.
13. "Pokes" (coll.).
14. Mend.
17. Third note of scale.
21. Opposite of "max."
24. Million (comb. form).
25. Sloppy "no."
27. On a horse's neck.
29. Type of "work" in radio.
30. Three-element tubes.
32. Current measure (abbr.).
35. Leaping current.
36. Fastener.
38. Point of balanced frequencies.
41. Could be a bad capacitor.
42. A thin silk made in Caucasasia.
43. Motor winding (abbr.).
44. Transmitter (abbr.).
46. Light.
47. B flat in Tartini's system of solmization.
51. Unit of electric current.
52. Sleep.
53. Used in making varnish.
54. We.
56. It travels at the speed of light (abbr.).



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2 for \$9.95. Each only **\$4.99**

PERMA-FLUX HI FI HEADSET—  
15,000 cyc. NEW with cushions. **\$8.95**

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Tone signals the location of metal objects buried 2 ft. or more. Excel. cond. Depot re-pack. Never sold at this fantastically low price! **\$24.95**

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NEW WALKIE-TALKIE CHASSIS—BC-611  
Really F.B. for making your own Walkie-Talkie! Crystal controlled, with antenna. Does not contain coils, crystal or tubes. Each **\$6.95**

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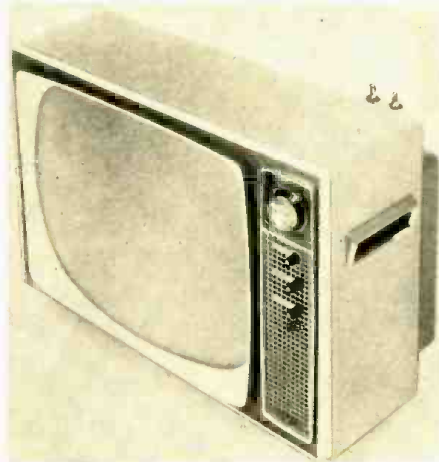
## What's New in Radio

### SHALLOW TV SETS

The Television Receiver Department of General Electric Company, Syracuse, N. Y. has unveiled its new "Designer Series," a line of TV receivers whose unique cabinet design gives the appearance of extreme slimmness.

The "Gramercy 17's" and the "Barclay 21's" comprise the two sizes in the series. The former uses the 110 degree aluminized picture tube with 155 square inches of picture area while the latter provides 262 square inches of viewing space.

The cabinets are formed of vinyl-covered aluminum in the 21-inch models and high-impact, color impregnated polystyrene in the 17-inch models. The cabinets follow as closely as possible the contours of the picture tube. In place of the conventional hard-board back and tube cap, the set



has a contoured steel panel back. This panel extends out from the cabinet to accommodate the picture tube but is not as wide nor as high as the cabinet itself.

The polystyrene cabinets are available in aqua, beige, or mahogany with oyster white tube masks. The cabinets for the 21-inch sets are aluminum covered in scuff and stain resistant vinyl in russet with leather finish or a linen finish, both with dove grey tube masks.

### NEW TUBES FOR MOBILE

The Electron Tube Division of Radio Corporation of America, Harrison, N. J. has announced the availability of eight new industrial tubes for two-way mobile radio systems operating from 12-volt storage batteries.

The new tubes are especially designed for transceiver applications. To insure dependable performance when storage batteries are charging and discharging, the heaters of these tubes

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## THE NEW Ghirardi RADIO-TV SERVICE LIBRARY

Almost 1500 pages and over 800 clear illustrations show step-by-step how to handle every phase of modern troubleshooting and servicing.

### 1—Radio and Television Receiver TROUBLESHOOTING AND REPAIR

A complete guide to profitable professional methods. For the beginner, it is a comprehensive training course. For the experienced serviceman, it is a quick way to "brush up" on specific jobs, to develop improved techniques or to find fast answers to puzzling service problems. Includes invaluable "step-by-step" service charts, 820 pages, 417 illus., price \$7.50 separately. (Outside U.S.A. \$8.00.) See combination offer below!

### 2—Radio and Television Receiver CIRCUITRY AND OPERATION

This 668-page volume is the ideal guide for servicemen who realize it pays to know what really makes modern radio-TV receivers "tick" and why. Gives a complete understanding of basic circuits and circuit variations; how to recognize them at a glance; how to eliminate guesswork and useless testing in servicing them. 417 illus. Price separately \$6.75 (outside U.S.A. \$7.25).

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- Radio & TV Receiver CIRCUITRY & OPERATION (Price \$6.75 separately)

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### 1-INCH MICROAMP METER

1 inch round, 0-200 Microamps. Ideal for transistorized circuits. A sensational buy at ..... **\$5.95**  
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Primary 115V, 60 Cy. Sec., 400-0-400 V. @ 200 Ma., 6.3 V @ 5 Amp., 5 V @ 4 Amp std. mounting plus 8 Hy 200 Ma chokes and two C-8 B Mfd. oil condensers. Kit **\$7.50**

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-10.0 to +6 DB (Weston) 4.95 0-1.5 Amp. DC 3.95  
0-15 DC KV 3" w/ shunt 58.95  
0-31 1/2 KV. 3" w/ shunt. 6.95  
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115 V. 60 CYC. SEL-SYNS High torque. Useful as antenna indicators, etc. each \$5.95 (\$10.50 pr.)  
Cramer Synchronous TIMER MOTORS. 115V 60 Cyc. 1 1/2: 1: 5: 10 RPN. each \$2.95

### Photo Scoop!

### 60-SECOND MICROFLEX TIMER!

1/10 sec. increments. To operate on 110VAC, or 12 VDC. Clutch operates on 12 VDC. Useful for photo darkroom (reg. \$69.00). **\$15.95**  
Special

### WHILE THEY LAST!

### ESTERLINE-ANGUS RECORDER

Model AW 500-0-500 Microamp. each **\$159.50**

### DU MONT POWER TRANSFORMER

950 V. CT 300 ma; 2 6.3 V. @ 5 Amps; 2 5 V. @ 4 Amps. ea. **\$7.50**

### Selenium Rectifiers

30-36 VAC input. 24-28 VDC output. 5 Amps \$4.50 2 Amps \$2.19 1/2 Amp \$1.19 150 Ma 110V. \$1.29

### Special on . . . POWER SUPPLIES!

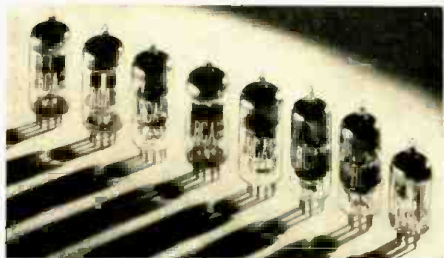
PRI-115 V AC SEC.-540-0-540 V @ 280 MA 5.4 & 3 V @ 6 Amps CT 12 V @ 5 Amps 40 V @ 50 MA 6.3 V CT @ 7 Amps Hy 250 Ma. 4 10 Mfd. 600 V Cap. 3 5U4's **\$26.95**  
PRI-115 V AC SEC.-940-0-940 V @ 230 MA 230 MA CT @ 10 Amps 1-6.3 CT @ 4 Amps 1-6.3 CT @ 4 Amps Hy 250 Ma. 2 6 Mfd. 1500 V Cap. z 836's **\$23.95**

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# Advance Electronics

6 West Broadway • New York 7, N. Y. • REctor 2-0270

are designed to withstand an intermittent heater-cycling test of 2000 cycles minimum at high heater voltage. Designed to operate over a heater voltage range of 12 to 15 volts, the tubes are subjected to rigid controls and tests for heater-cathode leakage,



interelectrode leakage, elevated heater-voltage life performance, as well as intermittent short circuits.

Included in the new series are the 7054 and 7056 sharp cut-off pentodes, 7055 twin diode, 7057 medium-mu twin-triode, 7058 high-mu twin-triode, 7059 and 7060 medium-mu triode-sharp cut-off pentodes, and 7061 beam power tube.

### ALPHA TEST-LEAD LINE

Alpha Wire Corporation, 200 Varick St., New York 14, N. Y. has a new test-lead line on the market, designed especially for the service industry.

The line consists of the 12 most useful combinations of test prod and meter tip types. The lead wires are a full 50 inches long and are made of #18 gauge wire encased in heavy-duty, high-dielectric rubber. Voltage breakdown is better than 12,000 volts at 60 cycles.

A special display rack, measuring 38" x 27 3/4" x 12", holds ten each of the 12 different test-lead items and features each pair of test leads individually packed in an attractive, dirt-free, clear plastic tube.

The manufacturer will be happy to supply complete details on this new line upon written request.

### SELF-SERVICE TUBE CHECKER

Century Electronics, 111 Roosevelt Ave., Mineola, N. Y. is now offering a

self-service tube checker which is suitable for the "do-it-yourself" departments of service shops or for bench mounting in the service lab.

The Model SS-1 "Fast - Check" will handle over 600 tube types with only two settings. It will check quality, shorts, and leakage, as well as gas content. The circuit is so designed that it will accept new tube types as they appear on the market.

A colorful display tops the cabinet with a tube chart installed directly below the ad panel. The 7 1/2-inch meter is designed to withstand rough handling and is fully protected against accidental burn-out. The tester operates on 117-

volt power lines and has a three-wire UL-approved line cord.

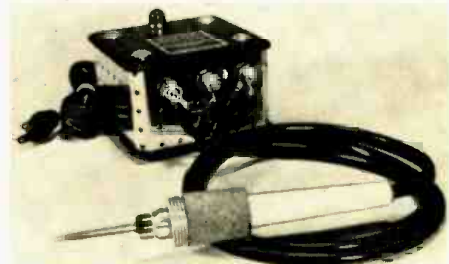
The company is offering this tester in both console and counter models. Write the manufacturer direct for free literature and further details.

### MINIATURE SOLDERING TOOL

Wassco Electric Products Corp., 204 S. Larkin Ave., Joliet, Ill. is currently marketing a new low-cost dual-metal-tip soldering tool designed for continuous industrial production soldering.

Especially suited to soldering of miniature connectors and other precision operations, the handpiece provides two very slim metal alloy electrodes arranged at a 3-degree included angle. By adjusting electrodes in or out, the working gap at the tip is easily set from 1/32" up to 3/16" for best accommodation to the work at hand.

The tapered tips of the electrodes provide a pre-loaded spring tweezer function without finger fatigue. The handpiece is designed to be used with



the firm's new 105-A1 100-watt power unit but may also be used with the 105-B2 500-watt unit. The 105-A1 has three heat outputs; 15, 50, and 100 watts. The handpiece and power unit together are catalogued as Bench Set No. 10579.

### WIRE DISPENSER KIT

Belden Manufacturing Company of Chicago has recently introduced a new hook-up wire dispenser kit which is designed to eliminate the problems of waste and inconvenience for the technician, hobbyist, and experimenter.

The kits are being offered in the 14 most popular assortments of vinyl, vinyl-nylon, textile, and Teflon insulated wires. The rack, which holds five square spools of wire, is given free of charge. The rack is so designed that it can be hung on the wall or stood on the bench.

Since the dispenser kits are individually packaged in colorful illustrated cartons, they can double as counter or rack displays.

### BATTERY ELIMINATOR

Seco Manufacturing Company, 5015 Penn Avenue South, Minneapolis, Minn. has recently introduced its Model PS-2 battery eliminator which is specially designed for operating and servicing portable radios and low-power transistorized equipment.

The PS-2 supplies filtered d.c. in voltages from 0 to 15. The output supply is sufficient for checking transistor receivers of up to 22.5 volts. The unit can also be used to check batteries by substitution. The eliminator uses a



line bypass system to eliminate hum modulation. Internal impedance is less than 2 ohms. The voltage scale is



calibrated at 15 ma. while maximum output is 100 ma.

The instrument comes complete with plug-in jacks for an external voltmeter, 40-inch leads, and insulated clips. The case measures 4½" x 5" x 1½". For complete information and a descriptive data sheet, write the manufacturer direct.

#### WRL "SIDEBANDER"

WRL Electronics, 34th & Broadway, Council Bluffs, Iowa is now offering a complete bandswitching suppressed-carrier sideband rig, in kit or assembled form, as the DSB100.

The "Sidebander" offers continuous band coverage from 3 to 9 mc. and 12 to 30 mc. which includes all the popular MARS, CAP, and special emergency service frequencies. Designed for double-sideband, AM, or c.w., the unit may be used to convert present AM equipment to sideband



and can be used with standard crystals and regular v.f.o. There is a minimum of 35 db carrier suppression.

A three-stage r.f. section allows straight-through operation for maximum efficiency on all bands. An internal tone generator facilitates tuning. The pi-net output is 52 to 1000 ohms. Speech clipping and filtering assures good communication and maximum bandwidth. The 600-volt power supply has ample reserve to drive external accessories, if desired.

The unit measures 8" x 14" x 9". The company will supply further details and prices on either the kit or wired unit upon request.

#### SUBMINIATURE TANTALUMS

The Distributor Sales Division of Aerovox Corporation, New Bedford, Mass. is now offering a line of wire tantalum capacitors in subminiature

September, 1958

# NEW!



## For the One Man in Nine who really understands hi-fi!

If you're a notch above the average hi-fi fan, understand electronic theory, can read a schematic and handle a soldering iron, here's an inexpensive book that will add countless hours to your high fidelity pleasure!

The 1959 Edition of the HI-FI ANNUAL & AUDIO HANDBOOK features 43 big articles and 325 illustrations—covers every phase of hi-fi enjoyment. The cost? Only \$1.00—at your favorite newsstand or radio parts store.

Prepared by the editors of RADIO & TV NEWS, the world's largest selling technical electronics magazine, this year's HI-FI ANNUAL & AUDIO HANDBOOK contains:

**STEREO AND FM**—A big, definitive section on how to convert or get started in stereo and FM: Stereo control center. Stereo balance and gain control. Speakers for stereo. Testing FM tuners. Adding a tuning indicator.

**AMPLIFIERS AND PREAMPLIFIERS**—High power vs low power. Why do amplifiers sound different. Complete plans for 6, 10 and 15 watt amplifiers. RC filter

tone controls. RIAA equalization for early preamps. Audio operated switch. Reducing hum and noise in preamplifiers. Defense of the split-load phase inverter. New look at positive current feedback.

**TAPE RECORDERS AND MICROPHONES**—Measuring wow and flutter. Bias-erase oscillators. Playback standardization. Portable tape recorder amplifier. What do you know about recording tape? Microphones? "Outboard" equalizer-bias amplifier for tape recording.

**LOUDSPEAKERS AND ENCLOSURES**—Why low-efficiency speaker systems? "Ultralex" speaker enclosure. Choosing your crossovers. The "Tiny Mite" loudspeaker enclosure. Speaker damping with series resistor. Electrostatic speakers.

**PLUS helpful features on room effects, room resonance and stereo, testing loudspeakers, checking speaker performance, electrostatic speakers and transient response, transients and directional effects, speaker power and efficiency, speaker mounting, and much, much more!**

All the skill and know-how of the nation's top hi-fi authorities are yours for only \$1.00 in the 1959 HI-FI ANNUAL & AUDIO HANDBOOK. This unique volume goes on sale everywhere in September. Watch for it!



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Over 40 years' experience and the record and reputation of NRI back up this learn-by-doing Professional TV course. TV servicing has only started to grow. New sets, new developments, portables, color TV make this a golden opportunity for the man who is trained to service sets quickly and correctly.

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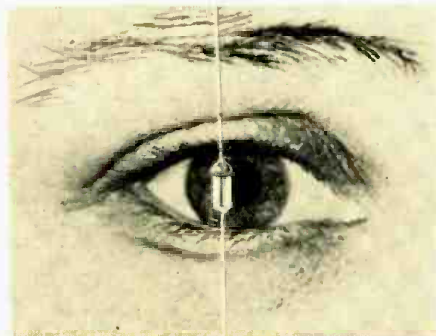
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sizes for applications in low-voltage devices such as personal portables, hearing aids, and transistorized circuits.

Type WT units are lead-mounted, wire tantalum units in polarized types only. These are designed for use where



a.c. voltage is small with respect to d.c. polarizing voltage. The capacitor consists of a high-purity tantalum anode and fine silver cathode with special electrolyte and spacer material. The case and attached lead form the cathode and are uninsulated. The anode tantalum wire extends through a bushing and is attached to a solderable lead with a welded connection. A thermosetting resin embedment encases the welded joint to provide maximum protection.

The new capacitors are available from local distributors in standard voltage ratings of 1, 2, 4, 6, 8, 10, 20, 40, and 80 volts d.c.

### NEW HAM RECEIVER

Hammarlund Manufacturing Company, Inc., 460 W. 34th Street, New York 1, N. Y. has recently added a triple-conversion, 17-tube superhet to its line of receivers for the radio amateur.

The Model HQ-170 offers full dial coverage of the 6, 10, 15, 20, 40, 80, and 160 meter amateur bands, separate vernier tuning ( $\pm 3$  kc. for SSB operation), a separate linear detector for c.w. and SSB reception plus normal diode AM detection, seven selectivity positions for mechanical-filter-type skirt selectivity, selectable sideband, h.f.o. control ( $\pm 2$  kc.), fast-attack a.v.c., and a built-in crystal calibrator.

In addition, the circuit includes a slot filter which is adjustable  $\pm 5$  kc. over the passband for better than 40 db attenuation. Additional attenuation of 20 db at any point is available with the slot-depth control. A dial-scale reset feature and automatic noise limiter are also included. The receiver is housed in a ventilated metal cabinet of modern design.

For a data sheet on this receiver and other details as required, write the manufacturer direct.

### "15-IN-1" TRANSISTOR KIT

Students, experimenters, and hobbyists who are interested in learning how transistors can be used are being offered a "15-in-1" experimenters' kit by Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.

The new kit is designed to provide the maximum of instruction, entertain-

ment, and usefulness at minimum price. All components needed to build 15 different devices are included in the kit. A detailed instruction manual explains the operation of each circuit, shows how to mount the components, and how to make the necessary connections for building such devices as an electronic timer, a burglar alarm, two-stage audio amplifier, two-stage broadcast receiver, and many others. The kit is battery powered, shockproof, and entirely safe. It is catalogued as the KT-134.

### "APACHE" TRANSMITTER KIT

Heath Company of Benton Harbor, Mich. is currently marketing a 180-watt amateur radio transmitter in kit form as the "Apache."

The transmitter operates with 150-watt phone input and 180-watt c.w. input. In addition to c.w. and phone operation, built-in switch-selected circuitry provides for SSB transmission through the use of a plug-in external adapter.

The circuit incorporates a compact and stable v.f.o. providing the low-drift frequency control necessary for SSB



transmissions. A slide-rule type illuminated dial with vernier tuning provides ample bandspread and precise frequency settings.

The bandswitch allows quick selection of 80, 40, 20, 15, and 10-11 meter bands. This unit also has adjustable low-level speech clipping and a low-distortion modulator stage employing two EL34's in push-pull class AB operation. Time sequence keying is provided for chirpless break-in c.w. operation.

The final amplifier is completely shielded for greater TVI protection and transmitter stability.

A companion receiver, the "Mohawk," is available for use with this transmitter.

### YOKE REPLACEMENT KIT

Triad Reformer Corporation, 4055 Redwood Ave., Venice, Calif. has introduced a new yoke replacement kit which makes it possible for the TV technician to service literally thousands of different TV chassis while maintaining a very small yoke inventory.

The "Yoke Pack" contains eight yokes and 25 network kits, offering almost unlimited network combinations. Housed in a display case, the kit offers both 70- and 90-degree type yokes, with inductance ranging from 8 to 30 mhy. for horizontal matching, plus a special unit for 70-degree drive applications.

RADIO & TV NEWS

## FAMOUS PE-103A DYNAMOTOR

Completely shock mounted, with filter base and 11 foot long heavy duty cables. 6 & 12 volt DC input, 500 volt DC output at .16 amp. Excellent cond. Shipping wt. 60 lbs. **\$12.95**

**813 TUBES \$7.95**

All new in original govt. cartons. Pair for **\$15.00**

**10MFD 600 VOLT OIL FILLED CONDENSERS**

Porcelain insulated terminals. Ea. **95c**

**0-100 MIL. DC METER**

Rnd. case, 3 1/2 flange, fits 2 3/4 panel hole. Ea. **\$1.95**

**T-17 AIR FORCE CARBON MICROPHONE**

All in original overseas wrapping. Ea. **\$3.95**

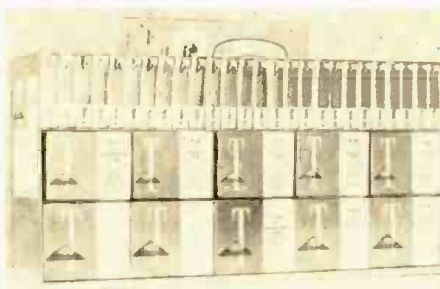
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Other Tubes, Resistors, Condensers Available, Send Your Requirements

**L & L ELECTRONIC SALES**

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Mounting and centering problems are solved with such accessories as the yoke clamp (CL-1) and the centering cover



(YC-1), both of which are included in the kit.

Additional information on this service item will be supplied by the company upon request. **-50-**

## IRE WRITING SYMPOSIUM

THE second annual Symposium of the IRE Professional Group on Engineering Writing and Speech is scheduled for October 1-2 at the Hotel Biltmore in New York City. Keynote speaker will be Dr. George H. Brown of RCA. Other speakers include Dr. Samuel J. Mason of MIT ("How to Murder an Audience") and Dr. James Angell of Philco ("Use of the Vu-Graph"). The two-day meeting will deal with common problems in oral and written communication, and will include sessions on speaking techniques, visual aids, and various aspects of writing. For information on program details, registration fees, etc. write to H. B. Michaelson, IBM Research Center, Box 218, Yorktown Heights, New York. **-30-**

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Give You **110 A.C. HOUSE CURRENT ANYWHERE** You Drive or Cruise

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For 6 and 12 Volt Car Batteries—Capacities: 15 to 200 Watts **\$12.95 UP**

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One of the great conveniences of our electronic age

**101 USES**



PORTABLE TV



DICTION



ALL ELECTRIC SHAVERS



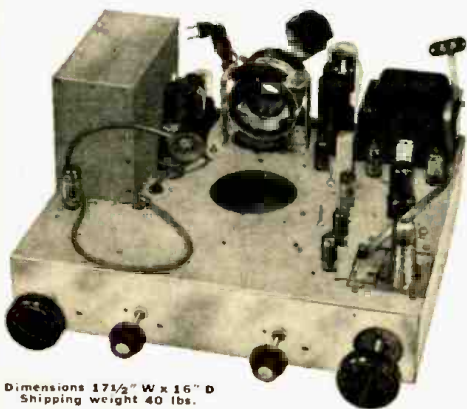
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## DX-16 Super Deluxe TV KIT \$2.49 Starts you off . . . on the EASY-PAYMENT-PLAN



Dimensions 17 1/2" W x 16" D Shipping weight 40 lbs.

70° or 90°—operating all 17", 21", 24" and 27" PICTURE TUBES  
NEW IN DESIGN—Mounts Horizontally, Vertically or Sideways.

- ★ Produces a Superior 16-Tube Chassis with 30-Tube performance.
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- ★ 5 Microvolts Video Sensitivity (20 volts peak to peak at CRT grid).
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- ★ 3 Hi-gain Video I.F. Stages for excellent Contrast and Details.
- ★ AGC Level and Area Control, for adjusting reception to signal area.
- ★ All Video and I.F. Coils factory pre-aligned and tuned.
- ★ Horizontal Sweep Circuit is the famous RCA Synchroguide Network.
- ★ Large 250 ma Power Transformer ★ Large 12" Concert-tone Speaker.

Sold on the Easy-Payment-Plan—\$2.49 starts you off. You receive LIFE-SIZE step-by-step Building Instructions . . . just buy a few dollars worth of parts at a time as you build . . . or buy it complete at the low price shown below.

COMPLETE KIT WITH SET OF **Westinghouse TUBES** 4-6CB6 and 6U8, 6T8, 6C4, 12BH7, 6SN7, 6HQ6, 6W4, 6K6, 1X2U, 5U4, 6BN4 and 6UG8 included in the Tuner. (less CRT) . . . **\$79.97**

**BUILD YOUR OWN TV CABINET FOR ANY TV CHASSIS** Comparable to the type that Top Mfrs. use on their higher priced TV sets.

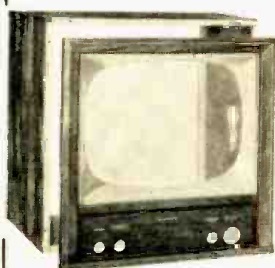
CABINET KIT with 90% of the job done, includes—  
FRONT SECTION complete as pictured in Solid Mahogany, Walnut or Blond Korina.  
TOP, SIDES, BACK, MASK, SAFETY GLASS, ETC. and Easy-to-follow Instructions.

Front, Top and Sides supplied in a beautiful Piano Finish . . . Knob panel undrilled for drilled on receipt of your template) . . . For matching Mask specify type of CRT used. Same price for Mahogany, Walnut or Blond.

**21" CABINET KIT** 26"-H, 25"-W, 22"-D **\$24.95** | **17" CABINET KIT** 24 1/2"-H, 22"-W, 22"-D (s.w. 34 lbs.) **\$24.95**  
(Shipping weight 36 lbs.) | **24" or 27" CABINET KIT** 30"-H, 28 1/2"-W, 22"-D **\$36.47**  
(s.w. 50 lbs.)

**FRONT SECTION only** for WALL INSTALLATIONS Includes Mask, Safety Glass, Decals and Illustrated Instructions. **21" . . . \$17.45** | **24" or 27" . . . \$22.97**  
(Shipping wgt. 30 lbs.)

Same price on Mahogany, Walnut or Blond or in Natural (unfinished) for your own color application.



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As much as \$15 worth — Everything Brand New and sold to you with a money back guarantee.

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## Plus a FREE SURPRISE PACKAGE

- \$15 — "JACKPOT" TELEVISION PARTS... \$1
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- 20 — TUBULAR CONDENSERS .25-600v... \$1
- 20 — TUBULAR CONDENSERS .001-1000v... \$1
- 3 — ELECTROLYTIC COND. 60/40-450v... \$1
- 100 — ASSORTED FUSES popular sizes... \$1
- 100 — ASST. 1/2 WATT RESISTORS some 50%... \$1
- 70 — ASSORTED 1 WATT RESISTORS... \$1
- 35 — ASSORTED 2 WATT RESISTORS... \$1
- 50 — ASST. TUBULAR CONDENSERS... \$1
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- 50 — ASST. CERAMIC CONDENSERS... \$1
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- 50 — ASST. TERMINAL STRIPS 1, 2, 3, 4 lug... \$1
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- 5 — ASST. TV ELECTROLYTIC CONDENSERS... \$1
- 25 — ASST. MICA TRIMMER CONDENSERS... \$1
- 50 — TUBULAR CONDENSERS .001-600v... \$1
- 50 — TUBULAR CONDENSERS .01-400v... \$1
- 2 — ELECTROLYTIC COND. 40/10-450v... \$1
- 2 — ELECTROLYTIC COND. 40/10-450v... \$1
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- 35 — CERAMIC COND. 20-25 mfd & 15-47 mfd... \$1
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## The "Electro-Melodeon"

(Continued from page 63)

you can't get something for nothing. Although it has the advantage of cheapness, resistive tuning cannot be used over a very wide tuning range. This is because too much resistance in series with  $C_2$  will affect the generation of overtones and will impart an unpleasant quality to the note. For this reason,  $C_2$  must have only a little more capacity than is required to produce the desired pitch. Then, just a few hundred ohms will be needed to accomplish the final precise tuning.

Work on the keyboard should not be started until the rest of the instrument has been completed. Then, connect together all of the  $A$  terminals of the 25 switches. A lead from one of the  $A$  terminals is then run to  $R_{16}$ . Next, wire up the  $B$  terminals. A connection is then made from the common  $B$  line to the junction of  $C_{16}$  and  $R_{20}$ . Finally, wire all of the  $C$  terminals together. A wire goes from this common line to the junction of  $CH_2$  and  $C_1$ .

You can now begin to install the  $C_2$  and  $C_3$  capacitors. Start with the highest note, "A" (880 cps), and work down the scale. Either an audio oscillator or an accurately tuned musical instrument must be available for checking the frequency of each note as the capacitors are wired in place. The approximate value of  $C_2$  required for each of the 25 notes is given in Table 1. Since the resonant frequency of the oscillator is dependent upon  $CH_2$  and  $C_6$ , as well as  $C_2$ , manufacturing tolerances in these components may make it necessary to modify the values shown for  $C_2$  to some extent. I suggest that you obtain a few extra .001 and .002  $\mu$ fd. capacitors. These can be used to parallel the  $C_2$  capacitors, when necessary, so that resonance will be achieved when  $C_2$  is set at mid-range.

As can be seen in Fig. 2, I used a number of ceramic capacitors in the keyboard circuit. This was only because I happened to have a large number of them in my junk box. If you go out and buy the keyboard capacitors new, I recommend that you get either mica or paper ones because of their accuracy and temperature stability. Unless designed specifically for frequency determining circuits, disc ceramic capacitors are apt to be lacking in both of these important characteristics.

Although any person who knows how to read music will experience little difficulty in learning to play the "Electro-Melodeon," the following hints may prove helpful. The melody is played with the right hand. This leaves the left hand free to operate the controls. Volume should be adjusted with the "Expression" knob, not the "Fundamental" or "Voice" knobs. These latter controls are used only for blending the sine- and overtone-outputs from the oscillator. The different tonal qualities resulting from changes in the position

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of the "Stop" switch will be most noticeable when the "Voice" control is fairly well advanced and the "Fundamental" control is near minimum. The "Vibrato" switch, normally left on, is turned off only for special effects. Do not depress more than one key at a time. If you do, you'll merely be throwing an extra capacitor across the oscillator tuning circuit. The result will be a note which is lower in pitch than that produced by either key alone.

If you, too, are fascinated by electronic musical instruments, but feel that a full-sized organ is beyond your capabilities, why not try your hand at constructing an "Electro-Melodeon"? I'm sure that you'll be both surprised and pleased when you discover how much pleasant music can come from this relatively simple, inexpensive instrument.

### MICROPHONE TESTS AS THEY USED TO BE

By FRED LINGEL

"JOE took father's shoe bench out," sounds like a misplaced phrase but in the days not too long ago, it was part of a daily recital at some of our development laboratories.

Electronic equipment to mix audio frequencies properly and then inject them into a microphone was not readily available back in 1928. It was therefore common practice for a trained operator to repeat the two sentences "Joe took father's shoe bench out. She was waiting at my lawn" into a microphone under test. First he called them into a standard microphone or transmitter and then into the microphone under test. A technician or technical assistant, as he was often called, would listen in another room. He would note the sound intensity from first one transmitter and then the other. Then he would call back to the operator to add or subtract attenuation from the circuit of the test transmitter. When he thought the two units sounded at about the same intensity, he would let the operator know and the amount of attenuation would be recorded for that particular transmitter.

The two sentences were chosen as those most suitable for duplicating the general range of frequencies used in voice telephone communication. In addition, the sentences contained frequency combinations such as those to give "s-es" which were found most important in understandable voice transmission. Trained technical assistants and good operators were often able to repeat test data to within 1/2 db.

Of course, back in the days of Joe and his father's shoe bench there were no decibels, as such. Instead it was a "T.U." or transmission unit. This was short for "the attenuation which would result from one mile of standard telephone cable." The present day decibel is 10 times the logarithm to the base 10 of the power ratio of the two transmitters. One T.U. produced roughly the same attenuation.

So for the record of how it was done not-too-long ago, we have for the hi-fi do-er of today the story of Joe and his waiting miss. And, too, there is a number D90753, the part number of one of the test transmitters. It means nothing today but it's strange the things one remembers as time rolls by.



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1C6	.25	6AN8	.89	6SJ7	.74	12SK7GT	.49
1C7G	.30	6AQ5A	.53	6SK7	.75	12SN7GT	.67
1D6	.28	6AS5	.60	6SN7GTB	.65	12SQ7	.67
1D7G	.30	6AT6	.53	6SQ7	.67	12V6GT	.58
1H5GT	.72	6AU4GTA	.85	6T4	1.12	12W6GT	.75
1L4	.45	6AU6	.52	6T8	.90	12X4	.45
1LC5	.49	6AV6	.44	6U8A	.85	14A7/12B7	.81
1LC6	.46	6AW8A	.88	6V6GT	.58	14AF7	.88
1LH4	.60	6AX4GT	.66	6W4GT	.65	14B6	.78
1LN5	.46	6BA6	.50	6W6GT	.76	14Q7	.96
1N5GT	.48	6BA7	.92	6X4	.46	17AX4GT	.72
1R5	.63	6BA8A	.91	6X5	.56	19AU4GTA	.92
1S4	.77	6BC5	.57	6X8	.85	25CU6	.25
1S5	.60	6BD6	.57	7AU7	.69	25AX4GT	.75
1T4	.60	6BE6	.55	7C4	.65	25BK5	.75
1U4	.60	6BF6	.49	8CG7	.67	25BQ6GA/	
1V5	.55	6BH6	.73	8CM7	.75	25C6B	.89
1V2	.55	6BK5	.62	12AD6	.59	25CD6GB	1.59
1X2B	.66	6BQ6GA/6CU6	.90	12AF6	.58	25L6GT	.62
2AF4	1.02	6BQ6GT	.90	12AL5	.52	25W4GT	.73
3AF4A	1.02	6BQ7A	.89	12AQ5	.61	25Z5	.75
3AL5	.49	6BU8	.70	12AT6	.48	25Z6GT	.75
3AU6	.58	6BZ6	.55	12AT7	.74	26	.78
3BN6	.75	6BZ7	.99	12AU6	.58	27	.71
3BU8	.71	6C4	.49	12AU7A	.61	34	.25
3CB6	.58	6C5	.72	12AV6	.46	35A5	.82
3CS6	.58	6C6	.89	12AX4GTA	.72	35B5	.66
3DT6	.54	6CB6	.55	12AX7	.68	35L6GT	.65
3V4	.59	6CD6GA	1.48	12B4A	.72	35W4	.39
4BC8	1.03	6CG7	.61	12BA6	.55	35/51	.35
4BN6	.75	6CG8A	.80	12BA7	.85	35Y4	.66
4BQ7A	1.01	6CM7	.69	12BD6	.56	35Z3	.66
4BC5	.58	6CS6	.57	12BE6	.57	35Z5GT	.49
4BU8	.71	6CU6	.99	12BF6	.49	36	.25
4BZ7	1.03	6D6	.92	12BH7A	.77	39/44	.25
4CB6	.56	6DB5	.69	12BK5A	.91	41	.77
5AM8	.79	6DG6GT	.67	12BL6	.58	42	.75
5AN8	.90	6DQ6A	.99	12BQ6GTB	1.19	43	.82
5AQ5	.54	6F5	.78	12BY7A	.69	45Z3	.30
5CG8	.81	6F6	.90	12C5/12CU5	.56	50C5	.53
5J6	.71	6F6GT	.71	12CN5	.49	50L6GT	.65
5U4GB	.55	6G6	.99	12CX6	.56	50X6	.80
5U8	.84	6H6	.70	12DK7	.81	50Y6GT	.79
5V3	.90	6J5	.65	12DQ6A	1.11	50Y7GT	.78
5Y3GT	.39	6J6	.75	12E6	.75	57	.49
5Y4GT	.64	6J7	.90	12F5	.75	75	.95
6A7	1.01	6K6GT	.52	12K8GT	.69	80	.60
6A8	.98	6K7	.90	12K7GT	.85	83	.85
6AB4	.57	6K8	1.15	12L6GT	.67	84/6Z4	.64
6AF4A	.95	6N7	1.15	12Q7GT	.79	89	.35
6AG5	.65	6Q7	.86	12SA7	.81	117N7GT	2.25
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### Removing Resonances

(Continued from page 45)

12-position switch and a series of capacitors. The device covers a range of 300 to 3000 cps with the values shown. For frequencies above this range a standard, two-gang variable capacitor of the type used in broadcast receivers may be employed (with the sections paralleled) to tune continuously to the top of the audio range.

An inductance with good "Q" is important in achieving the narrow rejection slot needed to compensate for some resonances. A low-"Q" LC combination can be used to some advantage but will usually mean unnecessary attenuation of frequencies above and below the point of resonance. The 2.4-henry choke used in the circuit is rated at a minimum "Q" of 20 and, in order to obtain minimum insertion loss, a variable resistor is placed between the audio signal source and the LC elements to control the depth and width of the rejection slot. To some degree the effectiveness of this expedient is contingent upon the signal source being of relatively low impedance, such as the cathode-follower output found in most current preamplifier-control units. A high-impedance signal source will make it impossible to minimize the amount of rejection past a certain point. It should be noted, too, that apparently a number of preamplifier control units with cathode followers use a relatively small coupling capacitor to feed the outgoing line with the result that impedance at low frequencies may be on the order of 20,000 to 100,000 ohms. If the capacitor in the LC circuit is of nearly the same value or larger than the coupling capacitor, then serious low-frequency attenuation may result. In this case it may be desirable to parallel the control unit's output coupling capacitor with a 20- $\mu$ fd. electrolytic.

Once the series-resonant circuit has been "tuned" to the frequency where the greatest improvement in listening quality is noticed, it may be tucked out of sight where the settings of the two controls are not likely to be disturbed. It should be noted, however, that both the frequency and intensity of resonances in the system may vary over a

period of time, depending upon temperature, humidity, and other factors. This is one of the reasons why some outfits appear to change character over the months and years, hence retuning of the series-resonant circuit may be desirable after a period of time has elapsed.

Several precautions are in order when locating the series-resonant unit. The most important of these is to keep it away from power transformers, motors, and other magnetic devices whose fields may cause inductive hum pickup. A second, and somewhat contrary, recommendation is to keep the length of shielded cable between the unit and power amplifier relatively short in order to minimize the effects of cable capacitance on high-frequency response. Usually the choke in the series-resonant circuit can be oriented for minimum pickup from a particular hum source and, as the audio level will probably be a fraction of a volt, there should be no problem in most installations.

When dealing with resonant frequencies below 300 cps, it is desirable to use a larger value of inductance in order to insure a favorable LC ratio. Power supply chokes are readily available in values from 8 to 30 henrys and are relatively inexpensive. Care should be taken in selection, however, as reasonably good "Q" and freedom from distributed capacity that might cause an unwanted peak in the mid-frequency range are requisite. Fig. 3 gives the component values for a circuit employing a 15-henry choke and tuning from 30 to 300 cps. With this circuit, it is possible to compensate for the primary resonances of speakers and phonograph pickup arms as well as possible enclosure or room resonances falling within this range.

Fig. 5 shows some of the circuits that may be used to achieve rejection of a particular frequency range. Fig. 5A is identical to those already described and requires a relatively low-impedance audio source for the widest range of operation. The circuit of Fig. 5B may be used with a medium-to-high-impedance signal source, as can the circuit of Fig. 5C which is similar. However, for moderate amounts of attenuation, these two circuits act like band-rejection filters, due to their phase characteristics, and are less use-

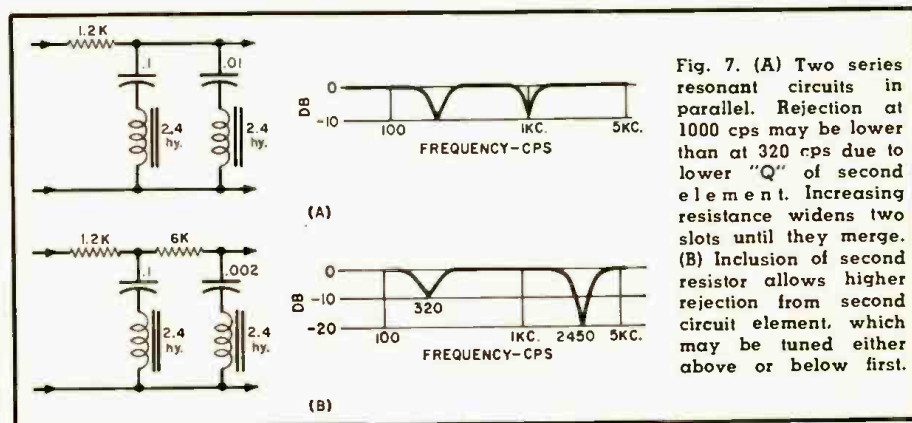
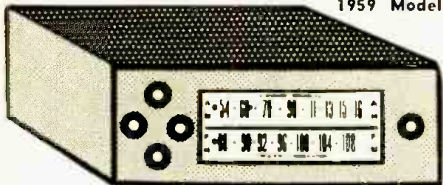


Fig. 7. (A) Two series resonant circuits in parallel. Rejection at 1000 cps may be lower than at 320 cps due to lower "Q" of second element. Increasing resistance widens two slots until they merge. (B) Inclusion of second resistor allows higher rejection from second circuit element, which may be tuned either above or below first.

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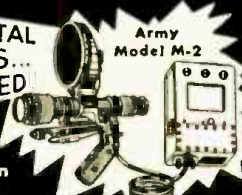
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ful in suppressing a single resonance in the system. The circuit of Fig. 5D although again looking much like the preceding configurations, provides a slot of constant width and varying depth and should be driven by a low-to-medium-impedance signal source. Fig. 5E is a circuit in which the tube plate resistance is used as the element determining the amount of rejection obtained. Fig. 5F is a parallel-resonant circuit which can be placed in the cathode circuit to obtain rejection by means of degenerative feedback.

Thus far we have proceeded on the assumption that there will be only one major undesirable resonance in the system, although of course this may be far from the actual case. Fig. 4 indicates five of the most common resonant peaks that may be encountered in a system. It may be desirable to compensate for two or more of these. Fortunately, this is quite easy to do by cascading or paralleling series-resonant elements, as shown in Fig. 7. Preferably the operating frequencies of the two circuits should be fairly well separated and the one which requires the higher amount of rejection should be inserted the farthest from the signal source.

The use of series-resonant compensation provides a convenient and versatile method of reducing the unwanted effects of resonance in a hi-fi system and, in the author's experience, can produce an astonishing improvement in clarity and naturalness, particularly in the case of mid-range defects. In addition, these circuits may be used to some advantage in recording work to improve instrumental balance or to reduce the harshness or nasal quality of a voice. They can also be used to achieve a wide variety of tonal coloration in such recording applications.

No doubt a great many other uses for the resonant circuits described in this article will suggest themselves to the audio experimenter who wants to try some novel effects.

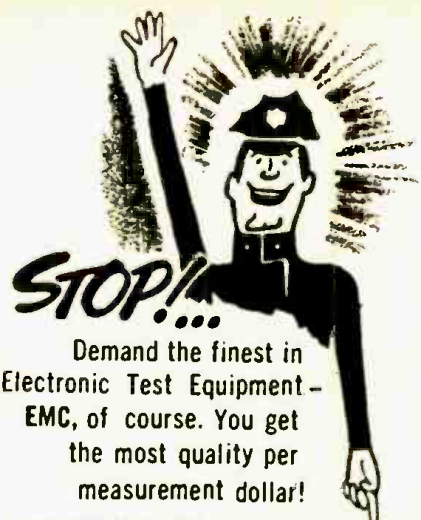
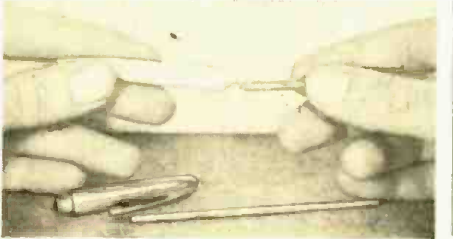
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By PETER BARNA

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### NEW! EMC Model 108 Handi Tester

The only appliance and auto battery tester in its price class to use a D'Arsonval, instead of an iron vane type meter. Gives exclusive advantages of maximum accuracy and scale length, and minimum battery replacement cost . . . at no added charge. Complete with test leads and instruction manual.



- Wired ..... \$15.95
- Kit ..... 12.95

### NEW! EMC Model 905-6A Battery Eliminator, Charger, and Vibrator Checker

A MUST for auto radio service. Features continuously variable voltage output—In either 6 or 12 volt operation. Checks all 6 or 12 volt vibrators.



- Wired ..... \$67.90
- Kit ..... 44.90

### NEW! EMC Model 601, Wide Band Oscilloscope for Color & Monochrome TV

Features full 5 mc band with push-pull vertical amplifier with sensitivity .02 volts per inch, retrace blanking amplifier for clearer pictures, and multivibrator sweep from 15 cycles to over 75 kilocycles. Wired and tested ...\$117.90



### NEW! EMC Model 206P Dynamic Mutual Conductance Tube Tester

The lowest priced mutual conductance tube checker on market. Checks tubes for microhm value and gas content. Completely flexible switching. Your best buy in a quality tube tester. (Hand rubbed Carrying Case) ...\$83.50



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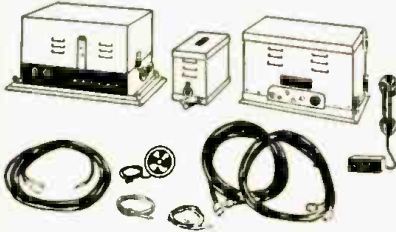
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**30-50 MC FM MOBILE TYPE FMTR FOR 6 VOLT OPERATION**

Complete with all accessories including crystals to your specific frequency. Units wired with Peak Modulation. Complete package ready for immediate installation (less antenna). Used, checked out. **\$109.95**

Above consists of Radio Trans., 35-UFM, Power Supply Type VPA-3A, Radio Rec. Type 11-UF, and accessories (less antenna assembly) for accomplishing an operating 2-way mobile communication system. Designed normally to derive all its primary energy from 6-volt, 3-cell lead storage battery.

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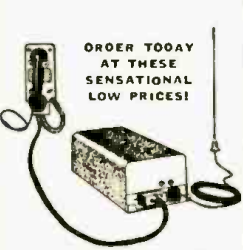
**SEPTEMBER SPECIAL!**  
Same as above wired for 12 V. operation. **\$149.95**

Individual Accessories Avail. for FMTR EQUIPT. Antenna consisting of base, whip & mount. **\$15.00**  
Crystal Set for Rec. & Trans. **20.00**  
12 V. Conversion Kit **35.95**

**2210 FM MOBILE IS2-162 Mc 6 Volt**

Current Regulations, Phase Modulation

FM Transmitter-receiver with 6 V. Power Supply mounted in a single case 17" L x 8" W x 6" H. Power output 0 V., 10-17 watts; 12 V.: 15-20 watts. A single power supply furnishes plate current alternately to both the transmitter and receiver. In one compact unit are included all the necessary control features: volume control, squelch adjustment, receiver and transmit pilot lamps and primary fuse. Universal mounting facilities permit installation in almost any desired location. Used, checked out, ready for operation with cables and accessories (as illustrated below) **\$129.50**  
Crystals & 12 V. Conversion Kits Available.



**ORDER TODAY AT THESE SENSATIONAL LOW PRICES!**

**TYPE 2365 FM MOBILE**  
25-40 OR 30-50 Mc 6 V.  
Current Regulations Phase Modulation  
Same specifications as 2210 above, except freq. range 25-40 Mc. Power output: 0 V.: 30 watts; 12 V.: 35-40 watts. Used, checked out, ready for operation with cables and accessories (as illustrated below) **\$99.50**

Crystals, antennas & 12 V. Conversion Kits Avail.

**BC-221 Frequency Meter**

Real Value! QUANTITY IS LIMITED—so first come, first served. They are just like new, with original calibration charts. Range 125-30,000 KC with crystal check points in all ranges. Complete with crystal and tubes. **\$119.50**



MODULATED TYPE **\$139.50**  
MODULATED TYPE with AC Power Supply **159.50**  
These Frequency Meters are factory tested, checked for frequency alignment and GUARANTEED.

**J-38 KEY**

Mounted on black bakelite base, 4 1/2" x 3", easily attached to operating desk. Has jumper strip, binding posts and circuit closing switch, fully adjustable, 1/16" solid silver keying contacts. Metal parts are cadmium-plated. **\$1.29**



New **\$2.95**  
J-45 Key with metal knee band. Brand new. **\$2.95**

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HS-23 high impedance, brand new **\$4.55**  
HS-33 low impedance, brand new with cord and PL-54 plug **\$4.65**

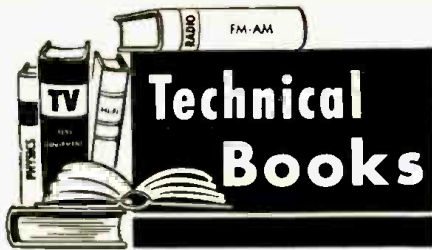


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BC-457 Trans. 1 to 4.3 mc. mod. used. **\$4.95**  
BC-458 Trans. 5.3 mc to 7 mc. mod. used. **\$4.95**  
BC-696 Trans. 3-4 mc. used, as is. **\$3.95**  
GC-602 Control head for GC-521 new. **\$0.70**  
Plugs for above Command Sets, PL-152-A or PL-150-A **\$0.55**

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"TV DISTRIBUTION SYSTEMS AND ANTENNA TECHNIQUES" by Jack Beever. Published by Howard W. Sams & Co., Inc., Indianapolis. 163 pages. Price \$2.95. Soft cover.

The boom in two-set TV homes, the increase in the number of hotels and motels providing television to their patrons, and the mushroom growth of "community antenna systems" have left many technicians ill prepared to cope with the problems of multiple-set installations.

In order to remedy this serious lack, the author offers a thoroughly practical approach to the problem. He provides complete information on every type of TV signal distribution system, explains the requirements of long-line or community antenna systems, and discusses such vital matters as the original installation, troubleshooting, and continued maintenance. Nor has he overlooked the business aspects of such work—he covers the various points involved in bidding, cost estimating, and selling multiple-set installations.

The text material is written in easy-to-understand form and the lavish use of illustrations further simplifies the technician's task. Since both local and fringe area v.h.f. as well as u.h.f. installations are covered, a thorough understanding of the subject matter in this text should equip the technician to handle any antenna job that he is asked to tackle. Since the author is a field engineer with Jerrold Electronics Corporation, the material has been tested in the course of making hundreds of multi-set installations throughout the country.

"OFFICIAL REGISTRY OF RADIO SYSTEMS IN THE TRANSPORTATION SERVICES" compiled and published by Communication Engineering Book Company, Monterey, Mass. 84 pages. Price \$4.00. Soft cover.

This is the 1958 edition of a publication which gives the details of every mobile radio system in the U. S. operated by railroads, taxicab companies, auto services, bus lines, and truckers (excluding ham stations).

This edition, revised from FCC records, lists the name and address of each company, the number and location of its fixed transmitters, the number of mobile transmitters authorized, operating frequencies, call letters, and the make of equipment used.

"AUDIO DESIGN HANDBOOK" by H. A. Hartley. Published by Gernsback Library, Inc., New York. 218 pages. Price \$2.90. Soft cover.

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Hoses: 115 V., 400 CY., 22 CFM. w/bracket. **5.00**

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J-44 High Speed Hand Telegraph key with On-Off switch, adjustable spring tension and contact spacing. 1/8 in. silver contacts, mounted on bakelite base. **prepaid \$1.60**  
R-14, Headphones, 8000 ohm Imp **prepaid 2.95**  
2270-1845 Terminal Board, 18 dual lugs. **.25**  
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MEX-A/P: Probe, Type used on CR 34 A/P Scopes. **10 for 2.00**  
Relays, 6 V. DC, 2 Pole Single Throw. **.85**  
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Intercom Test Handsets (Recond. slnt.) per pr. incl. 50 ft. wire. **3.95**

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thoroughly familiar with Author Hartley's style and his unique faculty for "stirring up the Indians." An individualist of the first water and a respected British audio engineer, Mr. Hartley has covered audio techniques—from amplifiers to transformers, feedback, tone controls, speakers, and enclosures—in his own inimitable fashion.

Written at a not-too-technical level, with a minimum of mathematics and engineering concepts—this volume would be entirely suited for both the professional sound man and the enlightened audiophile.

The text itself is divided into twelve chapters covering the perception of sound, the audio output stage, inverters and drivers in audio amplifiers, voltage amplification, amplifier design, audio transformers, negative feedback, filters and tone controls, amplifier power supplies, speakers and enclosures, measurements and testing—winding up with a humdinger concluding chapter, written in first person singular, entitled "High Fidelity—hail and farewell."

The same spritely approach which characterized the author's series of articles in this magazine, "Realistic High Fidelity," is carried over into this book.

We believe that most persons interested in the electronic reproduction of sound will find this volume both challenging and instructive.

The lucky winners of Thorens' unique "10 Year" hi-fi contest receive their awards from Paul W. Kind (center), head of the firm. Hi-fi salesman James Carroll (left) of Harvey Radio Co., New York receives a check for being the "favorite audio salesman" of the winner, Hannes Beckmann (right) of New York. As the author of the best 50-word description of his "favorite hi-fi dealer's salesman," Mr. Beckmann will receive his choice of any one Thorens hi-fi product each year for ten years. For his first choice, he selected the firm's new TD-124 turntable. The winners were selected by the editors of six leading publications in the hi-fi field: W. A. Stocklin, Editor, RADIO & TV NEWS; Warren DeMotte, Associate Editor, HI-FI & MUSIC REVIEW; John M. Conly, Editor, High Fidelity; Milton B. Sleeper, Publisher, Hi-Fi Music at Home; M. Harvey Gernsback, Editorial Director, Radio-Electronics; and Anthony Lord, Managing Editor, High Fidelity Trade News.



September, 1958

## LOCALIZER RECEIVER

108.3 TO 110.3 MC



Crystal Control on 6 preset Channels. AM. Can be tuned to receive signals from Satellite Explorer. Audio and Band Pass Filter 90 & 150 cycle for aircraft instrument landing. Complete with Tubes. Voltages required 12 or 24 VDC & 220 V 80 MA.

Used: **\$9.95**

Used. Less Tubes & Crystals \$1.95  
 BC-732 Control Box \$2.00  
 1-101 Crosspoint Indicators. Cracked Glass 1.50  
 PLUGS 1/Receiver (2). Control Box (1), or Indicator (1) Each Plug 1.00  
 DM-53—24 Volt Dynamotor—Used 2.95  
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## Police • Fire • Sheriff • Commercial FM RECEIVER

30 TO 50 MC



Government Surplus Receiver converted to receive FM signals in the 30 to 50 MC Band—in a range of 10 MC spread—such as: 30-40; 31-41; 32-42; 33-43; 34-44; 35-45; 36-46; 37-47; 38-48; 39-49; or 40-50 MC. Continuous or push button tuning. adjustable squelch, speaker phone jacks, 10 tubes. Size 1 1/2" x 6 1/2" x 12 1/2". When ordering, specify operating Freq. and Freq. spread desired.

No. BC-3050—NEW **\$29.95**

110 Volt 60 cycle Power Supply \$14.95  
 DM-34 12 Volt Dynamotor—New 4.95  
 Battery Cable & Plug (Required with Dyn. only) 2.75

## MISCELLANEOUS

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 BD-71 Switchboard—6 line Used: 14.95  
 RM-29 Telephone Control Box New: 6.95  
 T-17 Carbon Microphone—New: \$6.95  
 M-22 Handset—New: \$3.95  
 TS-13 Handset—New: 3.95  
 TS-9 Handset—U: \$2.95  
 T-26 F-1 Microphone—N: 1.95  
 C-161 or C114 Load Coils: \$1.95  
 Navy Filter: 1.95  
 BC-929 Oscilloscope—Used: \$9.95  
 New: 14.95  
 BC-906 Fred. Meter—143—227 MC—U: \$7.95  
 N: 9.95  
 RD-7 APA-23 Recorder Used: \$29.95  
 New: 29.95  
 TS-385 Oscillator—376—418 MC—U: \$9.95  
 N: 14.95  
 BC-376 Oscillator—75 MC—Chas. less Tubes, U: 8.95  
 BC-1203 Audio Amplifier Modulator New: 16.95

## UNIVERSAL DYNAMOTOR



6 Volt 8 A input; output 12 V 1.8 A  
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 input; output 24 V 1.8 A 500 V  
 50 MA. Will operate BC-603-683-3050-ARB—etc.  
 PM Type No. 0515—  
 with Instructions **\$4.95**

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220 VDC 80 MA DM-34/BC-603	\$ 4.95	\$ 2.95
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300 VDC 260 MA PE-98/SCR-522	19.95	12.95
540 VDC 450 MA DA-12	14.95	11.95
425 VDC 163 MA WE-377	12.95	9.95
225 VDC 100 MA D-402	8.95	5.95
230 VDC 90 MA PE-133	4.95	....
250 VDC 60 MA DM-32 12 V	4.95	....
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 BC-684 FM—27 to 39.1 MC Used: 14.95  
 BC-3050 FM—30 to 50 MC 10 MC Spread New: 29.95  
 BC-603 FM—20 to 17.9 MC New: 14.95  
 BC-683 FM—27 to 38.9 MC Used: 24.95  
 J-208 FM Generator Used: \$39.50—New: 79.50  
 BC-1268 Control Indicator Oscilloscope New: 14.95  
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NAVY ARB/CRV 46151—Four Band, 6 Tube Superhel—Local and remote tuning and band change; illuminated dial, sharp & broad tuning; AVC, CW, provisions for operation of DU-1 Loop. Complete with Tubes: 1/2SA7, 1/2A6, 4/2SF7, & 24 Volt Dynamotor. Size: 8" x 7" x 16". Conversion for 12 volt or 115 V 60 cycle available. Price—Used **\$18.95**

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27—8 month guarantee—all others 1 year. Aluminized Tubes \$5.00 more than above prices. These prices are determined to include the return of an acceptable similar tube under vacuum.

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 FT-171 holders. Pin spacing 3/4". Banana pins.

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 .01% Tolerance. \$2.00 .005% Tolerance. \$2.75  
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 9001KC to 12,000KC: .005% Tolerance. \$3.00  
 Specify holder wanted.

3500 KC hermetically sealed frequency marker crystal .005% tolerance fits octal tube socket. **\$1.75**

ANY AMATEUR BAND CRYSTAL .01% Tolerance  
 NOVICE BAND CRYSTALS **\$1.50**  
 80 meters 3701-3749KC  
 40 meters 7152-7198KC  
 15 meters 7034-7082KC each

6 METER TECHNICIAN BAND CRYSTALS  
 8335KC-8550KC within 1KC—  
 each **1.50**

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SEALED OVERTONE CRYSTALS supplied in metal HC/6U holders—pin spacing .486, diameter .050.  
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 30 to 54 MC. .005 tolerance. \$4.10 ea.  
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FUNDAMENTAL FREQ. SEALED CRYSTALS  
 In HC/6U holders from 1400KC-10,000KC any frequency .005 tolerance. \$3.50 ea.

### TEXAS CRYSTALS, TRANSISTORIZED 100 KC MARKER OSCILLATOR

Compact, portable, in attractive metal carrying case with handle. Size: 4"H x 3"W x 6"D. Connects to any receiver to get 100 KC markers from 100 KC to 50 MC. Factory wired with two transistors, one 100 KC crystal, self-contained battery. Shipping weight, 10 oz. Add 50c for prepaid parcel post. **\$17.95**

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All marine frequencies from 2000-3200KC  
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Stock crystals in FT-243 holders from 5675KC to 8650KC in 25KC steps. . . .75¢ or 3 for \$2.00

FT-241 lattice crystals in all frequencies from 370KC to 540KC (All except 455KC and 500KC.) . . .50¢

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# TEST REPORT Hi-Fi Components

## NEW SHURE "DYNETIC" CARTRIDGE



having a magnetic input without the use of a special transformer. Tests made in our own laboratory showed an extremely smooth response from 30 to 17,000 cps and then dropping off rather rapidly. For those who are interested in an extended high-frequency response, the load resistance may be increased.

The stylus assembly is held in place by a plastic composition which provides extremely high needle compliance, resulting in practically no "needle-talk."

Listening tests made in comparison with other cartridges showed that this new Shure unit is a top contender in the present cartridge field. It is extremely smooth yet brilliant and the over-all effect is one of ease. The published tracking force requirement of three to six grams certainly was confirmed in that we had no tracking problems, even on some of the loudest passages. This led us to believe that even lower tracking pressures could have been used.

Another important feature is that stylus replacement is especially simple and fast and no tools are required. It is not a turnover cartridge as many are today. It is available in only two models—the M5D for microgroove records with a 1 mil diamond stylus and the M6S for standard 78 rpm records with a 2.7 mil sapphire stylus.

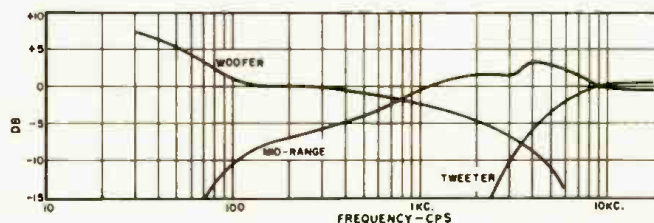
THERE are always surprises from Shure Brothers. It wasn't too long ago that they announced the development of their "Studio Dynetic" cartridge and tone arm assembly. It was a big surprise then in that this cartridge was an electromagnetic transducer where formerly Shure Brothers were primarily known in the field of crystal and ceramic cartridges. They now have a relatively new addition to their line—the "Professional Dynetic" series which like its predecessor is an electromagnetic transducer using a moving magnet. It differs in that this unit needs no special tone arm. It can be used with almost any arm found on record changers and with transcription turntables. Its recommended load impedance is 27,000 ohms and it has an output voltage of .021 volt which is suitable for driving almost any high-fidelity system

## "SHIELDCREST" SPEAKER SYSTEM

WE have seen and tested many speakers from such countries as England, Japan, and Germany but only recently have we run across such units imported from Denmark. The one we have just tried is a three-way system consisting of a 12-inch woofer, 5-inch mid-range, 2-inch tweeter, and an LC crossover network. All of the speakers are cone-type units and are being marketed under the tradename of "Shieldcrest" for \$24.88 (including crossover network) by Olson Radio Warehouse of Akron, Ohio.

These units are certainly worthy of comment, not only because they are extremely low priced but also because

we encountered some unusual results. Our first approach was to analyze the dividing network and the results are shown in the diagram below. It was interesting to note that there are actually three crossover points; one at about 750 cps, one at 3500 cps, and one at 9000 cps. The woofer and mid-range curves roll off at only about 3 db per octave. This may be compared with the usual 6 db per octave, or even 12 db per octave, that is more widely used. Further analysis showed that the entire network is basically a two-way system with the mid-range speaker operating throughout the entire mid- and high-frequency range.



Response characteristics of the dividing network showing the crossover points.

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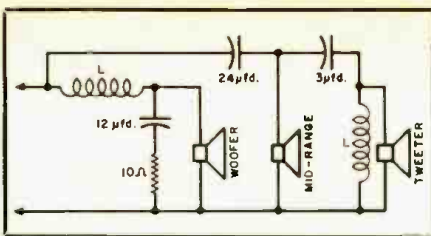
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Wiring diagram of the crossover network.

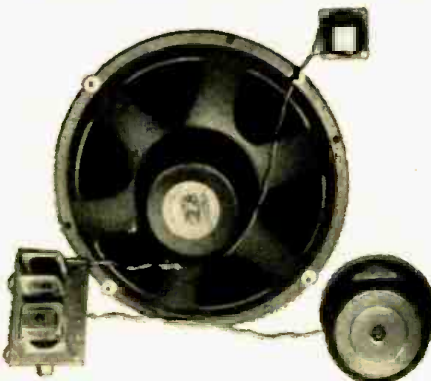
This is rather unusual but not necessarily detrimental to the over-all performance of the system. We know of another system which sells in the \$500.00 range that was designed in similar fashion.

Normal practice is to cut off the speakers very sharply at the crossover points to confine each speaker to its particular portion in the audio spectrum. The greatest advantage of this principle is to reduce intermodulation distortion.

The individual speakers, particularly the woofer, were extremely good performers. Cone resonance of the woofer was found to be quite low—on the order of 34 cps. We ran across one point at which the woofer did break up audibly but with further re-checking we were unable to repeat the break-up condition.

Listening tests showed up quite well.

The three speakers with the LC network.



Under normal room listening conditions, with an infinite baffle, the speaker system had a pleasant quality. It was somewhat heavy at the bass end but some high-fidelity enthusiasts may prefer this.

We do not wish to imply that this system can compare with any of the much higher priced, top-quality systems on the market today in "cleanliness" of response and freedom from intermodulation distortion, but in view of its modest price, we cannot deny that it is a good system.

## GARRARD AUTOMATIC RECORD CHANGER

The Garrard RC121/II record changer is one of the most recent additions to British Industries Corporation's line of hi-fi components. This unit warrants special mention in that it incorporates

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The Garrard RC121/II Record Changer

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It will handle all four speeds: 16 $\frac{3}{4}$ , 33 $\frac{1}{3}$ , 45, and 78 rpm. It will automatically play any number of records up to ten, in 7", 8", 9", 10", or 12" diameters. All 10- and 12-inch records of the same speed can be intermixed in any desired order without affecting the automatic operation of the changer. All other size records may be played automatically at the same time provided the smaller diameter records are placed above the larger ones.

In addition to the automatic mixing facilities, records may also be played manually and the changer stopped and started as desired without rejecting the record being played.

The manual operation is a "must" feature, in our opinion, for any record changer. Although the basic idea on the part of an owner is to use a record changer to play a stack of records automatically, there are many times when one would like to play individual records.

The manual control is not unusual since most record changers provide the same facility, but in this particular unit the ease with which one can switch from automatic to manual operation is quite gratifying.

The use of the center post for stacking records is the simplest arrangement for automatic record changers and this unit is no different from others using a similar mechanical system in that there is bound to be eventual wear on the center hole of the record.

Extensive listening tests were made using several different test records and we were pleasantly surprised to find very little wow, flutter, or rumble even under exaggerated conditions. It was unusually free from such unwanted effects considering that this changer is in the medium-priced field and therefore should not be expected to match the quality of any of the really top-notch professional units that are available on the hi-fi market today.

-30-

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## Manufacturers' Literature

### INDUSTRY "FACT BOOK"

Electronic Industries Association, 1721 DeSales Street, N.W., Washington 6, D. C. has announced publication of its 4th annual "Fact Book" for 1958.

The value of consumer products, tubes, semiconductors, components, and military and industrial equipment is included in this new reference book along with details on the production and sales of various industry items.

Non-members and the general public can obtain copies of the book by writing the Washington headquarters and enclosing 50 cents per copy.

### TRANSISTOR CATALOGUE

Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y. has just issued a four-page, two-color catalogue sheet listing the complete line of Texas Instruments semiconductor devices which it is prepared to supply from stock.

Among the units listed are silicon transistors, silicon diodes and rectifiers, as well as germanium transistors. Complete electrical specifications are given on each type handled.

Copies of this brochure are available without charge from the distributor.

### DYNAMOTOR CATALOGUE

Carter Motor Company, 2793A W. George St., Chicago 18, Ill. is now offering copies of its new 28-page dynamotor catalogue to interested persons.

The catalogue lists the company's new fan-cooled "Genemotor" as well as several new models comprising the "Genemotor" line which has been materially improved in appearance, performance, and service accessibility. In addition, eleven new listings appear in the 1½" and 2" frame "Genemotors," increasing their range of application.

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### EICO'S NEW CATALOGUE

Electronic Instrument Co., Inc. 33-00 Northern Blvd., Long Island City 1, N. Y. is now offering copies of its 16-page, 2-color catalogue describing the complete EICO line of electronic test instruments and high-fidelity equipment available in both kit and wired form.

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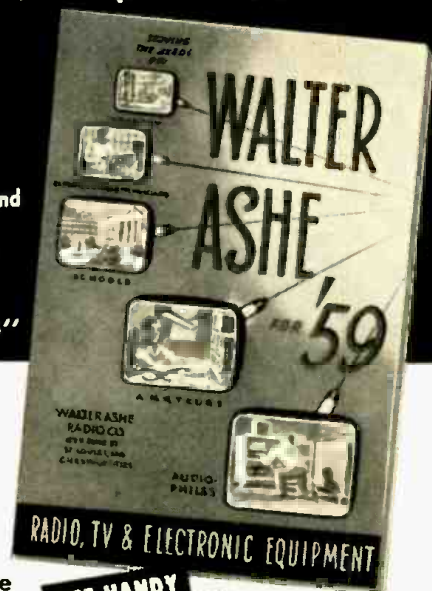
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**DATA ON "FRAMELOK GRID"**

A new booklet which describes the design and performance advantages of its "Framelok Grid" construction for electron tubes has been issued by *Sylvania Electric Products Inc.*, 1100 Main St., Buffalo, N. Y.

This 12-page brochure lists structural features of the new grid design and points up their effect on other tube elements. Ratings and performance characteristics of the firm's first "Framelok" tube, a 6FH6 horizontal deflection type, are included in the brochure.

**MAINTENANCE HINTS**

*National Electronics, Incorporated*, Geneva, Ill. has issued a pocket-sized, 20-page booklet entitled "Maintenance Hints."

Designed to be of help to equipment engineers and users who work with equipment incorporating electronic tubes, the publication gives maintenance hints for equipment using ignitrons, thyratrons, and gas-filled rectifiers. In each instance both causes of troubles and symptoms are discussed in non-technical terminology with a final section of the booklet devoted to approved practices for handling electron tubes.

The company will supply copies of this handbook without charge as an industry service.

**"BUSINESS BUILDERS"**

*CBS-Hytron's Advertising Service*, Parker Street, Newburyport, Mass. has just issued a completely revised fourth edition of its "Business Builders Catalogue" of sales promotion materials, technical literature, and service tools for independent service technicians.

The 16-page catalogue describes and illustrates over 90 useful items ranging from printed-circuit soldering aids to illuminated outdoor signs. A new easy-to-read format makes it possible to find needed items quickly.

When writing for a copy of this publication, please specify form PA-37. It will be supplied complete with order blank and price list.

**EIA STANDARDS LIST**

Electronic Industries Association, Room 650, 11 West 42nd St., New York 36, N. Y. has issued a 12-page booklet which lists recommended standards, specifications, and engineering publications which are currently available.

The list includes bulletins and publications of general interest, television and facsimile test charts, specifications for military components, standards, plus an alphabetical listing of the standards.

For a free copy of this index plus details on how individual standards can be ordered, write to the Engineer-

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16DP4	13.50	17TP4	16.50	21F KP4	15.75
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ing Office of the Association at the New York address rather than EIA headquarters in Washington.

### UTC TRANSFORMERS

*United Transformer Corporation*, 150 Varick St., New York 13, N. Y. has just issued its 25th anniversary catalogue covering electric wave filters, high "Q" coils, transformers, reactors, and magnetic amplifiers.

This 34-page publication provides complete specifications on a wide variety of components and, in addition, carries schematics for five amplifiers ranging in power from 20 watts to 60 watts. A reactance-frequency chart has been included for the convenience of amplifier designer-builders. The company's line includes a number of transformers designed especially for transistor circuits.

### B&K TEST INSTRUMENTS

*B&K Manufacturing Co.*, 3726 N. Southport Ave., Chicago 13, Ill. has just issued a colorful 4-page booklet which covers the firm's tube checkers, "Television Analyst," and test instruments for in-the-home servicing and shop use.

Performance and other pertinent data is provided on each instrument, along with a photograph and price information. Copies of Bulletin No. AP12 are available without charge.

### AUTO RADIO CAPACITORS

*Sprague Products Company*, North Adams, Mass. is currently offering a new manual which gives a complete list of "Atom" and "Twist-lok" electrolytic replacement capacitors for use in auto radios manufactured from 1946 through 1957. Some forty makes of radios are listed alphabetically with the company's replacements cross-referenced to the original part numbers.

Copies of the manual are available from the firm's distributors without charge or from the company at 51 Marshall St. for 10 cents.

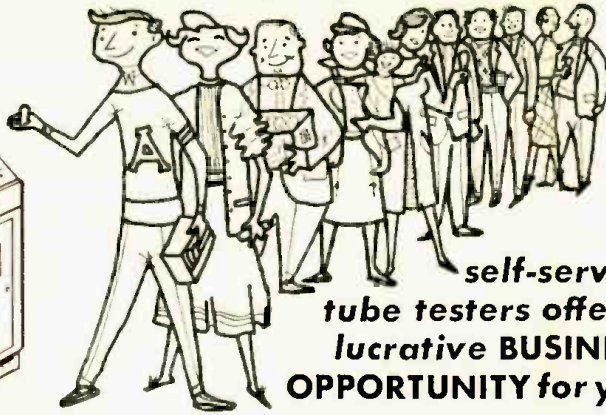
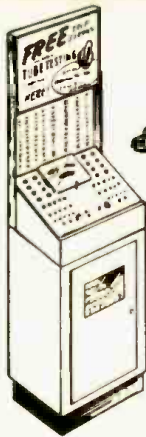
### NEW MILLER CATALOGUES

*J. W. Miller Company*, 5917 S. Main Street, Los Angeles 3, Calif., has announced publication of two new catalogues of interest to the electronic industry.

No. 159 is a new edition of the "TV Technician's Coil Replacement Guide" which lists the company's replacements for parts which appeared in the color and black-and-white sets of some 67 manufacturers. Both original part numbers and *Miller* replacements are listed in tabular form.

The second publication, No. 59, is a general catalogue covering the firm's complete line of industrial electronic, radio, and TV r.f. coils; chokes, line filters, coil kits, i.f. transformers, and special i.f. windings.

Copies of either or both of these catalogues are available without charge upon written request direct to the manufacturer. Please order by catalogue number.



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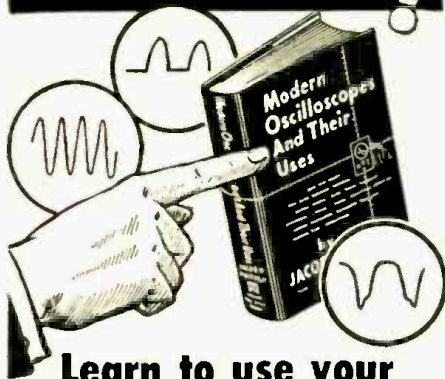
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## Within the Industry (Continued from page 28)

Institute of Radio Engineers and the Acoustical Society of America. He has been a director of EIA since 1956.

\* \* \*

**A. W. ORLACCHIO** has been appointed chief engineer of the *Glennite Instrumentation Division, Gulton Industries, Inc.*



Mr. Orlacchio joined the firm in 1952 and was placed in charge of the development of electromechanical instruments. His new duties as chief engineer include all design, development, and production engineering for products of the Division.

Previously employed at the National Bureau of Standards in Washington, D. C., he worked in the field of propagation of sound through solid media.

Mr. Orlacchio is a member of the Acoustical Society of America, the Institute of Environmental Engineers, and the Instrument Society of America.

\* \* \*

**JERROLD ELECTRONICS CORPORATION** has moved to new and larger quarters at Jerrold Building, 15th Street & Lehigh Avenue, Philadelphia 32, Pennsylvania . . . **SUPERSCOPE INC.** has moved its executive offices to 8520 Tujunga Avenue, Sun Valley, California . . .

**AMPHENOL ELECTRONICS CORPORATION** has announced the formation of a new western division to be located in Chatsworth, California. A 20,000 square foot plant has been erected to house the division, which will have its own complement of sales, engineering, manufacturing, and financial personnel. General manager will be James H. Schaefer . . . **PACKARD BELL COMPUTER CORPORATION** has announced the relocation of its offices to 1905 Armacost Avenue, Los Angeles 25, Calif. . . . **JENSEN INDUSTRIES**, Forest Park, Illinois, announces plans for a plant expansion to increase its floor space by 50 per-cent. The firm will thus increase its factory to 60,000 square feet . . . **TELONIC INDUSTRIES, INC.** plans to move its engineering division, **TELONIC ENGINEERING CORP.**, to Laguna Beach, California where it will expand its development and engineering facilities . . . **H. H. SCOTT, INC.** is now settled in its new building at 111 Powder Mill Road, Maynard, Mass.

\* \* \*

**ELECTRONIC INDUSTRIES ASSOCIATION** has appointed the following as members of a newly established engineering department policy committee: Ben Adler, president of *Adler Communications* and chairman of the EIA technical products division; Robert S. Bell, president of *Packard Bell Electronics Corp.* and chairman of consumer products division; Sidney R. Curtis, senior vice-president, of *Stromberg-Carlson Co.* and chairman of military products

# GREAT!

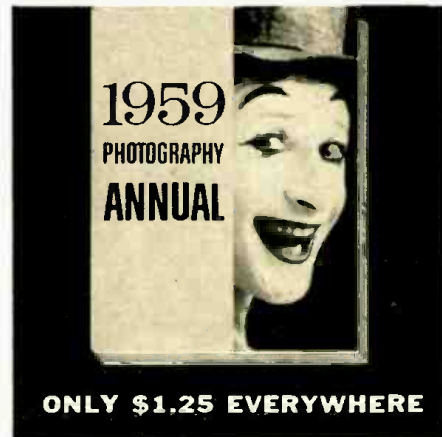


Photo by Hy Peskin, courtesy of Sports Illustrated © Time, Inc.

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16HP4	15.00	17CP4	20.50	21YPS1	22.00
17HP4	13.75	17GP4	21.50	21Y4A	25.00
15HP4	14.50	17LP4	18.00	21ZP4	21.00
16HP4	18.50	19A4	24.00	21ZPH4	24.00
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16KP4	15.75	21AP3	25.00	26CP4A	38.00
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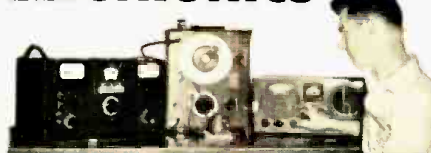
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September, 1958

division; D. W. Gunn, vice-president, sales, of *Sylvania Electric Products Inc.* and chairman of the EIA tube and semiconductor division; and W. S. Parsons, president of *Centralab*, division of *Globe Union, Inc.* and chairman of the EIA parts division.

The principal function of the committee will be to provide closer liaison between the Association's engineering department's various committees and management.

**ELECTRONIC INSTRUMENT CO., INC. (EICO)** has expanded its design laboratories and production lines to a newly modernized, one-level 45,000 square foot area at 33-00 Northern Blvd., Long Island City 1, N. Y. . . . Construction is now under way on an ultra-modern, one-story plant for the manufacture of special-purpose vacuum tubes by the components division of **INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION**. The 58,000 square-foot building, rising on an 18-acre site, is located in Roanoke, Virginia . . . The computer division of **BENDIX AVIATION CORP.** has established a computing center at 205 East 42nd Street, New York, N. Y.

**ANDERSON CONTROLS, INC.** has relocated its general offices at 9959 Pacific Avenue, Franklin Park, Illinois

**THE NARDA ULTRASONICS CORPORATION** has acquired a one-story building at 625 Main Street, Westbury, Long Island, N. Y. The new facility will provide the company with 16,500 square feet of additional production space . . .

**PIONEER ELECTRONICS CORPORATION** has taken over an additional building adjoining its plant at 2235 South Carmelina Avenue, West Los Angeles, California. The modern, one-story brick building will provide an additional 10,000 sq. ft. for warehouse, administration, and testing facilities . . .

**INSTRUMENTS FOR INDUSTRY, INC.** has completed plans for a new building to be located on New South Road, Hicksville, New York . . .

**MERIT COIL & TRANSFORMER CORPORATION** is establishing a Canadian warehouse at 700 Weston Road, Toronto . . . Negotiations will be completed shortly for the construction of a new 150,000 square foot electronics laboratory building on Route 128 in Burlington, Mass. for the microwave and power tube division of **RAYTHEON MANUFACTURING COMPANY**. Estimated completion date is early 1959 . . .

**U. S. ELECTRONICS DEVELOPMENT CORP.** has announced the moving of its entire administrative and manufacturing facility from Glendale, Calif. to Phoenix, Arizona.

**ROBERT R. SHERWOOD** has been appointed executive vice-president of *Rek-O-Kut Company, Inc.* . . . *Sylvania Home Electronics*, a division of *Sylvania Electric Products Inc.*, has announced the following promotions: **RICHARD J. STAFFORD**, marketing administrator; **CHARLES L. HUBBARD**, product planning manager; and **JOHN E. LAU**, sales manager, radio and high-fidelity . . . **E. C. RAYMUND** has been promoted to the post of executive vice-

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**SEPTEMBER 12-14**  
*Seventh Annual Chicago High Fidelity Show.* Palmer House, Chicago. Complete information from International Sight and Sound Exposition, Inc., 1 N. La Salle, Chicago 2, Ill.

**SEPTEMBER 15-19**  
*13th Annual Instrument Automation Conference and Exhibit.* Sponsored by Instrument Society of America. Philadelphia Convention Hall, Philadelphia. Fred J. Tabery, exhibit manager, 3443 S. Hill St., Los Angeles, 7, Calif.

**SEPTEMBER 22-24**  
*National Symposium on Telemetering.* Sponsored by IRE and PGTRC. Americana Hotel, Miami Beach, Fla. Contact Ken West, 1345 Indian River Dr., Eau Gallie, Fla. for program details.

**SEPTEMBER 24-25**  
*Industrial Electronic Conference.* Sponsored by IRE, AIEE, PGIE. Rackham Memorial Bldg., Detroit, Mich. H. W. Patton, Acromag Co., 22519 Telegraph Rd., Detroit, Mich. for details

**OCTOBER 1-2**  
*Engineering Writing & Speech Symposium.* Sponsored by IRE and PGEWS. For details, see page 149.

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Answer to Puzzle appearing on page 144.

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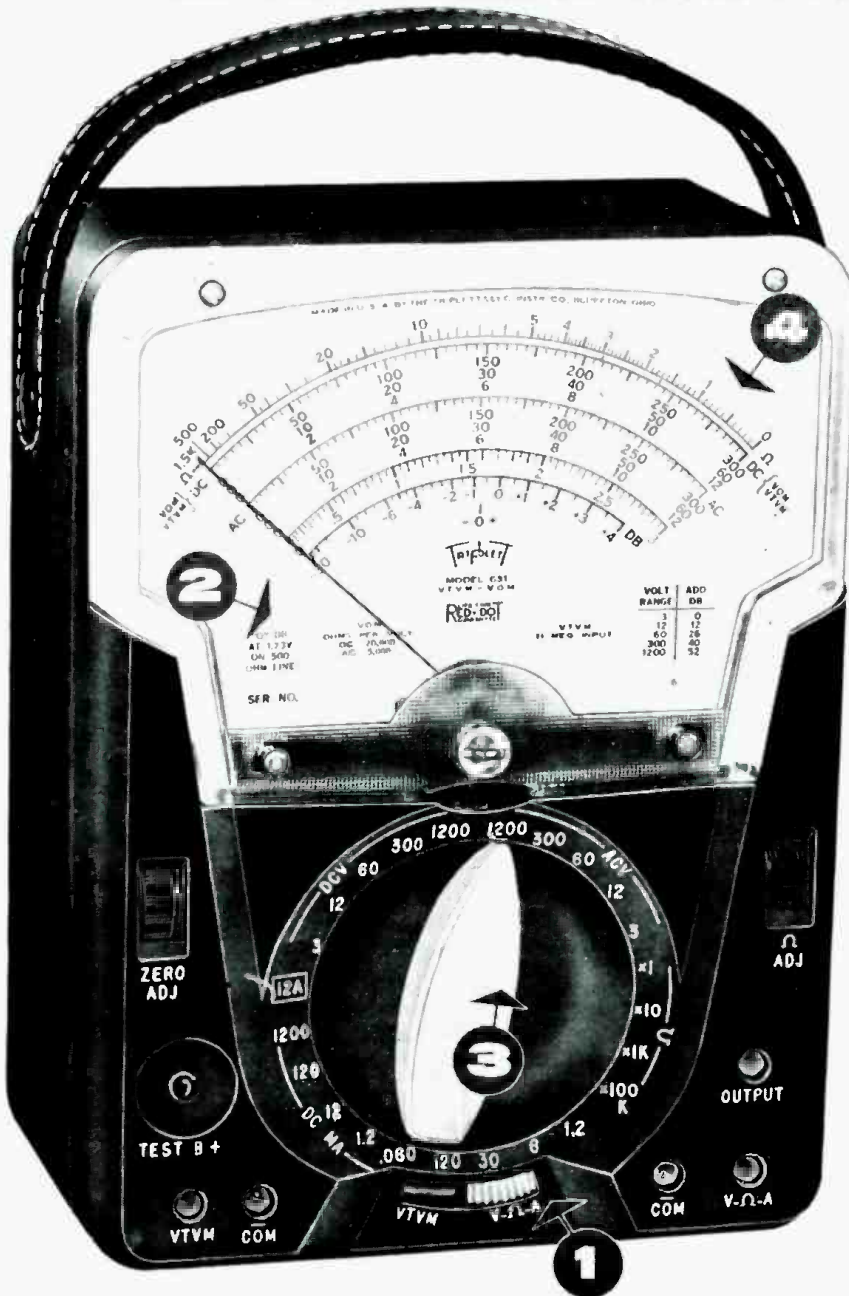
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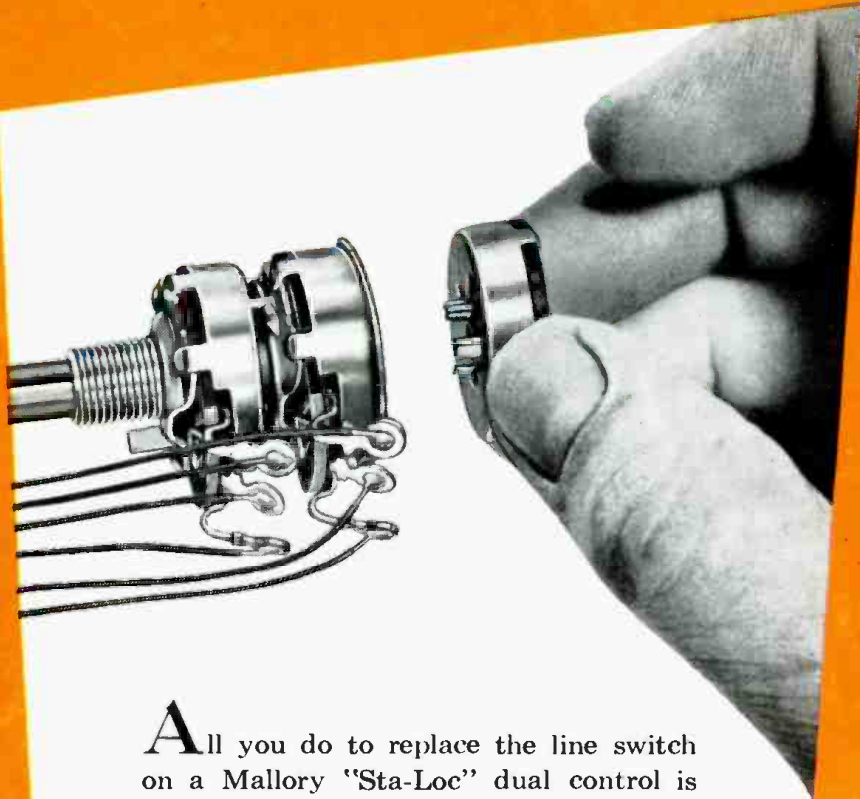
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