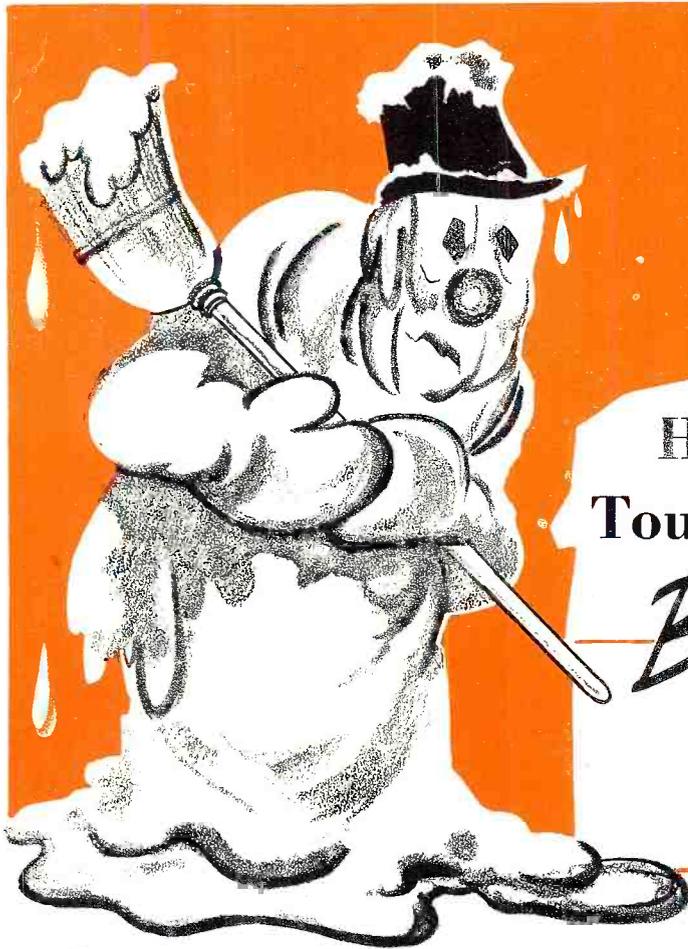


JANUARY  
1949  
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# RADIO & TELEVISION NEWS

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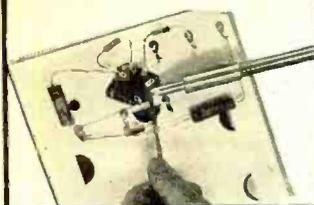
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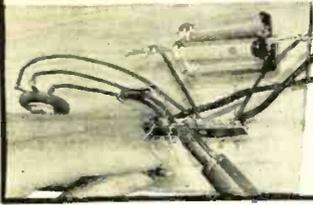
**YOU PRACTICE** Radio Soldering with Soldering Equipment and Radio Parts I send you. Get practical experience mounting and connecting parts.



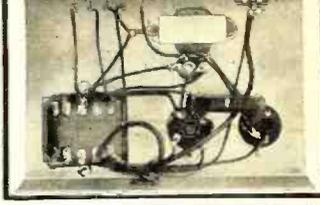
**YOU BUILD** this Tester with parts N. R. I. sends early in course. Soon helps you fix neighbors' Radios and **EARN EXTRA MONEY** in spare time.



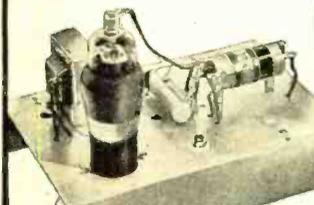
**YOU TEST** Radio Circuits like this built with parts I send. Build special circuits; learn how to locate and repair circuit defects.



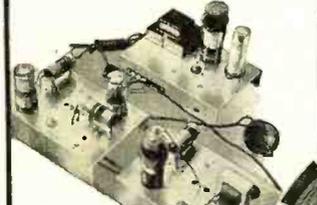
**YOU BUILD** Vacuum Tube Power Pack; make changes which give you experience with packs of many kinds. Learn how to correct Power Pack troubles.



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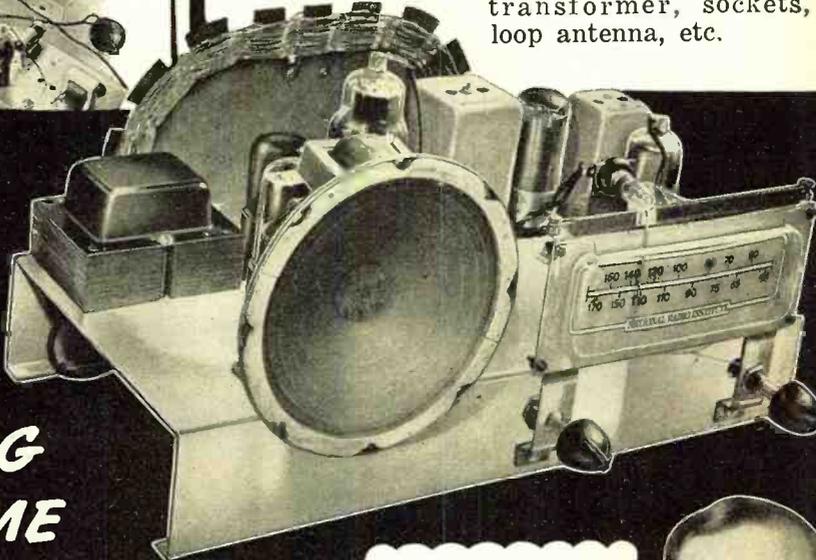


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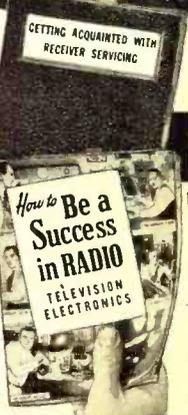
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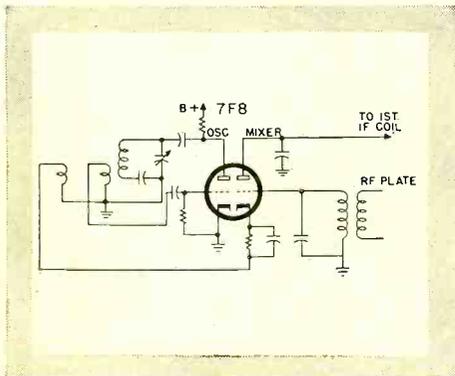


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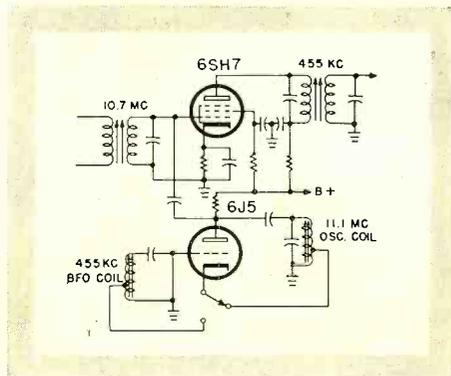
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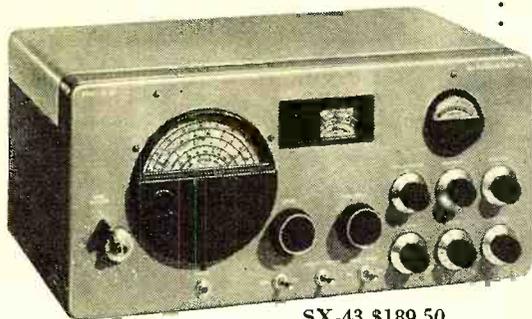
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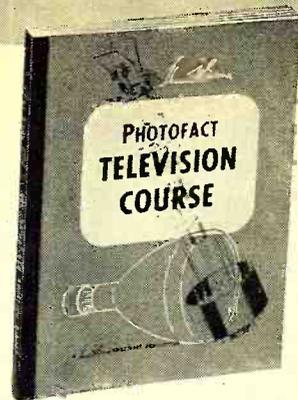
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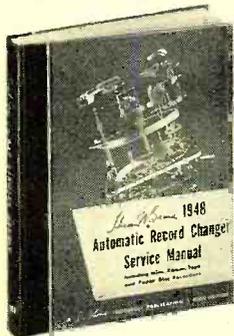


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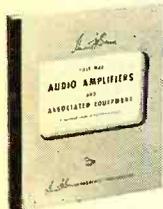
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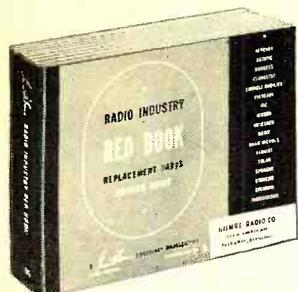
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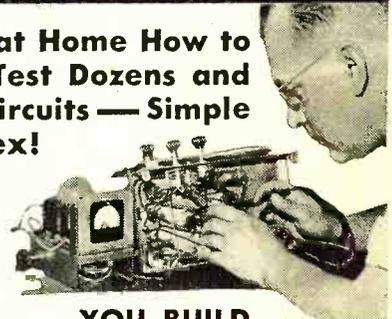
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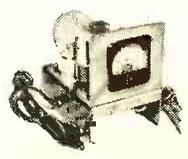
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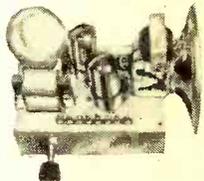
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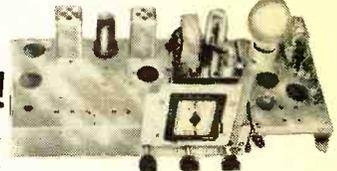
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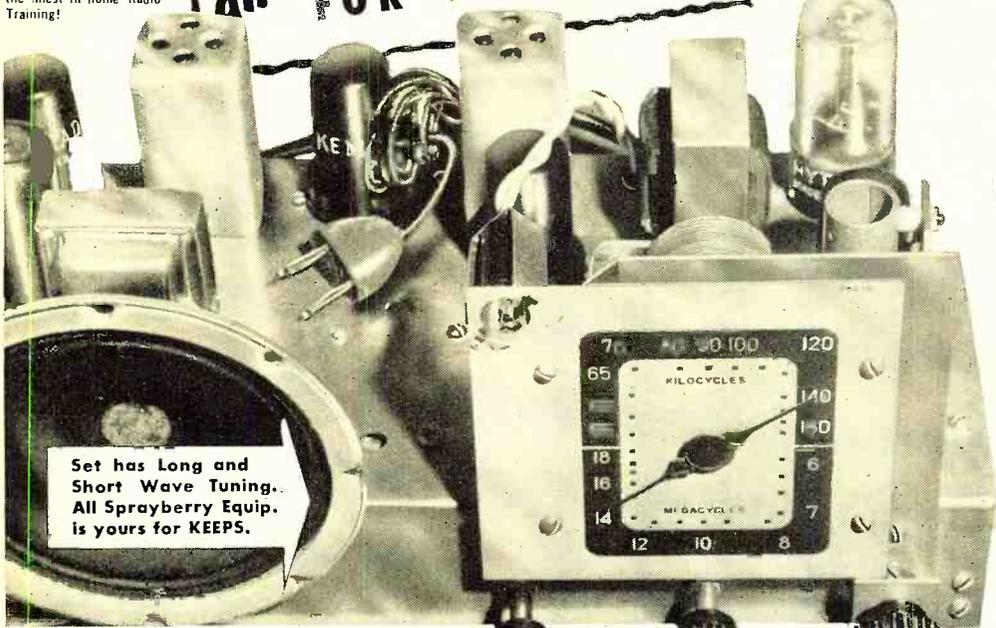
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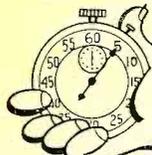
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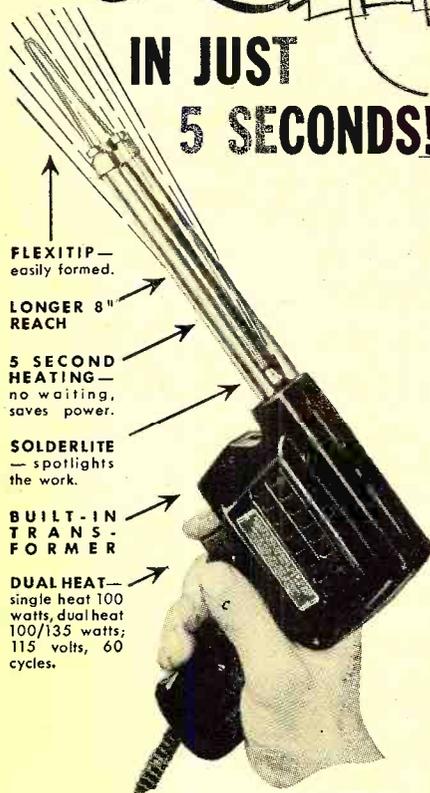
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**AS PROMISED** in our last month's column, **RADIO & TELEVISION NEWS** has provided a stimulus to encourage the training and licensing of new Ham blood in the form of a \$10,000 amateur equipment contest to be conducted during 1949. The purpose of this contest is to increase the number of licensed amateurs from its present level of 80,000 to a minimum of 100,000 in 1949. According to Government statistics, amateur radio is showing a declining rate of numerical gain. Coupled with this is the fact that the age of the average licensed amateur has increased from the prewar average of 29-30 to a current average of 34.

Amateur radio needs new blood. To get it **RADIO & TELEVISION NEWS** is offering amateur radio equipment and complete Ham stations having a value of \$10,000 as a reward for those contributing most to the increase and betterment of amateur radio during 1949.

The contest is designed on a point system; for the training and bringing to operator and station licensed status of any new amateur, 1 point for the individual trainer and 1 point for his club or association. Full contest rules will be announced next month. In the meantime, we urge all amateurs to select suitable prospects whom they can train to successfully secure an amateur license by next Fall. Now is the time to get started and we are giving you this advance announcement so that it will receive your careful consideration at a time when it is vital to the future security of our hobby.

Chances are that the majority of the new licensees will be teen-agers who have the time to study radio theory and to learn the code. Unlike the "busy breadwinner" these youths can be trained and ready to take their exams and to get their coveted radio operators license by next Fall. We sincerely hope that all amateurs will do their part to augment our unique hobby.

Our new series "The Beginning Amateur" starts in the next issue. This series will be ideally suited for basic study material and will help the contestant in training his new prospect. As previously mentioned, full contest details and entry blanks will appear in next month's (February 1949) issue. All amateurs will have an equal chance to win and the time to start the ball rolling is now.

**SEVERAL** months ago we sent a rather lengthy questionnaire to all of our readers. Seventeen major question classifications were divided into sixty-eight individual queries and these were subdivided into three hundred possible specific answers. The

questionnaires were distributed to our 185,500 readers.

Many readers have written to us requesting information as to the results of this survey. Briefly, they are as follows; within three weeks of distribution 30% of all subscriber questionnaires and 11% of all newsstand questionnaires had been filled in and returned, at which time tabulation was begun. Quantities received since have raised this total to more than 32,000 or more than 17% of the entire net paid circulation. It was interesting to note that over 97% of these returns were filled out accurately and completely. We are told that this is a new record in useable response to a questionnaire as complicated as the one used.

All screening, tabulating, and statistical counting was done by the *International Business Machine Company*. Here are some of the highlights resulting from this questionnaire. There are more than 1,000,000 people employed in the Radio-TV-Electronic industry.

In the Radio-TV-Electronic industry there are 2015 rated Component and Equipment Manufacturers, 2526 rated Wholesalers and Distributors, 3874 unrated Wholesalers and Distributors.

There are now 18,280 rated Dealers and 8720 unrated Dealers. Radio Servicemen, both full and part time, now total 92,000. At the time the survey was tabulated there were 78,434 licensed amateurs and the number of estimated Short-Wave Listeners has now been established as approximately 80,000.

We asked our 185,500 net paid circulation, "Do you share your copy of **RADIO & TELEVISION NEWS** with others?" The average was 2.1 readers per copy or a total of 393,991.

Of particular interest is that the average reader earns more than 50% of his total income from employment in some phase of the Radio-TV-Electronic industry and indicates his preference for this magazine by a margin of better than 3½ to 1. Mr. Average **RADIO & TELEVISION NEWS** Reader is 29½ years old.

The above are only a few of the many questions answered and tabulated.

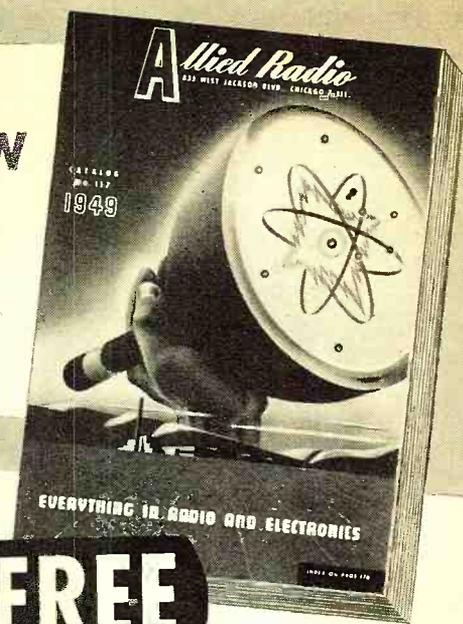
We would like to thank all of you for your cooperation in taking the time to fill out such a lengthy questionnaire. Your help makes it possible for us to satisfy your needs for specific types of material. **RADIO & TELEVISION NEWS** is designed as your book, therefore, such questionnaires serve as an indication of editorial material which will be of the greatest value to the majority of readers. Again, many thanks. O. R.

**RADIO & TELEVISION NEWS**

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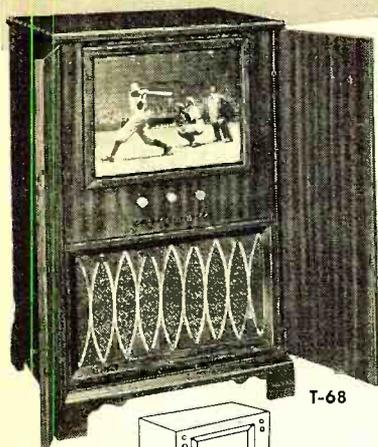
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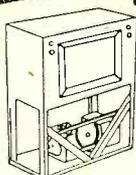
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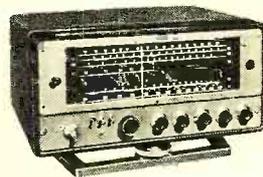
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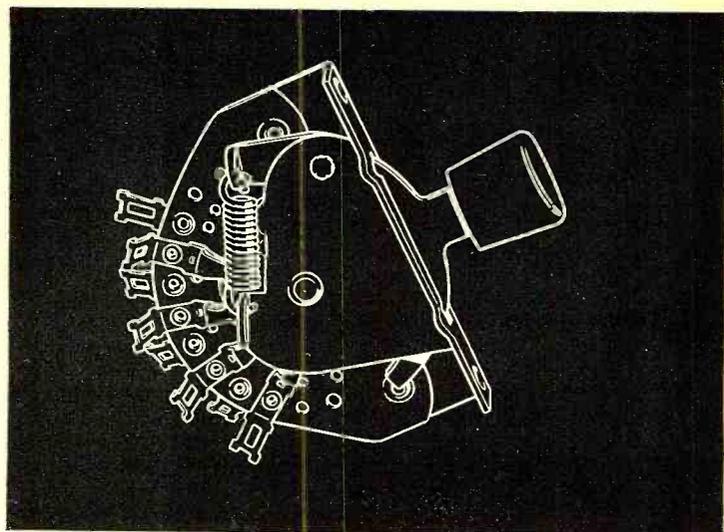
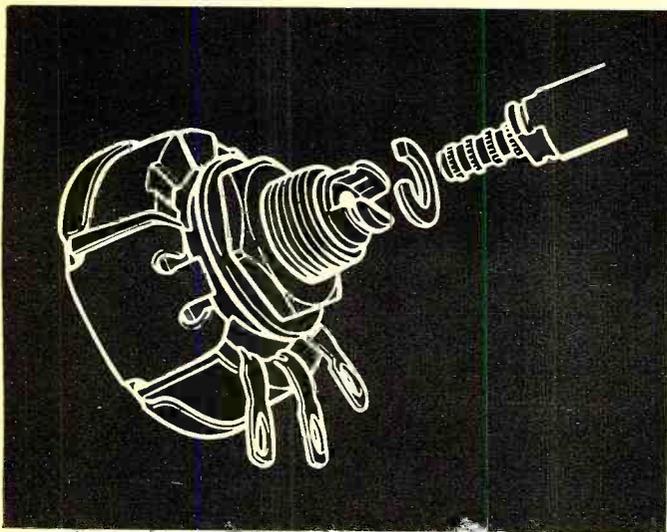
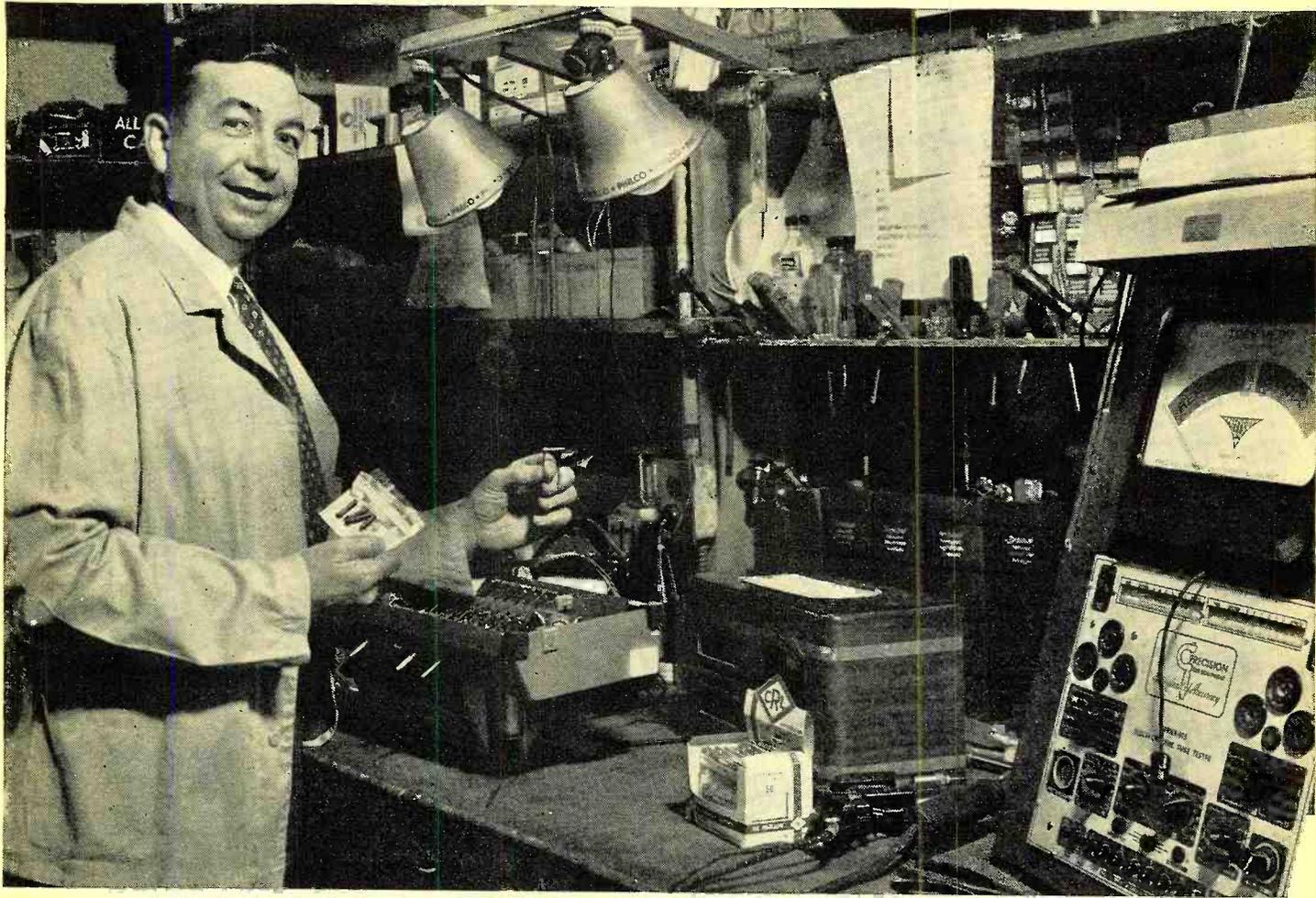
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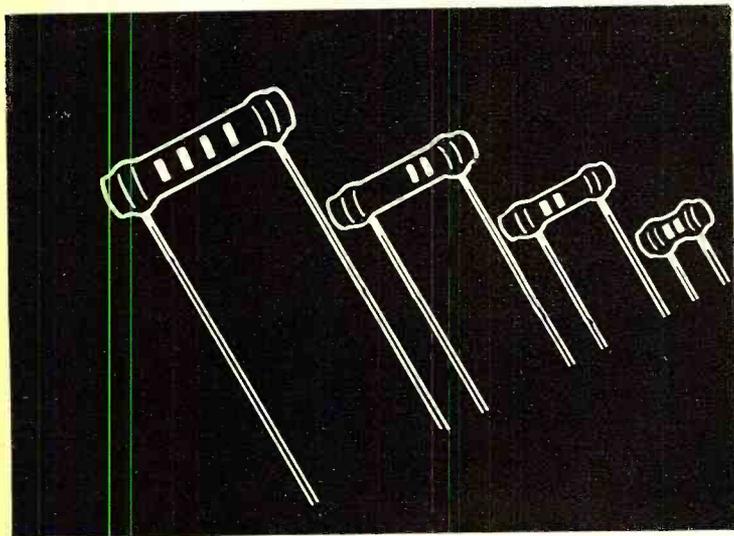
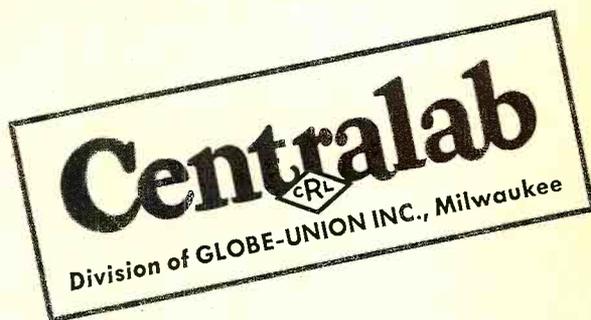
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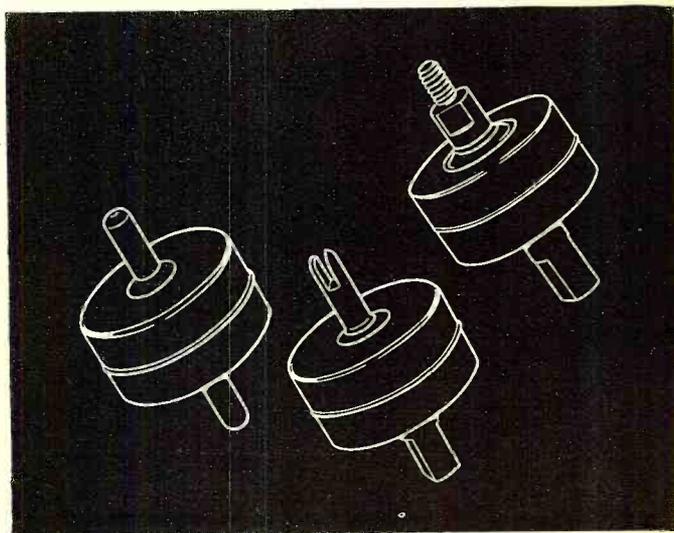
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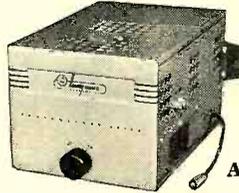


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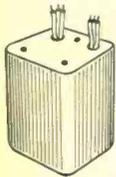
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# Spot Radio News

\* Presenting latest information on the Radio Industry

By RADIO & TELEVISION NEWS'  
WASHINGTON EDITOR

**THE STRIKING ROLE** which radio communication plays in *public safety* and industries was dramatically revealed during the recent Washington hearings involving the changes of the *rules and regulations governing public safety radio services* (formerly called *emergency radio services*).

An intriguing illustration was the motion picture industry, where it was learned radio setups are essential at remote locations and between various units at locations. Detailing these features at the hearings, attorneys for the Motion Picture Research Council, who presented the case for the movie makers, said that radio provides communication between remote locations and the nearest commercial communication facilities for the safety and protection of life and property and for the conduct of essential business, and, in addition, provides communication between the various units of a location in order that action and sequence of action can be timed, not only for successful photography, but to prevent or minimize loss of life in the event of a miscarriage of planned events. Describing a typical instance where radio played a major part, the movie producers' counsel said that during the making of the picture *Fort Apache*, which was photographed primarily in Monument Valley where the nearest telephone was twenty-eight miles away, radio provided not only instant means of outside contact but saved the life of one of the actors who had suffered a bad fall from a horse and required immediate hospital attention. The attorneys also reported that there have been numerous instances where actors and actresses have become violently ill and only through radio communication has it been possible to make instantaneous contact with the studio or with their doctors to prevent permanent or fatal injuries. For example, they pointed out, during the filming of *Happy Times*, Danny Kaye dislocated a vertebra which could not be treated by the first-aid personnel who were present. By means of radio, Kaye's own doctor was contacted and arrived at the location in time to prevent further and serious injury.

In view of the vital services which radio provides, the film makers requested that the FCC reconsider its proposed ruling which would eliminate

specific frequencies for the motion picture industry. The film attorneys reported that the FCC proposals could "have been reached only because of a lack of understanding and appreciation of the dependency that motion picture producers have on the use of radio as an essential means of communication in the filming of pictures. In addition, this exclusion of the motion picture industry from the radio spectrum ignores its paramount importance as a means of education and information not only for the American people, but for the people throughout the world, an importance certainly not claimed by those who lay pipes, drill oil wells, and cut trees."

At present four studios are licensed and operate their own equipment: Columbia Pictures, Warner Brothers, Paramount, and 20th Century-Fox. Facilities for other companies are supplied by private carriers, such as the Red Starr Sound Systems. Frequencies used include 1652 kc., 30.62 mc., 31.06 mc., 33.54 mc., 152.75 mc., 162.99 mc., 153.11 mc. and 153.47 mc.

Twentieth Century-Fox representatives also appeared to describe the need for radio, stating that they do not ask for equal consideration with power, petroleum, or forest products radio services, since the great importance of these services to our national economy cannot be disputed. The only effect the film producers request for frequencies would have on these services, the attorneys said, would be "to deny them the use of the twelve frequencies earmarked for the motion picture stations after the exhaustion of their assigned frequencies, and this, if prejudicial at all, is so remotely so as to justify no serious objection thereto."

**PRESENTING THE VIEWS** of the radio committee of the International Municipal Signal Association, Herbert A. Friede, committee chairman, said that the allocations in the 152-162 mc. band are not adequate to care for the needs of the Fire Services, since it is not possible to engineer and install a complete system within the allotted channels.

Friede reported that this condition was very evident when the city of New York attempted to equip its fire department. He pointed out that the

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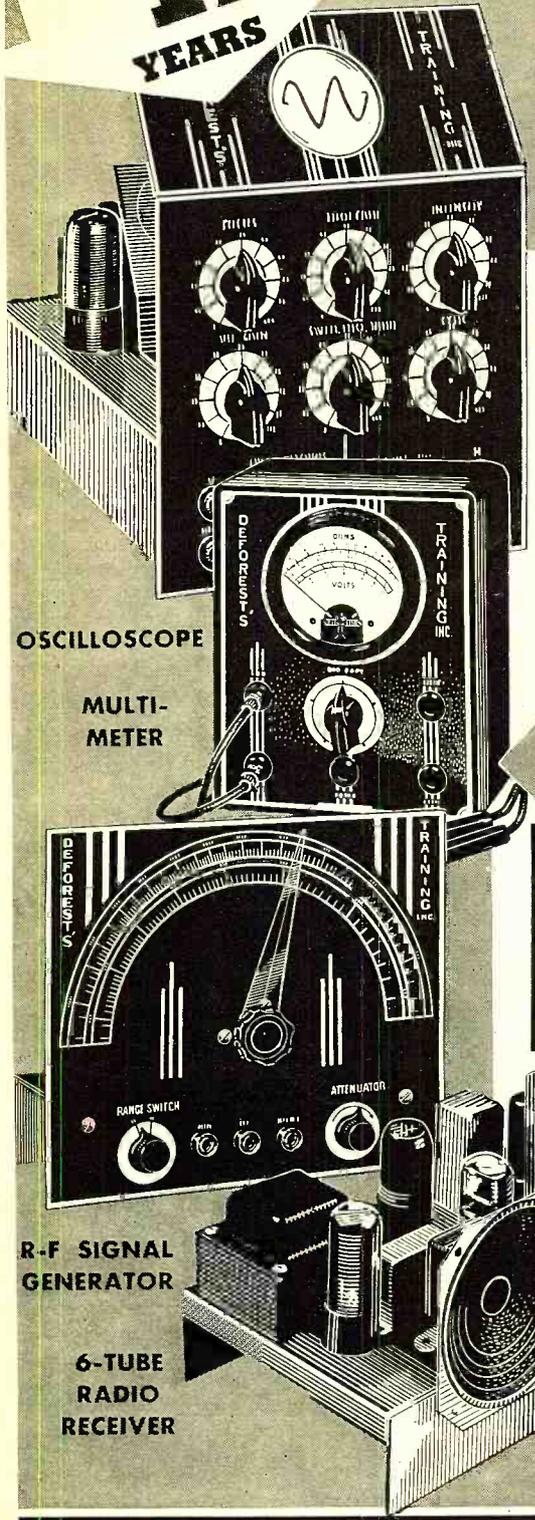
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city is . . . "divided into five boroughs, each comparable to a city and in addition the marine service, plus a channel necessary for coordinating purposes, are very essential to provide an adequate radio service. . . . If a system properly engineered to meet the needs of this department should be installed in the 152-162 mc. bands those cities adjacent in New Jersey could not hope to operate in the same part of the spectrum as all usable frequencies as allocated would be used in New York City."

Friede also covered the Civil Defense aspect of the problem. He said that a completely independent network of these services, in cooperation with the military, is very desirable and necessary. It was learned that the Fire Services are establishing completely equipped disaster mobile units or field headquarters with an independent source of supply for all purposes. These will be assigned to battalions or groups of fire fighting units and will respond on all multiple alarms of fire. They will also accompany fire fighting equipment when responding to mutual aid calls, and act as field headquarters or communications unit during the time such units are in service at the scene of fire, and in case of war or other serious abnormal conditions would be in the affected area to constantly maintain contact with headquarters, keeping those in command in contact with all operating mobile units and those using pack sets, messengers and perhaps citizens radio apparatus.

**IN ANOTHER APPEAL** for reconsideration of the public safety frequency proposals, the United States Independent Telephone Association attorneys declared that the assignments are "woefully inadequate to permit common carrier telephone companies to carry out their responsibility of rendering adequate and efficient service. . . . In fact if these present assignments stand, services now rendered by telephone carriers will have to be curtailed and persons now served on an experimental basis will be deprived of these services because of the reduction of channels."

The association representative declared that analyses made by some of the independent telephone companies have indicated the need for at least eighty frequencies or twenty usable alternate channels in the foreseeable future for general public purposes.

Eighteen classifications of persons or groups now using the mobile radio-telephone service were cited: Ambulance; doctors and physicians; security services such as burglary, fire, and protection agencies; public health; food distribution services, including dairies and other perishable commodity handlers; fuel distribution services; automobile repair and towing services; aircraft transportation; taxicab operation; railroad transportation; small police and fire departments; protection services, including armored cars; pick-

(Continued on page 148)

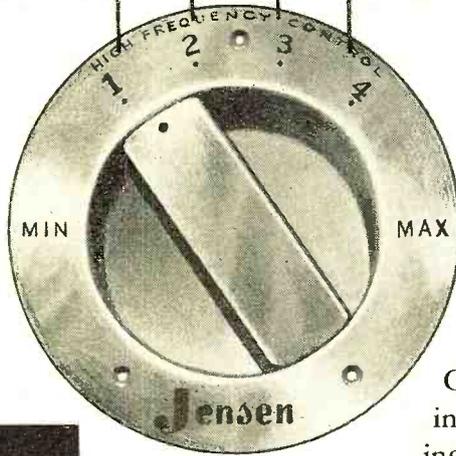
**RADIO & TELEVISION NEWS**

2. for average "AM" Broadcast

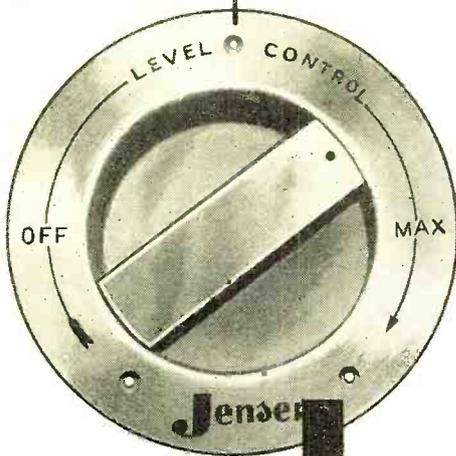
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#### Model HNP-51 Coaxial

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A superior quality 15-inch Coaxial loudspeaker with excellent polar pattern. Response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 20 watts maximum speech and music signal input. Input impedance 500-600 ohms. List price . . . . \$85.00



#### Model JHP-52 Coaxial

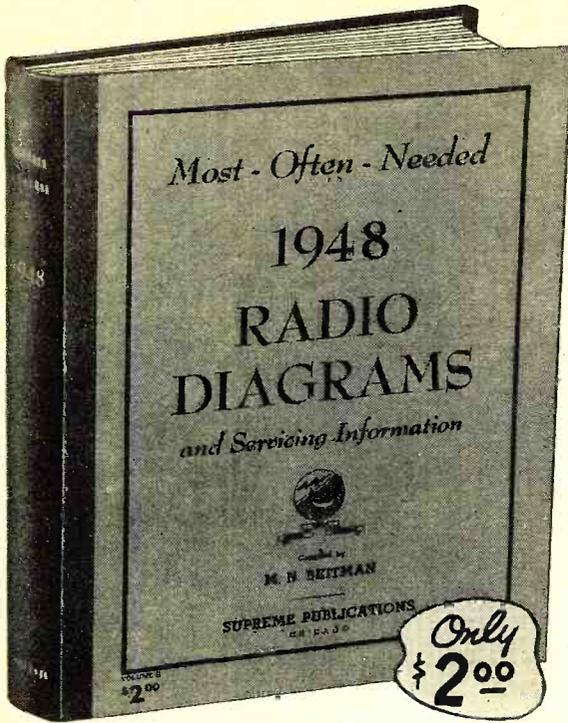
A high-quality 15-inch Coaxial loudspeaker at an economy price. Frequency response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 16 watts maximum speech and music signal input. Input impedance 500-600 ohms. List price . . . . \$72.00



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The ultimate in 12-inch Coaxial value. Frequency range, in a Bass Reflex enclosure, from 50 to 12,000 cycles. Power rating 12 watts maximum speech and music signal input. Input impedance 6-8 ohms. "Bridging" type network. H-F range control not included but "shelving" type control (ST-606) may be added by user. List price . . . . \$30.00

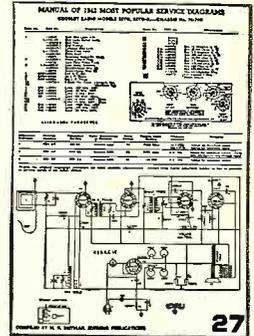
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Compiled by M. N. Beitman, radio engineer, teacher, author & serviceman.



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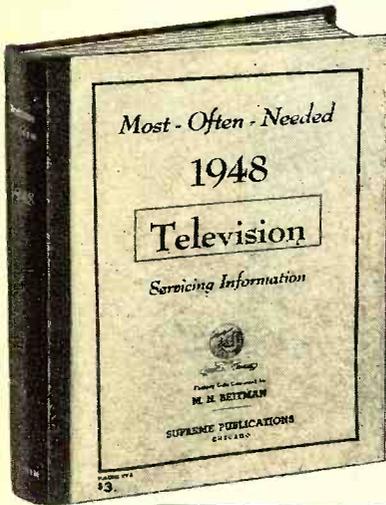


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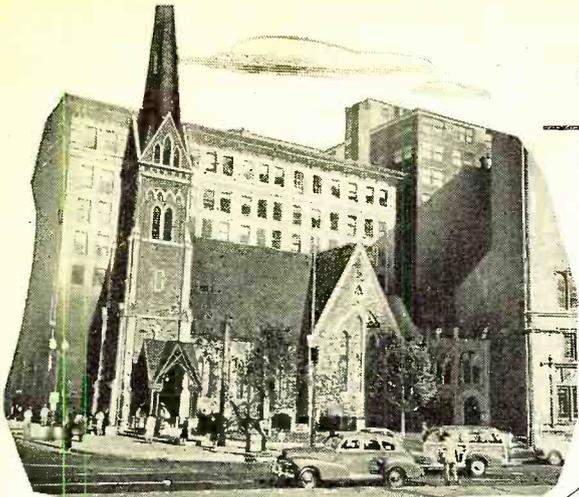
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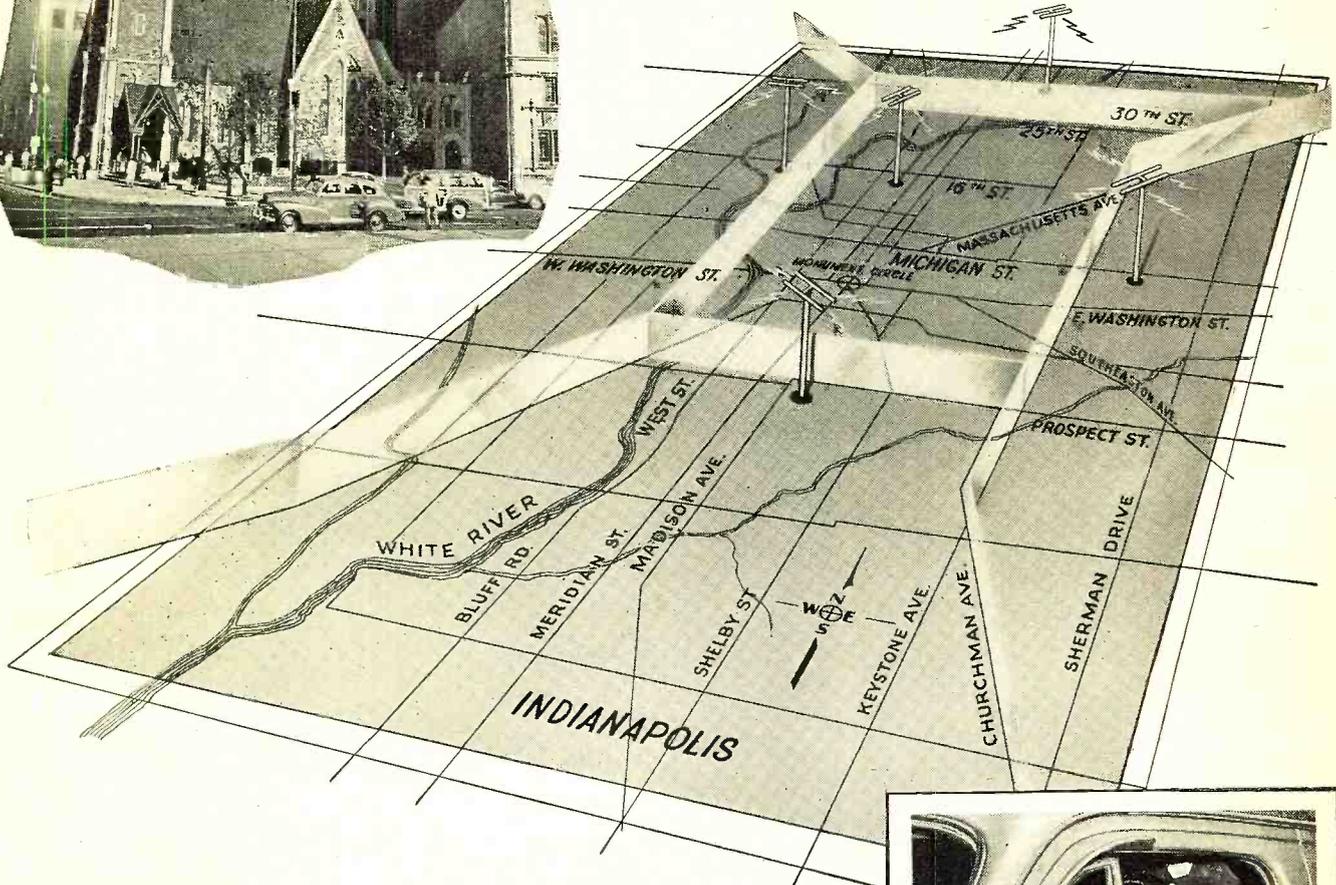
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**RADIO & TELEVISION NEWS**



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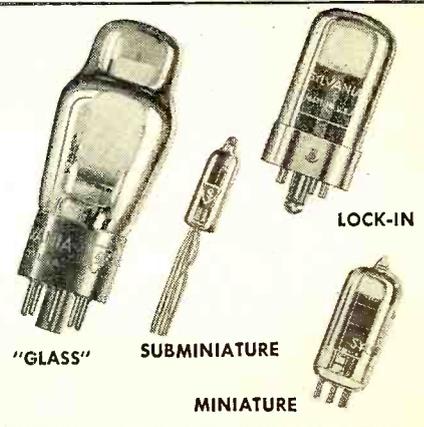
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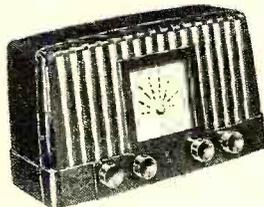


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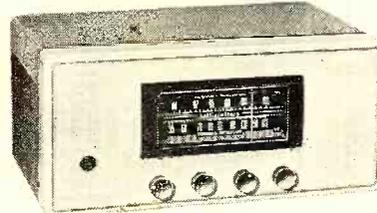


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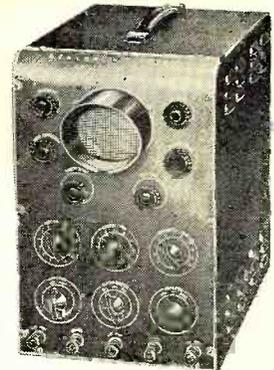
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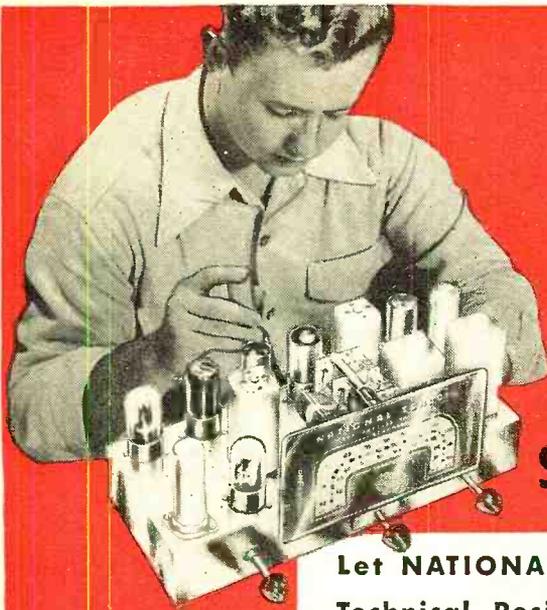
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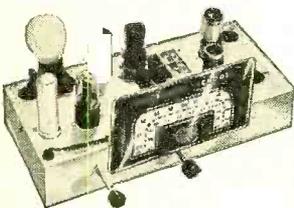
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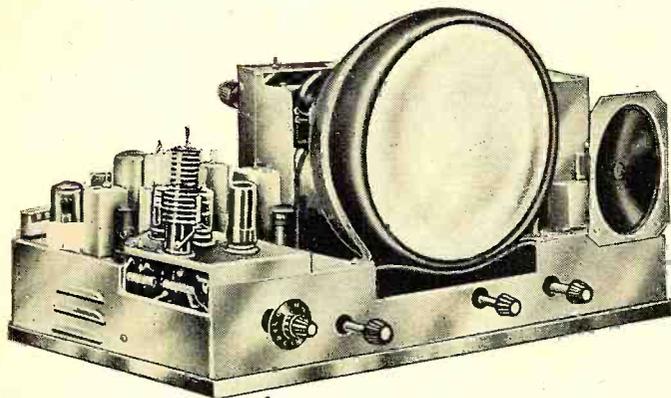
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# New TV KITS and CABINETS

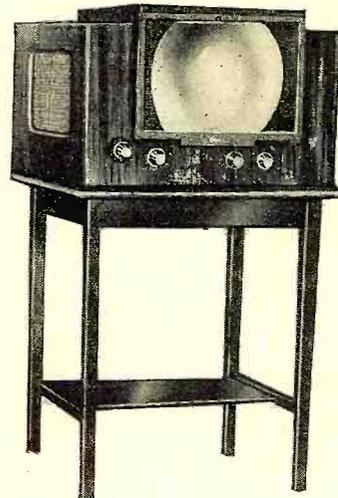
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Model 10A TV Kit

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- CONTINUOUS TUNING ON ALL 12 CHANNELS
- LONG-RANGE RECEPTION



## New 150 Sq. In. TV Kit

Model 10CL, with Roto-Table

This new Model 10CL is a 10" electromagnetic TV Kit, equipped with an all-angle lens (with color kit) giving a picture of 150 sq. in. The image is clearly visible from a very wide angle of vision, because of this specially designed lens. Also has the new CONTINUOUS TUNING UNIT shown on the right. This kit comes COMPLETE with CABINET, LENS, and ROTO-TABLE; also double-folded dipole antenna (all channel) and 60 ft. of lead-in wire.

MODEL 10CL TV Kit.....Net \$299.00

## New 10" TV KIT at amazingly low price!

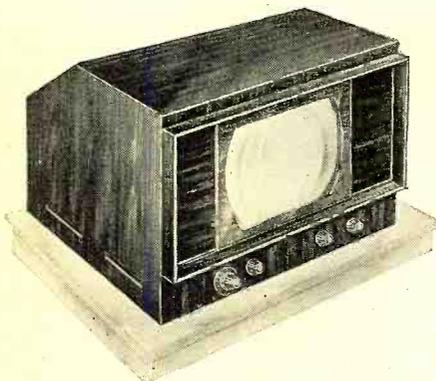
The new Transvision Model 10A electromagnetic TV Kit gives a bright, stable 52 sq. in. picture. Has 10" picture tube, and CONTINUOUS TUNING UNIT (shown on the right hand page) on all 12 channels. Its high sensitivity makes for improved long-distance reception; especially good on high channels. Complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.

MODEL 10A TV KIT, less cabinet.....Net \$199.00

MODEL 12A TV KIT, same as above, but has a 12" picture tube.....Net 263.00

◀ NEW STREAMLINED CABINETS for Transvision Model 10A or 12A TV Kit. Made of select grain walnut with beautiful rubbed finish. Fully drilled, ready for installation of assembled receiver.

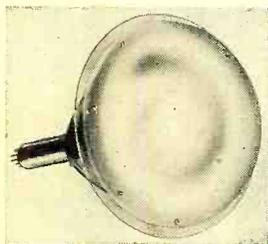
Walnut Cabinet for 10A or 12A (Specify).....Net \$44.95  
Mahogany and Blonde slightly higher.



New streamlined cabinets for Models 10A or 12A TV Kits, designed by Hal Bergstrom.

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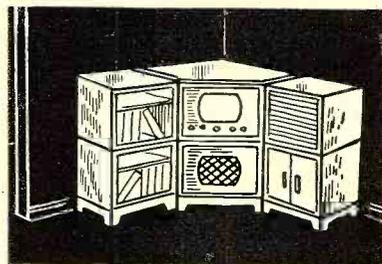
Transvision's simple step-by-step Instruction Sheet makes assembling a TV Kit a pleasure. Each kit comes complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire. Nothing else to buy!



**TRANSVISION ALL-ANGLE LENSES for ALL TV SETS.** Give picture sizes up to 150 sq. in. Exclusive patented feature makes image visible from wide angle. Lenses come with adapter for installation on ANY 7" or 10" picture tube, and with color kits. All-Angle Lens for 7" tubes (gives 75 sq. in. picture), Net \$21.95. All-Angle Lens for 10" tubes (gives 150 sq. in. picture), Net \$32.50.

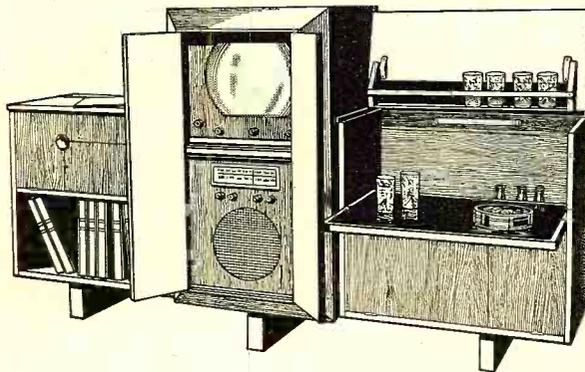
## ASSEMBLE Your Own CABINETS

Transvision's "MODULAR" Cabinets come in knock-down, unpainted units, offering an unlimited range of combinations, including even a bar. Finish them off to suit your taste and need.



Corner piece, shown above, has room for TV, Phono, Record Storage, and open Book Case. COMPLETE.....Net \$84.00  
For other units and prices, write for "Modular" Catalog.

"CUSTOM-ART" CABINETS Made to Order. Radiomen, Dealers—Here is a beautiful line of exclusive, custom-built cabinets, designed and completely built in our factory, and finished to your customers' specifications . . . at very reasonable prices.



Shown above is Transvision's "Modern Comprehensive" which has provision for TV/FM/AM, Record Changer, Album Shelf, Bar, and Concealed Wine Cellar. For further details on the complete line, write for FOLDER No. D-1.

## GET into the TELEVISION BUSINESS in a BIG WAY

Radiomen, Servicemen, Dealers . . . Transvision offers you, through your jobber, a 3-point Dealer Plan for making big money in television: (1) Sell TV sets constructed by you from Transvision Kits. (2) Sell exclusive Custom-Built Jobs with beautiful "Custom-Art" Cabinets. (3) Sell "packaged" Transvision TV Products, including Kits, Components, and Accessories. For FULL DETAILS about this amazing plan, WRITE FOR FOLDER No. D-1, or ask your jobber.

**FREE 162 p. TELEVISION COURSE** with purchase of any Transvision TV Kit . . . You don't need this course to assemble a Transvision Kit, because the job is easy enough and our instruction sheet is simple and clear. BUT, if you want a good introduction to television fundamentals as a basis for further study, the Transvision Television Home-Study Course is ideal. Remember, you pay nothing extra for this course. Ask your jobber.

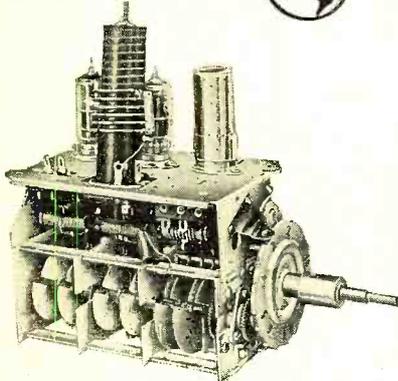
For FREE 20 p. TV BOOKLET and 8 p. CATALOG, SEE YOUR TRANSVISION JOBBER.....

# TRANSVISION

## New TV INSTRUMENTS

### TUNERS, BOOSTER, and ACCESSORIES

For Every Television Installation Requirement



#### NEW 12-Channel TV Tuner CONTINUOUS TUNING

**Model CT-1** (part #653), for TV channels 2 to 13, is notable for its high gain, sensitivity, excellent image rejection ratio, and **CONTINUOUS TUNING** feature. May be used with any 7", 10", 12" or 15" kit.

**Model CT-1 TV Tuner** . . . . . Net \$32.50

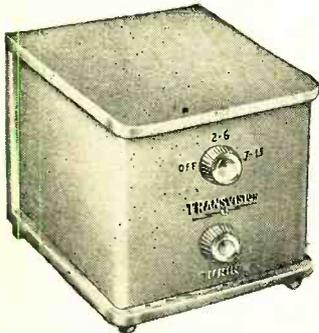
**Model TT-2** (part #301-1 or #301-2) covers all TV channels, also FM band (88-108 mc.). Available for 7", 10", 12", or 15" kits. Specify tube size.

**Model TT-2 TV/FM Tuner** . . . . . Net \$44.95

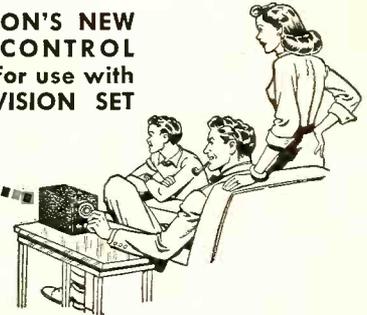
#### TRANSVISION ALL-CHANNEL TELEVISION BOOSTER CONTINUOUS TUNING

To assure television reception in weak signal areas, or areas which are out of range of certain broadcasting stations, Transvision engineers have designed this new booster. It increases signal strength on all television channels. Tunes all television channels continuously. Can be used with any type of television receiver. Unusually high gain in upper television channels.

**Model B-1** . . . . . List \$44.95



#### TRANSVISION'S NEW REMOTE CONTROL UNIT KIT—for use with ANY TELEVISION SET



**OPERATES ANY TELEVISION SET from a DISTANCE up to 50 feet.**

Now you can sit back in your easy chair, a comfortable distance away, and operate your TV set. This new **Transvision REMOTE CONTROL UNIT** turns **ANY SET on**, tunes in stations, controls contrast and brightness, turns set off. Especially ideal for commercial installations where the TV set is inaccessible.

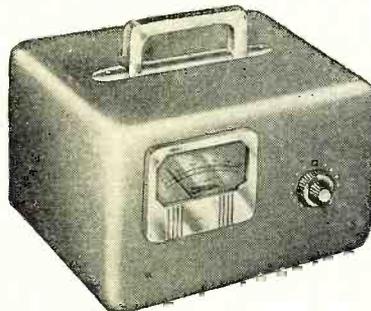
**TUNER UNIT** is a high gain, all-channel, **CONTINUOUS TUNING UNIT** (about 50 microvolt sensitivity). Supplied in **KIT form** . . . easy to assemble in about an hour.  
**Model TRCU Remote Control Unit Kit** with 25-ft. cable . . . . . Net \$69.00  
Also available without cabinet . . . . . Net 65.00

#### TRANSVISION FIELD STRENGTH METER

Saves 1/2 the cost of TV installations

**Improves Installations! Saves 1/2 the Work!**

Has numerous features and advantages, including — (1) Measures actual picture signal strength . . . (2) Permits actual picture signal measurements without the use of a complete television set . . . (3) Antenna orientation can be done exactly . . . (4) Measures losses or gain of various antenna and lead-in combinations . . . (5) Useful for checking receiver re-radiation (local oscillator) . . . (6) **12 CHANNEL SELECTOR** . . . (7) Amplitudes of interfering signals can be checked . . . (8) Weighs only 5 lbs. . . . (9) **Individually calibrated** . . . (10) Housed in attractive metal

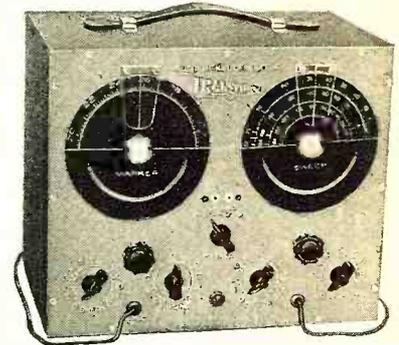


carrying case . . . (11) Initial cost of this unit is covered after only 3 or 4 installations . . . (12) Operates on 110V, 60 Cycles, AC.

**Model FSM-1**, complete with tubes . . Net \$99.50

#### TRANSVISION TELEVISION and FM SWEEP SIGNAL GENERATOR

Complete frequency coverage from 0-227 MC with no band switching. . . Sweep width from 0-12 MC completely variable. . . Accurately calibrated built-in marker generator.



**OUTSTANDING FEATURES:** (1) Frequency range from: 0-227 MC . . . (2) Dial calibrated in frequency . . . (3) Sweep width from 0-12 MC completely variable . . . (4) Self-contained markers readable directly on the dial to .5% or better. (No external generator required to provide the marker signals) . . . (5) Crystal controlled output makes possible any crystal controlled frequency from 5-230 MC . . . (6) Plenty of voltage output—permits stage-by-stage alignment . . . (7) Output impedance 5-125 ohms . . . (8) Directly calibrated markers, 20-30 MC for trap, sound and video IF alignment . . . (9) RF for alignment of traps for IF channels when a DC voltmeter is used as the indicating medium . . . (10) Unmodulated RF signal to provide marker pips simultaneously with the main variable oscillator . . . (11) Markers can be controlled as to output strength in the pip oscillator . . . (12) Power supply completely shielded and filtered to prevent leakage . . . (13) All active tubes are the new modern miniature type . . . (14) Phasing control incorporated in the generator . . . (15) Operates on 110V, 60 Cycles, AC.

**Model SG** . . . . . Net \$99.50

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manual

The most comprehensive practical book on antennas ever published. Practical help in radiation, propagation, feed line and antenna problems for radio and television. Simple language; little math. Practical "how-to-build-it" data, with every "why" and "how" information. A necessity for every radioman.



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# Within the INDUSTRY

**ERWIN A. LARSON** is the new distributor sales representative for the Metropolitan New York district for the renewal tube department, Radio Tube Division, of *Sylvania Electric Products, Inc.*



After graduation from Duke University in 1942 Mr. Larson saw active service in the Navy in New Guinea, Philippine, Okinawa, and Japanese campaigns. He was formerly associated with the *Shaffer Leather Company* of Akron, Ohio.

**HENRY YATES SATTERLEE** has been appointed to the *Cannon Electric Development Company* factory sales engineering staff with headquarters in Los Angeles.

Mr. Satterlee who recently joined *Cannon Electric* assumes his position with a wide experience in engineering, aviation, and in sales promotion. After attending M.I.T., he was employed by *J. P. Morgan & Co.*, and later headed *Giro Associates*, of New York.

He has also been associated with *Curtiss Wright Flying Service*, *Fairchild Engine Co.*, and with *Pacific Engineering Co.* of Los Angeles.

**L. S. RACINE**, sales manager of *Chicago Transformer Division, Essex Wire Corporation*, was recently appointed chairman of the Transformer Section of the Parts Division of Radio Manufacturers Association for the year 1948-49.



Mr. Racine has been associated with the electronics industry since 1929 and was appointed production manager of *Chicago Transformer* in 1931. He has served in the post of sales manager since 1945.

His appointment as chairman of this important RMA committee brings to the post a man well-known in the industry as well as a person thoroughly familiar with the transformer manufacturing field.

**MOTOROLA, INC.**, through its president Paul V. Galvin, has announced the purchase of the inventory and certain assets of the Car Radio Division of the *International Detrola Corporation* of Detroit.

*International Detrola* produces car radios for automobile manufacturers. The amount of the purchase was not disclosed. *Motorola* will continue to

make these car radios at its recently enlarged plant at 4545 W. Augusta Boulevard in Chicago.

As a result of this purchase, *Motorola* for the first time will supply auto radios directly to the automobile manufacturers. The company, now in its twentieth year of manufacturing auto radios, will continue to produce car radios under the *Motorola* brand name.

**ROBERT FINLAY**, wartime procurement engineering counsel for the *Hallcrafters Company* in Washington, has announced the opening of his own offices at 104 Brookside Avenue, Ridgewood, New Jersey.



Mr. Finlay will serve as liaison consultant between electronics manufacturers and government agencies. He will represent a select list of companies before government purchasing and procurement agencies.

He recently marked a quarter of a century in the electronics field since leaving the military academy at West Point. Mr. Finlay spent the war years in Washington where he was instrumental in processing millions of dollars worth of electronic equipment orders for the Armed Forces and lend-lease products.

**CORADIO, INC.** of New York City has announced that it has received an exclusive contract for the installation of the company's radios in the entire national hotel chain operated by the *Milner Hotels, Inc.*

The contract, secured through *Coradio's* franchised distributor *Wittick Sales Co.* of Detroit, covers 170 hotels containing 17,617 rooms, located in 38 states. Installation has already begun and units are now operating in 14 of the hotels of the chain.

This is believed to be the largest installation of coin radios under any one contract. It is expected that approximately 10,000 units will eventually be installed. The company is using its ordinary marketing channels to complete the installation in all of the 170 hotels.

**ROCKE, INC.** of 13 East 40th Street, New York has been appointed industrial and manufacturing sales representative for *American Television & Radio Co. (ATR)* of St. Paul, Minnesota.

The firm will represent the company in the metropolitan New York and the New Jersey areas. *Rocke, Inc.* is the

Editors and Engineers  
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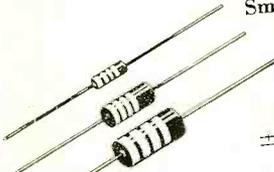
# "I like the **DEPENDABILITY** of **OHMITE** Products"



AMONG radio servicemen, amateurs, and industrial users everywhere—there's a definite preference for Ohmite resistance products. These men know—from experience—that Ohmite resistors and potentiometers provide long, trouble-free service.

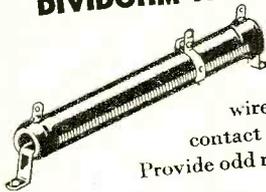
Here's the reason why you get extra performance. Every Ohmite product is designed and constructed to stand up under severe operating conditions. Every unit is built to withstand the effects of shock, vibration, temperature extremes, altitude, and humidity. Make sure you get the benefit of this unfailing dependability. Ask for Ohmite products by name.

## LITTLE DEVIL COMPOSITION RESISTORS



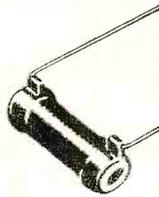
Small and sturdy, these units come in 1/2, 1, and 2-watt sizes. 10 ohms to 22 megohms. Tol.  $\pm 10\%$  and  $\pm 5\%$ . Values to 2.7 ohms available in 1-watt size,  $\pm 10\%$  tolerance.

## DIVIDOHM ADJUSTABLE RESISTORS



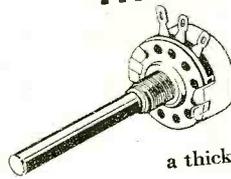
Used as multi-tap resistors or voltage dividers. Have a narrow strip of exposed wire along one side to provide a contact surface for the adjustable lugs. Provide odd resistance values quickly.

## BROWN DEVIL WIRE-WOUND RESISTORS



Rugged, dependable, vitreous-enamelled surface protects winding from mechanical damage. Brown Devils are easily mounted by tinned-wire leads. Tol.  $\pm 10\%$ . In 5, 10, and 20-watt sizes.

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A 2-watt molded composition unit with good margin of safety. It is unaffected by heat, cold, moisture, or length of service. Resistance element is a thick, solid-molded ring.

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RHEOSTATS • RESISTORS • TAP SWITCHES • CHOKES • ATTENUATORS

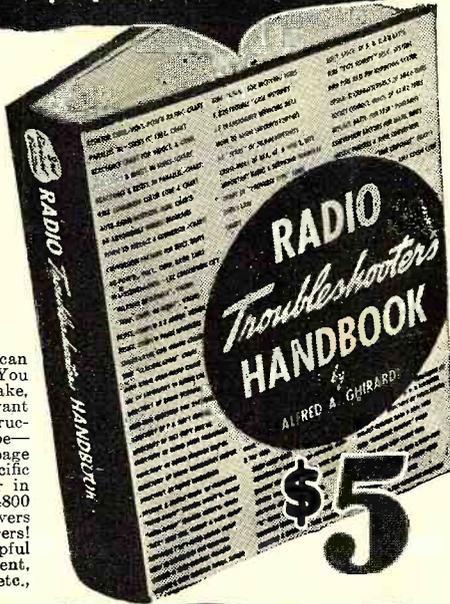
# LET THIS "AUTOMATIC TEACHER" show you exactly how to repair over 4800 RADIO MODELS without expensive test equipment!

## GHIRARDI SAVES YOU TIME — HELPS YOU MAKE MONEY

Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK is the ideal manual to show you exactly how to repair radios at home in spare time—quickly and without a lot of previous experience or costly test equipment. It contains MORE THAN 4 POUNDS OF FACTUAL, time-saving money-making repair data for repairing all models and makes of radios better, faster and more profitably than you may have thought possible!

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1300 pages, 706 illus.  
723 review questions

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types; how they work (with wiring diagrams), when and why to use them; how to build your own; preliminary trouble checks, circuit and parts analysis; parts repair, replacement, substitution; obscure radio troubles, aligning and neutralizing; interference reduction—and hundreds of other subjects including How to Start and Operate a Successful Radio-Electronic Service Business. 723 self-testing review questions help you check your progress EVERY STEP OF THE WAY. Only \$5 complete (\$5.50 foreign.) Use coupon for 10-day examination.

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### MONEY-SAVING OFFER!

Get BOTH big books — Radio's most famous Service Library — over 2030 pages — at a bargain combination price. See coupon.

domestic division of *Rocke International Corporation* which has been associated with the radio parts industry for 25 years.

*Lewis & Sachs Company* of New York will continue to handle all *ATR* distributor sales in the same territory.

\* \* \*

**WILLIAM P. LEAR** has been named to the newly-created post of chairman of the board of *Lear, Incorporated*. He will also serve as director of research and development for the company.



At the same meeting of the board of directors **Richard M. Mock** was named president of the corporation, succeeding Mr. Lear to the post. Mr. Mock who has been executive vice-president since June 1947, has been carrying the duties of president for some time to allow Mr. Lear to devote his time and energies to technical development of aircraft radio, automatic flight control, and wire recorder products.

Mr. Lear served the company as its president since the inception of the organization almost twenty years ago. Mr. Mock has been with the company since 1940 and has held the position of application engineer, chief engineer, sales manager, and manager of the Electro Mechanical Division before becoming executive vice-president.

\* \* \*

**REFCO CORP.** has been recently formed in New York City to do contract and subcontract work for the radio, electrical, and electronics trade.

The company is set up to produce cable harnesses, resistor board assemblies, switch cables, assembling, wiring, testing of units, and subassemblies of specialized radio equipment, power supplies, radar, television, industrial and medical electronics items.

The new firm is headed by **M. J. Simons** who is serving as president and general manager; **Elias A. Smyrnakis**, vice-president and production supervisor; and **Richard L. Crandall**, secretary and treasurer.

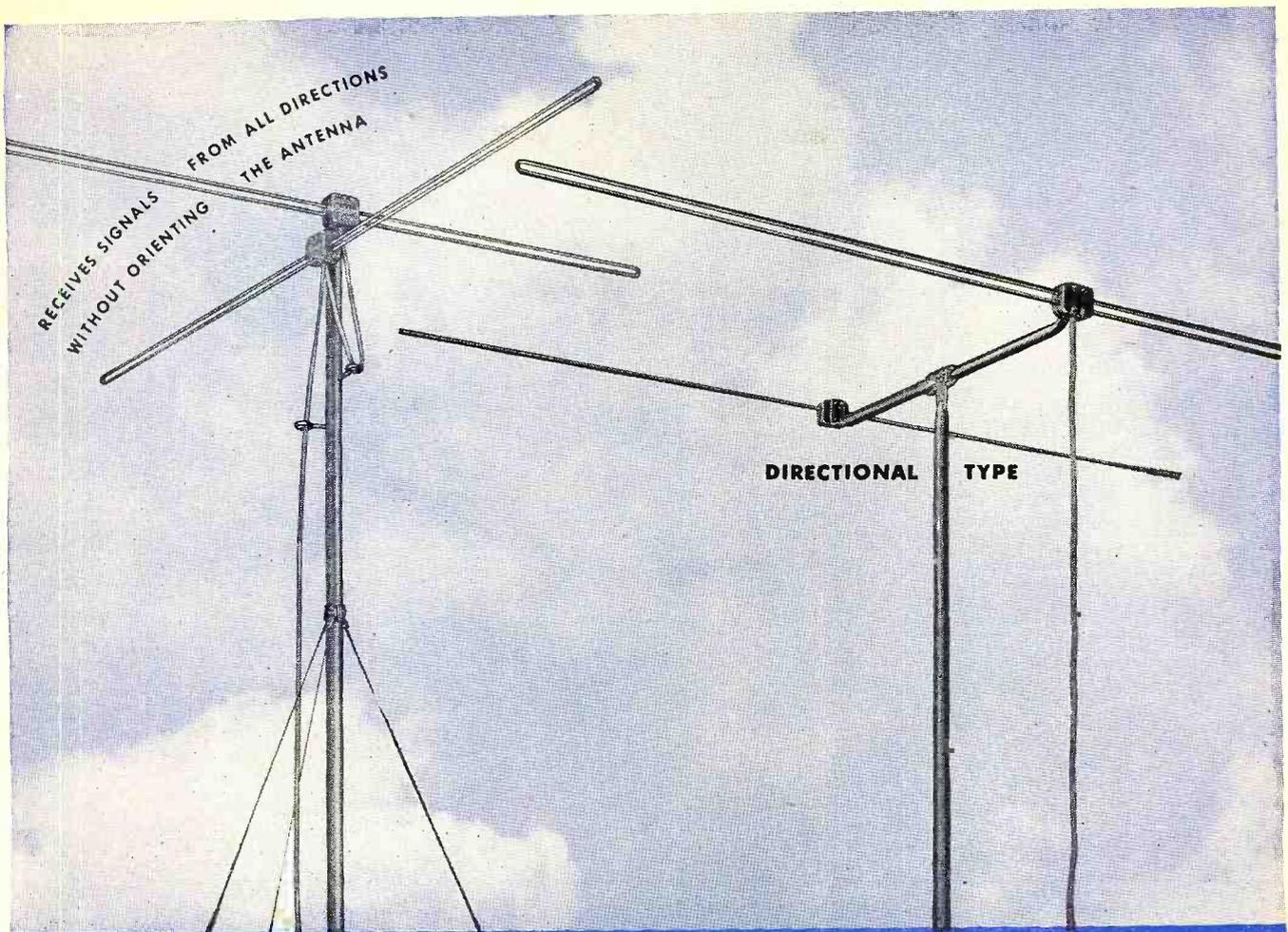
The company maintains headquarters at 4509 White Plains Road, New York 66, New York.

**ROBERT E. BURROWS**, well-known radio executive, has been appointed sales and advertising manager of the *Meissner Division of Maguire Industries, Inc.* of Mt. Carmel, Illinois.

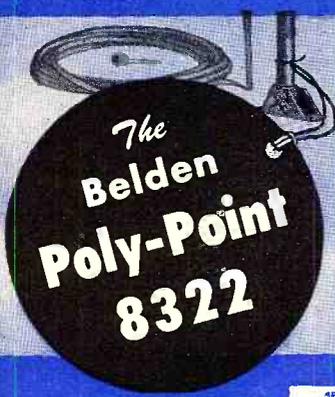


Mr. Burrows joins *Meissner* from *Westinghouse Electric International Company* of New York where he was manager of the Home Radio Department, handling the export activities of that department. Prior to joining *Westinghouse*, he was advertising and

(Continued on page 164)



*Insure* **FM Performance**  
**with a GOOD FM ANTENNA**



*The*  
**Belden**  
**Poly-Point**  
**8322**

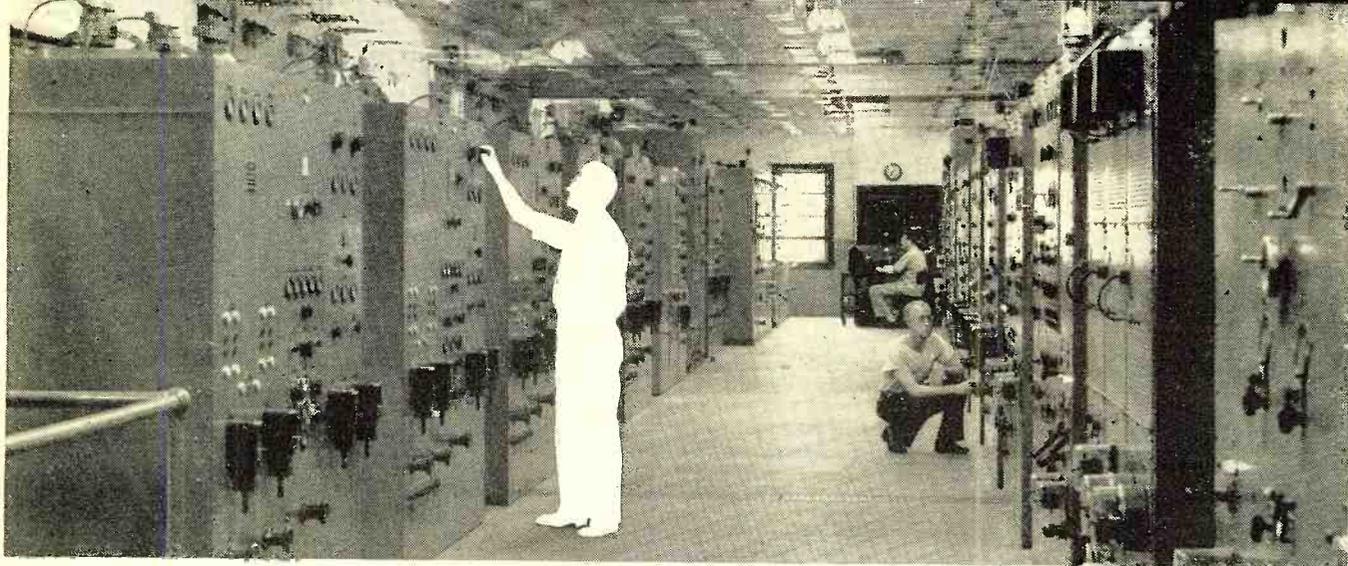
- Belden FM Antennas are engineered for finest FM reception.
  - Use Belden 8322 Poly-Point Antenna to receive signals from all directions without turning!
  - Use Belden 8320 Dipole Antenna for installations requiring directional characteristics.
  - Sturdy aluminum construction withstands severe ice loading and high wind.
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- ASK your Belden Jobber



*The*  
**Belden**  
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**8320**

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If you have had professional or amateur radio experience and want to make more money, let us prove to you we have the training you need to qualify for a better radio job. To help us answer intelligently your inquiry—*please state briefly your background of experience, education and present position.*



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 BROADCASTING       AERONAUTICAL RADIO ENGINEERING  
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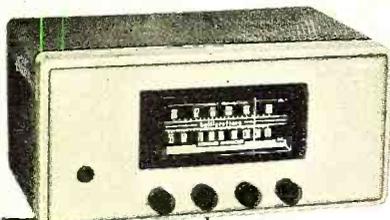
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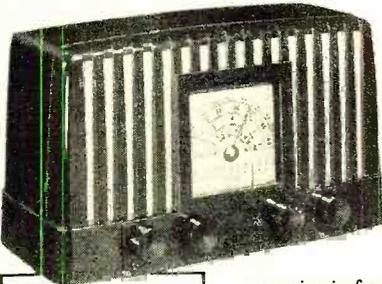


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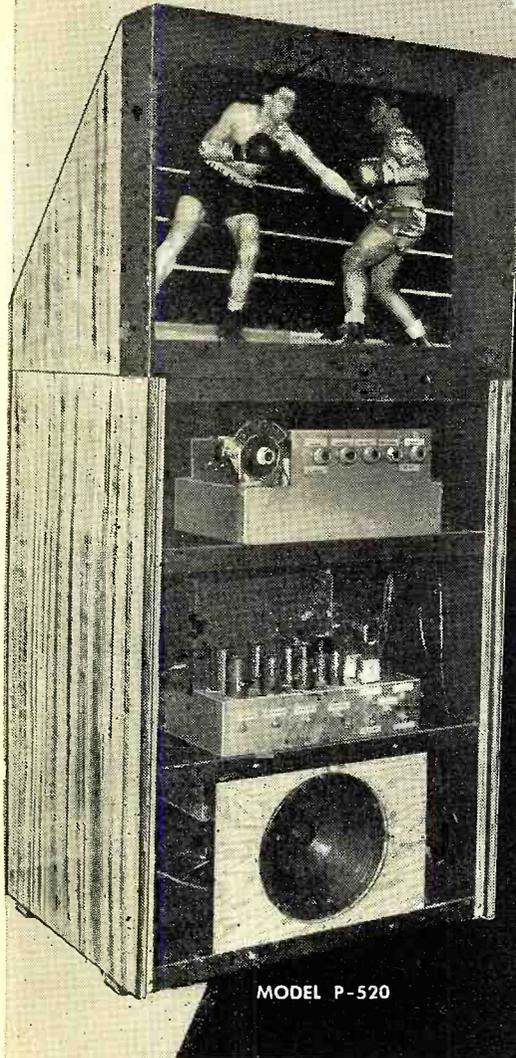
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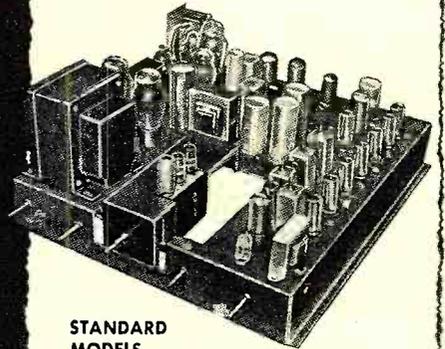
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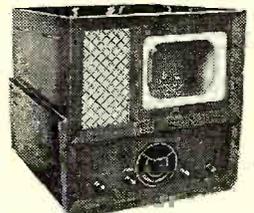
Gives continuous tuning for all 13 channels plus all FM Radio. Available for all tube sizes.

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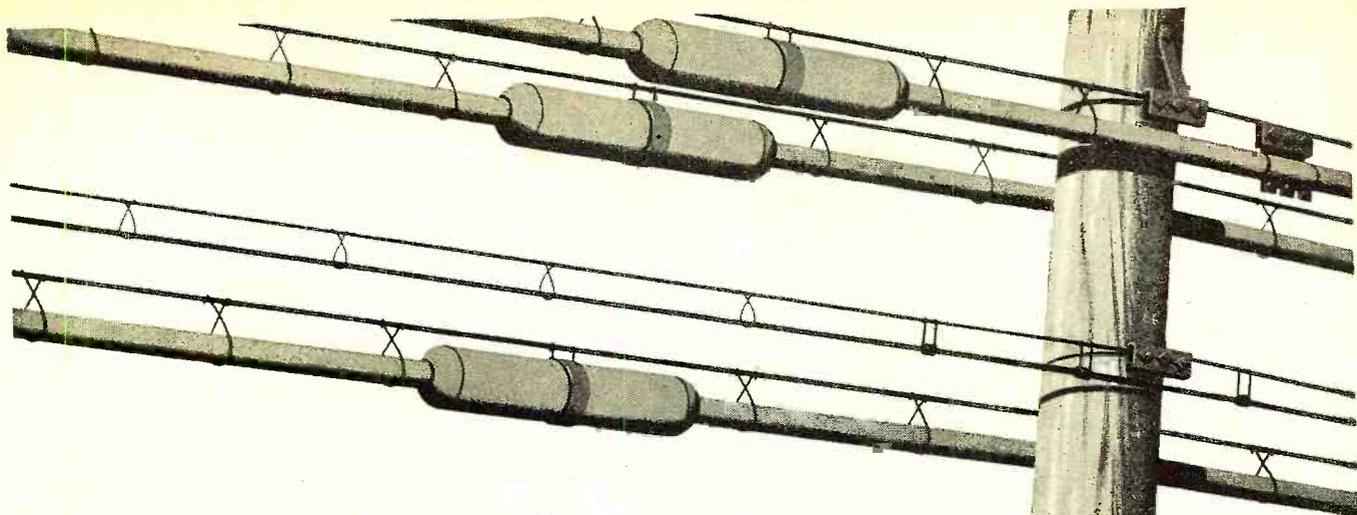
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## The **case** of the Creeping Sleeve

Lead sheathing on telephone cable meets many stresses — the tug of its own weight, wind pressure, contraction and expansion from cold and heat. Then, too, there's the pressure of nitrogen gas put in Long Distance cable to warn of sheath breaks and keep out moisture.

And, sometimes, lead is subject to "creep"—a permanent stretching — even when the stress is but a fraction of the normal tensile strength. Creep is especially likely at the lead sleeves used where two lengths of cable are joined. The sleeve may stretch and break open exposing telephone circuits to the elements.

So Bell Laboratories scientists have developed methods to test and control creep. In a special testing room, weights are applied to scores of samples of lead, under controlled conditions. Exact records of the amount of creep are obtained with a precision instrument.

Years of careful study have produced a lead composition which resists creep and yet has all the other properties required of sleeves. This means better telephone service for you and helps give that service at lowest possible cost. It is an example of the way Bell Telephone Laboratories scientists study and improve every part of the great telephone plant.

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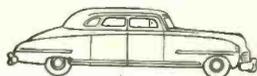
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"I was issued license P-2-11188 on November 4. The next day I was signed on board a tanker as Radio Operator-Purser. Besides radio operating, I handle the payrolls, etc., which is all over-time and brings my monthly pay up to between \$500 and \$650."

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# There's Money In CUSTOM INSTALLATIONS



A group of Jensen "Customode" units assembled in one of the several ways in which these cabinets can be used.

By

**JOHN D. GOODELL**  
The Minnesota Electronics Corporation

**Part I. There is plenty of custom work to be done in every community but you'll have to go after it.**

**F**EW people expect to purchase a good piano for much less than a thousand dollars. A fine violin may be worth many times that price. The total value of the instruments used by a dance band might approximate five thousand dollars, and fifty thousand would not be an unreasonable estimate for a symphony orchestra.

The music reproducing system of a home radio-phonograph is expected to produce a close reproduction of the performance of any or all of these instruments combined. It is remarkable that the critical listener may obtain such equipment for less than the price of a good piano alone. It is unfortunate that many people make the mistake of comparing the output of a music reproducing system with live music but fail to compare the cost with the original instruments. Perhaps the most unfair concepts about cost involve the loudspeaker. The loudspeaker is expected actually to vibrate mechanically so as to duplicate the complex resultant pattern of a hundred instruments playing simultaneously. Yet, if the loudspeaker is as expensive as a medium-sized accor-

dion or a good guitar, it is often considered outrageously high priced.

The loudspeaker and its enclosure are expected to reproduce the lowest notes of a pipe organ, a piano, a bass viol or a tuba, yet very few people will expect it to occupy as much room as the smallest of these instruments.

Part of these general misconceptions originate from the fact that even a low-priced table model is capable of producing a great deal of pleasant music. As a matter of fact, it is educational and worthwhile to listen to a good acoustic phonograph. The frequency response is limited, indeed, but the range that is reproduced is often startlingly "clean." The customer to whom music is important is not satisfied with merely "pleasant" music. He is seeking an auditory experience as close to the original performance as possible. Some people may quarrel with this statement and perhaps it should be qualified to include, "together with facilities for modifying the original in accordance with personal preference." These comparisons are important and may be of great aid in discussing the selection of equipment with a prospective customer.

A great portion of any selling problem is solved when customer confidence has been developed. A large percentage of customers for high quality home-music systems are remarkably well informed and often have considerably more listening experience than the average engineer. It is important that the engineer, technician, or salesman be competent to answer the majority of their questions in reasonably non-technical terms and to have the good judgment to say, "I don't know, but I'll try to find out for you," when this is the indicated reply.

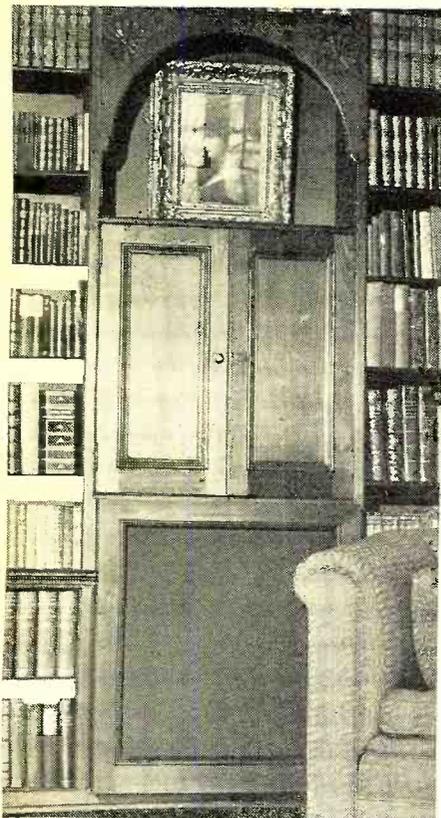
Everyone active in the audio industry is asked by friends and customers to advise them which loudspeaker, amplifier, tuner, pickup? What kind of cabinet—bass reflex, corner cabinet, etc.? Unfortunately, stock standard answers are not possible. Assuming that the individual who is asked for these answers has first-hand knowledge of all or most of the units available on the market, the minimum information required for complete answers will include replies to the following counter-questions:

1. Will you use the equipment enough for direct listening to warrant a sub-



Another possible combination of Jensen "Customode" units. These cabinets can be arranged in various ways to meet different decorating and space requirements.

Custom installation taking advantage of an existing alcove in a built-in bookcase. Rear of speaker enclosure opens into basement and mounting board is rigidly coupled to floor. In addition to providing architectural unity, custom installations require the use of the finest radio and acoustic equipment.



stantial investment, or do you simply want to obtain pleasant background music for other activities?

2. How large is the room in which the equipment will be installed? Is it heavily carpeted and draped so that sound is quickly absorbed, or can you observe a distinct reverberant liveness when you clap your hands sharply?

3. Do you listen principally to symphony, piano, string quartette, or dance music, or to a wide variety of music?

4. Do you prefer listening to low or medium loudness levels, or do you turn up the volume to approximate the effective loudness of the original music?

Most prospective customers have equipment of some kind. Fifteen minutes of discussion and listening with them in their homes to their existing equipment will usually produce a great deal more accurate information than can be obtained in several hours of discussion elsewhere. The language of sound is sadly lacking in accurate, well-defined adjectives. A volume level considered moderate by one observer may be intolerably loud for another. The ideal location, built-in possibilities, or cabinet dimensions and styles are best determined by actual observation of the room.

It is not too difficult to bracket prices for any customer. The minimum cost for phonograph equipment only to be used in an average living room to produce good reproduction of recorded music will approximate \$250 to \$300. The maximum cost for radio and phonograph facilities of the highest quali-

ty to be used in a relatively large room with ample reserve power will approximate \$1000. These estimates are very rough and are not intended to include cabinets or installation costs which will vary a great deal and should be separately computed. However, the response to such a broad indication of prices will rapidly lead to a discussion of requirements that may be readily tied down to a close bracket. In some instances, depending upon the policies and methods of operation of an organization or individual custom builder, it may be wise to include a reasonable installation estimate in the initial approximate figures. Others may prefer to specify this separately.

When it is possible to have facilities for demonstration sufficiently elaborate to permit switching various speakers, amplifiers, and pickups into the system, the customer may make his own selection on the basis of listening tests. This is a desirable arrangement although there are a number of problems involved. Unless the switching facilities are carefully designed, the characteristics of the various units may be seriously affected. For example, it may appear desirable to operate all the speakers from 500-ohm lines in order to simplify impedance matching. This involves a 500-ohm line-to-voice coil transformer at each speaker, or a single 500-ohm line to multiple voice coil matching transformer with a suitable selector switch. In any event, a transformer that will probably not be used in the final installation is introduced, and for valid demonstration, it must be a very high quality unit. If voice coil impedances are run directly from the various amplifiers to selected speakers, the switching network may become quite complicated. Switching facilities for pickups are still more likely to seriously affect the results obtained. Nearly all technicians realize that pickups of different operating principles (crystals, magnetics, etc.) require different equalizing networks. Many are not fully aware of the importance of proper impedance loading of cartridges of varying design but using the same basic principles. The capacity of the cable used to connect the pickup to the amplifier input is often neglected. Six feet of average shielded cable may introduce sufficient capacity to resonate the coil of a magnetic pickup well within the audio range. A peak in the response curve around eight to ten kilocycles produced in this manner results in extremely objectionable increased noise and distortion.

Few demonstration sound rooms, even in the stores of large distributors, have really satisfactory and flexible facilities of this kind, and the problem is considerably more complicated than cursory consideration indicates.

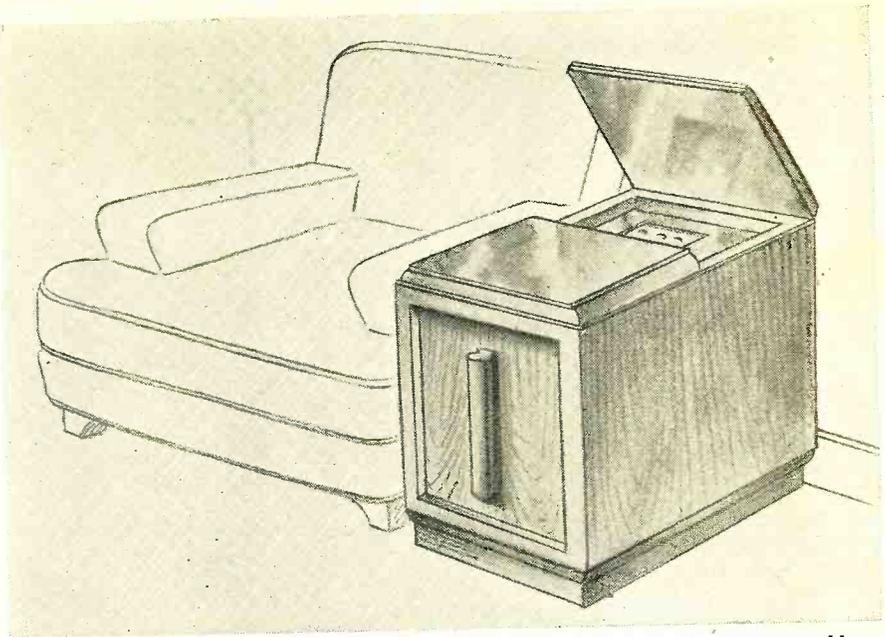
Where comparison tests are being made for any reason, it is extremely important that the source material be standardized. It is not difficult for an experienced listener to differentiate

rapidly between a very poor system and a very good one. It is impossible for even the most competent and well-trained observer to make sure judgments of relative quality in good systems without direct comparison, or at least a set of recordings with which he is thoroughly familiar. Even then, if he is a really competent listener, he will be slow to reach positive conclusions.

In calling on customers in their homes to listen to their existing equipment, it is extremely valuable to have available several records with which you may judge for yourself the characteristics of their systems. These should be records with a wide variety of music, and you should have listened to them for sufficient time on top-flight equipment and poor reproducers to know what they sound like under all conditions. In general, they should include:

(1) A piano record, preferably recorded at high level but without distortion in the record (not easy to find, but perhaps at least a section of the record may be found that is entirely clean). Such a record will provide a rapid guide to the dynamic range of the machine. If the system does not have adequate reserve power, the initial transients of the piano tone will drive it into flat-top distortion and the tone quality will go to pieces when the loudness level is brought up to anything approaching the loudness of a real piano in the room. Surprisingly few phonographs are capable of reproducing piano music at normal loudness levels without distortion. Many times the records are wrongly blamed for distortion that originates in the amplifier.

(2) A symphonic record with wide dynamic range, a few crescendo passages with cymbal crashes and kettle drums. If the frequency response is limited, the cymbals will lack crisp-



Submitting professional looking sketches of projected custom installations can add to your prestige, help the customer visualize the work, and provide a sales stimulus.

ness and "shimmer." Triangles are often used as a criterion, but it is not always easy to judge their relative loudness.

(3) A string quartette. This is an excellent type of recording with which to judge the ability of the reproducer to "separate" instruments. String tones are also a good indication of frequency response, and on a system with poor treble response will sound thin, flute-like in the upper register, and lacking in brilliance.

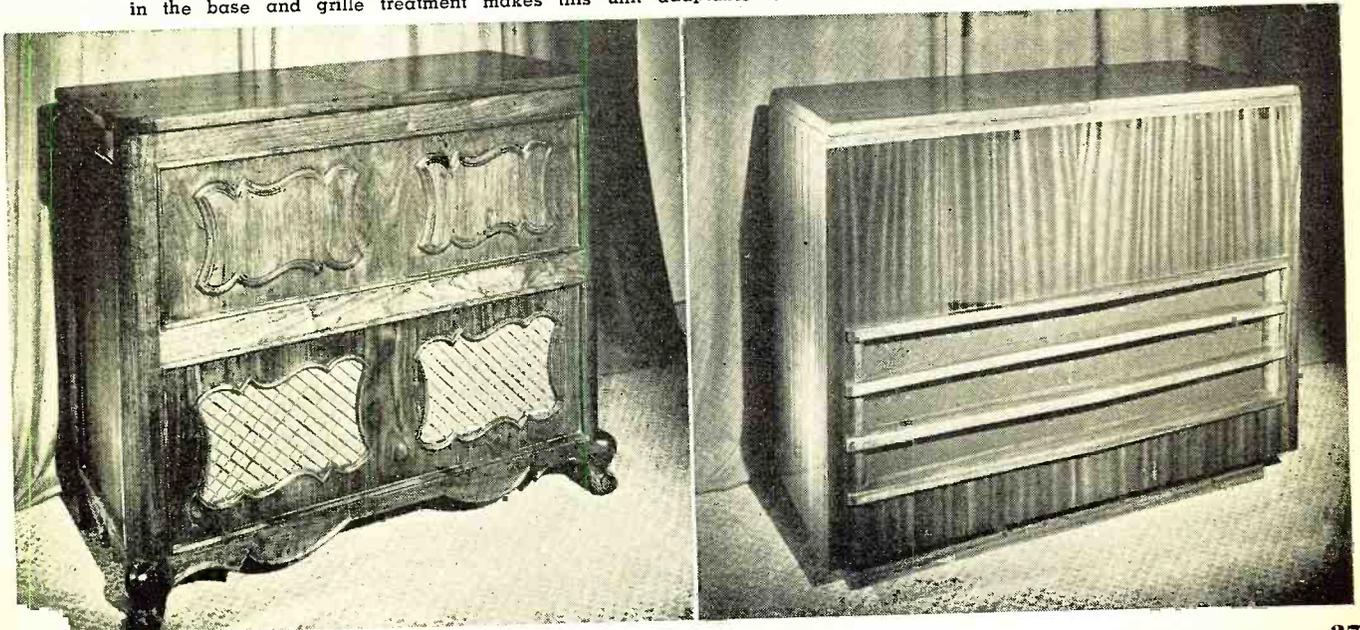
(4) A popular music record with snare drum and cymbals and a vocal chorus.

(5) A frequency record covering the range from 50 to 10,000 c. p. s. A special frequency record of this kind is available with several interesting test tones on the reverse side. This in-

cludes a sine wave at 1000 cycles that starts clean and is gradually driven into severe distortion. Aside from using it to demonstrate just what distortion sounds like to the customer (the question is not uncommon), it is very valuable in making rapid observation of frequency response. On very wide range equipment, the distortion will be extremely objectionable. On limited range equipment the high frequency components of distortion will not be evident, and on very narrow range equipment, the distortion may not be evident in any serious form at all. Another cut on this record demonstrates harmonic and intermodulation distortion combined with two frequencies. Lastly, there are two sets of grooves with no signal except the

(Continued on page 140)

(Left) A massive walnut cabinet that was designed for full power output from two coaxial speakers. (Right) A modern cabinet of ribbon mahogany housing four loudspeakers which lend spatial perspective. A slight change in the base and grille treatment makes this unit adaptable to various decorative schemes in the home.



# The Television TEST PATTERN

By  
M. S. KAY

EVERY television station, prior to its actual broadcasting period, transmits a test pattern for the purpose of permitting set owners to adjust their receiver controls for optimum reception. In addition, many stations set aside 3 to 4 hours during the day—generally the morning and afternoon—during which they transmit nothing but a test pattern accompanied either by a 400 cycle audio note or music. The purpose of this transmission is to enable television servicemen to install and/or repair television receivers. Without such aid, television work would be confined only to those relatively few evening hours when the stations are on the air. While equipment is becoming available now which will permit adequate television service work without the need of a transmitter on the air, no such simple solution is in sight for television receiver installations. Only a signal received from a station, as normally transmitted under actual operating conditions, can be of any assistance in properly orienting the television antenna.

Television test patterns assume many forms, but the one in most common use today is that shown in Fig. 1. This pattern is produced by the RCA "Monoscope" tube, 2F21, from a plate built into the tube. When the station is transmitting this test pattern, the "Monoscope" supplies the complete signal in place of the television camera tube.

With the aid of these test patterns, the television serviceman can check the adjustment of the following items concerning a television receiver: 1. Focus Setting; 2. Aspect Ratio; 3. Linearity Adjustment; 4. Frequency Response; 5. Shading and Contrast; 6. Interlacing.

1. *Focus*: Focusing of the image is probably the simplest operation of all. It consists merely in rotating the focus potentiometer until the various sections of the test pattern stand out sharp and clear. On either side of the correct focus control setting, the image will become blurred and fuzzy. Some receivers achieve focusing control by permitting adjustments to be made on the physical positioning of the focus coil along the neck of the cathode-ray tube. These adjustments are generally screwdriver adjustments and must be made from the back of the receiver. When one man is working alone on a set, the only way that he can see what

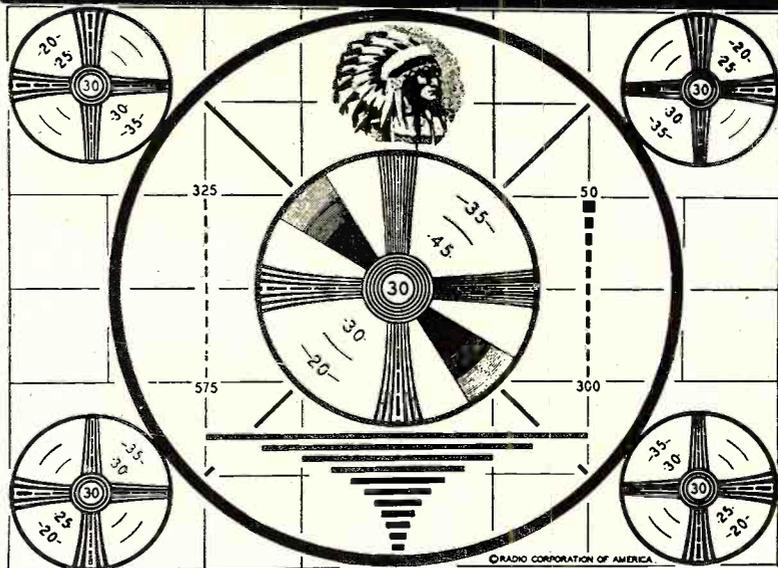


Fig. 1. "Indian Head" test pattern used by many television stations.

**The test pattern has been designed to convey important performance data. Study it carefully.**

is appearing on the screen is through the use of a mirror, placed facing the screen and tilted slightly upward.

2. *Aspect Ratio*: The aspect ratio is the ratio of the image width to the image height and in modern television has been standardized at 4 to 3. This means that the width is one and one-third times greater than the height. On the test pattern, Fig. 1, the large circle has a diameter which represents the three in the aspect ratio. In other words, it is three-fourths of the image width. The picture appearing on the television receiver screen should be adjusted until the upper and lower portions of the large circle are touching the top and bottom edges, respectively, of the screen mask. The width of the image is then increased until the four smaller circles are each in one corner of the screen. Note that the background of squares in the image also indicates the aspect ratio. There are eight horizontal squares across the image to six vertical squares. 8 divided by 6 equals 4 over 3.

3. *Linearity*: To check the proper setting of the vertical and horizontal linearity controls, examine the central circles in the image. If they are egg-shaped, the beam is not traveling at a uniform speed over the screen. Vertical non-linearity is indicated by the

circle being "egg-shaped" in the vertical direction. See Fig. 2. By the same token, horizontal non-linearity is indicated by having the circle "egg-shaped" in the horizontal direction (Fig. 3). Whichever control is affected should be adjusted until the circles become circular again. (Note: It frequently happens that after this adjustment has been satisfactorily made for one station, that the same test pattern for one or more of the other local stations will be slightly egg-shaped. This is due to non-linearity in the scanning equipment at the broadcast station. The only thing the serviceman can do is to set the receiver linearity controls to some compromise position. Fortunately, with transmitted programs, slight non-linearity is seldom noticeable.)

4. *Frequency Response*: The frequency response of a television receiver is one of its most critical features and determines how well an image will be resolved. Of particular importance is the extent of the low and high ends of this response and a careful check of the test pattern will indicate whether the system is fully compensated at each of these ends.

*High-Frequency Response*. High-frequency response of the receiver can be judged by examination of the four

wedges at the center of the test pattern. The numbers close to the wedges (i.e., 20, 30, 35, and 45) stand, respectively, for 200, 300, 350, and 450 line resolution. Between each of these numbers is a line which stands for the middle value. Thus, the line between 20 and 30 stands for 25, and the line between 35 and 45 is for 40. At the center, the number 30 means 300 lines. The word "line" refers to the number of lines that could be accommodated within the vertical height of the pattern. The frequency at which the system cuts off is indicated in the wedges at the point where the lines blend together and are no longer visible separately and distinctly. Thus, in most receivers, the lines run together between 30 and 40. In a poorly designed set, the lines may blend at 25. The circles in each corner also contain wedges with numerical line markings. However, the resolution of these circles is made less than the resolution of the center circles because the beam is not capable of being as sharply focused at the sides of the screen as it is in the center.

The wedges are formed with the black and white lines having the same width if measured along a line normal to the wedge centerline at that point. It will be noted that the two horizontal wedges are identical to the two vertical wedges. This permits us to check both the horizontal and vertical resolutions of the system. The horizontal wedges are used to determine vertical resolution and the vertical wedges are used to determine horizontal resolution. That this should be so is evident from the following reasoning. Vertical resolution, for example, is dependent upon the closeness with which lines can be placed above each other. In the horizontal wedges, the lines are placed one above the other, with the spacing between them varying at various points along the horizontal wedges. When the lines are no longer distinguishable from each other, we have reached the limit of the vertical resolution. By the same token, the vertical wedges indicate how closely lines or details can be placed next to each other horizontally. When the system is no longer able to resolve these pinpoint white and black lines, they become indistinguishable and the limiting resolution has been reached.

In a television receiver, the vertical resolution is almost entirely a function of the number of lines used, in this case, 525. Normally, the performance of the receiver has little effect upon this vertical resolution unless the interlacing is poor in which case other indications on the test pattern reveal this. (To be explained in detail later.) The horizontal resolution, on the other hand, is dependent upon the response and performance of the receiver r.f., i.f. and video-frequency stages and this is important to the serviceman. Hence, the vertical wedges are examined to determine where the lines blend and the reading at this point is recorded as so many lines, say 300. This means

that up to the number 30 in the test pattern the lines are separate and distinct but beyond this they run together. Through experience, most servicemen know that a resolution of 300 lines is close to a 4.0 mc. bandpass in the receiver, but they possess no accurate method of determining the system response for other values of line resolution. With the following formula, the conversion from the number of lines to frequency response can be readily achieved.

$$\text{Freq. (cycles)} = 12,500 \times N$$

Where:  $N$  = number of lines as read from the test pattern. For example, if the lines merge at 300 lines, the receiver response is:  $\text{Freq.} = 12,500 \times 300 = 3,750,000 \text{ cycles} = 3.75 \text{ mc.}$

When the receiver system is over-compensated at the high frequencies, so that a definite peak results, then a process known as "ringing" will take place. We check for "ringing" with the two columns of single rectangular areas located on either side of the inner circle. The numbers (50, 300, 325, and 575) indicate the width of the nearest rectangle, the width being given as the number of lines which could be accommodated vertically in the image. If over-compensation or "ringing" is present, the rectangles will be followed on the screen by multiple rectangles somewhat similar to ghost images, but evenly spaced from each other. This can be explained as follows.

When a signal containing high-frequency components is applied to this system, the effect, if sudden enough, will produce a series of high-frequency oscillations. These oscillations generally die out rapidly, but before they do, they place several small lines on the screen, each evenly spaced from the original sharp line (or rectangle) that produced them. The lines are produced by the negative peaks of each

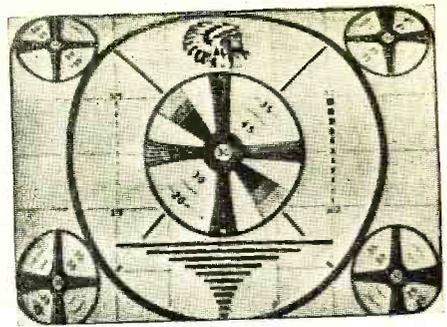


Fig. 2. An example of vertical non-linearity in a test pattern. Note how compressed the Indian Head is whereas the bottom third of the pattern image is "stretched out."

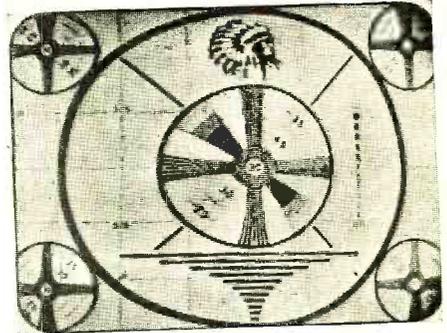


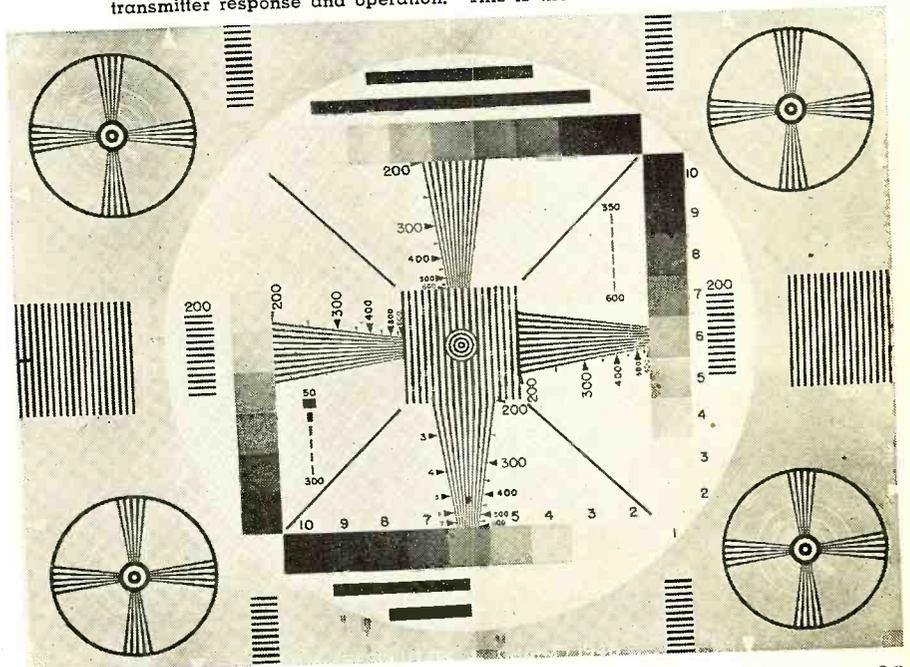
Fig. 3. Example of horizontal non-linearity.

oscillatory cycle. Not all the oscillations produce visible marks on the screen. Generally only the first two or three are able to do this, depending on the extent of the over-compensation.

When only slight over-peaking is present, it can be detected by examining the black horizontal bars at the bottom of the image. At the left-hand edge of these bars, the margin will be excessively black whereas at the right-hand edge, there will be a short excessively white margin following these

(Continued on page 135)

Fig. 4. A comprehensive test pattern designed for checking television transmitter response and operation. This is the standard RMA chart.





# WHY MUST WE HAVE BAD AUDIO?

By LLEWELLYN BATES KEIM

*A few simple and inexpensive changes and the addition of a new loudspeaker of outstanding performance will lift a poor receiver into the high-fidelity bracket.*

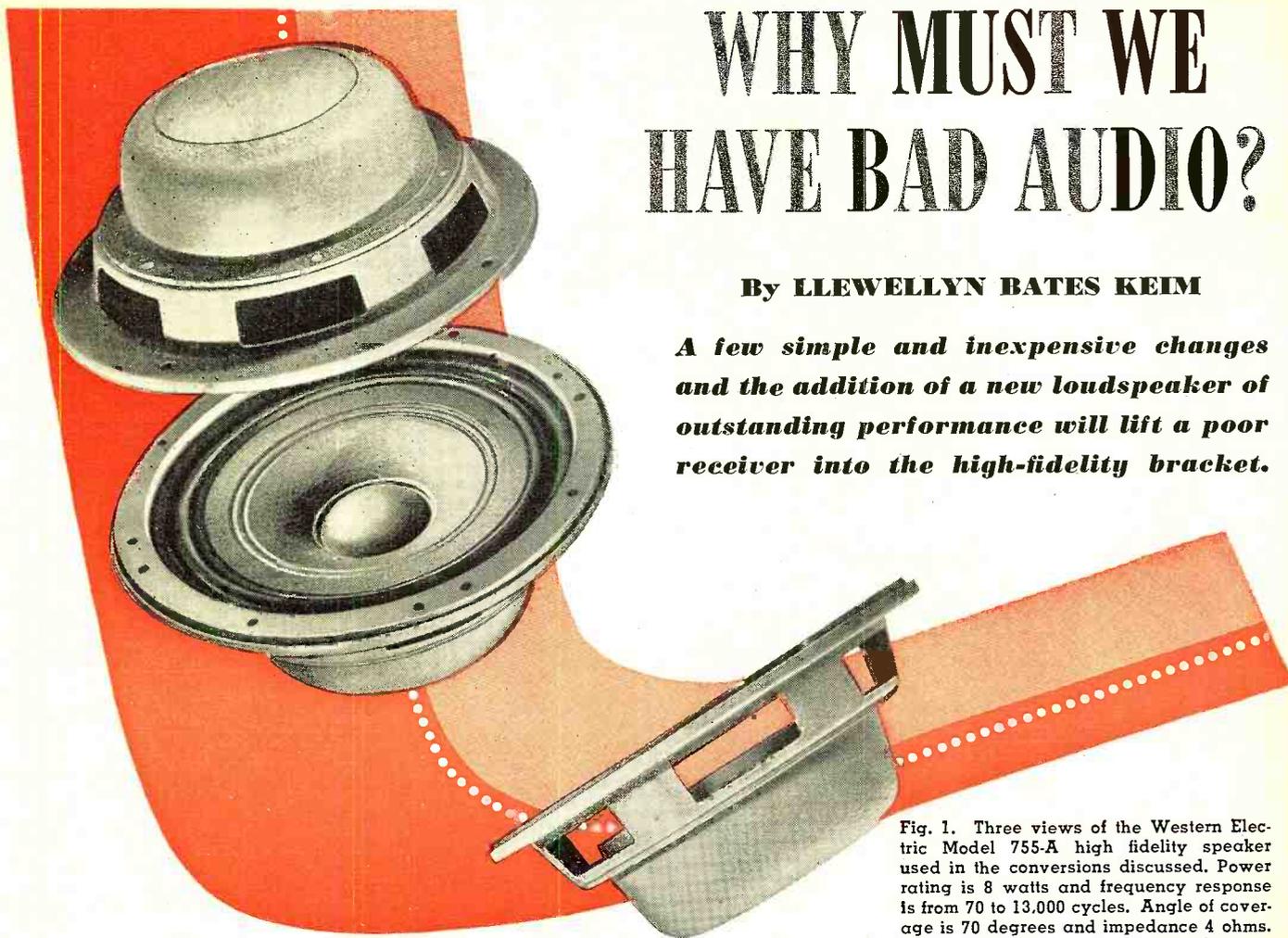


Fig. 1. Three views of the Western Electric Model 755-A high fidelity speaker used in the conversions discussed. Power rating is 8 watts and frequency response is from 70 to 13,000 cycles. Angle of coverage is 70 degrees and impedance 4 ohms. The unit should be housed in a 2 cu. ft. baffle totally enclosed except for 7" baffle hole. Inside dimensions of baffle should be 19" wide, 22" high, 8 7/8" top depth, and 11 13/16" bottom depth. Lining should be 1" sound absorbing glass wool.

**A** STUDY is currently being made by the author on present-day radios and radio-phonograph combinations with a view to preparing a market analysis of just what the public is being offered for its radio dollar. As a result of this work, the following study is offered as being of interest not only to the consumer, the radio retailer, and the serviceman, but to the design engineer. This article will point out where most manufacturers have strayed from good engineering practices and how this has affected consumer acceptance of high-fidelity reproduction. It tells a story that is sad in its implications but one that is not hard to correct. Proper buying resistance on the part of the public can force this needed designing revolution in less than one season if the radio set manufacturers would display a willingness to offer top quality merchandise for the price.

It is a sad commentary that either through a lack of "know-how" or through willful neglect the audio system built into almost every radio receiver on the market today fails to live up to high fidelity standards. Not one of the many sets tested thus far by the author has incorporated an audio channel that was capable of reproducing FM program material adequately.

Yet, in all cases, the advertising material covering the receivers stressed the advantages of "FM reception."

This article, however, will be a specific case study of changes made in three standard sets which will, perforce, remain nameless. The article will deal with typical examples of how a competent serviceman, dealer organization, or even the manufacturer can better the product before it is offered to the customer.

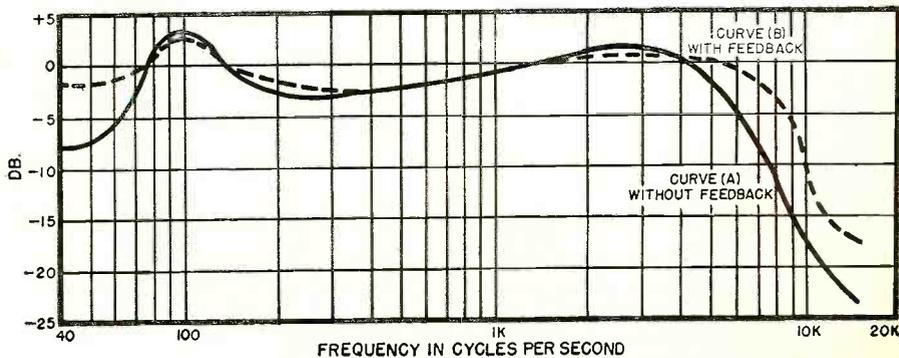
No one will doubt, if he is being honest with himself, that the prime requisite of a good audio system is a good loudspeaker. Fortunately there are

many excellent loudspeakers on the market today.

Unfortunately, feminine aesthetes usually prevent the use of large, theater-type dual systems. The need for a separate and large baffling enclosure often rules out the truly desirable audio installation, but in some cases where the family is desirous of securing the ultimate in sound reproduction such installations can be made.

Within the past few months the introduction of small, highly efficient,

Fig. 2. Audio system response curves for original receiver with volume control set halfway.



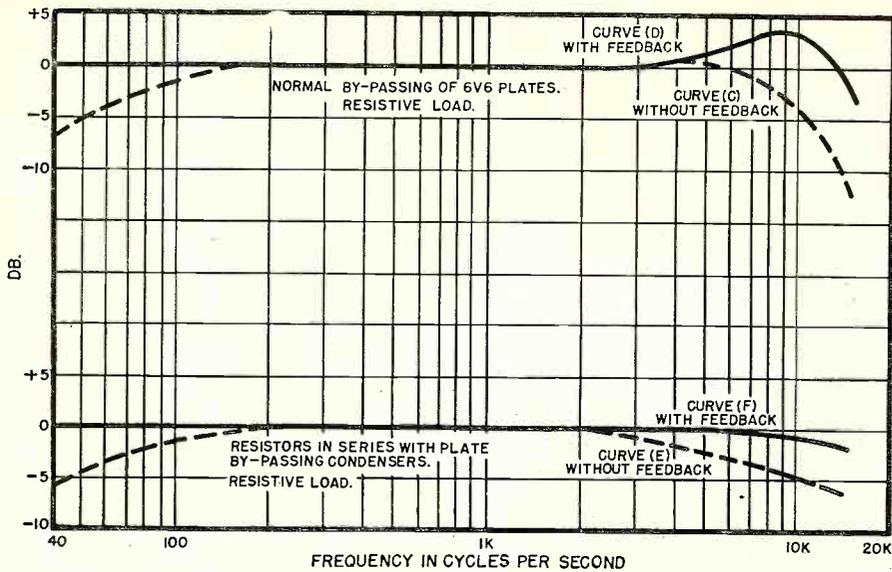


Fig. 3. Curve shows improvement in the set's response after circuit alterations were made. Curves were taken with the volume control full-on.

single-unit transducers, which lend themselves to inclusion within the confines of the set's cabinet, have been introduced.

One such speaker is the new *Western*

*Electric Model 755-A* which has a response extending from 70 to 13,000 cycles and performs through this range with a small, completely enclosed baffling structure which does not require

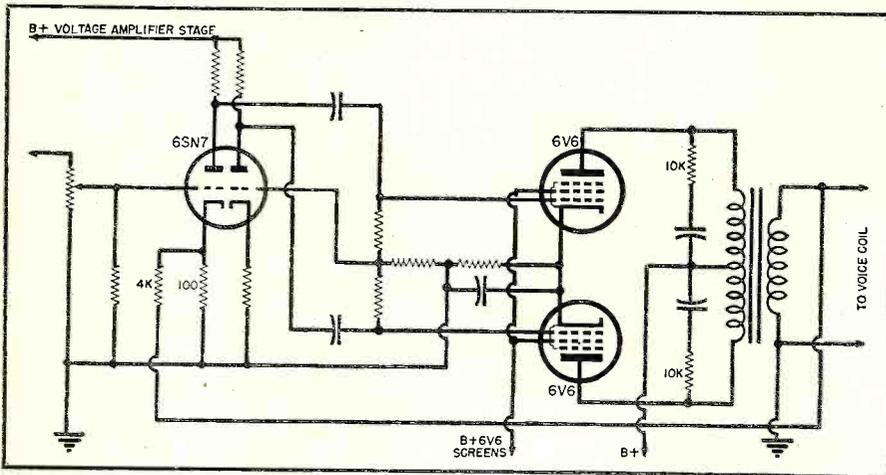
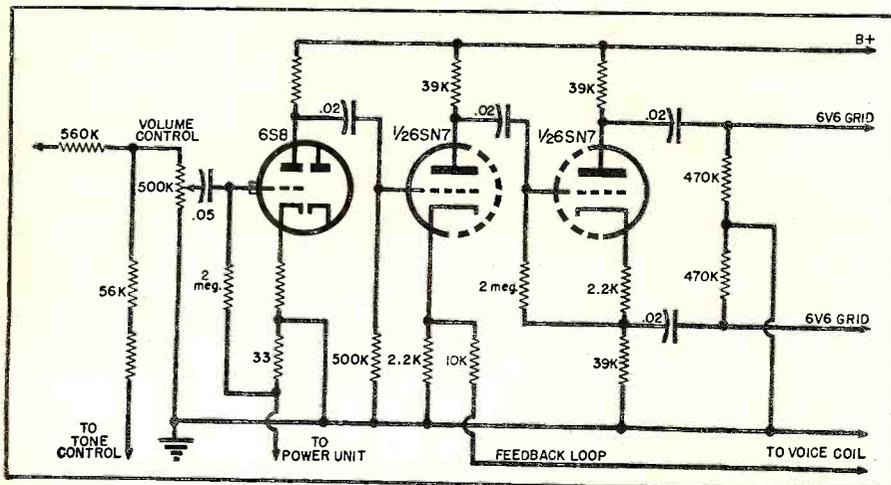


Fig. 4. Audio system of first set showing the four added resistors which were inserted in the circuit to improve the response and performance.

Fig. 5. Schematic diagram of modified audio system of the second receiver tested. All changes indicated on the diagram are explained in the text.



any venting port. This new unit is illustrated in Fig. 1. The added first-cost of equipping a receiver with an improved audio system can be fully justified in terms of improved performance. The dealer who is alert to such possibilities could so equip a set and have it on display on his sales floor, perhaps next to the same model receiver as it arrives from the manufacturer. This is one way to speed up the turnover of stock and at the same time render a valuable service to your customers.

Let us point out at the inception of this detailed description of the changes made on these sets that the same improvement can be made in almost any set without too much difficulty or highly specialized training. A sound background of audio frequency fundamentals and the ability to interpret a schematic diagram are the only special requirements. What has been done in the way of improvement on the three sets used as examples can be done on any receiver providing it has the space to mount a new loudspeaker, and the necessary power output to drive that speaker. The receiver should have a reasonably husky output transformer in order that the transfer of ten watts of audio power may be accomplished properly and not through a bell-ringing coil, or similar unit of inadequate power handling capacity. This is one of the all-too-prevalent faults which may be found in the current market offerings.

The first study concerned a combination AM-FM tuner which incorporated 10 tubes and a 12 inch loudspeaker. A frequency run of the audio amplifier was made with the gain control advanced about halfway. The output voltmeter shunted the voice coil of the speaker. Curve A in Fig. 2 indicates the results obtained. The set showed a peak at 100 cycles and very poor high frequency response. Some thought was given to the problem of improving the results obtainable from the receiver. 7 db. of inverse feedback, measured at 1 kc., was introduced around the entire audio system, from the voice coil winding to the cathode of the input stage. Curve B of Fig. 2 shows the improvement which was obtained. While the response was considerably improved the set still failed to meet "high fidelity" standards.

The use of pentodes in the output stage of the receiver meant that some form of plate bypassing was necessary in order to stabilize tube performance, prevent "singing," and eliminate supersonic oscillation. As constructed, the condensers in this set are quite large, and although they could not be eliminated entirely, some modification of values was tried. A set of curves was run, using a resistor as a load instead of the loudspeaker voice coil, in order to standardize the measuring technique. Curves C and D of Fig. 3 show the amplifier performance with the resistive load, with and without the feedback loop connected. The peak occurring at about 9 kc. is due, in part, to these bypassing condensers. A 10,-

000 ohm carbon resistor was inserted in series with each of the bypass condensers and the frequency response measurements were repeated. Curve E of Fig. 3 shows the results introduced without the feedback loop in operation and Curve F shows the improved circuit with the use of feedback. Now the amplifier is performing within limits of  $\pm 2$  db. from 40 to 15,000 cycles although all that has been done to the set is add a feedback connection and four carbon resistors. See Fig. 4. Listening tests were then made with the original loudspeaker and with the 755-A. A rapid transfer switch was used so that the two units could be interchanged. The improvement was so remarkable that the performance of the receiver was unrecognizable from its previous state. The conversion was simple and required but little time and effort, excluding the time spent in making response curves, but it did change the set from a mediocre one to a creditable performer worthy of the name under which it was being marketed.

So gratifying was this experiment that a larger console radio-phonograph unit became the next subject for study. The measured results were highly disappointing in the data revealed. This set was an 11 tube receiver, incorporating an unconventional tone control system. Because it was hoped that the receiver might be made to perform more satisfactorily, a new loudspeaker was installed first, together with the proper amount of baffling. However, listening tests showed that there was no combination of settings of the tone controls that would produce anything but a "boomy" response. Even listening to an FM station transmitting live material failed to show any high frequency transmission of the audio system, nor was it possible to operate the set at medium to high volume levels without distortion. Analysis of the published schematic revealed insufficient bias on the first audio stage so that an input signal of any appreciable level caused serious distortion. Tests with an audio oscillator, after installation of a suitable cathode biasing resistor, showed that it was virtually impossible to develop more than four watts of power, a very low figure considering the tube manufacturer's rating on 6V6's. Examination of the output transformer seemed to indicate that this was the offending component as the core was too small for a unit called upon to handle any appreciable audio power. The next step was to substitute a more adequate output unit. This transformer was mounted externally to the chassis but the move was well justified. The first runs, using the oscillator as a signal source, are not plotted as the results were poor. Further study of the schematic showed a rather heavy use of bypassing condensers throughout the receiver's audio channel, thus precluding anything like a flat audio response. Removing the 500  $\mu$ fd. condenser from the plate

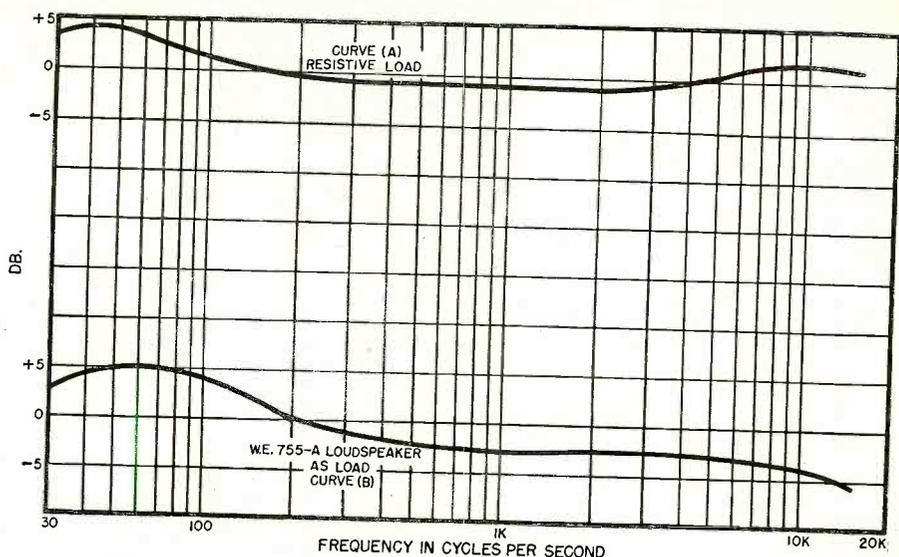


Fig. 6. Performance curves of the amplifier shown in Fig. 5. These curves were made with volume control in mid-position and optimum tone control settings.

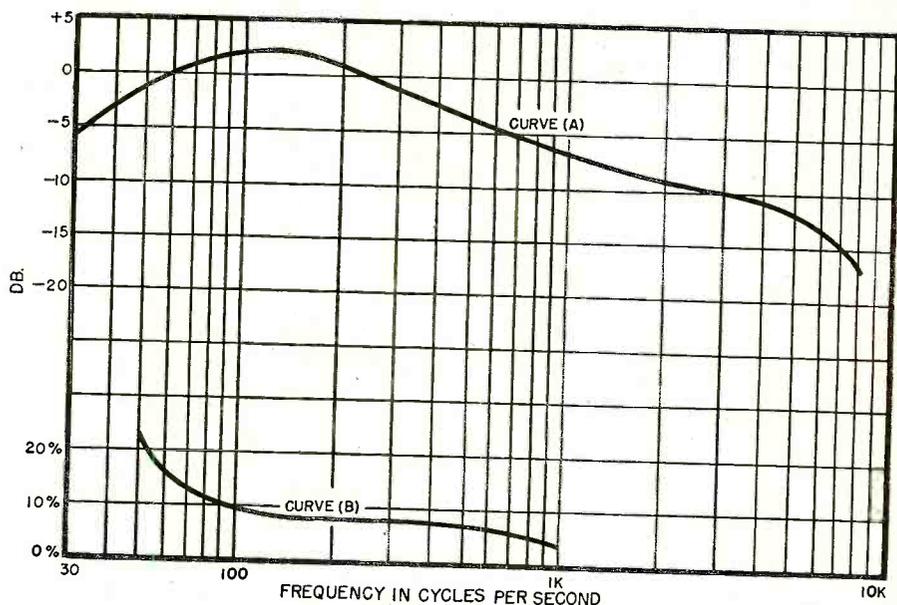
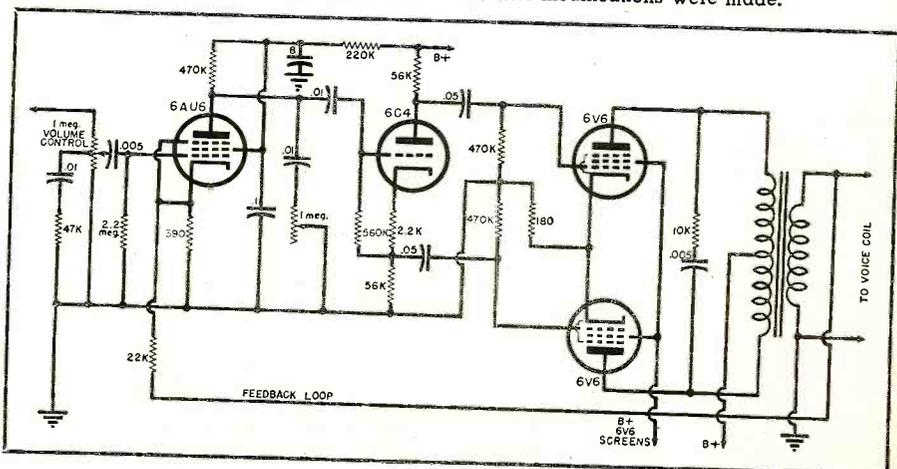


Fig. 7. Response of audio system shown in Fig. 8 before modifications.

of the first audio tube, and the .005  $\mu$ fd. unit shunting the output transformer primary improved matters to some extent but was not the final solu-

tion to the problem. The tapped control used in the volume adjustment was changed from a high resistance (Continued on page 122)

Fig. 8. Third audio system described, after modifications were made.





# TV PROMOTION

The "living room" atmosphere achieved by Philco Corporation in this display proves to be a powerful sales stimulus. A special backdrop simulates a garden scene.

By  
**HERBERT S. LAUFMAN and  
MILT HOPWOOD**

Hopwood, Laufman, Fomund &  
Cross

***Getting on the television bandwagon now will give you a money-making business in the years to come.***

**S**O THERE'S a new television station in your town—or there will be soon! And you're to be charged with the responsibility of selling a fine line of television sets in addition to being expected to install, service, and repair the sets to the complete satisfaction of your customers.

This is a big problem, but not unusual. Since the war more and more dealers have been meeting the challenge of television—and making money.

With the establishment of a TV station in your vicinity certain problems will arise unlike any which have occurred since radio was first introduced. Basically the problems boil down to this: *The public must be sold on TV as practical, entertaining, and necessary before sets can be sold.*

Only when this is accomplished will your television business assume money-making proportions. As with any other commodity, the desire must be created before a purchase will be made. This is best accomplished by a

concerted sales promotion campaign. It must be handled cooperatively by the manufacturers and distributors of all television lines and by the stations. Until the public is completely "sold" on television, it is up to all interested parties to cooperate in selling video to the public.

Top-notch entertainment and public service features will make television a necessary and practical adjunct to daily living. It is up to the dealers, station owners, manufacturers, and distributors to recognize this responsibility and underwrite cooperatively costs of television programs until sets begin to move and thus create a more profitable market for the advertiser. Once sets are in homes and public places where they can be seen set sales will gather momentum and continue to multiply. Other advertisers will then underwrite the still high production costs.

A well-rounded sales promotion program should include, in addition to television itself; radio, newspapers, di-

rect mail, posters and billboards, public demonstrations, and "trial installations."

Sales resistance to television assumes diverse forms. According to a recent survey, reasons for not buying TV sets were found to be (in order of prevalence):

1. Too expensive
2. Sets not perfected
3. Programs not interesting or poorly done
4. Sets will become obsolete
5. Landlord won't allow antenna installation
6. A.C. service not available.

In each of these instances it has been found that the lack of complete and correct information has led the customer to draw these conclusions. When the facts were accurately presented to the customer, in almost every case, resistance was eliminated.

Here, then, is the list of objections with the answers you can use to combat such objections.

1. *Too expensive*—This argument can be overcome by pointing out that there are many sets now on the market which retail for less than \$200.00.

2. *Sets not perfected*—Untrue. The picture received on the screen of a properly installed television receiver is clear enough for complete satisfaction. Most improvements, in the near future, will be made in transmitting equipment and will be reflected in current receivers.

3. *Programs not interesting or poorly done*—Professional baseball, foot-

ball, boxing, etc. are televised as they happen and provide "in person" coverage. Production techniques are much more polished than, say, even a year ago.

4. *Sets will become obsolete*—According to the most reliable industry estimates, color television is at least five years away. Black and white channel allocations are now relatively stable and persons hesitating to purchase a set because of possible obsolescence should hesitate no longer.

5. *Landlord won't allow antenna installation*—While many landlords will not permit each owner-tenant to erect a separate antenna some may be talked into permitting a multi-set antenna system to be installed. Indoor antennas can be used in some instances depending on the location of the customer's residence.

6. *A.c. service not available*—Inverters are available to convert d.c. to a.c. and permit the operation of standard television receivers.

### Newspaper Promotion

Newspapers play a natural part in television promotion. Many TV stations are owned and operated by newspapers. Whether the newspaper is financially interested in television or not they usually devote a special section to television at the time new stations go on the air. Space in this section is sold to dealers, distributors, and manufacturers and affords a concentrated kick-off of particularly high reader interest. Arrangements can usually be made with the distributor or manufacturer to help pay for space in this section. Cooperative advertising contracts vary but usually the manufacturer or distributor will pay half the line costs of the ads.

### Trial Installation

Television must be seen to be sold!

Television sets in public places such as hotels, bars and grills, office building lobbies, department stores, and theaters afford the general public the opportunity for seeing television in operation. Here the desire to buy is created.

Special arrangements should be made with such establishments to put TV in on a trial basis. The management of public places generally cooperates because television programs draw crowds and increase customer traffic. This is particularly true of bars and grills. In New York, Chicago, and several other television cities this market has been saturated first and has done more to stimulate set sales than any other single factor. By emphasizing installation in these places, the advantage of a vast number of viewers per set helps present a large audience for advertisers despite limited set sales.

There are few products which cannot find a market in the bar and grill trade. Most nationally advertised products such as cigarettes, automobiles, beverages, TV receivers, watches, razors, cosmetics, etc. find here the

SETS IN OPERATION AS OF NOV. 1ST		TV CONSTRUCTION PERMITS	
New York-New Jersey.....	320,000	Albuquerque, N.M.	New Orleans, La.
Philadelphia.....	77,500	Ames, Ia.	Oklahoma City, Okla.
Chicago.....	41,650	Binghamton, N.Y.	Omaha, Neb.
Los Angeles-Hollywood.....	38,200	Birmingham, Ala.	Peoria, Ill.
Boston.....	30,400	Bloomington, Ind.	Phoenix, Ariz.
Baltimore.....	26,000	Charlotte, N.C.	Pittsburgh, Pa.
Washington.....	24,050	Columbus, Ohio	Portland, Ore.
Detroit.....	20,500	Davenport, Ia.	Providence, R.I.
Cleveland-Akron.....	16,572	Dayton, Ohio	Riverside, Cal.
St. Louis.....	13,000	Erie, Pa.	Rock Island, Ill.
Schenectady-Troy.....	10,600	Grand Rapids, Mich.	Rochester, N.Y.
Bridgeport-New Haven.....	9,800	Greensboro, N.C.	Rome, N.Y.
Milwaukee.....	9,300	Indianapolis, Ind.	St. Petersburg, Fla.
Cincinnati.....	8,000	Jacksonville, Fla.	San Diego, Cal.
St. Paul-Minneapolis.....	7,500	Johnstown, Pa.	San Francisco, Cal.
Buffalo.....	6,300	Kalamazoo, Mich.	Seattle, Wash.
Toledo.....	4,100	Kansas City, Mo.	Stockton, Cal.
Richmond.....	4,000	Lansing, Mich.	Syracuse, N. Y.
Atlanta.....	3,800	Lancaster, Pa.	Tulsa, Okla.
Dallas-Ft. Worth.....	3,350	Louisville, Ky.	Utica, N.Y.
Memphis.....	1,500	Miami, Fla.	Waltham, Mass.
Salt Lake City.....	750	Nashville, Tenn.	Wilmington, Del.

Notes: At this writing 46 stations are in operation in 25 cities.  
 Over 300 requests for construction permits covering television stations are now on file with the FCC.  
 It is expected that more than 850,000 television sets will be installed by the end of 1948. More than 440,000 TV sets were produced during the first eight months of this year, more than all the sets produced in 1947 and part of 1946.  
 In October of 1948 more than 104,700 sets were produced.

Here is your television market. Facts and figures on stations and set distribution.

same prospects as they reach through their magazine, newspaper, or radio coverage.

As the sale of television sets to homes increases the number of viewers in public places tends to decline. The home market has become the measuring stick for a profitable TV market from the sponsor's point of view.

Before great sums of money are invested in television, advertisers must be assured of a home market. Despite the large audience available in public places, it must be realized that attention is greater and interest higher in the home where the evening is usually set aside for television entertainment and the disturbing overtones of conversation, cash registers, and clinking glasses are absent.

Trial installation is one of the most potent selling techniques yet devised. Once a set is installed in the home, nine-tenths of the selling is done. In

the home where the family can see it, admire it as a piece of furniture, compare it with existing room appointments, there is a much less formidable selling job to be done. An offer to place a set in the home at no cost is a lure that customers find hard to resist.

### The Kiddies

Youngsters constitute one of the most enthusiastic segments of the television audience and can be instrumental in directing an enormous amount of business in your direction.

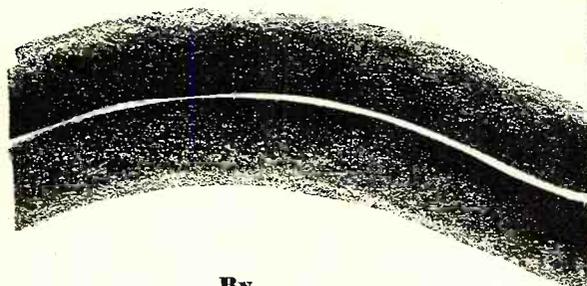
Almost every TV city has its "kiddie shows." They range from the lovable puppets "Kukla and Ollie," a dragon and little boy, appearing on WBKB, Chicago; and NBC's "Howdie Doodie," to adventure serials, animated cartoons, western movies, and typical "uncle" shows where the funnies are

(Continued on page 119)

Although space is at a premium, Hudson-Ross of Chicago recognizes the importance of providing suitable "settings" for their line of telecasts. In separate viewing booths, the prospective customer is cut off from outside distractions in the store.



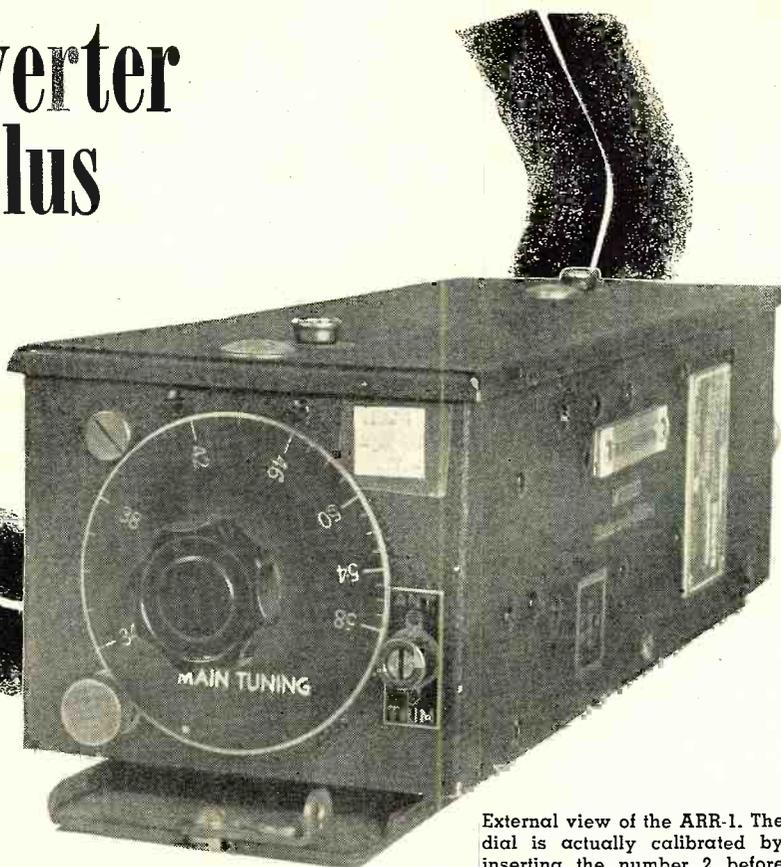
# A 220 mc. Converter from the Surplus R-1/ARR-1



By

LEROY W. MAY, JR., W5AJG

**With minor alterations, the ARR-1 becomes a high gain converter with two stages of r.f. amplification.**



External view of the ARR-1. The dial is actually calibrated by inserting the number 2 before each of the dial markings. Thus, 38 becomes 238, the frequency to which the unit is tuned. Since the photo was taken the amateur assignment has been lowered to 220-225 mc. instead of 235-240 mc. A simple alteration of the tuning coils effects this lowering of frequency.

ASSUMING you have enjoyed some success on the 144 mc. band and operation therein has now become "normal" instead of "snafu," as it was when the can-opener was first applied to the now famous SCR-522, perhaps you have raised your sights to our next higher authorized amateur band, the 220-225 mc. strip, sometimes known as the 1 $\frac{1}{4}$  meter band.

In the past, and even up to the present as far as commercial equipment is concerned, units covering this frequency are still rather expensive and scarce. However with the television activity extending upwards to the edge of our 220 mc. band, such equipment may become a reality. It is doubtful, very doubtful though, that such apparatus will sell for anything under the one-hundred dollar level.

Until such a time then, a break is in store for these good hams interested in high quality equipment for the 220 mc. band, in the form of airborne surplus units. With such apparatus as this available and at such moderate cost (four to ten dollars at the present market), it is doubtful if one could construct a decent superregenerative rushbox receiver at anywhere near the same price. As it stands when completed the R-1/ARR-1 will be essentially a two-stage r.f. acorn-tube superhet converter, employing a total of four tubes.

To be described is a piece of airborne (Navy) gear called a Model ZB-2 aircraft radio. The receiver por-

tion is probably better known to those who had dealings with it as the R-1/ARR-1. Needless to say, it is a natural for the v.h.f. ham and is one of the most beautifully built pieces of surplus imaginable—with its acorn tubes and ganged, slug-type of tuning mechanism.

As for size—it will, of course, be excellent for mobile use as it was originally an airborne type and is built to withstand severe jolts. The R-1/ARR-1 measures 3 $\frac{1}{2}$ " wide by 3" high and 10" deep, and is constructed of aluminum throughout.

Inspection of Figs. 3 and 4 before and after conversion will show the unit's construction, and it is a safe bet that somewhere along the line, a v.h.f. amateur had something to do with the design, as it is entirely straightforward and logical in layout, which is somewhat more than we can say of some surplus gear released since the war.

The wartime role played by the ARR-1 was considered secret, of course, and even today it is not too well understood or appreciated. In an effort to provide secret communication or intelligence for "homing" purposes, it was found that by taking a fairly low radio frequency, say around 700 kc., and modulating it by voice, tone, or pulse, or perhaps other methods and then using this 700 kc. modulated carrier to modulate one somewhere between 234 and 258 mc., it could not be detected by standard enemy v.h.f. re-

ceivers. That is, the 200 mc. or so carrier could be tuned in, but for all practical purposes it would appear to be unmodulated. The ARR-1 unit which was used to receive the signals however, consists of three 954 tubes in a cascade r.f. stage and one 954 as a low frequency detector. It was here in this last stage that the low frequency 700 kc. component was separated from the 200-mc. carrier. It was then passed on to the regular low frequency receiver and detected in the usual fashion. In actual practice, both the r.f. carrier and the modulation carrier could be changed daily, the former from 234 to 258 mc. and the latter from 200 to 1500 kc.

Since the design of the ARR-1 is straightforward, it is quite easily modified to resemble a bonafide converter. The last 954 stage, which is originally a broad-band "detector," is rebuilt into a regular acorn tube mixer stage. The output frequency is changed from the original 700 or so kc. to one of 30 mc. The third r.f. stage is also rearranged and changed into a 955 acorn tube oscillator to inject into the mixer stage.

Naturally, any other frequency besides 30 mc. may be chosen for the i.f. frequency from the converter. Our selection of this frequency is intentional inasmuch as our station equipment readily tunes to 30 mc. and since we intend to experiment with the 30 mc. radar preamp strips now on the surplus market. It is believed that the converter coupled to one of these strips

**RADIO & TELEVISION NEWS**

with the bandwidth narrowed down somewhat would make an excellent complete receiver for the 220 mc. band, at the same time not tying up any of the regular station equipment.

### The Original Circuit

Wiring schematics of the ARR-1 do not seem to be readily available for some reason and this has caused many fellows to hesitate to buy these units. While no schematic was available for our particular unit, we did take the time and trouble to trace through the original circuit. Fig. 1 shows the circuit of our model. It is probably representative of all the ARR-1 units. The function of the several sockets that appear at the rear of the ARR-1 is not known. They appear to be cross connections of the main power supply, probably to furnish voltages for other units. At any rate they are not an integral part of the wiring and hence are not shown in Fig. 1.

The 954 acorn type, r.f. pentode input stage is a conventional r.f. amplifier with a tuned grid circuit. The antenna and grid connection for the 954 is tapped down on the grid coil. The next two stages, also consisting of 954 acorns, are capacity-coupled and provide three ganged r.f. stages covering 234 to 258 mc. As the tuning dial is rotated, polyiron slugs move in and out of the field of all the tuned circuits. This is a beautiful, simple, and effective trick for tuning and makes a surprisingly smooth and easily handled converter. Since our amateur band is now 220-225 mc. it becomes only necessary to squeeze the tuning coils slightly to alter the frequency range. More on this later.

The fourth, and last, 954 acorn stage is the broad-band detector, the output of which is fed into a coax type connector. As is almost every piece of Army or Navy equipment, each and every component is stencilled with a number. This makes identification particularly easy and this notation is used in Fig. 1.

### The Modification

The first step in the modification is to rewire the filament circuit. It will be found that originally the heaters could operate on either a 12.6 volt series-parallel arrangement or a 25 volt series circuit by throwing the d.p.d.t. toggle switch on the underside of the unit. Rewiring is a very simple operation. Merely put the filament voltage selector switch on the 12.6 volt position and unsolder the black and white tracer heater wire on tube  $V_{103}$  (should be the heater lead where  $C_{125}$  is located). Then ground the socket pin where the heater wire was just removed. This same procedure is then followed on  $V_{102}$ . In this case, change the heater lead from the pin where  $C_{125}$  is attached to the pin where  $C_{129}$  is soldered. Then ground the  $C_{125}$  side of the heater circuit. Condensers  $C_{125}$  and  $C_{129}$  may be removed if desired. The heaters will now operate on 6.3 volts a.c. Actually it is not necessary to go

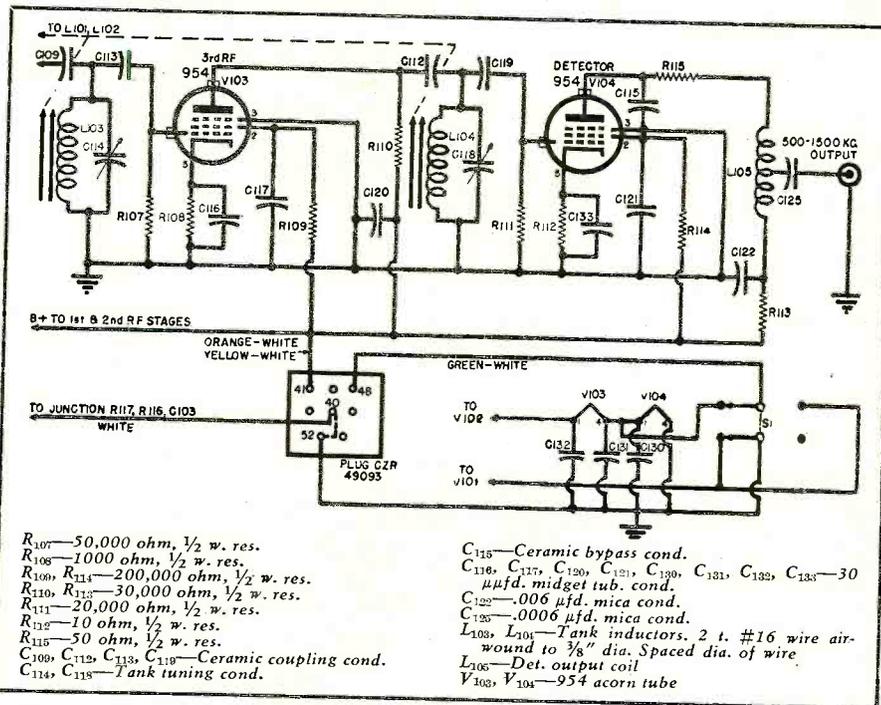


Fig. 1. Original diagram and parts list for the last 2 stages of the surplus ARR-1 unit.

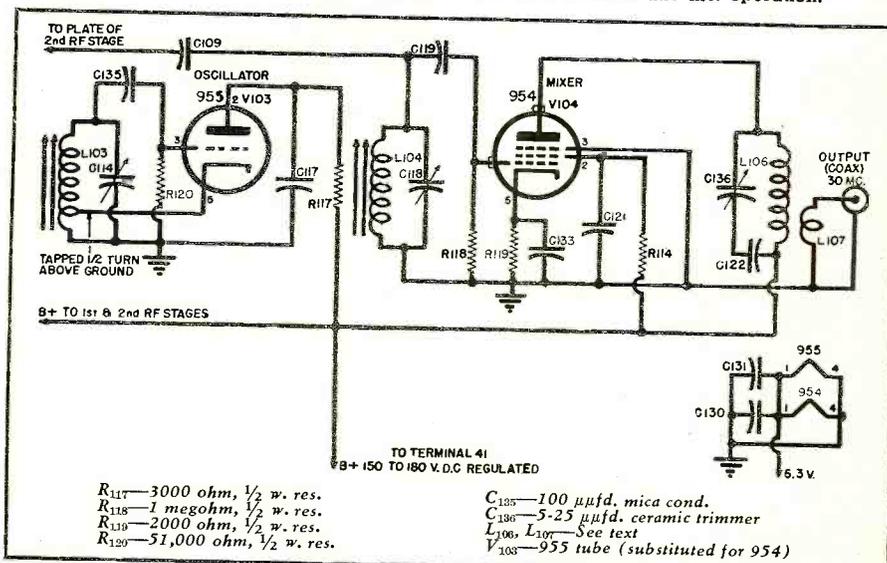
to this trouble as the filaments may be operated directly from a 12.6 volt transformer without any modifications whatsoever. Two very light duty 6.3 volt windings may be tied in series to accomplish the same end. The current drain is quite small. Most experimenters by now have used this trick on various pieces of surplus gear they have converted. Also, it goes without saying, a transformer delivering 24 or 25 volts a.c. will do the job. Just throw the switch to the 24 volt position.

The second step in the modification is to rebuild the mixer stage. To do this, remove the following components from this stage;  $L_{105}$ ,  $C_{125}$ ,  $R_{113}$ ,  $R_{115}$ , and  $C_{115}$ . In the place of  $L_{105}$  and  $C_{125}$  substitute the circuit shown in Fig. 2. These parts have been relabeled as

$L_{106}$ ,  $L_{107}$ , and  $C_{136}$ . In removing  $L_{105}$ , we stripped the wire from the form and used this form to wind  $L_{106}$  and  $L_{107}$ . To tune to about 30 mc. the coil  $L_{106}$  should consist of 14 turns of d.c.c. No. 18 wire, closewound.  $L_{107}$  is also wound on the same form and is placed as close to the cold end of  $L_{106}$  as possible. This new coil  $L_{107}$  consists of 7 turns of No. 26 d.c.c. wire closewound. The new tuning condenser  $C_{136}$  is a 25  $\mu$ fd. ceramic trimmer.

In the cathode of the last stage, remove  $R_{112}$  (10 ohms) and substitute in its place a 2000 ohm,  $\frac{1}{2}$  watt carbon resistor which we have relabeled  $R_{119}$  in Fig. 2. In the control grid circuit, remove the 20,000 ohm resistor ( $R_{111}$ ) and substitute a 1.0 megohm resistor, ( $R_{118}$  in Fig. 2). This completes the

Fig. 2. Circuit diagram shows modification of the ARR-1 unit. The changes affect only the last two stages of the converter. Parts listed are the additional components required to complete the conversion to 220 mc. operation.



modification of the 30 mc. mixer stage.

The third 954 r.f. amplifier stage is now rebuilt into a 955 acorn oscillator stage. First, remove  $R_{108}$  (1000 ohms) and  $C_{116}$  from the cathode pin of the 954 acorn socket ( $V_{103}$ ). Once this socket pin is clear, take a piece of stiff wire a few inches long and bring it from the socket thru a hole in the partition wall and solder it to coil  $L_{103}$ . A piece of spaghetti may be used for insulation. The connection to coil  $L_{103}$  should be made about one-half turn above the ground end. The hole in the partition wall just referred to is conveniently provided by removing a shield partition screw. The photo-

graph, Fig. 4, shows this arrangement quite clearly. After soldering the cathode lead to  $L_{103}$ , squeeze the turns of the coil together as closely as possible without having them actually touch each other. This should place the frequency of the oscillator tank about 30 mc. lower than that of the mixer grid circuit. If it does not, then wind another coil similar in shape but slightly larger in diameter to cover the necessary 30 mc. lower frequency range. In all the alterations of the coils, as well as the squeezing of same, a grid dip meter is indispensable. With it one can trim every coil to the exact frequency desired and can be certain

that when the voltages are applied the set will be on frequency. Lacking the grid dip meter, it is necessary to use the older, but still workable, method of "cut and try." It will simply consume more time and patience. Final tuning and padding of the oscillator is done with  $C_{114}$ .

Since the oscillator plate of the new 955 acorn tube must be at r.f. ground potential, it must be bypassed properly. However, in switching tubes the screen bypass condenser  $C_{117}$  accomplishes this purpose and hence remains in the circuit.  $R_{109}$  must be removed and a 3000 ohm resistor ( $R_{117}$ ) substituted. The suppressor pin of the 954 now becomes the control grid pin of the 955 acorn and so must be ungrounded. This pin then connects to the tuned circuit  $L_{103}$  and  $C_{114}$  through a new 100  $\mu\text{fd}$ . postage stamp size mica ( $C_{135}$ ). A 51,000 ohm resistor,  $R_{120}$  is soldered between the control grid pin and ground to serve as the grid leak.

It is now necessary to reroute the output of the second r.f. stage ( $V_{102}$ ) into the tuned circuit,  $L_{104}$  and  $C_{118}$ . Perhaps the easiest method of doing this is to drill a small hole in the shield partition separating the second r.f. stage from the new 955 oscillator stage. Then cut  $C_{109}$  loose at the tank circuit end, thereby removing the plate circuit of  $V_{102}$  from the oscillator LC ( $L_{102}$  and  $C_{114}$ ). Solder a short length of wire on the free end of  $C_{109}$ , which has now become the interstage coupling condenser and bring it through the shield partition and tie it onto the mixer grid coil. This should be at the junction of  $C_{119}$ ,  $C_{118}$  and  $L_{101}$ . This may be seen to be a better advantage in Fig. 3. The injection of the oscillator voltage at these frequencies is not a serious problem and the stray fields between the oscillator and mixer stages should serve this purpose admirably.

Components  $C_{112}$ ,  $C_{120}$ , and  $R_{110}$  are not used and should be removed from the circuit. This completes the wiring changes except for shorting out resistor  $R_{116}$  in the cathode circuit of the first r.f. stage. This 100,000 ohm resistor was used to control the sensitivity of the receiver. It could be used as protection against strong signals or overloading, but probably will always be shorted out of the circuit in normal use of the receiver when in the receiving position. If desired, this feature may be continued to be used through a normally-closed relay, which would open when transmitting.

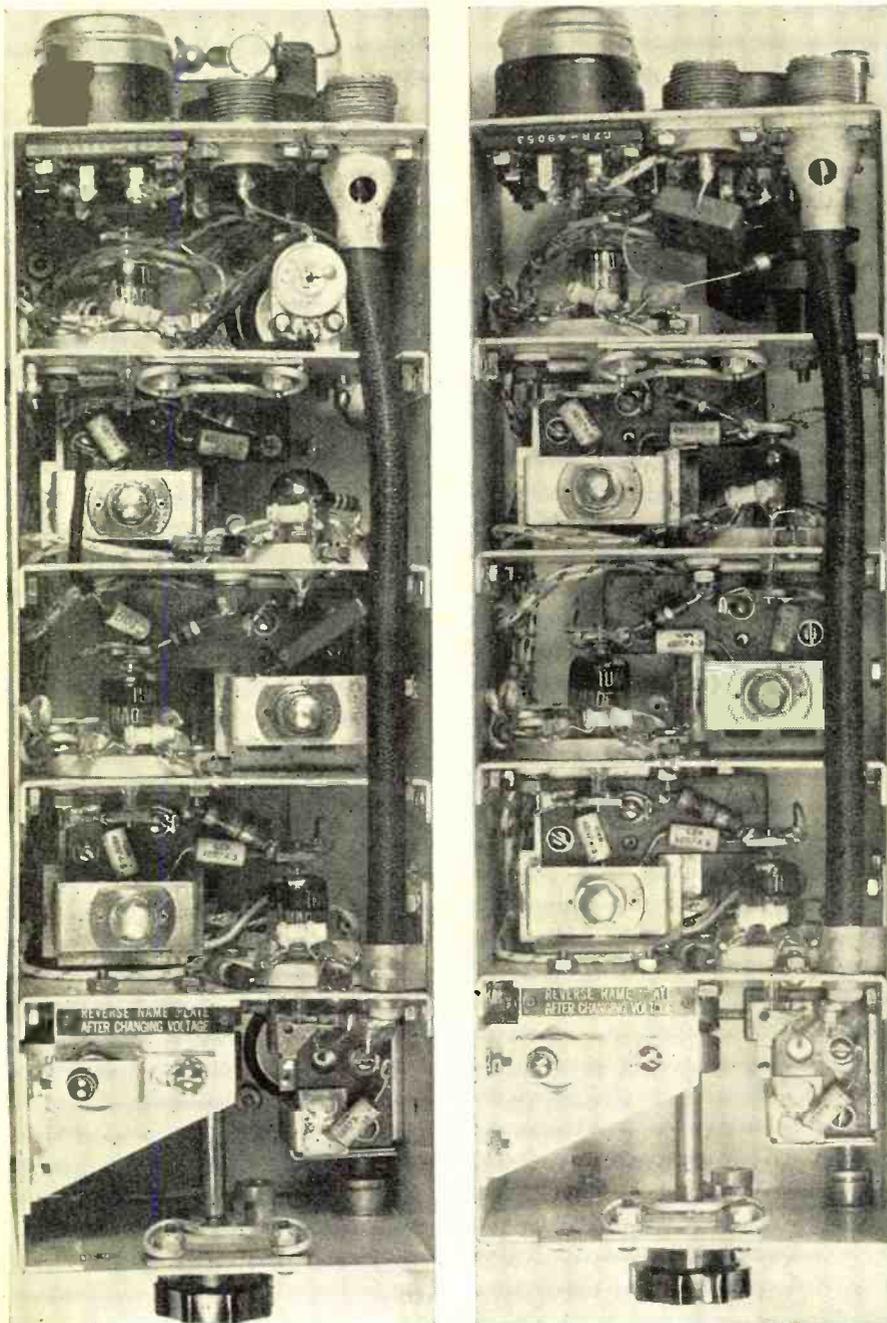
Almost any power supply will serve for this unit, although a 150 to 180 volt supply that is well regulated would naturally be preferred. The plate current drain is less than 15 ma. so it is entirely feasible to "borrow" this amount of voltage from some other existing piece of station equipment.

#### Tuning Up

The tuning up procedure is no more involved than that required in any other home constructed converter. As previously mentioned, the use of a

(Continued on page 111)

Fig. 3. (Left) Top view of the ARR-1 after modification. Condenser  $C_{109}$  may be seen rerouted through the partition wall between the second and third compartments from the top. In the extreme top compartment, the new 30 mc. tank is under the coaxial input cable. The 955 acorn has been substituted for the third r.f. stage as an oscillator. The filament voltage changeover switch is in the bottom compartment. (Right) Top view of the ARR-1 unit before modifications were made.

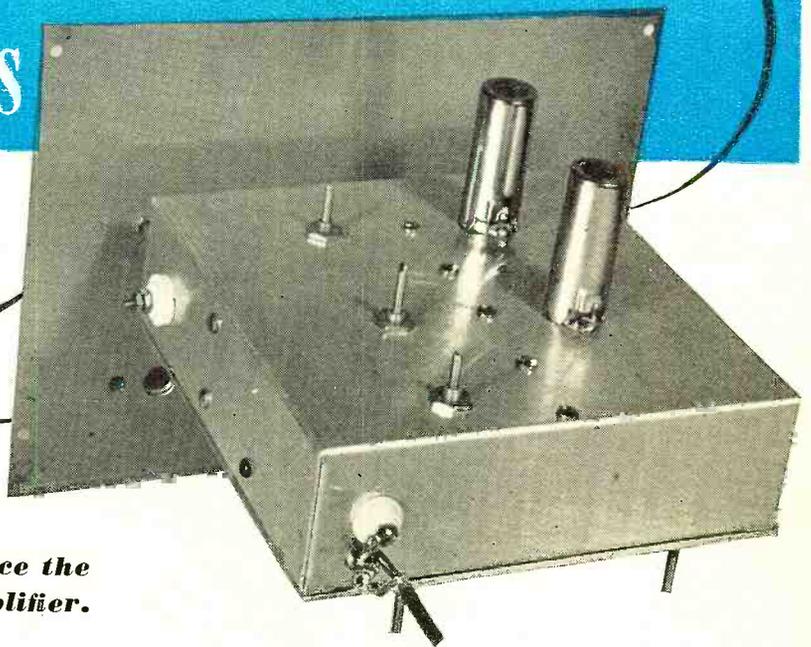


# W3KPX High-Gain PREAMPLIFIER for 10 Meters

Rear view of the home-built, high gain preamplifier. This unit is used in conjunction with a prewar communications receiver in author's shack.

By  
**HARRY D. HOOTON, W3KPX**

***Pep up that old receiver and reduce the images with this ten meter pre-amplifier.***



**H**OW many times have you listened on the 10-meter amateur band and decided *not* to turn on the transmitter because the band was "dead?" The author, using a prewar design communications receiver, experienced this condition entirely too often, *particularly when other local hams were working DX at that time.* Since the purchase of a new receiver was out of the question, it was decided to make an effort to improve the sensitivity of the existing receiver.

Considerable work was done on the front end of the receiver, especially the r.f. amplifier. All paper bypass condensers were either removed and mica condensers substituted in their place, or the paper condensers were shunted by appropriate mica units. This improved the sensitivity considerably on both 10 and 20 meters but the performance on 10 meters was still far from satisfactory.

At this point it was decided that an auxiliary unit—either a converter or a preamplifier—would be required in order to obtain the necessary 35 to 50 db. gain ahead of the mixer in the receiver. A minimum of operating controls was desirable so the converter seemed a logical choice and a great deal of experimental work with various types of converters, particularly those of the grounded-grid variety, was carried out. The results were disappointing to say the least. The required gain was readily obtainable but the signal-to-noise ratio was not improved; in fact, S9 signals were often

barely readable in the high noise level. Furthermore, the oscillator circuit in the receiver is not well shielded, and it was found difficult to eliminate "birdies" and "unmodulated carriers," due to the oscillator harmonics, in the 10-meter band. In view of these numerous difficulties, it was decided to discontinue work on the converters and concentrate on the design of a good, high-gain, low-noise-level, preamplifier.

This preamplifier incorporates two 6AG5 miniature pentodes in a two-stage circuit. The use of high-"Q," iron-core, r.f. coils and plate circuit tuning in the output stage, boosts the gain and selectivity tremendously. Once the gain and selectivity were obtained, the greatest problem was to "tie down" the circuit so that these desirable features could be utilized without having the circuit "take off" into oscillation without a moment's notice. Experiments indicated that it would be necessary to completely shield the components associated with each tuned circuit and to make effective use of the bypass condensers incorporated in the circuit.

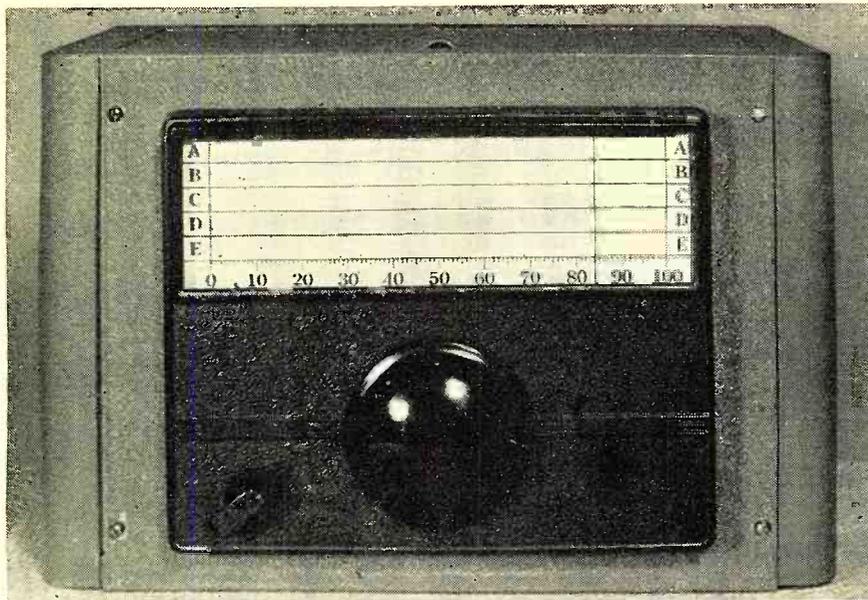
The first experimental circuit was built up on an iron chassis; this unit proved unsatisfactory and it was decided to use an aluminum chassis, with all components, except the tubes, enclosed, in order to obtain better ground connections and more complete isolation between the various parts of the circuit.

The physical layout and construction

of the unit is shown in the photographs. The circuit is divided into three sections, as indicated by the dotted lines on the schematic, and all of the components indicated in a section are enclosed in one of the compartments shown in the bottom chassis photograph. The compartment near the front panel contains the components of the input circuit; the center compartment contains the components associated with the plate circuit of the 6AG5 input stage and the grid circuit of the second 6AG5; the compartment at the rear of the chassis contains the components of the 6AG5 output circuit. An aluminum plate covers the bottom of the chassis thus completing the shielding.

The two 6AG5 heaters are operated from a 6.3 volt filament transformer operating on the 110 volt a.c. line; the plate and screen voltages are taken from the receiver. The average communications receiver can handle an additional few milliamperes drain from the high voltage supply but the filament windings are usually loaded to the limit. If desired, a separate power supply, using a selenium rectifier, may be used for operation of the preamplifier.

The construction and wiring of the unit is very simple and should present no difficulties to any ham. However, a few precautions should be observed. The coils should be wound exactly as shown in the constructional details sketch. The grid end of  $L_1$  and  $L_2$  should be connected to the terminal at



Front view of preamplifier. The unit is housed in a standard cabinet.

the end of the winding space nearest the core adjustment screw; the other terminal should be connected to the common ground. Since the coils are mounted under the chassis, this method of connection will reduce the distributed (grid-to-ground) capacitance and give a much higher "Q" tuned circuit. It also helps to prevent interstage oscillation because the "hot" ends of the coils are in line with the centers of the compartment shields thus preventing stray coupling around the edges of the plates. The large soldering lug under the mounting nut should be connected to ground; otherwise the iron slug may assume an electrical potential different from that of the coil and may cause noise or microphonism during adjustment.

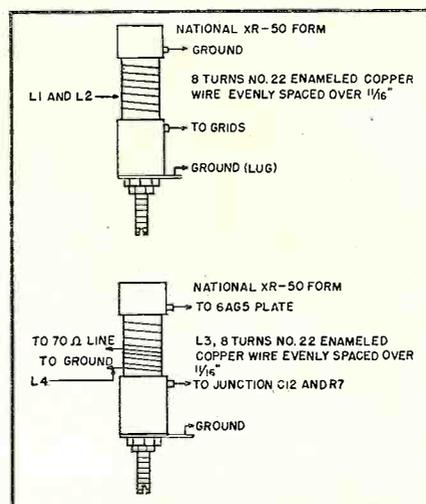
All leads, particularly those of the plate and grid circuits, must be short and direct. Keep the leads from the coils to their respective tuning condensers very short and avoid making sharp turns or bends. All connections must be well-soldered with rosin-core solder and a clean, hot and well-tinned iron. The various bypass condensers are mounted directly on the terminals of the sockets and other bypassed components; the ground side of these condensers is soldered to a lug bolted to the aluminum chassis. The various ground lugs are then soldered to a common ground wire which, in turn, is connected to "B-minus." The importance of good ground connections in a high-gain amplifier of this type cannot be over-emphasized. If trouble from interstage oscillation is experienced, check the ground connections first of all.

In the author's arrangement, the length of the coaxial output cable is adjusted so that the output winding  $L_4$ , the receiver antenna coil and the cable capacitance form a resonant circuit. This provides a good impedance match between the two units and boosts the apparent gain tremendous-

ly. For the *Hallicrafters* SX-25, a 24-inch piece of RG-29-U (53 ohms) proved satisfactory. When using the preamplifier with other receivers, it may be necessary to use a different length of cable and increase or decrease the number of turns in  $L_4$  until the maximum signal transfer is obtained.

The adjustment of the preamplifier circuits should be carried out by means of a stable, low-level local signal. A suitable signal source will be the 10-meter harmonic of a 40-meter crystal oscillator. The test signal should be of such a level as to give a maximum reading of S3 to S4 on the receiver carrier level indicator *without the preamplifier*. A higher level signal will make peaking of the tuned circuits difficult. With the signal tuned for maximum indication on the receiver, connect the preamplifier, as shown, and rotate the tuning dial for maximum S-meter indication. Even though the preamplifier circuits are not peaked, a gain of 10 to 15 db. should

Fig. 1. Winding details for the three coils.



be obtained. Turn the preamplifier gain full-on and adjust the output coil slug for maximum S-meter indication. The adjustment of this slug will be somewhat critical. Next, adjust the second 6AG5 grid coil slug for maximum indication on the receiver. This circuit will also be slightly critical in adjustment. At this point, rock the tuning dial slightly each side of resonance and carefully readjust the output coil slug for maximum indication. Most of the over-all gain of the preamplifier circuit is built up in this stage and a careful adjustment of these two slugs may give as much as 10 db. gain over a simple peaking alignment. The antenna coil slug will be quite broad in adjustment and should peak with the slug approximately half-way inside the coil. If the antenna circuit does not peak at all, or peaks with the slug completely out of the coil, loosen the antenna coupling by reducing the capacitance of the trimmer condenser  $C_1$ . If the antenna circuit peaks very sharply or oscillates when brought to resonance, the antenna coupling should be increased. The setting of  $C_1$  will affect both the gain and the signal-to-noise ratio and the correct position will be found by the trial and error method.

The bandpass of the unit (the region where signals can be received without retuning the preamplifier) is about 20 kc. each side of the resonant frequency. This is generally sufficient unless the operator listens for calls far removed from his operating frequency. This narrow bandpass is very desirable for elimination of images and other types of interference but requires the adjustment of two dials when covering the entire band. If some sacrifice in gain can be tolerated, greater bandpass may be obtained by stagger-tuning the tuned circuits in a manner similar to that of a television video i.f. amplifier. Experiments with this preamplifier show that with  $L_2$  peaked at resonance,  $L_1$  peaked 25 kc. below resonance and  $L_3$  peaked 25 kc. above resonance, the receiver may be tuned over a range of approximately 150 kc. before readjustment of the preamplifier dial is necessary. The gain under these conditions will be reduced to approximately 20 to 30 db. over-all. However, when the circuits are tuned in this manner, the antenna coupling may be loosened, permitting some regeneration in the first 6AG5 circuit and thereby increasing the over-all gain. Again the setting of  $C_1$  must be carried out by experiment.

The output impedance of the preamplifier, using the coils as specified, is around 50 to 70 ohms. Tuning the coupling circuit as outlined will give a good signal transfer with either a 50 or 70-ohm coaxial line of the proper length. If a long coaxial line must be used, it may be necessary to use an impedance-matching transformer in order to match the low-impedance line to the receiver input. Most modern communications receivers have an input impedance of around 400 ohms and

a transformer consisting of 12 turns of No. 22 enameled wire, closewound on a National XR-50 coil form, as secondary, and 3 turns of No. 22 as primary, will give a good impedance match.

The primary, if the transformer is connected as shown in Fig. 2, should be wound over the "cold" end of the secondary winding. If the secondary is center-tapped and the center-tap connection is returned to ground, the primary should be wound over the center of the secondary. In the latter type of winding the ground connection, indicated by the dotted line from "A" to "G" (Fig. 2) is not used. The coaxial outer conductor must be connected to the ground terminal of the receiver in every case. The use of 300-ohm "ribbon" lines between the preamplifier and receiver is not recommended.

The preamplifier input circuit is designed for a single-wire transmission line. The author uses a relay system which connects one conductor of the transmitting antenna transmission line to the preamplifier input when the transmitter is in standby position. In case it is desired to use a separate receiving antenna, with a two-wire transmission line, the trimmer condenser  $C_7$  should be omitted. For matching a 300-ohm "ribbon" line to the 6AG5 input an antenna coil consisting of about 6 turns of No. 22 enameled wire may be interwound with the "cold" end turns of  $L_1$ . Sufficient turns should be used to "load" the input circuit so that the best gain and signal-to-noise ratio will be obtained. In experiments with a separate receiving antenna, the author used a half-wave folded dipole and two-wire transmission line made from the 300-ohm ribbon. The results were satisfactory but the connection to the transmitting antenna proved better and more convenient.

If the preamplifier unit is carefully constructed and aligned, as described above, no trouble should be experienced. It must be remembered, however, that this is a very high-gain instrument and unless good quality components and good construction (particularly ground connections) are employed, oscillation may occur when the circuits are peaked and the gain control fully advanced. If the circuit oscillates during alignment, check the various bypass condensers for good ground connections. Make certain that the aluminum compartment shields are making good contact with the chassis. The aluminum bottom plate should be held in place by means of self-tapping screws in order to insure a good electrical contact between it and the chassis. The tube shields must be grounded to the chassis; it may be necessary to solder a short piece of flexible wire to the shield and attach it to the chassis by means of a soldering lug and self-tapping screws in order to obtain a low-impedance ground connection. Oscillation may be due to insufficient antenna coupling

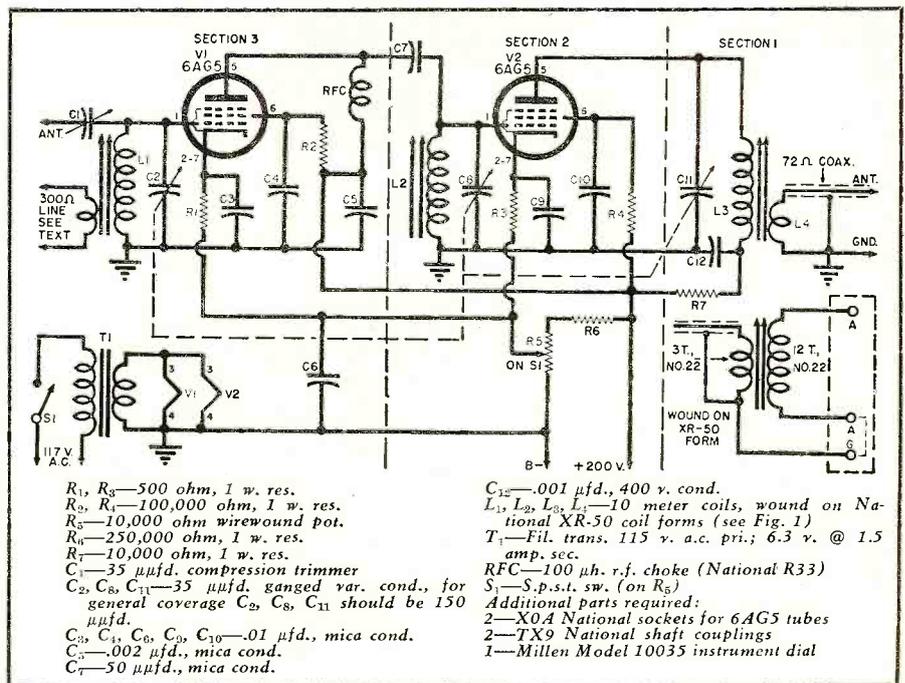


Fig. 2. Circuit diagram of the two-tube preamplifier. The circuit shown at the lower right may be used to match preamplifier to the normal 400 ohm receiver input.

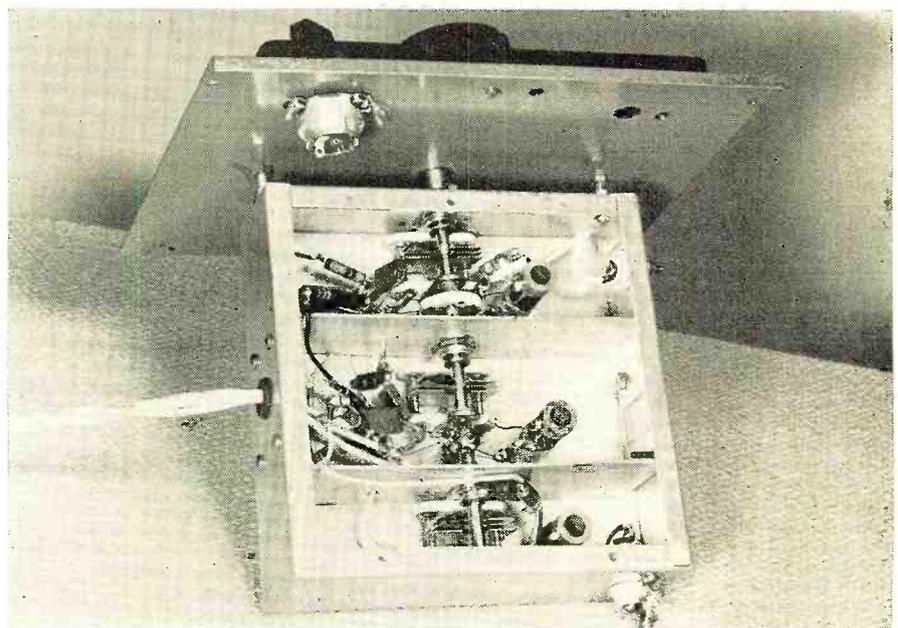
since there is some regeneration in the input circuit. The trimmer  $C_7$  should be near maximum capacitance in order to properly load the input circuit. The "B-plus" voltage should be approximately 200 volts; the circuit may oscillate if voltages higher than this value are applied to the plates and screens of the 6AG5 tubes.

The high-gain preamplifier unit described above has been designed especially for ham purposes on the 10-meter band and therefore no provision has been made for bandswitching or plug-in type coils. Some hams or short-wave listeners may require a general coverage unit which will not only provide better receiver sensitivity on 10

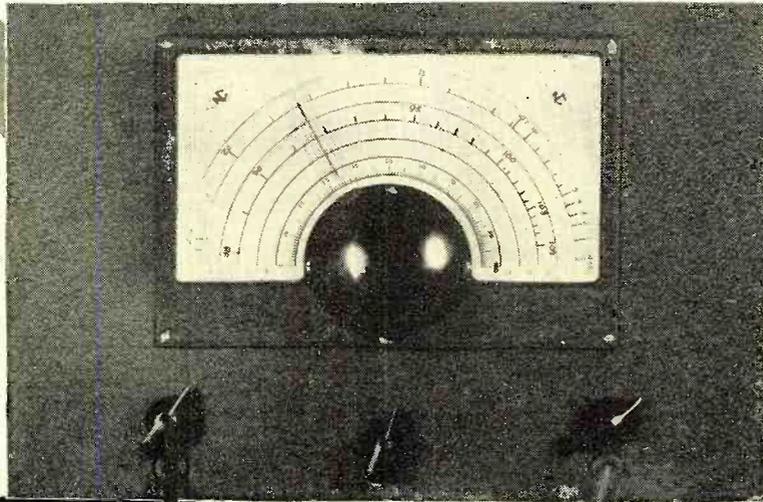
meters but will "pep up" the so called "dead" range between 20 and 30 mc.

If a general coverage unit is desired, the coil data, as given in Fig. 1, will be correct. It will be necessary to add a small 20  $\mu\text{fd}$ . variable air trimmer across  $C_8$  and another across  $C_{11}$  in order to obtain proper tracking across the entire dial scale. The 150  $\mu\text{fd}$ . condensers should have a very low minimum capacitance. The adjustment procedure will remain essentially as described above except that the 20  $\mu\text{fd}$ . trimmers should be set at about half maximum capacitance and the coil slugs adjusted so that the 10-meter band falls near the extreme high-frequency end of the tuning scale. —50—

Under chassis view of preamplifier. Chassis is a standard 7 x 7 inch aluminum unit.



# A Precision FM SWEEP GENERATOR



Front view of the home-built precision FM sweep generator.

***An instrument of extraordinary stability that any serviceman can build. Covers .3-23 and 87-109.7 mc.***

IN REVIEWING commercial sweep equipment now available to the service industry it was found that there was no "one unit" instruments available within the average serviceman's purchasing range. By a "one unit" instrument is meant one which would completely align a FM receiver without the use of additional equipment. There are any number of excellent technical and sales appeal reasons why such a unit is not available, and it might be more accurate to say that these are correlated. A sweep generator to have wide sales appeal should cover the range of relative zero through 216 mc. It should also do a job on both FM and television receivers. There are today available instruments of this type that are excellent "sweepers," but in every case it is necessary to use a separate unmodulated generator to provide marker "pips." This is required to trace out the exact frequency and amplitude response of the pattern observed.

Although the above mentioned instruments serve a multitude of practical applications they have the singular disadvantage of requiring the separate marker generator. This of course means that a job requiring the regular test oscillator (marker generator) will have to wait while FM alignment is being done. This loses time, and in

the busy service establishment this means less sets serviced. The instrument to be described is not intended to replace those mentioned, but simply serves as an auxiliary device to avoid conflicting use of present equipment. It is believed that as such it will soon repay the initial component cost, and time involved in construction. This unit may, of course, serve as the complete FM alignment tool in areas where television has not as yet become popular.

It was mentioned that available FM-TV generators required separate generators to provide frequency marker points. There are several reasons for this. The oscillator that generates the frequency swept signal is a fixed device, and to obtain enough "swing" for television alignment (some ten megacycles) necessitates operating this oscillator at a frequency in excess of 100 mc. A second variable frequency oscillator is mixed with this fixed oscillator, and the sum and difference frequencies used as final output. The fixed oscillator may have beautiful stability in terms of its fundamental, but when this drift is translated in terms of the lower beat output the error is prohibitive. The variable oscillator must also operate at a high frequency to give the frequency change required in terms of

megacycles if bandswitching is to be avoided. This drift will also appear in any low frequency "beat" output. The great frequency range obtained by this process when spread over 180 degrees of a dial could not be read close enough for FM work even if no drift existed in the oscillators. For the above reasons marker signals are a must when using such instruments.

In order to circumvent the above difficulties for just the FM job required considerable scratching of our collective heads. The first apparent requirement was to lower the frequency of the fixed oscillator to the lowest point that would provide sufficient "swing" for FM application. The choice of a tube for this oscillator was also something of a problem, as low interelectrode capacitance was also to be desired both in terms of the sweep width required, and to hold the drift problem to minimum. Lady Luck was with us when we came across the 12AT7. The frequency selected for the fixed oscillator (f.f.o.) was 55 mc., and when operating at this frequency the 12AT7 exhibits practically zero change vs. time when used in the circuit indicated in the schematic (Fig. 1). Another reason for choosing 55 mc. was the fact that it was desired to run the v.f.o. (variable oscillator) on the low side of 55 mc. to improve its stability. A third reason for this choice was, of course, the frequency range required by mixing these two oscillators. The range produced is 300 kc. to 23 mc. the difference; and 87 to 109.7 mc. the sum. These frequencies are simultaneously present and no bandswitching is needed. The combination of frequencies to be described has been very carefully chosen and this should not be changed in duplicate design. A lot of very unpleasant things can happen such as two or three adjacent responses if the oscillator settings are not exactly followed.

By  
**DOUGLAS H. CARPENTER**  
and  
**OWEN SHEPHERD, JR.**

**RADIO & TELEVISION NEWS**

The design of this sweep generator is by no means original, and the general circuit conformation may be found in most present day instruments. The first requirement is of course an oscillator whose frequency may be varied linearly. To obtain this a reactance modulator is employed. The reactance modulator is a tube that causes a phase change of the fixed oscillator's plate current when a modulating voltage is applied to the reactance modulator grid. In this circuit the reactance modulator is the second half of the 12AT7. The 12AT7 is a dual triode and two functions are obtained in the same envelope. The variable oscillator is the cathode-grid-screen section of a 6BE6 pentagrid converter. This oscillator is varied over the range of 32 to 54.7 mc. by the tuning condenser  $C_6$ . The screen of this oscillator is voltage regulated by the OB2,  $V_4$ , providing a constant 105 volts to the screen (actually the plate of the variable oscillator) to keep the frequency regulation of this oscillator optimum. The fixed oscillator frequency swept signal is taken off across  $R_8$  and is applied to the signal grid of the 6BE6 through the coupling condenser  $C_5$ . The physical plate of the 6BE6 is not a part of an oscillatory circuit but simply provides a means of getting the required voltage out of the tube. The effective resistance of the plate load resistor is shunted for r.f. by the combination of  $C_9$  and  $R_{11}$ . Even with this low value of output load the voltage developed across  $R_{11}$  at the desired frequencies is from over .5 volt to .3 volt as  $C_6$  is tuned through its extreme limits. This provides more than enough voltage for stage-by-stage FM alignment, and the rough output control  $R_{14}$  is satisfactory for attenuation to prevent overload throughout the r.f. range. To provide the required ranges the following occurs.

The frequency modulated signal from the f.f.o. is injected at the signal grid of the 6BE6. This signal is varying around 55 mc., determined by the amount of modulating voltage applied to the reactance modulator grid. The local oscillator (v.f.o.) may be generating any frequency in the range of 32 to 54.7 mc. depending on the setting of  $C_6$ . These two frequencies are mixed due to intermodulation of the 6BE6 electron stream and the sum and difference frequencies will appear in the plate circuit. It is these frequencies in which we are interested. The difference range is of course the f.f.o. minus the v.f.o. or a continuous range of 300 kc. (55-54.7) to 23 mc. (55-32 mc.). The sum range, provided at the same time, is the addition of the respective frequencies, or 87 to 109.7 mc. This is derived by 55 + 32 and 55 + 54.7. It may be noted that when for instance an FM i.f. of 10.7 megacycles is being generated on the difference range the sum is 99.3 mc. In every instance the sum is remote from the difference and vice versa so no

(Continued on page 88)

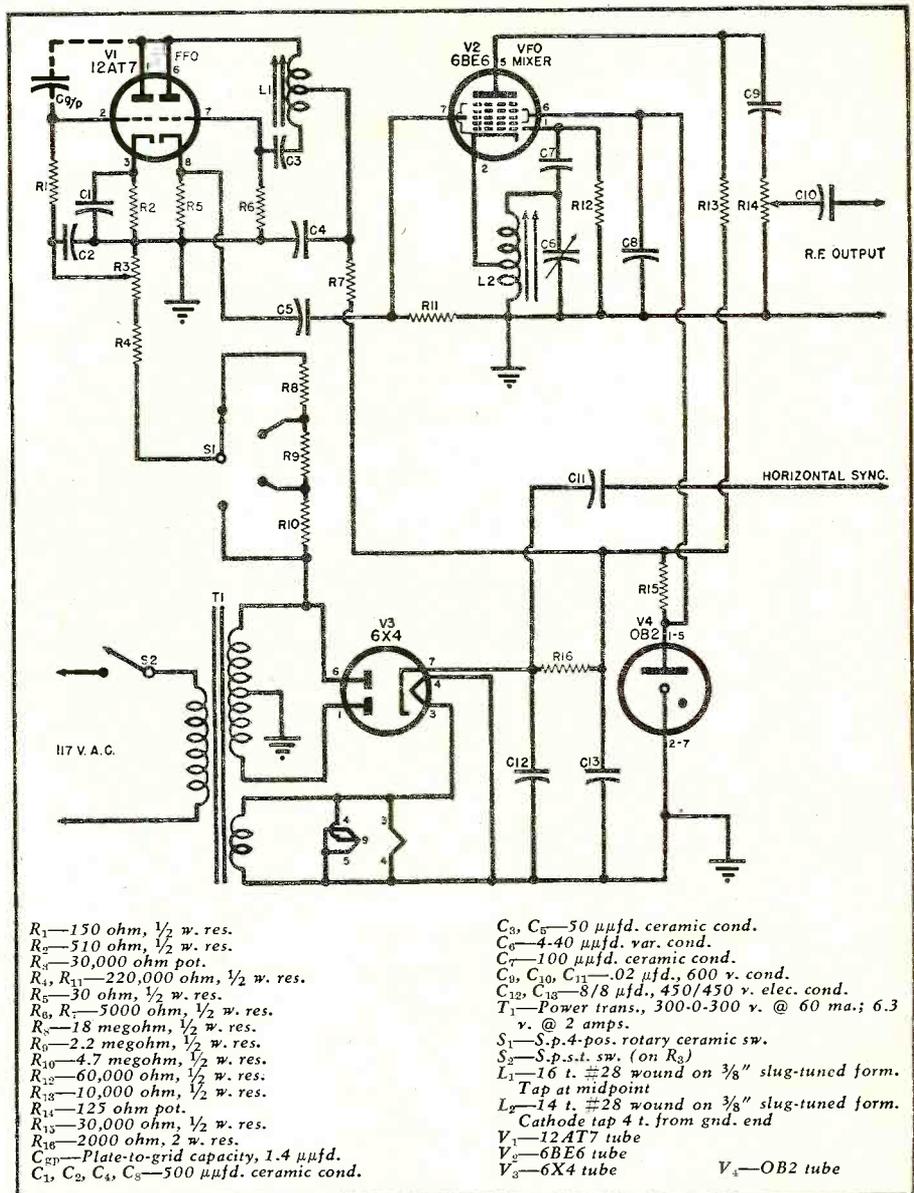
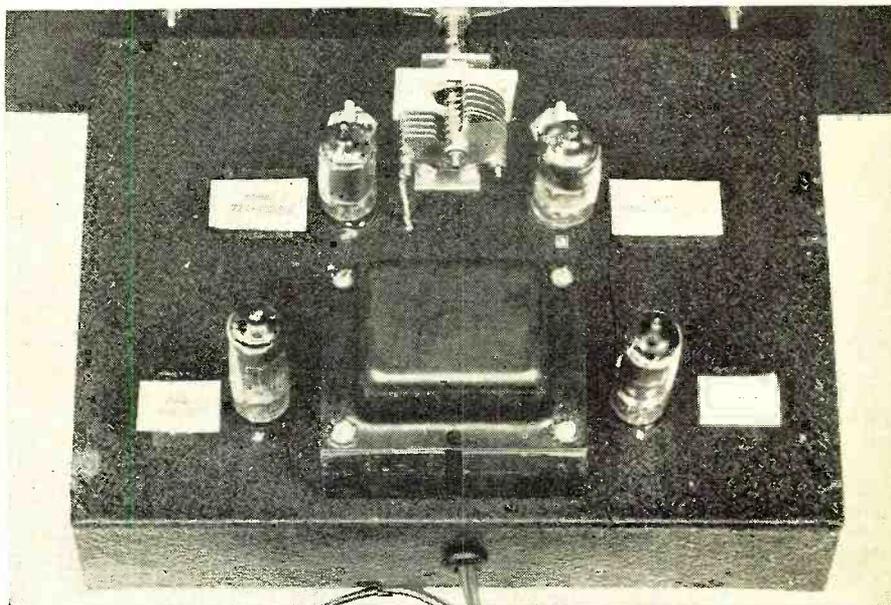


Fig. 1. Complete circuit diagram and parts list of the stable FM sweep generator.

Top view of the sweep generator which is designed specifically for FM servicing.



# MICRO GROOVES

## Mean More Money

By

**JOHN B. LEDBETTER**

Eng., WKRC, WCTS-FM, WKRC-TV

INTRODUCTION of the new Columbia Long-Playing Microgroove records represents perhaps the greatest single step forward in the history of phonograph records. At least, it is the most notable contribution toward high fidelity in home-type record-playing systems since the development of Vinylite.

Microgroove records have the following advantages over standard 33 $\frac{1}{2}$  r.p.m. records: (1) longer playing time, (2) high-fidelity frequency response, (3) improved dynamic range, (4) extremely light needle pressure, (5) practically no needle scratch, background noise, or turntable rumble, (6) longer record life.

Using the Microgroove system, up to 50 minutes may be recorded on a 12-inch 33 $\frac{1}{2}$  r.p.m. disc, as compared to 8 or 9 minutes on a standard 33 $\frac{1}{2}$  r.p.m. and 4 to 5 minutes on a standard 78 r.p.m. disc. This is accomplished by recording at 224 to 300 lines-per-inch instead of the conventional 90 to 112.

A comparison between the groove widths of a Microgroove record and a standard 33 $\frac{1}{2}$  are shown in Fig. 2. It will be noted that groove widths of the new records are about one-third those of the standard type. This necessitates the use of a very light-pressure playback head and a much smaller needle tip radius than usual. More care must also be exercised in handling and changing records in order to prevent damage to the delicate grooves.

To more fully understand the advantages of Microgroove records, it might be well to discuss some of the shortcomings which limit high-fidelity recording at 33 $\frac{1}{2}$  r.p.m. The first and most important limitation arises from the very nature of lateral-disc recording—the inherent inability to obtain a flat frequency response over the entire recorded portion. This is because the velocity of the recording stylus decreases as it moves toward the center of the disc. As this velocity decreases, insufficient space is provided in the groove to permit satisfactory cutting of the higher frequencies, especially those of very short duration. As a re-



Fig. 1. Top view of an Admiral Microgroove record player showing the two pickup arms used.

***The introduction of Microgroove recordings offers a new source of revenue for the radio serviceman.***

sult, these higher frequencies are either lost entirely or attenuated to a serious degree as the recording diameter is decreased. This effect can be seen in Fig. 2C. Letting A, B, C, and D represent the same frequency at different recording diameters, note the increased distortion when the stylus compresses each audio cycle into a smaller segment with each successive revolution. This condition, often referred to as pinch effect or translation loss, necessitates the placing of a practical limit on the minimum cutting diameter, and the use of an equalizer to restore in part the loss of high-frequency response at the inner diameters. (This is done by gradually pre-emphasizing the higher frequencies as the stylus moves inward. For inside-out recording, of course, the process is reversed). In practice, the minimum recording diameter is about 8 inches at 33 $\frac{1}{2}$  r.p.m. and 5 $\frac{1}{2}$  inches at 78 r.p.m.

High-fidelity response in Microgroove records is attained through the use of two important recording factors. Fidelity in recording depends

mainly on; minimum recording diameter, record speed, ratio of modulated to unmodulated grooves, and stylus tip radius. Ordinarily, high-frequency response is reduced at 33 $\frac{1}{2}$  and proportionately increased at 78 r.p.m. The range of high frequencies, on the other hand, can be increased by equipping the stylus with a smaller stylus tip. In Microgroove records, slow speed and the increase in cutting lines-per-inch result in much longer playing time, while the accompanying loss in high-frequencies is more than compensated by employing a special pickup having a .001-inch stylus tip radius and a pressure of .20 ounce. (Compare this with the .003-inch stylus radius and 1.0-ounce pressure of standard pickup heads). The smaller tip radius, in fact, allows such high-frequency compensation that frequency response and lack of distortion at the inner diameter (5 $\frac{1}{2}$  inches) of Microgroove records is still much better than that of a standard 33 $\frac{1}{2}$  disc at its 8-inch diameter.

In recording Microgroove records, the NAB curve is closely followed, ex-

cept that emphasis is added for frequencies below 100 cycles. This allows a reduction in turntable rumble and background noise. Greater dynamic range is made possible by recording on Vinylite discs. The extremely low noise level of this material, aided by the light pickup head pressure, results in a virtually noiseless record groove. Because of this absence of noise, it is possible to record all low and high passages without increasing or compressing the volume. This makes for almost unbelievable naturalness in record reproduction.

### Opportunities for the Serviceman

Long-playing records have opened up an entirely new field, and the aggressive serviceman will find the number of applications and opportunities unlimited. Here are a few which immediately suggest themselves: (1) sales and service of new Microgroove changers and record players, (2) adaptation of standard players, (3) wiring phonograph connections into straight receivers, (4) replacement of the regular audio system and speaker with high-fidelity units, and (5) custom building of amplifiers and speaker systems to meet individual tastes. Many servicemen have already made a habit (and a profitable one at that) of carrying a portable long-playing phono unit along on all service calls. Advantages of the new system are explained to the customer and he is invited to try it himself. Inevitably, such a demonstration results in the sale of a new changer or player, or the revamping of the customer's old player.

### Microgroove Adaptation of Old-Model Record Players

For adaptation of standard record players, all that is necessary is the replacement of the 78-r.p.m. motor with a dual-speed turntable motor, and the pickup and arm with one of the new Microgroove units. Any 33½ r.p.m. motor will be satisfactory; some of the most popular units now available are the *Alliance Model MP DO 600*; *General Industries Models DR and DM* and their *Green Flyer* model; and the *Garrard Model 201-V*. The *Garrard* is a high-quality precision unit in the higher-price range; the others list below \$30.00. Single-speed 33½ r.p.m. motors also are available for ordinary record players in which operation at 78 r.p.m. is not desired. A few of these models are the *General Industries LX-3, CX-3* and *RM4-3*; and the *Alliance MPO 625*.

Several good Microgroove pickups are available. These include the *Shure Model 900MG* pickup and cartridge, and the *Astatic Model FL-33*. The latter employs the *LP-33* plug-in cartridge for Microgroove operation. This cartridge is instantly interchangeable with the *LP-78* cartridge when standard phonograph records are to be played.

In adapting standard record changers, it is not advisable to replace the regular pickup arm with a Microgroove interchangeable unit. In the

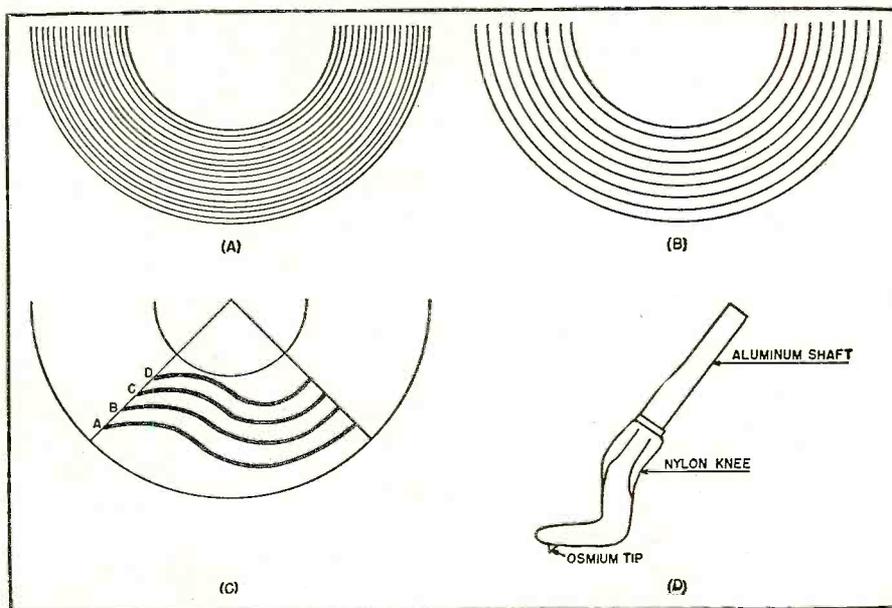


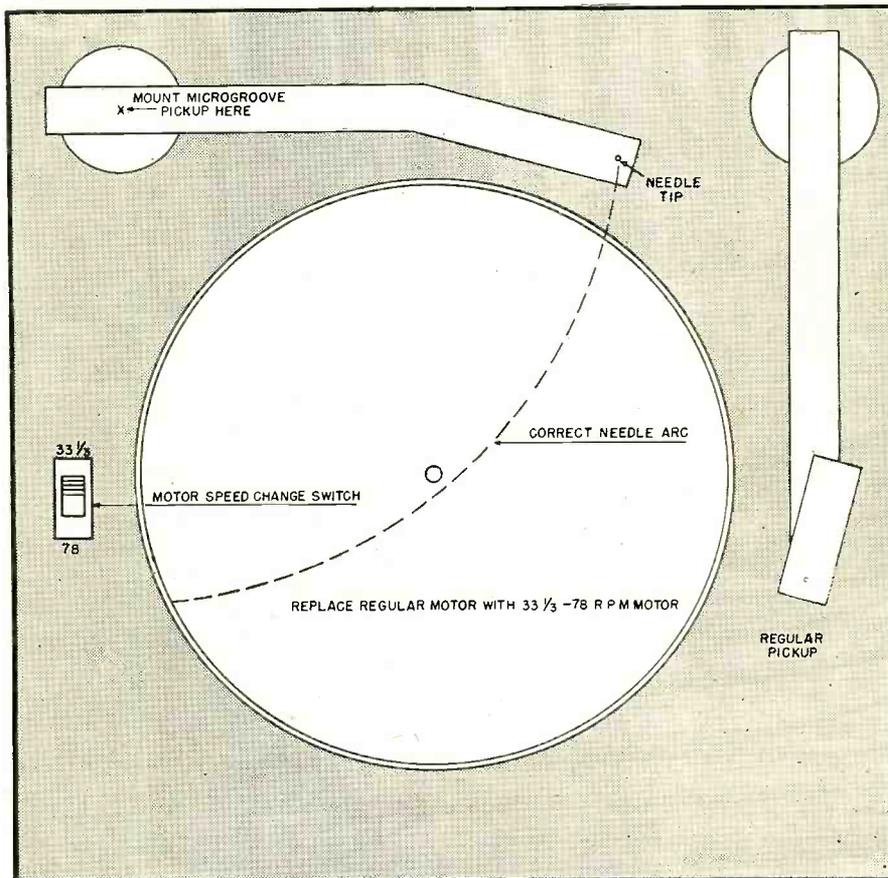
Fig. 2. (A and B) Comparison of the number of grooves cut on a (A) Microgroove and (B) standard recording. (C) An exaggerated example of the "pinch effect." (D) The Webster-Chicago nylon "knee-action" needle designed to be used with Microgroove records.

first place, the changing cycle is too slow and the dropping force too heavy and abrupt. Better results will be obtained by installing the Microgroove pickup on the record changer chassis (see Fig. 3). In installing the new arm, be sure its position will allow the correct swing across the disc radius. This may be compared with the swing of the record changer pickup.

A d.p.d.t. switch will be required for cutting in the proper pickup and starting the proper motor. This switch may be installed in place of the original on-off switch or, if the latter is specially designed or a part of the reject-select mechanism, it may be left intact and an extra Microgroove-operation switch installed.

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Fig. 3. In the case of record changer units which are to be used to play both Microgroove and standard recordings, it is advisable to install a second, separate pickup.



# Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



## BARNEY IS A BIG BOY NOW

**A** SUDDEN January thaw had melted the snow into a slushy mess; and as Barney returned to work at Mac's Radio Service Shop after his lunch hour, he had to pick his way carefully around the soot-covered puddles standing on the sidewalks. The dazzling sunshine and the bright blue sky overhead, though, were the things that struck a responsive chord in Barney's naturally cheerful nature; and he was doing his whistling best to recall last summer's hit of "Woody Woodpecker" as he stepped inside the shop.

Mac was sitting on Miss Perkins' desk talking to her, and Barney had the uncomfortable feeling that they had been talking about him. What led him to this intuitive conclusion was the fact that they were still doing it. Mac was saying:

"But he has to know sometime. He can't go on being just a big, innocent, trusting lummock all his life. He is a big boy now, and it is better that he should hear things from me and get them straight than to pick them up goodness knows where."

Miss Perkins looked wistfully over her glasses at Barney standing pop-eyed in the door and said in her best soap-opera imitation, "Yes, I suppose you are right, but I can't bear to see that innocent, carefree expression go out of those lovely, lovely blue eyes. But go ahead. Take him into the back room and tell him all, but please, please close the door behind you!"

"Hey, look, you two—" Barney began to protest as Mac took him gently by the hand and led him into the service department. "I'm not so—I mean I know—"

"Yes?" Mac encouraged as he shut

the service room door and leaned against it.

"Well, doggone it," Barney spluttered, "why are you giving me this bees-birds-and-flowers routine?"

"Whatever are you talking about, Barney my boy? I was just telling Miss Perkins that I thought it was high time you learned something about the seamier side of servicing, or intermittent radios," Mac explained blandly.

"Is that all!" Barney said with a sigh of relief as he stretched his lanky frame out on the service bench and waited with a stubby pencil poised over his dog-eared notebook.

"Don't dismiss the subject of 'intermittents' so lightly," Mac told him. "Radio men spend more time 'cussing' and discussing such sets than they do on any other subject. The discussing is fine, but I think the 'cussing' is rather shortsighted and foolish."

"Why 'shortsighted'?" Barney wanted to know.

"Well, if the servicemen would stop and think a bit, they would be grateful for the intermittents. Since these sets are the most difficult to repair and take the most experience and good equipment to solve, they separate the men from the boys in the service game. If the only troubles that radios ever had were burned out tubes and blown bypass condensers, anyone could learn to be a serviceman in a month, and all the equipment he would need would be an ohmmeter. It is the tough sets, such as the intermittents, that serve as a challenge and give a fellow a chance to prove just how good a serviceman he really is—or isn't!"

"What do you call an 'intermittent,' Boss?"

"That depends upon how long I

have been working on it," Mac said with a slow grin; "but seriously, an intermittent is any set that suffers abrupt changes in the quality of reception at irregular and unpredictable time intervals. That phrase 'change in the quality of reception' may cover everything from slight changes in volume or tone-quality to the set's going completely dead; or it may be a noise that comes and goes along with normal reception. The time interval may be every few seconds or once or twice a week. The significant point is that the objectionable feature is only present part of the time."

"What's the most common type?" Barney asked.

"I'd say that the set that changes volume abruptly shows up the most often. This is the radio that the customer usually brings in with the remark, 'This set will be playing along just fine until someone flips on a light in the house or the refrigerator starts up, and then it will blare out and scare you half to death. You turn it down, and then a few minutes later the volume drops so low you can't hear it.'"

"I can't see what makes such sets so hard to fix."

"You will, my boy, you will!" Mac promised. "For one thing, almost any part that is used in a radio can cause just such a symptom: a bad tube, a defective coil winding, a poor resistor, or almost any condenser in the circuit can be the culprit. It is like having an oleomargarine salesman sandbagged at a dairymen's convention; there are lots of suspects!"

"Another thing that complicates matters," Mac went on, "is that the intermittent is touchier than a sun-burned rattlesnake. Often the slightest jar, the smallest voltage surge, or the least circuit-loading, such as is caused by using a voltmeter or a signal tracer, will cause the low-volume condition to disappear for the rest of the day."

"What is the best instrument with which to tackle such a set?" Barney wanted to know as he scribbled away at his notebook.

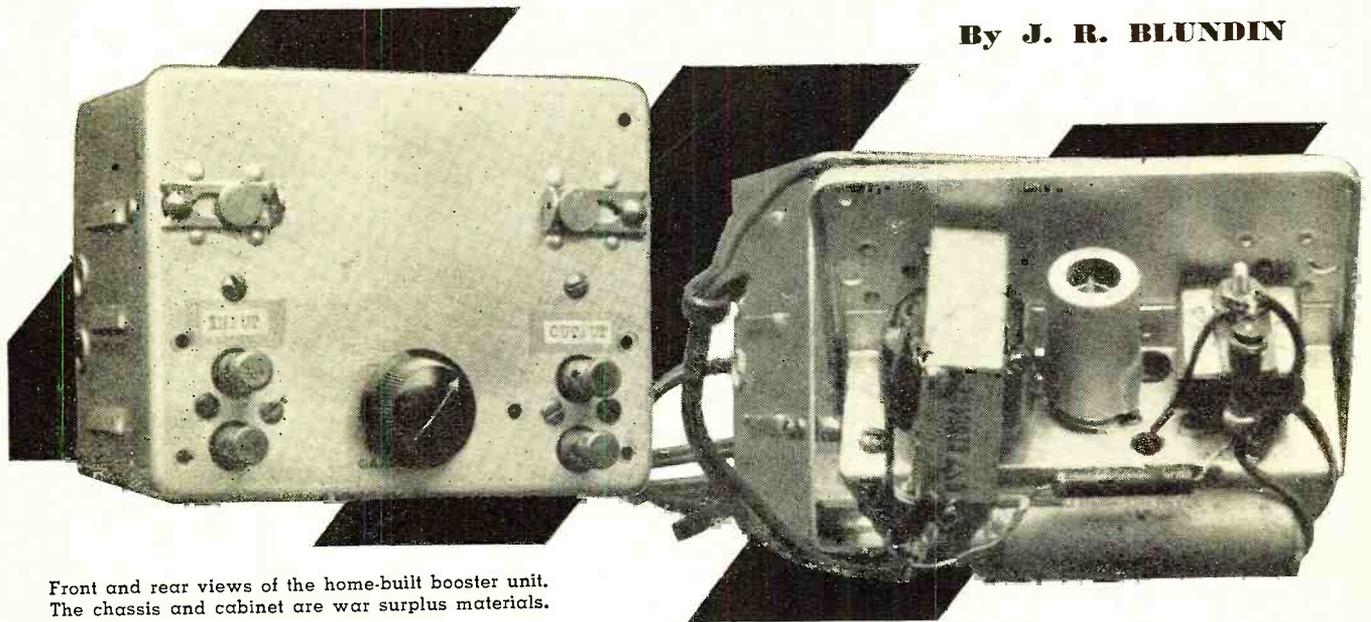
"I use every instrument in the shop on some of them," Mac replied, "but I honestly believe that the best service instrument of all is good old-fashioned horse sense. The best way to find the cause of an intermittent condition is to corner it. By that I mean that you must use a process of elimination. Let's take one of those sets that hop up and down in volume as an example:

"The first thing to do is to determine whether the trouble lies in the r.f. or the audio section. A signal tracer, a v.t.v.m., a scope, or even a pair of headphones in series with a condenser across the detector output will tell us this. If the signal drops at this point when it does in the speaker, our trouble lies in the r.f., oscillator, or i.f. circuits; if not, we know it is in the audio section. In the latter event, we can move our testing equipment from point

(Continued on page 138)

# A Simple PREAMPLIFIER for Boosting TV Signal Strength

By J. R. BLUNDIN



Front and rear views of the home-built booster unit. The chassis and cabinet are war surplus materials.

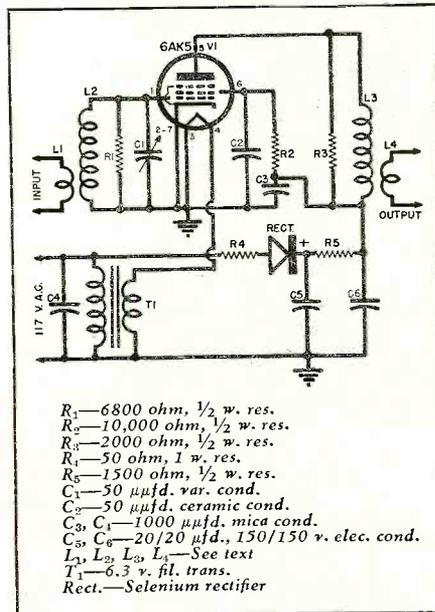
## Construction details covering a booster unit for use in fringe areas, and with indoor TV antennas.

WHEN the television set owner is not located near one of the metropolitan areas, good television reception becomes somewhat of a hit and miss proposition. All sorts of tricks must be tried in order to capture that elusive bit of signal that may mean the difference between seeing a picture or just hearing sound. The booster described in this article was designed for such a purpose.

A "booster" is nothing more nor less than a wide-band preamplifier capable of amplifying the television signal, without distortion, before it reaches the TV receiver. The front end of a television receiver must pass a band of frequencies approximately 6 mc. wide in order to provide good picture resolution, and this wide-band response must be preserved in any preamplifier, r.f. stage or booster that may be used ahead of the TV receiver. In order to achieve this wide-band response some sacrifice in gain must be made and the selectivity curve must be flattened by the use of low "Q" coils. This is exactly opposite to a selective radio receiver where high "Q" and sharp selectivity is desired. This wide-band requirement has several disadvantages. For one, it takes several stages to equal the over-all gain of a conventional amplifier. This causes complications in isolating each stage to prevent feedback and regeneration which tend

to sharpen the bandwidth and defeat the purpose. Another thing which is prevalent in TV receivers is the "wide open" front end which has the characteristic of picking up signals of all frequencies, in the band in which it is operating, along with noise and amplifying them. It therefore becomes

Circuit diagram of television booster unit.



necessary to provide additional pre-amplification to increase the signal-to-noise ratio in weak areas.

### Construction

The booster consists of a one-tube preamplifier designed to pass a band of frequencies 6 mc. wide from 44 to 88 mc. with continuous tuning. A 6AK5 tube is used as a conventional r.f. amplifier with coils shunted by resistors to lower the "Q" and give broad-band response. A war surplus chassis and cabinet lent itself nicely to the housing of this unit, however any suitable chassis and box the experimenter may have handy will do.

As can be seen from the schematic diagram the booster is of the a.c.-d.c. variety and one side of the power line is connected to the chassis, making it hot to ground if the power plug is inserted incorrectly. This makes little difference in the operation of the unit but may present a shock hazard if a grounded object should be touched at the same time as the booster. It may be advisable to use an insulated panel and cabinet to prevent this. The input and output circuit is isolated from ground making it possible to use the booster with any type of TV receiver.

The input and output binding posts are mounted on Plexiglas strips and clearance holes are drilled in the front panel to insulate them. The grid coil  $L_2$  consists of a self-supporting coil  $\frac{1}{4}$ " i.d. closewound with 8 turns of #18 enameled wire. The input coil,  $L_1$  is wound over the ground end of  $L_2$

(Continued on page 106)

# SINGLE TURN LOOP

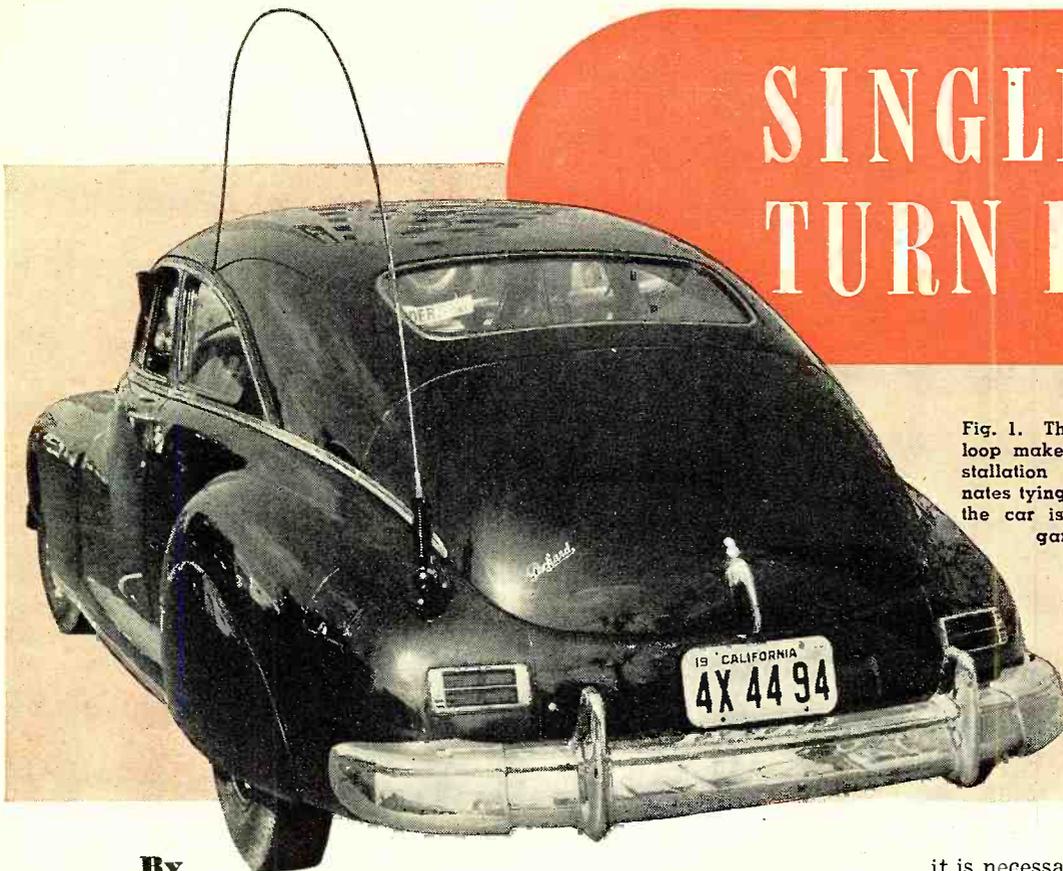


Fig. 1. The single-turn loop makes a neat installation and eliminates tying down when the car is put in the garage.

By  
**WOODROW SMITH, W6BCX**  
Author, "The Antenna Manual"

**Designed for 75 meter mobile operation—it delivers a much stronger high-angle sky wave than a vertical whip.**

WITH mobile 75-meter phone operation now authorized, many amateurs are wondering just what the possibilities are with regard to "getting out" on 75 from a car, and those contemplating such operation (as well as those who already have taken a fling at it) are, of course, vitally interested in the question: "What is the best type of radiator?"

First, it is perhaps well to review some of the pertinent considerations involved. The problem is primarily one of obtaining good radiation efficiency, good "transfer" efficiency, and a suitable vertical directivity pattern. It may be assumed that if a certain mobile antenna makes an effective radiator at 4 mc., it can be made to serve as a satisfactory receiving antenna.

### The Sky Wave Does It

It is important that the reader realize that the ground wave telephony signal range at 4 mc. for 10 to 25 watts of transmitter power (which includes the range of power employed in the great majority of amateur mobile installations) is not more than approximately 20 miles in the daytime, or 5 miles at night, over typical, moderately irregular terrain of average conductivity when using an 8-foot vertical whip. The range is greater in the

daytime than at night because of the lower atmospheric noise level existing in the daytime.

While much greater ground wave ranges are possible when the path is entirely over sea water or salt marsh, this represents a special case, seldom encountered, and for amateur mobile work the important thing is the range when the transmitter and receiver are separated by typical, irregular (rolling) terrain of average conductivity, and neither transmitter nor receiver is in an elevated location. A well elevated location for the transmitter or receiver, or both, will extend the range somewhat, but not nearly as much as on 10 meters.

The big difference between ground wave propagation on 10 and on 75 is explained by the fact that a 75-meter ground wave is primarily a "surface wave," while a 10-meter ground wave is primarily a "space wave." Exceptions would be 10-meter propagation over salt water with both antennas located close to the water, or 75-meter propagation between two mountain peaks separated by a flat valley. However, it is obvious that these are special cases.

For reliable 4 mc. phone communication over distances exceeding a few miles when the radiated power is low,

it is necessary to utilize the *sky wave*. This calls for a "high angle" radiator.

The radiation pattern of a conventional whip radiator is such as to make it a poor "high angle" radiator. The high angle radiation usually will be somewhat greater when the whip is mounted on a vehicle than when mounted on a flat ground screen, due to the asymmetrical mounting and the irregularities of the car body, but even so, only a small portion of the total radiation will be directed upwards at high angles.

At 100 miles the field strength of a short vertical whip is much weaker than for the same whip in a horizontal position when transmission is via the *F<sub>2</sub>* layer (as at night), and considerably weaker when transmission is via *E* layer (as during the daytime when the *E* layer *MUF* exceeds the operating frequency). The inferiority of vertical orientation of a whip for sky wave communication becomes more pronounced as the distance is decreased. Tilting a vehicular whip away from the vehicle helps the high angle radiation some, but the performance still is inferior to that of the same whip in a horizontal position.

In addition to the inappropriate vertical pattern of a vertical whip, a big drawback to the use of a short whip on 75 is its poor efficiency. Only about 1 or 2 per-cent of the transmitter output power actually is radiated by a typical 8-foot whip at 4 mc. The extremely low radiation resistance results in low radiation efficiency. Also, the required impedance matching device has a low "transfer efficiency" because of the high value of reactance it must "match." As a result, all but a very

small portion of the transmitter output power is wasted in heating up the antenna and the antenna matching network inductance. The efficiency may be increased slightly by "top loading" of the whip, but it, nevertheless, is still distressingly low.

### Advantages of a Loop

In the accompanying illustrations are shown details of a single-turn loop installation which has definite advantages compared to a whip for 75-meter mobile operation.

First, there is a physical advantage. The loop will not bang against as many low overhanging branches as will a whip, and it does not require tying down before putting the car in a garage.

Second, the pattern of the loop makes it an effective "high angle" radiator in all compass directions, yet still permits ground wave operation except directly broadside to the line of the loop.

Third, the over-all efficiency (radiation efficiency and transfer efficiency combined) is somewhat better than that obtained with a typical whip installation.

The loop may consist of either a standard 8-foot whip sprung to provide as open a "loop" as possible, or it may be made up from a length of 1/2-inch diameter 24ST aluminum or dural tubing. If a commercial whip is used, it preferably should be of the one-piece variety in order to avoid the possibility of poor contact developing at section joints. Very heavy current flows in the loop, and the r.f. resistance should be kept as low as possible in order to minimize  $I^2R$  losses. For the same reason, chrome plating is preferable to other types of commonly used plating, such as nickel.

The loop is attached physically and electrically to a suitable point on the rain gutter common to practically all "hard top" cars. To avoid damage to the gutter, the loop is attached to it via about 6 inches of heavy, flexible copper braid, and is first formed or sprung (if aluminum tubing is used) so that it takes the desired open shape under slight tension when the "fed" end is mounted whip fashion on the rear bumper or rear fender (or "bus-tle" if the car is of the "new look" variety and has no rear fenders in the usual sense). The complete installation resembles a tied-down whip except for making electrical contact to the car body at the unfed end of the whip. The exact method of making a low-resistance electrical contact to the rain gutter will be left to the discretion of the reader, as some methods require less defacing of the car than others, some are simpler than others, and different owners have different ideas about such things. Also, the tools or available facilities will have a bearing on the matter.

A piece of Vinylite sleeving should be slipped over the loop element before attachment to the gutter and later slid down over the flexible braid

in order to prevent scratching of the car top when the loop gets shaken around.

It should be noted that the car body itself serves as part of the closed loop circuit, and must pass heavy current. The fact that it is steel is not serious, because there is so much of it that the effective r.f. resistance is low. However, if the body construction is not such that the portion between the "tie down" point on the gutter and the point at which the transmitter chassis is grounded to the car body is one continuous piece of metal (including welding), then the two or more pieces should be bonded together by means of suitable jumpers to insure low resistance contact between them. Likewise, all connections in the loop circuit should be well made in order to keep the resistance at a minimum.

### Coupling to the Loop

Fig. 2 shows the method of coupling the loop to the transmitter and receiver. The coupling network serves at the same time as the tank circuit for the r.f. output stage, and also acts as an impedance matching device for the receiver.

The circuit presumes a power pentode or beam tetrode single-ended output stage, which is by far the most popular arrangement for mobile work. If a triode were used, neutralization would be complicated by the plate circuit requirements.

Shunt plate feed is used in order to avoid the necessity for a blocking condenser in series with the loop circuit, as a mica condenser at such a point is undesirable.

The r.f. voltage developed across  $C_1$  and the current through  $L_1$  will be very high considering the transmitter output power. However, the components are inside, out of the weather, and designing them for low losses, therefore, is not difficult.

For a transmitter power of 25 watts, plate modulated,  $C_1$  should have 3000-volt spacing. 2000-volt spacing will suffice for a power of 10 watts or less. This makes a pretty husky condenser, considering the low transmitter power,

Fig. 3. Mechanical illustration showing how the single-turn loop is installed in car for 75 meter mobile operation.

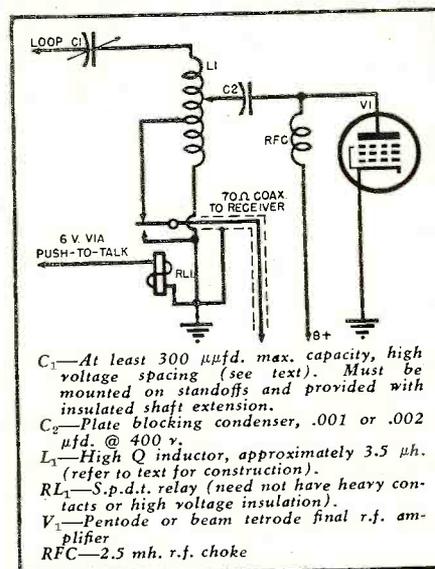
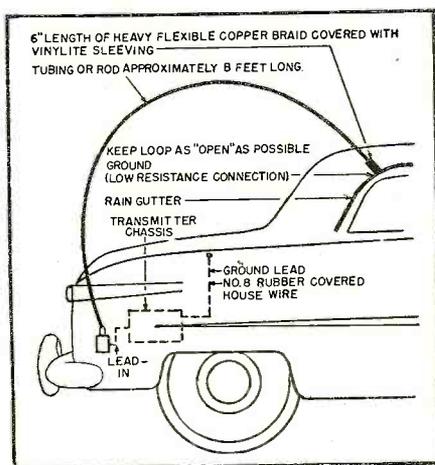


Fig. 2. Coupling network and tank circuit for use with single-turn loop of Fig. 3.

but that is what is required for the job. The rotor of the condenser is "hot" to ground, and, therefore the condenser should be mounted on stand-off insulators and provided with an insulated extension shaft. The condenser should be provided with a rotor lock in order to insure preservation of the setting when the vehicle is in use.

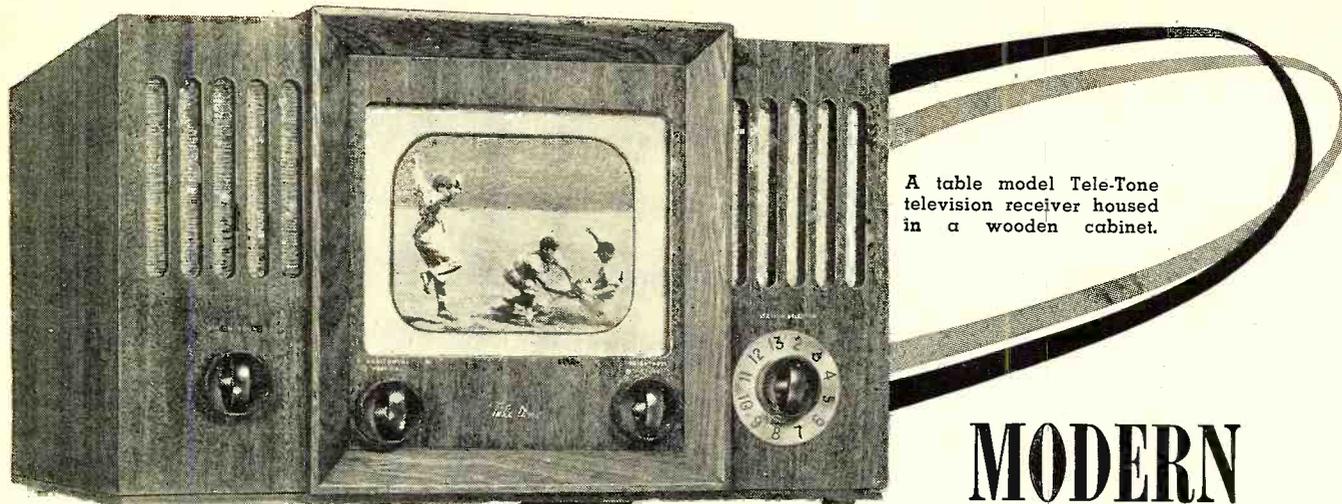
The inductor  $L_1$  likewise must be much huskier than ordinarily would be employed in the plate tank of a low powered transmitter. This is necessary not only to handle the very heavy circulating current without overheating, but also in order to obtain the highest practicable "Q."

It is recommended that the coil be space wound with No. 8 bare copper wire or 1/8 inch copper tubing on a ceramic form. The required inductance is approximately 3.5 microhenries, the value being determined by the exact length and diameter of the loop material, the length of the lead-in, and other factors which will vary with the installation. About 9 turns on a 2 1/2-inch form will be required, but the safe procedure is to wind on a few extra and then remove them as required in order to obtain resonance with about 300  $\mu\text{fd}$ . at the low frequency edge of the band. Yes, the coil will look more like a plate tank coil for a kilowatt stage, but its use here is justified by a substantial increase in the "transfer efficiency" and, therefore, in the percentage of the transmitter output power radiated by the loop.

It will be noticed that the circuit tunes quite sharply, which is to be expected when the very high "Q" of the circuit is considered.

The transmitter loading is adjusted to the desired value by tapping the plate connection up or down on the coil. The loading is increased by moving the tap towards the ground end of the coil. One adjustment will hold for the entire band.

(Continued on page 162)



A table model Tele-Tone television receiver housed in a wooden cabinet.

**MODERN**

# Television RECEIVERS

By MILTON S. KIVER

**Part 10. Covering several different types of a.g.c. systems currently found in present-day video receivers.**

Automatic volume control is now standard equipment in all AM sound receivers. Through its use, a fairly constant radio output is obtained for wide variations in input signal, thereby reducing the effects of fading and blasting when tuning from one station to another. For television, the counteracting of fading is not very important because fading is negligible at the high frequencies used. However, automatic gain control (a.g.c.) is still advantageous for maintaining the output signal level constant when switching between stations and for stabilizing the synchronizing circuits. The a.g.c. is especially helpful when the sync circuits do not incorporate any form of automatic sync control.

For those readers who might be confused by the seemingly interchangeable use of a.v.c. and a.g.c., it should be recalled that a.v.c. is really a method of automatic gain control since the controlling voltage delivered to the tubes by the a.v.c. system regulates their gain. Of course, as a consequence of gain variation, the output volume varies, but this is a secondary effect. However, the term a.v.c. has been more frequently employed so that now one seldom finds the term a.g.c. used in conjunction with sound systems. In television, the notation "a.g.c." is the only proper one to employ since a.v.c. has no significance. Yet, in spite of this, some manufacturers still cling to the a.v.c. notation, even in video systems.

In a sound AM receiver, the a.v.c.

voltage is obtained at the second detector and a circuit frequently used is illustrated in Fig. 1. It will be remembered that the objective in an a.v.c. network is not to feed the instantaneous audio variations back to the r.f. and i.f. stages, but rather to apply an average voltage that is related to the carrier level. Such an a.v.c. voltage is derived from the average voltage developed across the load resistor of the second detector. The detector output consists of a pulsating d.c. voltage that can be separated into an audio voltage and an average d.c. voltage dependent upon the carrier strength. The audio signal is filtered out in the a.v.c. line (by  $R_1$  and  $C_1$  of Fig. 1) and only the average d.c. voltage reaches the grids of the controlled tubes.

The objectives of automatic gain control systems in television receivers are similar to those of AM sound systems. The method for obtaining the necessary voltage, however, is different because of the different character of the video signal. A study of the television modulated signals (Fig. 2) reveals that, as far as a.g.c. is concerned, the average video voltage is of no use to us. This average video voltage is the resultant of two voltages: (1) an instantaneous or a.c. component which gives the detail information of the image, i.e., the persons, objects, and scenery in the picture, and (2) a so-called d.c. component which provides information concerning the background shading of the scene, i.e., whether the background is bright or

dark. The same people and objects can be placed against a bright background or a dark one; the a.c. video component remains the same in either instance. Only the d.c. components of the two scenes would differ. Note, however, that the d.c. component changes with each scene and is in no way related to the strength of the carrier. Thus, neither the a.c. nor the d.c. components of a video signal are suitable for furnishing the necessary a.g.c. voltage. What we require is some component in the incoming signal which is indicative of the strength of the carrier and yet which does not change with anything but the carrier.

With the present system of transmission, the carrier is always brought to the same level at the synchronizing pulses. See Fig. 2. Thus, as long as the signal being received is constant in strength, the synchronizing pulses will always reach the same value. If something should affect the carrier level, the amplitude of these pulses would likewise change. Hence, the strength of the synchronizing pulses will serve nicely as a reference level for an a.g.c. system and all receiver a.g.c. systems in use today develop control voltages which are derived, in one way or another, from the sync pulse level of the incoming signal.

A simple yet effective method of developing a suitable a.g.c. voltage is employed in the Farnsworth Model GV-260 television receiver. See Fig. 3. The a.g.c. diode is one section of a 6H6 and receives the incoming signal from the video i.f. system through a

.5  $\mu$ fd. condenser,  $C_1$ . The load for the a.g.c. tube is  $R_1$ , a high-valued resistor of 1 megohm. To better understand the operation of this circuit, consider the equivalent diagram shown in Fig. 4. (The cathode resistor and condenser are omitted from the equivalent diagram because they do not affect the a.g.c. voltage development.) The a.g.c. tube will not conduct until its plate is driven positive with respect to its cathode. When this occurs, electrons flow from the cathode to the plate of the diode and into  $C_1$  where the negative charge is stored. Very few electrons attempt to go through  $R_1$  because of its high value. Due to the low impedance offered by the tube when it is conducting,  $C_1$  charges up to the peak of the applied voltage which, as we note from Fig. 2, is the value of the synchronizing pulses.

During the negative excursion of the incoming signal, the plate of the diode is driven negative with respect to its cathode and no conduction through the tube occurs. However, if we examine Fig. 4, we see that a complete circuit exists with  $C_1$ ,  $R_1$ , and the input coil all in series. Since a voltage exists across  $C_1$  and a complete path is available, current will flow with the upper end of  $R_1$  becoming negative with respect to ground. Due to the long time constant of  $R_1$  and  $C_1$ , the charge accumulated across  $C_1$  will discharge slowly across  $R_1$ , so slowly, in fact, that only a small percentage of the voltage across  $C_1$  will be lost during the interval when the tube is non-conducting.

When the incoming signal becomes positive again, the tube does not immediately conduct. This is so because the applied signal voltage must first overcome the negative voltage existing across  $C_1$ . Since  $C_1$  has lost but little of its voltage, tube conduction will occur only at the very peaks of the positive cycle. These peaks, of course, are the synchronizing pulses. Thus the voltage across  $C_1$  is governed entirely by the sync pulses and this is what we desire. The negative voltage across  $R_1$  is filtered by  $R_2$  and  $C_2$  to remove the 15,750 cycle ripple of the horizontal sync pulse and then fed to the video i.f. amplifiers as the control voltage. It is interesting to note that the same diode also supplies the sync pulses to the horizontal and vertical sync systems. Since current only flows through this diode at the sync pulses, voltage pips will appear across the 4700 ohm resistor in the cathode leg of the tube at these times. These pips are tapped off and applied to the sync separating circuits.

The a.g.c. system of Belmont television sets, Fig. 5, closely parallels that of the Farnsworth receiver.

In Garod television receivers, the contrast control is incorporated into the a.g.c. network, Fig. 6. The negative voltage of the contrast control is fed to two points; the r.f. amplifier and the a.g.c. section of a 6AL5 duodiode. Since the voltage at the contrast control is negative and it is ap-

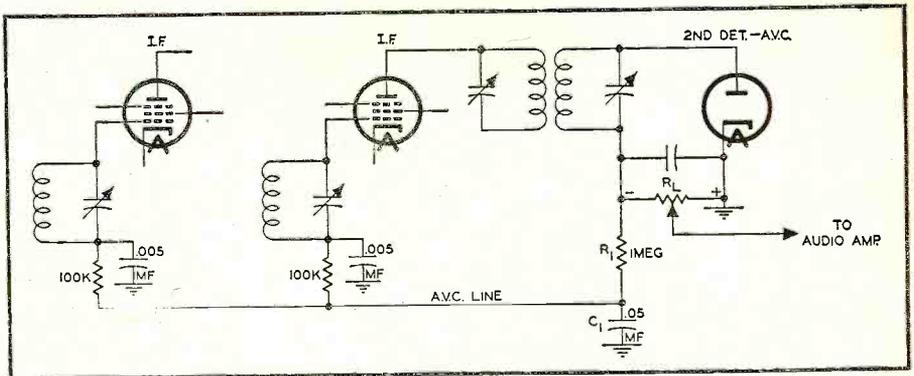


Fig. 1. A typical a.v.c. network found in standard broadcast AM receivers.

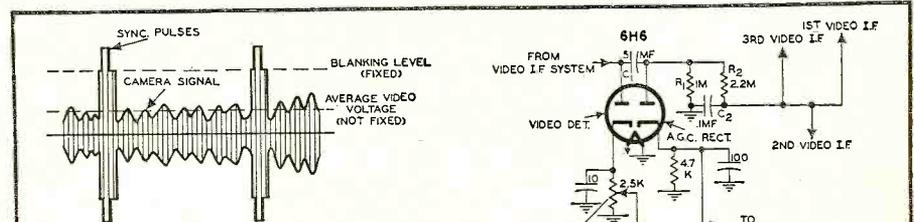


Fig. 2. Only the blanking and the sync pulse level of a television signal are indicative of the true carrier level.

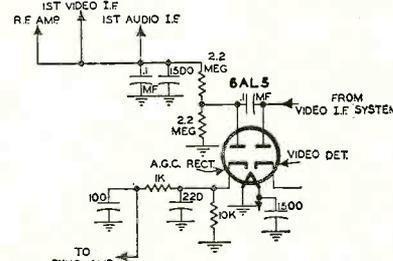


Fig. 5. The a.g.c. system used by Belmont. It is similar to the Farnsworth system.

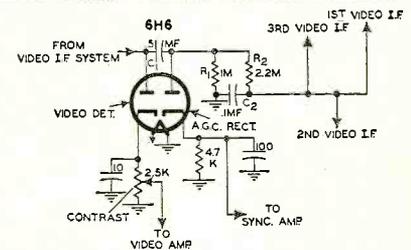


Fig. 3. The a.g.c. network in Farnsworth television receivers (the Model GV-260)

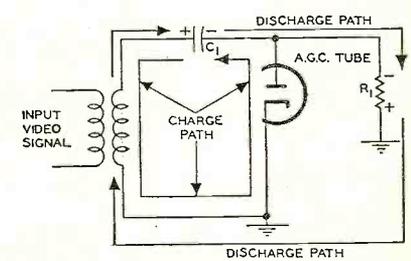


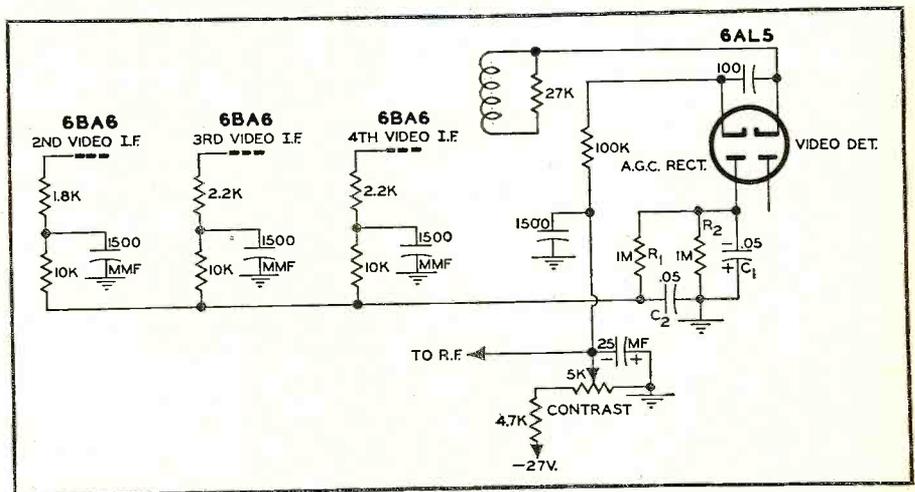
Fig. 4. The equivalent a.g.c. network of Fig. 3, and its mode of operation.

plied to the cathode of the a.g.c. tube, this tube will conduct, even in the absence of a signal. The tube current, flowing through the 1 megohm plate resistor, will cause a negative voltage (with respect to ground) to appear here. This negative voltage is then transferred through a low-pass filter ( $R_1$  and  $C_2$ ) to the grids of the second, third, and fourth video i.f. amplifiers.

Thus, even in the absence of a signal, the bias on these tubes is directly controllable by the contrast control.

When a signal arrives at the second detector, it is applied to the a.g.c. diode through a 100  $\mu$ fd. condenser. On the negative peak of each signal, the cathode will be driven even more negative causing additional current to flow through the tube and increasing the

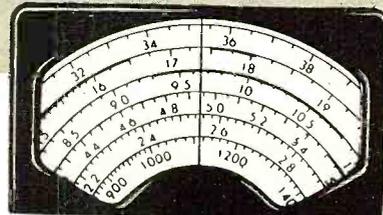
Fig. 6. The a.g.c. network used in the Garod line of television receivers.







# International SHORT-WAVE



Compiled by **KENNETH R. BOORD**

“**JACKO**,” *Radio Australia's* laughing Kookaburra (otherwise known as the “*Laughing Jackass*”), whose cheery laughter rings out at the beginning of transmissions from the Australian overseas short-wave stations, is probably one of the most famous birds, in the world. At least, his voice is known to countless thousands of listeners as the signal for the commencement of programs beamed from “*Down Under*.”

Robin Wood, *Radio Australia's* program manager, has a private problem concerning a cousin of “*Jacko*.” It seems that a certain Kookaburra has taken to occupying the radio mast at the Wood household, and settles down there as dawn breaks each morning.

Mr. Wood, in the manner of all program managers, invariably tunes to *Radio Australia* in the morning, and with the opening of the early transmission, out booms the laughter of the recorded “*Jacko*.”

This is the signal for Friend Kookaburra outside the house to become most agitated. He flies at windows, answers the call of the *Radio “Kooka,”* and generally suffers a severe mental upset. His chief ambition, of course, is to get inside the house and take a look at the other fellow—and this is probably the only instance on record where the laugh has been on the “*Laughing Jackass!*”

### From Hawaii

According to “*The Listener In*,” Australia, the National Bureau of Standards has begun broadcasting of standard frequency, standard tone, and time signals from Hawaii.

The new station is located at Puuene, Maui, and has been allocated the call-sign WWVH. Frequencies are one of 5, 10, and 15 megacycles. Power is approximately 400 watts.

The transmission will be continuous, except for a short period each day when the transmitters will be off the air so that the oscillators may be checked with the American station WWV (Washington, D. C.).

Transmissions will consist of 4000 cycles and 440 cycles tone signals, interrupted for one minute every five minutes during which the call WWVH and the time in GMT is to be sent in telegraphic code. A “tick” is broadcast every second, except the fifty-ninth. The first “tick” after the skip marks the beginning of a new minute. Tone

comes on exactly on the hour and every five minutes thereafter. The accuracy of WWVH will not be quite as precise as WWV which is one in fifty millions, but it is expected to maintain an accuracy of one in ten millions.

Operation of WWVH was to have been somewhat irregular until November 1 when it was proposed to have three frequencies in continuous operation—except for the calibration checks made against WWV.

This is the beginning of a new service which will eventually increase power to 2500 watts. WWVH will confirm reports from Engineer-in-Charge, Field Station, National Bureau of Standards, Box 901, Puuene, Maui, Hawaii. (Major, Western Australia)

### Verification Data

*Radio Moscow* is again asking for reception reports and “promises” to verify and to send data on the U.S.S.R. to anyone who writes in to Radio Moscow, Overseas Service, Moscow, U.S.S.R. Has a Mailbag Program around 2115 on Saturdays (see “This Month’s Schedules” for frequencies in use). (Dallmeier, N. Y.)

QRA of the short-wave station at Makassar is now Radio Indonesia, Makassar Studio, Strandweg Zuid 2, Makassar, Celebes, State of East Indonesia. (Kary, Pa.)

Address of commercial phone stations in Iceland is Ministere des Com-

(Note: Unless otherwise indicated, all time herein 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.)

Graham Hutchins, DX Editor, is shown at the microphone at Radio Australia while Robin Wood, program manager, is shown at the right.



munications, Direction Generale des Postes et des Telegraphes, Reykjavik, Iceland. (Kary, Pa.)

VLT2, 7.280, Port Moresby, Papua (British New Guinea), sent verie-card from Brisbane Engineering Department of the Australian Broadcasting Commission, Brisbane, Queensland, Australia, after initial verification by letter direct from the station; power of both VLT5 and VLT7 (9.52) is 2 kw., not 500 watts as previously listed; returned IRC. (Kary, Pa.)

Verification cards received from the new overseas s. w. outlets of New Zealand are quite attractive (differ greatly from former plain, pink card issued by old ZLT7, 6.715). (Kary, Pa.) Address is P. O. Box 3045, Wellington, New Zealand.

QRA for TGLA, 6.290, is Radio Periodico y Difusora, La Voz de Centro America, 10a Calle Oriente No. 22, Guatemala, Guatemala; QSL'd by letter in Spanish. (Kary, Pa.)

Address of RIAS, Berlin, is RIAS-Berlin, Schoeneberg, Kuffsteiner Str., RIAS-Haus., Germany. (Miers, Germany)

Oslo verifies with a nice card bearing picture of Oslo on one side; takes about 4 months regular mail. Leopoldville, Belgian Congo, replies in about 90 days, with folder type card and letter. (Underwood, N. J.)

### Club Notes

England—U. S. representative of the *International Short Wave Club* (London) is Jack E. Gardner, 1449 E. 15th St., Jacksonville 6, Florida; New Zealand representative is Albert F. Lark-  
(Continued on page 126)

# New 2-Way Radio Equipment for Metropolitan Police

By

**DONALD P. WHITACRE, SR.**

Chief Eng., Vetric, Inc.

and

**LESLIE BAIRD**

A test installation of the Vetric two-way radio unit on a two-wheel police motorcycle.



**Equipment especially designed to withstand hard mobile use is being "road-tested" in Los Angeles.**

CRIME prevention and detection will get a boost in Los Angeles with installation of new two-way radio equipment for all its motorcycle police. Receivers have been in use for some time by many motorcycle police departments over the country, but two-way equipment has been used in very few instances. The California Highway Patrol has used a few motorcycles with two-way sets and some smaller California cities such as South Gate, South Pasadena, Beverly Hills, and Santa Monica, and Newport Beach have found them successful.

Paramount among the requirements of such equipment are ruggedness of construction to withstand extreme vibration, light weight, and moisture-proof housing. Also important are the specially covered cables to resist splattering of gas and oil, and sufficient audio output for open motorcycle use in the heaviest acoustical noise areas. Of contributing importance are the quick disconnect plugs. One plug on the control head having a latchlock device to avoid accidental disconnection and to maintain positive contact at all times, and several connectors at the receiver, transmitter, and junction box serve to facilitate removal of all units when servicing and checking.

Metropolitan police departments are

intensely interested in this new communication development, as greatly increased efficiency in employment of their motorcycles has become possible through the use of two-way radio. The greatest stumbling block in the past has been the difficulty in designing radio equipment which could "live" while absorbing the terrific pounding and vibration encountered when motorcycle mounted—aircraft vibration problems are mild by comparison.

Low center of gravity, light weight, and security of mounting were additional problems difficult of solution in themselves.

Nearly every law enforcement agency in Southern California cooperated in the design of this equipment and deepest appreciation and gratitude must be expressed to the various members of the American Police Communication Officers Association for their suggestions, criticism, and encouragement. The contributions of Mr. Hirschel Calvert of the Pasadena Police Department, Mr. R. A. Kridler of the California State Highway Patrol, and Mr. Fred Crowder of the Los Angeles Police Department (who operated the pilot models on test) have been most outstanding.

Vetric, Incorporated, of Los Angeles, has designed equipment, type CM-1, in various models to cover both AM and

FM bands, the particular installation described here being AM. All units operate from a 6 volt d.c. storage battery source and are controlled from a control head assembly of the headlight type arranged to mount on the motorcycle handlebars, either right or left. This equipment is now undergoing tests by the Traffic Bureau of the Los Angeles Police Department.

## Control Head

The control head has a number of unusual features, such as; light rugged cast aluminum housing finished in black wrinkle to avoid light reflection, microphone hanger, transmitter filament switch, locking type master switch controlling all equipment, volume control, squelch control, and "XL" microphone cable connector of the quick-disconnect, vibration and moisture-proof type. A receiver "on" signal light, a moisture-proof modified 5" heavy-duty PM speaker acoustically modified to match the housing and employing a large Alnico V magnet for unusual sensitivity, hardware for mounting and Vinylite covered cable to reach to the junction box mounted on the rear fender above the battery are also included.

## The Receiver

The 2AR-1 receiver is a 7-tube single conversion superheterodyne designed for reception of amplitude modulated signals in the frequency range of 1½ to 2½ megacycles, with the following type line-up: 6C4—crystal oscillator; 6BJ6—r.f. amplifier;

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6BH6—converter; 6BJ6—i.f. amplifier; 6AQ6—squelch amplifier and first detector; 6AQ6—first audio amplifier; and 6AK6—final audio amplifier.

No paper tubular condensers are used, all being either ceramic or mica, with the exception of the filter components which are hermetically sealed electrolytics rigidly mounted by brackets on the chassis.

All i.f. transformers over 1" in their greatest mounting dimension are mounted with four bolts, 6/32 or larger, and in a vertical position. Sockets are ceramic and are built so that spring-loaded shields hold the tubes firmly in vertical position at all times. Resistors and bypass condensers are rigidly mounted on heavy phenolic terminal boards.

A variable sensitivity control is available on the chassis for installation adjustment only. In cases where the extremely high sensitivity of the receiver is not needed, a considerable reduction in conversion hiss can be had by reducing the r.f. stage gain. This results in the receiver having an unbelievably "dead" sound, when no signal is being received, even with the squelch wide open. The receiver chassis "plugs" into a ¼" base plate, 13½ x 4½", by means of Type K Cannon plugs, making the unit easily removable for service or replacement, without use of tools.

The metering jack and selector switch on the chassis provide for metering: (1) crystal activity; (2) a.v.c. bus; (3) audio output; and (4) plate voltage.

All critical alignment and tuning adjustments are available from the top of the chassis; while the three service alignment adjustments are readily available from the underside. Receiver sensitivity of the order of one microvolt is obtained with a supply voltage and current of 150 v. d.c. at 40 ma. The chassis control varies the sensitivity from 1 to 24 microvolts. The efficiency of the receiver may be appreciated by the fact that there is a measured gain of 200 in the r.f. stage alone. Squelch action can be varied over a range of from zero to 90 microvolts input to fully open the receiver.

Efficient a.v.c. action maintains the audio output essentially constant with an input of from 3 microvolts to 0.1 volt at the antenna. The distortion is less than 10% over audio range of from 200 to 4000 cycles, at 1 watt output, which has proven to be more than adequate. Current drain of the receiver at 6 volts is only 2.2 amperes or less. This low drain is of utmost importance as motorcycle batteries are only rated 22 ampere hours.

The complete receiver unit consists of the receiver chassis, CMR-1 vibrator power supply, mounting plate, and dust cover.

The base plate and dust cover are finished in baked black enamel or anodized finish, and snap catches make the dust cover instantly removable.

The reversibility of the synchronous

vibrator in its socket permits operation on vehicles with either positively or negatively grounded battery. All components in the vibrator supply are rigidly mounted and all condensers are mica with the exception of one inductively wound tubular condenser which works at 6 volts and is rated 50 volts working. The receiver power pack supplies part of the transmitter plate supply when transmitting; being transferred by the relay in the transmitter when the mike "talk" button is operated.

The receiver connector receptacle, attached to the base plate, terminates the inter-connecting cable from the junction box. Coaxial antenna fittings of the RG8/U cable or equivalent are furnished. The receiver is designed to operate on all lengths antenna from a one foot whip, where the receiver only is installed, to a quarter-wave transmitter antenna, when the equipment is used with any type CM-1 transmitter.

#### The Microphone

The microphone is a specially designed waterproof "close-talking" carbon mike in a rugged phenolic case. A coiled, retractable type cord, and a waterproof, instantly detachable, latchlocking plug with special rubber gasket completes the mike assembly. The case contains the "push-to-talk" switch. The frequency response of this mike is matched to the transmitter to obtain maximum clarity and intelligibility over the voice frequency spectrum.

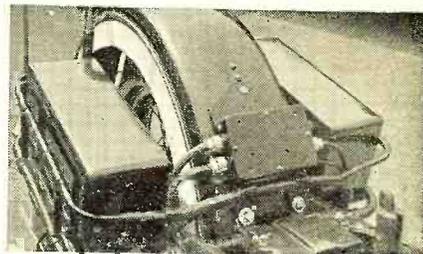
#### The Transmitter

The 40AT-1 transmitter, 4-tube, amplitude modulated, is designed as a companion unit to any CM-1 receiver, and may be operated on any assigned frequency between 30 and 50 mc. Each transmitter must pass an

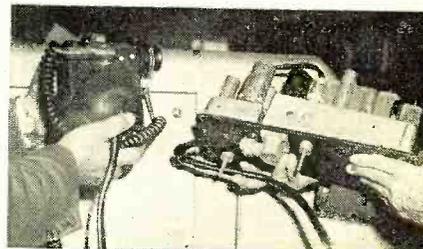
(Continued on page 138)



Rear view of complete assembly showing control head, mike, xmtr-receiver, and antenna.

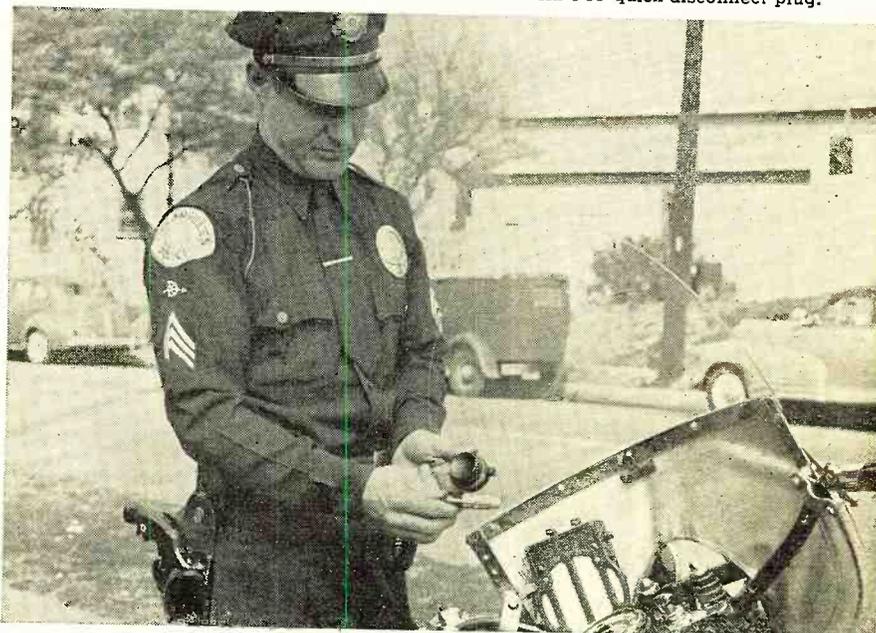


Closeup of installation showing junction box, transmitter (left), and receiver (right). Each unit has its own complete power supply.



(Left) control head, and (right) transmitter. Control head mounts on handle bars, while transmitter is mounted on the rear cycle rack.

Sgt. D. McLean of the Traffic Division Los Angeles Police Department, holds the "close talking" carbon microphone with its XL-4-11 quick-disconnect plug.



# Build Your Own COMMUNICATIONS RECEIVER

By

**J. T. GOODE.**

Standard Coil Products Co.

HIGH frequency tuner construction becomes more exacting as the frequency is increased. At 146 mc. the length and size of wire used in coils determines the inductance more than the number of turns.

Such being the case, lead lengths become vitally important. Long grid and plate leads will reduce the actual inductance required to tune a certain frequency.

Gain per stage is largely governed by the impedance of the tuned circuits. Maximum inductance gives maximum gain.

By careful chassis layout, lead length can be held to a minimum. Proper location of parts will reduce the possibility of regeneration.

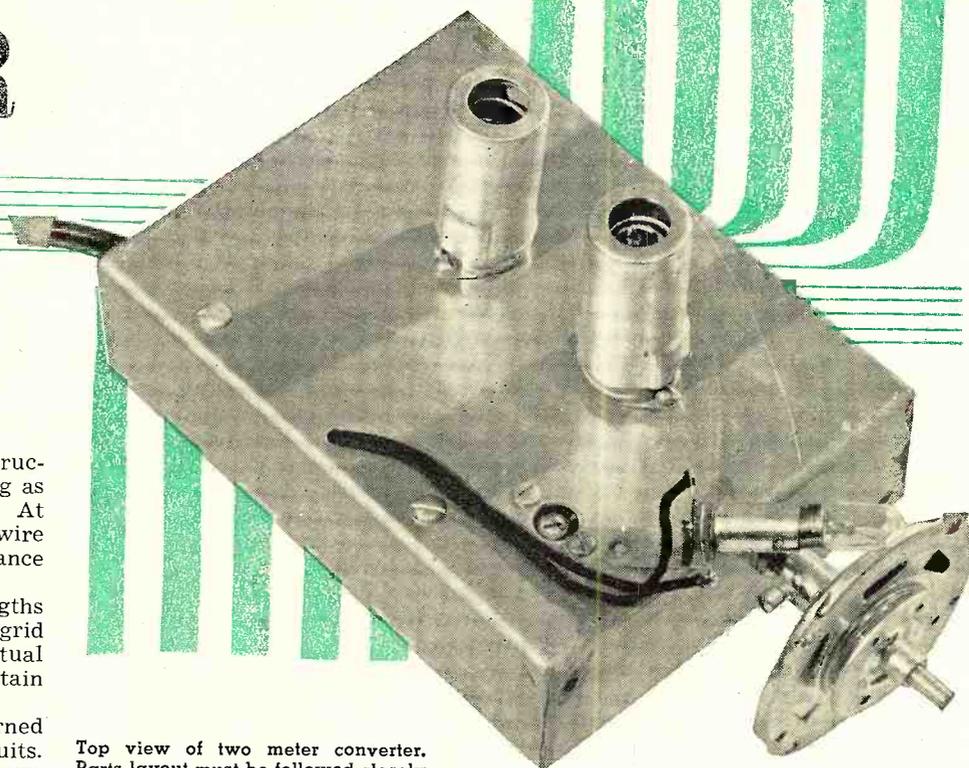
There are several ways of designing high frequency converters. One method is to design the grid and plate circuits for broad-band operation with a fixed frequency oscillator. Tuning is accomplished by varying the i.f. frequency.

This type of design lacks gain due to the broad-band characteristics of the mixer plate circuit. Another disadvantage is the variation of gain over the tunable range.

A more conventional type circuit is one where all tuned circuits are tracked by using a multi-section variable condenser. The main disadvantage of this type of circuit is the minimum capacity of variable condensers. Although this minimum capacity may be in the order of  $2 \mu\text{mfd.}$ , the impedance of the circuit is reduced resulting in less gain.

Another problem is the ability of the builder to get such a circuit to track and keep the regeneration out due to the added lead length.

Another design somewhat parallels television tuners. Here the circuits are pretuned to give required sensitivity and selectivity over a band of frequencies. By using some of the ideas of a television tuner a simple high



Top view of two meter converter. Parts layout must be followed closely in order to insure correct operation.

## **Part 6. Construction details covering the two meter converter to be used with home-built set.**

gain two meter converter can be designed.

Bandwidth is calculated percentage-wise. By dividing the center frequency of the two meter band (146 mc.) into the bandwidth (4 mc.) the result is 2.7%. At six meters the result is 8%.

By pretuning the grid and plate coils to 146 mc. the loss in gain at 144 and 148 mc. is in the order of 1 db. This amount of variation in gain for all practical purposes is negligible. Since the only capacity in the tuned circuits is tube capacity, the coil inductance is maximum resulting in maximum gain.

This same design can be used at six meters but the "Q" of the tuned circuits must be reduced if the sensitivity of the tuner is to remain comparatively flat over the tunable range. This can be accomplished by shunting the tuned circuits with resistors. This results in reduced gain and image ratio.

While this type of design is considered satisfactory for television tuners it is a serious compromise from a communications standpoint.

The sensitivity of the two meter converter to be described is in the

order of one microvolt with a signal-to-noise ratio of fifteen-to-one. The image ratio is one hundred-to-one.

Sensitivity measurements were made using a Ferris Model 18-C signal generator. The sensitivity of the converter was such that it exceeded the leakage of the generator and absolute measurements could not be made.

An interesting sidelight was the reception of a San Diego amateur station while calibrating the converter. The antenna consisted of a shielded lead going to the frequency meter. This was a distance of approximately one hundred miles.

The design of the converter is as follows; tuned-grid tuned-plate 6AK5 r.f. amplifier, and 6J6 mixer-oscillator.

$L_1$  is the antenna coil and this is tuned to 146 mc. The only capacity in this circuit is the tube capacity. Tuning is accomplished by spreading the turns of the coil. The primary winding consists of three turns of number 22 hook-up wire wound tight around the grid coil.

$L_2$  is the plate coil and this is tuned in the same manner by adjusting the spacing of the coil. The capacity of

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this circuit is that of the plate of the 6AK5 and the grid of the 6J6. Since two tube capacities shunt this coil it has less turns than the grid coil.

$L_1$  is the oscillator coil. This circuit is unique because of its simplicity.  $C_1$  is a Johnson 160-203, 1.72 to 3.3  $\mu\text{fd}$ . butterfly condenser. The tuned circuit is shunted by a 5  $\mu\text{fd}$ . N300 ceramic condenser. The action of this condenser is twofold. First it corrects frequency drift and second, it spreads the two meter band over approximately 90 per-cent of the condenser rotation. The tuning condenser has a rotation of 90 degrees from minimum to maximum capacity.

$L_2$  is the low impedance i.f. transformer tuned to 14 mc. This circuit is tuned by shunt capacity,  $C_2$ , and variable condenser  $C_3$  giving a total capacity of approximately 60  $\mu\text{fd}$ .

The construction of this coil is as follows. It is wound on a  $\frac{3}{8}$  inch form approximately one inch long. The primary winding consists of 18 turns of number 22 enameled wire closewound. The secondary winding consists of 3 turns of number 22 silk enameled wire closewound around the "B plus" end of the coil form. A terminal board is secured to the end of the coil form. All leads terminate at tie points on this terminal board. The average junk box will yield sufficient material to make this coil.

Wire size is not important. Two wire sizes above or below number 22 should make little or no difference. If insulated wire is not available for the secondary winding, cover the primary winding with clear Scotch tape and wind the secondary over this tape. This will provide sufficient insulation between the windings. Secure the windings in place with some type of insulating varnish or coil dope.

This type transformer can be used in place of the one described for the six meter converter.

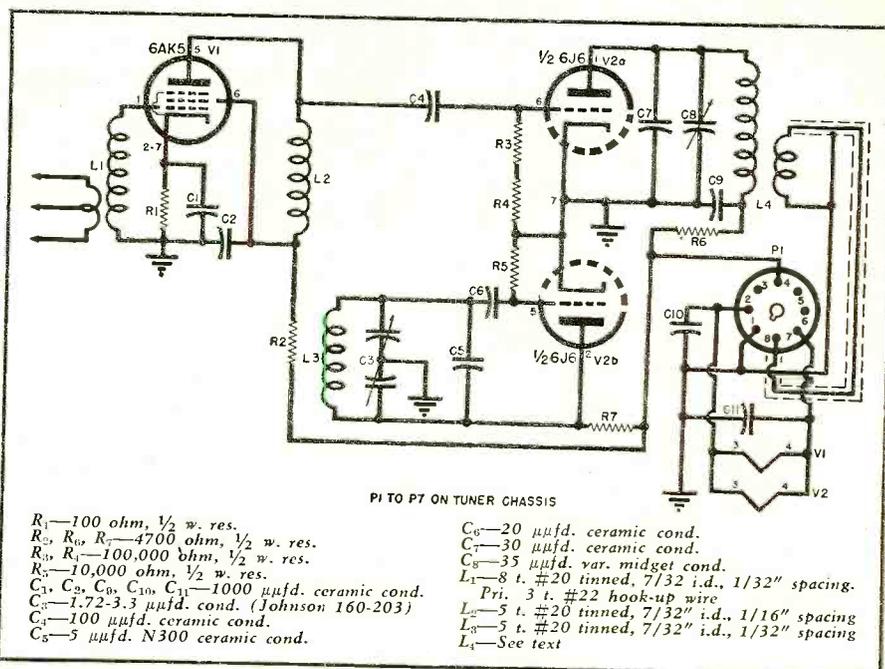
Oscillator injection voltage is coupled to the grid of the mixer by capacity between the elements of the 6J6. The amount of injection voltage can be read by connecting a v.t. voltmeter at the center point of the mixer grid resistors  $R_3$  and  $R_4$  and ground. The voltage appearing at this point should be in the order of one volt.

### Mechanical Construction

The actual layout of parts should closely follow that shown in the photograph. The oscillator tuning condenser mounts on the front of the chassis. The 6J6 oscillator and mixer tube is mounted one and a half inches back from the front edge of the chassis in a straight line behind the variable condenser.

The 6AK5 tube socket mounts one and a half inches behind the 6J6 socket. The antenna input terminal board mounts on the back side of the chassis in direct line with the tube sockets.

The oscillator coil mounts directly across the butterfly condenser. Condenser  $C_1$  also shunts this coil by con-



Circuit diagram and parts list for the two-meter converter unit.

necting directly to the tuning condenser. One side of the butterfly condenser connects directly to the plate of the 6J6. Condenser  $C_6$  goes from the other side of the tuning condenser to the grid of the 6J6.

Condenser  $C_7$  connects directly across  $C_8$  and the upper end connects to the plate and hot side of  $L_2$ .

Note the location of  $L_2$  in the photograph. This coil is mounted in such a way to be at right angles to the grid coil  $L_1$ . The plate of the 6AK5 connects to the end of the coil that is nearest the 6J6 tube socket. Condenser  $C_4$  connects to the coil at the nearest point and to the grid of the 6J6. This coil is supported by the plate and screen connections of the 6AK5 and condenser  $C_1$ .

$L_1$  grid coil is supported by its own leads connecting to ground and the grid of the 6AK5. The primary winding connects to the antenna input terminals further aiding the support of this coil. A coil form is inserted in this coil. When final adjustment has

been made coil dope is used to cement the turns to the coil form.

A solder lug is mounted under the tube mounting screws and all grounds go to these points.

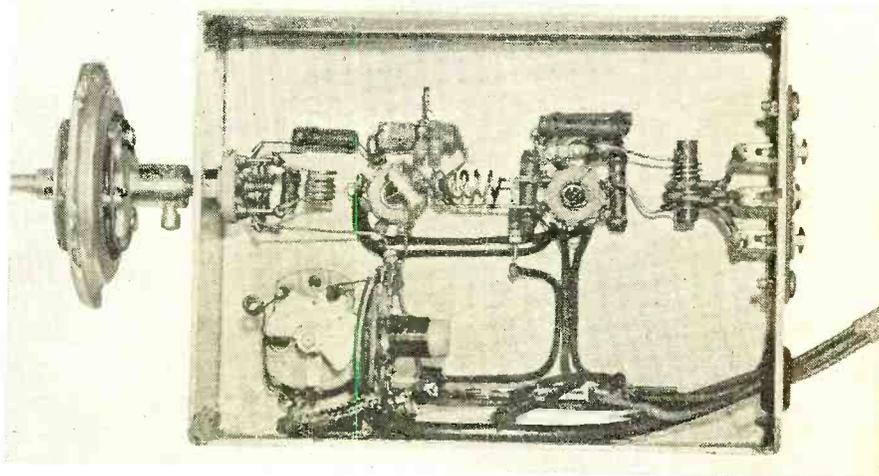
### Tuning Procedure

If the coils are wound according to the information given, final adjustment should consist of varying the spacing slightly. The coils were designed and tuned by using an accurately calibrated grid dip meter with the coils wired into the unit. The unit was then turned on and found to be within two megacycles of the desired frequency.

Connect the two meter converter to the all-wave tuner plug, through  $P_1$ , shown in diagram. Tune the all-wave tuner to 14 mc. Connect a signal generator to the antenna terminals of the two meter converter and tune the signal generator to 14 mc. Increase the signal generator output to maximum. With this high level sufficient

(Continued on page 114)

Under chassis view of converter. Chassis measures  $5\frac{1}{2} \times 4\frac{1}{8} \times 1\frac{1}{2}$  inches.



# SYNTHETIC REVERBERATION

By  
**J. F. DUNDOVIC**

**A converted magnetic recorder is used to introduce artificial reverberation into musical reproductions.**

**W**ITHIN the past few years many orchestras have been making their recordings in "live" studios, thereby enhancing the color and quality of the music. One way in which one might give an ordinary record this "live" effect would be to place the loudspeaker in a large room such as an auditorium. The sound waves being reflected back and forth from wall-to-wall and mingling with the original music would constitute the natural form of reverberation.

A method more practicable for most cases is to introduce electrically a train of decaying echoes into the reproducing system. A very close approximation to natural reverberation may be obtained through the medium of a magnetic recorder, which stores the sound for a fraction of a second and then re-introduces it into the amplifier as a succession of echoes. One

such system, shown pictorially in Fig. 1, uses a recording head followed by a number of spaced pickup heads.<sup>1</sup> The output from each pickup is attenuated to a lower value than the one ahead of it so that the echo train decays to zero in from one to two seconds. The spacing between heads, and the tape speed should be such that the time it takes a portion of the tape to travel from one head to the next is less than one-sixteenth of a second. Otherwise, instead of a smooth blending, the ear will hear distinct echoes and the total effect will not be so pleasing.

The system designed by the writer is illustrated in Fig. 2, and uses but one recording and one playback head. To obtain the succession of echoes, delayed regenerative feedback is used in a manner somewhat similar to the old regenerative detector. A sound appearing across the output of the am-

plifier comes through the loudspeaker and is also recorded on the moving tape. A fraction of a second later the recorded sound is picked up by the playback head and fed into the amplifier input at a slightly lower level than the original sound possessed. This "echo No. 1" appears at the loudspeaker and is re-recorded upon the tape. As "echo No. 2" it is again picked off the tape at a still lower level. The process is repeated until the train of echoes has become inaudible. The advantages of this system over the aforementioned one are its simplicity and its effect of achieving an indefinitely large number of echoes.

A *Brush "Soundmirror"* was modified by the writer for an experimental model, and the results obtained have been quite satisfactory. The effect upon music is to give an illusion of third dimension or depth to the reproduced sound. More reverberation can be tolerated with music than with speech. For example, a radio announcer sounds as if he were speaking from the middle of a huge, empty room when an excessive amount of reverberation is added.

Any wire or tape recorder may be used as a basis for a synthetic reverberation system provided it is possible to place another pickup head adjacent to the regular one. Due to the fact that the recorder is immobilized for any normal recording and playback while being used for reverberation purposes, it might be well to consider making up a special assembly. Constructing a recorder for this purpose would be a somewhat simplified undertaking as there is no need for the supply, takeup, and rewind mechanisms. A recent issue of *RADIO NEWS*<sup>2</sup> featured an article concerning the construction of a tape recorder which would serve admirably as the basic unit for a synthetic reverberation system.

## Conversion

For those who possess a "Soundmirror" and would like to use it for experimentation with artificial reverberation, the following modification used by the writer may be of interest. First, the erase head is removed and another record-playback head is

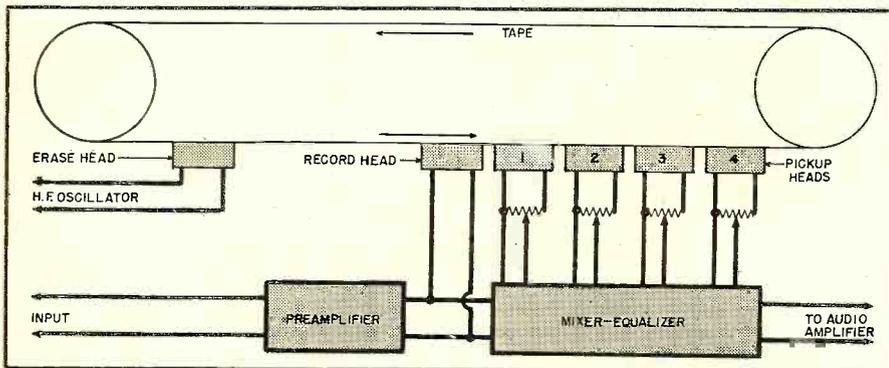


Fig. 1. Diagram shows conventional system (not described in text) whereby four individual pickup heads are used to supply reverberation effect.

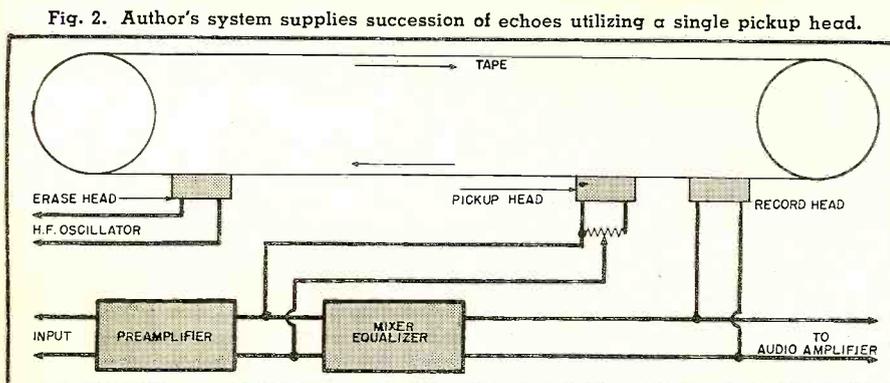


Fig. 2. Author's system supplies succession of echoes utilizing a single pickup head.



# SERVICING

# Simplified

By  
**S. J. RICHARD**

Radio Div., Delehanly Inst.

and

**J. T. CATALDO**

General Research Laboratories

**Servicing receivers by means of a circuit disturbance test is easy and time-saving.**

**N**UCH has been written in the past five to ten years on methods of radio servicing. Various authors have their preferences as to circuit isolating by means of signal substitution, signal tracing, etc. The object of this article is to discuss a simplified method of servicing a radio receiver by using a no more impressive and expensive test equipment set-up than the common screwdriver and a volt ohmmeter. Even now, the cries of "screwdriver mechanic," "Butcher," and "Ham and Egger" fill the air. It should be noted that the authors do not imply that the screwdriver method is the only acceptable means of servicing a radio. It is merely intended to demonstrate that a radio technician, should the need arise, can localize the trouble and repair the defective set by means of a screwdriver, a volt ohmmeter and some knowledge of a radio circuit. The techniques employed conform to good engineering practices and the radio technician should feel no shame in employing them. In fact he should, instead, feel proud in that he has repaired a receiver with inexpensive test equipment.

The intelligent man neither accepts

nor condemns before he has heard the evidence in the case. Therefore, if you will peruse the following discussion and consider the logic of the technique, it is certain that you will adopt circuit disturbance tests as part of your radio techniques in order to save you time. The theory behind these techniques rests on the fact that the radio receiver (superheterodyne) consists of three distinct amplifiers (viz. r.f., i.f. and audio) and two detectors, commonly termed "mixer" and "sound detector." If the set is inoperative and the power supply is not defective, only one of the five above-mentioned channels will be found defective in approximately ninety per-cent of the radios.

Let us take a hypothetical case of a six-tube a.c. receiver and start troubleshooting from the speaker end, working toward the antenna. Invert the set in the customary manner and turn on the receiver to full volume.

With the screwdriver, short the cathode of the output (6V6) stage to ground. This removes the bias from the output tube and should result in a click in the speaker. If the click is not heard after performing this test a few times, one of five things may be wrong with the receiver:

A-1. Speaker voice coil is open.

B-1. Speaker field coil is open (in electrodynamic speakers).

C-1. Output transformer is shorted or open (in primary or secondary).

D-1. Output tube is defective.

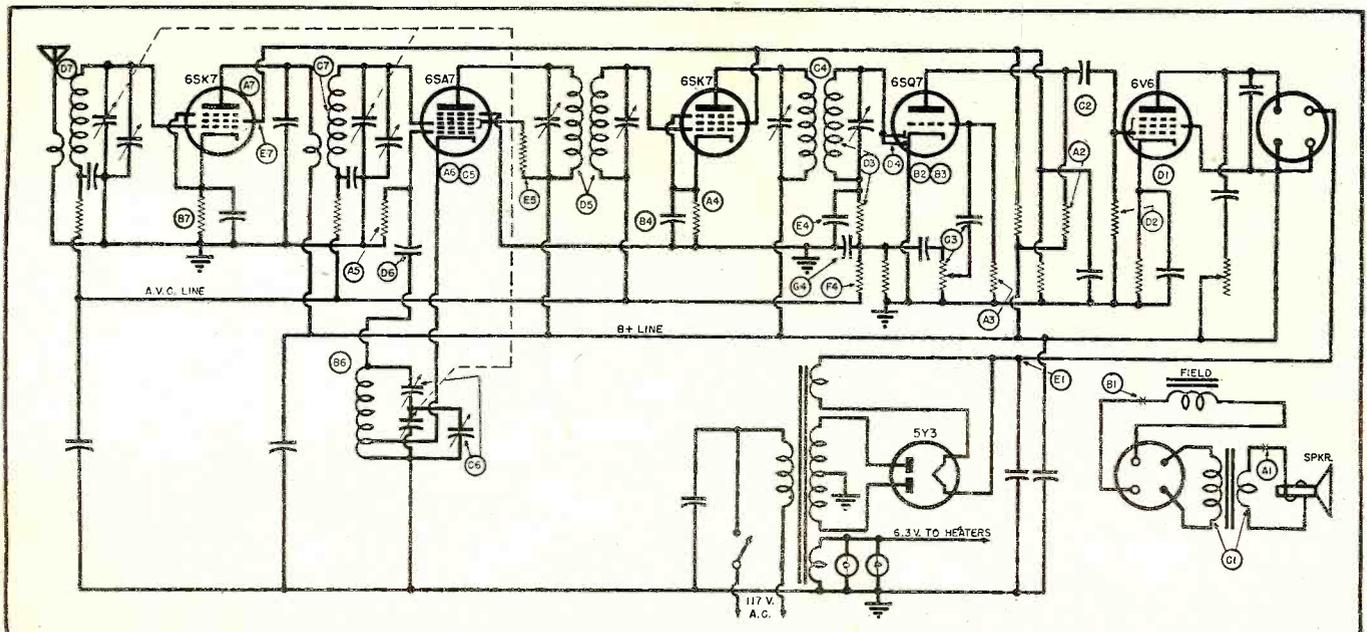
E-1. No "B plus."

Defect D-1 above can easily be ascertained by substituting a new tube or testing the suspected one in a tube tester. The other components may be tested with a volt ohmmeter in a few minutes and the repair or replacement of the defective component may be effected.

However, if the click is heard when the bias is removed, this indicates that the output stage, including the speaker and at least part of the power supply circuit, is functioning. With the audio output stage functioning, we can amplify any circuit disturbances which we will create in the forward stages of our receiver.

Next, we short the plate circuit of the voltage amplifier (6SQ7) to ground. This may be done without harming the receiver as the load resistor in this circuit (in conventional receivers) is on the order of 250,000 ohms or more and the increase in plate current which would flow because of this short would not be greater than one milliamperere. This short removes

Circuit diagram of the six-tube superheterodyne used by the authors to demonstrate "circuit disturbance" testing techniques.



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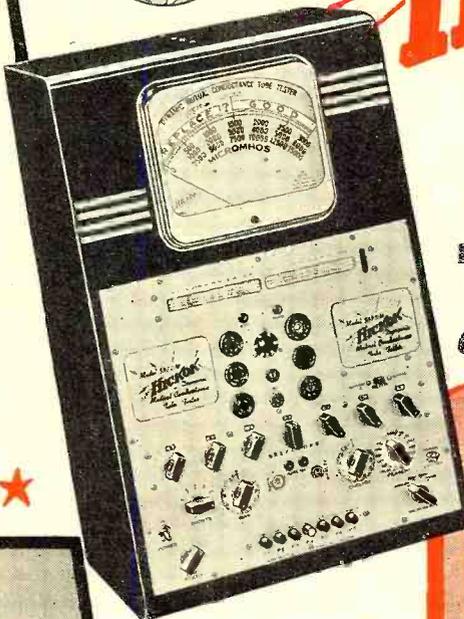
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the charge from the coupling condenser and a surge of current flows through the grid resistor of the output stage. If the characteristic click or noise is not heard, we have localized the trouble as:

- A-2. Open plate load resistor.
- B-2. Shorted voltage amplifier tube.
- C-2. Open coupling condenser.
- D-2. Shorted output stage grid resistor.

If we hear the noise with which we have become familiar, we will continue working toward the antenna end of the receiver by shorting the grid of the voltage amplifier tube to ground. The small bias (contact bias) of 0.5 to 1.0 volt is removed from the grid. The absence of an audible click or disturbance noise indicates that the defective part is:

- A-3. Contact bias resistor is shorted.
- B-3. Tube (6SQ7) inoperative.
- C-3. Shorted volume control.
- D-3. Short in the diode load circuit.

The failure may be determined as noted previously with a voltohmmeter. Assuming that the click is audible, we have established, with a reasonable amount of certainty, that the audio section of the receiver is operative and we now have a two-stage audio amplifier at our disposal to further probe into the intricacies of the forward receiving circuits.

Now assuming that the audio section has been checked by means of circuit disturbance and not found wanting by the absence of the customary noise which accompanies such an operation, we are ready to probe into the intermediate frequency stage of the receiver. We proceed by shorting the cathode of the i.f. stage (6SK7) to ground thus removing the bias from this stage. Incidentally, this operation checks the i.f. stage, i.f. transformer, second detector, and associated circuit components. Should we not receive an audible indication with this operation, then we may look for trouble at the following points:

- A-4. Shorted cathode resistor.
- B-4. Shorted cathode bypass condenser.
- C-4. Open or shorted i.f. transformer (primary or secondary).
- D-4. Inoperative diode.
- E-4. Open or shorted r.f. condenser in diode return circuit.
- F-4, G-4. Shorted a.v.c. filter. Shorted diode load.

Should the customary disturbance noise be heard, we can reasonably assume that the electrical circuits are intact from the cathode of the i.f. stage to the speaker.

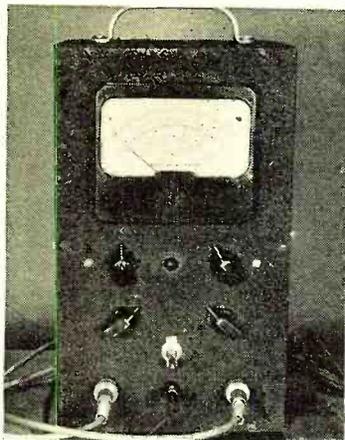
So it is forward again. We now apply our new technique to the mixer stage, shorting converter (6SA7) cathode to ground, thus sending an electrical disturbance through this section of the receiver. Should we hear the click we are on the home stretch. If there is no audible indication when we remove the bias from the mixer stage, check the following:

- A-5. Open or shorted oscillator grid leak.

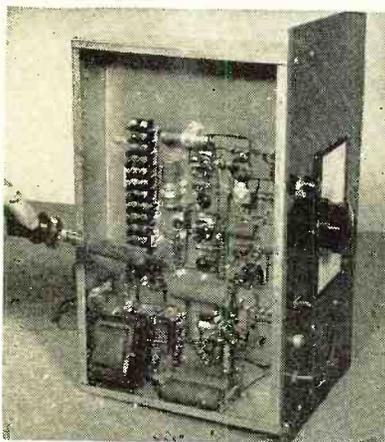
*(Continued on page 124)*

RADIO & TELEVISION NEWS

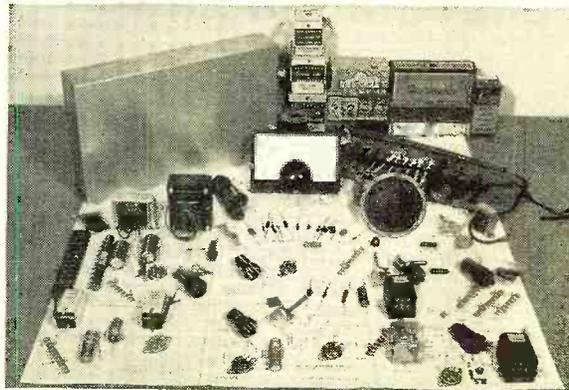
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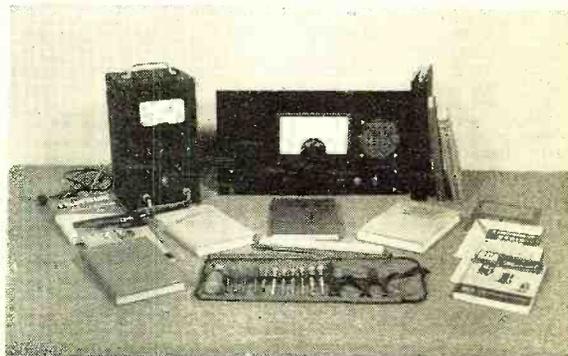
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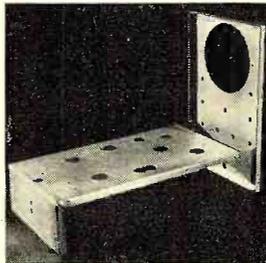
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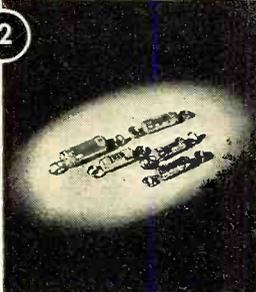
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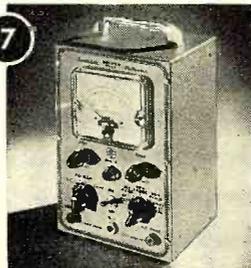
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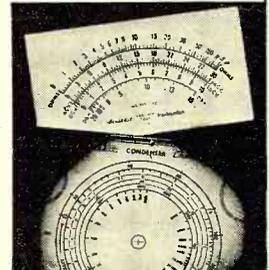


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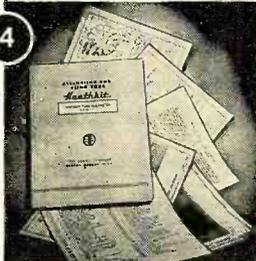
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4

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9

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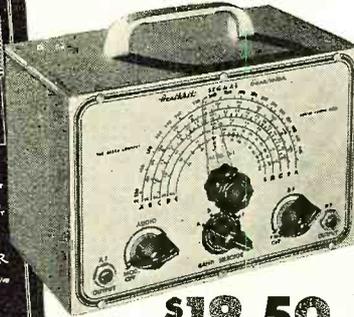
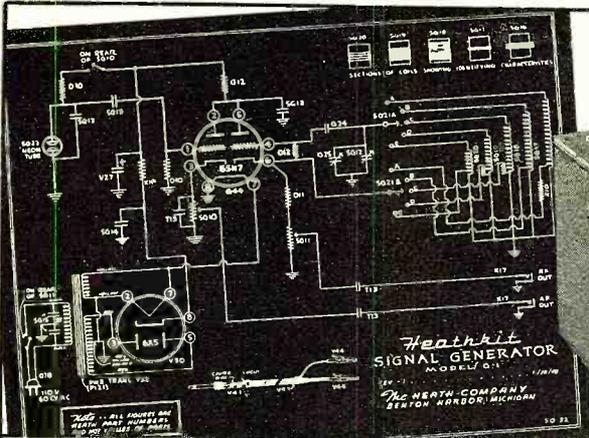
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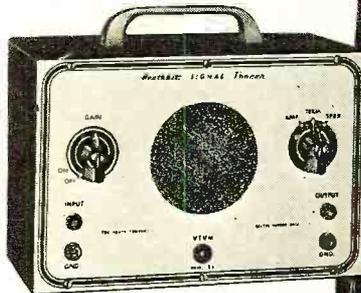
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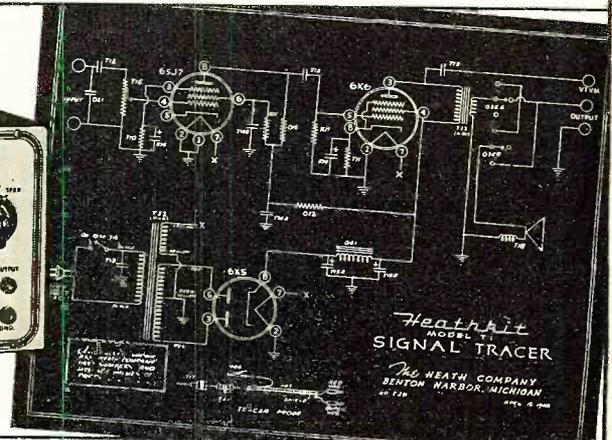
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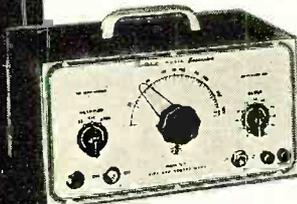
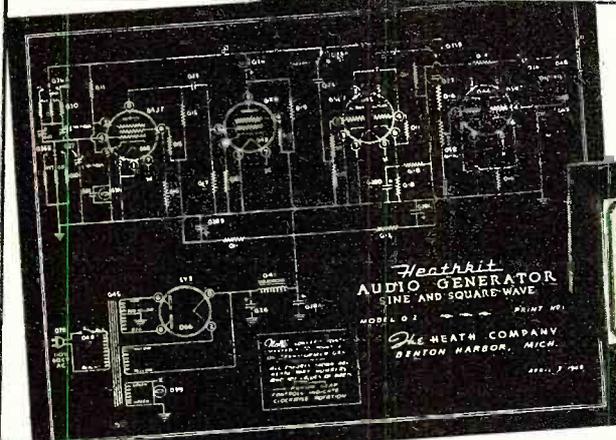


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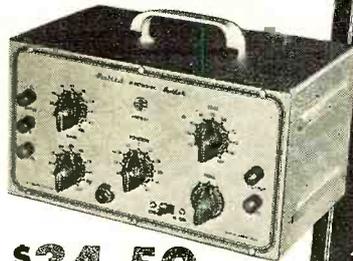
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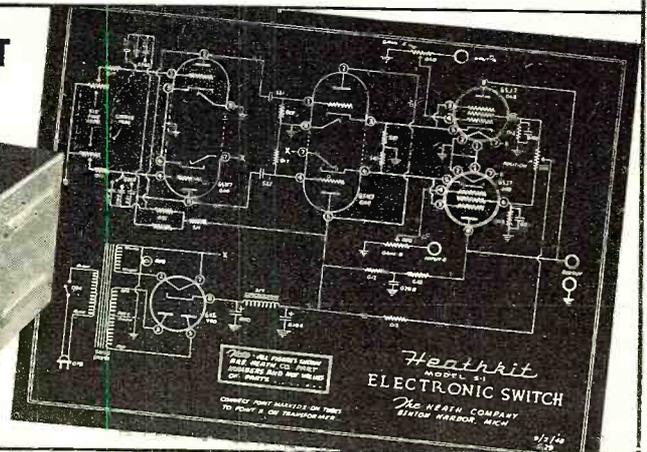
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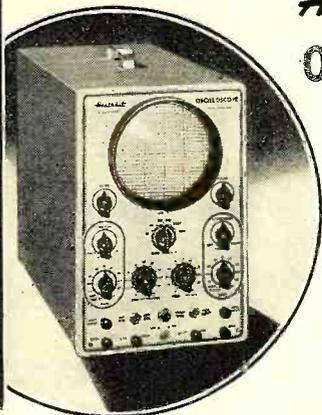
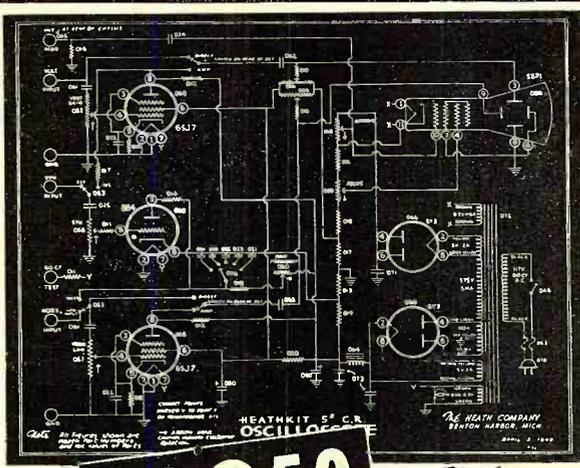
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- ★ Deflection sensitivity .65V per inch full gain.
- ★ Frequency response  $\pm 20\%$  from 50 cycles to 50 Kc.
- ★ Input impedance 1 Megohm and 50 MMF.

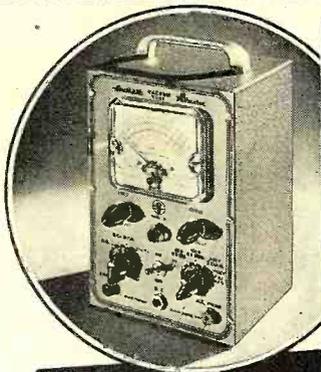
The Heathkit 5" Oscilloscope Kit fulfills every serving need. The husky cased power transformer supplies 1100 Volts negative and 350 Volts positive. Tubes supplied are two 6SJ7 amplifiers, 884 sweep generator, two 5Y3 rectifiers, and 5BP1 or 5BP4 CR tube. Grey crackle aluminum cabinet and beautiful grey and maroon panel. Chassis especially designed for easy assembly. An oscilloscope provides almost endless sources of experimentation in radio, electronics, medicine and scientific research. Detailed instructions make assembly fun and instructive.

**\$39.50**

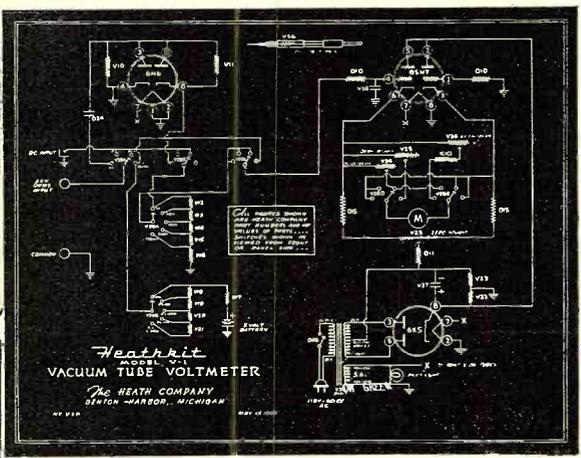
Nothing ELSE TO BUY  
SHIPPING WT. 24 LBS.  
EXPRESS ONLY

## Heathkit VACUUM TUBE VOLTMETER KIT

Everything you want in a VTVM. Shatterproof solid plastic meter face, automatic meter protection in burn-out proof circuit, push pull electronic voltmeter circuit assuring maximum stability. Linear DC and AC scales. Complete selection of voltage ranges starting with 3 Volts full scale up to 1,000 Volts. Isolated DC test prod for signal tracing and measurements of voltage while instrument is in operation. An ohm-meter section accurately measuring resistance of 1/10 ohm to one billion ohms with internal battery. Extremely high input resistance 11 megohms on all ranges DC and 6.5 megohms on AC. All these features and many more are the reasons hundreds of radio and television schools are using Heathkit VTVM's and recommending them to all students. Like all Heathkits, the VTVM kit is complete, 110V 60 cy power transformer, 500 microamp meter, tubes, grey crackle cabinet, panel, test leads, 1% ceramic precision divider resistors and all other parts. Complete instruction manual. Better start your laboratory now,



**\$24.50**



Shipping weight 8 lbs.

Nothing ELSE TO BUY

### HEATHKIT 3-TUBE ALL-WAVE RADIO



110 Volt AC Operation  
**\$8.75**

Operates head speaker. Add postage for 3 lbs. ... \$8.75  
HS 30 Headphones per set ..... \$1.00  
2 1/2" Permanent Magnet Loudspeaker ..... \$1.95  
Mahogany Cabinet ..... \$2.95

An ideal way to learn radio. This kit is complete ready to assemble, with tubes and all other parts. Operates from AC. Simple, clear detailed instructions make this a good radio training course. Covers regular broadcasts and short wave bands. Plug-in coils. Regenerative circuit.

### HEATHKIT HIGH FIDELITY AMPLIFIER KIT

Build this high fidelity amplifier and save two-thirds of the cost. 110V 60 cy transformer operated. Push pull output using 1619 tubes (military type 6L6's), two amplifier stages using a dual triode (6SL7), as a phase inverter give this amplifier a linear reproduction equal to amplifiers selling for ten times this price. Every part supplied; punched and formed chassis, transformers (including quality output to 3-8 ohm voice coil), tubes, controls, and complete instructions. Add postage for 20 lbs.



**\$14.95**

12" PM Speakers for above ..... \$6.95  
Mahogany Speaker Cabinet, 14 1/2" x 14 1/2" x 8" ..... \$8.75

### 110V.-A.C. MILITARY RECEIVER POWER SUPPLY KIT



**\$5.95**

Ideal way to convert military sets. 110V 60 cy. transformer operated. Supplies 24 Volts for filament - no wiring changes inside radio. Also supplies 250V D.C. plate voltage at 50-60 MA. Connections direct to dynamotor input. Complete with all parts and detailed instructions. Shipping wt. 6 lbs.

### 110V.-A.C. TRANSMITTER POWER SUPPLY KIT



**\$14.50**

For 8C-645, 223, 522, 274N's, etc. Ideal for powering military transmitters. Supplies 500 to 600 Volts at 150 to 200 MA plate, 6.3 C.T. at 4 Amps, 6.3 at 4 Amps, and 12V at 4 Amps. Can be combined to supply 3-6-9-12 or 24 Volts at 4 Amperes. Kit supplied complete with husky 110V 60 cycle power transformer, 5U4 rectifier, oil filled condensers, cased choke, punched chassis, and all other parts, including detailed instructions. Complete - nothing else to buy. Shipping Wt. 22 lbs.

### INTERPHONE 2-WAY CALL SYSTEM KIT

Ideal call and communication system for homes, offices, factories, stores, etc. Makes excellent electronic baby watcher. Easy to assemble with every part supplied including simple instructions. Distance up to 1/5 mile. Operates from 110V A.C. 3 tubes, one master and one remote speaker. Shipping weight 5 lbs.



**\$14.50**



The HEATH COMPANY

BENTON HARBOR 15,

MICHIGAN



# Buy HEATH SURPLUS Now!

ALL QUANTITIES LIMITED SUBJECT TO PRIOR SALES

## APN/1 RADIO ALTIMETERS



**\$34.50**

NO. 200. The last chance to get a complete new 14 tube radio altimeter. Contains 420 Mc. transmitter and receiver, power supply, range switches, two antennas, meter indicator, all plugs and instruction manual. This unit makes excellent amateur station as it is right in the band. Shipped in original export crate. Weight 87 lbs.

## G.E. BC 375 TUNING UNIT

NO. 203. Model TU10B covers 10 Mc. to 12.5 Mc. New complete with aluminum cabinet. The best buy of surplus. Over \$30.00 worth of new variable condensers, coil, dials, switches, etc. Add postage for 20 lbs.



**\$2.49**

G.E. 50 AMP CIRCUIT BREAKER  
NO. 204. New General Electric 50 Amp 220 Volt AC circuit breakers. 100 Amp when used on 110V. Add postage for 4 lbs.



**\$2.95**  
EACH—  
3 FOR  
\$7.50

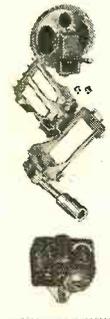
## BC 347 AIRCRAFT INTERPHONE AMPLIFIER

NO. 205. Interphone amplifier contains 6F8 tube, Ouncer transformers, diagrams, etc. in aluminum cabinet. Add postage for 4 lbs.



**\$2.95**

## 274N COMMAND SET ACCESSORIES



NO. 238. 5" PM Speaker with output transformer matching headphone output. \$2.80  
NO. 239. Dual receiver rack FT277A with connecting plugs. \$1.00  
NO. 240. Single transmitter rack FT234A. \$1.00  
NO. 241. Spline shaft for tuning command receivers. Allows use of regular tuning knob on BC 453-4-5 receivers. \$ .39  
BC 451 CONTROL BOX  
NO. 236. Control box for 274N transmitters. Contains proper cw-switch, 4 channel switch, power switch, mike jack and telegraph key. Add postage for 2 lbs. \$1.95

## METER SPECIAL

NO. 237. Brand new DeLur Model 312 0-800 M.A. D.C. Square 3" 0-10 M.A. basic meter with built in shunt. Probably the best buy ever offered in a surplus meter. Shipping Weight 1 lb.



**\$2.95**

## A-62 ARMY PHANTOM ANTENNA



NO. 206. Contains tuning condenser, coil, resistors, tuning dial, tuning indicator, binding posts, steel case, useful for building amateur transmitter. Add postage for 8 lbs. \$1.95

## BENDIX MR9C COMPASS CONTROL UNIT

NO. 207. Tuning and control unit for Bendix MN 26 radio compasses contains tuning dial, band switch, crystal switch, AVC switch, volume control, fuses, phone jacks, etc. Shipping Weight 5 lbs. \$9.50



## BC731 CONTROL BOX



with Weston Model 476 AC Voltmeter  
NO. 208. Excellent buy in motor control box. Size 8"x10"x5 1/2". Contains Weston 0-150V. AC 3 1/2" voltmeter, motor starting switch, 28 fuses all 30 Amp 110V. and 8 fuse holders. Fuses and holders alone worth the price. Shipping Weight 18 lbs. \$7.95

## BC 645 GENERAL ELECTRIC TRANSCEIVER



NO. 201. Complete 15 tube transmitter-receiver. Ideal for new citizens band 460 Mc. for communication between office and car, home, boat, etc. Conversion article in August ELECTRONICS Magazine. Brand new in original G.E. cartons with tubes. Add postage for 25 lbs. **\$19.50 . . . 2 for \$35.00**

ACCESSORIES FOR BC 645  
PE101C Dynamotor for car use. \$ 3.95  
110V 60 Cycle Power Supply for home or office use. \$14.50

## T32 TABLE MICROPHONE

NO. 210. One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons. Add postage for 5 lbs.



**\$2.95**

## MINIATURE ELECTRIC MOTOR



NO. 211. Tiny Delco motor only 1" x 1 1/4" x 2" 10,000 RPM. Operates from 6 to 24 V. Excellent for models. Add postage for 1 lb. **\$2.95**

P. E. 103  
6 VOLT

## DYNAMOTOR



NO. 212. Dynamotor only from PE 103 power supply. Input 6 or 12 Volts, output 500 Volts at 160 MA. Brand new original cartons. Shipping Weight 29 lbs. **\$5.95**



**\$5.95**

## G. E. 1,000 VOLT 350 MA DYNAMOTOR

NO. 213. An ideal dynamotor for mobile operation in taxicabs, police cars, sound systems and amateur stations. Supplies above voltage from 12 Volts or 500V. at 350 MA from 6 Volts. Complete with starting relay, and fuses. New. Our Dynamotor A. Shipping Weight 72 lbs. **\$5.95**

## DM-36 DYNAMOTOR

NO. 215. Western Electric 24 Volt input, 220V. at 60 MA out. With filter assembly. Shipping Weight 6 lbs. **\$2.95**



## G.E. BC 306 ANTENNA TUNING UNIT

NO. 231. Matches any aerial to 150 Watt transmitter, used on BC 375. Brand new. Add postage for 20 lbs. **\$2.95**

## W.E. BC456 MODULATOR

NO. 217. Modulator from 274N command transmitters contains 3 husky relays, 3 tubes, VR150, 12J5 and 1625. Brand new. Add postage for 11 lbs. **\$3.95**



**\$7.95**

## BE 77 TELETYPE TEST SET

NO. 218. Contains zero center voltmilliammeter, switches, relays, voltage divider resistors, neon indicator, etc. Excellent foundation for radio tester. Shipping Weight 10 lbs. **\$9.95**

## BENDIX MN 20E DIRECTION FINDER LOOP

NO. 219. Ring type loop excellent for use on boat or aircraft. Extremely rugged construction. Low impedance manual type. Add postage for 8 lbs. **\$9.95** EACH



## LP 18C DIRECTION FINDER LOOP

NO. 220. Motor driven streamline pod type loop used on automatic direction finders. Has Selsyn transmitter and motor, fits most military direction finders. Add postage for 20 lbs. **\$14.50** EACH

## KIT SPECIALS

POTENTIOMETERS  
NO. 232. Kit of 10 excellent shaft type potentiometers good variety **\$1.95**  
SOCKETS  
NO. 233. Kit of 20 high quality sockets several different types. **\$1.00**

## RCA NAVY COMMUNICATION RECEIVER

NO. 202. The last of these beautiful RCA sets. Covers 195 Kc. to 9.1 Mc. continuously. Supplied complete with tubes, control box, tuning unit, 24 Volt dynamotor, band change motor, plugs and circuit diagram. Superheterodyne circuit covers aircraft, broadcast, short wave, marine, foreign broadcasts. Has sharp or broad I.F.'s B.F.O., etc. Shpg. Wt. 30 lbs. **\$29.50**



## PE 125 TRANSMITTER POWER SUPPLY

NO. 223. Operates from 12 to 24 Volts and supplies 500 Volts at 160 MA. Extremely rugged construction used in Army tanks. Complete with fuses — relays — filters, etc. Ideal for boats. Shipping Weight 73 lbs. **\$12.95**

## FM PUSH BUTTON TUNER

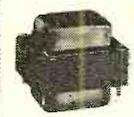
NO. 224. Brand new ten push button tuning assembly from Army FM receiver. Contains 4 gang 100 MMF silver plated tuning condenser. Add postage for 10 lbs. **\$2.50** EACH



## RG 8/U FLEXIBLE COAXIAL CABLE

NO. 225. Standard television lead in 52 ohm. Any length up to 1,000 ft. Add for postage. **4¢ PER FOOT**

## POWER TRANSFORMER Specials



NO. 226. Primary 117V. 60 cycle. Secondaries supply 746 V. CT at 220 MA, 6.3V. at 4.5 A., and 5V. at 4A. Will handle 13 tube radio receivers. Supply is limited, order early. Shipping Weight 11 lbs. each. **\$3.95 . . . 3 for \$9.95**

## OUTPUT TRANSFORMER

NO. 227. Push pull 6V6's to 6-8 ohm voice coil excellent characteristics. **3 for \$1.95**

## TRANSFORMER TRANSFORMER

NO. 228. The transformer for Transmitter Power Supply, 600 Volt at 200 MA and 4 Amp. filaments of 3 to 24 Volts. Also 5 Volts at 4 amperes for rectifier. Shipping Weight 12 lbs. **\$9.50**

## MILITARY POWER TRANSFORMERS

NO. 229. Convert your military receivers without rewiring the filament. "A" type supplies 500 VCT at 50 MA, 5V. at 2A. and 24V. at 1/2 A. "B" type supplies 500 VCT at 50 MA, 5V. at 2A. and 12V. at 1 Amp. State whether A or B type desired. Shipping Weight 4 lbs. **\$2.95**



## HOME WORKSHOP GRINDER KIT

NO. 230. Easily assembled 110V AC or DC ball bearing fully enclosed motor from Army surplus dynamotor. Purchaser to make simple changes and shaft extensions, detailed instructions and all parts supplied. Motor approximately 5,000 R.P.M. Ideal for tool-post grinder, flexible shaft tool, model drill press, saw. Shipping Weight 6 lbs. **\$3.95**



## HEARING AID HEADPHONES



NO. 216. The Army's best — eliminate flat ears and outside noise. Complete with transformer for conversion from low to high impedance. With cord and plug complete. Add postage for 1 lb. **\$1.00**

## TELEVISION CONDENSERS

NO. 221. Tbc triple .2 MFD 4000 V.D.C. Filter used on Army radar. Ideal filter for H.V. television set. Add postage for 3 lbs. **\$3.95**  
NO. 222. G.E. Pyranol capacitor .25 MFD 6000 V.D.C. Porcelain insulated, an outstanding buy for high voltage filters. Add postage for 3 lbs. **\$3.95**

HOW TO ORDER • • • GIVE PART NUMBER AND DESCRIPTION • • • ADD POSTAGE FOR WEIGHT SHOWN. NO ORDERS UNDER \$2.00 • • • WE WILL SHIP C.O.D.



# ELECTRONIC BARGAINS for EXPERIMENTERS and HOBBYISTS

ALL QUANTITIES LIMITED SUBJECT TO PRIOR SALES

**STANCOR FILAMENT TRANSFORMER**  
 NO. 242. Heavy duty Stancor No. ST355 supplies 5V at 6 Amps, 5V at 3 Amps and 5V at 3 Amps from 220V 60 Cy. primary or 1/2 above from 110V. Cased type. Ship. Wgt. 7 lbs. Each. **\$1.50**



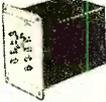
**G.E. THYRATRON TRANSFORMER**  
 NO. 243. New G.E. Transformer supplies 2.5V at 100 KVA, has 3KV insulation 100V 60 cy. primary. Shipping Wgt. 13 lbs. Each. **\$9.50**



**RCA SATURABLE REACTOR TRANSFORMER**  
 NO. 246. New RCA No. CRV30531 AC current 750 MA DC current 2 Amperes. Rated 1.75 henries. Shipping wgt. 4 lbs. Each. **\$1.00**



**12.6V POWER TRANSFORMER**  
 NO. 247. New cased 110 V 60 cy. Power Transformer. Supplies 440V Ct. at 60 MA, 6.3V at 2A, and 12.6V at 1 Amp. Excellent for military sets. Shipping Wgt. 6 lbs. Each. **\$1.95**



**RCA INPUT TRANSFORMER**  
 NO. 248. Heavy duty RCA No CRV-30529. Input has primaries 60V to 200 and 25 ohms secondary 250,000 ohms C.T. Shipping Wgt. 2 lbs. Each. **\$1.00**



**REPLACEMENT POWER TRANSFORMER**  
 NO. 251. Excellent value transformers made by one of largest transformer companies. 110V 60 cy. Primary supplies 746 V Ct. at 150 MA. 5V at 4A and 6.3V at 4.5 Amps. Shipping Wgt. 7 lbs. Each. **\$2.95**



**FEDERAL POWER TRANSFORMER**  
 NO. 252. New cased 110V 60 cy. Power Transformer. Supplies 480V CT at 50 MA and 6.3 V at 2.1 Amps. A beautiful transformer. Shipping Wgt. 4 lbs. Each. **\$1.50**



**HEAVY DUTY 6-12-24 VOLT VIBRATOR**  
 NO. 253. A husky vibrator used on army transmitter. Rated 30 amperes at 6 Volts 220 cycle with contacts for 12 and 24 Volts. Synchronous type, has many industrial applications. Ship. Wgt. 3 lbs.



**4 CHANNEL PUSH BUTTON TUNER**  
 NO. 254. Permeability tuner from BC 728 containing RF, first detector, and oscillator coils. Covers 2 to 5 MC. Complete circuit diagram furnished. Shipping Wgt. 2 lbs. Each. **\$2.50**



**CONDENSER SPECIAL**  
 NO. 255. An ideal oil filled power supply filter used in army 16 tube unit, has 2.5, 2.5 and 5 MFD all at 600V D.C. rating. Shipping Wgt. 3 lbs. Each. **\$1.50**



**AEROVOX TELEVISION CONDENSER**  
 NO. 256. Aerovox Hyvol .05 MFD at 7500V. rating. Excellent television coupling condenser with mounting bracket. Shipping Wgt. 3 lbs. Each. **\$3.50**



**BC 746 TUNING UNIT**  
 NO. 257. Plug in transmitter tuning unit from army Walkie Talkie. Contains antenna and tank coils, tuning condenser, transmitting and receiving crystals. Ideal transmitter foundation. Shipping Wgt. 1 lb. Each. **\$1.00**  
 (Same as above except transmitter crystal in 80 meter amateur band. \$2.50 each)

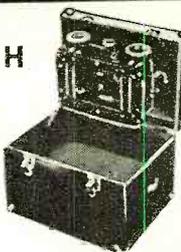


**T30 THROAT MICROPHONE**  
 NO. 258. Makes excellent contact microphone for musical instrument or vibration pick-up. Shipping Wgt. 1 lb. \$1.00 each  
 Extension cord with switch for above \$ .50 each



## BRAND NEW ARMY AIR FORCE ASTROGRAPH

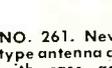
NO. 259. The case of this unit makes the finest tool and service kit ever designed. Ply-wood construction, 14 x 11 x 10" high, with 8 covered compartments in the bottom for repair parts, leather handle, steel reinforced covers, hinged lid. Also excellent as case for radio, phonograph, movie projector, camera, shell case, fishing kit, picnic kit, etc. The astrograph itself, (which cost the government \$125.00) makes an excellent contact printer, and can be used for a foundation for enlarger, strip map holder, etc. The case alone worth twice the give-away price of **\$3.95**



**AN27/ARNS ANTENNA**  
 NO. 260. Standard blind landing antenna system. Brand new in original crate. Ship. Wgt. 14 lbs. **\$9.50**



**AS114/APT ANTENNA SYSTEM**  
 NO. 261. New blade type antenna complete with case assembly, in original carton. Shipping Wgt. 9 lbs. **\$7.50**



**AS115/APT ANTENNA SYSTEM**  
 NO. 262. New blade type antenna complete with case assembly, in original carton. Ship. Wgt. 11 lbs. **\$7.50**



**AT38A/APT RADAR ANTENNA**  
 NO. 263. New radar dome type antenna with mounting base and connections, in original carton. Ship. Wgt. 11 lbs. **\$14.50**



**AN104A BLADE ANTENNA**  
 NO. 264. Standard blade antenna used on many military fighting planes with coaxial connection at base. Shipping Wgt. 3 lbs. **\$1.50**



**BENDIX MT51C TRANSMITTER CONTROL BOX**  
 NO. 285. Contains channel switch, emission switch, send receive switch, power switch and indicators for Bendix aircraft transmitters. Ship. Wgt. 3 lbs. **\$5.50**



**BC 670B REMOTE CONTROL BOX**  
 NO. 265. Motor starting control box: has starting and stopping switch, indicator, cable and plug. Wooden case. Ship. Wgt. 6 lbs. Each. **\$1.95**



**BK 22 RELAY ASSEMBLY**  
 NO. 266. Used on SCR 269 Radio Compasses. Contains stepping and control relays - junction box of aluminum. Brand new. Ship. Wgt. 7 lbs. Each. **\$3.95**



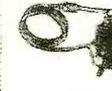
**HEINEMANN CIRCUIT BREAKER**  
 NO. 267. Heavy duty type 7 Amp. 24 Volt D.C. Many uses around shop. Shipping Wgt. 2 lbs. Each. **\$1.00**



**CUTLER HAMMER MOTOR FIELD CONTROL**  
 NO. 285. Rated 10 ohms. 3.2 Amps. Maximum. 6 1/2" diameter with knob and mounting feet, can be used to regulate generator output voltage. Shipping Wgt. 5 lbs. Each. **\$2.50**



**PENN THERMO RELAY**  
 NO. 268. Thermo Relay with a range of 45° to 100° complete with 5 Ft. flexible cable to immersion bulb. Shipping Wgt. 6 lbs. **\$3.50**



**B & W 11 to 14 MC TANK COIL**  
 NO. 281. Plug in type used on BC 610 Transmitter. New, original cartons. Shipping Wgt. 2 lbs. Each. **\$1.50**



**DM 64A 12 VOLT DYNAMOTOR**  
 NO. 269. Input 12V at 5 Amps. Output 275 Volt 150 MA. New. Shipping Wgt. 7 lbs. Each. **\$5.50**

**DM 32A COMMAND SET DYNAMOTOR**  
 NO. 270. Part of 274N Command Receivers. Input 28 Volts, output 250V at 60 MA. Shipping Wgt. 4 lbs. Each. **\$5.50**

**DM 21 12 VOLT DYNAMOTOR**  
 NO. 271. Used in Army BC 312 Communication Receiver. Input 12 Volts at 3.3 Amps. Output 235 Volts at 90 MA. New, original cartons. Shipping Wgt. 8 lbs. Each. **\$5.50**

**PE94C SCR 522 POWER SUPPLY**  
 NO. 272. Complete dynamotor power supply for the SCR 522, operates from 28 Volts. Complete with controls, filters, etc. Original carton. Shipping Wgt. 34 lbs. Each. **\$8.75**

**PE101C BC645 POWER SUPPLY**  
 NO. 273. Complete power supply for BC 645. Operates from 12 or 24 Volts. Supplies both AC and DC required. Shipping Wgt. 13 lbs. Each. **\$3.95**

**DM 35 12 VOLT DYNAMOTOR**  
 NO. 274. New input 12 Volt at 18.7 Amperes. Supplies 675V at 275 MA or 1/2 above voltage from 6 volts. Excellent for auto use. Shipping Wgt. 11 lbs. Each. **\$7.50**

**PE 86 DYNAMOTOR**  
 NO. 214. A popular 28 Volt receiver dynamotor used on present military equipment. Supplies 250V at 60 MA. Shipping Wgt. 4 lbs. Each. **\$5.50**

**GN 58 HAND GENERATOR**  
 NO. 275. Makes excellent home lighting plant, operated by wind propeller, waterfall, gas engine, or hand crank. Reduction gear allows full output at slow speed; supplies 6 volts at 2.45 amp, 425 volts at .115 amp. New. Add \$ .50 each postage for 28 lbs. Each. **\$7.95**



**COLLINS AUTOTUNE CONTROL HEAD**  
 NO. 278. Brand new controls used on the ART/13, 100 Watt, Transmitter. Types 7, 8, 10, and 11 available. Get a spare while available at new cost is over \$22.00 each. Shipping Wgt. 3 lbs. Price any type (mention when ordering). Each. **\$4.50**



**MC 432 VHF ANTENNA LOADING UNIT**  
 NO. 279. Contains 2 pole, 5 position rotary switch with silver ceramic variable condensers, and coils for matching VHF Transmitter to AN109 antenna with 50 ohm line. Many useful parts. Shipping Wgt. 2 lbs. Each. **\$1.50**



**148 OUTDOOR TELEGRAPH KEY**  
 NO. 280. Rugged enclosed type for outdoor use, built for army to withstand hard usage. Complete with cord and PL55 plug. Shipping Wgt. 2 lbs. Each. **\$2.00**



**ONE KILOWATT ADJUSTABLE ANTENNA LOADING COIL**  
 NO. 282. Huge porcelain coil 4" diameter 8 1/4" long, has 5 sliders for adjustments. Shipping Wgt. 5 lbs. **\$3.50**



**300 MA SELENIUM RECTIFIERS**  
 NO. 209. Rated 300 MA at 36 Volts, complete with mounting brackets. Shipping Wgt. 1 lb. 3 FOR \$1.00



**DUAL SELENIUM RECTIFIER**  
 NO. 283. Two units mounted on single bracket, each section rated 15V. at 1/2 Amp. Shipping Wgt. 1 lb. 2 FOR \$1.00



HOW TO ORDER • • • GIVE PART NUMBER AND DESCRIPTION • • • ADD POSTAGE FOR WEIGHT SHOWN. NO ORDERS UNDER \$2.00 • • • WE WILL SHIP C.O.D.

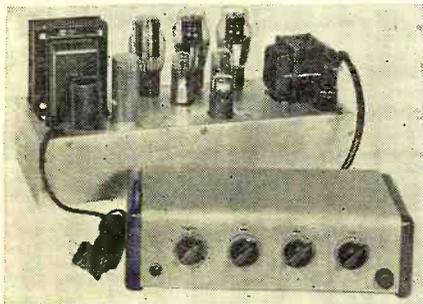
**The HEATH COMPANY**  
 ... BENTON HARBOR 15, MICHIGAN

# What's New in Radio

## ALL-TRIODE AMPLIFIER

A new 10-watt model of the *Brook* amplifier which provides the advantages of all-triode audio performance in the moderate price field, has recently been announced by *Brook Electronics, Inc.* of Elizabeth, New Jersey.

A new circuit development, known as the "transient peak" circuit, permits the amplifier to handle power



peaks considerably higher than its 10-watt rating, at the same time holding distortion within the figures published by the manufacturer as applying to constant power output. Intermodulation and harmonic distortion are virtually eliminated and frequency response is practically flat from 20 to 20,000 cycles.

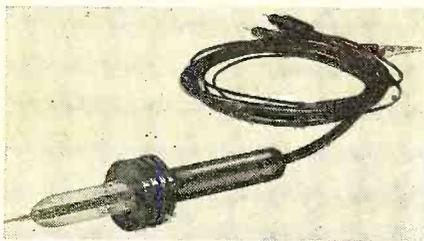
Both bass and treble controls provide attenuation as well as boost and consist of two-stage resistance-capacitance networks in which equalizing curves for various types of recordings are obtained through use of eight-step selector switches. Two high-impedance inputs provide high gain with equalization for magnetic-type pickups and medium gain for crystal pickups and tuners. Output impedances range from 2 to 500 ohms.

Distortion analysis and complete technical specifications will be supplied by *Brook Electronics, Inc.*, 34 DeHart Place, Elizabeth 2, New Jersey, without charge or obligation.

## TV TEST PROBES

A new series of television test probes has been announced by *Precision Apparatus Co., Inc.* of Elmhurst, Long Island.

Known as the Series TV High Volt-



age Safety Test Probes, the new units afford direct measurement facilities up to 30,000 volts d.c. with complete safety to the operator.

These probes provide direct kilovolt-meter facilities with present high sensitivity test sets and vacuum tube voltmeters. They can be used with most popular high sensitivity test sets due to the availability of stock value and special value multiplier cartridges. Convenient, tool-less interchange of the special tubular multiplier permits a single *Precision* TV probe to be used with various test sets, provided the proper cartridge is used.

The functional safety of these probes is provided via extended high dielectric anti-leakage paths; a multi-channeled guard barrier; full handle length internal arc-back shield directly grounded; external arc-back barrier directly grounded; fully shielded instrument connecting cable; all critical high potential and ground connections within the probe are positively accomplished by means of high compression contact springs; and the probe head constructed of custom-molded polystyrene while the handle and barrier are of bakelite and the internal components of lucite.

For additional information contact *Precision Apparatus Company, Inc.* directly at 92-27 Horace Harding Blvd., Elmhurst, L. I., New York.

## TONE GENERATOR

A small, portable tone generator, designed primarily for use in broadcast studios, is currently in production by the *RCA Engineering Products Department*.

The new instrument, the Type WA-26A, combines a high quality audio oscillator and sensitive meter to supply a suitable tone for use in equalizing remote telephone lines.

The tone generator circuit is an *RC* type, allowing selection of ten frequencies from 50 to 15,000 c.p.s. The output is metered and calibrated in dbm. An output of either 150 ohms or 600 ohms may be selected by means of a switch mounted on the front panel.

The unit is supplied with a black leatherette carrying case and weighs 9 pounds, 4 ounces including batteries.

For full details on the Type WA-26A write to Engineering Products Department, *Radio Corporation of America, RCA Victor Division*, Camden, N. J.

## "NOISERASER"

Development of a new instrument in the audio electronics field has been announced by *The Minnesota Electronics Corporation* of St. Paul.

Known as the "Goodell Magnetic Noiseraser," the instrument is designed to eliminate all signals and background noise from entire reels of magnetic tape in a few seconds. It removes saturation signals and completely reconditions old tape, according

to the manufacturer. It can also be used to condition new tape before recording to reduce inherent noise level thus permitting an increased dynamic range of from 4 to 6 db. to minimize the probability of peak signals producing distortion.

Power supply requirements are 110 to 120 volts, 60 cycle a.c., with current drain approximately 8 amperes for the Model N-7 (7" reel size) and 16 amperes for the Model N-14 (14" reel size).

Complete details on the new instrument are available from *The Minnesota Electronics Corporation*, 6th and Minnesota Streets, St. Paul 1, Minnesota.

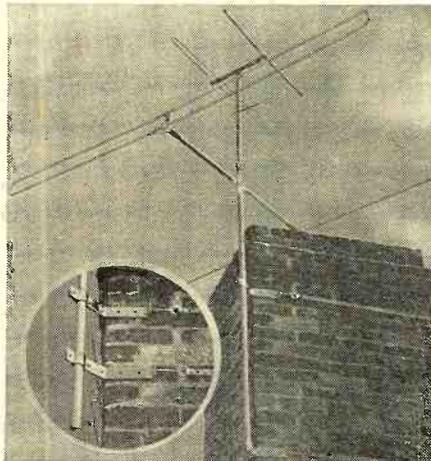
## ADJUSTABLE ANTENNA MOUNT

The *JFD Manufacturing Co., Inc.* is now manufacturing an adjustable chimney antenna mount which has been especially designed for television antenna installations.

According to the company, the new unit may be erected in 5 minutes using only a pair of pliers and a screwdriver. There are no holes to be drilled or other adjustments to be made.

The unit mounts on any chimney, pipe or other rectangular-shaped extension and is securely held with two 12 foot lengths of heavy-duty galvanized steel bands.

Constructed in two separate sections, the mount permits unlimited spacing between brackets. This



achieves maximum support of antenna masts even though they are over 6 feet in height. No secondary mounts, guy wires, or additional supports are necessary when installing unusually high antenna masts.

The brackets hold any size mast from 1/2" to 1 1/2" o.d. and do not require spacers or shims. All parts are made from galvanized steel and are corrosion-proof.

For further information on the new adjustable chimney antenna mount

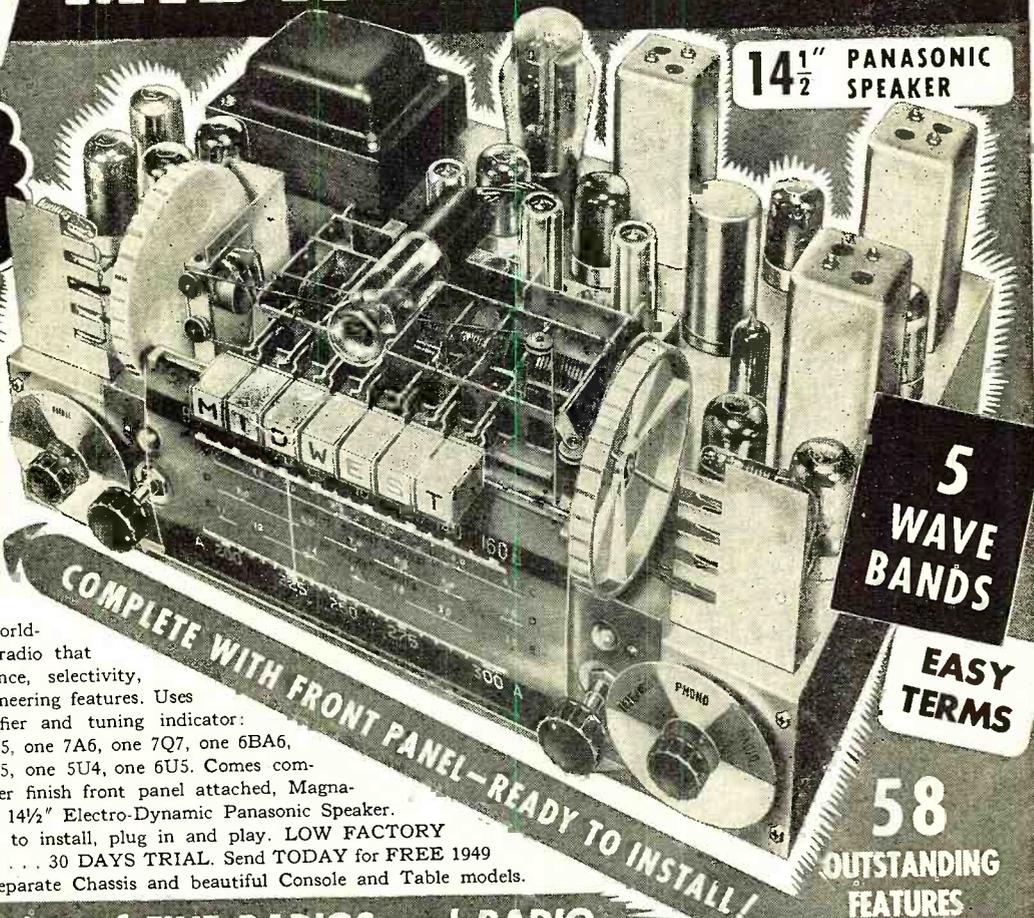
**RADIO & TELEVISION NEWS**

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**MIDWEST RADIOS**

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**AM-FM**  
**CHASSIS**

**30 DAYS TRIAL**



**14 1/2" PANASONIC  
SPEAKER**

**5  
WAVE  
BANDS**

**EASY  
TERMS**

**58**

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- TRI-MAGNADYNE**  
Coil System
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and many other features

Here is the last word in radio engineering . . . a powerful, world-ranging, magnificently-toned radio that is unsurpassed for performance, selectivity, sensitivity, and advanced engineering features. Uses these latest-type tubes, rectifier and tuning indicator: three 7A7, three 7A4, two 7C5, one 7A6, one 7Q7, one 6BA6, one 6BE6, one 6C4, one 6AL5, one 5U4, one 6U5. Comes complete with satin stripe copper finish front panel attached, Magna-Tenna Loop Aerial and giant 14 1/2" Electro-Dynamic Panasonic Speaker. Requires only a few minutes to install, plug in and play. **LOW FACTORY PRICES . . . EASY TERMS . . . 30 DAYS TRIAL.** Send TODAY for FREE 1949 Midwest Radio Catalog of separate Chassis and beautiful Console and Table models.

**A Complete Line of FINE RADIOS and RADIO-PHONOGRAPHS . . . Available in SEPARATE CHASSIS Like the POWERFUL SERIES 16 AM-FM Model above or in COMPLETE CONSOLES like this...**



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**SYMPHONY GRAND**  
**AM-FM Radio-Phonograph with**  
**TELEVISION Audio Switch-Over**  
**and NEW Intermix AUTOMATIC**  
**RECORD CHANGER**

A Magnificent musical instrument and a masterpiece of cabinet design—the finest Midwest Radio in 29 years of manufacture. Offers world-ranging radio reception and newest automatic Intermix Record Changing Phonograph. Uses Series 16 Super DeLuxe AM-FM Chassis. Giant 14 1/2" Panasonic Speaker; Tri-Magnadyne Coil System; Built-In Loop Antenna. Other luxurious console and table model cabinets available with Series 16, 12, and 8 chassis—on Easy Terms and 30 Days Free Trial.

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January, 1949

# A WIDE RANGE HIGH QUALITY INSTRUMENT



- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality and enjoyment at a price that defies competition.
- Features, 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" PM speaker; smooth flywheel tuning; phono input provision; separate AM and FM antennas.

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Here's a bargain in parts cabinets that you can't afford to pass up. These rugged all steel cabinets are an unusual buy. Supply is limited. Order yours today.

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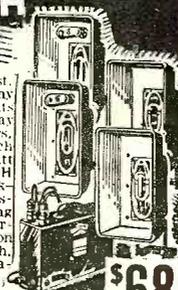


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509 ARCH ST., PHILADELPHIA, PENNA.

## E-Z TO ASSEMBLE! Save Money With This WAR SURPLUS Aircraft PHOTO FLASH KIT!

Offered at fraction of original cost. Simple to assemble. Save many dollars. Comes brand new in its original box complete with: gray metal finished case, all connectors, relay control, 2 condensers each 2000 volts—light output 100 watt seconds, 4 HIGH SPEED FLASH TUBES—plastic sealed, unbreakable. ALSO 4 reflectors, transformer, connectors, connecting cords, spare parts. After conversion unit operates on battery or on 110 volt A.C. by flick of switch. Complete instructions and diagrams.



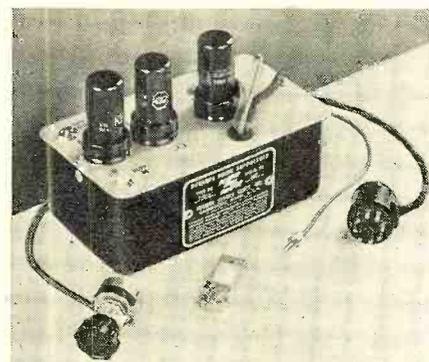
Immediate Delivery on all mail orders! Complete \$68  
CINEX, INC., 165 W. 46th St., N. Y. 19, N. Y. Dept. RR-7

write to *JFD Manufacturing Co., Inc.*, 4120 Fort Hamilton Parkway, Brooklyn 19, New York.

### LOW-COST D.N.S.

Low cost, remote control, and easy installation are features being claimed for the new Type 10-A Dynamic Noise Suppressor being manufactured by *Hermon Hosmer Scott, Inc.* of Cambridge, Massachusetts.

This unit may be added to most existing a.c. phonograph or radio-phonograph systems. Designed primarily to minimize the background noise on records which proves so annoying to the



discriminating music lover, the unit may be used for both AM and FM reception.

Further simplifying the dynamic bandpass principle of suppression, the Type 110-A covers a frequency range equal to or greater than most records on the market. A specially matched pickup is included for wide range performance and low needle-talk; and a single control connected with a two-wire cable enables great flexibility in mounting and operation.

Only one connection is necessary to install the Dynamic Noise Suppressor 110-A in its position between the pickup and the amplifier. Small and compact, it can be located in any convenient spot within the phonograph cabinet.

*Hermon Hosmer Scott, Inc.*, Dept. RN, 385 Putnam Avenue, Cambridge, Massachusetts will supply additional details and prices on request.

### TV TRANSFORMERS

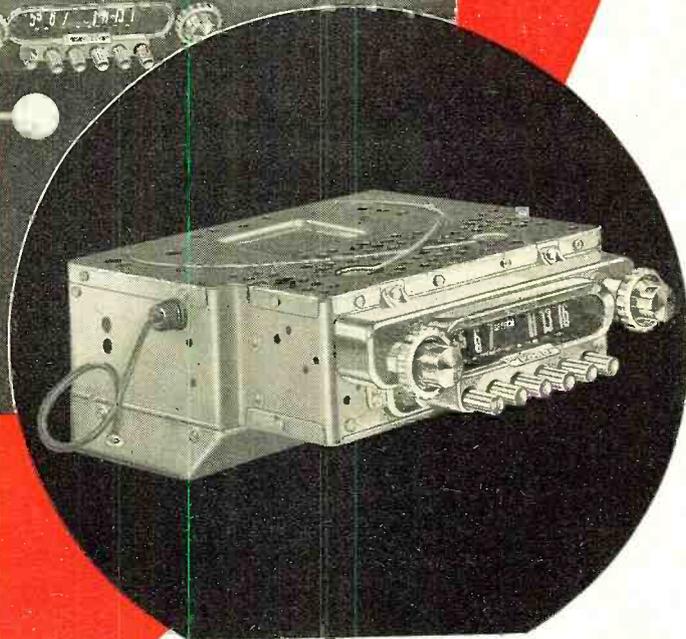
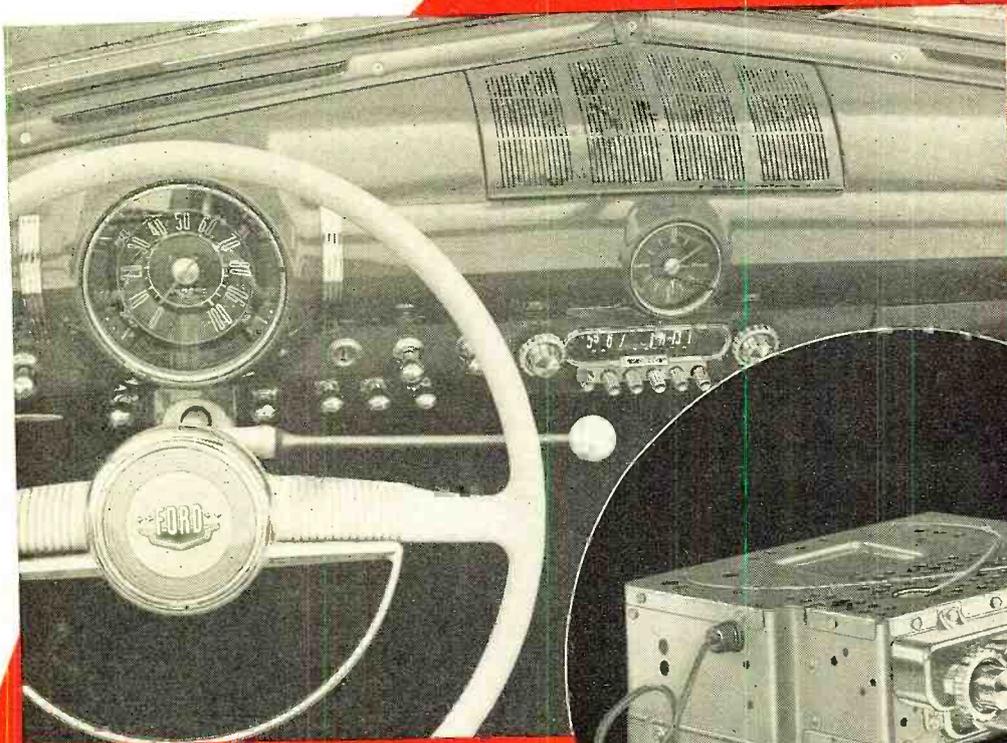
A high-voltage, corona shielded, tuned transformer assembly which includes octal socket for use with 1B3-8016 type tubes has been developed by *Spellman Television Co., Inc.* of New York.

The filament voltage is easily adjustable through a small access hole in the bottom of the spun copper cup, allowing the tube to be used for voltages from 1 kv. to 20 kv.

This unit is designed to operate in conjunction with r.f. step-up coils of approximately 200 kc. frequency, solving the problem of research workers and experimenters in the construction of corona-free high voltage r.f. power supplies. To obtain 20, 30, 40 kv. or high voltages it is merely necessary to use doubler, tripler, or quadrupler circuit.

(Continued on page 151)

**AUTO RADIO and HYTRON go together**



"A Ford in your future?" There will probably be a fine new Ford radio receiver on the dash. Chances are good this receiver will be equipped with tubes by Hytron. For Hytron is a major supplier of Ford auto radio tubes. That is only natural. Hytron specializes in auto radio tubes -- both GT and miniature. Close engineering co-operation with leaders like Ford help make Hytron auto radio tubes leaders, too. 'Nuff said. Hytron and auto radio go together.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921.

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January, 1949

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★ ★ ★ BRAND NEW GENERAL ELECTRIC TEST EQUIPMENT AT HALF PRICE ★ ★ ★

**AUDIO OSCILLATOR**  
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**3-INCH OSCILLOSCOPE**  
SALE PRICE **\$4995**

**SILVER VOMAX**  
SALE PRICE **\$4295**

General Electric YGA-4 Audio Oscillator. Variable from 25 to 16,000 cycles. Brand new. Weight 31 lbs. Regular price \$49.50. Sale price \$29.95.

General Electric YGA-2 Sine or Square Wave Generator. Variable from 20 to 20,000 cycles. Accurate to one cycle below 33 cycles. Weight 43 lbs. Regular price \$150.00. Brand new Sale price \$59.95.

General Electric YCW-1 Capacitance and resistance Bridge. .000005 to 200 mfd. Resistance scales 5 ohms to 20 megohms. 2" meter. Weight 20 lbs. Regular price \$59.50. Brand new Sale price \$29.95.

General Electric YGS-3 AM/PM Signal Generator and Audio Oscillator. Up to 200 megacycles. Weight 43 lbs. Regular price \$195.00. Sale price, brand new \$99.50.

General Electric CRO-3A 3 inch Oscilloscope with vertical and horizontal amplifiers. Weight 35 lbs. Regular price \$98.50. Sale price, brand new \$49.95.

The ever famous Silver Vomax Model 900. Vacuum tube volt ohmmeter. Made to sell for \$59.95. Brand new now only \$42.95.

If the above information on each piece of General Electric test equipment is not enough to convince you, read our last month's advertisement in Radio News, or write for our General Electric test equipment catalog. However, don't wait too long to order. Only a few hundred pieces of each type are available.

**1948 MODEL—MIKE—BROADCASTER ONLY \$7.95**

Broadcasts 800 to 1500 KC from either a phonograph pick-up or a crystal or dynamic mike. Makes any radio receiver a P.A. system, record player or recording amplifier. Gives broadcast quality. Has fader control from mike to record, simulating a regular broadcast station. This is a powerful model; using 2-35B5, 12SJ7 and 35Z5 tubes. Priced with tubes and connecting instructions. Works on 110 volts AC-DC. Crystal mike and desk stand \$4.95 extra. Model DE-5 truly a de-luxe-mike-phonoscillator.



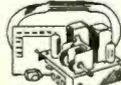
**3-TUBE PHONO. OSC. ONLY \$4.95**

Model DE-4—Phonograph oscillator. Broadcasts from 800 to 1500 KC. Gain for any crystal or A.I. pick-up. A new powerful circuit is used to assure plenty of power. Has variable gain control for proper modulation. Priced with tubes ready to operate, two 50B5 and 31W4.



**SUPERHET BROADCAST TUNER \$7.95**

Broadcast superhet tuner for connection to any phono amplifier or P.A. system. Built on a small compact chassis with dial plate and tuning knob furnished. Requires only three connections to amplifier. Uses three miniature tubes. Loop antenna and instructions. Specify when ordering, whether tuner is to be used on AC-DC or AC type amplifier. If you don't specify we will ship tuner for AC type amplifier. Stock No. PAT-3. Net Price \$7.95.



**8-WATT AMPLIFIER WITH P.P. 50B5 \$9.95**

4 tube, plus rectifier, AC-DC amplifier. Push-pull 50B5 output tubes with 12SL7 Gain for mike or E.C. variable reluctance pick-up, 12SL7 Gain for conventional crystal pick-up and phase inverter. This is a nice small audio amplifier, with tone and fader control, plus inverse feedback. Furnished wired and tested, complete with tubes, 6 watts output. Ready to play. Weight 6 lbs. Model TM-5. Net price \$9.95. Crystal mike and desk stand \$4.95 extra. 8" PM speaker \$2.95 extra. G.E. variable reluctance pick-up cartridge \$4.69 extra.



**COMPLETE WIRE RECORDER \$69.95**

Portable Wire Recorder Model GN-11  
Has ready wired and tested 5 tube AC type amplifier with push-pull 6V6 tubes. Built-in eraser circuit. Input for crystal mike or phono pick-up. Diagrams show how you can record from any radio receiver. 3 position switch enables you to quickly change from record to playback or conventional P.A. system. This amp delivers 12 watts of good clean audio. Here is what you get: Webster 70 recording mechanism, with 15 minute spool of wire, attractive leatherette covered case. 6" heavy duty PM speaker and wired and tested 12 watt AC wire recording amplifier. All you do is mount the amp, recording mechanism and speaker. Simple instructions furnished. Portable Recorder Model GN-11. Net \$69.95. Crystal mike \$4.95 extra. Deluxe Portable Wire Recorder Model GN-12. Has same features as the model GN-11, as well as a larger split type leatherette covered case and a heavy duty 10 inch PM speaker. Deluxe Portable Wire Recorder Model GN-12. Net \$79.95. Crystal Mike \$4.95 extra. Recording Wire, 15 minute spool \$1.30, 30 minute spool \$1.95. 1 hour spool \$3.25. Either the GN-11 or the GN-12 wire recorder listed above may be had with the Webster wire recording mechanism or the AIR KING type wire recording mechanism which will record from a phono record. Specify when ordering which mechanism you want.



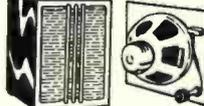
**RECORD PLAYER \$14.95**

Complete record player. Component parts shipped separately. Amp and tone control is ready wired and tested. Amplifier has four tubes, 12SQ7, 2-117Z3, 50L6. All parts are included, self-starting phono motor, crystal pickup, 6" heavy duty PM speaker and amplifier, with tone and volume control. Deluxe heavy wooden case is covered with brown leatherette and has chrome fittings and speaker grill. Stock No. CE-8. Net Price \$14.95. Super deluxe record player with push pull 705 AC type amplifier and 6 inch speaker. All you do is mount amp, in the case. Case is of the accepted type. This player should sell for \$35.00. Stock No. DL-3. Net \$19.95. Offered with Stewart Warner automatic changer. Stock No. ARO-4. Net \$27.95.



**15" THEATRE TWIN SPEAKER \$29.95**

Our sound laboratory has assembled this fine speaker combination. A super heavy duty 15" cinaudraph Alnico V PM and a University Lab. trumpet type high frequency tweeter. Ready-cut plywood baffle and cut to fit grill cloth. All you do is bolt speakers to the baffle and connect in the 1 mfd. high pass filter. This combination will take 35 watts of audio and reproduce 40 to 10,000 cps. A speaker combination of theatre quality. Stock No. BW-3L. Net \$29.95. If a baffle cabinet is desired, order the L-25 below. University Lab. high frequency tweeter trumpet with connecting instruction. Same tweeter as used on the above theatre combination. Net \$11.76. Walnut floor type speaker baffle. Size 12x22x26". Will accommodate either 12 or 15" speakers. 12" speaker cutouts in corner of grill. Weight 30 lbs. A \$25.00 value for only \$19.95. Stock No. L-25. Net \$19.95.



**SCOOP SALE ON MAGNAVOX**

A red hot McGee special. Latest 1948 production Magnavox auto radio replacement speakers. Same as used in original equipment. 8 ohm neck and standard voice coils. Every speaker is guaranteed. They will take the wallop of any car radio.  
6" square 4 ohm field..... \$2.49  
7 1/4 ohm field..... 2.98  
8" 4 ohm field..... 2.98  
6x9" 4 ohm field..... 2.98  
5000 Famous Magnavox permanent magnet Alnico 3 speakers. We are offering these first quality speakers to you, practically at manufacturers prices. There are latest 1948 production. All are guaranteed to be perfect; no rubbing cones.  
5" 8 oz. Alnico 3 magnet speaker, net..... \$1.79  
8" 12 oz. Alnico 3 magnet speaker, net..... 2.98  
10" 20 oz. Alnico 3 magnet speaker, net..... 4.95  
12" 20 oz. Alnico 3 magnet speaker, net..... 5.95

**COAXIAL 12 Inch P. M. Speaker \$12.95**

NATIONALLY FAMOUS MAKE NET  
Made by a nationally known builder of fine speakers, to sell for \$27.50 list. Offered by McGee for only \$12.95. Has a frequency response of 50 to 10,000 cycles. Alnico V magnet, 3" high frequency tweeter, built-in high pass filter. Only 2 wires to connect to any 8 ohm output. Will take 18 watts peak audio. Used on radios selling for up to \$400.00. A real McGee super value. Shipping weight 3 lbs. Stock No. 4-12X. Net Price \$12.95, two for \$25.00.



**15" "KING COAX" SCOOP PRICE \$25.00**

The King Coax. A 21.5 oz. 15 inch Alnico V. P.M. speaker with a built-in high frequency tweeter. Will respond to from 50 to 12,000 cycles. This is a ruggedly built speaker with a convenient one piece molded cone. Built-in high pass filter, hook to any 8 ohm output. Built by the maker of our ever popular 12 inch coax model 4-12X. This speaker has a retail list of over \$60.00. We offer you our 5-15X 15 inch coax for only \$25.00. Weight 20 lbs.

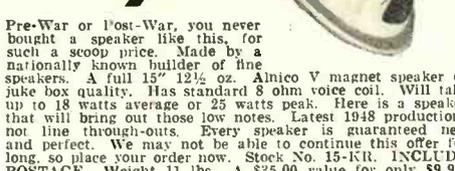
**OUR LEADER 12 INCH COAXIAL P.M. \$9.95**

Model 12-1N—Our leader 12" coaxial P.M. speaker, with 3" tweeter. Equal to above model 4-12X except tweeter will not respond to as high a frequency. Matching network is built-in; hook to any 8 ohm output. Will take 15 watts. Weight 12 lbs. Net \$9.95, 2 for \$19.00.

**15-INCH PERMANENT MAGNET SPEAKER SCOOP OF ALL TIMES**

Pre-War or Post-War, you never bought a speaker like this, for such a scoop price. Made by a nationally known builder of fine speakers. A full 15" 12 1/2 oz. Alnico V magnet speaker of juke box quality. Has standard 8 ohm voice coil. Will take up to 18 watts average or 25 watts peak. Here is a speaker that will bring out those low notes. Latest 1948 production; not line through-outs. Every speaker is guaranteed new and perfect. We may not be able to continue this offer for long, so place your order now. Stock No. 15-KR. INCLUDE POSTAGE. Weight 11 lbs. A \$35.00 value for only \$9.95.

**SCOOP \$9.95 PRICE**



**15 INCH 35-WATT P.M. SPEAKER \$19.95**

Model 15-LS. 15" 21 1/2 oz. Alnico V Magnet P.M. Speaker. Will take 35 watts with ease. Thousands of dollars were spent in building the fine tools to produce this speaker. The 8 ohm voice coil is 1 1/2" in diameter and has been heat treated and plastic coated. Constructed to eliminate loose voice coils, wires and wrapping. Made by a renowned builder of fine speakers. Truly the King of juke box speakers. Weight 15 lbs. Net Price \$19.95, 2 for \$36.00.

**Children's Player Kit \$7.95**

New, children's electronic player. Offered in kit form. Includes all material necessary. Attractive red plywood cabinet, self-starting phono motor and crystal pick-up, 4x6" PM speaker and parts to build 70L7 amplifier. Stock No. LI-1. Net Price \$7.95.



**Portable Player Kit Scoop \$9.95**

Deluxe portable electronic recorder player kit. Includes all parts and easy to wire diagram. Comes complete with grey leatherette portable carrying case self-starting phono motor, pickup, 5" PM speaker and all necessary parts to build 70L7 amplifier. Stock No. CK-1. Net Price \$9.95.



**12" 15 WATT P.M. SPEAKER 5 for \$22.50**

Nationally known 12" 6.8 oz. Alnico V PM, with 1" 8 ohm voice coil. Will take 15 watts. Grey finish. Our leading 12" speaker. Stock No. CH-12. Net. \$4.95, 5 for \$22.50.



Super heavy duty 12" 12 1/2 oz. Alnico V magnet PM with 1 1/4" with 8 ohm voice coil. This speaker is equal to 60 oz. of old type magnet. Will take 25 watt peak. Stock No. CH-13—\$8.95; two for \$17.00.

**POPULAR FIELD AND P.M. TYPES**

- 6" 1.5 oz. Alnico V PM speaker..... \$1.49
- 6" 2.15 oz. Alnico V PM speaker..... 1.98
- 4x6" 1.5 oz. Alnico V PM speaker..... 1.49
- 4x9" 3.16 oz. Alnico V PM speaker..... 2.98
- 10" 4 oz. Alnico V magnet PM speaker... 3.95
- 10" 7 oz. Alnico V magnet PM speaker... 4.45
- 12" 7 oz. Alnico V magnet PM speaker... 4.95
- For radio set and amplifier use, 12" 15 watt, 8 ohm voice coil Alnico V PM. A scoop for \$4.95, 5 for..... 22.50
- 4" 450 ohm field speaker..... 1.89
- 5" 450 ohm field speaker..... 1.89
- 4" 4 ohm field speaker for auto sets.... 1.89
- 5" 4 ohm field speaker for auto sets.... 1.89
- 5" 450 ohm field speaker, with output transformer to match single 50L6 tube Utah..... 1.98
- 8" 450 ohm field speaker, with output transformer to match single 6V6 tube... 2.25
- 8" 1000 ohm field speaker..... 2.95
- 6" square 1000 ohm field speaker, with 7000 ohm output transformer..... 1.95
- 12" RCA 450 ohm field speaker, ideal for console radio replacements..... 4.95
- Either 1000 ohm or 2500 ohm 12" Cinaudraph Speaker, \$4.95.

**P.M.'s—WITH OUTPUTS ATTACHED**

- 6 1/2" 1.47 oz. Alnico V PM with PP 50L6 output..... \$1.95
- 5" 1.47 oz. Alnico V PM speaker with 50L6 output..... 1.49
- 5 1/2" Utah, 2.15 oz. Alnico V PM speaker with output transformer to match 3Q5 tube..... 1.95
- 4"x6" Alnico V PM with 50L6 trans.... 1.69
- 4" 1.47 oz. Alnico V PM with 50L6 trans... 1.49

**P.M.'s—WITH ADJUSTABLE CONES**

The voice coils on these speakers are mounted to an adjustable metal rim, that can be shifted several thousandths of an inch. The cream of the speaker production. Nationally famous maker. More output per watt.  
5 1/2" 1 1/2 oz. Alnico V magnet P.M..... \$1.49  
5 1/2" 2.15 oz. Alnico V magnet P.M..... 1.98  
6" 2.15 oz. Alnico V magnet P.M..... 2.98  
6" 3.16 oz. Alnico V magnet P.M..... 2.98  
8" 2.15 oz. Alnico V magnet P.M..... 2.98  
8" 3.16 oz. Alnico V magnet P.M..... 3.98  
12" 7 oz. Alnico V magnet P.M..... 6.95

**EASY TO FIT IN—P.M. SPEAKERS**

McGee offers the answer to your replacement speaker problems. All fully guaranteed first line run (not odds and ends), with Alnico V magnet and standard RMA 3.2 ohm voice coils. Cadmium plated with dust cover. The small size pots make them adaptable to tight places. All have the same size magnet width and depth. 2 1/4" pot size only 1 1/4" by 1 3/4". Packed 24 to the case.  
4" square frame 1 oz. magnet speaker..... \$0.99  
5" round frame 1 oz. magnet speaker..... .99  
5" round frame 1 1/2 oz. magnet speaker..... 1.19

**McGEE RADIO COMPANY** ORDER FROM THIS AD PRICES F.O.B. K. C. SEND 25% DEPOSIT—BALANCE C.O.D. 1225 MCGEE ST., KANSAS CITY, MISSOURI

**RADIO & TELEVISION NEWS**

# McGee Offers Complete Radio and Amplifier Kits for the Student and Engineer

## BUILD THIS 8-TUBE HI FIDELITY RADIO AND AMPLIFIER

- 8-INCH SLIDE RULE DIAL • RECEIVES BROADCAST and 19 to 49 METERS • PUSH PULL OUTPUT TUBES • BASS BOOST TONE CONTROL • EVERYTHING FURNISHED • CHASSIS SIZE 9 1/2 x 11 x 8" HIGH • BEST RADIO KIT VALUE IN THE WORLD



8-Tube Kit \$37.95

Here is something new in radio. A real 15 watt power amplifier with bass and treble controls. Has extra gain stage for crystal or dynamic mikes. And on the same chassis, a standard superhet radio receiver. We furnish all parts, knobs, esoucheau plate and tubes: 6SA7, 6SK7, 6SN7, 6S7, 6S7, two 4V6 and 5Y3. No cabinet. Extra care in designing the power supply section assures low hum level, making this unit ideal for recording as well as P.A. use. We furnish everything as well as schematic diagram and photos of the completed chassis. Weight 35 lbs. **\$29.95**

PRK-24. Radio-Amp. Kit with 12" P.M. speaker. With tubes... Net **\$37.95**

PRK-15. Exactly the same kit as the PRK-24 kit, except it is furnished with a 12" Cinaudagraph wide range speaker. (Has built-in high frequency tweeter.) **\$37.95**

This is our finest kit.

## GAROD PERSONAL RADIO KIT, \$14.95

Size 5 1/2 x 3 1/4 x 4 1/8—Weight 3 1/2 Lbs. Simple Assembly and Wiring Instructions



This kit is ready for immediate delivery. The same nationally known factory that manufactures tens of thousands of this radio is here producing this radio kit for us. Every part, from the cabinet down to the last resistor, is matched. The chassis is ready punched; all you do, is mount the parts and wire. This radio kit will assemble into a beautiful personal radio for you, just the same as it does for the factory. We furnish you a diagram, photograph of the completed chassis and full assembly instructions so that those with a minimum knowledge of radio may wire this kit. The beautiful case is made of metal with plastic hinged lid and snap-on back. The tube face of the receiver has an inlaid gold design. The circuit is the conventional lucite face type, with A.V.C. Receives the broadcast band 540 to 1650 KC. two gang superhet type, with A.V.C. Receives the broadcast band 540 to 1650 KC. Uses miniature tubes: 1H5 converter, 1S5 detector, V.C. 1T4 amplifier and 3S4 power amplifier. Alnico V P.M. speaker. The loop antenna is built in the lid. Radio comes on automatically when lid opens. Operates on self-contained batteries. (Not A.C.-DC). Nothing else to buy, tubes and 67 1/2 volt battery and flash cell (Not A.C.-DC).

Model X-45. Price **\$14.95**. Include Postage for 6 lbs. Scoop Model X-45 Personal Portable Kit Wired and Tested With Batteries. Net **\$17.95**

## 12-WATT AMP. KIT, \$10.95

KIT MODEL AC-12. 12 watt amplifier kit. Ideal for high quality record player as well as public address or recording amplifier. Matched component parts, ready punched chassis pan. One control fades from phono to microphone. Gain enough for crystal or dynamic microphone. 100 mil power transformer, for 110 volt AC 60 cycle operation. Priced complete with tubes: 2-6V6, 6SN7, 6SH7 and rectifier. Diagrams and photos furnished. Kit AC-12. Net **\$10.95**. 12" Alnico V P.M. speaker \$6.95 extra. Crystal microphone and desk stand \$4.95 extra. The above AC-12 amplifier wired and tested ready to operate net **\$14.95**. Special Stock No. AC-125. 12-inch Alnico V P.M. speaker \$5.95 extra. Crystal mike and desk stand \$4.95.

## WALNUT ARM CHAIR CABINET, \$29.95



WILL HOUSE CRP-15 KIT Beautifully made walnut armchair cabinet. Outside dimensions 24" high, 16 1/2" deep and 27" wide. Ample room for radio receiver 14" long, 9" high, and 10" square. Will accommodate speaker up to 12". Has record album storage compartment. Hinged lid covers changer compartment. Cabinet AL-15. Net price **\$29.95**. General instrument changer \$14.95 extra. Armchair cabinet in blonde finish. Net price **\$34.95**.

## DELUXE 30-WATT AMP. KIT, \$29.95

Kit model RA-30. A complete 30 watt high fidelity push pull 6L6 amplifier. Ready punched chassis, with cover to match. Beautiful ovalscent finish. Input for two mikes and crystal pick up. Perfect for the new GE VR Card. Slide. Twin tone controls bass and treble. Inverse feed back. Heavy duty output trans for 4, 8, 16 and 500 ohm. Everything furnished including diagram and tubes 2-6S7, 2-6C5, 2-6L6, 5V4. Worth twice our price. Buy an arm chair will be proud of. Kit model RA-30. Net **\$29.95**. Furnished with a merit impregnated and shielded wide range output transformer with 5, 16, 250 and 500 ohm secondary \$5.00 extra.

## 20-WATT AMP. KIT, \$17.95

Build this 20 watt utility 110 volt AC 20 Watt power amplifier. Ready punched chassis, size 12 x 6 x 2 1/2 inches. Has two input circuits, one mike and one phono. Mike stage has 135 DB gain for crystal or dynamic mike. Has bass and treble control. Designed for use with 100 mil power transformer. All parts and easy-to-follow diagram furnished, including tubes: 2-6SN7, 6J7, 2-6L6GA, 5Z3. Kit Model 20-LX. Net **\$17.95**.

## JUKE BOX AMP. KIT, \$24.95

Juke Box amplifier kit. Model KV 7. All the necessary parts and tubes to build a juke box type amplifier. Has push pull tube tubes in the output. Proper tone control circuits. Super heavy duty power transformer, choke and output trans. Everything furnished including tubes, diagram and photo. Inputs for mike variable reluctance pick or crystal pickup. Gives 25 watts of power. Scoop price **\$24.95**.

## 6-110 VOLT POWER SUPPLY KIT, \$14.95

New utility power supply kit. Works on either a 110 volt storage battery or 110 volts AC. Furnishes power for a 25 watt amplifier and will run 6-110 KR complete with diagram **\$14.95**. 6-110 volt 60 cycle vibrator only **\$5.95**. Thermador 6-110 power transformer **\$5.95**.

## Complete Intercom SCOOP PRICE \$14.95

The nicest Inter-com you have ever seen. Made by a top quality manufacturer. A complete two-station unit with 50 feet of connecting wire. Sub-station and Master are black plastic case size 8 x 6 x 5 inches. Made to sell for **\$25.00**. Stock No. DG-29. Sale Price **\$14.95**.

## \$59.50 Value Musical Amp., \$24.95

8 watt musical amplifier, 4 tube AC type. Inputs for crystal or dynamic mike and phono or instrument pickup. 2 gain controls and tone control. Attractive leatherette covered case. Made by a large manufacturer to sell at \$59.50. Brand new, fully guaranteed. For 110 volt AC operation. Our scoop price, **\$24.95**. Stock No. XR-3. Contact instrument pickup. **\$6.95** extra. Deluxe instrument pickup with volume control, **\$8.95** extra. Crystal mike and desk stand **\$4.95**. Shipping weight, 20 lbs.

## 3-TUBE MUSICAL AMP., \$19.95

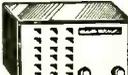
In same deluxe case as the model XR-3 shown above. Has same features except it is designed for instrument pickup only. No input for mike. Stock No. XR-22. Net **\$19.95**.

## 4-TUBE T.R.F. KIT BARGAIN SPECIAL \$6.95



4 tube AC-DC, TRF radio kit. Ideal for students and beginners. Every part furnished to build this kit, including tubes, diagram and photos. Has Alnico V P.M. speaker and tubes 12SK7, 12SJ7, 50P5 and 35W4. Plastic cabinet with airplane dial. Receives broadcast 550 to 1600 KC. This is the easiest type of radio to build. Kit Model TP-4. Weight 6 lbs. Net **\$6.95**.

## DELUXE 5-TUBE AC-DC KIT OUR LEADER \$9.95



Made from Detrola Components A full size 5 tube superhet radio kit housed in a 13 inch wood cabinet with full plastic front. Lighted slide rule dial. Incorporates a standard 2 gang superhet circuit. Loop antenna, ready punched chassis, etc. This is another one of our fine production radio kits. Every part is furnished including tubes, 14Q7, 14B6, 1437, 50B5 and 35V4. Diagrams, photos and instructions are included. Priced complete with Receives broadcast 550 to 1650 kc. Weight 9 lbs. Kit model TF-6B. Net **\$9.95**. Model TF-6B wired and tested. Net **\$14.95**.

## 8-TUBE, 2-BAND Basic Parts Kit \$6.95

Detrola basic parts kit. We furnish pieces listed, you furnish tubes and small parts. You get cadmium plated ready punched chassis; for up to eight tube receiver, size 14 x 5 1/2 x 2 1/2 inches. 6" slide rule dial, a pair of 456 kc. I.F. transformers, 3 gang tuning condenser, band switch and coils with trimmers, for broadcast band and 6 to 18 mc band, loop antenna and a diagram to build an eight tube radio with RF stage. Scoop price, Stock No. DBK-8. Wt. 10 lbs. Net **\$6.95**.

## GAROD DELUXE 5-Tube Kit \$12.95

This is our latest and finest AC-DC radio kit. Receives Broadcast, 540 to 1650 KC. Has full 100% illuminated slide rule dial. Choice of Ivory or Walnut plastic cabinet. Full high efficiency 2 gang superhet circuit, with loop antenna, and part kits. Everything furnished, including tubes, 6S7, 12SK7, 50B7, 50B5 and 35V4. This kit will go together just like it would on the production line. Diagram, photos and instructions are furnished. Shipping weight 9 lbs. Kit model XA-49. Net **\$12.95**.

## 100 CARTONED AND GUARANTEED RADIO TUBES for only \$35.00

Popular GT tubes. All individually cartoned and branded Hy-Vac. Guaranteed best quality. Full replacement. These tubes meet the ever-growing need for low-cost service replacement and counter sales. Over 800,000 sold. A scoop item for the service dealer.

39c EACH IN SMALLER QUANTITIES

117P GT 3V4	5V3 GT 25L6 GT 1T4	12SF7 6X4	6C4
32L7 GT 6C5	6K6 GT 7017 GT 1L4	6F5 6B16	6A7
12A8 GT	6Q7 GT 117L7 GT 1U4	6J5 6AK5	6AG6
12K7G GT	6V6 GT 117Z3 1R5	6S7 6B6	
22E6 GT	12SQ7 GT 6X5 GT 12A7E	156 12SJ7	80
6A7	6SA7 GT 12BA6	3Q4 6A5	12A16
47	35Z5 GT 6SD7 GT 12BE6	354 6A7	12A17
12F5 GT	6SK7 GT 354 1B4	6S7 50B7	19T8
658 GT	6K7 GT 5B85 12K8	6BA6 6BE6	1258
6P5 GT	6A8 GT 6SQ7 GT 50B5	12A6 6A7E	6AL5

## 75% OF THE TUBE YOU USE, 49c EACH, GUARANTEED NAME BRANDS CARTONED AND UNCARTONED

12AH7 6C5	6S7 6SR7	12SG7 6R7	35Z5 GT 6K5 GT
27 6H6	6F7 6V6 GT	12SH7 6L7	35W4 6A3
26 6J5	6SQ7 6X5 GT	12S7 7Z4	50B5 6B3
78 6K7	6SH7 12S7	12SA7 12SQ7	2525 2051
76 9001	6S7 12A7E	12SL7 12S7R	2526 2525
5U4G 9002	12BA6 12SC7	50L6 6D6	6B4 6C4
5Y3G 9003	6SL7 12BE6	1T4 12SK7	6C6
6AC7 1625	6SG7 12H6	1R5 25L6 GT	6J7
	6SA7 6SN7	12J5 GT 155	35L6 GT 7
35Y4 1407	7E5 7H7	7B6 7F7	7C5
14A7 14B6	7E7 7C7	7A7 7N7	7Z4

Sylvania or Equal. 1LN5, 1LD5, 1LH4, 1LC6, 1LA6, 1LB4, 1LC5, 3LE4. @ 59c. 10 for \$5.50.

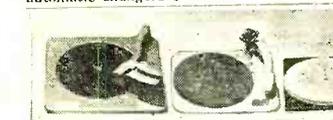
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New Metal WAA 6L6 (Rusty). Each, 49c. 10 for \$4.50.

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## PHONO-MOTORS, \$1.98

Standard 78 RPM phono motor with turntable **\$1.98**. Deluxe 78 RPM phono motor with turntable **\$2.95**. General Industries Kit 4 regular \$15.00. 1st motor with weighted turntable 78 rpm, net **\$5.95**. Dual speed rim drive for reg. and LP records **\$4.95**. Replacement phono motor for automatic changers **\$1.49**.



AERO \$12.95, DETROLA \$12.95, G. I. \$14.95, FARNSWORTH \$19.95, VM-400 \$19.95, SEEBURG \$29.95



Get in on McGee's big January sale of automatic record changers. A good supply of every one advertised at unbeatable values.

Latest Aero changer, made for Stewart-Warner. Equipped with the popular Webster high list bouncing pickup cartridge. Plays 10 1/2" or 12" records automatically. Base size 12x13". Scoop price **\$12.95**.

Ever popular Detrola changer. Base size 11 1/2"x12". Plays 10 1/2" or 12" records automatically. A scoop price **\$12.95**. 2 for **\$25.00**.

General Instrument automatic changer. Base size 10 1/2"x12". Plays 10 1/2" or 12" records automatically. A real value at only **\$14.95** each.

Farnsworth, 2 post automatic changer; complete with new variable reluctance cartridge. Net price, each **\$19.95**.

V-M 400, twin post automatic record changer, will intermix 10" and 12" records. Scoop price, each **\$19.95**.

Famous Triple Post Seeburg intermix automatic changer, will play 10" and 12" records together. Net price, each **\$29.95**.

Leatherette covered bases designed to fit any of the above changers **\$1.95** extra. Specify type of changer when ordering base.



## SAVE ON PICK-UPS CARTRIDGES AND V.R. AT MCGEE

Astatic MLP-1 cartridge used in Webster Chicago and many other original equipment changers, with needles **\$1.49**.

Astatic MLP-2 improvement over the MLP-1. Has quiet type QT needle, no surface noise. Scoop price **\$1.95**.

Standard L-10, L-26, cartridges, old standbys, thousands in use. Complete with rest clip. Each, **\$1.49**.

Astatic L-70, L-75, cartridges or Shure Equal. Each, **\$1.49**.

Astatic L-72A 3 1/2 volt output, used in one hung record players, etc. Also where tone networks are used, **\$1.69**.

NI-1 Nivon cartridge with permanent, but changeable needle. **\$3.29**.

RCA magic-tone cell, with permanent sapphire needle. Modernization kit replaces 95% of old cartridges in RCA radio phonographs, built during 1938 and later. 4 page instruction book included. A scoop at only **\$1.95**.

Astatic QT 3-M cartridge with silent needle response to 10,000 CPS. Reg. \$8.40 List. Scoop price, **\$3.29**.

## COMPLETE PICK-UPS—NAME BRANDS, \$1.95

Complete arm with cartridge of normal output and weight. Shure Astatic or Webster. Our pick as available. Net **\$1.95**.

Complete extra lite weight arm with cartridge of normal output. Shure or equal. Net **\$1.95**.

# McGEE RADIO COMPANY ORDER FROM THIS AD SEND 25% DEPOSIT—BALANCE C.O.D. PRICES F.O.B. K. C. 1225 MCGEE ST., KANSAS CITY, MISSOURI

January, 1949

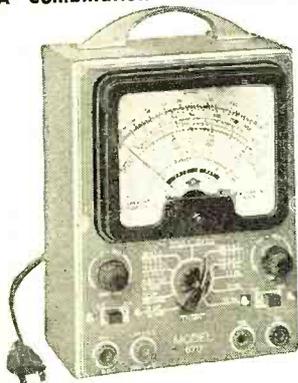


**MONEY BACK GUARANTEE** — We believe units offered for sale by mail order should be sold only on a "Money-Back-If-Not-Satisfied" basis. We carefully check on the design, calibration and value of all items advertised by us and unhesitatingly offer all merchandise subject to a return for credit or refund. You, the customer, are the sole judge as to value of the item or items you have purchased.

**THE NEW MODEL 670**

**SUPER METER**

A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS



D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500. A.C. VOLTS: 0 to 15/30/150/300/1500/3000 Volts. OUTPUT VOLTS: 0 to 15/30/150/300/1500/3000. D.C. CURRENT: 0 to 1.5/15/150 Ma.; 0 to 1.5 Amps. RESISTANCE: 0 to 500/100,000 ohms, 0 to 10 Megohms. CAPACITY: .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for electrolytics). REACTANCE: 700 to 27,000 Ohms; 13,000 Ohms to 3 Megohms. INDUCTANCE: 1.75 to 70 Henries; 35 to 8,000 Henries. DECIBELS: -10 to +18, +10 to +38, +30 to +58.

The model 670 comes housed in a rugged, Crackle-finished steel cabinet complete with test leads and operating instructions. Size 5 1/2" x 7 1/2" x 3".

**2840**  
net

**THE NEW MODEL 770—AN ACCURATE POCKET-SIZE**

**VOLT OHM MILLIAMMETER**

(Sensitivity: 1000 ohms per volt)  
**FEATURES:**



Compact—measures 3 1/8" x 5 7/8" x 2 1/4". Uses latest design 2% accurate 1 Mil. D'Arsonval type meter. Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. Housed in round-cornered, molded case. Beautiful black etched panel. Depressed letters filled with permanent white, insures long-life even with constant use. Specifications: 6 A.C. VOLTAGE RANGES: 0-15/30/150/300/1500/3000 volts. 6 D.C. VOLTAGE RANGES: 0-7 1/2/15/75/150/750/1500 volts. 4 D.C. CURRENT RANGES: 0-1 1/2/15/150 Ma., 0-1 1/2 Amps. 2 RESISTANCE RANGES: 0-500 ohms. 0-1 Meg-ohm.

The Model 770 comes complete with self contained batteries, test leads and all operating instructions

**1390**  
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**THE MODEL S-35—A POWERFUL**

**REFLEX PROJECTOR**

COMPLETE WITH BUILT-IN DRIVER UNIT CONSERVATIVELY RATED AT 35 WATTS—HANDLES UP TO 55 WATTS WITHOUT BLASTING. DRIVER UNIT MFG. BY WESTERN ELECTRIC

Heavy gauge aluminum in the main trumpet section completely eliminates blasting and blaring. New plastic diaphragm overcomes the resonant peaks of the old type; also it is absolutely impervious to atmospheric changes whereas the old type was subject to atmospheric corrosion. Complete unit unconditionally guaranteed for one year.



**SPECIFICATIONS:**

POWER (CONSERVATIVE)—35 WATTS; AIR COLUMN—3 1/2 FT.; DISPERSION—80°; POWER (PEAK)—55 WATTS; BELL DIAMETER—1.5"; IMPEDANCE—8 ohms; FREQUENCY RANGE—130 to 5000 C.P.S. PROJECTION—1/2 mile; FINISH—Attractive two tone crystalline.

The Model S-35 Comes Complete with Built-in Driver Unit, ONLY

**2850**  
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**THE MODEL 88—A COMBINATION**

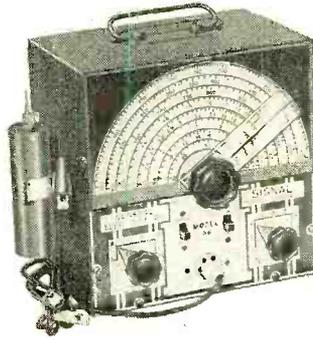
**SIGNAL GENERATOR and SIGNAL TRACER**

**SIGNAL GENERATOR SPECIFICATIONS:**

- Frequency Range: 150 Kilocycles to 50 Megacycles.
- The R.F. Signal Frequency is kept completely constant at all out-put levels.
- Modulation is accomplished by Grid-blocking action which is equally effective for alignment of amplitude and frequency modulation as well as for television receivers.
- R.F. obtainable separately or modulated by Audio Frequency.

**SIGNAL TRACER SPECIFICATIONS:**

- Uses the new Sylvania 1N34 Germanium crystal Diode which combined with a resistance-capacity network provides a frequency range of 300 cycles to 50 Megacycles. The Model 88 comes complete with all test leads and operating instructions. ONLY



**2885**  
net

**THE NEW MODEL 247**

**TUBE TESTER**

Check octals, loctals, bantam jr. peanuts, television miniatures, magic eye, hearing aids, thyratrons, the new type H.F. miniatures, etc.

**Features:**

- ★ A newly designed element selector switch reduces the possibility of obsolescence to an absolute minimum.
- ★ When checking Diode, Triode and Pentode sections of multi-purpose tubes, sections can be tested individually. A special isolating circuit allows each section to be tested as if it were in a separate envelope.
- ★ The Model 247 provides a super sensitive method of checking for shorts and leakages up to 5 Megohms between any and all of the terminals.
- ★ One of the most important improvements, we believe, is the fact that the 4-position fast-action snap switches are all numbered in exact accordance with the standard R.M.A. numbering system. Thus, if the element terminating in pin No. 7 of a tube is under test, button No. 7 is used for that test.

20% DEPOSIT REQUIRED ON ALL C.O.D. ORDERS



ONLY

**\$29<sup>90</sup>**  
NET

Model 247 comes complete with new speed-read chart. Comes housed in handsome, hand-rubbed oak cabinet sloped for bench use. A slip-on portable hinged cover is indicated for outside use. Size: 10 3/4" x 8 3/4" x 5 3/4". ONLY

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Covers all auto  
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mid-1930's to  
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ing mobile FM.



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## SERVICING THE MODERN CAR RADIO by A. L. Hurlbut

Second edition, 702 pages,  
8½ x 11, 222 illus., over 500  
schematic circuit diagrams of  
auto radio receivers, \$7.50

Here—written by a practical auto radio expert of 20 years' standing—is everything to help the beginner or experienced serviceman gain profitable skill in the fast-growing field of car radio servicing. A complete guide to the work. Book not only describes installation, testing, and repair methods fully, but also gives needed special facts of car radio circuits, differences between car and home radio servicing problems, shop set-up and business-getting ideas, etc. Particularly valuable for busy servicemen is the array of over 500 diagrams of specific circuit details on a large percentage of sets you may be called upon to repair.

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for alert servicemen, says A. A. Ghirardi,  
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able to mount them on anything at all, merely make neat connections, smoothly soldered, to guard against possible corona discharge effects, and slip a piece of large diameter spaghetti over the whole assembly. Be sure the assembly does not lie closer than ½ inch to any other object, otherwise arcing through the spaghetti to ground might occur.

It is urgently advised that when any work is done on a television set, particularly the high voltage supply circuit, that a ground lead be clipped onto the chassis and to the anode cap and lead. Since there is no bleeder in this circuit the filter condenser and picture tube capacity can hold a hefty charge for an hour or more, and contact with any part of the high voltage circuit may shock or startle the serviceman enough to cause damage, either to himself or to the picture tube. Merely shorting the high voltage line to ground with a screwdriver momentarily is not sufficient, since there is also energy stored in the supply transformer stray capacity to ground, and this will leak through to the d.c. side of the rectifier and cause another charge to appear there even after the high voltage line has been once discharged. Thus the necessity for leaving the grounding connection on all the time one may have contact with any exposed high voltage point.

—30—

### Sweep Generator (Continued from page 53)

consideration need be given this. The first receiver circuit is in itself selective enough to pass only the desired frequency, and most certainly reject a frequency removed by some 90 mc. There is one other aspect that has to be considered. The selection of 55 mc. was the lowest practical frequency for the f.f.o. that would not throw a second harmonic in the FM band of 88 to 108 mc. If for instance the f.f.o. center frequency was 52 mc. the second harmonic would land at 104 mc. We would have a frequency modulated signal in the FM band whether we liked it or not, as there is no shielding provided in the unit. The user must be cautioned about one thing in the final application of this instrument for FM r.f. alignment. This is that the v.f.o. is operating throughout the range of 32 to 54.7 and is capable of generating an unmodulated harmonic in the FM band. As we previously pointed out the frequencies have been carefully chosen, and any variation would involve computing all the variables discussed above. To illustrate the case where the frequency swept sum of 100 mc. was being used for r.f. alignment. To produce this the

### AN EASILY-BUILT CAPACITY DETECTOR

BY ANDRE BOURGET, VE2VP

A FEW months ago the author built a capacity detector which has proven to be so satisfactory that the circuit is being described in the hope that it may be of use to other readers.

The principle involved in this circuit is as follows: A standard oscillator feeds a sharp-tuned circuit which is tuned to the same frequency. The r.f. is then detected and sent as a d.c. control voltage to the grid of a second tube. The tube being controlled then operates a relay in its plate circuit. When the oscillator changes frequency because of a change in capacity between its control wire and the ground, the voltage developed by the rectifier drops and

the relay operates.

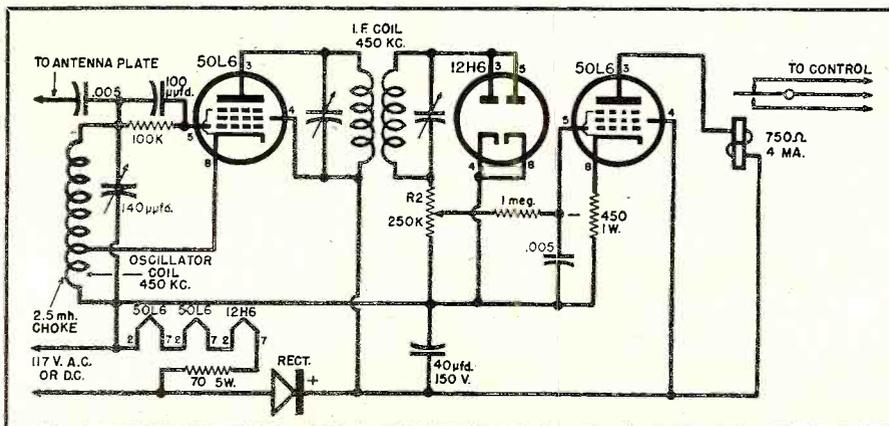
By adjusting R<sub>2</sub> at the critical point, it was found that the apparatus was sensitive enough to detect the passage of a person as far away as three feet from the plate (four inches square) connected to the control wire.

The principle is simple and the circuit uses standard parts which can be purchased in any radio shop. The complete apparatus costs less than \$5.00 to build.

This circuit can be made to operate at other frequencies than the ones indicated if it is found that the operation of the circuit interferes with broadcast reception in any way.

—30—

Circuit diagram of the capacity detector. If a 2.5 mh. r.f. choke is used for the oscillator coil, it should be tapped at 1 pi from the ground end. A conventional 455 kc. b.f.o. oscillator coil may be used in place of the above.





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THIS basic CREI Servicing Course paves the way to greater earnings for you. Since 1927 thousands of professional radiomen have enrolled for our home study courses in Practical Radio Engineering. Now, CREI supplies the answer to the need for a Practical Servicing Course. You do not have to be, or want to be, an engineer to benefit from this course. It is written for you—the average good serviceman! It's not too elementary for the experienced. It's not "over the head" of those who have limited experience—if they have real ambition and natural ability.

CREI developed this course at the request of several large industrial organizations. The urgent need of capable, trained servicemen is one of the big problems of the industry. Hundreds of thousands of Television

Receivers will be marketed in 1949. By 1951 two million TV units are expected to be flowing into American homes. With Television comes FM receivers and circuits. This new field demands a tremendous increase in the number of properly trained television and FM technicians to install and service this equipment.

**CREI EQUIPS YOU TO INSTALL AND SERVICE ALL TYPES OF TELEVISION AND FM RECEIVERS**

Now . . . with the help of this new CREI streamlined Service course you can move ahead to unlimited opportunities in your chosen field. CREI has again taken the lead by offering a course so entirely new that for the first time in our twenty-one year history we can offer a down-to-earth course of training for servicemen. In offering this course at a popular price, CREI is enabling thousands

of the "top third" now engaged in service work to enter the ultimate profitable field of television and FM installation and service.

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January, 1949

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Please send me complete details of your new home study course in Television and FM Servicing. I am attaching a brief resume of my experience, education and present position.

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**RM-4 RECORDING MOTOR.** Heavy duty 110V, 60 cycles. Silent operating for WIRE, TAPE or DISC RECORDING & PLAYBACK. 3 3/8" sq. x 2 3/4". Less turntable, mtg. plate & reduction drive wheel. Shpg. wt. 6 lbs. Made for heavy duty and long life. Terrific buy at this price! **\$4.95**

**WIRE RECORD-PLAYBACK HEAD.** Great performance at "a steal" price! Precision built Triple-Coil (record, playback, erase), 4 pin plug-in type. Moulded bakelite housing (1 1/2" x 7/8") accurately "V" grooved for maximum Fidelity & Sensitivity. For replacement or new application. **\$6.95**

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Instant Location of Shorts. Opens Grounds at a Fraction of the Cost of High Priced Test Instruments!

Here's big news for radiomen, electricians, students! The "do-all" tester, makes trouble shooting easy and fast. Cash in on repairing irons, refrigerators, washing machines, battery chargers, vacuum cleaners, medical apparatus, lighting and wiring systems and motors of every type.

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**RESISTANCE**—50,000 ohms  
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Miniature (1" sq. x 2 1/4") Per 100. **\$0.98**  
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EXPERIMENTAL KIT of 10 assorted powerful Bar, "U," Block, Circular, etc. These assorted gems at this sensational, money saving price! **\$1.98**

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**"OUNCER" OUTPUT TRANSFORMER** (7/8" x 1 1/4"). 2000 ohm tapped double primary to voice coil. Excellent with Beam Power Tubes (50L6, 50B5, etc.) Back by popular demand at a popular price **49c**  
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A once-in-a-lifetime buy at this price. Heavy duty aluminum. Smooth ball-bearing action. For side or bottom mtg. Shpg. wt. 2 lbs. pair; 11" extension (15" overall) pair **\$1.98**  
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**More For Your Money**  
A real "Gold Mine" of useful new & dismantled radio & Electronic components for every Radioman. 17 full pounds of: Coils, sockets, wire, transformers, speakers, accessories, hardware, knobs, etc. etc. All these AND MUCH MORE. (Shpg. wt. 21 lbs.) for ONLY. **\$2.95**

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v.f.o. must be operating at 45 mc. The unmodulated second harmonic of the v.f.o. is of course 90 mc. and this will appear 10 mc. away (lower) than the desired frequency swept signal. This is not detrimental from an application standpoint, but is simply mentioned so that the user will be aware of the nature of this response if the receiver is tuned through the r.f. range while the sweep generator is left fixed.

**Oscillator Calibration**

The calibration of the two oscillators requires the use of an accurate signal generator, a signal tracer, and a short-wave receiver of some sort. These are more or less common pieces of equipment in any service shop. The authors had laboratory equipment available which made life much simpler, but the system to be described was developed and proved equally accurate. When the unit is finally constructed the output is fed into the signal tracer in parallel with the accurate signal generator. The slug in the f.f.o. coil ( $L_1$ ) is first adjusted with the calibrating generator set at 55 mc. When the proper frequency is set a squeal will be heard in the signal tracer speaker indicating that the f.f.o. and the calibrating oscillator are within audio beat of each other. This oscillator is set to zero beat and lacquer or coil dope applied to the f.f.o. slug screw to hold the set. The v.f.o. is next set in similar manner. First set the 32 mc. point by the above process, and the 54.7 mc. point by bending the back plate of  $C_6$  slightly. After these have been accurately set the dial may be calibrated. The first 15 mc. or so may be set in terms of listening to the actual beat difference in the short-wave receiver as  $C_6$  is tuned throughout its range. The receiver calibration may be rechecked against the serviceman's own standard signal generator at all points required. All required points may be lightly indicated in pencil, and most used points such as 4300, 5250, 10,700 penciled carefully. Two other frequencies namely 455 kc. and 21.9 mc. should be noted, as one is used for broad-band broadcast i.f. and the other is a standard television sound i.f. The television i.f. is nothing more than an FM receiver section, and may be aligned by conventional FM visual technique. The calibration of the oscillators is now done, and the r.f. range may be laid in in terms of the i.f. calibration, as one range is a function of the other. For example if the difference frequency of 10 mc. is considered this means that v.f.o. is 10 mc. away from the f.f.o. or 45 and 55 mc. respectively. The sum of r.f. points would of course be 100 mc. All other r.f. points may be laid in on an adjacent scale by the same simple computation.

**Sweep Width Calibration**

As previously mentioned the amount of carrier shift or swing obtained from the f.f.o. is determined by the amount of voltage applied to the

**FL-8A FILTER**

LISTEN ONLY to the Signal You WANT to Hear



Improves ANY receiver! 1020 cps Filter, connects between output of receiver and phones or speaker. Hear only ONE signal at a time. Cuts out interference and background noise. AMAZING PERFORMANCE! BRAND NEW War Surplus item. Add 15c for postage. **\$1.39**  
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110V, 60 cy. panel type has Milliammeter on front panel with tubes 6V6, 6J7, 45, 80. VR105 **\$9.95**

**PARABOLIC REFLECTORS**  
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input jack, output meter jack, 5" P.M. speaker for hum checking are plus features for added versatility.

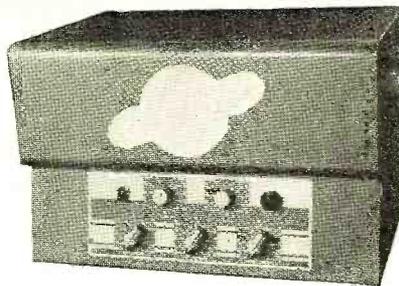
COMPLETE FOR ONLY  
**\$29.95** with probe.

## SUPER 25 WATT HI-FI AMPLIFIER KIT

Including all parts, schematic and layout diagrams, enabling you to easily build this fine, deluxe amplifier.

### FEATURES:

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Nowhere can an amplifier of comparable features be had for twice the price. This amplifier, designed from the famous Clark Amplifier, will fill 90% of all sound uses.

**\$22.95** COMPLETE WITH TUBES

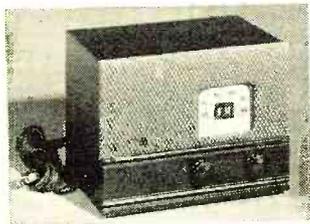
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### WITH 50L6 OUTPUT TRANSFORMER

3" PM Alnico V.....	\$1.25
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## REGENCY FM TUNER



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  - Compact
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  - Easily attached to any radio or amplifier
  - AC operation
  - 88 to 108 megacycles operation
  - Tube line up 6BE6, 6AL5, 2-6BA6; Ratio Detector type.
- PRICE..... **\$20.59**

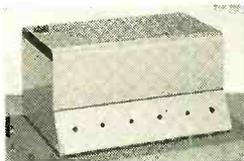
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AC plug, with rubber plug cap, screw or terminal type. 10 for **65c**. 100 for **\$5.49**.

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100 ma 6 plate Selenium Rectifier. **69c** each. 10 for **\$5.90**.

75 ma Selenium Rectifier. **49c** each. 10 for **\$3.98**.

3CPI tube with screen. **\$1.69** each. 3 for **\$4.47**.

Midget IF transformers, 456 KC, dimensions 3/4" x 2". **99c** per pair. 6 pairs **\$5.29**.

3-tube phone amplifier, built of highest quality parts, using 50L6, 35Z5, and 12SQ7. **\$4.95** with tubes.

Pick-Up Arm, Standard Crystal Cartridge, Hi-Gain, complete with hardware. **\$2.29**.

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## HEAVY-DUTY POWER TRANSFORMER

Ideal for heavy duty amplifier or small transmitter. Primary 115 volts, Secondary 6.3 V 10 amps, 6.3 V 6 amps, 5V CT 3 amps, 850V CT 142 ma, Bias 65V 142 ma. Terminal board type connections, upright mounting.

PRICE NOW..... **\$3.95**

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RA18 12 watt peak amplifier. An amplifier designed especially for home, or small audience use.



- 3 separate controls—mike, phono, treble and bass
- Output transformer for use with 4 to 8 ohm PM speakers
- Frequency response 2db from 50 to 10,000 cycles

This fine amplifier is small in size, light in weight, attractive, and operates superbly—making it adaptable to many uses.

ONLY **\$21.50**

## VULCAN SOLDERING IRON



100 watt 110-120 Volt. Complete with stand. 3/8" replaceable tip, 14" overall length. This is just the iron for general radio and electrical work.

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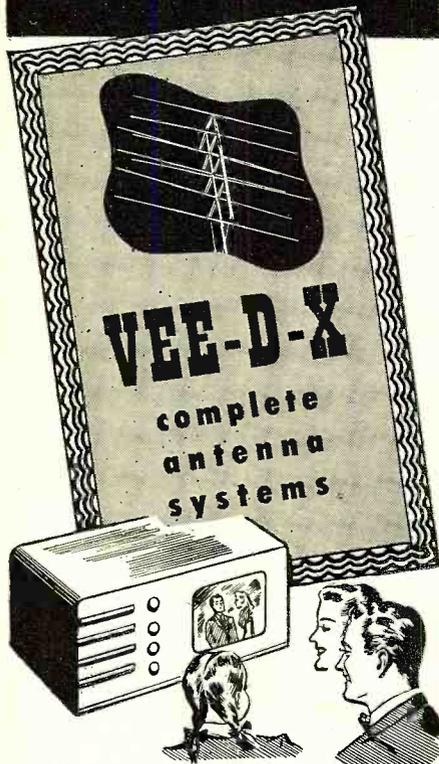
## FINEST QUALITY CRYSTAL MICROPHONE

Made by a well-known manufacturer. Comes complete with 100 feet of mike cable. This is just the mike for general sound use!

**\$5.95**

Radio Parts Company, 614 RANDOLPH ST., CHICAGO 6, ILL.

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INSURANCE is protection against personal loss . . . a VEE-D-X high gain, long range antenna is your protection against weak, spotty TV pictures. The VEE-D-X high gain means plenty of "power" to send signals booming into your receiver. No matter how good your pictures are now, a VEE-D-X installation makes them better. For consistent reception during the winter weak signal periods, replace ordinary antennas with a high gain VEE-D-X. In primary areas, VEE-D-X supplies the DGA-12, the SKY MONITOR. A broad band TV and FM antenna that has extremely flat response across the entire FM and TV spectrum.

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VEE-D-X Supplies everything for complete TV antenna systems: • High gain antennas • primary area FM and TV antennas • two and three stage pre-selectors • mast sections • all angle mount base • chimney mount • cable clamps • cable thimbles • guy wire • rotators • guy rings • guy ring collars • transmission line • stand-offs.

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# VEE-D-X

Adds more vision to television

actance modulator grid (within the limits of the straight portion of the tube characteristic). To accurately determine the amount of swing some means must be provided to give voltage steps to this grid, and a means employed to vernier each voltage value. This is accomplished by the four-step switch  $S_1$  in conjunction with the potentiometer  $R_3$ . It is seen that  $S_1$  adds resistance to the series voltage dividing circuit of which  $R_3$  is an element. As each series resistance is added less voltage is available across  $R_3$ , and consequently less swing is obtained. The reactance modulator is not a linear device vs. grid voltage as evinced by the values of resistance in the switch sections. With  $S_1$  connected to the transformer secondary 1200 kc. of swing is obtained as  $R_3$  is rotated to its extreme limit. The next step provides 600 kc.; the next 300 kc.; and the last 70 kc. This swing is practically a linear function of  $R_3$ , and if  $R_3$  is calibrated from 0 to 10 it is simple to determine the exact swing. The simplest way to calibrate the full swing of each step is again to listen to the beat difference in the short-wave receiver, and as the sweep is expanded on each step to check the end limits of the sweep with the standard signal generator. This provides an accurate calibration method, and bandwidth measurements may be relied upon once this calibration is done.

### Synchronizing Circuit

The isolating condenser  $C_{11}$  provides a 120 cycle saw-tooth wave that may be used for synchronizing purposes of the oscilloscope. If this is attached to the external binding post (external lead from  $C_{11}$ ) of the scope it will stabilize the pattern observed on the scope screen. If the scope time base is turned off this may be connected to the high side of the scope horizontal amplifier and used for direct control. In this case the "mirror image" pat-

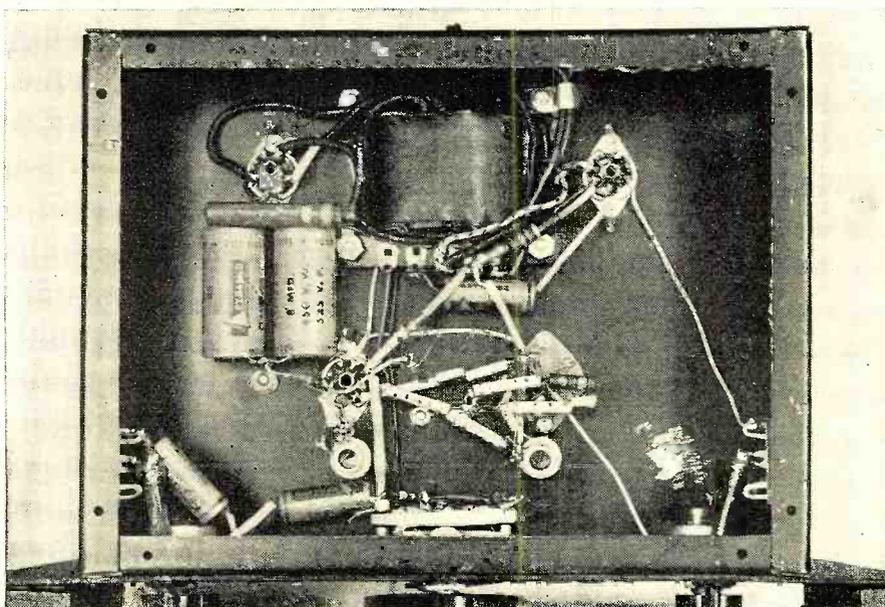
tern described in current articles covering visual alignment will be observed. This voltage is of the proper form and in exact phase with the reactance modulator voltage so that proper synchronizing or "locking" of the pattern will be realized.

### Mechanical

As illustrated by the accompanying photographs the unit was conventionally mounted on a small chassis. There is no critical wiring with the exception of the oscillator grid and plate leads. Mechanical layout is not included, as it seemed improbable that this exact conformation would be duplicated, nor need it be. The *National* dial was selected because of its excellent vernier and reset characteristics. The *National* dial or a comparable unit should be used as the accuracy of calibration is dependent on this.

The unit described was built and calibrated in two evenings. We will not attempt to give data on the frequency accuracy of this device. We were frankly amazed at the stability of the unit, and feel that whoever builds this instrument has a pleasant surprise in store in terms of an accurate FM source. Space does not permit dealing with the alignment application of FM receivers. Several excellent articles have recently appeared dealing with this phase, and the reader is referred to issues of various trade magazines for representative information. It is felt that there is a definite place in the service shop for this generator. The advantages of calibrated sweep, and a hand calibrated dial have never been available to the serviceman except at prohibitive cost. If component values are carefully followed, and the calibration procedure painstakingly done the time involved will be well spent in the realization of an extremely worthwhile instrument. —30—

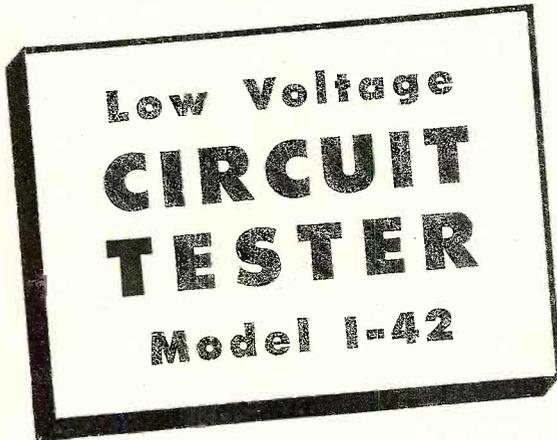
Under chassis view of home-built sweep generator showing simplicity of wiring.





# PRECISION TEST EQUIPMENT

(Government Surplus Equipment)



- ★ Here is an instrument that any mechanic that works on automobiles, boats, or airplanes would be proud to own and we offer it at a fraction of its original cost.
- ★ The low voltage circuit tester is a self-contained trouble-shooting device for making a complete and rapid check of the generator—battery circuit, including any current and voltage regulators which may be used. Battery voltage, regulator and cut-out settings, and generator performance can all be easily determined.
- ★ This tester is enclosed in a gray heavy-gauge metal box with a strong hinged top that, when opened, is supported by a slide rod and when closed, is latched by clamps. There is a carrying strap attached to the box.
- ★ This instrument was manufactured for the Quartermaster's Corps, United States Government Ordnance Department under the most rigid specifications. It is comparable in beauty and dependability to instruments made today that sell for many more dollars than our price. Electric Heat Control Company, Cleveland, Ohio, or the Heyer Products Company, Inc., Belleville, New Jersey manufactured these for the Army. Although the unit you receive may be made by either of these companies, it will be practically identical to the unit made by the other company and all are made under Heyer Products Company's design and according to Government specifications.
- ★ This low voltage circuit tester is  $11\frac{1}{16}$ " wide x  $9\frac{1}{16}$ " deep x  $7\frac{1}{2}$ " high and can be used on either a 6 volt or 12 volt system. There is a metal chart attached to the lid of each unit which is easily readable while using the instrument. This chart shows settings of all controls and gives operation instructions to be used in conjunction with the operating manual which is included with the tester. One can quickly determine and correct trouble with this instrument. There are two battery leads with drive-in connectors (with spikes—lead coated) 8' long; ammeter lead (3-wire) complete with calibrated shunt, 6' long; voltmeter leads with alligator clip connectors and rubber insulators 8' long, and field rheostat leads with alligator type connectors and rubber insulators 5' long. The direct reading meter scale 4" in diameter with color-coded scales, along with the push-button switch, voltage selector (3-circuit toggle switch), meter polarity switch, utility switch, volt-ammeter scale selector switch, field rheostat, regulator test selector switch, multisection load resistor, is used to control all operations and functions of this instrument. The master meter reads



0-60 volts and 0-60 amperes. One switch box indicator has following ranges: 0-9 volts and amperes, scale deviation—0-9 range in 1/10th of a volt, 0-18 in 2/10th's of a volt, 0-60 in 1 volt and ampere division, 0-9 in .05th of a volt and ampere.

- ★ They are brand new. Each weighs approximately 14 pounds. The price that we quote is only made possible because of the fact that they are Government surplus and this company bought them at a "steal." Remember, this is truly the finest of instruments and we cannot over-emphasize that we believe it is the best bargain ever offered.

**PRICE \$29<sup>95</sup>** **TERMS: Cash with Order**

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**CABLE CONNECTORS AND PLUGS  
All Brand New**

Manufacturer	Type	Price Ea.
	AN3101-16-10P	\$0.50
Amphenol	AN3101-18-18S	.70
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Amphenol	AN3102-28-10P	.60
Amphenol	AN3102-32-5P	.60
Amphenol	AN3106-18-11S	.65
Amphenol	AN3106-18-18P	.65
Amphenol	AN3106-24-6S	.80
Amphenol	AN3106-24-7P	.90
Amphenol	AN3106-32-5S	.65
Harwood	AN3108-14S-2S	.65
Aero	AN3108-14S-2S	.65
Cannon	AN3108-14S-2S	.65
Amphenol	AN3108-18-12P	.80
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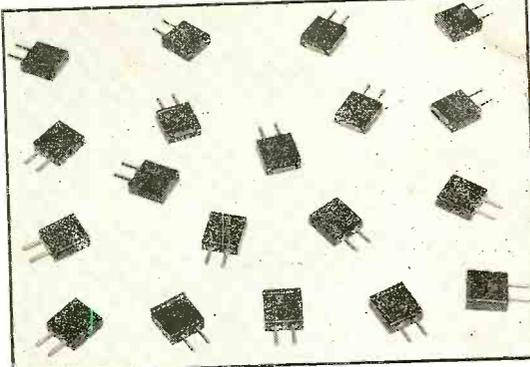


**ELECTROLYTIC CONDENSERS, ALUMINUM CANS**

30 Mfd.	450 volts	\$0.60
20 Mfd.	450 volts	.50
40 Mfd.	450 volts	.75
50 Mfd.	350 volts	.50
2500 Mfd.	3 volts	.25
1000 Mfd.	25 volts	.50
50 Mfd.	10 volts	.45
1000 Mfd.	15 volts	.45
30 Mfd.	150 volts	.35
.14 Mfd.	50 volts	.15
100 Mfd.	300 volts	.75
100-100-100 Mfd.	35 volts	.65
20-20-20 Mfd.	25 volts	.35
2000 Mfd.	50 volts	1.50

**HIGH VOLTAGE CONDENSERS**

1 Mfd. 10,000 volts Aerovox	\$15.00
.25 Mfd. 20,000 volts Aerovox	4.95



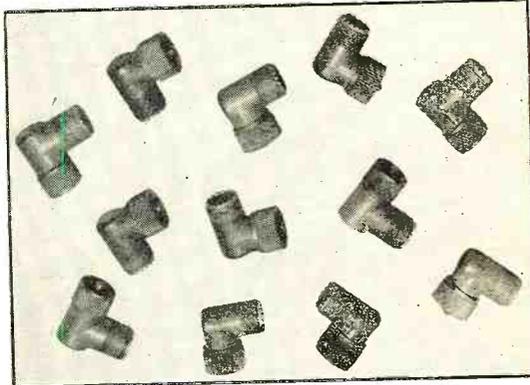
**CRYSTALS  
IN STANDARD 5-PRONG SOCKET HOLDERS**

10 Meter Ham Band	8486	\$0.75	5560	\$0.50	
7120	\$0.55	8488	.75	5810	.50
7130	.55	8520	.75	7600	.50
7140	.55	8530	.75	7670	.50
7160	.55	8540	.75	7680	.50
7180	.50	8541	.75	7690	.50
7210	.50	8542	.75	7700	.50
7220	.50	8547	.75	7710	.50
7240	.50			7920	.50
7250	.50	20 Meter Ham Band		7940	.50
7260	.50	7120	\$0.55	7950	.50
7270	.50	7130	.55	7970	.50
7280	.50	7140	.55	7990	.50
7290	.50	7180	.55	8245	.50
7300	.50	7190	.55	8248	.50
7310	.45	7180	.55	8250	.50
7320	.45			8251	.50
7330	.45	40 Meter Ham Band		8252	.50
7340	.45	7120	\$0.55		
		7130	.55		
		7140	.55	2 Meter Ham Band	
6 Meter Ham Band	8351	\$0.75	8065	\$0.75	
8356	.75	8092	.75	8100	.75
8357	.75	8104	.75	8103	.75
8360	.75	8105	.75	8106	.75
8361	.75	8108	.75	8110	.75
8362	.75	8111	.75	8114	.75
8367	.75	8115	.75	8120	.75
8400	.75	8124	.75	8126	.75
8450	.75	8127	.75	8128	.75
8451	.75	8129	.75	8130	.75
8452	.75	8132	.75		
8476	.75	8136	.75		
8477	.75	8139	.75		
8480	.75	8194	.75		
		Odd Frequencies			
		6450	\$0.50		

**A tremendous bargain—quartz crystals without holders**

Get an assortment of these and grind to your own frequencies or use them as they are. .5X.6" B-cut lapped on faces and squared on edges (Ready to use). We will give you an assortment of these from approximately 13 thousandths of an inch to 24 thousandths of an inch whereby you can grind to frequencies desired.

**An Assortment of 20 Different Thicknesses ..... \$2.50**



**AMPHENOL LOW-LOSS UHF CONNECTOR** for RG type cable. Rugged construction, heavily silver plated, provides easy assembly and positive connection. Type 83-1AP Angle Plug Adapter polystyrene insert, pin and socket—very special—20c each.  
Type 83-1R Receptacle, chassis type, low-loss Mica filled insert, very special, 30c each.

**ESSE**

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Unless Otherwise Stated, All of  
This Equipment Is Sold As Used  
**CASH REQUIRED**  
**WITH ALL ORDERS**  
Orders Shipped F.O.B. Collect

**You Can't Match these  
MID-AMERICA Values!**



**Electronic Lab  
Model 2606  
PORTA-POWER**

Ready for immediate installation to operate mobile transmitters, receivers, public address systems, etc. Requires only 6 VDC input; supplies 300 VDC at 100 MA under load. Hum-free output. Trim metal case with bumper feet; measures only 5"x3 1/2"x4 1/2". Complete with 6X5 tube. Nothing else to buy. Regular \$29.95. You save 60%!

Only  
**\$11.95**

**807 SCOOP!**

Famous-make 807's at a wonderful bargain price. Only 400 on hand, so order quick. First come, first served. Each only..... **\$1**

**BK-22-K Relay Assembly**

Part of the 269-F Direction Finder. Contains many useful parts: 12-volt DPST relay, 28-volt stepping relay with 5-deck, 6 position switch, fuse clips, terminal boards, other parts. Brand new. MA-2182, **\$2.49** only



**FM-AM and HAM ANTENNA**



AN-104-B. 1/2 wave at 100-156 MC; formerly used with SCR-522, 274-N, ARC-5. A pair makes an excellent broad-band dipole for FM reception. Coaxial connector in base. Very sturdy. Use anywhere. MA-2153..... **39¢**

**Money-Saving KITS!**

**MA-2481**—Communication knob kit for amateurs and set-builders. 18 set-screw knobs for 1/4" shafts. Many are expensive brass-insert construction. Plenty of knobs to give professional appearance to any transmitter, receiver, etc. A really terrific value..... **\$1.49**

**MA-50870**—31 miniature base pilot light sockets in a great assortment to meet every set-builder's needs. Never before at this low price..... **89¢**

**MA-2480**—40 push-on knobs in a wide variety of types PLUS a generous assortment of felt washers. Meets more replacement needs. All knobs for 1/4" shafts; no less than 3 of any type..... **98¢**

**MA-3050**—Steatite and glazed porcelain stand-off insulators. Total of 32 in 8 different types. Keep high voltage and rf away from chassis or panel. Ideal for all amateurs..... **79¢**

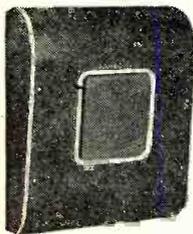
**T-17 MICROPHONE**



Famous T-17 carbon mike with built-in hiss filter. 5-foot rubber covered cable with PL-68 plug. These are used units but in perfect operating condition. Don't miss out on this great value..... **79¢**

**PARI-DYNAMIC J-61**

**Speaker Wall  
BAFFLE**



Handsome cabinet completely enclosed and finished with simulated brown leather and chrome trim. Internal sound-absorbing material corrects for high-fidelity reproduction. Takes any 6" speaker. Wonderful for homes, stores, offices, etc. Regular \$14.50. Shpg. wt. 8 1/2 lbs. Not many of these at this price..... **\$4.95**

**Order from this ad**

Quantities on above-listed items are strictly limited! You must act fast to make sure you get what you want. Send 25¢ deposit. Pay balance plus postage on delivery. Get your name and address on Mid-America's select mailing list to receive monthly bargain bulletins that give you first crack at the latest, greatest, money-saving buys in radio parts, electronic equipment, tubes, etc. Send orders and mailing list data to Desk E-19.

**MID-AMERICA CO. Inc.**

**2412 S. Michigan Avenue  
Chicago 16, Ill.**

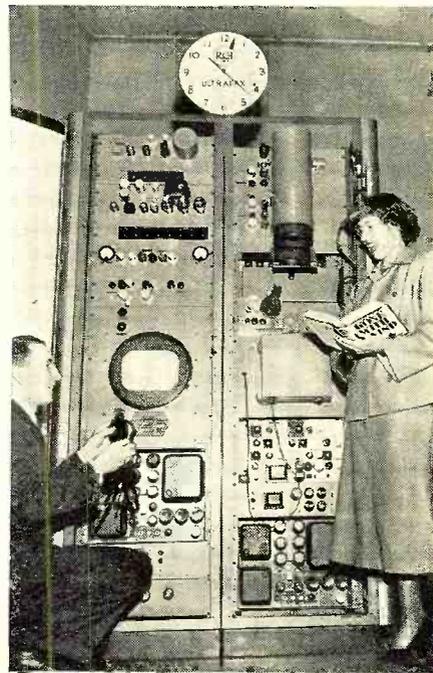
# RCA "Ultrafax" System

**A new "million words a minute" communications system demonstrated recently in Washington, D. C.**

**T**HE Library of Congress in Washington, D. C. was recently the scene of a unique demonstration of a new system of television communications which is capable of transmitting and receiving written or printed messages and documents at the rate of a million words a minute.

The demonstration of "Ultrafax" was conducted by *Radio Corporation of America*, developers of the new system. David Sarnoff, president of RCA, explained that the development presents several new and interesting communications possibilities among which are the exchange of international television programs; combined television and "Ultrafax" service for the home which would permit various types of publications to be transmitted directly to the viewer without interrupting the program being viewed; the transmission of a full-length motion picture from a single negative in the production studio to the screens of thousands of motion picture theaters throughout the country; and the possibility of a radio-mail system with vast pickup and delivery services of the Post Office Department.

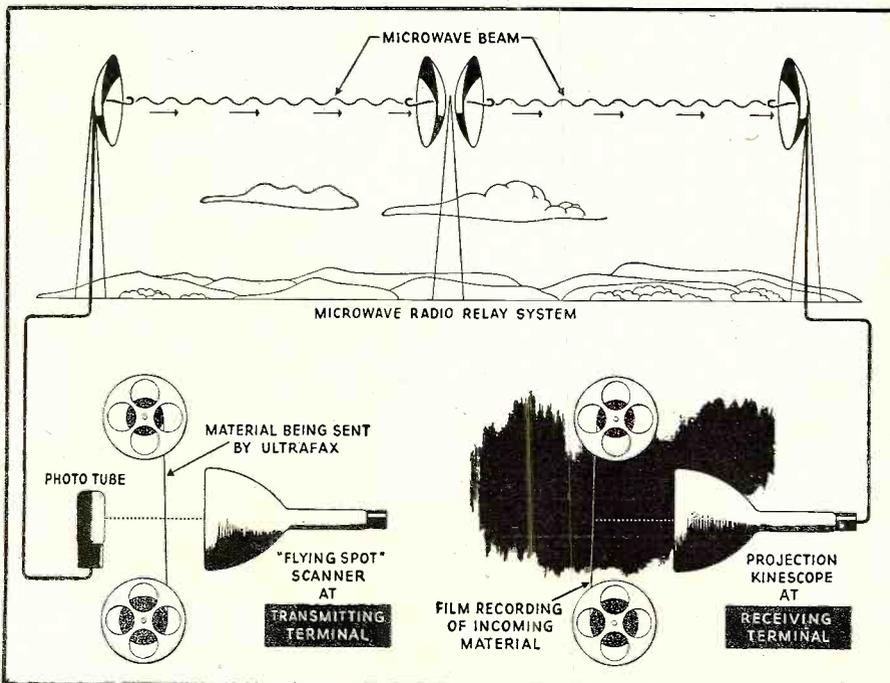
The first message to be publicly transmitted was a handwritten letter by Mr. Sarnoff. Letters from Secretary of Defense Forrestal and Wayne Coy, Chairman of the FCC, were also transmitted over the "Ultrafax" system.



Donald S. Bond, research engineer for RCA, demonstrates "Ultrafax" at the Library of Congress while Jean Montgomery looks at a copy of the 1047-page novel "Gone with the Wind" which was transmitted word-for-word in its entirety in about two minutes. Documents beamed through the air are received and reproduced as exact duplicates of the original. "Ultrafax" is an RCA development.

-30-

Operating details covering the new RCA "Ultrafax" system of high speed communication.





### "TRANSTATS"



**Amertran Voltage Regulator**  
11.5 KVA 50/60 cy. Commutator range 0-115 V. Max. Amps. 100. Reconnection diagram available for 230 V 50 A operation.

**BRAND NEW. In original Factory Cases. GUARANTEED. \$75.00**

TRANSTAT-115 VAC 60 CY. 25 KVA @ 3.17 A 103-126 V by AMERTRAN. \$9.45  
TRANSTAT-115 VAC 400 CY. 5 KVA 5.3 A 92-115 V by AMERTRAN. \$2.50  
**COMMAND SET EQUIVALENT-BC 430.** Excellent VFO using 2 Type 45's and 2 Type 10 tubes. 40 WATTS CW with one coil. (COIL RANGES: 2 - 2.5, 2.5 - 3.2, 3 - 3.6, 3.6 - 4.5, 4 - 4.8, 6 - 7, and 7.3 - 9 MC) \$7.95  
**COMMAND TRANSMITTERS-2 - 3 MC.** LN \$4.95, 3 - 4 MC. LN \$12.95, 4 - 5.3 MC. LN \$5.95, 5.3 - 7 MC. LN \$5.95  
**SALVAGE COMMAND TRANSMITTERS @ \$2.95. NO CHOICE OF FREQUENCIES.**  
**COMPASS RECEIVER-BC 433 G. FREQUENCY 850-1750 KCS 15 TUBES \$14.95**  
**SCR 173-TRANSMITTER - RECEIVER.** 2400-3700 KCS 10 W OUTPUT. W/SPARE PARTS. PHONE AND CW OPN. \$45.00  
**RA-50A WESTERN ELECTRIC RADAR HIGH VOLTAGE POWER SUPPLY-** Consists of trans. 20,000 Volts C.T. @ 750 VA. FILTERING BY .05 MFD @ 12,500 VOLTS with two 705 A S Tubes. Fil. trans. supplies 5 Volts 10 AMPS @ 15,000 VOLTS TEST. 2 1/2 x 17 x 11 1/2 @ \$49.95  
**RCA AUDIO FREQUENCY METER MODEL 306A.** Measures unknown frequencies from 0-50,000 cycles. LN. \$75.00  
**LAB METERS-4 - 1/2 scale desk type vertical 50-50 MA; 150-0-150 MA. your choice LN. \$2.50**  
**TRANSMITTER AND RELAY RACK CABINETS-** Chrome decorated, hinged door on top w/catch and hinged door on back. Amateur or W.E. notched. Black cracked, 28 1/2" high, 18" deep. Panel space 26 1/4" LN \$15 ea. 2 for \$27  
**TUNING UNITS P/GP7 AIRCRAFT EQUIP.** Pick Freq. wanted. 350 - 800 KC; 800 - 1500 KC; 4525 - 6500 KC; 6200 - 9050 KC. Parts alone worth the money. \$3.00 Each  
**PE204 VIBRATOR POWER SUPPLY-** Input 12 VDC Output Two 4.3 VDC @ 50 MA. Two 45 VDC @ 0.5 MA. Two 85 VDC @ 5 MA. Loaded with parts. \$1  
**BATTERY CHARGERS-Input 115 V 60 cy. Output 7.5 Volts @ 6 A. Portable. Insulated leads. Each. \$8.25**  
**WILLARD STORAGE BATTERIES-** Used in GE Portables Model LB330 - 2 V @ 20 AH. 4" x 3 1/2" x 5 1/2" @ \$2.50 each. 10 for \$20.00. case lots of 36. ea. \$1.50  
**INTERCOM SETS-Two way system for YR shack and home. Battery operated. Complete w/wire. per set. \$9.95**  
**"FLASHLIGHTS" BY KWIKLITE-2 cell metal case-60c; PLASTIC-75c; 3 CELL METAL CASE-80c; PENLITES. 35c**  
**GARAGE/MECHANIC'S EXTENSION LIGHT-25' heavy duty cord. Switch on handle. Metal bulb protector. \$2.50 ea. 10 for \$22.00**  
**BATTERY CLIP ASSEMBLY-Eight foot - two conductor cord with 2 prong Hubbell male and female connector, heavy-duty Al. licator battery clips on two ends. ea. 69c**  
**EXTENSION CORDS-2 cond. 7' lengths PL35 and JK26 on ends. Ea. 35c**  
**CRYSTAL CONTROLLED MV SIGNAL GENERATOR-MM-144 Hickok. 15 KC - 30 MC. Crystal controlled @ 100 and 1000 KC. battery operated. Portable. Completely shielded, with instruction book. LN \$45.00  
B AND W 300 WATT TANK COILS-1.5 - 5.7 MC @ 75c; 20 METER W/LINK @ 95c; 40 METER W/LINK @ 95c; Budd 160 METERS 50 W Socket type 55c. 4 for \$1.50**

# SPECIAL SURPLUS BROADCAST OF OUR SUPER SPECIALS!!!

**WESTERN ELECTRIC PRECISION CRYSTALS-40 Meter Band 7270 KC 95c ea. 2 for \$1.75**  
**INVERTERS-ATR. 6 VDC to 110 VAC 60 cy. \$5W \$17; 12 VDC to 110 VAC 60 cy. 125W \$14.50; ELEC. LAB 12 VDC to 110 VAC 60 cy. 150 W. \$16; 110 VDC to 110 VAC 60 cy. 250W. \$26.50**  
**HELIPOTS-Model A. 20,000 OHMS 5W. 10 turns 3600' Rotation. 0.5 Guar. Linearity \$4.50; W/Stop. \$5.00**  
**DAVEN SOUND ATTENUATORS.** Compact constant impedance attenuators that will dissipate 10 Watts in any position. Type 350E. Ladder network. 250/250 OHMS IMPEDANCE ATTENUATION 2 DB. Type 350A 30/30 OHMS IMPEDANCE. Linear attenuation. Your choice. \$2.50  
**"TELEVISION" GUY WIRE-1/8" Dia. Galv. Perf. Steel. Excellent elasticity. Rust proof. Ideal for television antenna installations. 1000 ft. rolls. \$3.00/M**  
**HEAVY DUTY PLATE TRANSFORMER-AMERTRAN. INPUT 115/230 V 60 CY OUTPUT 4730/2365 volts @ 1.66 KVA. 11 x 11 x 9. WGT 150 lbs. \$27.50**  
**RL-42B ANTENNA REEL-W/MOTOR AND GEAR BOX-Perfect Beam rotators. Wt. 4 lbs. Easily mounted, magnetic clutch. Reversible with SPDT switch. Many other uses. \$4.95**  
**"BEAM INDICATOR" SELSYNS-GE model 2J1G1 Operates from 57.5/57.5 volts 400 cycles w/wiring diagram for 110 V 60 CY operation. \$2.50 per pair. Also available GE Model 2J1P1 115/57.5 Volts 400 CY. Per pair. \$3.00**  
**SELSYNS-DIEHL/BENDIX SYNCHRO TRANSMITTERS. 115 V 60 cy. 3" Dia. Each \$4.35. Pr. \$7.95**  
**ANTENNA CHANGE OVER SWITCH-SPDT. knife operated. Heavy duty. Isolantite insulation. Each. \$2.50**  
**HEINEMAN CIRCUIT BREAKERS-24 VDC @ 220 AMPS. SPST 95c ea.; 0311M-10. 24 VDC @ 10 A. SPST \$1.45. 0322M-10. 24 VDC @ 15 AMPS. DPDT. \$2.25**

### WESTON PORT. VOLTMMETER

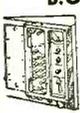


Model 280. Two ranges 3-15-150 Volts and 3-15-150 Amperes. Accuracy 1%. Complete with black leather carrying case.  
**BRAND NEW. SPECIAL \$21.00**

**24 VOLT RELAYS-Leach. 180 OHMS. DPDT. 10 AMPS. 65c (Have thousands of others. Write for list.)**  
**"S" METER-MFG M.B. 0-1 MA 1 1/4" dia. Pilot lite mounting. \$3.50**  
**PHONES-HS 300, 600 OHM IMPD. rubber ear inserts. LN 35c ea. 65c new. HS-23. 8000 OHM IMPD. LN \$1.00. New \$2.00 extension cords. 35c**  
**"MIKES"-T-17 Hand mike. carbon. 95c**  
**T-32 Carbon. Desk mount. LN. \$3.25**  
**KEYS-J-38 Hand keys. Each. 95c**  
**CHEST UNITS-T-26 Earphone and mike for chest use. \$1.75**  
**SOLDERING IRONS-JACKSON "STANDARD" No. 323. Removable tip 150 Watt 115 VAC/DC \$2.95. General Electric Model 1-79 115 VAC/DC 250 Watt. Removable tip. Heavy duty. \$7.50**  
**FRACTIONAL HORSE POWER MOTORS-OSTER 27.5 VDC 1/20 HP 3600 RPM. SHUT WOUND. \$7.55**  
**UNIVERSAL ELECTRIC 115 VDC. 12 AMPS .003 HP 5000 RPM. \$4.50**  
**OSTER 6 VDC 1.8 AMPS 5000 RPM. 6 oz./in. torque W/BLOWER Size 1 1/2 AND IMPELLER. \$4.50**  
**EMC 110 VAC 60 cy. 1/40 HP 1725 RPM LN. \$4.50**  
**OSTER 27.5 VDC1/100 HP. Series wound. 7000 RPM. \$2.50**  
**UNIVERSAL ELECTRIC 28 VDC. 0.6 AMPS 5000 RPM 1/100 HP. \$2.50**  
**GEAR REDUCTION MOTORS-**  
EMC 110 VAC/DC 1/20 HP 200 RPM @ \$8.50  
EMERSON-24 VDC 24 AMPS. Series wound. 100 RPM 160 OZ/FT torque. \$7.95  
EMC 28 VDC 6 AMPS 1 RPM. \$4.85  
G.E. 27 VDC 5 AMPS 250 RPM 8 OZ/IN torque. LN. \$2.50

All items new except items notated LN (meaning like new). If not rated, 25% with order. balance C.O.D. F.O.B. Boston. Let us quote on your requirements. Write for our Catalog. Minimum order \$3.00.

### B.C.-604 F.M. TRANSMITTER



Wide or narrow-band FM. 30 watt power output. Excellent possibility for ten or eleven meter exciter. Range 20-27.9 MC. Working space permits modification. Complete with tubes but less power supply \$11.50 and xtls. LN.

**DYNAMOTORS-**  
PE103. BALLENTINE 6V-21A/12V-11A: 500 VDC @ 160 MA W/O Filter. \$8.95  
GE. 28 VDC @ 5 AMPS; 575 VDC @ 160 MA. \$3.95  
DM21A, 14V @ 3.3A; 235V @ .090A. \$3.50  
PE94C. SCR522. 24VDC W/Filter. \$3.25  
BD-AR83. PIONEER 14 VDC @ 6.5 AMPS; 375 VDC @ 150 MA. \$2.95  
DM410. 14V @ 2.6A; 240 Volts @ 80 MA W/Filter. \$2.00  
PE-86D. 28 VDC @ 1.25 AMPS; 250 VDC @ 60 MA. \$2.00  
EICOR. 13 VDC @ 3.3 AMPS; 220 VDC @ 100 MA. \$2.50  
WINCO. 18 V. 450 VDC @ 150 MA. \$1.95  
DM36-D. 28 VDC @ 1.4A; 220V @ 80 MA. \$1.05  
**COPPER OXIDE RECTIFIERS-110 VAC-28 VDC @ 10 AMPS \$7.50; 55 VAC-28 VDC @ 1-8 AMPS. \$4.50**  
**CHOKES-2.5 HENRIES @ 700 MILS. 14 OHMS. \$5.95**  
20 HENRIES @ 45 MILS. 500 OHMS. 60c  
40 HENRIES @ 20 MILS. .80c  
Audio. 150 HENRIES @ 1 MIL. 7.000 OHMS .45c  
**TRANSFORMERS-**  
THORDASON (70R62) 115 V 60 cy. 350-0-350 @ 145 MILS; 5 V @ 3 A; 6.3 VCT @ 4.5 A. \$4.25  
JEFFERSON FIL-115 V 60 cy. 20 Volts @ 10 A. \$3.95  
POWER. Thordason (92R21) Pri 115 V 60 cy.; Sec. 389-0-389 Volts @ 200 MA; 5 V @ 3 A; 6.3 VCT @ 5 A. Each \$4.95  
POWER. 115 V 60 cy. 650 VCT @ 150 MA; 5 V @ 3 A; 6.3 V @ 5 A. \$4.00  
POWER. 115 V 60 cy. 430 VCT @ 145 MA; 6.3 V @ 5 A; 5 V @ 3 A. \$3.50  
OPEN CORE POWER. 115 V 60 cy.; 18 V @ 6 A. \$2.95  
POWER. 115 V 60 cy. 600 VCT @ 70 MA; 5 V @ 3 A; 6.3 V @ 2 A. \$2.50  
Audio-Output-Pri 5000 OHMS Sec 16 OHMS HERM. SEALED. .95c  
MIKE TRANS-PRI 150 OHMS Sec. S. Grid. Ratio 20:1. "UTC". .85c  
MIKE TRANS-PRI 35 OHMS Sec. 600/200 OHMS. .75c  
INPUT-Ratio 1:2. Freq. Resp. 500-15,000 within 3 DB. .60c  
AUDIO-FEDERAL "OUNCER" Pri 8000 OHMS SEC 600 OHMS. .60c  
MIKE TRANS-"OUNCER" PRI 300 OHMS. Sec. 25 MRG. .50c  
OUTPUT TRANSF for BC 221. 125 OHMS .35c  
**FUSE HOLDERS-3 AG BUSS TYPE HCM 15c**  
**NEON TESTER-Indicates 60-500 VAC/DC. Useful for determining open or short CKTS. Three Conductor Rubber Insulated, 7' length W/PL-68. .22c**  
**PANEL LAMPS-#44 and #47 @ 55c per carton 10; #51 @ 45c per carton 10.**  
**NEON LAMPS-NE 45 @ 20c each; NE 48 @ 15c ea.; NE 32 @ 25c ea.; NE 2 @ 8c ea.; cartons of 10 only.**  
**110 VOLT PILOT BULBS 6S6, D.C. BAY. 16c ea.; 95c carton 10.**  
**CATHODE RAY TUBES-5BP1 @ \$3.00; 5 BP4 @ \$4.95; 5 CP1 @ \$3.50; 3 EP1 @ \$2.95.**  
**ROYAL PLUG FUSES-15 or 25 Ampere-23c box of five.**  
**FRICTION TAPE-1/2 lb. 3/4" wide, fresh stock 17c ea.; 10/\$1.50.**  
**CARBON PILE VOLTAGE REGULATORS-BENDIX/ECLIPSE TYPE 956 Model 1 Style A. 13 Volts. \$1.25**  
**ECLIPSE TYPE 1339-4-B. 115 AC W/Rectifier/Transformer Unit. \$2.95**  
**ECLIPSE TYPE 1339-1-A. Set at 115 AC. \$2.95**  
LELAND Set at 18 Volts. \$2.95  
**PHONO MOTORS-HEAVY DUTY. GENERAL INDUSTRIES. 115 V 60 cy. 5 AMPS 80 RPM Minus turntable. \$3.75**  
Same as above but 115/230 Volts AC. \$4.00

# ELECTRO Sales Co.

110 Pearl Street, Boston, Mass.  
January, 1949

Phone Liberty 2-5589 or HANcock 6-5069

# LARGEST WAR SURPLUS STOCK

## PREAMPLIFIER BUY

External source of power supplies this compact aluminum case only 5 3/4" x 4" x 2 1/2", containing dual triode power tube 6F8G, inside the case, not standing out from it, and all brand new, in original packing, for only..... **\$1.29**

## RADAR ANTENNA

AS-69: fish-hook type radar antenna assembly; can be used with APT-2, APT-3 and APT-5. **\$2.95**  
NEW. F.O.B. Chicago, only.

## MICROPHONE BUY

T-24: Hand-held mike, carbon, with push-to-talk switch, brand new, far superior to older styles. SPECIAL. F.O.B. Los Angeles, only **79c**

## 24,000 OHM HEADSET

P-16: Has long cord, needs no extension, ends in standard plug PL-55. Very high impedance. Brand new. SPECIAL..... **95c**  
HS-16: Brand new..... **\$1.49**

## ALTIMETER TRANSCIVER RT-7/APN-1

Frequency 418-462 Mc FM, with 14 tubes: 3-12SR7; 4-12SH17; 2-12H16; 1-VR150; 2-955; 2-9004; 27 V. Dynamotor, used in working condition..... **\$7.95**

## SELSYN INDICATORS

For use with beam rotators for indication of direction of beam. Operate from 15-24V, 60 cycle AC supply. Small model, 3 inch diameter, only..... **\$2.45**

## 3" SELSYN INDICATOR

With direction selector dial. BRAND NEW. F.O.B. Chicago, only..... **\$1.49**  
Large model, 5 inch diameter, only..... **\$4.95**

## 400 CYCLE AUTOSYN MOTOR

Ideal for indicating direction of antenna systems—BRAND NEW..... **\$2.95**

## RADIO PARTS

Assorted Bypass Condensers, 400-600V..... 100 for **\$4.29**  
100 Resistors 1/2 to 1 watt..... 95c  
Electrolytic condensers 50-30, 150 Volt..... 10 for **\$2.89**  
1/2 and 2 Meg. Volume Controls 1" shaft with switch, each 39c..... 10 for **3.00**  
1/2 Meg. Volume Controls 1" shaft without switch..... 10 for **1.95**  
Crystal Pick-up, new light wt..... each **1.79**  
Heavy Duty 12" PM Speaker..... each **5.95**

## OUTPUT TRANSFORMER

Hi-Fi: used in Scott-made Navy receiver. Fully potted. Pri. 5000 ohms, output secondary 600 ohms CT, inverse-feedback secondary..... **\$1.49**  
60 ohms CT. ONLY

## DYNAMOTORS AND INVERTERS

BD-77—Dynamotor Unit 14v in. 100v 350ma out, with relay fuse box and filters. F.O.B. Chicago only..... **\$5.75**  
DM-21—Dynamotor: Part of BC-312 and BC-314 14v in. 235v 100 ma out..... **\$2.47**  
PE-101-C—Dynamotor Unit: 12 or 24v in. outputs 800v, 20 ma. 400v, 135ma, 9v, 1.1A..... **\$2.75**  
PE-55—Dynamotor Unit: 12v in. 16 amp. 500v out. 200 ma F.O.B. Chicago only..... **\$3.75**  
PE-206—Inverter Unit: rotary converted, 28v in. 80v at 500 VA, 800 cy. out. F.O.B. Chicago only..... **\$3.95**

DM-32A—Each **95c**, 3 for..... **\$2.00**  
DM-25—12v input, 250v @ 50ma output, ideal for command receivers. New..... **\$3.95**  
1A53—12v-24v input, output 500v @ 50ma, ideal for 6 volt installation, lightweight, new..... **\$2.95**  
DM-35—12v input, 625v output @ 285ma, used, good condition..... **\$4.95**  
EICOR TYPE—14v in, 400v, 200ma out, with mtg. rack, brand new..... **\$14.95**  
DM-34—12v in, 220v, 80ma out, as used on the tank receivers BC-603 and BC-683..... **\$2.95**

## SCR-178

Portable two-way radio, 2.4 mc, 3.7 mc, battery operated, complete with carrying case, excellent condition, F.O.B. Chicago, only..... **\$14.95**

## BC-122

Westinghouse transmitter, V or CW, 325 Kc to 800 Kc, in handy portable field case, 3 panel meters plus many parts, less tubes, excellent condition, F.O.B. Chicago, only..... **\$9.95**

## T-26/APT-2

Radar jamming transmitter, 450-710 mc. Heising amp. mod, by noise from 931A photo-tube. Output 3 to 7 watts. All controls on front panel, 2-6AC7 and 1-6AG7 video circuit supply random noise, with pass band of 20 kc, to 4 mc, to the 807 mod, 2-368AS tubes in a push-pull 1/4-wave transmission-line osc. circuit supply the RF. Power furnished by 2-5R4GY and 1-2X2 tube. Contains 27rdc blower, input 27rdc and 75-85v or 105-125v, 400 to 2600 cy. Brand new in original export case, with all tubes and handbook. Don't let this get away from you—Order to-day! F.O.B. Chicago, only. At only..... **\$9.95**

## AN/APTS ULTRA

## HIGH-FREQUENCY TRANSMITTER Brand New

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Glide path receiver. Crystal control of local oscillator. 332-335 mc, complete with relays, 7-6AJ5, 1-12SR7, 2-12SN7, 1-2SD7, and 3 crystals: 6497 kc, 6522 kc, 6547 kc. 90-cycle band-pass and 150-cycle band-pass filters, excellent for making an intermodulation checker. Beautiful cabinet and chassis as foundation for many interesting experimental and construction projects. Broad pass band on 20.7 mc IF's ideal for television. Schematic furnished. Used, excellent. Only..... **\$6.45**  
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 6-12 V. 60 cycles. 5 inch indicator with 0-360° dial. Heavy duty transmitter. **\$4.95**  
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 RA-34 RECTIFIER. Makes a ground Xmit of BC-191, the 12V version of BC-375-E. Convert BC-375-E to 12V by changing heater link switches and relay connections, power it with RA-34. Input 105-125 or 210-250V, 60 cy. Outputs: For plates, 1000V filtered dc at 350 ma; for relay and mike, 12V filtered dc at 2.4 A; for heaters, 12V ac at 14.25 A. With tech. manual. Used, excellent condition. F.O.B. Los Angeles, only **\$59.75**  
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 Same as BD-71 described above, except larger: for 12 trunks. Condition; used, good. **\$19.75**  
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 Sturdy, highest quality telephone at less than price of a better-class toy. With ringer. Requires only two flashlight batteries for each phone and two wires between each phone. Excellent condition, used. Each..... **\$7.95**

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 Convert your low-impedance headset to high-impedance, HS-23 by switching to R14 receiver units. New, per pair, F.O.B. Los Angeles, **49c**  
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 ASB-7 Radar Indicator Unit: For conversion to test scope or for use as modulation monitor. Has standard test-scope CR tube, 11 Cent. V Cent. Brill. Foc. Gain, and range selection switch. External power source was used. Tubes: 4-6AC7, 3-6H6, 1-5BP1. Condition; used, excellent. LOOK AT THIS PRICE; F.O.B. Los Angeles, **\$9.95**  
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**RADIO SCHOOL SPECIAL**  
 BD-57-A code practice switchboard. Has built-in motor alternator supplying 400 cycle tone for up to twenty student positions. All cords and plugs supplied. **\$12.50**  
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Build a compact 3-tube AC phono amplifier. Uses 6X5, 6V6 and 6J5. Kit includes ALL necessary parts — punched chassis, power transformer, tone and volume controls, 6-foot line cord and plug, resistors, condensers, hardware, etc.; less tubes. Easy-to-follow wiring diagram & instructions supplied. **\$4.95** COMPLETE

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For Television and FM

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**NATION WIDE RADIO**  
(The Serviceman's Supply House)  
572 W. Randolph Street  
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# DO YOU KNOW?

By DAVID SCOTT

16. What is meant by linear displacement?

A. Linear displacement occurs when a whole line in the image is displaced bodily with respect to the rest of the pattern. Linear displacement may be controlled by proper design and adjustment of circuits used in the deflection beams of transmitter and receiver. The amplitude, duration, and timing of each cycle must be the same as those preceding it. This brings in the need for sync signal.

17. What is meant by non-linearity of scanning?

A. Non-linearity of scanning arises from an inconstant speed of the scanning spot as it moves across the line. If the transmitter scanning spot moves faster than the receiver's scanning spot, then the received picture elements will be bunched. If the received spot is faster, the received elements will be spread. This defect is controlled through the design and adjustment of the deflecting current or voltage generators.

18. What is the result of non-linearity in the vertical displacement circuit?

A. Non-linearity of the downward motion of the scanning spot

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causes some lines to be spread further apart than other lines.

19. What is the effect of power supply ripple voltage on vertical deflection?

A. 120 cycle power supply ripple voltage superimposed on the verti-

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cal deflection voltage causes alternate bunching and spreading of the lines.

20. What is the effect of power supply ripple voltage on horizontal deflection?

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A. 120 cycle ripple voltage superimposed on the horizontal scanning voltage causes a displacement of lines so that they do not square evenly.

21. What is the result of changes in the horizontal scanning amplitude?

A. Changes in the horizontal

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scanning amplitude cause distortion.

22. What is meant by pairing?

A. Pairing is caused by one field not fitting accurately into the spaces left it by preceding field. Pairing may be partial or complete. Pairing is the result of inaccurate timing in the vertical displacement circuit.

23. What is meant by rotary disc scanning?

A. Rotary disc scanning is the process of scanning an object through a rotating disc with concentrically punched holes so that different portions of the image are focused on a photoelectric tube at a time.

24. What are the drawbacks of rotary disc scanning?

A. Drawbacks are: 1. Moving mechanical parts; 2. High illumination is necessary; 3. Low definition; 4. Low output.

25. What are the efficiency reducing factors of the iconoscope?

A. Efficiency reducing factors of the iconoscope are: 1. Not all of the stored charge is passed on to the amplifier; 2. The photoelectrical emission of the charge is limited by the low value of the electric field at the surface of the mosaic.

26. Define the power density of a scanning beam.

A. Power density is the factor concerning the number and energy of electrons in the scanning beam. Power density is equal to the number of microamperes per square centimeter of cross sectional area in the beam multiplied by the voltage drop through which the beam passes. Power density is measured in watts per square centimeter.

27. What is gamma?

A. Gamma is the figure of merit comparing the over-all tonal contrast of the picture elements existing in the received picture as compared to the original scene.  
(To be continued)



## Television Receivers

(Continued from page 62)

of the incoming signal and, yet, to maintain the over-all bias at a negative potential.

A second voltage applied to the grid of the a.g.c. amplifier is obtained from the horizontal deflection system. This voltage is amplified in the 7B6 and then rectified by the diode section of the same tube. It is this rectified voltage which is finally employed as the a.g.c. voltage to control the gain of the r.f., input i.f., and 1st video i.f. amplifiers.

When the signal level increases, the a.g.c. rectifier develops more voltage across  $C_1$  and  $R_1$ . This means more positive voltage for the a.g.c. amplifier (7B6) and a greater output from this tube because of the increased gain. The horizontal deflection voltage fed into the tube remains constant and a more positive bias for the tube will produce a greater output. This means more rectified a.g.c. voltage fed to the controlled stages. However, since the final a.g.c. voltage is negative, the gain of the controlled stages decreases, counteracting the increased video signal and reducing the output to the normal level.

When the video signal decreases, less positive voltage appears across  $C_1$  and  $R_1$  and the a.g.c. amplifier bias becomes correspondingly more negative. Less gain in this tube provides less voltage at its output and the negative a.g.c. voltage decreases. As a result, the gain of the controlled stages rises and the signal level is again brought back to the normal level.

Whereas in previous a.g.c. systems, the output of  $C_1$  and  $R_1$  was used as the controlling a.g.c. voltage, here it is used to control the bias of the a.g.c. amplifier. The final product of both systems is the same but this arrangement is more sensitive to carrier changes because of the addition of the amplifier. A divider network at the output of the diode section of the 7B6 feeds less a.g.c. voltage to the r.f. amplifier than to the i.f. stages. The potentiometer in the a.g.c. system permits the system to be adjusted for maximum sensitivity.

Probably the most elaborate a.g.c. system currently in use is that employed in the RCA television projection receivers. This is shown in Fig. 9. A portion of the video signal output of the fourth video i.f. amplifier is fed to the 6AL5 a.g.c. detector. Since the time constant of the diode load resistor ( $R_1$ ) and condenser ( $C_1$ ) is somewhat longer than one horizontal line, only the peak sync pulses are effective in developing a voltage across this combination.

The -110 volts is applied equally to the plate and cathode of  $V_1$  and consequently has no effect upon the operation of this tube.

The voltage developed across  $R_1$ ,  $C_1$  is fed to the a.g.c. amplifier. Across

**New Amertran HIGH POWER TRANSFORMER**



Perfect for home spot welders, THAWING TRANSFORMER, high voltage filament supply (Insulation test, 35,000 volts). Input: 105 to 125v, 6 taps, 60 cy. Output: 190 amps @ 5v cont. duty. Approx. momentary 1000 amp current 1000 amps or more **\$13.95**

**NEW! RL-42-B ANTENNA REEL Motor & Gear Box Perfect Beam Rotator**



Lightweight (4 lbs.), easy mounted, magnetic clutch, will reverse with s.p.d.c. switch. Also for barbecue spit or door opener. Many other uses. SHPK. wt. 4 lbs. **\$4.25**

**Synchronous (Self-Rectifying) VIBRATOR**



Hermetically Sealed Good for 100 milliamperes. Does not require rectifier tube. Fits standard octal 7B6 socket. Orig. Gov't price over \$5. Shipping wt. 2 lbs.

6 Volt Model..... **\$1.29**  
12 Volt Model..... **99c**

**4 x 4 MFD—1500 V.D.C. DUAL OIL TRANSMITTING CONDENSER**

Perfect for 90% of amateur requirements ..... **\$3.69 each**

**8 x 8 x 8 x 8 MFD—600 V OIL FILTER CONDENSER**

Just the thing for a lifetime power supply—in the same price range as Electrolytics. Packed Unit Shpg. Wt. 4 1/2 lbs. **\$3.75 each; 3 for..... \$9.95**

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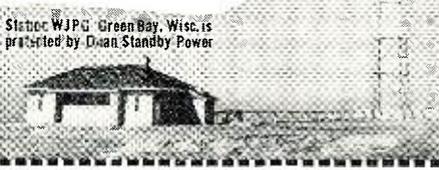
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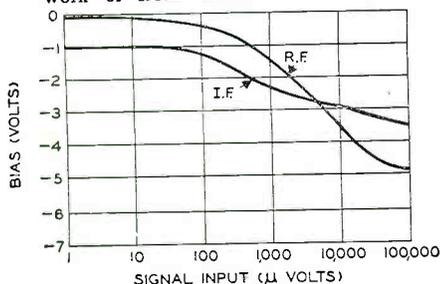
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this path, however, we find two diodes designed as a two-stage clipper or noise-limiting network. Their purpose is to prevent noise pulses from seriously affecting this system. All television a.g.c. systems operate on the peak of the incoming signal and ordinarily this is the position of the synchronizing pulses. However, a sharp impulse of noise can extend even beyond these pulses and cause the system to react to it. In the RCA system, the double diodes provide a low resistance path across  $C_1$  and  $R_1$  whenever noise pulses are present. In this manner they prevent  $C_1$  from charging to the peak value of the noise pulses. As soon as the noise passes, the normal sync pulses assume immediate control of the circuit. Without the diodes,  $C_1$  and  $R_1$  would charge to the peak value of the pulse and maintain this condition until  $C_1$  returned to its normal level. How long this would take would depend upon the charge placed across  $C_1$  by the noise pulse and the time constant of  $C_1$  and  $R_1$ . Under extreme conditions, this excessive voltage might cause the receiver to become insensitive for as long as 10 horizontal lines. The visual effect would be 10 dark lines (appearing as a dark bar across the picture).

Under normal conditions, the plates of the diodes have a greater negative voltage than their cathodes. As a result, the diodes are non-conductive and the voltage developed across  $C_1$ ,  $R_1$  is transferred to  $V_s$ . However, when a large noise pulse arrives, the positive voltage developed across  $R_1$ ,  $C_1$  is great enough to lower the  $-110$  volts reaching the plates of the diodes to the point where their plate voltage is less negative (or, what is the same thing, more positive) than their cathode voltage. At this moment the diodes conduct, shunting their low resistance across  $R_1$ ,  $C_1$  and preventing any large amount of voltage from developing here. When the noise impulse has passed, the diodes once again become non-conductive, permitting the normal voltage variations from  $R_1$ ,  $C_1$  to reach  $V_s$ . For additional protection against noise, the integrating network of  $R_2$ ,  $C_2$  acts to remove the effects of any noise impulses.

Thus, the only voltages which will affect the circuit are the normal variations in sync pulse levels due to changes in carrier amplitude. These are the changes to which we desire the circuit to respond.

Fig. 10. The signal input versus bias control voltage for the a.g.c. network of RCA television receivers.



January, 1949

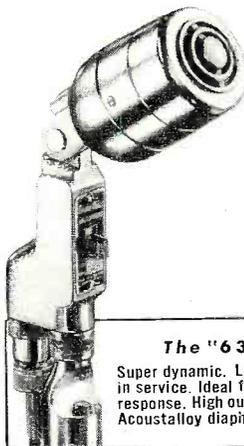
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The d.c. voltage at the cathode of  $V_3$  is obtained from the voltage drop across  $R_3$  and the center arm of the contrast control. With a weak signal input, this bias is sufficient to reduce the plate current of  $V_3$  close to cut-off, causing the plate voltage to approach ground potential. (Note: Enough current flows so that the negative voltage developed across  $R_1$  and  $R_2$  counteracts the +30 volts applied to  $R_3$ .) The r.f. bias voltage, obtained from the junction of  $R_1$  and  $R_2$  is zero volts and the i.f. bias to -1 volt. These biasing voltages permit the receiver to operate at maximum gain under weak signal conditions.

Upon the arrival of a strong signal, an increased positive voltage is developed across  $R_1$ ,  $C_1$ . This causes  $V_3$  to conduct more strongly, forcing the voltage across  $R_1$  and  $R_2$  to become more negative. (In any tube, whenever the plate current increases, the negative voltage across its plate load resistors likewise increases.) This drives the r.f. and i.f. bias voltages more negative, the precise amount dependent upon the strength of the signal. See Fig. 10.

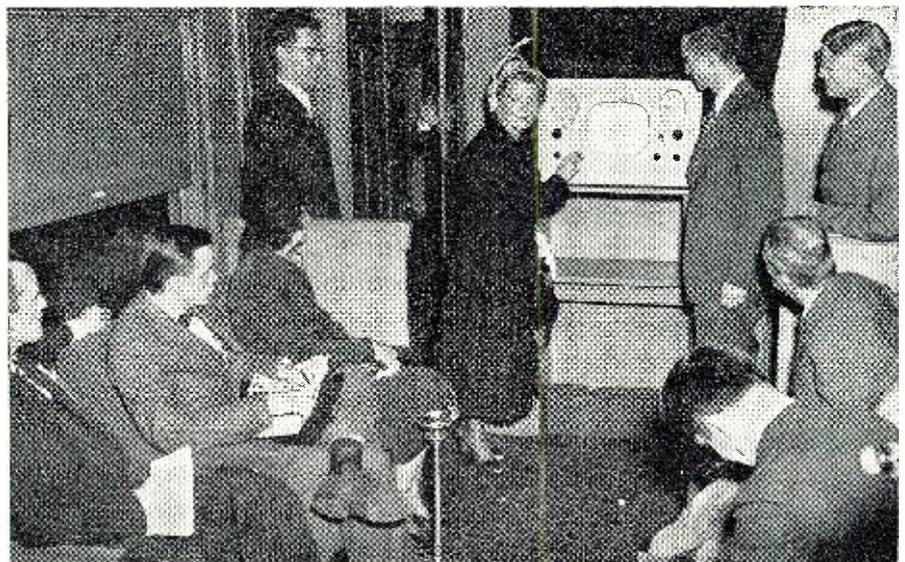
The bias versus signal input chart (Fig. 10) indicates that the r.f. bias is lower than the i.f. bias up to signal inputs of approximately 8500 microvolts. Beyond this, the r.f. bias increases more rapidly while the i.f. bias tends to taper off, finally reaching -4 volts at extreme signal strengths. This particular design was chosen in order to obtain the maximum signal-to-noise ratio from the receiver. The r.f. stage is permitted to function at full gain on all relatively weak signals. At the same time the i.f. bias is gradually increased to prevent these stages from overloading. On strong signals both i.f.

and r.f. bias voltages rise fairly rapidly. On very strong signals more bias voltage is applied to the r.f. tubes because more negative voltage is required to bring them to cut-off. In RCA television receivers, triodes are employed in the r.f. stage. Now, although the triodes are not generally classified as remote cut-off tubes, sufficient curvature is present to require a fairly high negative voltage for cut-off.

The behavior of the i.f. bias voltage is governed somewhat by the presence of  $V_4$ . The plate of this tube has a potential of approximately -2.5 volts and will not conduct until its cathode voltage becomes more negative than this. The cathode voltage, in turn, is determined essentially by the plate voltage of  $V_3$ , being connected to it through  $R_6$ . With an input signal of 1000 microvolts, the plate potential of  $V_3$  is approximately -2 volts and  $V_4$  remains non-conductive. When the input level rises to 10,000 microvolts, the plate voltage of  $V_3$  becomes -5 volts. Now  $V_4$  will conduct because its plate is 2.5 volts more positive than its cathode. Due to the voltage drop in  $R_6$ , the i.f. bias rises only to -3 volts. With increasing signal strength, the i.f. bias gradually approaches -4 volts. When  $V_4$  conducts, it shunts  $R_1$  and  $R_2$ , and preventing the i.f. bias from becoming too highly negative.

The setting of the contrast control determines the initial d.c. bias applied to the grid of  $V_3$ . If the negative d.c. bias voltage to  $V_3$  is increased, the set operates with greater gain because the i.f. and r.f. bias voltages are less negative. With more gain, a stronger signal will reach the cathode-ray tube and produce greater contrast in the picture. (To be continued)

The second game of the World Series was witnessed by a group of newspaper and magazine writers on the Baltimore and Ohio train from Washington to New York. Shown at the receiver is Miss Frieda Henneck, member of the Federal Communications Commission, and right, J. H. Wallis, communications engineer of the B & O, and Frank R. Norton, television engineer for Bendix Radio. Fairly satisfactory reception was reported by viewers with best pictures when the train was either standing or traveling at high speeds. At moderate speeds, fluctuations in signal strength and slow passage of objects caused interference and heavy flicker.



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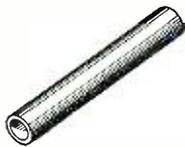
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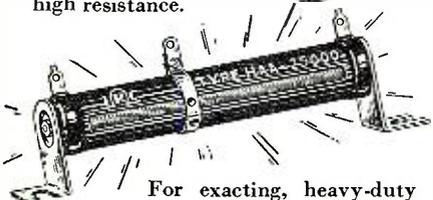
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## TV Booster

(Continued from page 57)

and consists of 2 turns of #24 cotton covered wire held in place with cement or coil rope. The lead length of  $L_2$  is approximately  $\frac{1}{2}$ " to the tuning condenser and must be mounted on it from the stator to ground. This is shunted by a 6800 ohm,  $\frac{1}{2}w.$  resistor  $R_1$ . The plate coil,  $L_3$ , is wound the same as the grid coil  $L_2$  with same diameter and size wire except it has 25 turns. The output coil  $L_4$  is the same as the input coil  $L_1$  except it has 10 turns and is wound over the "B plus" end of the plate coil,  $L_3$ . The plate and grid coils should be mounted at right angles to each other to minimize coupling.

Lead dress is not important except that the ground leads at the tuning condenser and tube socket should be made very short and of heavy wire. A common ground lead should be used for all r.f. circuits. The filament transformer was made from a discarded output transformer which was re-wound for 6.3 volts to light the tube. The use of zero bias on the tube may not seem conventional but with reduced screen voltage the plate current is held to a safe value. By operating the cathode at ground potential more stable operation and better gain can be realized due to the elimination of any degenerative effects and better isolation between input and output circuits can be maintained. No provision was made for an "On-Off" switch but if the constructor so desires a switch could be incorporated which would connect the antenna straight through to the TV receiver when the booster is turned off. This will allow the optional use of the booster without disconnecting the antenna. An additional contact should be provided on this switch to break the a.c. line when in the "Off" position.

Operation of the booster is straightforward. The unit is placed in series with the antenna lead to the TV receiver. Connect it to the receiver with a short piece of 300-ohm twin-lead or any impedance line that matches the receiver input and hook the antenna lead-in to the input terminals of the booster. After the warm-up period turn the booster tuning control for the brightest picture raster and tune in the TV receiver in the normal manner. After the picture is received the booster should be readjusted for maximum brilliance pleasing to the operator. It may be necessary to back down the contrast control on the TV receiver if too much "snow" is encountered due to the increase in gain. In very weak areas two boosters may be used in series by connecting the output of one to the input of the other with 300-ohm ribbon and adjusting both for maximum gain. This may cause oscillation with some receivers having an r.f. stage as too much feedback will result. This will also cause an increase in noise which will show



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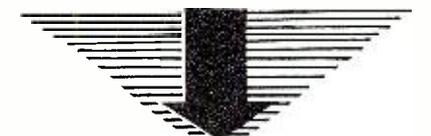
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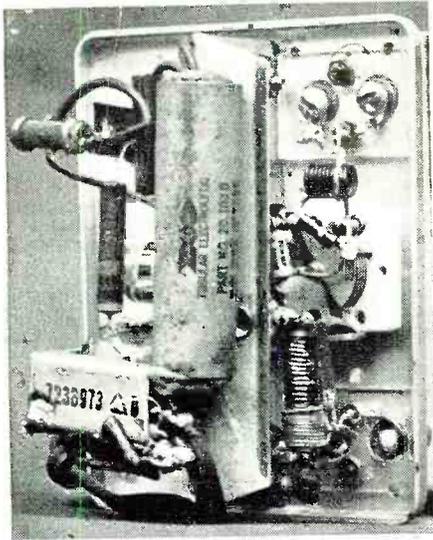
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**RADIO & TELEVISION NEWS**



Closeup view of chassis showing parts layout.

up as additional "snow" but if the contrast control is reduced it will be possible to receive very weak signals that could not otherwise be seen. In noisy areas it may be advisable to use coaxial cable for lead-in instead of twin-lead as the shielding will prevent noise pick-up. Two coax lines should be used, however, with their shields connected together so as to prevent unbalance of the antenna system. If the antenna lead-in is of a different impedance than the receiver, such as when coaxial cable is used with a receiver input of 300 ohms, the booster will help match the line to the receiver. The booster described above covers TV channels 1 to 6. If channels 7 to 13 are to be covered, smaller coils will have to be substituted and very-high-frequency construction techniques will have to be observed. One advantage of using a booster is to prevent radiation of the local oscillator in the television receiver from interfering with other sets in the vicinity. In very weak areas where noise is stronger than signal it is sometimes advantageous to put a booster right at the antenna itself and use another at the set end of the transmission line. This gives maximum gain without increase in noise level due to transmission line pick-up, as the signal is amplified before the line noise is added sufficiently to supply adequate signal to the second booster at the set. This entails remote control as well as weatherproofing the booster at the antenna and is rather complicated unless the booster is adjusted for single channel operation. One thing is important in using the booster at the antenna and that is to be sure and keep the booster power line away from open wire transmission lines or noise will be fed in by coupling. This is not necessary if coaxial cable is used. The input and output leads connecting the boosters should not be allowed to cross. In city locations where it is not practical to use an outdoor antenna due to landlord restrictions, etc., the booster will provide increased signal strength.

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1A3	45	39	6W4GT	69	59
1C5GT	69	59	6X5GT/G	49	39
1D7G	69	59	7A4	53	43
1LC6	69	59	7A7	59	49
1LD5	69	59	7B6	49	44
1LH4	69	59	7B8	69	59
1LN5	69	59	7C5	55	49
1Q5GT	55	49	7F8	61	54
1R4	69	59	7J7	54	49
1R5	55	49	7N7	49	44
1S5	59	55	7Q7	69	59
1T4	69	59	7X7		
1U4	49	35	(XXFM)	44	35
1U5	36	30	7Y4	44	35
1V	45	39	12A	79	69
2A5	54	43	12A6	29	25
2A6	45	35	12A8GT	35	28
2A7	32	25	12AT6	50	45
2X2/879	35	29	12AT7	69	59
3A4	49	39	12AU6	65	55
3B7/1291	59	49	12BA6	50	45
3Q5	55	49	12BE6	50	45
3S4	55	45	12F5GT	35	27
3V4	79	69	12H6	39	34
5U4G	50	40	12J5GT	25	19
5W4GT	39	34	12J7GT	45	39
5X4G	39	35	12K8Y	35	25
5Y3G	42	37	12SA7GT	40	32
5Y3GT/G	40	33	12SF5GT	40	32
5Z4	59	49	12SC7/		
6A7	50	45	1634	49	39
6AC5	69	59	12SG7	55	45
6AC7/1852	65	60	12SJ7GT	55	49
6AH6	49	39	12SK7GT	45	35
6AL5	49	38	12SL7	49	43
6AL7	69	59	12SN7	49	43
6AN5	65	55	12SQ7GT	40	32
6AQ6	59	55	12SR7	35	32
6AT7	65	59	14A7	65	55
6AU6	49	39	14B6	59	49
6BA6	49	39	19T8	89	79
6BE6	49	38	24A	49	39
6BG6G	99	89	25A6G	69	59
6BH6	79	69	25L6GT	55	45
6BJ6	59	49	25Z5	49	45
6B7G	55	49	25Z6GT/G	45	39
6C4	29	25	27	49	44
6C5GT	40	35	32L7GT	52	48
6F6GT	45	39	35L6GT/G	45	39
6F7/VT70	39	29	35W4	43	40
6H6GT/G	45	39	35Y4	43	40
6J5GT/G	45	39	35Z5GT/G	43	39
6J7GT	42	38	35Z6G	43	39
6K6GT/G	45	39	36	35	29
6K7	55	45	42	47	41
6K7G	50	41	45Z5	59	49
6K7GT/G	49	39	46	59	49
6L5G	69	59	50	1.49	99
6N4	49	38	50B5	42	32
6P5GT	55	49	50L6GT	50	45
6R7GT	59	49	56	55	45
6S7G	49	45	57	45	39
6SA7GT/G	44	37	58	45	39
6SB7	55	45	76	35	27
6SH7GT	40	32	77	49	39
6SJ7GT	44	37	78	40	38
6SK7GT/G	49	39	80	1.49	99
6SL7GT	49	47	81	69	59
6SN7GT	49	47	82V	79	69
6SQ7GT/G	44	37	83V	49	39
6SR7	43	36	84/6Z4	49	45
6SS7	59	49	85	49	45
6SV7	55	49	99V	35	25
6T8	89	79	99X	35	25
6U5/6G5	69	59	117L7	52	48
6U6GT	40	29	117Z6GT	89	79
6U7G	35	25	1231	39	29
6V5G	59	49	1644	29	19

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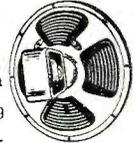
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412	422	431	441	451	474	487	496	502	507	512	519	519
413	423	433	442	453	475	488	497	503	508	515	522	
414	424	434	443	462	477	490	498	504	509	516	523	
415	425	435	444	465	479	491	501	506	511	518		
416	426	436	445	468	481	492						
418	427	437	445	470	483	493						
419	429	438	447	472	484	494						
420	430	440	448	473	485	495						

**49¢ each**

<b>Crystal Frequency Standards</b> 98.356kc	<b>For Crystal Controlled Signal Generators</b> 525kc
Easily altered for 100kc Standard. Mounted in low loss 3 prong holder.	526,388 533,333 537,500 527,777 534,722 538,888 529,166 536,111 530,555 531,944
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<b>I.F. Frequency Standards</b>	<b>200 KC CRYSTALS</b>
rc kc	Without Holders
450 461,111 <b>99¢ each</b>	527,777 534,722 <b>69¢</b>
451,388 464,815	529,166 536,111
452,777 465,277	3 for \$2.00

<b>Assorted Miscellaneous Crystals</b>	<b>For Ham and General Use</b>
Fractions Omitted	Fractions Omitted
370kc 377kc 384kc 387kc	390kc 396kc 404kc 408kc
372 379 386 388	391 397 405 409
374 380	392 398 406 411
375 381	393 401 407
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<b>CRYSTALS FOR SCR 522</b>	<b>Crystals from BC 6 10</b>
5910kc 7480 2045 2282 2435 3250 3570	<b>¼" Spacing—2 Banana Plugs</b>
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## Microgrooves

(Continued from page 55)

In many cases the regular audio system of the receiver will not reproduce the higher frequencies. The amplifier may either be rebuilt and a high-fidelity speaker installed, or the entire audio system replaced with a hi-fi amplifier, speaker, and speaker cabinet. Here again, a demonstration will convince the customer. There are many combinations of hi-fi amplifiers and speakers on the market which will give excellent results.

In custom-building, the customer's tastes and his ability to pay for them are the only limitations as to how far high-fidelity can be carried. For instance, he may desire the main installation in the living room, with speakers built into the walls and the record player concealed in a closet or bookcase, possibly with remote controls and extra speakers located in other parts of the house.

Don't overlook the possibility of extra players, either in custom-built installations or in regular replacements. Always recommend a good record changer for the living room or den and a small single-speed unit for the bedroom, guest room, etc.

### Phono-Combinations

Many receiver manufacturers are including facilities for Microgroove operation in their new phonograph-combination sets. *Philco* was first; they now include Microgroove changers in at least three combination consoles, including the Model 1613. *Crosley* is completing plans for a new dual-speed record changer. Shown in Fig. 1 and 4, respectively, are the *Admiral* RC-182 two-speed changer and the *Webster-Chicago* Model 133 Microgroove changer. *Admiral* uses a separate arm for each function; the *Webster-Chi-*

*cago* 133 is intended for use only with Microgroove records. Other record changers available are: the *Webster-Chicago* Models 246 and 256, which use a single pickup arm and stylus (with knob adjustment) to play both types of records; and the V-M Model 402 (also with single pickup for both types). *Knight* has a low-cost record player which uses the *Shure* 900MG pickup. *Webster-Chicago* also has announced several additional models of automatic Microgroove record changers, as well as replacement changers for existing radio-phonograph combinations. *Presto* is planning to produce a number of high-quality 12-inch turntable units, both with and without pickups. Their Model K-8 will also be modified to cut at 224 lines per inch and equipped with a dual-purpose pickup.

Attaching the LP phonograph to a straight receiver involves the usual simple procedure of installing a phono plug or jack and connecting to the receiver audio input. Here we again run into the problem of whether the receiver audio system is capable of the required high-fidelity response, and whether the customer desires full response.

### Needles

Microgroove needles must, of necessity, be capable of giving many hours of high-quality reproduction. Some types of Microgroove pickups employ permanent sapphire needles; others use osmium-alloy tips. *Webster-Chicago*, for example, has developed a "Nylon Knee-Action Needle" (see Fig. 2D) with an osmium tip. The nylon knee cushions shock and aids in filtering out noise. Most needles of this type have a normal playing life of at least 1000 hours, or under average use about a year.

### Precautions in Operating

Because of the extremely fine grooves, light needle pressure, and

*Webster-Chicago's* new Model 133 automatic Microgroove record changer. Equipped with a new balanced tone arm, the changer will handle ten 12" or twelve 10" records at 33 ½ r.p.m. turntable speed so that up to four hours of continuous record play can be obtained with a single loading. The unit is mounted on a metal base.



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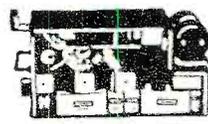
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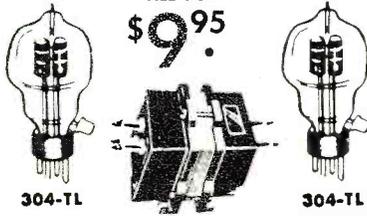
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300 ohm Amphenol. Per C.....	\$ 2.34
150 ohm Amphenol. Per C.....	2.16
75 ohm Amphenol (small). Per C....	1.98
Kilowatt 75 ohm Amphenol. Twin lead. Per C. ft. ....	7.20
3 Gang 410 mmfd. per Sect. Cond. Excellent Quality.....	2.95
4 Gang 150 mmfd. Variable.....	.95
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2 mfd. @ 2500 W.V. Each.....	2.95
4 mfd. @ 600 V. Oil—round can. Each	1.19
Relay, Cramer type TD-2-120S—Max. 1 min. delay. Cont. 10 amp. 115V....	4.95
Relay, Leach, 115V-AC DPST. New.....	1.50
Relay, Allen Bradley, heavy duty, 30 amp. 115V.-AC. Perfect for 1KW rig—Near new cond. ....	4.95
Toggle Switch—SPST—plus spring return.....	.19
Toggle Switch—H.D.—DPST—12 amp. 125 V. ....	.39
Siren, Commercial type, hand operated, very loud noise. Govt. cost \$21.00. Special.....	4.95
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Cable—6 wire #16, glass insul. shielded, plastic covered—perfect for beam cont. Per ft., .12.....	10.00
Cable—6 wire #18, unshielded. Per ft. ....	.08
Cable—4 wire #18 Plastic—shielded. Per ft., .06.....	5.50
Cable—Single shielded grid wire #20-AN Specs. Special!—Per hundred....	1.50

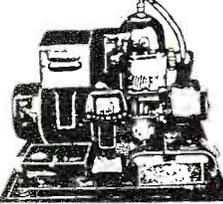
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505 7" .....	199.50
67 10" .....	299.95
60 12x16" .....	595.00
68 12x16" .....	695.00

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All types of accessories, including antennas, lead in, boosters, etc.

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S-59 .....	\$ 49.50
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S-40A .....	110.00
S-52 .....	110.00
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S-55 .....	129.50
S-51 .....	149.50
SX-43 .....	189.50
S-47C .....	209.50
S-47 .....	229.50
S-62 .....	289.50
SX-42 .....	295.00
R-44 speaker .....	24.50
R-42 speaker .....	39.50
HT-18 .....	110.00
HT-19 .....	359.50

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NC-33 .....	\$ 57.50
NC-57 .....	89.50
NC-46 .....	107.40
HFS .....	164.43
NC-173 .....	199.50
NC-183 .....	282.00
HRO-7C .....	324.86

All units above priced complete.

### RME

DB-22A .....	\$71.00
HF-10-20 .....	77.00
VHF-152 .....	86.60
84 .....	98.70

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small needle radius, extra care is required in operating. Be sure your customer is familiar with the following precautions: (1) Do not leave records on the record changer supports—they are likely to warp; keep them stored *on edge* in a record file, album, or cabinet. (2) Do not store records near radiators or other sources of heat. (3) Do not leave records on the turntable; this allows dust to gather in the grooves. (4) Handle records carefully; avoid scratching. (5) Clean records occasionally with a soft brush or lint-free cloth. (6) Do not leave the pickup arm resting on a record or turntable. (7) Never stop the changer while it is going through a changing cycle; wait until it is playing a record. (8) Locate the changer away from undue heat. (These precautions apply equally well to standard players).

Also caution the customer against allowing the pickup to be dropped onto a record manually. Unless care is exercised, it is rather easy to damage a groove. Most record-changer mechanisms are lubricated for 1000-hour operation and should need no attention before that time.

### Individual Opportunities

So far we have discussed only those applications which concern the regular customer; there are many more. Consider the industrial possibilities—every store, factory, office, etc., which employs record changers or players is a good prospect for a Microgroove installation. The p.a. field is ripe for conversion; dance halls, roller rinks, and amusement parks should be easy to sell. Some of these, of course, have coin-operated machines which have been installed on a commission basis and probably will not be interested. Most establishments, however, should be definite prospects. Arrange demonstrations for operators of high-class restaurants and dining rooms for an automatic "dinner music" installation; explain the advantages and dignity of a hi-fi system for classical and semi-classical orchestrations.

The individual serviceman can probably think of numerous other applications which would fit into his own locality. Whatever the application, Microgroove systems are to be recommended. The serviceman who keeps his customers up-to-date will never have to worry about idle moments.

## SAVE ON SURPLUS

### BC-683 F.M. RECEIVER

27 to 38.9 Mc. for 10 meter ham band. Forestry service. Police bands. Easily converts to 110v A. C. or AM-FM. Good used, with 12v dynamotor .....

\$19.95

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27 to 38.9 Mc. Companion to BC-683 30 watts. With 12v dynamotor .....

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Cramer timer with Veeder counter in hours and 1/10 hours to 9999.9. 110v. 60 cycles, a.c.

### SELSYN SPECIAL

diameter 4", length 5". 110V AC, 60 cycle. These large bronze selsyns are ideal for rotating beam antennas or other remote control applications. Can be used as variable speed motor. New, boxed. Special, each .....

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115v. 50/60 cy. primary, 5v. @ 10A, secondary. 35IKVA test with standoff socket for 872, 250R, 371 or similar rectifiers. American Trans-former Co. Spec. 29106 .....

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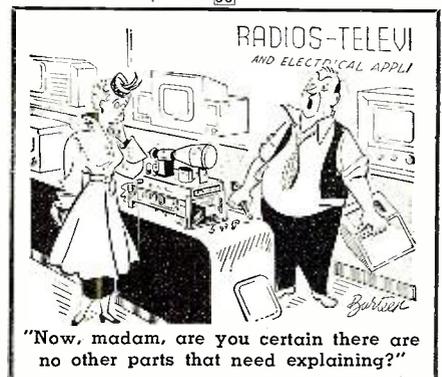


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TOOLS FOR CRAFTSMEN

# GREENLEE



## 220 mc. Converter

(Continued from page 48)

calibrated grid-dip oscillator is strongly recommended and makes the pruning of LC circuits a pleasure instead of drudgery. The oscillator should tune 30 mc. lower in frequency than the mixer and r.f. circuits, which for the amateur band 220-225 mc. will be 190-195 mc. The mixer output should resonate at approximately 30 mc. The antenna is designed to accept a coax type transmission line and the antenna trimmer extends through the front panel and is very useful in resonating the particular antenna in use.

### Other Uses of the ARR-1

As is the case with so many pieces of surplus equipment, once the experimenter obtains a unit, other uses suggest themselves immediately. The ARR-1 is no exception. The writer has been asked about some of these. In general, the ARR-1 could be made into a converter for either 50 mc. or 144 mc. by merely altering the LC tank circuits to resonate at these ranges instead of at 220 mc. as just described. As a matter of fact any range from about 50 mc. on up to perhaps 300 mc. could be accommodated. The procedure here would be to select that segment of frequencies desired and resonate the LC circuits to that frequency. Roughly the polyiron slugs will cover a segment of frequencies approximately 25 mc. wide from 200 mc. up, while at 150 mc. the range will possibly be 8 to 10 mc. in width, and at 50 mc. the tuning range will be somewhere between 4 to 8 mc. in width. By loading the LC circuits with resistors the r.f. bandpass would, no doubt, be quite adequate for certain of the television channels in use, and the gain of the ARR-1 would be quite excellent in this type service. This has not been tried, however, at this location, as at the time of writing, television is still some distance away in the writer's area.

Another use to which the ARR-1 has been put is that of preselection only, that is, a 50 mc., 144 mc., or 220 mc. preselector. In this case the modification of the mixer and oscillator circuits is unnecessary. The last 954 stage is disabled at the outset and the first three 954 stages are used for a three-stage preselector. Merely resonate the LC circuits at the frequency desired and couple off the third tank circuit  $L_{101}-C_{118}$  with a two turn link in inductive relation thereto. Shield this lead or, better still, use a length of coax cable over to the station receiver operating on these frequencies. This is especially advantageous in connection with the SCR-522 receivers. The added r.f. gain in front of these 522 units really boosts up the signals. The same principle could, of course, be used in ahead of TV receivers, should the set be short of r.f. gain. This is the same principle used in some of the commer-

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### BC-733D

A 10-tube superhet receiver for lateral blind landing guidance (CAA type certificate) TC-1045. Excellent condition 108-110MC. Tube complement: 1-12SG7; 2-12SR7; 1-12A6; 1-12AH7GT; 2-12SG7; 3-717A—tubes alone worth more than this low price. **\$3.95**  
EACH  
Schematics Furnished.

### AN/CRW-2 V.H.F. RECEIVER

6 tubes: 3-6SL7, 1-6SN7, 1-6SG7, 1-6J5. Dynamotor, plug-in coils and sensitive relays. This was one of the Army's "Secret" V.H.F. remote control receivers. A thousand and one uses. Like new in a metal case. **\$5.95**  
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### T-17B

Carbon Microphone. Like new. A real buy. EACH **\$8.95**

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Plays 10" or 12" records. Special purchase Stewart-Warner Stroboscopic. ea. ONLY **\$18.95**

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Has built-in EE-8 with hand set. 3' DB meter and remote control unit. **\$9.95**  
Used, very good.

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M-299 for SCR-522 permits use of carbon mike in place of magnetic. NEW. **\$1.50**  
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### BATTERY TESTER

A 2" meter 0-6 V.D.C. **3 for \$1.00**

### HOOK-UP WIRE

Approx. 400 ft. assorted gauges and colors—about 2 to 4 ft. lengths. **98c.**

### BC-727 INDICATOR BOX

With two red jewel pilot light assemblies. It's a steal! EACH. **29c.**

### BC-306

Antenna loading unit for BC-375. Excellent condition. **\$1.50**  
Another parts value.

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An ideal portable field telephone. Complete in a rugged steel case for years of wear. Ringer circuit and TS-13 handset. No leather case to deteriorate. Compact 5"x6"x9" also used as remote control on SCR-284. Simple two wire operation. 18 miles distance and upwards. Lt. wt. 13 lbs. Excellent condition. SPECIAL LOW PRICE **\$9.95**  
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### CORD CD-605

A two-foot cord with a PL-55 plug; with low to high impedance transformer for your headset. **39c.**

### BC-348

The finest surplus receiver. used, excellent condition. **\$89.50**

### TU-10B

Tuning unit for BC-375... a terrific parts value with a metal case. Brand New. See page 24 Nov. Radio Craft for conversion to 10 meter final. ONLY **\$2.10**

### BC-433G

15-tube superhet radio compass receiver 200 to 1750 Kc; CW-tone-voice. Like new. **\$14.95**  
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PL-172  
PLQ-103  
PLQ-254

### O-1 M.A.

3' meter—shunt included for 0-10 M.A. use. New. **\$3.95**

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For the BC-733 PL-59—PL-61—PL-64  
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Inverter. PL-3108-22-4S  
For the SCR-274-N PL-147, 148, 151, 152, 154A, 156, 258  
For the BC-375 PL-59—PL-61—PL-64  
For the ART-13 U-8U, U-10U, U-16U  
For the ARC-1 U-15U, U-16U  
For the ARC-5 ARC-9821-9126-9123  
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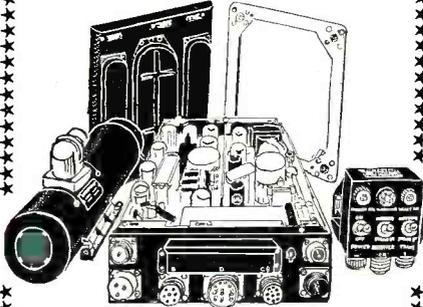
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Navy Model ABA-1 (CG-43AAG)  
Army Model SCR-515A  
Known as the BC-645



### 450 MC—15 TUBES, Brand New

Can be easily converted for phone or CW 2-way communication. Covering the following bands: 420-450 MC ham band, 450-460MC for fixed or mobile, 460-470MC for citizens, 470-500 MC television experimental. Size 10 1/2 x 13 1/2 x 4 1/2. Contains 15 tubes: 4-7H7, 4-7H7, 2-7EG, 2-6F6, 2-955, 1-WE-316A door knob.

Here is what you get:

- BC-645 with 15 tubes
- Dynamotor Keyer Unit, CWD-21AAX
- Remote Control Unit, CG-23ABJ
- Instruction Book

**\$12.95**  
Complete

Complete set of plugs, antennas and rack mountings for control box..... **\$3.95**

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3" BC991B—can be rack mounted; operates on 6VDC or 110VAC. Complete with 2-6H6, 4-6SF5, 1-6S11GT, 1-6SL7GT, 2-5Y3GT, 1-3P1; in original export packed cases.



**\$49.50**

Brand New  
COMPLETE SET of spare tubes same as above plus 1 extra 3P1 in export packed case..... **\$12.50**

### RADAR JAMMING TRANSMITTER

Ultra High Frequency

Band width 3 1/2 meg. wide

Range

1-931A 500-700 Meg.

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1-6AG7

2-703A

1-807

2-5R4GY

1-2X2

Simple to convert to many uses. Has 10 tubes, contains blower and motor to cool tubes. Brand New and complete with all tubes. Weight approx. 50 lbs. Size 21" x 10 1/2" w. 7 1/2" h. in metal case. Special—While they last..... **\$19.95**



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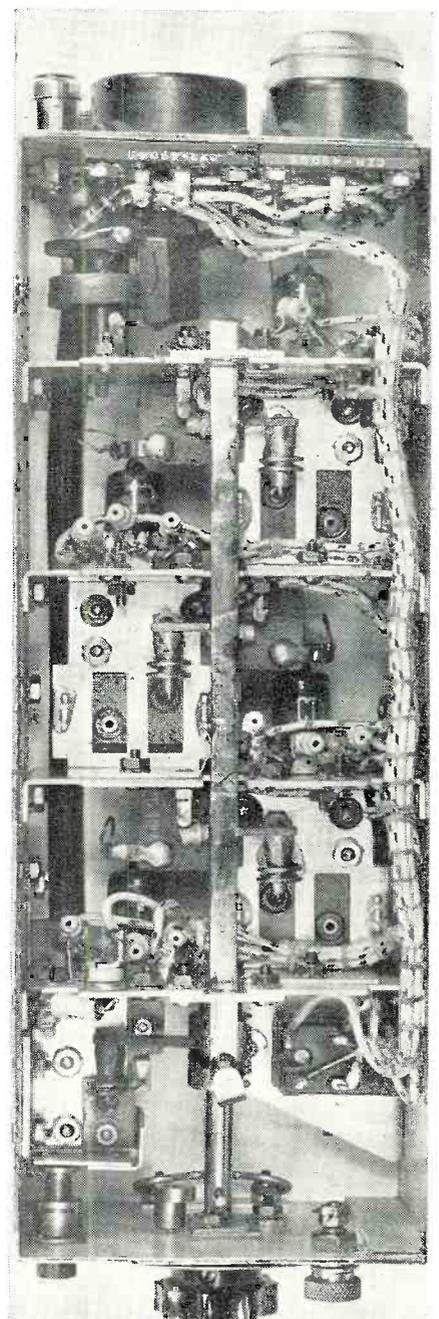
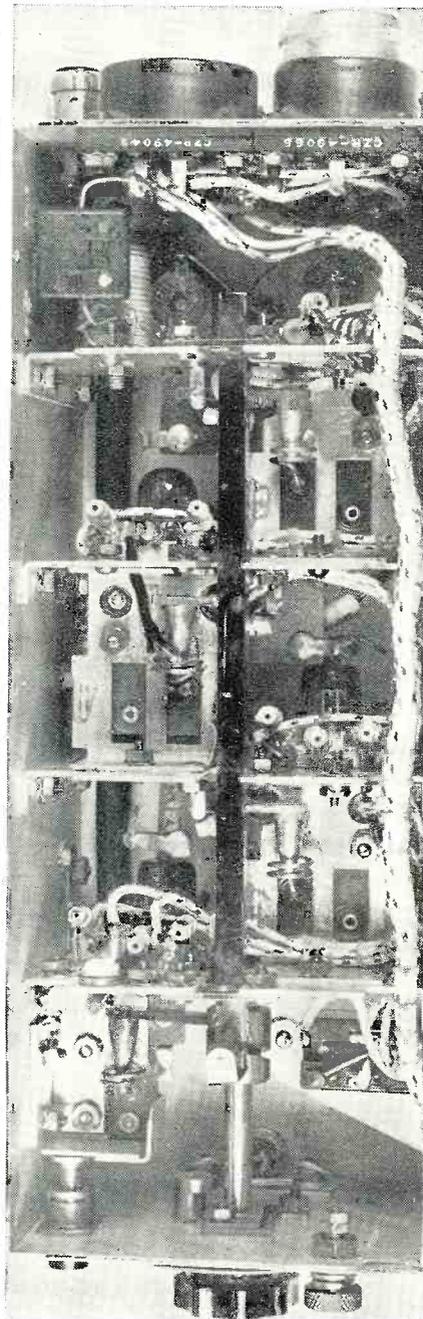
cially-built TV boosters, that is, merely preselection in the front end.

Along with the ARR-1, there is appearing on the surplus market a companion unit called the ARR-2. Inquiries have been received as to the function of this unit. Actually the ARR-2 (Type CW-46196) is similar to the ARR-1, containing the original r.f. cascade stages, plus the broad-band detector stage, but in addition, this ARR-2 unit contains the low frequency section as well as the subsequent audio stages. In this unit, provision is

made for changing the low frequency (200 to 1500 kc.) by turning a crank. Six preset frequencies are provided in the equipment. A dynamotor is an integral part of this equipment. Otherwise the unit functions exactly like the ARR-1, the chief difference being that type 6AK5 tubes are used in the r.f. section in place of the acorns. Either unit will work satisfactorily for the purpose described in this article.

An intriguing possibility exists in using a couple of the ARR-2 units for amateur work. Employed in the man-

Fig. 4. (Left) Bottom view of the modified ARR-1 as a converter for 220 mc. In the third compartment from the top can be seen the new oscillator tank coil and the cathode lead running through the shield wall to the 955 acorn socket in the second compartment. The 30 mc. tank and bypass condenser C122 are also visible in the top compartment. (Right) Bottom view of the unmodified unit. The dial knob at the bottom controls the long square shaft running down the middle of the converter. Attached to this shaft are slugs which are run in and out of the fields of the r.f. stage coils to tune the unit. The top compartment holds the 954 acorn, broad-band detector stage. The coaxial cable in the picture is for the input antenna.



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**Television Focus Coil**—fits all types of television tubes. D.C. Resistance 7,000 ohms. Price **\$2.95**

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Small size only 3" x 1 1/2" x 7 1/2". Very low price only.....each **\$1.95**

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ner originally intended, that is, double modulation on the transmitter, it would be possible to effect confidential communication and theoretically eliminate QRM. Or they might possibly be used in remote control applications, wherein certain functions are performed from a distance and without the possibility of anyone taking over control merely by locating the frequency of the transmitter and attempting to "jam" the channel, so to speak. It would perhaps be wise, however, to check with FCC inspector to ascertain if this type operation is strictly legal. As far as the writer is able to learn, this type operation is quite OK on the 220 mc. amateur band.

-30-

**Communications Receiver**

*(Continued from page 67)*

14 mc. energy should appear at the grid of the 6J6 to tune the mixer plate circuit. Adjust condenser  $C_8$  for maximum "R" meter indication.

Make sure this circuit is tuning. This can be determined by examining the position of the plates of  $C_8$  when the "R" meter reads maximum. If the condenser tunes with the plates completely open or closed the circuit is not tuned and the value of  $C_7$  should be changed.

Next change the frequency of the signal generator to 146 mc. Rotate the main tuning condenser until a signal is heard. If a signal is not heard vary the signal generator frequency until a signal does appear. If a signal appears when the signal generator is tuned to 155 mc. this means the oscillator frequency is too high and the oscillator coil turns should be pushed closer together. On the other hand if the frequency is 140 mc. the oscillator coil turns should be spread. Adjust the oscillator coil turns so the 143.5 to 148.5 mc. range is covered.

With the oscillator circuit adjusted to frequency, set the signal generator on 146 mc. Tune the converter to this frequency and reduce the signal generator input until a weak signal is heard. Adjust the inductance of  $L_1$  and  $L_2$  for maximum output by varying the spacing of the turns.

When this tuning is completed vary the frequency of the generator and converter over the two meter band noting the sensitivity. The output should remain comparatively flat over the entire two meter band. If not, repeat the tuning procedure until it does.

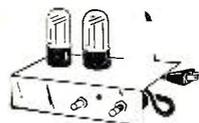
The sensitivity of this converter will exceed the leakage of most low priced signal generators. It is altogether possible the leakage may be of such a level that an "R" meter reading of "R9" will exist when the signal generator is not connected to the converter.

If such is the case final adjustment of  $L_1$  and  $L_2$  should be made on a received signal in the center of the two meter band.

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Automatic Stop Special Price	\$19.95
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Size	Price	Per 100
50x30 150v... Ea.	\$0.45	
40x40 150v... Ea.	.40	.001, .002, .005... \$0.40
20x20 150v... Ea.	.85	.01, .02, .05... .10
20x20 (10) 150v (23v) Ea.	.39	.1, .25... .50
10x10 450v... Ea.	.49	10 Mfd 450v... Ea. .35
8x 11 450v... Ea.	.49	25 Mfd 25v... Ea. .25
16 450v... Ea.	.39	25 Mfd 50v... Ea. .25
		50 Mfd 50v... Ea. .29

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If a signal generator is not available the oscillator can be set on frequency with a wavemeter. Since the i.f. frequency is 14 mc. the oscillator frequency should cover from 157.5 to 162.5 mc. This would give a half a megacycle overlap on each end of the band. By placing a voltmeter across  $R_1$  injection voltage can be read. When a wavemeter is tuned to the frequency of the oscillator there will be a noticeable dip in injection voltage.

With the oscillator set on frequency using this method,  $L_1$  and  $L_2$  should be adjusted on received signals.

This two meter converter can be used in conjunction with any receiver capable of tuning to 14 mc. When used with the equipment described in the previous articles voltage regulation is automatically supplied.

If the converter is to be used with other receivers, the addition of a VR 150 to the chassis is advisable. An appropriate value of dropping resistor will be required.

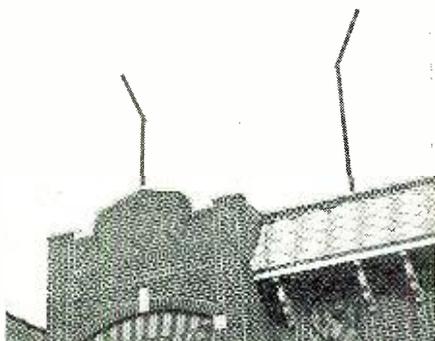
The design of this converter is somewhat different from that of the other units of this equipment. Every effort has been made to give the builder as much leeway as possible in the construction of the various units. At 146 mc. this is not possible. In this range of frequencies every lead becomes critical. If the instructions and photographs are followed, little, if any, difficulty should be experienced in the construction of this unit. On the other hand if the layout is changed the inductance of the various coils may require alterations.

A more serious problem may develop if regeneration becomes a factor. There is no indication of regeneration in the present design.

*(To be continued)*

### COCKEYED ANTENNA SUPPORTS

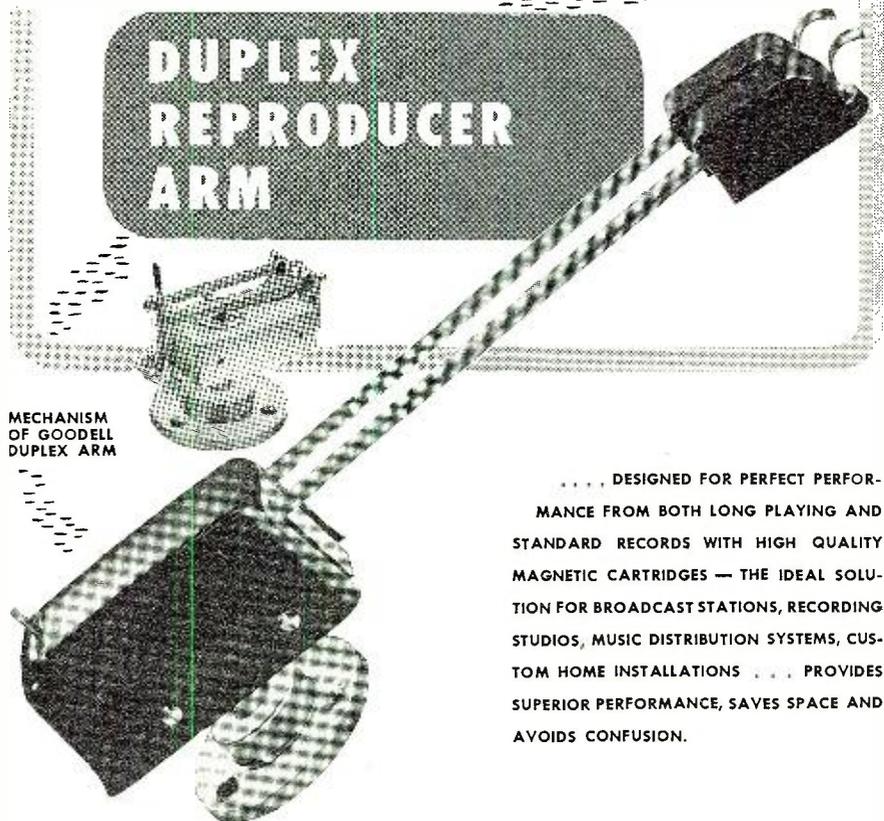
THE antenna sticks in this photo look as if they'd just endured a hurricane, but actually they were made that way deliberately. They belong to W2W-PD, Jackson Heights, N. Y., who found that the only supports on his roof for a ten-meter folded dipole were twelve feet apart, a little too little for a sixteen-foot antenna. He gained the needed four feet by offsetting the semaphore-like arms two feet from the vertical and guying them back to the base. The poles themselves are of wood, about 1 x 2½ inches cross section and fifteen feet high . . . . . R.H.



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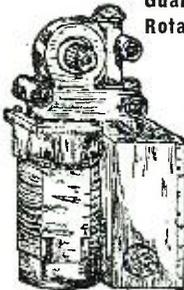
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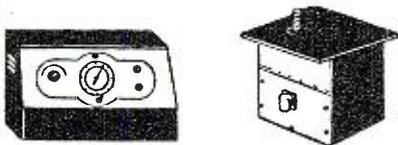


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# AFCA



# NEWS

This Association is a patriotic non-profit organization, with chapters in most of the larger cities, dedicated to developing and maintaining efficient personnel, commissioned, enlisted, civilian, for the supply (including design and development), installation, maintenance and operation of communications and electronic equipment for Army, Navy and Air Force and their supporting civilian activities. It publishes a magazine "SIGNALS" at its national headquarters in Washington. Every American interested in any way in communications is eligible and invited to join. Further details may be obtained by addressing the secretary at 1624 I St. N.W., Washington 6, D. C.

### Chapter Notes

#### Baltimore

The first fall meeting of the Baltimore Chapter was held on October 12th at the Consolidated Gas Electric Light and Power Company of Baltimore. Mr. Ralph L. Thomas, Vice-President in Charge of Operations, gave a speech on the grid in the Baltimore area and various generating stations that supply current to that area. A demonstration followed of the load analyzer board and load dispatching board which are used to control the power supply in the network.

The Western Electric Company Point Breeze Plant will be host to the chapter at its next meeting.

#### Boston

The Boston Chapter will work with the chapters of other military associations to sponsor the third annual Industry-Army Day meeting at Boston on February 4th. Lt. Col. George T. Cottle of the Boston Chapter was host at the initial meeting held on October 28th to discuss arrangements. Major Walter Grisetti from the Army Department in Washington outlined plans for Industry-Army Day. At another meeting held on November 4th, the chapter was represented by Mr. Charles F. Adams of the Raytheon Manufacturing Co., and Vice-President T. M. Hennessey of the New England Telephone & Telegraph Co.

#### Decatur

Chapter members attended a dinner meeting at the Decatur Club on September 16th. Mr. F. L. Kahn, in charge of circuit design for the Automatic Electric Company, discussed the Strowger automatic telephone system and the automatic toll director.

#### Kentucky

A dinner meeting of the Kentucky Chapter was held on October 22nd at the Phoenix Hotel in Lexington. The

guest speaker, Mr. Bernard T. Fagan, coordinator for the Lafayette Vocational School in Lexington, discussed the future of television. The program was concluded with a film of the Kentucky-Georgia football game.

#### Louisiana

The newest AFCA chapter was formed in New Orleans on October 28th. The organization meeting was arranged by Mr. W. H. Mansfield, AFCA chapter representative for the Southeastern part of the U. S., and Ralph Grist, both executives of the Southern Bell Telephone & Telegraph Co. in Atlanta, and A. Bruce Hay, Division Sales Manager of the Southern Bell in New Orleans. More than sixty topflight communications and photographic executives and engineers of the Army, Navy, Air Force and industry were present at the dinner meeting held at the Roosevelt Hotel. Brig. Gen. S. H. Sherrill, National Executive Secretary, who came down from Washington, outlined the aims and purposes of the Association and discussed its accomplishments.

Interim officers were elected as follows: Harry B. Lackey, president; Fred Weber, treasurer and A. Bruce Hay, secretary. Vice-presidents were chosen to represent the various fields of interest: Capt. Glenn W. Legwen, Navy; Col. A. H. Schroeder, Army; Col. Herbert DeBuys, Air Force; the Very Rev. Thomas Shields, S.J., president of Loyola University, colleges; George W. Healy, Jr., newspapers; C. C. Walther, industries; Jimmy Bryant, motion pictures; and Streuby L. Drumm, power utilities.

#### New York

The New York Chapter held a dinner meeting on October 20th at the Seventh Regiment Armory, New York City. The program included the first public showing of a film captured during World War II, which was photographed in color by Eva Braun, of Hitler and his friends during the early days of the war. Major Horace Roberts described the work being carried on by the Signal Corps Photographic Center and showed a film covering the life of General John J. Pershing.

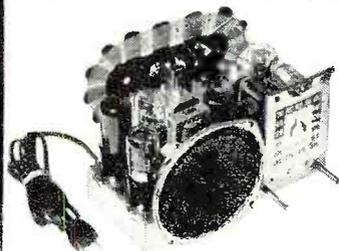
The following officers were elected for the ensuing year: President—Col. George P. Dixon; Vice-President—Lt. Col. Ralph G. Edwards; Secretary—Col. William H. Harrington; Treasurer—Maj. Theodore N. Pope.

#### Philadelphia

The first meeting of the fall season was held at the Officers' Club, Quartermaster Depot, Philadelphia, on Octo-

RADIO & TELEVISION NEWS

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.01	600		.54	4.86	41.25
.02	600		.63	5.67	43.75
.05	600		.72	6.48	52.50
.1	600		.90	8.10	57.50
.0005	6000v	\$0.22	1.98	17.82	137.50
.001	6000v	.23	2.07	18.63	142.50
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.05	6000v	.47	4.23	38.07	293.75

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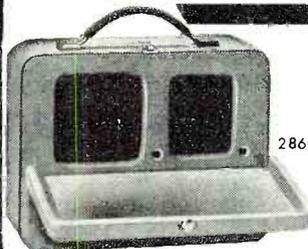
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286

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ber 14th. The chapter was in charge of distribution of AFCA information at the World Hobby Exposition held in Philadelphia from November 15th through 20th.

## Pittsburgh

At a meeting held on October 12th, officers were elected as follows: President—F. E. Leib; 1st Vice-President—E. J. Staubitz; 2nd Vice-President—E. C. Stern; Secretary—K. A. Taylor; Treasurer—C. A. McKenney; Asst. Treas.—S. W. Dana.

## Richmond

Chapter members attended a dinner meeting at Ewart's on October 13th. The speakers were: Capt. Robert J. Foley, assistant to Admiral Earl E. Stone, Chief of Naval Communications, who described many of the most interesting phases of submarine combat in the Pacific during World War II; and Brig. Gen. S. H. Sherrill, Executive Secretary, who discussed the progress made by the Association in the last year and its objectives in the light of the current international situation.

## Sacramento

Dr. Otto J. M. Smith, of the University of California, was the main speaker at the Sacramento Chapter meeting held on November 3rd. His subject was "Russia's Bomb." An added feature on the program was the film, "Tale of Two Cities"—the story of Nagasaki and Hiroshima.

## Southern California

The Southern California Chapter was successfully organized at the meeting held in Los Angeles on October 15th. The speakers were Capt. Harry C. Butcher, Naval Aide to General Eisenhower, and Col. Lloyd C. Parsons, Signal Officer of the Sixth Army. Chapter officers were elected as follows: President—Mr. H. W. Hitchcock; Vice-Presidents—Col. T. H. A. Lewis, Mr. Arthur C. Hohmann, and Mr. H. L. Hoffman; Secretary-Treasurer—Col. E. F. Zacker.

-30-

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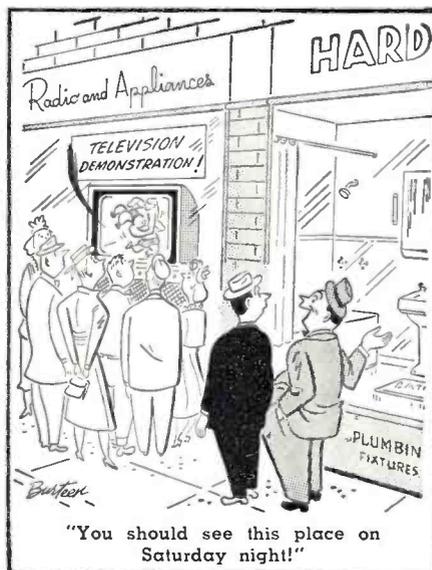
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Send for our FREE catalogue!



"You should see this place on Saturday night!"

**TV Promotion**  
(Continued from page 45)

read and birthdays of the listeners announced.

Most dealers encourage the troops of kids who pile into their stores in the late afternoon and watch television with rapt attention because the smart dealer knows that not far behind the children are the parents. What interests the children is sure to be investigated by the parents.

Installation of sets in boys' clubs and schools serves the dual purpose of keeping the children off the streets and popularizing television.

**Store and Window Promotion**

The way in which television receivers are presented to the customer can greatly influence sales. Window displays tell the passers-by that you sell television and serves as the first link in the chain of events that can result in a sale.

Television offers the opportunity to be dramatic—to put something in the window that is different. Whether the window area is small or large, television can provide an impact presentation. Animated displays, photographs of station equipment, pictures of the stars and programs available on television, all help contribute to customer interest.

The greatest of all eye-catchers is, of course, a television set in operation. What type of set and how many sets to be displayed will depend on the size and shape of the window. If the window is deep enough projection units can be shown, but no matter what type of receiver is shown in operation it must be in perfect focus at all times and shielded from glare or reflection. Nothing will harm the dealer more than to display a set with a fuzzy, poorly aligned picture on the screen.

It has been proven time and again that selling is easier when the prospect is removed from the distractions of the store and other customers. Accordingly, most successful dealers have set aside individual displays and sales areas for television. Small shop owners whose space is limited achieve the feeling of remoteness by setting aside one section of their display space exclusively for television sets.

New techniques for getting customers into the store appear daily, however, for the kick-off campaign just before the video station goes on the air most dealers use their mailing lists to extend invitations to visit the store to prospective TV buyers. If a definite "date" can be made, so much the better. In this case, however, it is advisable to follow up the invitation with a phone call. If the customer feels the dealer has a personal interest in him and is not using his name as one of a mass market, the response will be greater.

One Chicago dealer made an arrangement with various women's clubs whereby the club received 25 cents for

**SELENIUM RECTIFIERS**  
AND SPECIALIZED ELECTRONIC COMPONENTS

FULL WAVE BRIDGE TYPES			FULL WAVE BRIDGE TYPES			FULL WAVE BRIDGE TYPES		
Input	Current	Price	Input	Current	Price	Input	Current	Price
0-18VAC			0-54VAC			0-36VAC		
Type #			Type #			Type #		
B1-250	250 MA.	\$ .98	B3-150	150 MA.	\$1.25	B2-150	150 MA.	\$ .98
B1-500	500 MA.	1.95	B3-250	250 MA.	1.95	B2-220	220 MA.	1.25
B1-1	1 AMP.	2.49	B3-600	600 MA.	3.25	B2-300	300 MA.	1.50
B1-1X5	1.5 AMP.	2.95				B2-450	450 MA.	2.25
B1-3	3 AMP.	3.49				B2-600	600 MA.	2.95
B1-5	5 AMP.	3.95				B2-1	1 AMP.	3.95
B1-7X5	7.5 AMP.	7.95				B2-2	2 AMP.	4.95
B1-10	10 AMP.	9.95				B2-3	3 AMP.	6.95
B1-15	15 AMP.	13.95				B2-5	5 AMP.	9.95
B1-20	20 AMP.	15.95				B2-6	6 AMP.	10.95
B1-25	25 AMP.	20.95				B2-7X5	7.5 AMP.	13.95
B1-30	30 AMP.	24.95				B2-10	10 AMP.	15.95
B1-40	40 AMP.	27.95				B2-15	15 AMP.	24.95
B1-50	50 AMP.	32.95				B2-20	20 AMP.	27.95
B1-60	60 AMP.	36.95				B2-30	30 AMP.	36.95

THREE PHASE BRIDGE TYPES			FULL WAVE BRIDGE TYPES		
Input	Current	Price	Input	Current	Price
0-120VAC			0-72VAC		
Type #			Type #		
3B7-4	4 AMP.	\$32.95	B4-1X2	1.2 AMP.	\$7.95
3B7-6	6 AMP.	48.90	B4-3X5	3.5 AMP.	15.95
3B7-11	11 AMP.	65.00	B4-5	5 AMP.	17.95

CENTER TAPPED TYPES		
Input	Current	Price
12-0-12VAC		
Type #		
C1-10	10 AMP.	\$7.95
C1-20	20 AMP.	12.95
C1-30	30 AMP.	17.95
C1-40	40 AMP.	21.95
C1-50	50 AMP.	25.95
C1-80	80 AMP.	34.95
C1-120	120 AMP.	46.95

\*Select Proper Capacitor From List Shown Below, to Obtain Higher D.C. Voltages Than Indicated

RECTIFIER MOUNTING BRACKETS			RECTIFIER CAPACITORS		
For Types B1 through B6, and Type C1.....		\$ .35 per set	CF-13	6000 MFD	10VDC \$2.49
For Types B13.....		.80 per set	CF-14	3000 MFD	12VDC 1.69
For Types 3B.....		1.20 per set	CF-15	6000 MFD	12VDC 2.95

RECTIFIER TRANSFORMERS			RECTIFIER CHOKES		
Type #	Volts	Amps. Price	Type #	Amps.	Price
All Primaries 115VAC 50/60 Cycles			HY2	.03 Hy	2 \$2.25
XF15-12	15	12 \$3.95	HY4	.03 Hy	3 2.95
TXF36-2	36	2 3.95	HY5	.02 Hy	5 3.25
TXF36-5	36	5 4.95	HY8X5	.02 Hy	8.5 7.95
TXF36-10	36	10 7.95	HY10	.02 Hy	10 9.95
TXF36-15	36	15 11.95	HY12	.125Hy	12 12.95
TXF36-20	36	20 17.95	HY15	.015Hy	15 13.95

ELECTROLYTIC CAPACITORS			METERS		
100 MFD	50 VDC	\$2.20	O-15 M.A.D.C. Weston #506 2" Rd.....		\$2.95
40 MFD	150 VDC	\$1.90	O-30 A.D.C. Weston w/shunt 2 1/2" Rd., aircraft type.....		2.95
50 MFD	150 VDC	2.00	O-50 A.D.C. Weston #301 3 1/2" Rd., Enclosed shunt		5.50
8-8-20 MFD	350,150 VDC	4.70 43.00	O-60 A.D.C. West. w./shunt, 2 1/2" Rd., aircraft type.....		3.25
*20-20 MFD	400,250 VDC	4.50 38.00	O-120 A.D.C. West. w./shunt, 2 1/2" Rd., aircraft type.....		4.95
10 MFD	450 VDC	2.50 20.00	O-8 V.A.C. G.E. 3 1/2" Round.....		2.95
15 MFD	450 VDC	2.50 20.00	O-30 V.D.C. West 2 1/2" Rd., aircraft type.....		2.95
15-15 MFD	450 VDC	3.00 22.00			
40 MFD	450 VDC	4.20 36.00			

**SPECIALS!!**

**TRANSFORMER**  
High Current  
**AMERTRAN**

5.1 volts at 190 amps.  
Primary 105/125 Volts.  
Can easily deliver 250  
amps. Insulation 35 Kv.  
test. Approx. shipping  
wt., 75 lbs.

**\$17.50**

Plus \$2 crating charge

**VACUUM CAPACITOR**  
50 MMFD. **\$4.95**  
20 KV.

FENWAL THERMOSWITCH  
Normally open or closed. Adjustable from  
-40° to +400° F. Each..... \$1.25

**"A" ELIMINATOR KIT #KC 1-10**

A well-engineered 6 Volt D.C. power unit; for auto-radio and similar service work. Previously in the high-priced range. Now, in kit form, with all essential components to easily construct, and at a low price. This kit is designed to operate from a 115 V. A.C. 50/60 cycle source, and delivers 6 V. D.C., well filtered at eight amperes, with a peak rating of ten amperes. Complete with simplified instructions..... **\$19.50**

To avoid shipping errors, kindly order by type #. All prices subject to change without notice.

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INDUSTRIALS, EXPORTERS, SCHOOLS, GOV'T AGENCIES, LABORATORIES.

Our engineering staff is at your service to facilitate the application of rectifiers to your specific requirements.

Write for quantity discounts on company letterhead.

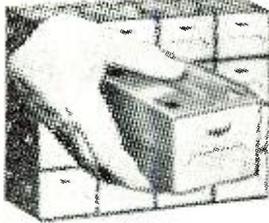
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**WHOLESALE RADIO**  
 of Baltimore

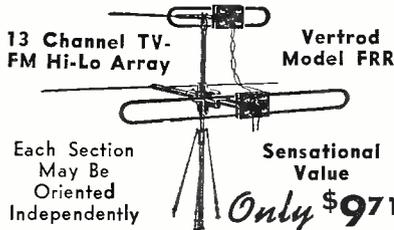
**The Tailor-Built Cabinet-  
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27/8" wide  
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 Lots of 10 or  
 More . . . 37 1/2c  
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Unit Rigidly Interlocks with Others at Top,  
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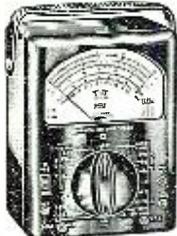
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 Model FRR

Each Section  
 May Be  
 Oriented  
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Sensational  
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Only \$971

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Completely NEW  
 Volt-Ohm-Mil-Am-  
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Large 5 1/2" Meter—Only  
 One Switch—20,000 Ohms  
 Per Volt Sensitivity—D.C.  
 and A.C. Ranges up to  
 6000 Volts—Max. Res.  
 Range up to 100 Meg-  
 ohms.

TRIPLET  
 MODEL 630 ..... \$3750

**Philmore's**

**Famous  
 RCA 630TS  
 10" TV SET  
 IN KIT FORM**

Complete  
 (Less Cabinet) \$205.00



Kit comes complete with 30 tubes, including 10" picture tube—with wire, solder and mounting hardware. It has three blueprints with easy to follow step by step instructions plus a large complete schematic. The front end and the video and sound I.F. circuits are pre-wired and aligned. All sockets and other important parts are assembled to the chassis.

TV Cabinet for RCA 630TS—\$33.75

**Brilliant G-E 1201**

FOR CUSTOM INSTALLATION  
 Deluxe 12 inch Alnico V  
 14.5 oz. P.M. Speaker



50-13,000 Cycles

25 WATTS

\$1770



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 FREE MONTHLY "FYI" BULLETIN  
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**WHOLESALE  
 RADIO PARTS CO., Inc.**  
 311 W. Baltimore St.  
**BALTIMORE 1, MD.**

each of its members who put in an appearance at his store and looked over his television display. Thus he was able to bring into his establishment the women who set local patterns, styles, and trends while at the same time accurately measuring the results of his promotion.

**The Dealer-Sponsor**

While most dealers handling television are not in a position to assume the role of program sponsor, such an advertising medium should not be completely overlooked. It might prove worthwhile to investigate the cost of sponsoring a program or one minute spot. Because of the limited audience for television at the present time costs are low when compared with similar services on radio. Television advertising takes diverse forms. It can range from the sponsorship of a special event to a one minute spot announcement. Between these extremes are newscasts, style shows, sport interviews, home-maker programs, dancing lessons, model airplane building, etc. Television is a versatile advertising medium and has the advantage of radio's auditory impact coupled with the asset of visual presentation. The power of a television sales message should not be underestimated as it comes closer to "personal" selling than any other mass media.

Ready-made television shows are available to the small sponsor at moderate prices. These packaged productions have the advantage of removing all responsibility for production details from the shoulder of the sponsor. In this way, even small business concerns can afford professionally produced spots on television.

**Installation and Service**

Television installation is generally handled in one of two ways. The dealer may either establish his own installation and servicing department or may farm out his work to contract organizations.

In cases where installations will require the services of two or three men

full time, it may pay to make arrangements with a contract organization. The contractor is advised of the job by the dealer and is compensated either by the dealer or by the buyer of the set upon installation. Usually a set will be installed and servicing guaranteed for a year on a service policy. Thus the buyer is protected against faulty installation or from loss in case his set does not function properly or a part needs to be replaced.

No matter which method is used, it must be done properly. Nothing will do more harm to television sales than examples of poorly installed sets and dissatisfied customers. A conscientious dealer won't allow a set to remain unless it is operating properly. Often owners will feel that it is working "good enough" but goodwill, more sales, and complete satisfaction are obtained if the set is replaced when necessary.

Promotion and merchandising of television sets doesn't stop at the sale and installation. A sound, friendly follow-up system results in pleased customers and more business.

Hudson-Ross, a Chicago television and radio dealer, has a unique method for getting live prospects.

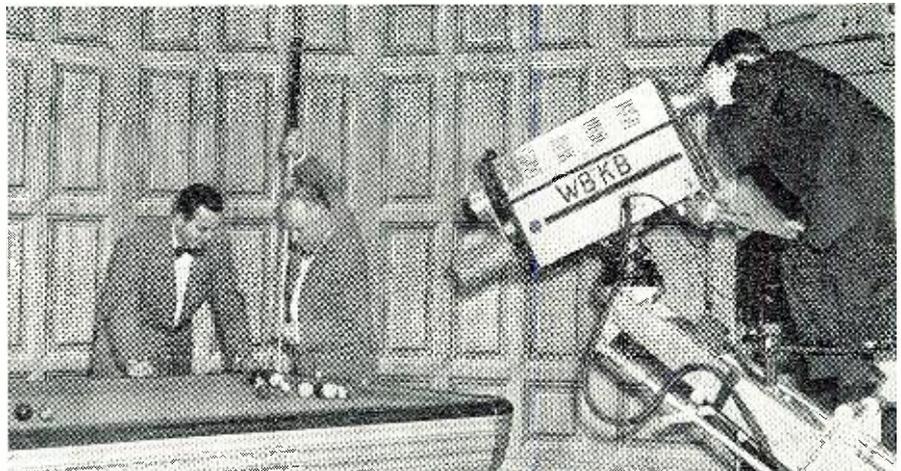
A customer is called a couple of weeks after installation and is asked if he's completely satisfied with his TV set. He is then asked if he would like to reduce his liquor bill.

"What can you do to help me reduce my liquor bill?" is usually the surprised response. "You're in the television business."

"Just this," is the smart promotional answer, "if you'll give me the names of the people coming to your house every night to watch television, we'll sell him a television set and then you won't have to play host to so many and your liquor bill will be reduced."

It is surprising how many sets are sold this way, and in dozens of other ways which can be invented. The public wants TV. It's willing to be shown. In five years television will be one of America's ten largest industries. You might as well be a part of it. —30—

Andy Ponzi, three times world's pocket billiards champion and present national champion, shows Sportcaster Milt Hopwood a fancy shot in the WBKB studios in Chicago. This type of studio program is finding wide audience acceptance.



**LARGEST STOCK OF**  
**ALL BRAND NEW—STANDARD BRAND**

# TUBES

**IN THE COUNTRY**  
**MINIMUM ORDER \$5.00**  
**QUANTITY PRICES ON REQUEST**

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
1B33	\$49.50	249C	3.49	923	.98	V70D	6.95	5W4GT	.66	6SJ7	.66	12SR7	.39
1B24	4.95	250R	7.95	925	1.40	VR75	.98	5X4G	.72	6XJ7GT	.66	12SR7GT	.39
1C21	1.29	250TH	19.50	929	1.25	VR78	.75	5Y3GT	.42	6SK7	.66	12X3	.98
1S21	1.95	250TL	19.50	930	1.10	VR90	.75	5Y4G	.60	6SK7GT	.66	12Z3	.88
7AP1	3.95	252A	4.95	931A	4.95	VR91	1.49	5Z3	.72	6SL7GT	.96	14A7/12B7	.88
2C21	.98	254	19.95	954	.75	VR105	.75	5Z4	1.06	6SN7GT	.88	14A7/XXD	.88
2C26A	.75	259A	4.95	955	.75	VR150	.98	6A3	1.86	6S07	.60	14B6	.88
2C34	.59	274A/B	1.25	956	.75	VI127A	3.00	6A6	1.06	6S07GT	.60	14B8	.88
2C40	1.98	282A/B	9.95	957	.75	VU111	1.19	6A7	.80	6SR7	.72	14C5	.88
2C43	7.50	304TH	6.95	958A	.75	WL460	14.95	6A8	.80	6SR7GT	.72	14C7	.88
2C44	1.75	304TL	1.49	1000 SPEC.	24.95	WL468	14.95	6A8GT	.80	6SS7	.66	14E6	.72
2C46	7.50	307A	4.95	1608	4.95	WL532A	4.95	6A8/6N5	.99	6S7	.88	14E7	.88
2D21	1.69	310	4.95	1613	.75	WL562	150.00	6A87 1853	1.06	6SV7	.88	14F7	.88
2E22	1.50	311A	1.98	1614	1.75	WL616	105.00	6AC5GT	1.16	6T7G	1.24	14H7	1.06
2E24	4.95	316A	.69	1616	1.39	Z225	1.95	6AC7 1852	1.16	6U5/6G5	.72	14H7GT	1.06
2E25	4.25	322A	120.00	1619	1.75	ZB120	6.95	6AD6	.88	6U6GT	.72	14J7	1.06
2E26	3.95	327A	1.98	1621	1.98	ZP477	14.99	6A17G	1.28	6U7G	.72	14K7	1.06
2E30	2.49	338A	5.95	1624	1.75	0A2	1.69	6AFC	1.28	6V6GT	1.28	14Q7	.88
2J21A	14.95	378A	4.95	1625	.49	0A3/VR75	.98	6AG5	1.06	6V6GT	.80	14R7	.88
2J26	14.95	350A/B	2.95	1626	.49	0A4C	1.06	6AG7	1.28	6V7G	.88	14S7	1.06
2J31	24.95	354C/D	19.95	1626	.49	0B2	2.05	6AH6	3.90	6X4	.60	14V7	1.06
2J32	24.95	368AS	4.95	1628	4.95	0B3/VR90	.75	6AJ5	.75	6X5GT	.60	14X7	.88
2J33	24.95	371A/B	2.95	1629	2.95	IA3	.72	6AK5	1.56	6Y6GT	.88	14X4	.88
2J34	24.95	393A	7.95	1631	1.50	0D3/VR150	.75	6AK6	.96	6Y7G	.88	19T8	1.28
2J37	24.95	394A	4.50	1633	1.65	0Y4	.88	6AL5	.80	6Z7G	1.28	19T8	1.06
2J37	24.95	417A	24.95	1634	.79	0Z4G	.88	6AL7GT	1.06	6ZY5G	.88	22	1.28
2J38	24.95	434A	3.95	1635	1.10	0Z46	.88	6A05	.80	7A4/XXL	.72	24A	1.06
2JBS1	4.95	446A/B	1.95	1636	5.95	01A	.50	6A06	.72	7A5	.72	25A6	1.06
2K21	25.00	450H	24.95	1637	1.06	IA3	.72	6A07GT	1.28	6B6GT	.72	25A6GT	1.06
2K25	24.95	464A	7.50	1641	.79	IA4	1.28	6AR5	.66	7A7	.72	25AC5GT	1.16
2K28	34.95	527	12.95	1642	.98	IA4F	1.56	6AS7G	4.95	7A8	.72	25I.6GT	.66
2K33	34.95	531	24.50	1644	1.49	IA5GT	.72	6AT6	.60	7AD7	1.06	25Y5	1.16
3AP1	4.95	575A	14.95	1654	1.98	IA6	1.28	6AU6	.80	7AF7	.72	25Z5	.60
3B22	4.95	731A	4.95	1851	1.25	IA7GT	.60	6AV6	.60	7AG7	.88	25Z6GT	.60
3B23	4.95	703A	4.95	1852	1.06	IB3GT	1.49	6B4C	1.28	7AH7	.88	26	.72
3B24	1.95	705A	2.95	1853	1.06	IB4	1.56	6B5	1.56	7B4	.72	27	.60
3B26	5.95	707A/B	24.95	1960	.95	IB5 25S	1.28	6B6G	.88	7B5	.72	28D7	.39
3BP1	3.95	708A	7.95	2050	1.19	IB7GT	1.06	6B7	1.28	7B6	.72	30	.39
3C21	5.95	710A	2.95	2051	.98	IC5GT	.88	6B8	1.28	7B7	.72	31	.39
3C22	12.95	713A	1.65	5514	4.95	IC6GT	1.28	6B8G	1.28	7B8	.72	32	1.28
3C23	4.95	715A/B	9.95	5516	5.95	IC7G	1.28	6BA6	.80	7C4 1203A	.39	32L7GT	1.28
3C24	.69	715C	24.95	5562	10.00	ID5G1	1.55	6BE6	.72	7C5	.72	33	.39
3C30	1.50	717A	.99	7193	.39	ID7C	1.28	6BG6G	1.92	7C6	.72	34	.39
3CP1	3.00	720DY	34.95	8003	5.95	ID8GT	1.56	6BH6	.80	7C7	.72	35/51	.80
3DP1	3.95	751A/B	4.35	8005	4.95	IE5GT	1.38	6B16	.80	7E7 1201	1.06	35/51	.72
REP1	3.95	801A	3.95	8008	3.75	IE7G	1.56	IE7G	.39	7E8	.72	35B5	.80
3E29	4.95	724A/B	4.95	8011	2.95	IF4	1.06	6C5	.66	7E7	.88	35I.6GT	.66
3FP7	3.95	725A	24.95	8012	4.95	IF5G	1.06	6C5GT	.66	7F7	.88	35W4	.46
3J31	49.50	726A	23.50	8013	2.95	IF6	1.56	6C6	.80	7F8	1.06	35Y4	.72
4-65A	14.50	750TL	49.50	8014A	24.95	IF7G	1.56	6C7	1.28	7G7/1232	1.06	35Z5	.72
4-125A	25.00	801	2.95	8017	1.49	IG4GT	1.28	6C8G	1.06	7H7	.72	35Z6GT	.60
4-250A	37.50	801A	.98	8020	3.95	IG5GT	1.06	6D6	.66	7J7	1.06	35Z5GT	.50
4A1	1.98	802	2.95	8025	2.95	IH4C	.88	6D8G	1.28	7K7	1.06	36	.39
4AP10	6.95	803	8.95	8025	2.95	IH5GT	.66	6E5	.85	7L7	.88	37	.39
4B24	4.95	804	12.95	8025	2.95	IH6G	1.28	6E6	1.06	7N7	.88	38	.39
4C35	19.95	805	5.95	CEQ72	1.95	IH6GT	1.28	6E7	1.06	7O7	.72	39/44	.39
4J26	110.00	805	1.25	CK1005	.69	IG6GT	1.28	6F5GT	.66	7P7	.88	41	.66
4J33	49.50	809	2.95	CK1006	.69	IL4	.80	6F6	.80	7S7	1.06	42	.66
5AP1	4.95	810	7.95	CK1090	4.95	ILA4	1.06	6F6GT	.66	7V7	1.06	43	.66
5AP4	5.95	811	2.45	EF50	.79	ILA6	1.06	6F7	1.06	7W7	1.06	45	.66
5BP1	2.95	812	2.95	FL3C	4.95	ILB4	1.06	6F8G	1.28	7X7/XXFM	1.06	45Z3	.60
5BP4	4.95	812H	6.90	EL225	1.95	ILB5	1.06	6G6G	1.06	7Y4	.72	45Z5GT	.72
5CP1	3.95	813	8.95	FL23A	12.95	ILC6	1.06	6H6	.60	7Z4	.72	46	1.06
5CP7	13.95	814	3.95	FG60	150.00	ILD5	1.06	6H6GT	.60	10	.69	47	.96
5D21	29.95	815	2.95	FG17	3.25	ILE3	1.06	6J5	.54	12A6	.60	49	.88
5FP7	3.95	816	1.19	FG27A	9.95	ILG5	1.06	6J5GT	1.19	12A6GT	.39	50	1.56
5GP1	4.95	826	.69	FG33	8.95	ILH4	1.06	6J6	1.16	12A6GT	.39	50A5	.88
5HP4	9.95	827	6.95	FG67	12.95	ILH5	1.06	6J7	1.28	12A7GT	1.28	50B5	.66
5LP1	11.95	829A/B	7.95	FG81A	6.95	IN5GT	.80	6J7GT	.80	12A8GT	.80	50L6GT	.66
6AF6G	.88	829B/3E29	4.95	FG105	19.95	IP5GT	1.06	6J8G	1.28	12AH7GT	.88	50Y6GT	.72
6C21	24.95	830	2.95	FG172A	32.50	IO5GT	1.06	6K5GT	.96	12AL5	.80	53	1.06
6D4	1.29	830B	5.25	FG235	59.50	IR4	1.06	6K6GT	.60	12AT6	.60	56	.72
6J4	3.95	831A	4.95	FG238B	160.00	IR5	.80	6K7	.60	12AT7	1.06	57	.80
7BP7	17.95	833A	34.50	GL146	11.00	IS4	.96	6K7GT	.66	12B5GT	.80	58	.80
7EP4	17.95	834	5.95	GL207	110.00	IS5	.72	6K8	.96	12A7G	.96	59	1.06
9AP4	24.95	836	1.15	GL530	49.50	IT4	.80	6K8GT	.96	12BA6	.72	70L7GT	1.56
9CP7	15.00	837	2.50	GL559	5.35	IT5GT	1.06	6L5G	1.06	12BE6	.72	71A	.80
9JP1	7.95	838	3.95	GL697	150.00	IU4	.80	6L6	1.42	12C6	.69	72	.66
9HP7	14.95	841	6.95	HF100	3.95	IU5	.72	6L7	1.16	12D5GT	.72	73	.66
10Y	.69	843	.69	HF210	17.95	IV	.88	6L8A	1.16	12H6	.72	76	.66
10SPEC	.69	845	4.95	HY65	2.49	2A3	1.28	6L7	.96	12J5GT	.39	78	.66
12DP7	14.95	845W	5.95	HY69	2.49	2A4G	1.28	6L7G	1.16	12J7G	.80	79	.88
12DP8	14.95	849A	60.00	HY75	1.25	2A5	.88	6N6G	1.56	12J7GT	.80	81	1.56
12GP7	14.95	849H	60.00	HY615	1.25	2A6	1.06	6N7	.96	12K7GT	.66	82	1.06
12HP7	14.95	851	75.00	HYE1148	.48	2A7	1.06	6N7GT	.96	12K8	.88	83	1.06
15E	1.50	860	3.00	KU610	9.95	2B7	.88	6P5GT	.96	12K8GT	.96	83V	1.28
15R	1.50	861	49.95	ML101	150.00	2E5	.88	6Q6/6T7G	1.06	12O7GT	.72	84/6Z4	.72
23D4	.49	864	.69	REL21	4.25	2V3G	1.98	6Q7	.80	12SA7	.66	89	.72
24G	.98	865	2.98	RK12	1.95	2X2A	1.25	6Q7GT	.72	12SA7GT	.66	89Y	.39
455SPEC	.49	866A	.99	RK21	3.95	3A4	.39	6R7	1.06	12SC7	.72	117L7GT	1.56
751L	3.95	866JR	1.25	RK22	4.95	3A5	1.39	6R7GT	1.06	12SF5	.80	117M7GT	1.56
100TH	12.95	868	1.95	RK25	2.95	3A8GT	1.98	6S7	1.28	12SF5GT	.80	117N7GT	1.56
100TS	3.90	869B	75.00	RK33	.98	3B7	.36	6S7G	1.28	12SF7	.80	117P7GT	1.56
114A	1.25	872A	2.95	RK34	3.95	3D6	.36	6S8GT	1.06	12SF7GT	.80	117Z3	.60
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## Bad Audio? (Continued from page 43)

value to one of 500,000 ohms. This improved the response with relation to the position of the setting of the volume control. A series carbon resistor of 560,000 ohms was installed between the audio coupling condenser and the high side of the volume control and 56,000 ohms was added in series with the 15,000 ohm resistor connected to the same terminal of the volume control. Two further changes were made to the input grid circuit. The value of the grid return resistor was reduced from 15 to 2 megohms and the coupling condenser next to the grid increased in value from .004  $\mu$ fd. to .05  $\mu$ fd.

The 6J5 used as a phase inverter was removed and in its place a 6SN7GT was installed with appropriate circuit changes. This provided a second audio stage, as well as a separate phase inverter element. There was another advantage gained as inverse feedback was to be introduced around the audio system from the voice coil to the cathode of the input section of the 6SN7, now the second audio stage. This feature would not have been possible without the added triode element, as it was desired to keep the feedback loop free of the tone control system of this receiver. Experimental determination of the amount of gain reduction showed that 4 db. at a reference of 200 cycles worked nicely and provided adequate damping of the loudspeaker when it was mounted in the recommended baffle. Fig. 5 shows the modified audio system of this second receiver. Curve A of Fig. 6 shows the averaged response of the amplifier, working into a resistive load, after the changes had been made. Curve B shows the response with the 755-A loudspeaker as a load, readings being

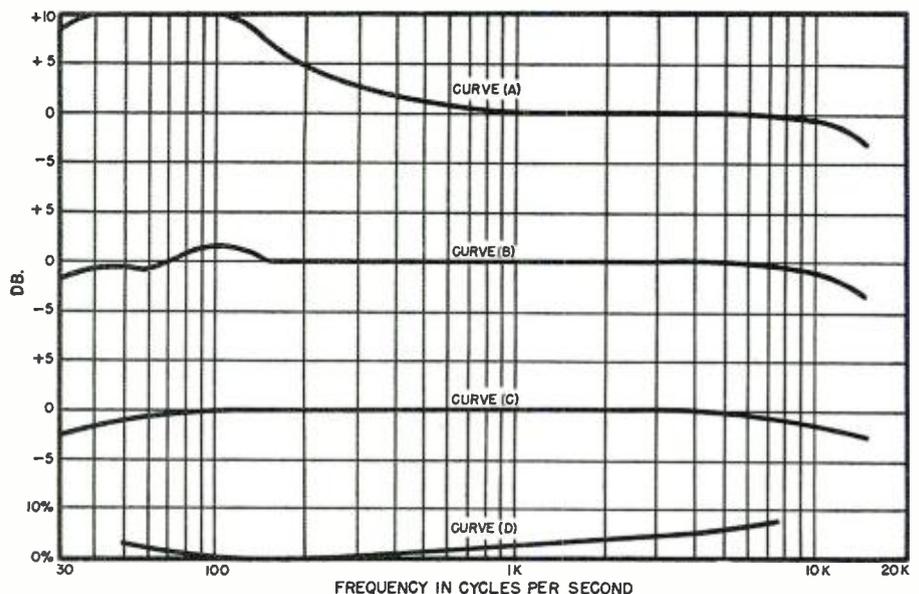
taken with a voltmeter in shunt with the voice coil windings, again using the optimum settings of the tone controls.

While at first glance, the modification appears to be a major operation, in reality it was not. Listening tests showed such marked improvement in performance that the work involved was fully justified. Fuzziness and ear fatigue had been eliminated and with the new output transformer installed it was possible to deliver between 8 and 10 watts to the speaker.

The third project covered a console model receiver of 11 tubes. AM and FM reception was provided in addition to the phonograph unit. From the preceding studies, it was decided to first make all tests with a resistive load on the amplifier and with the loudspeaker in the circuit last. Curve A in Fig. 7 shows the response obtained from the unmodified receiver with a median setting of the tone control. From this setting, some change in the amount of treble was obtainable but in all cases the results were short of the desired quality which an FM receiver should be capable of producing. Curve B shows a run made of the distortion of the amplifier, with a peak amount of 23% at 50 cycles. Here again insufficient power was being delivered considering the output tubes used in the receiver. Once more it was necessary to change the output transformer in order to provide satisfactory performance.

Analysis of the amplifier connections indicated that a most unconventional method of attempting to secure phase inversion had been tried. An unby-passed resistor in the cathode circuit of the output stage was supposedly functioning as a phase inverter although tests proved that, as a result, the second output tube was contributing little to the output of the receiver. A 6C4 miniature triode was installed in the set and wired to function as a self-balancing phase inverter. This

Fig. 9. Response curves of the third audio system tested after modifications.



delivered equal and opposite voltages to the two output grids of the 6V6's. The inverse feedback path was to the cathode of the output stage. This was altered to include the entire audio system with return being made to the cathode of the input tube. An unby-passed cathode resistor to this stage did the trick. This loop was adjusted for 10 db. of gain reduction at 400 cycles, again providing adequate damping of the loudspeaker. With this addition and the changes mentioned, the response of the receiver became more like that of a true console.

Another modification rendered the tone control system independent of the bass boost which was incorporated in this receiver by means of a tapped volume control. As the volume was increased less boost was incorporated while adjustment of the tone control affected the treble register alone. The changed audio system, as finally wired into the set, is shown in Fig. 8. Fig. 9 shows four performance curves for this receiver. Curve A is the response of the set with the 755-A loudspeaker as a load and with the modified bass boost system. Curve B was made under the same conditions only without modification of the bass circuit. Curve C is the performance of the audio system using a resistive load while Curve D shows the distortion when using the loudspeaker as the load. Obviously there is a tremendous improvement over the results of Curve B of Fig. 7, to which reference should be made. Listening tests with a critical audience proved the value of the changes.

Incidentally, it should be pointed out that all of the performance graphs have been drawn on identical scales in order to permit easy comparison of the results obtained.

Upon completion of the work, the question was raised as to why such changes should be necessary. Frankly, this question has me stumped. The modifications made on the equipment were simple and inexpensive and why they were not incorporated in the original equipment is puzzling. The appreciation of improved musical reproduction is not a matter for quick market assimilation but the eagerness with which the public is accepting the imported phonograph records with their increased frequency response is indicative of the demands that the public may soon be making of their radio sets.

What is the answer to the problem? I cannot suggest all of the possibilities but I can point out several practical steps than can be followed. If the manufacturer is really interested in offering quality merchandise let him return to the fundamentals of good audio practice and incorporate the more easily adaptable triode output stage, thereby eliminating the need for a feedback circuit and plate stabilization bypassing of the beam power tubes with its attendant attenuation of the higher audio frequencies.

Next, let the buyer determine what he is purchasing by means of a fair

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**832A TWIN BEAM TETRODE.** (Not pictured) 26 watts output up to 200 MEG! 750v. @ 90 ma. 6.3 or 12.6v. fil. BRAND NEW! \$2.50 ea. or 4 for \$8.40.

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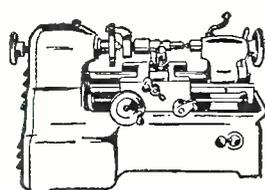
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test of the receiver made by an independent testing organization—at the dealer's expense—before investing in the set.

Finally, may I suggest a return to absolute honesty in advertising where by no claims of set performance are made which cannot be fully justified.

Now that a few simple techniques for improving home receiver performance have been outlined, it is to be hoped that new models will reflect better engineering design, improved components, and better use of circuits in order to provide really efficient overall performance. For too many years the emphasis has been not on improving receiver performance but in cutting production costs. The situation has now reached the point where the engineering society to which the majority of radio receiver designers belong has seen fit to condemn the practice as suicidal.

An ever-increasing number of independent, custom-builders of equipment is making itself felt in the industry as more and more people are turning to the high fidelity equipment available from such sources. These pioneers stand a good chance of becoming the purveyors of much of the radio receiving equipment in the future solely on the basis of the quality of the product they are able to offer the public.

-30-

### Serviceing Simplified

(Continued from page 72)

- C-5. Inoperative converter tube.
- D-5. Open or shorted input i.f. transformer (primary or secondary).
- E-5. Open or shorted oscillator anode circuit.

Should the mixer stage prove operative we can then go ahead and check the local oscillator. Regardless of the oscillator circuit (Armstrong or cathode tap) the grid bias is dependent upon the activity in the grid tank circuit. If the grid tank condenser is shorted, the grid bias rapidly reduces to zero and the local oscillator section of the mixer tube is shocked momentarily. This circuit discontinuity should produce an instantaneous surge condition at the oscillator grid which would beat against the tube and circuit noise in the mixer stage and produce an audio modulated radio frequency signal which would pass through the i.f. stage, be demodulated in the second detector and actuate the speaker as an audio frequency disturbance. Hence, to test the local oscillator (at various dial settings) short the oscillator tank either at the oscillator tuning section (rotor-to-stator) or at the grid-to-grid return section of the oscillator coil. As has been previously discussed, should the circuit be operative a distinctive circuit disturbance noise should be noted at the speaker.

Should no click or noise be apparent, it is reasonable to assume that the

local oscillator is inoperative and one of the following causes apply.

- A-6. Defective mixer tube (oscillator section).
- B-6. Open or shorted oscillator coil.
- C-6. Shorted oscillator tuning or trimmer condenser.
- D-6. Open or shorted oscillator grid coupling condenser.

We have now "disturbance-checked" the receiver through to its first stage. We now make the final test. (Which conversely is the first stage of the radio receiver.) Short the cathode of the r.f. amplifier to ground. Should we still receive the characteristic click, the trouble with the receiver is most probably in the antenna or r.f. amplifier grid circuit. This may be determined by a routine ohmmeter check. Should the circuit disturbance noise, on the other hand, be absent, we have finally located our evasive fault in the r.f. amplifier stage and we may locate and repair the fault with the aid of a volt ohmmeter. The fault would probably be:

- A-7. Inoperative r.f. amplifier tube.
- B-7. Cathode resistor or cathode bypass condenser shorted to ground.
- C-7. Open or shorted second r.f. transformer (primary or secondary).
- D-7. Open secondary first r.f. transformer.

E-7. Open or shorted r.f. amplifier screen circuit.

The above tests, although lengthy in reading, are relatively simple and quickly performed, requiring usually less than fifteen minutes to troubleshoot a receiver. The reader is advised to read the outlined procedure twice and perform the tests as he reads. In this manner, he will become acquainted with the procedure and the characteristic disturbance (click) resulting from the shorting tests.

The authors again want to state that the above technique is not necessarily the only method to employ. There are probably as many methods as there are radio servicemen. However, there exists a few fundamental methods of troubleshooting of which the technique described is one. As is evident, the method described starts from the speaker end of the receiver with the serviceman probing his way toward the antenna end. With another basic method, troubleshooting is started at the antenna end of the receiver and testing proceeds toward the speaker end. The authors plan to discuss such a method in a later article. It should be borne in mind, that in radio servicing as in any other trade or art, copying a method or style should not be disparaged unless a man dogmatically performs a copied method without knowing what he is doing. It is the opinion of the authors that servicemen should perform and copy several methods of troubleshooting and in so doing, they will subconsciously develop a method of their own which is a combination of the various methods copied and usually results in the fastest servicing by the individual concerned.

-30-



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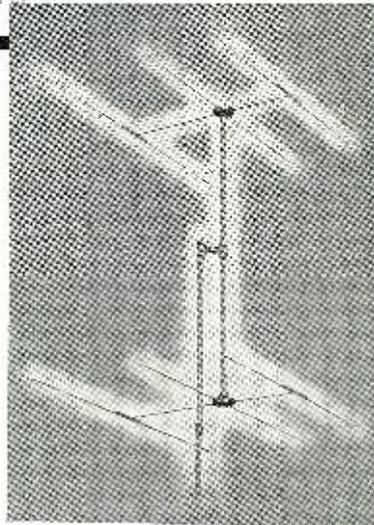


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## International Short-Wave

(Continued from page 63)

man, 10, Oban Road, Westmere, Auckland, W.2, New Zealand. Headquarters of this group is 100, Adams Gardens Estate, London, S. E. 16, England.

**United States**—An organization new to this department is the *Dial Spinners Club*; anyone wishing details should write to club headquarters at 907 Fulton Street, Rapid City, South Dakota. (Cooley, Pa.)

**The Short Wave Listeners Registry** has chosen these officials for the coming year—Bill Camp, editor; Russ Bearinger, president; Glen Jensen, first vice-president; Mrs. Arthur McArthur, second vice-president; Steve Sidor, secretary; Bill Cooley, publicity; Bob Camp (W3NJL), radio editor. Data concerning this club is available from 1042 Water St., Moosic 7, Pennsylvania.

Officers recently chosen by *Silent QRM'ers* are—Belle Aaron, president; Gustave Thomka, vice-president; Mary A. Matthews, secretary; Leonard M. Tompakov, treasurer; Betty Peck, YL director; Arthur Levi (Belfast, Northern Ireland), overseas representative; Herman Dallmeier, publicity director. For information on this organization, write to Miss Aaron at 1032 N. Broadway, Baltimore 5, Maryland.

\* \* \*

### This Month's Schedules

**Algiers**—Radio Algiers has been heard testing on its old frequency of 11.835 at 1130-1215. (Bluman, North Africa, via Swedish DX broadcast)

**Andorra**—NNRC reports Radio Andorra heard on 5.996 at 1630-1800 with bad QRM.

**Anglo-Egyptian Sudan**—Radio Omdurman has moved to 9.670; heard weakly in 2310-2345 transmission. (Beck, N. Y.) I believe this is the station Ferguson, N. C., and I have been hearing on 9.515 (some nights as high as 9.525); it is a "wanderer!"

**Angola**—CR6RF, 8.090, Caixa Postal 19, Benguela, Angola, verified with attractive card; now heard signing on 1330. (Cushen, N. Z.)

**Argentina**—LRY1, Radio Belgrano, Buenos Aires, noted recently 5 kc. lower than listed 9.455. (Kary, Pa.)

**Australia**—Melbourne has replaced VLG6, 15.24, with VLA11, 9.58, at 0100-0145 in beam to Europe (in French), and at 0200-0315 to Britain-Europe instead of VLC, 15.200. (Balbi, Calif.) In the Britain-Europe beam at 1500-1655, VLC, 15.200, has been replaced by VLC9, 17.840; VLC9 also is now used to South America at 1710-1815 instead of VLC. In the West Coast of North America beam at 2330-0045, VLG11, 15.200, is now used (daily except Saturdays); VLG11 formerly was beamed to Africa for this period. VLC9, 17.840, also has replaced VLC10, 21.680, to Britain-Europe at 0200-0245.

In Newfoundland, VLG6, 15.230, is heard 1500-1530 when is "blocked out."

**RADIO & TELEVISION NEWS**

### COMMAND RECEIVERS

**BC-455** 9.1 to 6 Mc. Used: \$6.95

BC-454 3 to 6 Mc. Used: \$4.95 New: \$6.95  
TUNING CRANK for Command Receivers Ea. 65¢  
TRIPLE RECEIVER RACK.....Ea. \$1.25

### AC POWER SUPPLY AND SPEAKER



Completely wired power supply and speaker with volume control C.W. and on & off switch, housed in metal cabinet. For command receivers with connections to plug into receiver or rack, and 110 Volt 60 cycle line. Voltage output: 250 V. 50 MA 6.3 V and 24 V.  
Price: Completely wired.....\$14.95  
Price: Kit of Parts only.....\$9.95

### MOBILE DYNAMOTORS FOR COMMAND RECEIVER

P.M. Field Dynamotors, operate 6 Volt DC input; Output 240 Volt 50 MA. Normally 12-24 Volt input; Output 500 Volt 50 MA. Size 4"W. x 3"D. x 7 1/2" L. NEW: \$1.95  
TRANSFORMER FOR RECEIVERS—115 Volt, 60 cycle Primary; Sec. 250-0-250 Volt 50 MA; 6.3 Volt and 24 Volt, with AC Schematic.  
Price: NEW.....\$2.95

### COMMAND TRANSMITTERS AND SCHEMATICS

BC-686 3 to 4 Mc. Used.....\$14.95  
BC-457 4 to 5.3 Mc. NEW.....\$8.95 Used 5.95  
BC-458 5.3 to 7 Mc. NEW.....7.95 Used 5.95  
BC-456 MODULATOR for Comm. Trans. Used.....2.50

### TRANSFORMER FOR COMMAND TRANSMITTERS

Primary 110 Volts 60 cycle; Sec. 525-0-525 Volt 250 MA; 12-12 or 24 Volt, 3 amp., 5 Volt.  
3 amp. Price: NEW.....\$9.95  
DUAL TRANSMITTER RACK, New, Ea.....\$1.25



### METER SWITCH

Battery Balancing Switch used to read battery voltage and to switch load from one battery to another. Contains Weston 2" Meter 0 to 15 DC Volts, switch DPDT—20 amp. 125 V, pilot light indicator, & pull sw. Case size: 4"x6 1/4"x 2 3/4". Price: NEW.....\$2.95

### MOTOR CONTROL RHEOSTAT

Heavy-duty, wire wound control for regulating speed of AC or DC motors, toy trains, etc. 150 watt, 8.28 ohms, 5 amps. Price.....\$1.75

### SELSYN TRANSMITTER AND INDICATOR

Ideal as Radio Beam position indicator for Ham, Television, or Commercial use. Complete with 1-82 five-inch indicator. Autosyn Trans., 12 volt 60 cycle Transformer, and wiring instructions.

Price: NEW.....\$7.95  
Price: 1-82 Indicator only.....\$4.95



### DYNAMOTORS

INPUT	OUTPUT	STOCK No.	PRICE
9 V. DC	405 V. 95 MA	DM 635 X	\$ 3.95
12 V. DC	220 V. 100 MA	D 402	3.95
12 V. DC	440 V. 200 MA	D 401	7.95
12 V. DC	F/ SCR 522	PE 98	12.95
28 V. DC	F/ SCR 522	PE 94	7.95
12/24 V. DC	F/ No. 19 MARK II	P/S #3	9.50
13/26 V. DC	F/ BC 645	PE 101	2.95
28 V. DC	400 Cycle Inverter	MG-149F	12.95
12/24 V. DC	500 V. 50 MA	USA/ 0151	1.95
28 V. DC	F/ Comm. Receivers	DM 32	1.95

### CHOKES

CHOKO 5-20 H 500 MA (Swinging) 5000 V. Test.....\$7.95  
CHOKO 8 H 500 MA Filter 5000 V. Test.....8.50

### SELSYNS

110 Volt 60 cycle 78411 Size V.....\$5.95 Pair  
21G1—110 Volt 60 cycle, Instructions.....3.00 Pair

### TRANSFORMERS

Primary 110 Volt 60 cycle; 24 Volt Sec. 1 amp. ....\$1.95  
Primary 110 Volt 60 cycle; 24 Volt Sec. .5 amp. ....1.50  
Primary 110 Volt 60 cycle; 14-14 Volt Sec. 7 1/2 or 15 amp. ....4.95  
Primary 110 Volt 60 cycle; 12 Volt Sec. 1 amp. ....1.50

### TUNING UNITS

TU-17 or TU-25 for BC-225. NEW: Ea.....\$4.50  
TU-5 for BC-191—BC-375. NEW.....3.95  
TU-7-8-9-10 or 26 for BC-191—BC375. NEW: 3.95  
RF Unit for BC-312—1st, 2nd, or 3rd.....1.50  
Detector Assy. BC-348-Q.....1.25

### 3 FOR \$1.50 SPECIALS

RF Unit 6 to 9.1 MC F/BC-454  
465 KC IF Iron Core 1st, 2nd, or 3rd  
455 KC IF Standard Replacement  
456 KC IF Pee Wee  
30 MC IF FM or T.V. Broad Band  
2.65 MC IF FM Narrow Band Assy.  
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25% DEPOSIT ON C.O.D. ORDERS

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★ BIGGEST VALUES ALWAYS ★

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(Only 2 to a customer)

Miniature Tube Sockets, 7 prongs socket and shield assembly complete **\$ .25**

**BRAND NEW TUBES Immediate Delivery**

2C44	\$.70	864/5T24	\$.80
2E22	1.39	872A	2.45
2C26	.55	826	1.00
2X2/879	.75	954	.65
3A4	.49	957	.65
3B24	1.25	991	.50
3B26	1.75	958A	.65
5R4GY	1.29	1201/7E5	.40
6AC7	1.00	1665/2050	.90
6AG7	1.00	8011	4.95
6L6GA	.95	8014A	4.95
7C4/1203A	.35	9001	.80
12A6	.45	9002	.80
12SH7	.69	9003	.80
15R	1.49	9006	.80
211	1.15	CNU7193	.49
371B	2.95	CRP72	1.00
446A/2C40	.70	E1148	.40
446B/2C40	.70	HY615	1.25
417A	4.95	OC3/VRI05	.75
705A	1.75	OD3/NR150	.75
715B	9.95	RK34	1.00
723AB	7.95	SN4	3.50
724B	.95	VT138/1629	.50
807	.95	VT-127A	1.50

#4 Pilot Bulbs—6 to 8 volts.  
Box of 10.....40c

**CRYSTAL X'DIODES**  
1N21B.....\$2.00 1N23A.....\$1.00

**6" Standard Brand LONG NOSE PLIERS \$1.00**

**OIL FILLED CONDENSERS**

GE Pyranol Capacitors, 4 MFD, 3000 volts DC **3.95**

Solar 10 MFD, 600 volts DC **1.95**

GE Pyranol Capacitor, 2 MFD, 2000 volts DC **1.50**  
GE, CD, Aerovox, Solar, Sprague.

1 MFD 5000 volts.....	\$3.95
5 MFD 330 volts AC.....	1.00
2 MFD 600 volts.....	1.00
4 MFD 600 volts.....	1.25
6 MFD 600 volts.....	1.50
7 MFD 600 volts.....	1.50
15 MFD 600 volts.....	2.75
2 MFD 1000 volts.....	1.25
8 MFD 1500 volts.....	2.50
2 MFD 2000 volts.....	1.25
1 MFD 3500 volts.....	3.50
1 MFD 5000 volts.....	3.95
.25 MFD 2000 volts.....	1.00
.30 MFD 2000 volts.....	1.00
1 MFD 3000 volts.....	1.00
1 MFD 7500 volts.....	2.00
.05 MFD 7500 volts.....	2.75
.035 MFD 10000 volts.....	3.95
1 MFD 10000 VDC—G. E.—Pyranol. Cat. 14F191.....	8.95
2 MFD 5000 VDC.....	1.95

**COIL FORM, Hammarlund SWF-5 4 for \$1.00 \$ .29**

**DYNAMOTOR**  
Dynamotor Model 5051  
DC input DC output  
volts 27.0 volts 285  
amps 1.50 amps .060 **75c**

METER Model MD 3001, MA 0-1 range. Two scales—0-5 DC KV, 0-10 DC Milliamperes. **2.95**

**SYNCHROS** Navy types, 5G, 5CT, 5HCT, 6G, 6SF, 6DG. Kayline has complete SD-3 Navy Radar Sets in stock. Write for information.

1" MIDGET METER, in all aluminum case, 0-1 MA. **3.95**

**HEAD SET**, Fine brand new miniature ear phones, 8000 Ohms, light weight. Special Purchase **2.49**

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**BENDIX TUNING METER**, type MT 31-C, complete with cord and PL-55 plug, 0-300 MA. **2.95**

**ALLEN BRADLEY CONTACTOR**, Bulletin 702, 115 volts, 60 cycle, size 1. Write for quantity prices.

**TRANSMITTING KEYS:** Type K-50...**69c**  
Type J-45...**79c**

**WESTINGHOUSE INERTEEN CAPACITORS**  
16 MFD 330 VAC.....**\$1.95**  
8 MFD 330 VAC.....**1.25**

**PAPER TUBULAR COND.**  
1 1000 VDC—Aerovox.....**\$0.10**  
.05 400 VDC—8 for.....**.50**  
.01 100 VDC—Midget-Solar, 25 for.....**1.00**

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40/30/10/10 MFD at 500/350/350/  
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**MICA CONDENSERS**  
.0005-500 volts—AER-CD-Solar.  
Per 100 **\$2.95**

**JENNINGS VACUUM COND.**  
12-25-50-100 MMF. Write for prices.

**HAMMARLUND TRANSFORMER**  
Transformer 1F part #SA166A 453K.....**1.00**

**TELEPHONE HANDSETS**.....**\$1.95**  
**PL55 PLUGS**.....**.19**  
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**RADAR RECEIVER**

A "hot" receiver covering the 174 to 210 MC Television band. Has individually slug tuned antenna R.F., Detector and oscillator circuits resulting in maximum sensitivity; contains 2 F.F. and 5 I.F. stages detector and video amplifier. Complete with 110 volt AC power supply and 14 tubes. **29.95**

**TRANSMITTER**  
Range 150-200 Mc  
BC-1072-A—An outstanding Kayline value. **24.95**

**HIGH VOLTAGE TRANSFORMER**, plate: 2100 volts @ .01 amps. New.....**\$4.95**  
59 HENRIES, 100 MA CHOKE.....**\$3.50**  
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**TELEVISION SPECIAL**, 30 Meg. 1F Transformer. While they last. (Type T-103).....**35c**

**HAMMARLUND RECEIVER COILS**, Large variety. Order by SA Part Number. Priced for closeout. ea. **49c**

**WAVEMETER**

Here's an amazing value on Wavemeters which tune from 150-210 mc and contain high quality resonant cavity wavemeter oscillator heterodyne amplifier electric tuning eye complete with 19 tubes, 110 v AC power supply. The tubes alone far exceed the entire **14.95** price.

**SPECIAL VALUES**  
RSS-8 amphenol steatite sockets.....12c  
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3AG fuse holder panel type.....19c  
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We welcome your inquiries regarding **MAGNET WIRE and miscellaneous RADIO HARDWARE**

**RELAYS**  
2500 Ohms, 4 Ma SPDT, 5 prong plug in type, hermetically sealed, all brand new **75c**

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**CARDWELL VARIABLE CONDENSERS**

No.	TYPE	MAX. CAP.	MIN. CAP.	No. PLATES	AIR GAP	LGTH.	LIST PRICE	OUR PRICE
PL-6043	EV-140-AD	140	5	27	.020	3 1/16	\$7.60	\$1.50
PL-7105	NT-50-GD	50	7	11	.070	4 3/4	7.00	1.95
PL-8005	XR500-PS	475	18	21	.030	2 1/8	6.50	2.95
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**AN/APT-2 AIRCRAFT RADAR JAMMER**  
425-750 mcs. Contains 10 tubes:  
(1)—807 (2)—703A (2)—6AC7 (1)—6AG7— (2)—5R4GY (1)—2X2 (1) 631A  
Unit has blower motor and 400 cycle pwr supply complete with all tubes etc.  
BRAND NEW. Now \$12.95

**RECTIFIER TRANSFORMER**  
110/220 V. 60 cycle Secondary 70-75 V. 3 amps plus 35-37 V. (Pri. in series.) Fully cased \$1.69

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Pri. 110/220 V. 60 cy. Sec. 820 Volts CT @ 775 ma. Fully cased \$5.95

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Pri. 110/220 V. 60 cy. Sec. 5 V. @ 15 amps. Fully cased \$2.95

**ALL PURPOSE TRANSFORMER**  
Ideal for Bias, Filament, Steadown, Isolation, etc. Pri. 110 V. 60 cy. two isolated secondaries 115 V. each @ 900 ma plus 6.3 V. @ 2 amps. Fully cased \$1.49  
Same as above but 6.3 V. 5 amps, 110x 110 V. @ 500 ma. \$1.49

**STANDARD BRAND METERS**  
2" 0-3 V DC (Basic 1 MA) 2" 150-0-150 Microamp  
2" 0-1 Amp R.F. 2" 0-1 ma DC  
2" 0-1 ma Basic (Volt Scale) 2" 0-1 ma DC  
2" 0-30 Amp D.C. \$2.69 ea.  
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2" 0-250 V DC 3" 0-80 ma DC  
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\$1.99 ea. \$2.99 ea.

1% Precision Resistors 15 Megohm non-inductive sealed in glass. 10 for \$2.50

**VARIABLE CONDENSERS CERAMIC INSULATION**  
MIDGET XMITTING  
35 mmf. .39 75 mmf. .3 spacing. \$5.95  
250 mmf. .49 150 mmf. .07 spacing. .95  
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APC 100. .29 Dual 250 mmf. 1 Sec. 3.95  
APC 140. .35 125 mmf. .07 Spc. .89

**CHOKES**  
6 Hy 50 ma AC/DC. . . . . 3 for \$0.99  
8 Hy 75 ma, 230 ohm. . . . . 2 for .99  
8 Hy 160 ma, 100 ohm. . . . . 2 for .99  
1.5 Hy 250 ma, 72 ohm. . . . . .59  
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4.3 Hy 620 ma, 42 ohm. . . . . 5.95  
C-D 16 mfd 450 Volt Electrolytic aluminum can with leads. . . . . 2 for \$0.89  
C-D 8MF 450 Volt Electrolytic in cans. Cans dented but electrically OK. . . . . 6 for .99

**WIRE WOUND RESISTORS**  
35 Watts 100, 220, 1500, 4,000, 5000, 10,000, 15,000, 40,000. Any type. 5 for \$0.99

**AMERTRAN H.V. PLATE TRANSFORMER**  
Pri. 110/220 V. 60 Cy. Sec. 1500-0-1500 Volts @ 600 ma. Built for continuous duty operation. 8x8 1/2x7. Swt 78 lbs. Ea. \$27.50

**STANCOR P 6014 POWER TRANSFORMER**  
375-0-375 Volts @ 150 ma; 6.3 V Ct @ 5 amps, 5V CT @ 2 A. Removed from equipment. Ea. \$2.95

**HALLICRAFTER S 22R RECEIVERS**  
110 Kc to 18 Megacycles in 4 bands. Used but perfect. 110 V AC/DC. Limited quantity. Ea. \$39.50

**VOLTAGE REGULATOR**  
110 220 V. 60 cy. input. Output variable from 95 to 130 V. 8.5 Amps. Ea. \$6.95

**WHATCHAMACALLITS**  
The Odds'n'End Radio Parts Are Beginning to Accumulate Again. If You're Sucker Enough to Send Along Six Bits with Your Order We'll See That You Get an Even Break.

**MISCELLANEOUS**  
.004 1000V. Micas. . . . . 6 for \$0.99  
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GE 24V DC Relays. . . . . 5 for .99  
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25 mfd 25 V. Electrolytic. . . . . 6 for .99  
JAN 6C4 Tubes. . . . . 4 for .99  
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705 A Sockets. . . . . 5 for .99  
10 mmf Midget Variable. . . . . 4 for .99  
CD .002 2500 WV Mics. . . . . 2 for .99  
50 ohm 20 watt adjustable. . . . . 4 for .99  
10,000 ohm 50 watt Rheostats. . . . . 2 for .99  
1/2 Meg Pots. 15,000 ohm Pots. . . . . 6 for .99  
Ceramic Grid Caps for 866. . . . . 6 for .99  
JAN 807 Tubes. . . . . 10 for .99  
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Ceramic 4 S Prono Sockets. . . . . 9 for .99  
300 ohm 50 watt Rheostats. . . . . 2 for .99  
50,000 ohm 1% wirewound precision. 5 for .99  
Butterfly Cond. 2-11 mmf Ball Bearing. 2 for .99

If not rated, 25% with order, balance C.O.D.—Minimum order \$5.00.

**PEAK ELECTRONICS CO.**  
188 WASHINGTON STREET, DEPT. MR  
NEW YORK 7, N. Y.

*Azores*—CS9MB, 11,090, Ponta Delgada, appears now to be on winter schedule of 1500-1600. (Ferguson, N. C.) Winter schedules, as given by Swedish DX broadcast, are 1500-1600 on 11,090 and 1700-1900 on 4,845.

*Brazil*—Sao Paulo is now using ZYB-9, 15,155, paralleling ZYB-8, 11,765; news in Portuguese at 2100; complete schedule not known; ZYB-7, 6,095, is not heard, so presumably the 19-meter channel is a replacement. (Kary, Pa.) Pernambuco has been heard on 9,655 to 2200 sign-off, fine signal. (Balbi, Calif.)

PRE-9, 15,165, Fortaleza, is heard daily around 1530 announcing in *English* and asking for reports to Caera Radio Club, P. O. Box 222, Fortaleza, Brazil. (Radio Australia)

*British Guiana*—ZFY, Georgetown, formerly 6,000, has dropped in frequency to around 5,984 where it has a much better signal. Closes around 2015 EST (9:30 p.m. British Guiana time). (Ferguson, N. C.) At times has been heard as late as 2200 closing down. (Rosenauer, Calif.)

*Burma*—According to Major, W. Australia, *Radio Rangoon* is currently scheduled 2015-2030, 9,543; 0115-0145, 9,543; 0915-1015, 9,543, and 6,035; news 1000.

*Camerouns*—*Radio Douala*, 9,149 (measured), has been heard by Kary, Pa., from tune-in at 1525 to sign-off at 1601; this was on a Sunday when program consisted of uninterrupted dance music (U. S., French, South American, and so on); at 1600, man announced "Ici Radio Douala," said goodnight to all (in French), and went off the air with a march selection (*not* "La Marseillaise"); signals were unusually strong but were subject to rather strong sideband QRM from a powerful teletype station on 9,150. It is possible that on weekdays this station runs only to 1400. I checked this outlet on a Sunday more recently and found program similar to that reported by Kary, except that sign-off at 1601 was quite abrupt after announcement—without any musical signature.

*Canada*—CBLX, 15,090, Montreal, varies at times to 15,088. (Kary, Pa.)

Latest winter set-up for CBC's International Service is—To Europe, 1000-1128, CKNC, CKCX; 1130-1330, CKNC, CKCS; 1330-1345, CKCS; 1345-1400, CKCS, CKLO; 1400-1420, CKLO; 1420-1700, CKLO, CHOL; 1700-1715, CKLO; 1715-1815, CKLO, CKOB; 1815-1830, CKLO. To Australia, New Zealand (*Sundays only*), 0345-0535, CHOL, CHLS. To Latin America and Caribbean, 1845-1925 (*English* to Caribbean), CKCS; 1845-1925 (*Spanish*), CKRA; 1930-1945 (*Portuguese*), CKRA; 1945-2025 (*Portuguese*), CKRA, CKLO; 2030-2130 (*Spanish*), CKRA, CKLO; 2130-2145 (*French*), CKRA, CKLO; 2145-2220 (*English*), CKRA, CKLO. To North West Territories (winter service to Artic settlements, *Sundays only*), 2310-2400, CKLO, CKOB. Channels used are CKNC, 17,82; CKCX, 15,19; CKCS, 15,32; CKLO, 9,63; CHOL, 11,72;

CKOB, 6,09; CHLS, 9,61, and CKRA, 11,76.

CHNX, 6,130, Halifax, Nova Scotia, is back on the air after a prolonged absence, relays regular programs of medium-wave CHNS. (Kary, Pa.) Has much better signal than formerly, may have increased power and/or put into operation a better antenna array. (I hope to have details next month, including complete schedule. However, appears to run around 0600 to 2200 or later.—K.R.B.)

Art Hankins, Pa., reported CFCX on 12,010 to the station and received a verification for its 6,005 outlet. Officials stated: "There wasn't any doubt that it was CFCX which you heard, but our transmission is on 6,005, which leads to the presumption that what you picked up was some sort of a harmonic signal. CFCF is relayed by CFCX, power output is in excess of 75 watts; schedule is weekdays 0630-0000, Sundays 0800-0000; address, Canadian Marconi Co., P. O. Box 1690, Montreal, Quebec, Canada." (I have heard this harmonic for a long time.—K.R.B.)

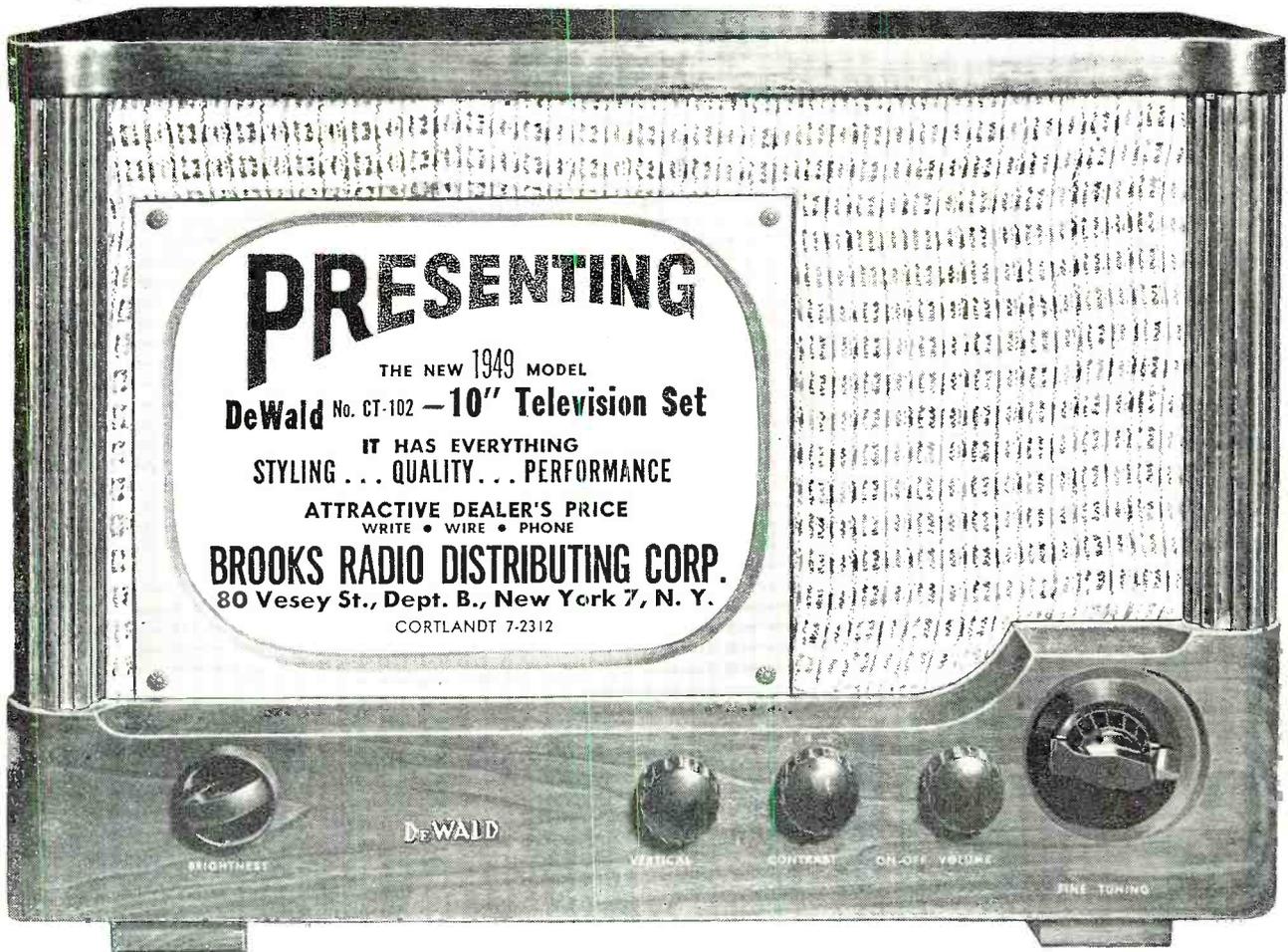
*Celebes*—*Radio Indonesia*, Makassar, formerly operating as "Radio Makassar," in a verie-letter to Kary, Pa., stated transmitters are on 9,550 and 5,030, the former with 10 kw.; announcement of station in Dutch is "Dit is Makassar, Radio Indonesia," in Indonesian it is "Disini Makassar, Radio Indonesia"; weekdays programs are 2200-0130 (2200-0000 in Indonesian; 0000-0130 in Dutch); 0400-1000 (0400-0700 in Indonesian; 0700-1000 in Dutch); and 1700-1900 (1700-1800 in Indonesian; 1800-1900 in Dutch); Sundays, 1900-0130 (beginning on Saturdays 1900-0015 in Dutch; 0015-0130 in Indonesian); 0400-1000 (0400-0700 in Indonesian; 0700-1000 in Dutch).

Station officials wrote Kary: "Perhaps, do you know the way to get some recordings of the latest songs? It's impossible for us to buy them here. Of course, you know we can't get dollars to buy gramophone records. Perhaps one of the American broadcasting stations can help us?" (*NOTE: This appeal should be a challenge to our readers. If anyone would like to contribute some up-to-date recordings to this station, the QRA is Radio Indonesia, Makassar Studio, Strandweg Zuid 2, Makassar, Celebes, State of East Indonesia.—K.R.B.*)

*Ceylon*—Major, W. Australia, airmails me that by this time it is likely that *Radio SEAC* will have been handed over to the Ceylon Government, after which it is to be known as "Radio Ceylon." At the time this was compiled the *Sunday* beam from *Radio SEAC* to the British Isles was being heard well here in West Virginia on 15,12 and 17,77 at (winter schedule) 1330-1530.

*Chile*—CE920, 9,200, Puntarenas, is heard signing off at 2200, signals rather poor. (Kary, Pa.)

*China*—XORA, Shanghai, formerly on 11,705V, now appears to be using 11,850 where it is badly QRM'd by BFEBS, Singapore, and/or All India



**REMEMBER**  
it's  
**EXCLUSIVE!**

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JH6	6AQ6	6S8	12A8	12BF6	42
1U6	6AT6	6SA7	12AT6	12F5	38
1L4	6AU6	6SD7	12AT7	12F6	46
1Q5	6BA6	6SF5	12AU6	12J5	47
1R4	6BE6	6SG7	12AU7	12J7	50B5
1R5	6BH6	6SH7	12BA6	12K7	70L7
185	6BG6	6SJ7	12SF7	12K8	80
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1U4	6C4	6SL7	12S17	12S8	12A
3A4	6C5	6SN7	12SN7	25Y5	6J7
3Q4	6F5	6SQ7	10	32L7	6K8
3S4	6F6	6SR7	20	37	7A17
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5Z3	6F8	26	50	78	
6A3	6Y6	27	56	81	
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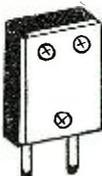
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50 mfd.	150V	.24	2.14	20.45
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Radio. (Balbi, Calif.) Shanghai sometimes is as high as 11.852; both it and Singapore vary back and forth around 11.850 in an attempt to get a clear spot! (Fern, Hawaii, via NNRC) Has been measured as high as 11.868. (Hutchins, Radio Australia)

XGOY, Chungking, has a strong signal on 7.153 now (in parallel with 11.913) mornings to sign-off 1045; often the 0900 news is better on 7.153 than on 11.913. (Balbi, Calif.) XGOY's 15.17 outlet is heard here in West Virginia at weak level to as late as 0730, news 0700; it is "squeezed" badly by Oslo on low side and BBC on high side.

Recently, Desouza, Singapore, Far East monitor for *Radio Australia*, checked 11.400 for a Chinese station previously reported as operating there with call XAET; he did not locate this station on 11.400 but did find XAET on 12.700, daily from around 0600 to sign-off 0800; entirely in Chinese and at times relays XNCR (Communist-controlled outlet); usually this XNCR relay is 0630-0700; call-sign XAET is repeated three times at 30-minute intervals.

Cushen, New Zealand, reports XRRA, Peiping, heard on 6.095 at 0530.

The station heard rather widely in Chinese on 12.120 in December 1947 on the East Coast to 1930 sign-off and announcing as "XAAE" apparently was in reality XKPB, Taiyuan, Shansi, China. (Kary, Pa.) Incidentally, Australians have recently reported XKPB has been heard mornings, around 0500.

XLRA, 11.490 (may be as high as 11.5), is heard in Massachusetts at 0625 with good level; XTPA, 11.650, Canton, is heard well around 0635-0815. (Harris)

Latest schedules received by Rose-nauer, Calif. from XGOA, Nanking, are: To North America, 15.105, 2100-2300; to Philippines, Australia, New Zealand, and South Pacific Island, 15.105, 0400-0530; to Mongolia, Tibet,

Japan, and Pacific Islands, 15.105, 0550-0730; to India, South Africa, and Europe, 15.105 and 11.880, at 0800-1015. It was explained: "The Central Broadcasting Administration operates two separate services from its Nanking outlet XGOA, The Central Broadcasting Station. The local service is heard over 660 kc., 5.985, and 9.730; the Overseas Service is presently heard on 15.105 and 11.880." Incidentally, XGOA's 15.105 outlet has been sending a fair (readable) signal to Eastern North America lately in the 2100-2300 beam, news 2115, 2230; signal improving.

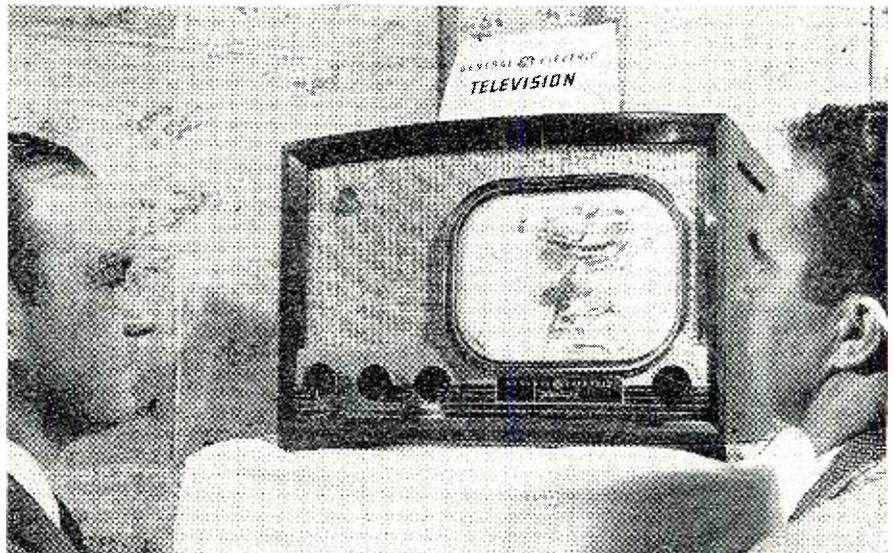
Colombia—Bogota appears to have another new group—HJKJ, 6.160 and HJKL, 950 kc., at 0650-2300 daily. (McPheeters, La.)

McPheeters, La., has received a letter from *Radio Pacifico*, Cali, with stations HJEX, 6.054.3 and HJER, 1030 kc. The letter (in Spanish) stated: "Indeed, by a special exchange worked out between Radio Pacifico of this city of Cali, and 'La Voz de Pereira,' of Pereira, Colombia, we have definitely remained located on 6.054.3 and 'La Voz de Pereira' moved to 4.865, as the Sociedad de Comercio which is in charge of the undersigned (Radio Pacifico) holds the concession for the frequency of 6.054.3 and was formerly owner of the already-mentioned Pereira transmitter." *Radio Pacifico* is on the air 0630-2230. It was stated they are anxious to receive reports, especially those in which reception of their station is compared with that of other Colombian transmitters.

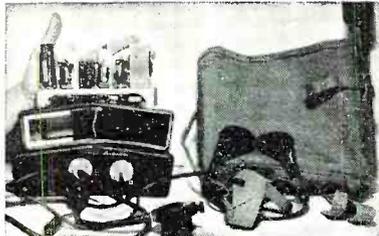
Cuba—COBC, 9.380, Havana, operates 0700-0000, fair signal, but badly QRM'd by a phone station (may be harmonic); COCW, 6.327, Havana, is scheduled 0600-0000, announces "*Cadena Rojo*." (Weisburg, N. Y.)

Curacao—PJC2, 7.250, Willemstad, sends schedule of 1130-1230, 1800-2130. Sometimes has been heard as late as 2155, however. Has *English* program

Television took a major role at the recent Los Angeles meeting of the American College of Surgeons. An actual major operation, which was under way at the General Hospital, was televised direct to the convention hall.



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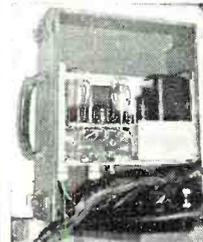
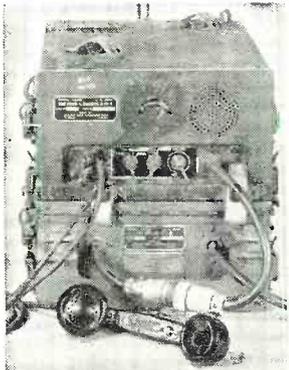


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Handset TS-13 w-PL-55 and PL-68, U-1\* **3.95**  
Diagram BC-659 or BC-620. **.65**  
Alignment Tool TL-207, U-1. **.95**



**VIBRATOR POWER SUPPLY PE-120** for BC-659 and BC-620; operates from 6, 12 or 24 v. depending on vibrator. With 12 or 24 v. vibrator, battery cable and plug. UNUSED **\$12.95** U-1 **\$9.95** U-2 **\$7.95**

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**INTERPHONE AMPLIFIER BC-347** aircraft type. Input: 200 ohm to single or push-pull plate. Complete with 6F8C tube, 2 hi-fidelity ooneer xfmrs, etc., in case 2 1/2"x4"x6". BRAND NEW, orig. cartons. **\$2.95**

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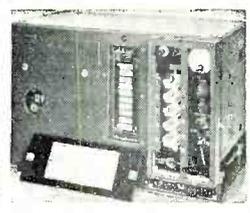
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Used, good, without dynamotor. **12.95**  
Extra 12 volt dynamotors; DM-34 for rec., U-2. **3.95**  
DM-35 for xmtr U-2. **4.95**  
Set of 80 xtals in drawer for BC-604 (when bought with BC-604) **12.95**

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U-2 with dynamotor **29.95** Without dynamotor **27.95**  
Choice of xtal for any channel. **1.00**  
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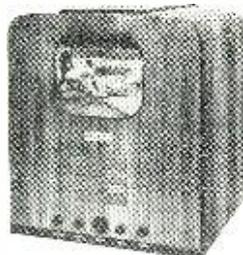
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New 7A Telekit has circuit innovations throughout, including high fidelity FM sound and 6,000 volt picture tube supply. Completely new sweep circuits, pre-built tuner, and easy-to-follow instruction book. Your cost \$59.50. Tube kit, including 7JP4, \$41.58. 7A cabinet \$21.00. See your local parts jobber or write to us for information. If your jobber does not carry Telekit, please send us his name

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Mondays at 2000; power 3 kw. (Driver, Ohio) First transmission may run as late as 1300. (McPheeters, La.)

Now that Juliana is Queen of the Netherlands, this station bears the slogan "Juliana-Zender" instead of former "Princess Juliana Zender." (Worris, N. Y., Driver, Ohio, McPheeters, La.) The station has informed Worris, N. Y., that the series of programs, "Holland Calling," has now ended and that on Mondays at 2000 they carry "Dutch Students Speak."

**Cyprus**—The Near East Arab Broadcasting Station on 6.135. 6.170, and 9.650 have been heard by Kary, Pa., best around 2320; 6.170 was best when logged, but only fair, in clear; 6.135 had some QRM and was slightly weaker than 6.170; 9.650 was weakest of the three, and all suffered heavy static. This particular transmission is scheduled to begin 2255.

**Czechoslovakia**—At the time this was compiled, no information was at hand concerning Prague's daily "evening" beam to North America, formerly at 2000-2100 on 11.840, but not reported lately. May have moved? (Frequencies to try include 11.84, 15.23, 15.32, 9.55, 6.01.)

Prague now has news 1245 on 9.55, 1445, 1645 on 6.010. (Pearce, England) The 11.840 outlet has been heard recently in New York closing at 1800. (Beck)

**Denmark**—Copenhagen's latest daily schedule to North America on 9.52 is 2130-2300 with repeat at 2300-0030. (Kary, Pa., Worris, N. Y.) *English* is usually around 2230 and 2345 (varies). Normally has good to excellent level in East but suffers bad QRM. Reports requested to Danish State Radio, Short-Wave Section, Broadcasting House, Copenhagen, Denmark.

**Dominican Republic**—HI2A. "La Voz de Releccion, La Voz del Pueblo," Santiago, has recently been on 7.217, moved from 6.786; fair signals nightly but with severe ham QRM. (Kary, Pa.)

**Ecuador**—HC1GQ, 9.190, Quito, Ecuador, "Radio Nariz del Diablo," was heard some time ago as early as 2100 to sign-off 2200, strong but somewhat under-modulated signal; announced slogan and location, but did not give call; apparently, this station is on only irregularly. (Kary, Pa.)

HC4NL. 9.870, Manta, "La Voz de Democracia," is back on the air, signs off 2232; suffers QRM from WON as well as from multiplex interference. (Kary, Pa.)

**Egypt**—According to a Swedish DX broadcast, Cairo programs are heard from around 1430 on 6.210 with bad QRM from Warsaw and Bucharest; at 1500 call of "Hona Iskanderiyah!" ("Here Alexandria!") is given; this may mean location or relay from medium-wave outlet.

SUX, 7.860, Cairo, has been heard in Pennsylvania with fair signals afternoon; commentary in Arabic by two men at 1605-1620, followed by Arabic music; apparently left the air 1628. (Kary)

**El Salvador**—YSLK, San Salvador,

is a new station on 9.540, gives schedule of 0900-1000, 1200-1500, 1800-0000; medium-wave outlet is YSLL, 1500 kc. (Fern, Hawaii)

**England**—BBC's North American beams are now 0600-0800, GWH, 11.80; 0800-0900, GST, 21.55; 0915-1215, GST, 21.55; 1300-1445, GST, 21.55; 1400-1600, GWG, 15.155; 1500-1745, GRF, 12.095; 1615-2215, GRH, 9.825; 1745-2215, GSL, 6.11, and 1615-2215, GSB, 9.51 (especially for West Coast).

**Finland**—Helsinki's OIX4, 15.190, is being heard with news for America, opening 0715 and closing around 0725; some days signals are good in level. (Ferguson, N. C.) Here in West Virginia signals are also good but modulation is not of the best quality.

**France**—Paris winter schedules, furnished by Worris, N. Y., include—1705-1830, 9.550 in French to Antilles, Guiana, St. Pierre, and so on; 1830-1835, 9.550 in Spanish to Santiago de Chile; 1915-1930, 9.550 in French to Latin America; 1945-2000, 9.550, 11.70 in *English* to North America; 2100-2115, 9.550, 11.700 in *English* to North America; 2115-2130, 9.550, 11.700, in French to North America; 0000-0015, 6.200, 9.550 in French to North Africa; 0030-0130, 9.550, in French to Tahiti, New Caledonia, New Hebrides, and so on. (This may not be complete schedule.)

**French Indo-China**—Saigon, 11.78, is heard with news 0900. (McAlister, Calif.)

**French Morocco**—Hagen, Ala., reports Rabat heard on 6.006 at 0155-0300; comes on with "La Marseillaise," and announces "Ici Radio Maroc;" popular music to 0200 when has news in French; at 0210 has lessons in Arabic; from 0225-0300 has popular and classical music; fades away around 0300 but has good signal at start. This one also heard in Kentucky by Alcock, who reports bad fade. (I have heard a station on this approximate frequency recently, but did not hear identification and perhaps erroneously assumed it was *Radio Noumea*, 6.000, New Caledonia, which is scheduled around 0200-0530 now.—K.R.B.)

**French West Africa**—*Radio Dakar*, 11.898, is heard in Newfoundland at 1330-1700. (Peddle) Heard in Ohio at 0200-0230; French news 0215. (Sutton) In a letter to McPheeters, La., station gave frequencies of 11.895 and 1448 kc.

**Germany**—At times. *Radio Volga*, 7.610, Berlin, Russian-controlled station, has a fair signal around 1600; usually suffers bad ham QRM (harmonics from 75-meter band). (Kary, Pa.) For the most part at least, this station relays Moscow.

The *Danish Brigade Radio*, Germany, verified by card for Cushen, New Zealand, and stated that it "closed on July 27 last because of special reasons."

Munich is heard well in New York at sign-on 0000 on 6.160 (light QRM); fades out around 0230; carries a different program from the outlet on 6.080. (Beck)

Baden-Baden, 6.332, is heard in Ala-

bama at 0000-0145; woman announcer, uses French. (Hagen) Frequency may vary slightly at times.

**Greece**—Bluman, North Africa, has confirmed to *Radio Australia* that AFN, Athens, on 8.000 is heard *Fridays only* at 1330-1430 and that call is KJOY.

**Radio Athens** has an excellent level carrier on 9.605 (stronger than BBC's GRY, 9.600!), but the audio is almost not there in the transmission beginning 0000. (Beck, N. Y.)

**Haiti**—HHCN, 6.407, Port-au-Prince, has been heard (in French) from tuning at 1930 to sign-off 2030. (Dallmeier, N. Y.)

The Haitian station now on 6.200 is HHCP, Cap-Haitien, a 60-watt job moved from 7.288; originally began on 7.600; signs on 0600 but is readable only to about 0645 after which it is obscured by QRM from an unidentified Latin American transmitter; is listed only 0600-0800 and 1700-1900; fair signals at sign-on; announces "Ici la IHCP, Cap-Haitien, Haiti." (Kary, Pa.)

HHYM, 6.000, Port-au-Prince, heard signing on 1810. (Kary, Pa.)

**Hawaii**—KRHO, Honolulu, relaying programs from the United States, is now scheduled on 9.530, 0600-0915 to China-Philippines; on 15.130, 0215-0345 (not Mondays) to China-Philippines, and on 15.250, 0400-0545 to China-Philippines.

**Holland**—Cushen, New Zealand, says PHI, 21.480, now uses 16-17 kw.; that PHI, 17.770 will increase to 40 kw. early in 1949; that PCJ, 9.590, 15.220, will increase to 100 kw. in August 1949, and that PHI, 11.735, 17.770, will increase to 100 kw. in 1950. He further states that the 21.480 outlet sends a good signal to New Zealand at 0500 with news.

The "Happy Station Programs" are now scheduled Sundays at 1030-1200 for East and Near East on 17.77, 15.22, 6.02; 1600-1730 to Africa and South America on 11.73, 9.59, 6.02; 2200-2330 to North America on 11.73, 9.59, 6.02. Tuesdays at 0330-0500 to Pacific, Australia, and New Zealand on 21.48, 17.77, 15.22, 6.02; Wednesdays, 1030-1200 to East and Near East on 17.77, 15.22, 6.02; 1600-1730 to Africa and South America on 11.73, 9.59, 6.02; 2200-2330 to North America on 11.73, 9.59, 6.02. Address is now Postbox 137, Hilversum, Holland (Netherlands). (Sklenar, Nebraska) (Incidentally, some weeks ago on one of the "Happy Station Programs," Eddie Startz made a beautiful musical dedication in memory of one of PCJ's staunchest supporters and a cooperater with this Department, Henry Callahan, whose death occurred in Philadelphia on October 1. Mr. Callahan had furnished many recordings to PCJ, gratis, and assisted in many other ways in helping Mr. Startz build up the PCJ library which was largely lost during World War II.)

**Honduras**—HRA, "La Voz de Lempira," Tegucigalpa, was erroneously listed recently as on 6.049; actually frequency is 9.049. (Kary, Pa.) (This

January, 1949

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All 117 Volts to 117 Volts 60 Cy.  
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For Small Transmitters. DC Voltage Ratings are Approx. Values Obtained at Output of a 2 section Choke input Filter. Using Mercury Vapor Rectifier Tubes Pri. is for 115 V. 60 cy.

Type No.	Sec. Rms. Volts	DC Volts	Sec. MA.	H. 4%	W. 3 1/2"	D. 4 3/8"	Price Each
P 57	660—660†	500	250	4%	3 1/2"	4 3/8"	\$ 6.76
	550—550	400					
P 58	1080—1080	1000*	125	4%	3 1/2"	5	8.23
	500—500	150					
P 59	900—900	750	225	4%	3 1/2"	5 1/8"	7.94
	800—800	600					
P 67	1450—1450	1200	300	5 3/4%	6 1/8"	4	19.84
	1175—1175	1000					
P 68	2100—2100	1750	300	5 3/4%	6 1/8"	4 1/4"	24.99
	1800—1800	1500					

\* For dual operation with simultaneous use of both sec ratings. † Has 40-volt bias tap.

### POWERSTAT VARIABLE TRANSFORMERS

Type 20: 115 V. input, 0-135 V. output @ 3.0 amps. 0.4 KVA. **\$12.50**  
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Type 1126: 230 V. input, topped at 115 V. 15.0 amps. 2.0 KVA. **\$46.00**  
Type 1226: 230 V. input, topped at 115 V. 0-270 V. output @ 9.0 amps. 2.4 KVA. **\$46.00**  
Type 1156: 115 V. input, 0-135 V. output @ 45.0 amps. 6.1 KVA. **\$118.00**

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Heavy Duty

7 x 7 x 2	94c
7 x 9 x 2	\$1.06
5 x 10 x 3	\$1.00
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1-3/16"	\$2.33
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Completely shielded, Insulator Terminals. Primary: 115 Volts 60 cycle @ 300 Ma.  
Secondaries:  
180 V. @ 20 Ma. **\$1.95** Special  
300 V. @ 20 Ma.  
6.3 V. @ 1.2 amps.  
5.1 V. @ 7 amps. C.T.

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Dual coil with armature pivoted normally open. Operates 220-250 Volts. 8000 ohms each coil, contacts S.P.D.T. Controls rated 2 amps. at 110 V.A.C. Ideally suited for balanced or bridge type circuits where limited current or power is available. **88c**

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Dual Primary 115 V. A.C. Each. Secondary 0—35 3/4" Volt at 3 amps. 0—70 7/5 Volt at 3 amps. This transformer is completely shielded. **\$1.95** Extra Special  
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Input 220-250 Volts 60 cy. Output 110-125 Volts 60 cy. Primary cord and plug, Secondary, Receptical.

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150 watts, P-62	\$6.45
250 watts, P-63	\$8.25
500 watts, P-64	\$10.65
1000 watts, P-65	\$20.25

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4 Mfd 600 Volt D.C. Sprague	49c
8 Mfd 1000 Volt D.C. Tube	\$1.69
7.5 Mfd 330 Volt A.C., G.E.	98c
2 Mfd 10,000 Volt D.C., C.D.	\$13.95
1 Mfd 750 V. Sprague	25c
Dual .1 Mfd 600 V. CD Type DYR each	19c, per 100, \$10.00

### CHOKES

SMOOTHING TYPE	SWINGING TYPE	PRICE EACH
C-80 10	C-87 4—16	150 \$3.09
C-81 10	C-88 4—16	200 \$3.92
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0Y4	1.72	2B7	.96	6K6GT	.54	6Y6G	.85	12AT6	.60	35Y4	.65
0Z4	.80	2X2	1.15	6K7.G	.60	6Z7G	1.40	12BA6	.65	35Z4GT	.54
1A3	.80	3A1	.72	6K8	.85	6Z55G	.80	12BE6	.65	35Z6GT	.45
1A4P	1.40	3B7/1291	.96	6L5G	.96	7A4	.85	12C8	1.15	36	.96
1A5GT	.65	3D6/1299	.96	6L6GA	1.15	7A5	.65	12H6	.65	37	.66
1A6	1.15	3Q4	.80	6L7	1.15	7A6	.65	12J5GT	.54	38	.80
1A7GT	.72	3Q5GT	.85	6N7	.85	7A7	.65	12J7GT	.72	39/44	.96
1B4P	1.40	3S4	.72	6P5GT	.80	7A8	.65	12K7GT	.60	40	.80
1B5/25S	1.15	3R4GY	1.15	6Q7	.72	7B4	.65	12K8	.65	41	.60
1C5GT	.80	5T4	1.40	6R7	.96	7B5	.65	12SA7GT	.65	42	.60
1C6	1.15	5U4G	.54	6RS6GT	.65	7B6	.65	12SC7	.80	45	.60
1C7	1.15	5V4G	.85	6S7	.96	7B7	.65	12SF5	.65	45Z3	.65
1D5GP	1.40	5X4G	.65	6SA7.GT	.60	7B8	.65	12SF7	.72	45Z6GT	.65
1D7G	1.15	5Y3GT	.45	6SB7.Y	.85	7C5	.65	12SG7	.72	46	.96
1D8GP	1.40	5Y4G	.54	6SB7.Y	.85	7C6	.65	12SH7	.80	47	.85
1E5GP	1.40	5Z3	.65	6SC7	.72	7C7	.65	12SJ7	.60	48	1.40
1E7GT	1.40	5Z3	.96	6SD7GT	1.15	7E6	.65	12SK7G	.60	50A5	1.40
1F4	.96	6A3	.96	6SF5	.72	7E7	.80	12SL7GT	.85	50A5	.80
1F5G	.96	6A4/LA	1.15	6SF7	.72	7F7	.80	12SN7GT	.80	50B5	.72
1F6	1.30	6A6	.96	6SG7	.72	7F8	.96	12SQ7GT	.60	50L6GT	.60
1G4	.96	6A7	.72	6SH7	.80	7G7	.96	12SR7	.80	50X6	.80
1G5G	.72	6A8GT	.72	6S17	.60	7H7	.72	12S3	.96	50Y6GT	.65
1G6GT	.96	6AB7	1.15	6SK7.GT	.60	7I7	.96	12S3(6Z5)	1.15	50Z6	.96
1H4G	.80	6AC7	.96	6SL7GT	.85	7K7	.72	14A4	.96	56	.65
1H5GT	.60	6AD7G	1.15	6SN7GT	.80	7L7	.80	14A7	.80	57	.72
1H6G	1.15	6AF6G	.96	6SQ7	.60	7N7	.80	14B6	.80	70L7GT	1.15
1J6G	.96	6AG5	.96	6SR7	.65	7Q7	.65	14C7	.80	71A	.72
1L4	.96	6AK5	1.15	6SS7	.65	7V7	.96	14H7	.80	75	.60
1LA4	.96	6AK5	.96	6ST7	.96	7W7	.96	14N7	.96	77	.60
1LA6	.96	6AL5	.72	6SV7	1.15	7x7	.96	14Q7	.80	78	.60
1LB4	.96	6AL7	.96	6T7G	1.15	(XXFM)	.96	14R7	.80	79	.96
1LC5	.96	6AQ7	.80	6U5	.72	7Y4	.65	14W7	.96	80	.45
1LD5	.96	6AT6	.54	6U6	.65	7Z4	.65	19	1.15	81	1.40
1LG5	.96	6B4G	.96	6U7	.65	12A	.65	24A	.80	82	.96
1LE3	.96	6B7	1.15	6V6	1.15	12A5	1.15	25A7	1.15	83	.96
1LH4	.96	6B8G	1.15	6V6GT	.72	12A6	.96	25L6GT	.60	84	1.15
1LN5	.96	6C4	.60	6V7G	.96	12A7	1.15	25Z5	.54	84/6Z4	.65
1N5GT	.72	6C5	.60					25Z6GT	.54	85	.80
1N6	.72	6C6	.72					26	.65	89	.80
1P5GT	.80	6C8G	1.15					26A7	1.15	117L7GT	1.40
1S5GT	.96	6D6	.80					27	.54	117N7GT	1.40
1R4	.96	6E5	.80					30	.72	117Z3	.65
1R5	.72	6F5GT	.80					31	.96	117Z6GT	.85
1S4	.85	6F6	.72					32	1.15	VR-90	.96
1S5	.65	6F6G	.60					32L7GT	1.15	VR-105	.96
1T4	.72	6F7	1.15					33	1.15	VR-150	.96
1T5GT	.96	6F8G	1.15					34	1.15	9001	.80
1V	.80	6G6G	.96					35	.72	FM-1000	1.15
2A3	1.15	6H6.GT	.60					35A5	.65	HY-117	1.15
2A4G	1.15	6J5.GT	.54								

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24 volt — 10 Amp — Fully enclosed — double shell upright. Mtg. 4x4x3 1/2. New. **\$4.95**

10 volt — 18 Amp — F.B. for 304, 813's, Batt. Chgr. 3 1/2 x 3 1/2 x 3 1/2 — G.E. **3.75**

15 volt — 12 Amp. Model R.R.—Fil. Supp., etc. 3 1/2 x 3 1/2 x 3 1/2 — G.E. **3.75**

Dual Filament — 6-3-3 Amp; 2.5-6 Amp in actual test this xformer withstands 14KV. breakdown. Hermet. sealed. New. **2.50**

Midget—6.3 V-1.2 Amp—New. **.3 for \$2.00**

Multi-Filament

#1-7.5 V-22A	Hermetic
2-6.3 V-8.A	Sealed
3-5.0 V-7.A	6x6 1/4 x 4 1/2
4-5.0 V-6.A	New

**\$6.25**

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error was mine, not Kary's!—K.R.B.)  
Iceland—TFJ, 12.175, Reykjavik, is still heard in Newfoundland Sundays 1115-1145. (Peddle)

India—Delhi has recently been testing on 15.13, 11.76, 9.68, 9.565 at 1400-1500, requesting reports to All India Radio, Broadcasting House, New Delhi, India. (Radio Australia) The 9.565 outlet has been heard in the United States during tests.

Iran—EPB, 15.100, Teheran, now has news 1340 (announces local time as 2210); news in French 1350 and signs off 1400. (Pearce, England) Is heard well in New York City on this schedule; news in Russian 1330. (Schild)

Iraq—Swedish sources say Baghdad is using 7.062 around 1130 in Kurdish; that signs on at 2230 on 7.092. Can anyone confirm? Baghdad has not been reported to me as heard in the United States for a long time.

Israel—Calls of Tel Aviv phone stations used for traffic to New York and elsewhere are now 4XA21, 18.890; 4XA22, 18.350, and 4XA23, 14.702. (Kary, Pa.)

Kol-Yisrael, Tel Aviv, is now on 6.817, scheduled 2245-0015, 0330-0645, 1030-1445; news 0545, 1415. (Bluman, North Africa, via Radio Australia) Still heard in Newfoundland with news 1415. (Peddle)

Italy—Weisberg, N. Y., has received these winter schedules from Radio Italiana—to Pacific area, 0600-0630, 15.12, 11.81; to East Africa, 1145-1225, 15.12, 11.81; to Latin America, 1830-2040, 15.12, 11.81; to North America, 2045-2155, 15.12, 11.81; Radio Bari, 1145-1155, 1,059 kcs.; to South Africa, 1430-1500, 9.63, 11.81; to North Africa, 1500-1530, 9.63, 11.81. And on c. w. at 1300 on IBC-IDO; at 2300 on IDR-IDO; IDO has been changed from 12,500 to 12,760; IBC uses 16.673, and IDR is on 5.455.

Jamaica—ZQI, Kingston, which for a time tested on 6.070, at last report had returned to old frequencies on regular schedule of 1600-1730 on 4.950 and 1900 (or 1930) to 2200 on 3.480.

Japan—JKC, 7.257, Tokyo, carries the English-Japanese lessons 0400-0415 daily, relayed from JOAK1. (Cushen, N. Z.)

JKE, 9.605, heard relaying WVTR at 0200-0300 with AFRS programs; JKD, 6.015, and JKE2, 4.860, heard relaying WVTR to 0905 sign-off; WLKS, 6.105, Kure, British-controlled outlet, is heard at 0900 sign-off with good level. (McAlister, Calif.)

Java—According to Major, W. Australia, at 0600 Batavia uses YDC, 15.145 and YDD, 7.270, in parallel beamed to Southwestern Pacific; he says YHN has been heard at 0900 announcing 27.68, 40, and 26.66 meters—but a check failed to reveal either of last two, they may be used later to India-Pakistan.

The approximate frequency of Soerakarta is now 10.620, moved from 11.125; schedule is believed to be 0530-1300 on this frequency and from 0530-0830 on 5.695; slogans are "Radio (Continued on page 153)

## TV Test Patterns

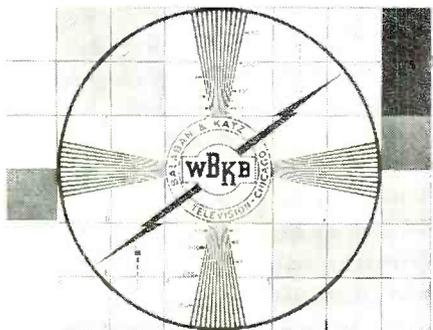
(Continued from page 39)

bars. The total effect is to outline the bars, and to make them more sharply defined. Some servicemen are in favor of slight high-frequency over-compensation because they feel that a sharper, crisper image is obtained. However, if this procedure is followed, it should be done cautiously lest excessive over-compensation and "ringing" be produced.

**Low-Frequency Response.** The eleven black horizontal black bars located at the bottom of the test pattern are for the purpose of checking the low-frequency response. When the system has poor low-frequency response, the reproduced edges of the horizontal bars will be sharply defined, but will change from black to an excessive white, with a streamer shading from this white back to the normal background. The visual effect is one of smearing, with the smearing going from left to right because that is the path of travel of the electron beam. Poor low-frequency response is generally accompanied by excessive phase shift and it is difficult to distinguish between the two. For the serviceman, however, the appearance of the smearing means that the low-end of the system's response curve is at fault and must be corrected.

**5. Contrast and Shading:** To check the over-all contrast of the test pattern, we have the Indian Head at the top of the center portion of the test pattern. The contrast control should be set so that the head appears pleasantly shaded, being neither so dark that the various shades of white and grey are obscured or so light that the entire image has a filmy, washed-out appearance. As a further aid in checking the receiver contrast range, the remaining two oblique wedges in the test pattern have four different tonal ranges. The innermost section of each wedge is black, with each additional wedge possessing a lighter shade of grey. If the transmitter and receiver are both operating normally, then each of the four shading steps should be distinctly separable on the test pattern. If the received pattern does not indicate these four graduations, either the

Fig. 5. Station test pattern of WBKB, Chicago.



January, 1949

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V-45 Onan 5 KW, 115 V, 43.4 amps, 60 cycle, single phase, 12 V. charging, 4 cylinders, 1800 RPM. Fully enclosed. Self-starting. Battery included. Trailer mounted. 4 pneumatic tires. Power Unit 65" L x 25" W x 36" H. . . . \$489.00

PE-95X 7.2 KW, 115 VAC 60 cycles single phase. Battery charger. Remote or local starting. Gasoline engine. 4 cylinder, 4 cycles, water-cooled, 1200 RPM, 12 volt starting. 22 1/2" L x 27 1/2" W x 38 1/2" H. 1600 lbs. . . . \$699.00

WISCONSIN TYPE AEH 2.0 KW, 115 VDC, 17.4 amps. Air cooled, single 3/4" cylinder, 1800 RPM. Equipped with charging handles, outlet box and voltmeter. Weight 150 lbs. Size 30" L x 23" H x 21" . . . \$189.00

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6K8G	.90	5BP1	1.15	872A	1.00
6L6G	.90	5BP4	2.50	1625	.40
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12A6	.25	249C	1.75	Tuigar	2.95

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transmitter or the receiver is at fault—the fault in this case being non-linear amplitude distortion of the video amplifiers. Where more than one station is operating locally, check with each station to determine whether their patterns show the proper shading. If all stations appear to have a poor shading in their test patterns then it is safe to assume that the trouble lies within the receiver since it is highly improbable that two or more stations, operating independently, would exhibit the same difficulty. However, if only one station presents a poor shading pattern, while the other test patterns are normal, then the defect lies with the transmitter. To the serviceman, the defect is important only when it arises in the receiver. The trouble, when it is here, can be traced to an improperly biased video-frequency amplifier or a gassy tube in this system.

6. *Interlacing:* There is one final test that can be made with this test chart and this is to determine whether the odd numbered lines are falling properly between the even numbered lines. If, for any reason, the vertical sweep oscillator is not operating properly, the lines of one field will not accurately drop into the spaces between the lines of the previous field. Lines of one field may fall close to or even directly over the lines of the previous field, in which case there is a loss in detail due to this partial pairing of lines. In the test pattern, we check the quality of interlace by examining the narrow diagonal lines in the center portion of the chart. Partial interlacing, which means incomplete interlacing, will be evident by the jagged reproduction of these lines. When there is a complete pairing of lines, or a complete absence of interlacing, then the test fails. In this case, however, the pairing is generally

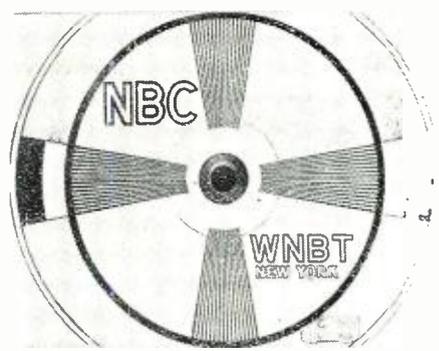


Fig. 6. Station test pattern of WNBT, New York.

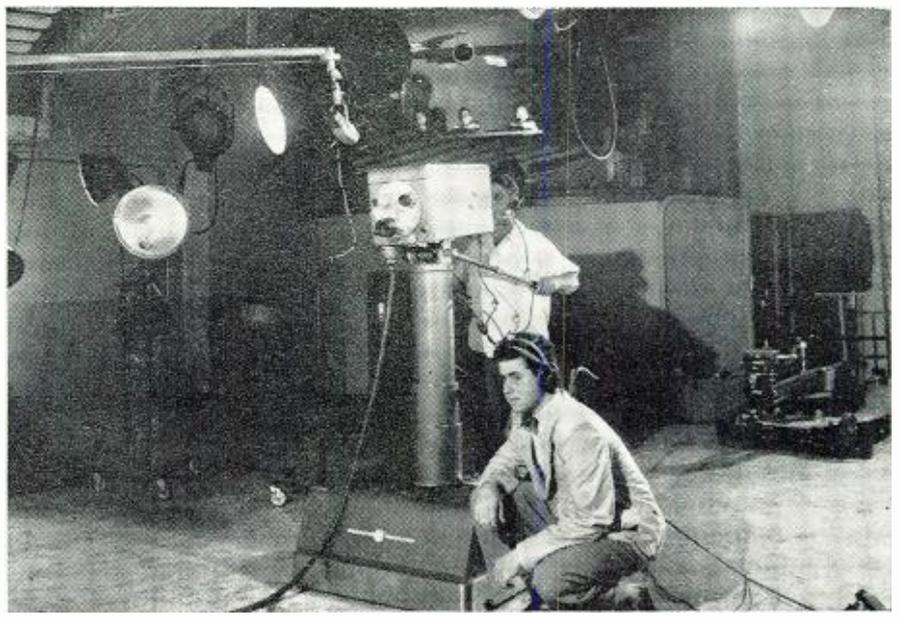
quite easily visible by noting the wide separation between the lines. Since the defect is due to an improperly functioning vertical sweep system, this should be checked.

A distinction should be made here between the reduction in vertical resolution due to incomplete interlacing and the same reduction arising from a limited frequency response. A limited frequency response will not cause the diagonal lines to become jagged, whereas poor interlacing will.

The foregoing discussion is designed to indicate the usefulness of test patterns to television receiver servicemen. More extensive test patterns are employed in the checking of television transmitters because of the greater number of adjustments that must be made in this equipment. A standard transmitter pattern developed by the RMA Committee on Television Transmitters is shown in Fig. 4. Finally there are individual test patterns developed by each station bearing a few of the markings (in one form or another) contained in the RCA "Monoscope" pattern and in addition, giving the station call letters. Two such patterns are shown in Figs. 5 and 6.

-50-

A General Electric television camera in action with its crew at the U. S. Navy Special Devices Center at Sands Point, Long Island, where the Navy is performing experiments in mass training of personnel by means of telecast lectures and equipment demonstrations.



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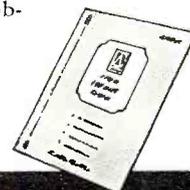
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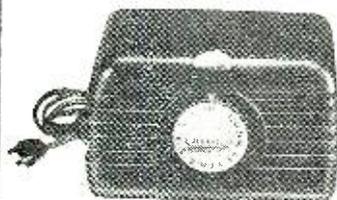
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**DEALERS** This new Model TV-FM Booster can be used in your store for demonstrating up to 4 TV or FM receivers and up to 4 antennas. Adapter switch backplates are available for this purpose. We will send you information on request.

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## Motorecycle Radio

(Continued from page 65)

output test requiring the development of at least 7 watts in a 50 ohm dummy load, such as a *Bird* wattmeter. It is housed identically with the receiver and mounts on the right hand side on standard *Harley-Davidson* type racks.

The tube line-up is as follows: 6AK6—harmonic crystal oscillator, using a low drift crystal for frequency stability; 6AK6—buffer doubler; 2E26—straightthrough final amplifier.

The modulator is a single 6V6 transformer coupled to the 2E26. The high level mike and high voltage gain microphone transformer supply sufficient voltage at the 6V6 grid to modulate the 2E26 100% with "close talking."

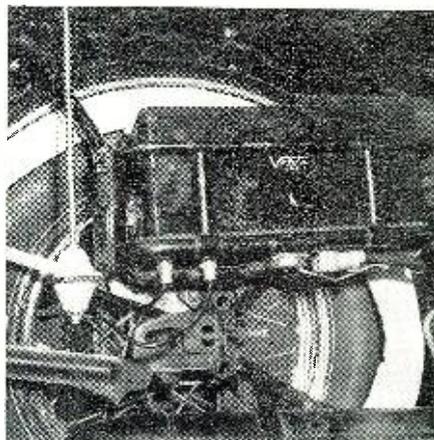
The standby current of the transmitter may be adjusted from zero to 1½ amperes with a warm-up time of 15 seconds at zero standby drain. Any intermediate drain and warm-up time, as determined by a curve supplied with the equipment, can be obtained by adjustment of a resistor in the filament circuit. Full standby current "ready to transmit" and with receiver operating does not exceed 10 amperes at 6 volts.

All transmitter adjustments are available from the top of the chassis with the dust cover removed, including oscillator tuning, buffer tuning, final amplifier tuning, and antenna matching. These adjustments are not critical and do not vary under severe shock and vibration, nor are they affected by the placement or removal of the dust cover. Coaxial connectors for 52 ohm antenna feed are employed.

Metering of the following circuits is provided by a single jack and five position switch; (1) crystal oscillator, (2) buffer grid current, (3) final amplifier grid current, (4) final amplifier cathode current, and (5) final amplifier plate voltage.

The power supply is identical in construction with the vibrator supply for the CM-1 receivers with the exception of higher voltage and current. A

Side view of xmtr. showing antenna mount, rack, coaxial plugs, and K junction shell.



CM-2 dynamotor supply may also be used interchangeably on the CM-1 transmitters where higher power output is desirable, such as for taxi or police automobile use. This approximately doubles the power ratings of all transmitters.

A single base plate is available for use on a 3-wheel motorcycle or cars, and the two units may be "plugged in" back to back, making a single compact unit 13¾x9¾x7½" high.

A complete motorcycle installation consists of a mike, control head, junction box, transmitter and base plate, receiver and base plate, antenna, and interconnecting cables fitted with *Cannon* electric connectors, all contoured and finished so as to blend into and become a part of the motorcycle itself, adding to rather than detracting from the over-all appearance. —30—

## Mac's Service Shop

(Continued from page 56)

to point through the audio amplifier until we reach a place where the signal voltage rises and falls in step with the volume issuing from the speaker. Then we work backward from this point at which the volume *does* change and forward from that at which it *does not*—just like two baseball players closing in on a runner caught off base—until we have narrowed down the separation of these two points to the smallest possible circuit distance—say the opposite ends of a coupling condenser. Then that condenser *has* to be the cause of the trouble; and incidentally, coupling condensers which have poor connections between leads and foil are one of the most common causes of intermittent sets."

"What if the trouble is ahead of the detector?"

"Use the same 'closing-in' tactics, but your instruments have to indicate r.f. and i.f. voltages. That means you must use an r.f. probe on the v.t.v.m. or scope, or you can employ the signal tracer. Plate, screen, cathode, and a.v.c. bypass condensers; defective windings in r.f., oscillator, or i.f. coils; and defective tubes are some of the most common causes of abrupt changes in the amount of signal voltage delivered to the detector tube."

"I can see how that would work if the set kept cutting in and out quite often, but what are you going to do if it won't cut out when you have it on the bench?"

"The only thing you can do is try to *make* it cut out," Mac said. "I usually start by tapping the tubes, especially the ones with gridcaps, such as the 6A7's, 6A8's, 6Q7's and 75's. Lots of times striking the caps of these tubes smartly on top with a bakelite rod will cause the volume to change with each blow; but you want to make sure that the change is not caused by the jarring of some other defective unit instead of the tube itself. If tapping the cap of a new tube has no such

effect, you can be pretty sure you have found the villain.

"If the tubes seem OK, I next try to find a bad condenser. I feed a strong unmodulated signal into the antenna post from the oscillator, tune this signal in on the receiver so that I hear the characteristic rushing sound, and then gently tap the various bypass and coupling condensers. Notice I say 'gently.' If you go yanking the condensers around roughly, you will have a lot of little intermittent conditions instead of just one. When you tap a condenser that has a poor connection between lead and foil and allow it to vibrate on its leads, you can usually notice a chopping-up of the rushing sound coming from the speaker. A good condenser will give forth nothing except possibly a slight microphonic sound."

"Do you have any other third-degree methods to make these intermittents sing?"

"Yes, most of them are affected by heat; so I use an infrared lamp to warm up suspected parts. These lamps have a small intense heating area that is fine for this job. Also, I try both low and high line voltages on the set, using the tapped isolation transformer for accomplishing this. Many a time I have first struck the trail of an intermittent condition by simply 'wracking' the chassis a little with my hands. Thumping the chassis in various spots with a little rubber hammer such as a doctor uses for testing reflexes is also helpful."

Mac was interrupted by the bellow of the one o'clock whistle at the laundry across the street.

"Well," he said, "the subject of intermittents is far too big for us to cover at one session; so suppose you work on the sets I think will fall under what we have talked about today for the rest of this month; then we will renew the discussion and talk about some other kinds of intermittents and some other methods of tracking down the causes."

"That's oke with me," Barney agreed as he closed his notebook and slid from the bench; "and in return, if there is ever anything you want to know about the bees or the birds or the flowers, just ask old Uncle Barney here!"

-30-

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10 henry 85 mils 250 ohms DC Ea. **.97**  
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## Custom Installations

(Continued from page 37)

inherent surface noise of a shellac record. This is valuable in checking the effectiveness of various methods for reducing surface noise, and again may be used to observe the frequency response of the system. The wider the response range, the louder will be the noise level.

While the selection of these records is important, it is of even greater importance to be fully familiar with them and with the results to be expected from them on various classes of equipment.

In the final analysis, the purpose of music, the excuse for its existence, is to provide enjoyment. Philosophically, this may be divided and debated in categories ranging from background music to serious expressions of important concepts. In general, satisfactory background music is not difficult to reproduce. For direct undistracted listening, the problem is much more involved.

Unquestionably the most important factors are that the reproduction be "clean," free from distortion and noise. This might be defined by saying that the reproducing system should not add anything to the signal. At power levels of 0.01 watt, this isn't too difficult. At levels used in average living rooms by serious listeners, it probably means a minimum electrical reserve power of eight watts with very low distortion, good transient response, and a reasonably efficient loudspeaker and cabinet. Obviously the design of such equipment would be appreciably simplified if it were necessary to reproduce only a single frequency. Filters could be inserted such that all other frequencies would be sharply attenuated, and if the system did develop distortion components or noise frequencies, they would not be heard in the output. The wider the bandwidth passed by the equipment, the more critical is the problem of reducing noise and distortion components introduced by the system. Now comes the customer question about whether extremely wide frequency response is desirable. There has been so much controversy on this subject that it is not strange if many people in the industry hesitate over the answer to this question. Still, the answer seems fairly obvious.

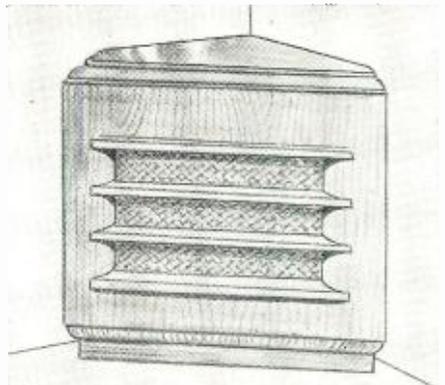
A recent article (unquestionably the most intelligently developed review of this general problem to date)<sup>1</sup> quotes Professor Harold Burris-Meyer twice, as follows: "Man has had a long time to throw away instruments of displeasing tone," and, "For too long have we made reproducing devices that remind the listeners of music, but do not reproduce it."

There is a straightforward and entirely reasonable rationalization of this problem. Most customers will react

favorably to it, and often will find themselves making a distinct effort to understand and enjoy wider range reproduction. In the first place, the structure of the human auditory system imposes certain definite limitations on the range of hearing. Among these is the limitation set by the frequency response characteristics of the ear. It is safe to say that the range of importance is limited to 30 to 15,000 cycles per second. Now, no one will debate very seriously whether the enjoyment of music is largely a matter of education. It is also obvious that one of the most important factors in enjoying music lies in the ability to perceive a variety of frequencies. If these things are true, then it seems quite clear that it is desirable to be able to enjoy as wide a range of frequencies as the ear is capable of hearing. The frequencies above approximately 4500 cycles per second are almost entirely harmonics that contribute nothing to the melodic line or fundamental musical structure, but are perceived as an extremely important facet of the quality of tone. If there were no harmonics observable from musical instruments, a few very simple instruments would suffice to provide all the variations in tone quality it would be possible to hear, or it would require an incredible number to produce a complex tone structure. This means that anyone who has been educated not to like wide range response is missing a great deal of the enjoyment inherent in music. Clearly, this is undesirable. To insist that a limited range is more desirable than wide frequency response is not incomparable to suggesting that vision should be limited to black and white, and such a position is not tenable on any reasonable basis.

It must not be overlooked that phonograph records taken by and large are not very good. This is a strong understatement. The distortion and noise inherent in a large percentage of recordings is such that they are intolerable when played on a full frequency range system operated wide open. On the other hand, records are being improved and there is reason to believe that a number of factors (not the least of which is the threat of mag-

Help your customer visualize a corner speaker installation by submitting a professional looking sketch of the projected unit.



**RADIO & TELEVISION NEWS**

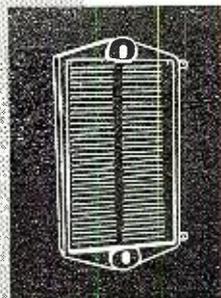
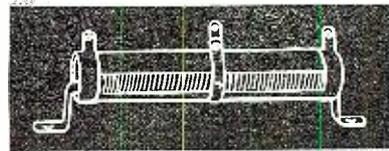
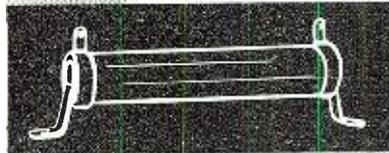
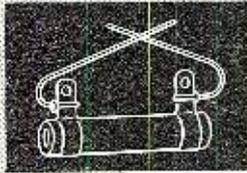
netic tape recording) will continue to influence the manufacturers in the direction of striving for still greater improvement. Thus, the reproducing system should be designed to take care of the finest available records and the finest that will be available as progress is made. It should also be capable of control so as to limit the response range in terms of the characteristics of the records. The only other approach would be to limit the equipment in terms of the worst records likely to be played, and this is so apparently foolish that the decision in favor of equipment capable of wide range response seems inevitable.

It is worthwhile to re-emphasize at this point that wide range equipment alone is not enough. It must be equipped with flexible and simple controls and it must be free of inherent noise and distortion. Remember that noise and distortion become increasingly difficult to eliminate as you broaden the response band. Remember that your customer in most instances will tolerate a limited response band much more readily than he will tolerate noise and distortion. Convince him, by demonstration with good records with quiet surfaces and clean recording, that he will be able to enjoy the advantages of wide range high quality equipment with some existing recordings and with an increasing number as improvement continues.

Almost all of this has been concentrated on record reproduction. In basic principle the same conditions apply to radio broadcast reception. On the few live programs broadcast over FM stations and a few AM stations, it is possible to achieve remarkable presence and realism with wide range equipment. This is increasingly true as the quality of broadcast signals is improved.

Along about now it is not unusual for the customer to say, "Well, there appears to be a great deal of truth in what you say. On the other hand, with all this improvement in recordings and radio broadcast methods, isn't it likely that reproducing systems will also be greatly improved? Isn't it foolish to invest a large sum of money in reproducing equipment that may be obsolete in a short time? How about the new long-playing records?" There are two answers for this. One is that improvement is inevitable (we hope) in everything, and it is entirely possible to go through life never buying anything and never enjoying anything because of the possibility that something better will be available next year. The counter to this is that right now we are going through a period in which there is more improvement than in normal times because of discoveries made during the war, etc. In this regard you may assure him with complete truth that very little work done in electronics during the war is applicable to audio reproducing problems. The best answer, and the most important one, is the second. Audio

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reproducing equipment has progressed so far beyond the available signals that it will be many years before the shoe is on the other foot, if ever. Given a perfect signal source, a perfect recording, or a perfectly broadcast live program, the realism that can be achieved by high quality audio reproducing equipment available today is so close to perfection that very few observers, if any, would be able sincerely to criticize it. It is possible that equally good equipment may be manufactured at lower prices (though this is unlikely for some time to come).

Certainly it is true that audio amplifiers are available with full frequency response and with inherent distortion so minimized that it becomes difficult to measure it in the laboratory, much less to hear it. Pickups are on the market that reproduce a frequency range covering the entire audio spectrum. Loudspeakers in properly designed enclosures certainly come very close, on a listening basis, to producing a pattern of sound that under ideal room conditions is difficult to distinguish from the original.

None of this means that improvements will not be made, nor that any really good engineer in the industry is completely satisfied with the results obtainable. It does mean that looking for rapid improvements or rapidly lowering costs for high quality equipment is not in accordance with the facts. It does mean that if a customer waits, say two or even five years, it is extremely unlikely that he will wish he hadn't purchased high quality equipment now. The question of tape recording will come up in many instances and the answer, of course, is that this accessory equipment is available now, that it can be added at any future time, and that while it has importance, it is obvious that it will take a very long time to accumulate a sufficient library of music on tape to replace the material available on discs,

even assuming that all of the advantage otherwise is with the tape, which it is not. Television? Right now, if the customer wants it, or later as an added entertainment feature. Most serious music listeners will recognize that television, however important as an entertainment medium, is not competitive with music reproduction. It is certainly no more competitive with recorded music than radio, and radio has by no means minimized the sale of phonograph equipment.

Finally, the question of service may arise. It is always an important and worthwhile policy to include in the price a sufficient allowance to permit you to guarantee service for a satisfactory length of time. However, it is important to point out that high quality equipment is usually easier to service than cheap equipment. The parts are laid out more cleanly, the wiring is easier to follow, etc. The customer should be assured that complete service information will be provided with his installation so that any competent radio serviceman would be able to handle whatever troubles might appear.

Along with this, it is important to provide for the customer a satisfactory and reasonably complete instruction manual for the operation of the various controls. It is worthwhile to write this yourself, drawing on material supplied by the manufacturers of the various components. Writing such an instruction manual is an excellent method of finding out how much, or how little, you know about the proper operation of a high quality music reproducing system. It is an excellent guide for finding weak spots in your knowledge and aiding you with an incentive to eliminate them.

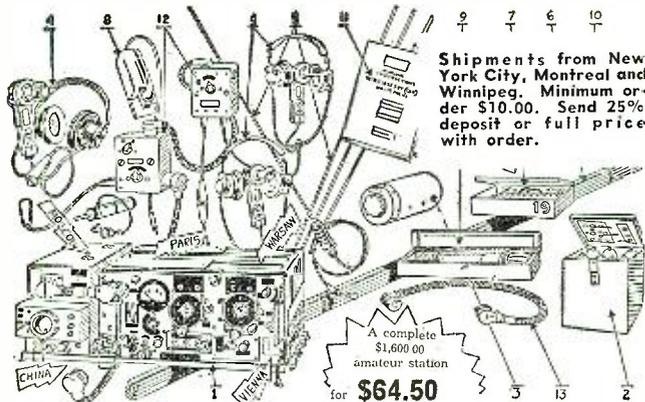
### REFERENCES

<sup>1</sup>LeBel, C. J.; "Psycho-Acoustical Aspects of Listener Preference Tests," *AUDIO ENGINEERING*, August 1947.

(To be continued)

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**HERE'S HOW IT WORKS:**

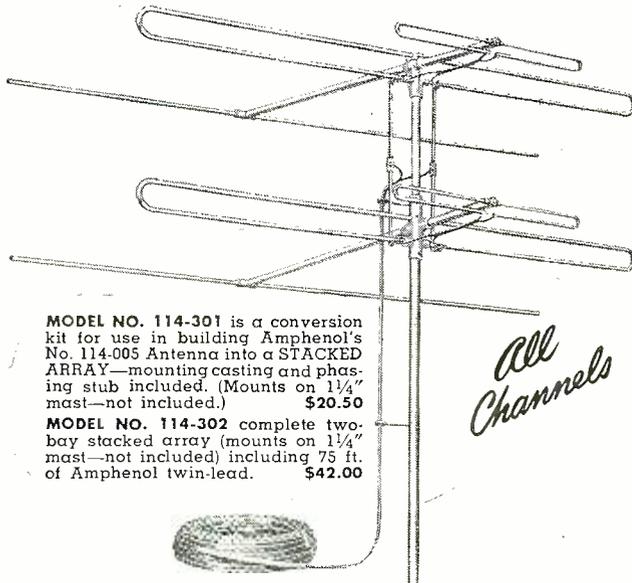
Let's suppose you want to buy a transformer which you locate at \$4.95. We probably know who offers the same transformer for \$2.95. When you describe your wants to us, we send you by return mail, absolutely free of charge, a full description, quantity available, and lowest price. When you order from us, we then buy it for you, and add our nominal commission.

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*All Channels*

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**Performance Charts Available**

If you are not now receiving the monthly AMPHENOL ENGINEERING NEWS—you will want to request the September issue which included pattern and gain charts for the Stacked Array. We will be glad to mail it and to place your name on our list to receive future issues—write Dept. 13D.



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# NEW RECEIVERS for Winter Market

## SMALL TV CONSOLE

A boon to apartment dwellers and persons living in cramped quarters has been offered by *Allen B. DuMont Laboratories, Inc.*, of New York.

Known as the "Sutton," the new model RA-103 television receiver is



styled in functional modern design and finished in blonde hardwood. The set offers large-screen television (7½" x 10") producing a 72 square inch direct-view picture with FM and television on all channels.

The "Sutton" features DuMont's exclusive patented "Inputuner" and tuning eye for quick, accurate tuning. The unit incorporates a 10 inch PM dynamic speaker.

The cabinet measures 28¾" by 38" by 20¼". The set uses 25 tubes plus 3 rectifiers.

For further details write *Allen B. DuMont Laboratories, Inc.*, 515 Madison Avenue, New York 22, New York.

## "FRONT ROW" TV

*Bendix Radio, Division of Bendix Aviation Corporation*, recently introduced its "Front Row" television receiver to the public.

The new set features push-button tuning coupled with automatic picture



control to make possible instantaneous program selection regardless of channel. Only two control knobs, in addition to the push-buttons, appear on the front panel. The service controls are concealed by a panel above the push-

buttons which snaps out for ready adjustment. FM sound is used, and a three-button tone control permits further adjustment to the tastes of the listener.

The Model 235M1, "The Fiesta," is compactly housed in a modern mahogany cabinet which retains its furniture appearance with doors over the controls and picture screen. Use of the Sheraton table base in solid mahogany brings a new "cabinette" style to television, standing at full console height. A similar ensemble in blonde mahogany is scheduled for early production.

The unit offers a 53 square inch screen. Automatic circuits provide bright, flicker-free pictures. The chassis uses only 180 watts. The set uses 21 tubes plus two rectifiers and two crystal detectors.

A built-in antenna is provided but provision for installing an outside antenna, where necessary, has been made.

*Bendix Radio, Division of Bendix Aviation Corporation*, Baltimore 4, Maryland, will supply additional details on request.

## FACSIMILE RECEIVER

*Stewart-Warner Corporation* has presented the first public showing of its home receiver for radio facsimile reception.

The device produces printed type-matter or photographs on a continuous paper roll eight inches wide. The new set, which combines facsimile reception with FM and AM radio reception, will go into production as soon as orders are obtained for sufficient sets to warrant setting up production lines.

Manufacture of the set is under license of the John V. L. Hogan patents.

Inquiries regarding the new facsimile receiver should be addressed to *Stewart-Warner Corporation*, 1826 Diversey Parkway, Chicago 14, Illinois.

## G.E.'S LP RECORD PLAYER

A phonograph attachment for playing the new Microgroove long-playing records has been announced by *General Electric Company*.

Designed to plug into the phonograph jack of two of the company's radio-phonograph combinations (the Models 118 and 119), the new unit may also be installed in other phonograph units. Because the attachment uses the company's "Electronic Reproducer" it will be necessary, however, to install a preamplifier in phonographs not so equipped.

The new player will take 10 and 12 inch records. An on-off switch, located at the front of the streamlined rosewood plastic cabinet, automatically switches from this unit to the standard

player in the radio-phonograph combination to which it is attached.

Further information on the new record player may be secured from *General Electric Company*, Electronics Park, Syracuse, New York.

## SELF-CHARGING PORTABLE

*General Electric Company* has recently added the Model 160 to its line of portable radios.

The new receiver weighs about 17 pounds and is housed in a streamlined maroon plastic cabinet with brass speaker grille. The unit features a 2-volt rechargeable storage battery and a built-in charger.

Other features of the portable include a built-in "Beam-A-Scope" antenna and a 5¼ inch Alnico 5 dynamic speaker. The set has 5 tubes.

The Model 160 will play from 12 to 15 hours when the storage battery is fully charged. The battery can be re-



charged by plugging the set into ordinary a.c. house power. A built-in indicator shows when charging is needed. When the set is used in remote areas beyond power company lines, the battery can be recharged from a 6-volt auto battery by means of a special charging cable.

For full details on the Model 160, write *General Electric Company*, Electronics Park, Syracuse, New York.

## FM-AM TUNER

An instrument type FM-AM tuner, the Model RJ-20, has been announced by *Browning Laboratories, Inc.*, of Winchester, Massachusetts.

Two tuners, independent except for the audio amplifier, are incorporated on a single chassis to achieve the desired result. The FM section is of the superheterodyne type using the *Armstrong* system with dual limiters. A standard de-emphasis circuit removes high frequency pre-emphasis applied at the transmitter. Sensitivity of the FM section is such that 20 db. of quieting is produced with as little as 6½ microvolts of signal. The 32 db. of quieting occurs with 10 microvolts and full 15 kc. audio response is maintained.

The AM section is a superheterodyne circuit using a tuned r.f. stage. The i.f. transformers used are variable in bandwidth from 8 kc. to 18 kc. A panel control permits selection of bandwidth.

Audio signals from either channel are fed through two cascaded triode

selection of services, rocket tuning, adjustable antenna signal maximizer, chromatic tone selector, and automatic stop record changer. Two full-length



doors open to reveal the dial panel, speaker, and drawer-type changer.

For further information on the Model 1407PF, write *Stromberg-Carlson Company*, Rochester, New York.

#### TEMPLETONE VIDEO

The *Templetone Radio Mfg. Corp.* of New London, Conn., has recently entered the television field with the Model TV-1776.

This table model receiver features a built-in filtered magnifier lens which provides a picture measuring over 50 square inches; four simple controls on the front panel for all normal operation; a 7" picture tube; hand-rubbed cabinet; and television coverage for all channels available in any FCC designated service area.

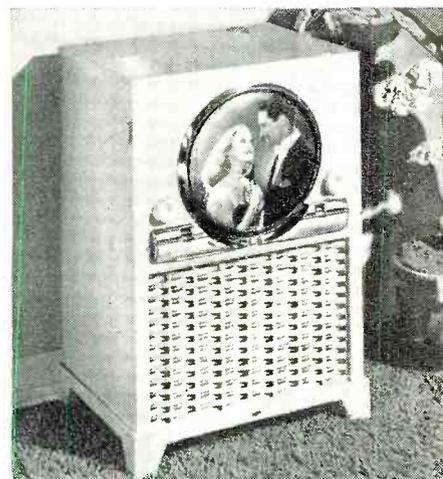
The new set measures 23½ inches wide, 13¼ inches high, and 17 inches deep.

The company will provide full information on the Model TV-1776 upon request. Write *Templetone Radio Mfg. Corp.*, New London, Conn.

#### NEW ZENITH VIDEO

*Zenith Radio Corporation* has announced a new and "revolutionary" line of television receivers to the trade.

Included among the new receivers



recently introduced is the Model 28T960E, an FM-television console featuring a "Big B" size "Giant Circle" luminized screen with from 1000 to

1500 more volts for clearer, sharper, larger, and brighter pictures, according to the company.

The receiver is pretuned and covers all 12 low-band channels. Only a simple adjustment is needed to adapt the set for receiving u.h.f. above 500 mc. A "Bulls Eye" tuning control is used to automatically lock in all tuning factors for the audio and video circuits. One twist of the knob is said to bring in the station perfectly tuned both in picture and in sound.

Gated automatic gain control maintains picture brightness and contrast, focus, and audio volume at constant level when tuning from one station to another. A contrast selector has been

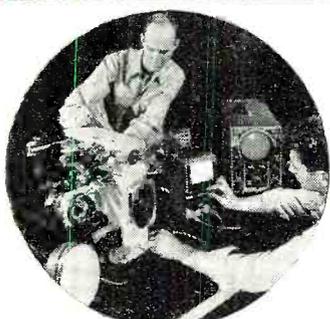
included to permit the user to make adjustments to meet his preference.

The set uses 24 tubes plus 3 rectifiers and the "Giant Circle" screen. A safety back panel includes a cut-off switch which opens the circuit when the panel is removed. The set is housed in a modern, simply-styled cabinet of African Afara veneer. The screen frame and control panel is accented by a tarnish-proof "Black Gold" luster finish. The receiver measures 34¼ inches high, 22¼ inches wide and 18¼ inches deep.

*Zenith Radio Corporation*, 6001 W. Dickens Avenue, Chicago 39, Illinois, will supply additional details on this line upon request.

-30-

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*A million new jobs* — almost 4,000 a week — will be created in the television industry during the next five years according to estimates of industry leaders. Actually, during 1948, television grew faster than any other industry in the history of America.

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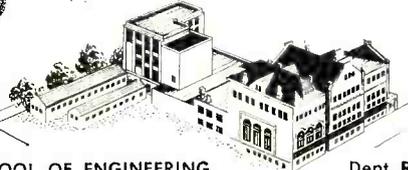
To help supply this needed manpower, the Milwaukee School of Engineering has expanded its radio and television courses. Now you can get complete practical, technical training in the MSOE laboratories. *This is not just a serviceman's course.* It prepares you for a career in all of the technical phases of television and radio.

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| 6 Ft Wire W-128          | 5 Clamp, Cord                |
| 2 Ea Mast Section MS-51  | SC-A-8637-#2                 |
| 6 Headset HS-30          | 2 Clamp, Cable               |
| 12 Insert M-300          | SC-A-8637-#7                 |
| 1 Microphone Cover       | 2 Clamp, MC-423              |
| M-367                    | 6 Cord CD-307-A              |
| 1 Microphone T-17-B      | 5 Cord CD-318                |
| 5 Microphone T-45        | 6 Cord CD-604                |
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Can Type . . . . . **.25 ea.**
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Tubular Oil Filled, Small **.10 ea.**
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Small Tubular. . . . . **.25 ea.**
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## Spot Radio News

(Continued from page 18)

up and delivery trucks; trucking, hauling and freight handling; contractors for buildings, roads, and services; newspapers; public utilities; and government agencies and officials.

**STATE COMMUNICATION FACILITIES** were also probed at the hearings. And here again the proposals were criticized. Reporting on this problem for the California State Communications Advisory Board, William E. Whiting, a radio engineer, said that the proposed listing of public safety services on a 20-kc. channel basis, instead of a 40-kc. basis, as originally planned, deprives these services of half of the space originally proposed as compensation for those in the 72-76 mc. band relinquished to TV. He said that as a matter of practical experience, it has been found that with present equipment it is impractical to operate with less than 80 kc. separation in one area.

He pointed out that only about one-third of the 154 channels available for public safety are actually usable. For example, in Southern California there are some forty-seven incorporated cities and towns in Los Angeles County alone. These cities are contiguous without natural barriers and each has

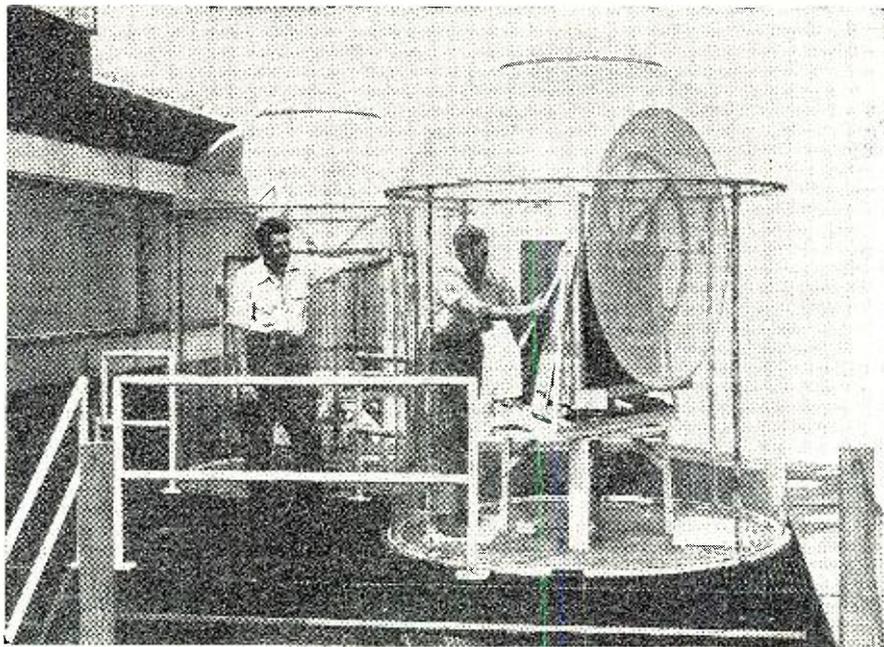
a requirement for a communication system. Whiting stated that in view of this situation, Los Angeles, which is now using twelve channels, will require fifteen upon the completion of two-way installations on motorcycle equipment. He said that it is impossible to share these channels with any other agencies inasmuch as the traffic load in Los Angeles is approximately 5000 messages per 24 hour period.

**THE NEWSPAPER CASE**, presented by William K. Van Allen for the American Newspaper Publishers Association, was replete with intriguing information.

Citing the use of radio by a small newspaper, Allen said that, in the instance of the *Douglas Budget*, Douglas, Wyoming, serving 2200 people in a mountainous area, radio has been the only means of covering hundreds of miles and providing an accurate and necessary news service.

Allen then offered an example of relay press use during a disaster, such as the '47 Maine forest fire. The *Boston Herald-Traveler*, which had received its license in January of the year, sent a mobile unit to Maine for the entire week. Because telephone lines were down, its mobile unit was the only facility available at the scene for transmission of news. So outstanding was this service, said Allen, that the Governor of Maine designated the *Herald-Traveler* and its station

To insure maximum steadiness of television reception in the New York metropolitan area, engineers of the New York Telephone Company and the National Broadcasting Company have enclosed the microwave antennas mounted on the Empire State and RCA buildings in special Plexiglas housings. The primary purpose of the new housings is to shield the parabolic antennas from high winds. If exposed, the big discs would vibrate in the wind and picture distortion would result. The structures also guard the costly apparatus against moisture, dirt, and unwary birds. The installation shown in the picture is made on the 87th story of the Empire State Building. The housing is made of 1/2 inch Plexiglas. Heavy members of the same acrylic plastic are used as framing. Reinforcing caps atop the domes are designed to withstand the full force of a direct hit by falling ice, and the housings are anchored to withstand winds of hurricane force. The housings were designed by network and telephone company engineers working with Ranger-Tennere Inc. of New York, the company that fabricated them. Plexiglas passes microwaves without perceptible distortion.



WHDH, as the official means of communication during the fire.

An incident, which illustrated the news speed offered by radio, was also presented by Allen. In New Bedford, Massachusetts, during January '48, an auto in which two men were apparently sleeping was found in a remote section of Westport, about fourteen miles from New Bedford and nearly that far from any normal means of communication. The police were notified and went to the scene to check. The *New Bedford Standard Times* which had a last edition deadline of 3:30 learned of the investigation about 3 p.m. A reporter was dispatched to the scene in a radio-equipped car and by 3:25 was able to radio his office that the two men were dead of monoxide gas forced into the car when the exhaust of their auto become clogged with snow. Without radio, said Allen, this story could never have appeared that day.

Commenting on why more newspapers have not sought to use the relay press service, Allen said that many papers had assumed that the service was much more expensive than it really is, while other papers had experimented with radiotelephone service supplied by the telephone company rather than with the relay service, and still others have been waiting until the service was put on a permanent basis before applying for a license. He said that forty-eight papers have now indicated that they'll use relay press, many having already mailed in their applications to the Commission.

Reporting on the suggested extended use of the telephone system circuits instead of relay press, Allen said that in many localities the service is not available, the lines are too filled in other areas, there are too many busy line delays, the service lacks privacy and last, but not least, the service is sometimes not available when the newspapers need it most.

**THE INVALUABLE SERVICE** afforded by radio in gas utility operation was cited in a report by the mobile radio committee of the American Gas Association. In the natural gas transmission operations, for instance, two-way communication has made it possible to dispatch crews already in the field and near trouble areas in a fraction of time. At a United Gas Pipeline Company field, last winter, an entire section of wells froze up in ten minutes, cutting off one-half of the total gas load at that time. With the use of radio circuits, restoration of service was possible in an hour, instead of a minimum of three hours which would have been involved with prior antiquated contacts.

Covering the need for radio circuits along the pipeline routes, the report stated that even when the utility goes to the expense of installing its own private telephone or telegraph lines along the pipeline, there is no guarantee against the failure of these facilities. It is unfortunate that such



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### AUTOMATIC AUTO RADIO

6 tubes superhet—8 tube performance. Universal mounting. Full vision slide-rule dial.

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### A.M. TUNER COIL AND CONDENSER KIT

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Send stamped addressed envelope for list of other schematics and conversions available.

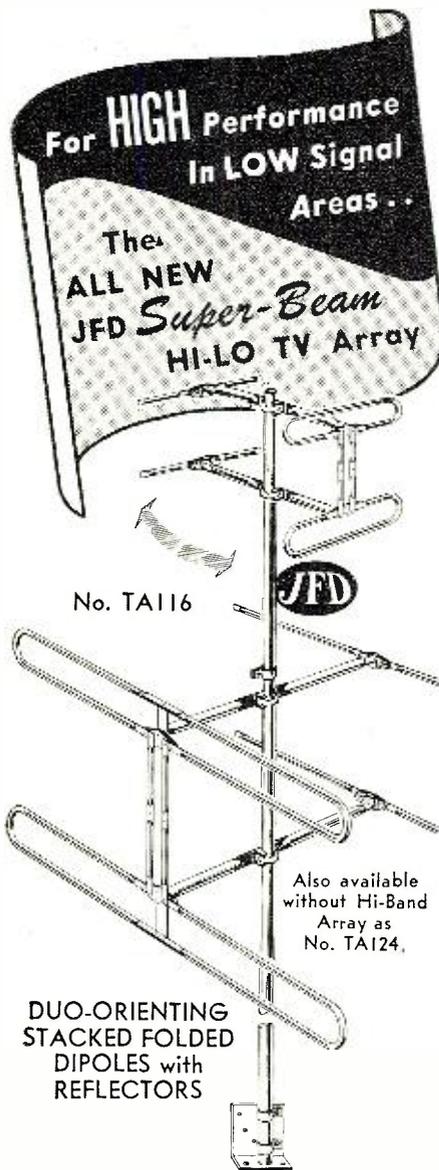
R. E. GODHEART

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BEVERLY HILLS, CALIF.

January, 1949

149

www.americanradiohistory.com



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CITIES	DISTANCE IN MILES
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Cleveland - Pittsburgh	120
New Haven - New York	110
San Diego - Los Angeles	100
South Bend - Chicago	90

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failure is most likely to occur at the very time that communication is most essential to prevent or correct emergencies, the report continued, since the same vagaries of weather which interrupt wire communications are apt to place a strain on gas transmission.

Setting forth the need for adequate channels, the report said that two-way mobile radio "is the fastest, most dependable and best adapted means of communication to insure prevention of emergencies, to effect speedy repairs, to safeguard the public, and to conduct gas utility operations."

**BROADCASTERS** also presented a very comprehensive review of how the proposed revisions in the allocations would affect present operations.

The testimony of Frederick T. Budelman of *Link Radio* was particularly pertinent, with a request being made that there should be no deletion of provision for remote pickup broadcast service in the 152-162 mc. band. He said that during the past two years, portable and mobile radio equipment for remote pickup service, operating in the 25-28 and 152-162 mc. bands, has been developed and widely used by both large and small stations, and is now providing a service never before possible. It has been used not only to bring to the radio audience special events that could not otherwise have been satisfactorily covered, he continued, but it has been of inestimable value to the public in carrying news of fires, floods, and other emergencies where minutes have meant saving of lives and property.

Budelman reported that while the 25-28 mc. band has been used, the narrow bandwidths available and higher levels of man-made noise existing on this band have somewhat limited its usefulness in comparison with the higher frequencies. And he pointed out, the 20 or 25 kc. channels available between 25 and 28 mc. make it necessary to either limit the audio range and distortion to levels not satisfactory for other than voice communications, or reduce the signal-to-noise ratio to a level inconsistent with normal broadcast standards. Accordingly, he said, these frequencies have found their greatest usage in cue circuits rather than program channels.

Commenting on the higher band channel, Budelman said that the low noise levels and favorable propagation of the 150-mc. bands have made them ideal for program circuits. It seems therefore unfair, he said, after . . . "forcing this service to move from its previous assignments in the 30-40 mc. band during the past three years and encouraging the development and purchase of equipment in the 152-162 mc. band, that the Commission should now invalidate the efforts and expense of manufacturers and users in making this shift. The prospects of such rapid reversals in policy cannot help but discourage development of programs on newly assigned bands for fear of another change in a few years."

The assignment of channels in the 450-460 mc. region will undoubtedly be of great benefit to broadcasters, he said, particularly for very-short-range mobile applications, or for portable use where semi-fixed line-of-sight paths are possible. He cited as an excellent example use of the latter in sound channels to accompany video microwave links for TV remote pickups. It is quite certain however, he said, from tests already run that reliable mobile coverage with broadcast quality over any appreciable area is very doubtful on these higher frequencies; on-the-spot coverage of special events and emergencies leaves no time to wrestle with propagation problems on 450 to 460 mc.

Testimony of many, many others, approving and criticizing the proposed allocations, was also presented during these hearings, one of the longest sessions in FCC history. The copy will take months and months to analyze, and it may be the Spring of '49 before a decision on the delicate channel problem will be made.

**BROADCAST INDUSTRY** officialdom toasted the FCC during their recent visit to New York City to witness a CBS color TV demonstration. Prexys, vp's, chairmen of the board, managing directors, and even the Mayor of New York City appeared at the event, held at the Roosevelt Hotel during a luncheon of the Radio Executives Club.

Seated at the long table were: Elden Park, vice-president and station manager of WINS; Elliott Sanger, general manager, WQXR; James Lawrence Fly, former chairman of the FCC and now in private law practice; Jack Poppele, vice-president of WOR and president of the Television Broadcasters Association; Commander Mortimer W. Lowei, vice-president of *Allen B. DuMont Labs*; Robert Kintner, executive vice-president of ABC; Joseph H. Ream, executive vice-president of CBS; Edgar Kobak, president of the *Mutual Broadcasting System*; Miss Frieda Hennock, FCC Commissioner; Niles Trammell, president of NBC; FCC Commissioner Rosel H. Hyde; Edward J. Noble, chairman of the board, ABC; William O'Dwyer, Mayor of the City of New York; Carl Haverlin, president of BMI and prexy of the club which gave the luncheon; Wayne Coy, FCC chairman; Brig. General David Sarnoff, chairman of the board of NBC and president of RCA; FCC Commissioner Edward M. Webster; Frank Stanton, president CBS; Mark Woods, president ABC; Dr. Allen B. DuMont, president of *Allen B. DuMont Labs* and WABD; Dorothy Thackrey, president and general manager of WLIB; Theodore Striebert, president of WOR; Charles Denny, former FCC chairman and now vice-president and general manager of NBC; Robert L. Swezey, vice-president and general manager of the *Mutual Broadcasting System*; Herbert Pettey, managing director, WMGM; Theodore Cott, vice-president and program director of

WiNEW, and Alec Templeton, who entertained with a musical satire on the FCC and allocations.

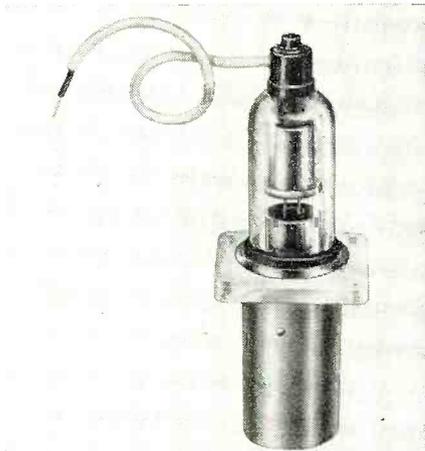
FCC Chairman Coy predicted, in a brief luncheon talk, that within the next few years there would be close to 1000 TV stations, reaching a large percentage of the people of the nation. And most of the industry's great at the luncheon appeared to agree that sight-and-sound service will become quite commonplace throughout the land and in perhaps 25,000,000 homes within the next five or six years. TV is certainly hitting the bell of progress. . . . L. W.

### What's New in Radio

(Continued from page 82)

cuits. To obtain still higher voltage, additional cascade units can be added.

These coils are provided with diagrams giving dimensions, instructions,



and all pertinent data. They are also available with a tested 1B3 type tube complete with plate cap.

Additional information and price may be secured by writing *Spellman Television Co., Inc.*, 130 West 24th Street, New York 11, New York.

### CONSOLE DEMONSTRATOR

The Receiver Division of *General Electric Company* has recently introduced a new console demonstrator which is designed to aid distributors in the sale of the company's Alnico V loudspeakers, variable reluctance cartridges, pickups and preamplifiers through actual selective demonstrations.

The console, built to take four speakers, a 5 1/4", 6 1/2", 8", and 12", is sold less the component parts. Speakers as well as the pickup arm, preamplifier, and turntable must be supplied by the distributors from stock.

One seven-position switch on the side of the unit does all the necessary selecting for any demonstration. Finished in three colors and natural wood, the unit has an over-all width of 33 1/4", an over-all height of 57" and weighs 57 pounds. The unit is completely wired for the installation of the components and includes leads for the external speakers and amplifier.

For additional details on the con-

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Covers 520 Kc to 1500 Kc Broadcast Band. 6 Tubes: 3—12SK7, 1—12SR7, 1—12A6, 1—12K8. Designed for dynamotor operation; can be easily converted to 110 volt or 32 volt use. Two IF Stages. Three-gang tuning con. BRAND NEW, in sealed carton, with tubes and instruction manual, less dynamotor, **\$22.50**

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BC-457—XMTR	6.95	8.95
BC-458—XMTR	6.95	7.95
BC-459—XMTR	16.95	19.95
BC-696—XMTR	16.95	19.95

## ARMY FIELD TELEPHONES

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### DC AMMETER 0-15 Amps



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motive, battery charging, general test work. Value \$25. All yours for only **\$3.99**

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sole demonstrator, write direct to the Receiver Division, *General Electric Company*, Electronics Park, Syracuse, New York.

### STANCOR "TELEMATCH"

The elimination of the electrical mismatch existing between antenna and receiver in nearly all television receiver installations is claimed for the new "Telematch" now being manufactured by *Standard Transformer Corporation* of Chicago.

Correcting this mismatch enables



the full broadcast signal picked up by the antenna to be delivered, with minimum loss, to the receiver for greatly improved reception, according to the manufacturer. It further permits, under certain conditions, the use of an inexpensive, easily-installed indoor antenna to provide satisfactory reception.

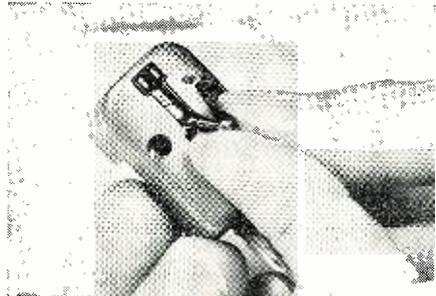
The "Telematch" is quickly installed by attaching two cable lugs to the receiver antenna input terminals. No tubes or electricity are used. The unit may be mounted behind the receiver or used on top of the cabinet. The "Telematch" is finished in brown and hammertone gold with plastic control knob.

Further details on the "Telematch" are now available from *Standard Transformer Corporation*, 3580 Elston Avenue, Chicago 18, Illinois.

### NEW GE UNIT

*General Electric Company* has announced a new variable reluctance cartridge with a replaceable stylus.

The new unit features a notched design, one-third smaller size, improved



shape, and more universal adaptability to the various tone arms. The cartridge also provides more clearance for record changers and higher lateral compliance for more faithful tracking.

The stylus may be replaced by the

customer, in four easy steps, a feature which is expected to result in more sales for the dealer.

The cartridge provides negligible needle scratch and needle talk, minimum record wear, wide frequency response, freedom from resonance peaks, and realistic reproduction.

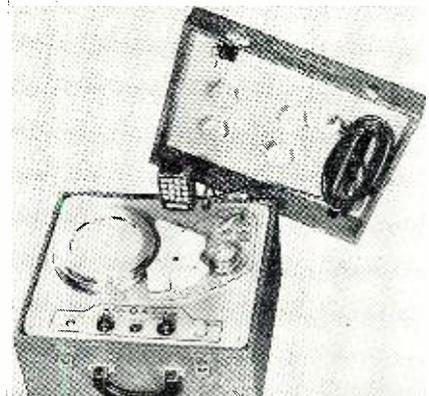
For complete information on the new variable reluctance cartridge write direct to *General Electric Company*, Electronics Park, Syracuse, N. Y.

### PORTABLE WIRE RECORDER

*Air King Products Co., Inc.* of Brooklyn has just introduced a portable wire recorder, the Model A-725, which includes amplifier and speaker in a complete unit.

The new unit features immediate playback, recording from microphone, radio, phonograph, or telephone; automatic shut-off at end of play or rewind of wire; crystal microphone for hand, table, or stand with plug-in mike cord; permanent recording as required; plug for cable to record from radio or phonograph; and safety lock to prevent accidental erasures.

Designed to sell in the moderate price class, the new Model A-725 uses four tubes plus a selenium rectifier. The recorder is housed in a carrying



case of blue-grey leatherette trimmed with bright nickel hardware. It weighs 21 1/2 pounds and the case measures 13 3/4" by 12" by 9".

For further information on the new portable wire recorder write *Air King Products Co., Inc.*, 170 53rd Street, Brooklyn 32, New York.

### CINAXIAL SPEAKERS

*Cinaudagraph Speakers* of Kansas City, Kansas, has announced two new 15" Cinaxial speakers designed especially for television, FM, and the new Microgroove records.

The lighter weight model has a 12 ounce magnet in the low frequency speaker and has a rated power handling capacity of 15 watts.

The heavier unit uses a 21 1/2 ounce magnet in the woofer and is rated at 18 watts. Both use especially designed 5" high frequency speakers equipped with 3.16 ounce Alnico magnet.

For further details on the Model CIN-15B (the light weight unit) and the Model CIN-15C write *Cinaudagraph Speakers*, 1401 Fairfax Trafficway, Kansas City 15, Kansas. —30—

**RADIO & TELEVISION NEWS**

## International Short-Wave

(Continued from page 134)

Gelora Pemoeda Indonesia" and "Radio Ncesantara." (Fern, Hawaii, via NNRC)

In verifying YDE, 11.770, for Boice, Conn., Batavia called attention to its broadcast in *English* at 0600 over YDC, 15.145 (appears to be that low most of the time although station lists it 15.150), and 7.270 which they listed as YDB3. A program schedule of the foreign transmissions was promised as soon as it is received from the printer.

In verifying for Gaynor, Calif., Batavia station officials said they have temporarily discontinued transmission beamed to the United States (formerly was at 0930-1000 on several frequencies), but that in approximately 9 months (should be in May 1949) they will resume these broadcasts on a 100 kw. transmitter.

**Kenya Colony**—The new Mombassa transmitter signs on at 2259 with a few bars of "Strike Up the Band;" call is "Your Forces Broadcasting Service, East Africa, radiating from Mombassa on 41.54 meters, 7.22 megacycles;" has BBC news relay 2300, 1100, 1300; closes down 1400 with Ted Lewis' "Good-night." (Bluman, North Africa, who reports this station to *Radio Australia*, says frequency is actually 7.190.)

**Luxembourg**—*Radio Luxembourg* gives schedule as 0600-0830 on 15.350, 1130-1800 on 6.090. (Worris, N. Y.)

**Madagascar**—Tanarive has been testing a new transmitter on approximately 7.375. (Sweden DX broadcast) Does anyone have further details? Dilg, Calif., reports both the 6.064 and 9.694 outlets are readable lately around 0930.

**Malaya**—British Far Eastern Broadcasting Service, Singapore, expects to have new, powerful transmitters ready within 18 months. (Cushen, N. Z.) (I understand these will be 100 kw.—K.R.B.)

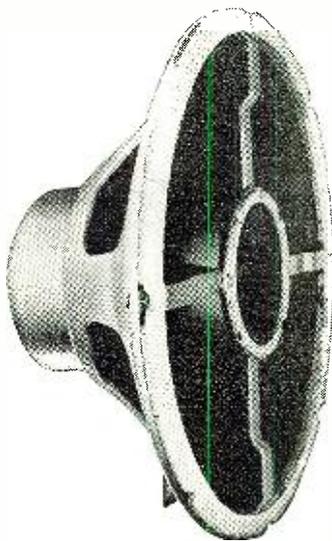
**Radio Malaya**, 4.820, Singapore, is heard at 0900 with news (at least some days is relayed from BBC), usually has a good signal in California. (McAlister)

**Mexico**—XBHX, Mexico City, "Banco Nacional de Mexico," is now on 13.995, fair signals daily to 1830 or 1900 sign-off. (Kary, Pa.)

XEBT, 9.625, Mexico City, normally has news nightly at 1935-1945. (NNRC) A "deadline" report from Ferguson, N. C., states that this series of newscasts in *English*, from the Mexico City *Daily Herald* as given by Allen B. McLean, terminated as of October 30, but that it was announced they might be resumed around January 1, 1949.

Stark, Texas, reports X9BGC testing on 5.869 about 5 minutes after the hour and after the half hour. This is the Mexican-American Hoof and Mouth Disease Control Commission.

**Monaco**—*Radio Monte Carlo*, 6.034.5 (measured), signs off 1716 after news in French (1700-1711); program res-



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All three models of the CINAXIAL Speaker (shown above) cover the range from 50 to 15,000 c.p.s.



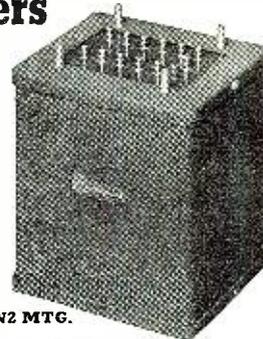
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OHMS to 3.2 and 8 OHMS—18 Watts

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@ 3A.—5V. @ 2A.—6.3V. @ 6A.—6.3V. @ 8A

#S-203 Power—360-0-360 @ 295 M.A. D.C.—5V.

@ 3A.—5V. @ 6A.—12.5V. @ 5 A.C.T.

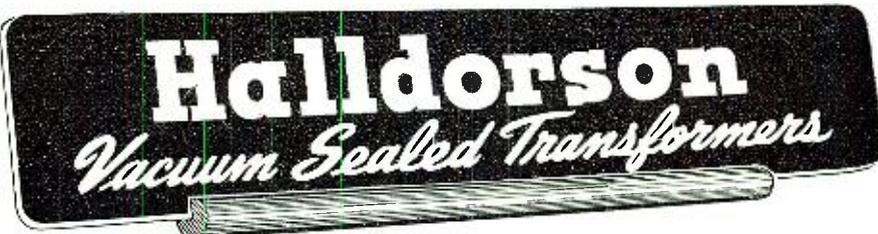
#D4-611—Horizontal Blocking Oscillator (Replacement for Type #208T1)

#D4-612—Vertical Blocking Oscillator (Replacement for Type #208T2)

#J-96—Vertical Output Trans. (Replacement for Type #204T2)

For more complete information write

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F-952	2500	2	2.5	1.75	6.3	.9	\$13.35

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F-960	775	225	5	3	6.3	1.75	\$14.80
F-961	800	300	5	3	5	6	\$30.75

## TELEVISION TRANSFORMERS

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F-970	Horizontal Blocking Oscillator Tr.	\$4.50
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## 10" TELEVISION KITS

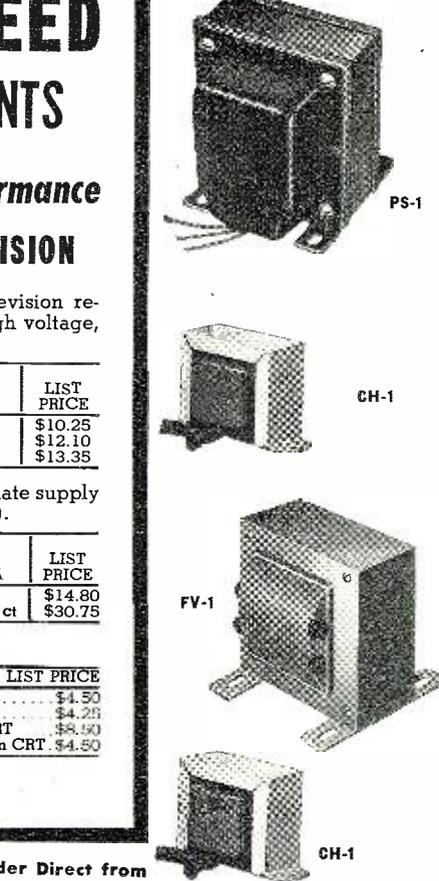
For those who want the ultimate in TV kits, this 10" kit has everything; electromagnetic scanning and focusing, A.F.C. horizontal hold control, and many other fine features. 17 tubes for this set sell for \$57.30, cabinet for \$23.50. Worth many times more than..... **\$99.50** LESS TUBES

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Locates every service trouble. Does everything and guaranteed to do everything we say it will. Aligns paddler. Locates dead spots, weak spots, defective parts. Checks gain. All parts including case, test leads, plug.

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**25 WATT P.P. 6L6 HI GAIN AMPLIFIER KIT**

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**\$11.95**

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Walker 5.9642

ume in French follows news; signals extremely good, channel clear. (Kary, Pa.) Now signs on half-hour earlier, that is at 0100. (Beck, N. Y.)

**Mozambique**—Laubscher, South Africa, airmails me that Lourenco Marques' "morning" session of musical programs with *English* announcements is at 0000-0300 over CR7BE, 9.715 on weekdays only (off Sundays); other Mozambique schedules include weekdays CR7BE, 9.715, 0700-1000; CB7AB, 3.493, CR7BV, 4.915, 1000-1600; Sundays, CR7BE, 9.715, 0200-1000; CR7AB, 3.493, CR7BV, 4.915, 1000-1600. Stark, Texas, reports hearing CR7BE (which he places as low as 9.707) on both schedules. I hear this one with good level here in West Virginia opening 0000, with popular music and *commercial announcements (English)*; gives frequent time checks; usually fades out here around 0100. According to Fern, Hawaii, CR7BE is on 9.710 and has replaced CR7BJ, 9.582.

**New Caledonia**—Radio Moumea, 6.000, FK8AA, fair and quite clear at 0500 in Pennsylvania, with popular Continental music to 0515 sign-off. (Kary) (I believe sign-on is 0200.—K.R.B.)

**New Zealand**—Wellington's available frequencies are ZL1, 6.080; ZL2, 9.540; ZL3, 11.780; ZL4, 15.280; ZL5, 17.770; ZL6, 25.800; power 7½ kw. ZL2, 9.540, is audible in Ohio at 0615-0630 sign-off. (Sutton) The only regular daily transmission so far reported is at 0200-0400 on 11.78 and 15.28; former is usually good to excellent while the 15.28 channel is poor to inaudible now in Eastern North America. An experimental transmission has been heard by Beck, N. Y., around 0120-0215 on 9.54 and 11.78, best on 11.78; at that time Wellington relays a local BCB outlet with a program primarily of popular music; may not be complete schedule of test.

**Nicaragua**—YNZZ, 6.464 (measured), Managua, has fair signal nightly; some CWQRM; appears to have program of U. S. swing music around 2030-2100; announces "Radio Mundial en la capital de Nicaragua;" no mention of call; uses 4-note chime prior to identification. (Kary, Pa.)

YNAS, 6.300, Managua, "Ondas del Xolothan," signs off 2200 with "La Marcha Patria de Nicaragua;" signals quite strong but suffers bad QRM from c.w. station WNU on same channel. (Kary, Pa.)

YNDG, Radio Colonial, 7.660, Leon, announces in *English* about every half hour. Schedule given by station is Monday-Saturday 0600-2300 and Sunday 0500-2100; transmitter is Halli-crafters HT-4E, 400 watts; antennas are two half-waves in phase connected to transmitter, 40 feet above ground, running E-W; also radiates with 2 other antennas about 5 feet away from the other one, by induction—one type "Y" antenna and the other a 4-half-wave in-phase directional. Stated when broadcasts were started, 100 watts was used (1938 to 1946); letter-verie was in *English*. (McPheeters, La.)

Norway—Oslo's 100 kw. transmitter is now on 11.735 in the nightly North American transmission (for a while was on 15.170). The 8 kw. transmitters are on 9.610 and 6.185 now for that beam at 2000-2100; also heard 0130-0230 on 15.17, 1.85, 9.61 with equally good strength; the transmission ending at 1705 (Home Service) is now heard on 11.85 and 9.610. (Beck, N. Y.)

Norwegian winter schedules from Swedish sources are 0130-0230, 7.24, 9.54; 0800-0900, 9.61, 7.24, 6.13; 1400-1500, 11.85, 15.17, 9.61; and 2000-2100, 7.21, 9.61, 6.185. (Worris, N. Y.) This may not be complete as I am hearing Oslo on 15.17 with powerful signal around 0600-0700 or later.

Pakistan—Frequency of Radio Pakistan, Karachi, is still in doubt, but Major, W. Australia, sends latest report on it being recently on (assigned) 6.075; is low-powered and so far has not been reported to me as heard in the U. S.; at last report was scheduled 0700-1230, 2100-2300, 0200-0330; English at 0730, 0745, 0830, 1030, 0300, 2130.

Panama—Hort, 6.060, "Radio Balboa," Panama City, is good to fair nightly, but with sideband interference from HJFA; requests reception reports to Ecuador numero 9, Panama City. (Kary, Pa.)

HPH was heard testing some time ago on 10.670. (Weisburg, N. Y.)

HOLA, 9.505, Colon, has English up to 1800. (Weisburg, N. Y.) Also announces English for 2200. (Hankins, Pa.)

Paraguay—ZPA5, 11.948, Encarnacion, is heard in Newfoundland at 1800-1930. Is officially listed on 11.945.

Peru—Kary, Pa., reports OAX4K, Radio Central, Lima, put in a rare appearance one night some time ago on 9.510 at 1825, was squeezed in between HOLA (Panama) and BBC's 9.525 outlet; fairly strong signals but had "buzz-saw" modulation.

Philippines—Manila (relaying "Voice of America") is now scheduled on 11.890 at 0400-0600 to China; 0600-0700 to USSR-Korea; 0700-0800 to China; 0800-0915 to East Indies, and 0915-1015 to China. On 15.330 is scheduled 0215-0345 (not Mondays) to South East Asia.

(Continued on page 156)

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KZRC, 6.135, Cebu City, has news 0900. (Cushen, N. Z.) Heard in California around 0800 announcing "KZRC, Radio Cebu;" interval signal is 3-note chime on half hour. (Stein)

KZMB, 6.000, is operated by the Manila Broadcasting Company, owner of KZRH (9.640), transmits at 1600-1100 and relays medium-wave 950 kc. (Fern, Hawaii, via NNRC) KZMB has been heard in California at 0900-1000 with good level. (Rosenauer)

Poland—Warsaw's 6.215 is fair to 1600 when news in Polish is read by a man and woman, alternately; slight sideband QRM from U. S. aircraft on 6.210 is noted. (Kary, Pa.) Now has English session at 1530 instead of 1430. (Pearce, England)

Portugal—Emissora Nacional, Lisbon, is still on 15.100 with identification at 1515 after program of light music and song recordings. (Pearce, England) Is heard in Newfoundland at 1545-1630. (Peddle)

Portuguese Guinea—Bissau's CQM4, 7.939, is heard in Newfoundland at 1700-1800. (Peddle) Sutton, Ohio, reports more recently this one has been heard signing off at 1730 with Portuguese National Anthem.

Roumania—According to a recent Swedish DX broadcast, Bucharest begins a transmission at 0700 on 11.900.

Bucharest, 9.250, is heard in Newfoundland at 1500-1530 in English. (Peddle)

South Africa—A verification from ZRB, 9.110, Pretoria, gave schedule

2355-1000 Mondays through Fridays and 2355-1030 on Saturdays (is off Sundays); it was stated they expect to use 6.210 in the near future (probably by now). (Hagen, Ala.)

Spain—Radio Nacional de Espana, Madrid, has a daily transmission of news in Spanish 0830-0850 on 15.630 "for all Spanish-speaking stations;" it is believed that quite a number of Latin American stations probably record this broadcast for use later in the day; signal fair, subject to bad fade at times, and some teletype QRM; assigned channel is 15.615. (Kary, Pa.)

Pearce, England, has heard Madrid on approximately 19.650 with news in Spanish by man and woman announcers at 0830; signed off with "Viva Franco, arriba Espana," at 0850; apparently not Sundays. (This is probably the same period heard by Kary on 15.630.—K.R.B.)

RNE, Madrid, can be recognized by poor quality of modulation. (Kary, Pa.)

Sweden—A new program for the United States, called "Sweden Today," is now scheduled from Stockholm at 0815 on 11.705, 15.155. (Sweden DX broadcast)

This winter, the 1900-2000 transmission from Stockholm is over SBO, 6.065, and SBU, 9.535. (Worris, N. Y.)

Switzerland—During the winter, Berne is operating on HER3, 6.165; HEI3, 7.21; HER4, 9.535; HEI5, 11.715; HEU5, 11.815; HER5, 11.868; HED7, 15.12; HER6, 15.305; HER7, 17.784.

## TWO NEW HAM CLUBS ORGANIZED

THE National Amateur Radio Council was formed recently and incorporated under the laws of the State of Indiana. The new organization publishes a monthly bulletin, and conducts regular polls among its members to determine their views on subjects affecting amateur radio.

A recent poll among the members resulted in the following majority recommendations.

1. Return of the 1.75 mc. band, either in full or in part, if possible.
2. Specific frequency assignments for SSSC operation.
3. A more difficult technical exam for class A privileges.
4. Opening of part of the 7 mc. band to phone operation.
5. Some bands being opened to 50/50 phone-c.w. operation.
6. Increasing the 3850-4000 kc. phone allocation.
7. Elimination of provision requiring new operators to operate one year on c.w. before being permitted phone privileges below 30 mc.
8. Opposition to the increase of code requirement to 16 w.p.m. as a requisite for a class A ticket.

Inquiries for further information about this organization may be addressed to the Acting Secretary, Bud Robinson, W9CCB, 604 N. New Street, Champaign, Illinois.

A SECOND organization, the Society of American Radio Amateurs, has been formed with the avowed purpose of furthering the amateur art, promoting fraternalism, and protecting the amateur frequencies against encroachment, the encouragement of "new

blood" and other such activities considered beneficial to amateur radio.

In a letter to the FCC on September 27, the organization went on record as being opposed to any increase in phone allocations at this time. It was also recommended that efforts be made to restore the 1.75 mc. band or such part as can be made available.

The group suggests that the following frequencies be set aside for SSSC use: 3850-3875 kc.; 14,285-14,300 kc., and 28,500-28,525 kc.

SARA also recommends that no phone allocations be made in the 7-7.3 mc. band; that all newly licensed amateurs be required to operate solely with a Type A-1 emission during the first year of their license period, with a further period of one year as a class B licensee before becoming eligible for a class A examination.

They further suggest that a code speed of 20 w.p.m. be required for the class A examination in the future, including renewals.

They ask that a new type of license for a term of six months to one year be created to stimulate the interest of youth in ham radio. The code test for this license is suggested as 5 to 8 w.p.m. This type of license would not be renewable. The frequency bands for this type of license should be restricted to 3700-3800 and 7200-7300 kc. with crystal control mandatory.

Further details on this organization may be obtained by writing to Secretary J. N. Boland, W4CC, P.O. Box 462, Benjamin Franklin Station, Washington 4, D.C.

Schedules are to Europe on HER3, HEI3, weekdays 0040-0150, 0610-0715, 1200-1700, and Sundays 0055-0140, 0245-1700; to Australia, New Zealand, Far East on HEI5, HER5, HER6, daily *except* Sundays and Wednesdays, 0215-0415; to Far East on HER7, Monday, Tuesday, Thursday, Friday, 0730-0915; to Africa, Saturdays on HER6 and HER7, 0930-1010, and on HER7 at 1010-1050; on HER6 and HER7 at 1050-1130; to England on HEI3, daily 1414-1515; to South Africa daily on HER6, 1530-1615; to Spain and Portugal daily on HER5, 1630-1715; to North America daily on HEU5 at 1730-1815; to Latin America daily at 1830-2000 on HER4, HER5, HED7; to North America daily on HER3, HER4, HEU5, 2030-2230. (Worris, N. Y.)

**Tangier Zone—Radio Internacional**, Tangier, International Zone, is now on 6.124 from 6.210; signals much stronger, but with severe QRM from Latin Americans; leaves the air 1900 with "La Paloma;" on the hour sounds 16-note chime, and clock chimes the hours (EST *plus* five hours); announcements in Spanish by a man and in French by a woman. (Kary, Pa.)

EA9AA, "Radio Africa," Tangier, on 7.080, is heard in England from sign-on 1400 to sign-off around 1657; gives calls in French and Spanish, but programs are all Spanish; verifies by letter in French, sends souvenir card. (Pearce)

**Trinidad—Radio Trinidad**, 9.625, has fair signal in Kentucky from 0545 tune-in to 0630 when fades badly; BBC news relay 0600. (Alcock)

**Turkey—TAP**, 9.465, has news daily during winter 1245; on Mondays and Thursdays has *English* session (for Britain) 1630, and on Sundays at 1630 has weekly Mailbag Program. (Pearce, England) Signals improving here in West Virginia.

**United States—Kary, Pa.**, has received this letter from the *Crosley Broadcasting Corporation*, Cincinnati, Ohio, which explains the unmodulated carrier heard on 6.080: "For your information, W8XAL is an unmodulated one-kilowatt transmitter identified once an hour by an automatic keying machine. It is owned and operated by the *Crosley Broadcasting Corporation* for the Bureau of Standards in Washington, the purpose being a long-time study of propagation conditions. W8XAL operates 24 hours a day with the exception of the time when WLWO, one of our international transmitters, uses the frequency. The antenna used on W8XAL is a vertical copper pipe radiating a non-directional signal. We are sorry to learn that this service is causing interference to foreign stations. Apparently, your location is just the right distance to receive a very heavy signal, although, as stated above, it is only a one-kilowatt transmitter." This unmodulated carrier has been widely reported to me.

**U.S.S.R.—Moscow** has been noted again evenings on 13.610, poorly modulated; news 2200, apparently from European Service. (Kary, Pa.)

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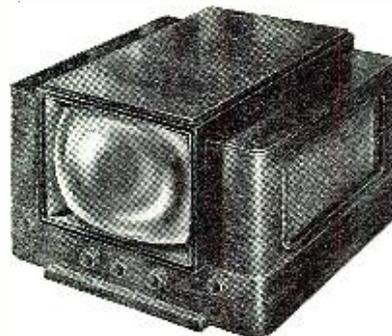
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by Worris, N. Y., from the American Embassy, Moscow, *Radio Moscow* currently has three separate Home Services operating (1) 2200-1545; (2) 0645-2200 (possibly longer), and (3) 1030 to some time after 1100. Wavelengths are (in meters) 1961, 1724, 1500, 420.8, 19.56, 25.62, 41.27, 31.09, 31.65, 25.26, 25.21, 25.08, 25.55, 25.36 for No. 1 Home Service; 1293, 360, 315.8, 30.61, 25.1 for No. 2 Home Service, and 360.6 and 31.41 (from 1100) for No. 3 Home Service. The American Embassy stated it regretted that it has access to no information concerning other language broadcasts or the location or power of *Radio Moscow's* transmitters. (Information cited was translated from the daily program schedule of *Radio Moscow* as published in the weekly newspaper, *Radio Programmy*.)

Moscow's North American schedule daily is announced as 0745-0815, 11.96, 11.72, 9.60, 9.54, 7.36, 6.29, 6.15; 1820-1930 and 2100-2215 on 15.23, 11.88, 11.72, 9.60, 7.36, 7.29. (Ferguson, N. C., Jeffrey, Indiana)

Vatican—Pearce, England, says that HVJ's 31-m. outlet recently has been on approximately 9.640 instead of listed 9.66; heard on Sundays with *English* 1000 and daily with *English* 1315.

\* \* \*

### Last Minute Tips

Ferguson, North Carolina, flashes: "On a number of evenings I have heard a station with what sounds like a Near East broadcast coming on the air 2315 on approximately 9.515 (close to GSB, 9.51), and running to 2345." (I checked this channel and found this station which I believe is the "wandering" *Radio Omdurman*, Anglo-Egyptian Sudan.—K.R.B.)

According to *Radio Australia*, the Forces' Broadcasting Services, Middle East Headquarters, by now should be broadcasting from Malta (moved from Jerusalem, Palestine, where call-sign was JCKW); power 7.5 kw. Transmissions will be beamed S and E to cover Cyprus, Canal Zone, Cyrenaica, and Tripolitania. Major Leslie Knight will be Officer in Charge FBS H.Q., Malta. Tom Moffatt will be Director of Programs; he was well-known from JCKW as sporting commentator. By this time should be testing in the 25-meter band. (NOTE: However, most sources say this station is locating on Cyprus instead of on Malta, and using its old 7.22 frequency, with schedule of 2230-0030, 0330-1500 (Sundays 2230-1500).—K.R.B.)

At the time this was being compiled, I received word from Ferguson, N. C., that Helsinki, Finland, had announced they are now testing over their new, powerful transmitter on 15.190 with antenna beamed on North America, 0345-0600, 0715-0730; asked for reception reports to Finnish Broadcasting Company, Helsinki, Finland. A check found them with powerful signals from 0715, but on date checked they continued to test at intervals to 0800.

*Radio Australia's* beam to British Isles-Europe at 1500-1630 is now on VLB2, 9.650, VLA8, 11.760, VLC, 15.200; all excellent in New York. (Beck)

YSUA, 6.250, San Salvador, El Salvador, is on daily 1230-0000. (McPheeters, La.)

A "Radiodifusora Nacional de Venezuela" outlet is heard evenings now on 13.340 paralleling YVKO, 5.020, relaying programs of medium-wave YVKA; does not announce 13-megacycle out-

John Brandt, W8WAB, Columbus, Ohio, member of the Columbus Amateur Radio Association, operates the receiver as Section Emergency Coordinator for Ohio, D. E. Cartwright, W8UPB (shown standing center), explains details of his dual 110 volt a.c. or 6 volt d.c. power supply to local Emergency Coordinator Ellis Miller, W8ARP, vice-president of the Central Ohio Radio Club of Delaware. In the background D. C. Waxler, W8CSY, secretary of the organization, examines the transmitting equipment. The group recently conducted an unannounced simulated emergency test to demonstrate the organization's efficiency.



let; modulation on latter is above 100 per-cent, and speech is badly distorted; may possibly be using facilities of phone station YVQ, Caracas, listed 13.345. (Kary, Pa.)

Guatemala's new program in English, "Guatemala Marches On," consisting of Guatemala music and talks on Guatemala and its history, is presented each Thursday 2330-0000 or later; there is a 15-minute prelude of marimba music 2315; they ask that reports be sent to "La Voz de Guatemala," Guatemala City, Guatemala, Central America; carried on TGWA, 9.760, TGWB, 6.440. (Beck, N. Y.) Widely reported. (A later report from Beck says schedule more recently seems extended to 0030—probably Mondays through Fridays, at least—and seems to have special broadcast in English now at 0000-0030 most nights.—K.R.B.)

"Radio Republik Indonesia," Bukit Tinggi, Sumatra, has moved from 10.570 to about 10.600. (Dilg, Calif.)

YVKC, Caracas, Venezuela, may have put its new 50 kw. into operation on 9.640 for at press time we received a report from Walt Morgan, Pennsylvania, that signals are now greatly improved.

ISWC (London) reports *Radio Hyderabad*, India, operates on 6.170 at 0730-1230 and on 3.335 at 2100-2310, 2330-0330, and 0630-1300. *Has anyone in North America heard this one?*

Herman Bluman, North Africa, says that the transmitter on 7.960 which was first believed to be Afghanistan is now finally identified as being in Shiraz, Iran. "*Radio Africa*," is operated on 14.278 and 7.080 at 0800-?, and 1490-1700. (Swedish DX broadcast) "*Radio Africa*" is at Tangier.

A correspondent residing near Athens, Greece, has informed Foerster, Ill., that *Radio Athens* publishes excerpts of letters from their foreign audience along with writer's name and address.

An airletter from Dorothy Sanderson, Australia, lists XGOY, 15.17, Chungking, heard 0445 with news, commentary; ZBW-3, 9.525, Hong Kong, carries BBC news 0600; XMTA, 12.21, Nanking, heard 0545; JWV2, 9.505, Tokyo, 0400 with English lesson; Hanoi's "*Radio France*," 6.190, Indo-China, news in French and music 0700; Rome on 6.085 in English and Italian around 1600; *Radio Monte Carlo*, 6.035, at 1600 with news in French, excellent level; VUM2, 9.59, Madras, India, at 0600 with news.

Flashes sent airmail from Bengt Nilsson, Sweden, include—VP4RD, 9.625, Port-of-Spain, Trinidad, has changed schedule to 0500-1300 and 1500-2200 Sundays and 0500-0800, 1030-1300, 1500-2200 on weekdays; HCJB 17.890, Quito, Ecuador, is heard in Sweden with tests on Tuesdays-Fridays around 1500-1600; Rabat, Morocco, has been heard on new frequency of 6.005 to sign-off at 1830 (in French); *Radio Pakistan* in Karachi is being heard on 6.210, news 1030, through QRM; call is PAK; KJOY, 8.000, Athens, Greece, is owned by U. S. Corps of Engineers, on the air only on

January, 1949

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1R5 . . . . . 70	6AC7 . . . . . 60	6AR6 . . . . . 65
1R5 . . . . . 70	6AC7 . . . . . 60	6X4 . . . . . 60
2X2 . . . . . 60	6AG7 . . . . . 60	6X4 . . . . . 60
305 . . . . . 70	6AG7 . . . . . 60	6X4 . . . . . 60
384 . . . . . 75	6AG7 . . . . . 60	6X4 . . . . . 60
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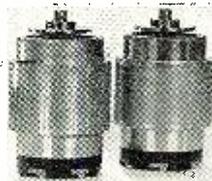
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Fridays 1330-1430; transmitter is *Colins* 30-K, power 300 watts; HLKA, 7.935, Seoul, Korea, heard in Sweden with good level from 1600; a station calling itself "Your Forces' Broadcasting Service" has been logged on 18.850 at 0535-0555; a new Italian station is heard on 18.350 at 1330.

Moscow's Home Service has been heard at 0100 on 9.480. (Sutton) (Some nights at least, I have heard this much earlier, around 2200.—K.R.B.)

Listeners in East who note Oriental music early evenings on stations in the 49-50 meter bands should not assume they are necessarily hearing China or India; recently such a Chinese program was heard by Kary, Pa., from COCW, 6.320, Havana, Cuba, and I recently noted Indian recordings being dedicated by ZFY, 5.984, Georgetown, British Guiana, to members of its Indian colony.

Fort-de-France, Martinique, has been heard on 19.570 calling Paris and Bordeaux at 0810, excellent signal. The U. S. War Dept. station in Honolulu, Hawaii, has been heard testing with voice, suppressed modulation, on 16.145 at 2135 to Washington, D. C.; suffered from its own multiplex transmissions. TFM, Reykjavik, Iceland, has been heard testing on 15.740 at 0815 to WGA7, New York; signals fair, used suppressed modulation, then to double sideband inverted speech, but using only the lower sideband. PGGF, the liner *Nieuw Amsterdam* (Holland-American Lines) has been heard at sea calling on 17.600 to GCN4, London, in standard speech prior to inverting at 0930. Paramaribo, Surinam, has been heard calling Amsterdam, Holland, on 17.680 in standard speech 1630, excellent level. WRA10, Tangier, is newly heard channel, 20.560, in the Tel-Aviv-New York circuit; this station relays WD9U to Tel Aviv, and after all traffic is cleared, can be heard conversing with Tel Aviv (4XA22); schedule irregular. HDS, 20.970, Quito, Ecuador, phone station, has been heard calling WOA2, New York, 1710 in standard speech; after making contact, went over to inverted speech. LSM5, 21.070, Hurlingham, Argentina, is call of Buenos Aires phone station working nightly to Rome with traffic in standard speech; no inverted speech noted; signals quite strong in Pennsylvania. WAR, Washington, D. C., key station of U. S. Army, was heard testing for some hours recently on 8.060, in standard speech with unusually good modulation; has also been heard as "This is Radio Washington testing" on 10.260, in poorly modulated speech around 1000, suffering from its own multiplex transmissions on same frequency; *Radio Balboa*, Canal Zone, another U. S. Army station, was heard answering on same frequency. (Kary, Pa.)

\* \* \*

### Acknowledgement

Many thanks for your fine cooperation and support of this Department during 1948. Keep up the good job, and may 1949 bring you the very best of DX, prosperity, and happiness! . K.R.B.

## Valuing Your Business

(Continued from page 40)

value of tangible assets to fix the price the buyer will pay and reimburse the seller for his ownership efforts and investment.

Although an intangible, not to be valued on the books of a going concern, goodwill becomes a commodity when a business is sold. There are two methods of valuing goodwill. The first takes into consideration three factors; net profit, capital investment, and the "number of years' purchase." This phrase was adopted from old English decisions and the American courts when they first began to value goodwill.

The "number of years' purchase" figure is a variable, running from two to ten years, depending upon circumstances, the length of time the concern has been operating, the trend of profits, and general economic conditions. A business only two years old, even though it showed a satisfactory profit, is not likely to have goodwill that will justify a big asking price. A business showing decreasing profits or losses is in a similar position. When times are bad, a seller may have to reduce the "number of years' purchase" figure to close the deal. Goodwill is worth most when the business has been showing satisfactory profits over a period of five or more years, and when the sale is made in good times.

Accountants differ widely as to the "number of years' purchase" figure to use as the multiplier in calculating what a business is worth. There is no fixed figure in any industry or commercial field, but we would say that a dealer in this field with a successful business should use at least five years as the multiplier. This would be the rockbottom calculation when setting a value on a business. If bartering to sell, the seller may "horse-trade" from a higher level but he should have some idea about fair value for his business and use this as a basis for barter. The same counsel is for the buyer. He should have some idea of fair value to give for a business and dicker accordingly.

However, the "number of years' purchase" is only one factor, the multiplier. What is the multiplicand, the number to be multiplied? The net profit for so many years? No, this does not represent a fair value for goodwill, although many seem to think so. The profits must exceed the current return on outside investments. Only this excess is considered. If the net profits show only four per-cent return on capital invested, the purchaser is not likely to pay much for the goodwill and it doesn't mean much to the owner because either could invest in outside securities without risk and get as big a return.

In these times, the calculation found most equitable is to average the net profit for the past three years, deduct

Year	Net profit	Capital investment	5% Return on capital investment
1945	\$ 2,500	\$20,000	\$1,000
1946	4,000	25,000	1,250
1947	3,500	30,000	1,500
Total	\$10,000	\$75,000	\$3,750

Table 1. Method for determining "number of years' purchase" figure discussed in text.

five per-cent of the capital investment (a reasonable return on safe outside investments today), and multiply the result by five or more years, representing the "number of years' purchase." If the capital investment has changed during the prior three years, take the average annual capital investment as shown by the books for this period.

To simplify understanding, we offer an explanation in Table 1.

The average net profit for the three years is \$3333, the average return on the average capital investment is five per-cent of \$25,000, or \$1250. The difference between \$3333 and \$1250 is \$2083, which multiplied by five years' purchase is \$10,415, the sum to be added to the tangible properties. If a seller figures his goodwill worth more, he can increase the "number of years' purchase" figure, but courts have rendered favorable decisions where the five-year period has been used in the calculation.

In the event that market value has increased tangible value substantially over book value, the seller should replace the average capital investment with the one revised figure. For example, after setting up a "Value of Business" balance sheet, if the capital investment shows \$50,000, the return on this investment at five per-cent would be \$2500 against the average net profit, \$3333, the difference \$833. This excess multiplied by five gives \$4165, the value of goodwill, less than the former figure because an increase in the market value of the assets had increased capital investment, or net worth, and a purchaser who had to pay \$50,000 for the physical assets of a business would be getting only \$833 more a year for his investment than he would get if he made outside investments at five per-cent.

In normal times, the books will usually reflect a fairly accurate value for net worth if the dealer has made the proper adjustments for depreciation, bad debts, etc., but in abnormal times, such as these, adjustments upward or downward, must be made to arrive at equitable figures, adjustments to reflect market values that are seldom made on the books unless the owner, for one reason or another, wants to find out what his business is worth.

The second method for computing the value of a business is simpler, but some accountants contend that it is not as accurate. On the other hand, it does have its proponents. We would suggest that you make the computation both ways and check one against the other before determining the value you would set on your business. Using this method the earnings are averaged

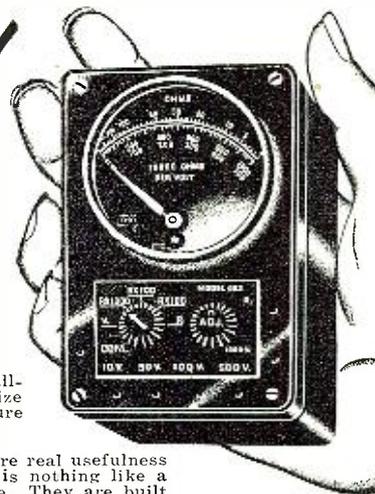
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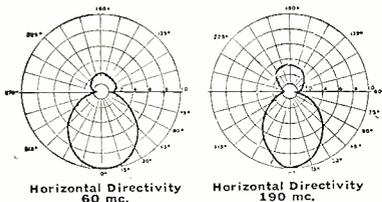
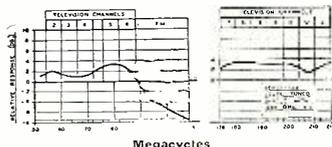
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Average earnings of business for past 5 years .....	\$ 7,500
Business is worth 10 times earnings or 75,000	
Business property .....	\$28,000
Merchandise .....	15,000
Fixtures and equipment .....	10,000
Truck .....	2,000
Cash .....	3,000
Total assets .....	\$58,000
Value of goodwill .....	\$17,000

Table 2. One method for computing the current value of your radio service business.

for the past five years, then multiplied by ten, then the assets deducted, the remainder is the value of goodwill. See Table 2.

The final answer to "What's my business worth?" may be the price you can get for it through shrewd bargaining ability. It is a big advantage, however, to have a sound basis upon which to start barter, and even though a dealer has no intention of selling, it is worth appraising a business to determine its value in the event that contingencies arise.

### Single Turn Loop (Continued from page 59)

The arrangement of Fig. 2 permits the loop to be matched accurately to the receiver input. The antenna tap is run up and down the coil experimentally until the optimum adjustment is found. Ordinarily it will be fairly close to the ground end of the coil. The transmitter output tube  $V_1$  will not load the tank appreciably during reception even if it is a cathode type tube and the heater is allowed to run, because of the fact that it is a pentode or beam tetrode and no screen voltage is applied during reception.

It will be noticed that due to the selectivity of the  $L_1, C_1$  circuit, the receiver sensitivity "peaks up" near the transmitter operating frequency. However, the sensitivity will not fall off appreciably within about 30 kc. of the frequency to which  $L_1, C_1$  is tuned. Because of the widespread practice of working stations on or about the same frequency, this characteristic should not be objectionable. Considering the high effective gain provided on reception by the arrangement on or near the transmitter frequency, the lack of sensitivity at frequencies well removed from the transmitter frequency is a small price to pay. Signals still can be heard 100 kc. or so removed from the resonant frequency of  $L_1, C_1$ , but the receiver will not be nearly as "hot" as at the resonant frequency.

If it happens that the receiver sensitivity does not peak up at the same frequency as the transmitter frequency, it indicates that the receiver input impedance is much higher than that of the 70 ohm coaxial line, and the mismatch is causing an excessive reactive component to appear at the relay end of the line, thus detuning the tank circuit  $L_1, C_1$  on reception. Should this condition be observed, it can be remedied by connecting a suitable value of inductance across the relay

end of the coaxial line. The exact value of inductance is not critical, and may readily be found by experiment. One value of inductance will serve for the whole band if "optimized" at the center of the band. This coil need not have extremely high "Q," and may be closewound with No. 26 or 28 enamelled wire on a 1/2 or 3/4-inch diameter form.

It is recommended that the regular side cowl or other standard "forward" antenna be used for standard broadcast reception, with a switch to throw the auto set input from the antenna to the converter. This is desirable in any case where a rear mounted antenna is used for amateur work, because the performance of the average auto radio will deteriorate considerably when a comparatively long piece of coaxial line is employed. Often the antenna trimmer on the auto set will not peak up, because of the excessive shunt capacity of the coaxial line to the rear of the car. With the selective coupling arrangement of Fig. 2 a separate antenna for standard broadcast is particularly desirable unless one is satisfied with reception of local stations only.

The antenna changeover relay is at a low impedance point and the contacts do not carry the antenna current on "transmit." Therefore, most any 6-volt relay having a set of s.p.d.t. contacts is suitable. If a multiple pole relay is used, the other contacts may be used for the transmitter control circuits and receiver muting. The logical place for the relay is right on the transmitter chassis, close to  $L_1$ .

Opening and closing the rear trunk door on the car will have an effect upon the resonant frequency of the loop-tank circuit. Therefore, provision should be made for reading the plate current to the final r.f. amplifier when the trunk is closed. With a little practice, one learns just how far to detune the tank condenser from resonance with the trunk partially open (just enough to reach in and tune the condenser) in order to achieve exact resonance when the trunk is closed.

### Comparison of Loop and Whip Performance

While accurate comparisons are difficult on sky wave transmissions, a check showed a 75-meter loop system patterned after that described here to be about 3 "S" points better on  $F_2$  layer (nighttime) transmission over an air line distance of 90 miles than a typical, top-loaded, 8-foot, vertical whip and coupling system fed from a transmitter delivering the same output power. This represents a power gain of more than 30 times, and made the difference between a barely readable signal and a good "solid" signal when received at a home station using a typical, horizontal, resonant doublet for reception. The superiority of the loop for sky wave communication was more apparent at closer distances, but was still pronounced at the greatest distance worked (about 285 miles).

For distances closer than 200 miles when  $F_2$  layer is controlling, or for distances closer than 100 miles when the  $E$  layer is controlling, the azimuthal directivity of the loop is insignificant. At greater distances (as well as for ground wave work at any distance) best results are obtained from the loop in a line roughly parallel with the car.

As for what can be expected with a 75-meter mobile phone rig when using a single turn loop of the type described, it is possible to work out to about 200 miles via the  $F_2$  layer with 20 to 30 watts input to the final stage when conditions are good, when there is no QRM, and when the other end of the circuit is a fixed station with a good receiving antenna. While it sometimes is possible to work farther to a fixed station, or to work another mobile station 100 to 200 miles away, such contacts will not be frequent.

### Using the Antenna On 10

If provision is made for disconnecting the radiating element at the tie down point on the rain gutter, and the antenna is of the flexible whip type (rather than aluminum tubing), the antenna may be used as a regular quarter-wave whip for 10-meter operation. The disconnect device should be designed to have very low contact resistance in order to minimize losses on 75. If the whip is about 8 feet long and the lead from the base to the 10 meter transmitter not over 2 feet long, the reactance presented by the antenna (due to the over-all length exceeding  $\frac{1}{4}$  wave length) may be tuned out by means of a 100  $\mu$ fd. midget variable condenser in series with the lead in.

### PAD KEEPS IRON CLEAN

A PAD of folded cotton rag, pinned to the front of the work apron, makes a convenient and effective cleaning device for a soldering iron. A quick swipe of the tip across the pad and the metal becomes bright and shiny. This arrangement is especially useful when working on tight wiring and it is necessary to pick up a drop of solder and carry it to the joint. Unless the tip is perfectly clean the solder will tend to fall off . . . . . R.I.I.



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 AY31, 26 volts, 400 cycle. Shaft extends from both ends. **PRICE \$10.00 EACH NET**  
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 J36A, Eastern Air Devices, .02 volt per R.P.M. **PRICE \$9.00 EACH NET**

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 12117, Pioneer, Input 12 volts D.C. Output 26 volts, 400 cycle. **PRICE \$17.00 EACH NET**

## INVERTERS—Continued

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 149H, Holtzer Cabot, Input 28 volts at 44 amps. Output 26 volts at 250 V. A. 400 cycle and 115 volts at 500 V. A., 400 cycle. **PRICE \$39.00 EACH NET**  
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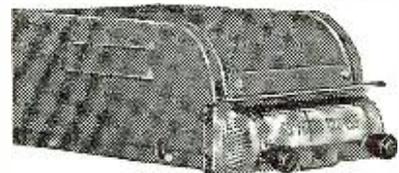
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.75 2000 V	.60	.002 3000 V	.65
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1.0 1000 V	.45	.003 3000 V	.65
2.0 200 V	.20	.004 2500 V	.35
2.0 600 V	.40	.005 1000 T.V.	.15
2.0 1000 V	.60	.005 3000 V	.65
4.0 600 V	.60	.006 2000 V	.35
4.0 1000 V	1.00	.008 1200 V	.15
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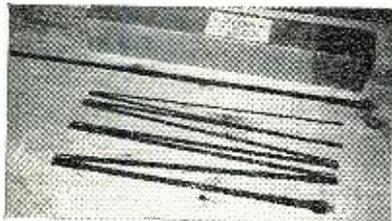
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## Within the Industry

(Continued from page 28)

sales promotion manager of the Receiver Division of *General Electric Company* and has been associated with the radio industry for more than 20 years.

\* \* \*

**JOHN F. BIGELOW** has been appointed director of service training for the radio division of *The Magnavox Company* of Fort Wayne, Indiana.



Prior to joining the company, Mr. Bigelow was manager of the publications and training section of the *Farnsworth Television & Radio Corporation's* service department. He had been with *Farnsworth* since 1943 and was engaged in television research and engineering for that company during the war.

At present he is an FM and television instructor for the *Warren Radio Company*, and he recently completed a textbook on television design and maintenance which is to be published shortly.

\* \* \*

**LESLIE F. MUTER**, president of *The Muter Company*, and Thomas A. White, president of the *Jensen Manufacturing Company*, have released a joint statement which reveals that *The Muter Company* has just acquired all of the common stock of the *Jensen Manufacturing Company*.

Both principals said that no consolidation of operations was currently anticipated and no changes in management were contemplated. The new board of directors of *Jensen Manufacturing Company* will be Thomas A. White, Leslie F. Muter, Hugh S. Knowles, Karl E. Rollefson, and A. A. Dailey.

*The Muter Company* manufactures components for radio and television receivers while the *Jensen Manufacturing Company* makes acoustic equipment, principally loudspeakers for radio, television, and other uses. Both companies are located in Chicago.

\* \* \*

**LEONARD G. TAGGART** is the new director of purchasing for *Sylvania Electric Products, Inc.*

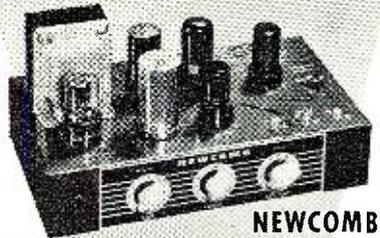
Mr. Taggart, who was formerly manager of purchasing for the company's Radio Tube Division, will establish a purchasing policy and coordinate purchasing activities of the Radio Tube, Lamp, Electronics, Fixture, Tungsten, and Chemicals Divisions, and the *Wabash Corporation*.



He started with the company in 1933 in the Engineering Specifications De-

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partment, later becoming an assistant in the Production Planning Department of the Radio Tube Division, Production Planning Manager, and Manager of Purchasing.

He served in the Army from 1940 until 1946. He will make his headquarters at 500 Fifth Avenue, New York, New York.

\* \* \*

**DR. WILLIAM W. EATON** has been named to the *Central Research Organization of Olin Industries, Inc.*

Dr. Eaton's appointment follows the recent formation of the new research organization which is designed to assure responsibility for the long range research activities of *Olin Industries, Inc.*

In his new position, Dr. Eaton will maintain his headquarters in the New Haven, Conn. offices of the company. In addition to the principal function of exploring new fields for possible future products, the *Central Research Organization* is also devoted to making basic research and studies in the field of scientific development.

-30-

## Synthetic Reverberation

(Continued from page 69)

ation desired. If the feedback is increased beyond a certain point a sustained oscillation will take place, which should be avoided.

The circuit conversion of Fig. 3 was designed so that as few changes as

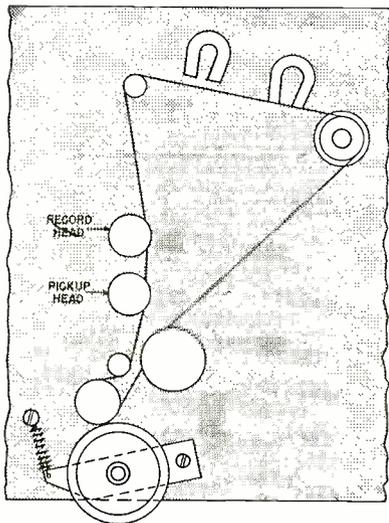


Fig. 5.

possible would be necessary in the recording amplifier. A more ideal mixing circuit is shown in Fig. 4 and may be used as a guide for those who would like to build a special unit for synthetic reverberation only.

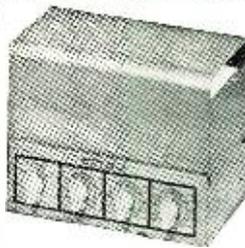
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- 1 Wolf, S. K.; "The Synthetic Production and Control of Acoustic Phenomena by a Magnetic Recording System," *Proceedings of the Institute of Radio Engineers*, July, 1941.
- 2 Hust, Lloyd B.; "Build Your Own Magnetic Tape Recorder," *Radio News*, February, 1948.

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- Selector switch for rapid changeover.
- Hum level 70 db below 12 watts.
- Tone compensation. Separate continuously variable bass and treble controls.
- Treble—from plus 10 db to minus 15 db at 10,000 cps.
- Bass—from plus 10 db to minus 15 db at 50 cps.
- Note—flat characteristics obtained with controls centered.
- Output impedance 2, 4, 8, 16 and 500 ohms.
- Straight AC for 110-120B 50-60 cycles fused.
- Tubes—6SL7, 6SK7, 2-6Y6, 5Y3.
- Chassis and shield silver gray hammerloid finish.

The HF 10 amplifier is a general purpose unit of small size (8"x9"x7") designed for high quality reproduction of sound, music and speech from records, radio and microphone. It is engineered and built to meet the high quality standards required of an amplifier when used in conjunction with the new high fidelity pickups, FM-AM tuners and wide range speaker systems.

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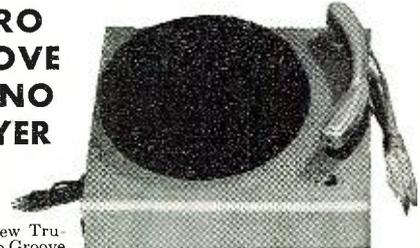
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- .0005, 6,000V
- 49c ea.....100 for \$45.00

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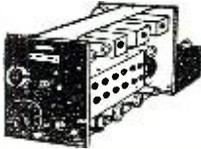
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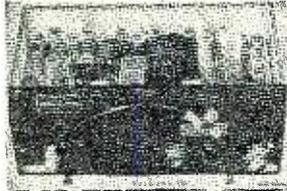
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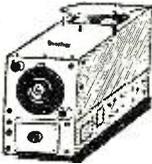
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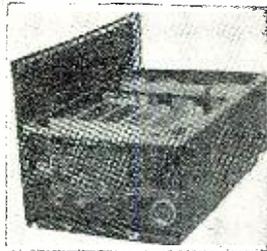
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**Manufacturers' Literature**

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.

**SOLDERING BOOKLET**

A new approach to increased profits has been suggested to servicemen in the booklet "Keep Your Iron In The Fire" which *International Resistance Co.* is offering free of charge.

Published for servicemen, the booklet covers eight ways whereby more time can be devoted to actual soldering. This is based on the concept that the soldering iron is the basic tool of the radio industry and the more irons the serviceman keeps in operation the more sets he repairs with a subsequent increase in sales volume.

The booklet also points out that there is a definite relationship between the number of hours the soldering iron is in operation and the serviceman's income. The pamphlet contains no advertising and any serviceman can secure a free copy of the publication by writing *International Resistance Co.*, 401 N. Broad Street, Philadelphia 8, Pa.

**BINDING POSTS**

*The Superior Electric Company* of Bristol, Conn. is now offering a new pamphlet describing its 5-Way Binding Post.

The booklet outlines the five uses for which the binding posts are adaptable; permanent clamping, spade lug connection, plug-in for banana plugs, looping and clamping, and clip lead. In addition, electrical equipment illustrating these various applications is shown.

The binding posts have been rated at 30 amperes current capacity and 1000 volts working voltage. The posts are available in either red or black phenolic plastic for quick color reference and terminal or polarity discrimination.

Copies of the pamphlet, with prices and details, are available on request from *The Superior Electric Company*, 411 Hannon Avenue, Bristol, Conn.

**IRC "PRECISTORS"**

A new bulletin covering the company's line of "Precistors" is now available from *International Resistance Co.* of Philadelphia.

The data sheet provides application data, and specifications on the DCF and DCH units. The former has an over-all body size (including caps) of 1 1/16" long by 3/32" in diameter, while the DCH units measure 2 1/16" long and 3/32" in diameter.

The Deposited Carbon Resistors have been designed for close-tolerance applications and to overcome inherent inadequacies of conventional type resistors in many advanced electronic

circuits. They are particularly suited for television circuits and similar applications.

For a copy of Bulletin B-4 giving complete data on the "Precistors," write to *International Resistance Co.*, 401 N. Broad Street, Philadelphia 8, Pa.

**RMA BOOKLET**

The Radio Manufacturers Association has recently announced the availability of a new publication "Classroom Radio Receivers" which was prepared by the RMA in cooperation with the Office of Education.

The report outlines the four factors which must be considered by any group contemplating the purchase of radio equipment for classroom use; first, the educational objectives of classroom audio activities; second, the specific broadcast programs that are or will be available for classroom use; third, the method of transmission (FM, AM, or short-wave) offering the desired programs; and finally, the type of classroom radio receivers needed to tune these programs.

The report amplifies each of these points and indicates possible solutions for the problem.

Single copies of the report "Classroom Radio Receivers" are available from Radio Manufacturers Association, 1317 F Street, N.W., Washington 4, D. C., or from the Radio Section, U. S. Office of Education, Washington 25, D. C. Prices on quantity orders will be supplied on request.

**NEMA STANDARDS INDEX**

The *National Electrical Manufacturers Association* has just issued an index covering a listing of standards on available products in the electrical, electronic, and radio fields.

Each of the standards are listed, numbered, and discussed briefly as to text and coverage. A price list, as well as ordering data, is also included with the index.

Requests for copies of the Standards Index should be addressed to *National Electrical Manufacturers Association*, 155 East 44th Street, New York 17, New York.

**ALLIED-SHELDON CATALOGUE**

*Allied Electric Products, Inc.* and its associated company, *Sheldon Electric Company, Inc.* have just issued a new, combined 24-page catalogue covering their complete lines.

Included in the catalogue are the *Sheldon* line of R-40 lamps; multi-purpose fluorescent starters for a.c., d.c., low temperature, adverse current and

ballast conditions; spring-action solderless contacts; cube taps, Continental and English type plug caps; and rectifier bulbs.

For a copy of Catalogue No. 150, write to *Allied Electric Products, Inc.*, 68-98 Coit Street, Irvington 11, New Jersey.

### CONDENSED CATALOGUE

*Alpha Metals, Inc.* has issued a condensed catalogue of its products which is now available free of charge upon request.

This four-page publication features a comprehensive solder selection guide which lists the sixteen metals that are most frequently soldered. The pertinent information given about them includes their order of solderability together with recommendations for the best flux core solder or solder and flux suitable to soldering operations, and also for the flux type most desirable when an external flux is used. Other tables list the physical characteristics of the various solders which are manufactured by the company.

A copy of Catalogue No. 201 is available on request from *Alpha Metals, Inc.*, 363 Hudson Avenue, Brooklyn 1, New York.

### B-A 1949 CATALOGUE

*Burstein-Applebee Company* of Kansas City, Missouri has recently released its catalogue No. 491 covering the 1949 line of radio and electronic equipment.

Included in this 130-page catalogue are radio receivers, television sets and accessories, record changers and equipment, all types of recording and playback equipment, intercoms, amplifiers, speakers, microphones, test equipment, tubes, replacement parts, antennas, ham equipment, tools, text books, as well as many other items needed by servicemen, hams, hobbyists, and industry.

A copy of the new Catalogue No. 491 for 1949 is available on request from *Burstein-Applebee Company*, 1012-14 McGee, Street, Kansas City 6, Missouri. Please be sure and specify Catalogue No. 491.

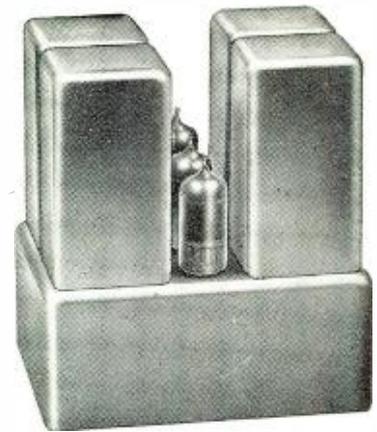
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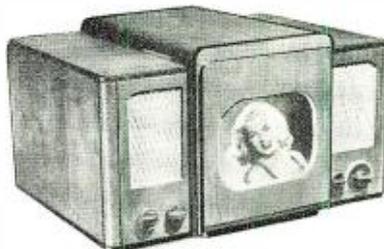
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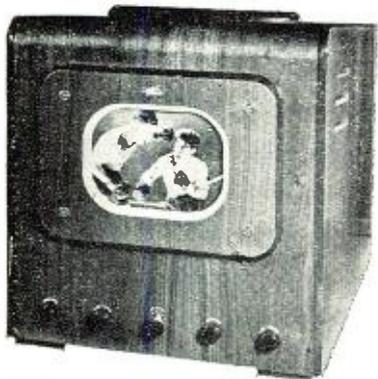
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January, 1949

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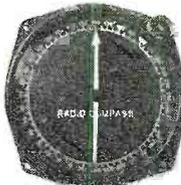
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BC 458 5.3 to 7 mc.	4.95
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6L6	1.25	810	4.95	58P4	2.95
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January, 1949

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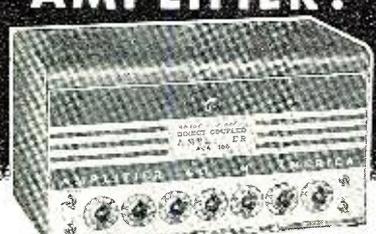
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Practical Radio Course (Part 60—End) (Ghirardi) . . . . . 72 Mar.  
 Students of Today—Technicians of Tomorrow (Chapel) . . . . . 68 Oct.

**MISCELLANEOUS**  
 A Crystal That Amplifies (Atkins) . . . 39 Oct.  
 Atom Smashers (Teevan) . . . . . 39 Mar.  
 Birth of a Service Note (Hooton) . . . . 50 Mar.  
 Exploring the Infinitesimal (Gootee) . . 39 June  
 Radio Quiz (Bukstein) . . . . . 148 Sept.  
 Television I.Q. (Bukstein) . . . . . 120 Oct.

**POWER SUPPLIES**  
 A Compact Bias Supply (Clemens) . . 180 Mar.  
 A Grid Bias Supply for Class "B" Modulators (Sherrod, W5ZG) . . . . . 94 Nov.  
 Another Method of Power Supply Control (Gallagher, W5HZR) . . . . . 88 June  
 A Regulated Power Supply (Rogers) 68 May  
 Build Your Own Communications Receiver (Part 1) (Goode) . . . . . 46 Aug.  
 Methods of Producing Negative Potentials (Carter) . . . . . 188 Mar.  
 Compact Power Supply Is Transformerless and Tubeless (Dexter) . . . . 51 Mar.  
 New Television Power Supplies Use Selenium Rectifiers (Eannarino) . . . . 54 Sept.  
 Novel Controlled Rectifier (Peschel) . . 58 Nov.  
 Power Supply Output Voltage Control (Peschel) . . . . . 66 Oct.  
 Regulated D.C. Supply Improvements (Kinsell) . . . . . 68 June

**RADAR, SONAR, ETC.**  
 The APS-42 Radar (Mailach) . . . . . 44 Apr.

**RADIO CONTROL**  
 Guided Missiles (Chapel) . . . . . 39 Jan.  
 Radio Controlled Model Sailboat (Schmidt, W1VDY, & Williams) . . . . 39 Apr.

**TEST EQUIPMENT**  
 A Compact Distortion Meter (Turner, W1AY) . . . . . 68 Nov.  
 A Compact Linear Diode V.T.V.M. (Turner, W1AY) . . . . . 40 July  
 A Crystal Controlled Signal Generator (Bann) . . . . . 51 May  
 A Crystal Diode Wave Shaper (Turner, W1AY) . . . . . 44 May  
 A Low Cost Volt-Ohmmeter (Lawson) 64 Sept.  
 A New AM-FM Signal Generator (Najork) . . . . . 49 Feb.  
 A Television Oscilloscope (Part 1) (VanArsdale) . . . . . 64 Apr.  
 A Television Oscilloscope (Part 2) (VanArsdale) . . . . . 52 May  
 A Universal A.F.-R.F. Wattmeter (Dexter) . . . . . 66 May  
 A Vacuum Tube Voltmeter (Krueger) 60 June  
 A Versatile Service Test Instrument (Haist) . . . . . 54 Apr.  
 A Versatile Signal Checker (Turner, W1AY) . . . . . 42 Mar.  
 A Versatile Substitution Tester (Fleishman) . . . . . 53 June  
 Audio Oscillators (Elisberg) . . . . . 92 Dec.  
 Gain Measuring Test Unit (Norman) . . 61 Sept.  
 Home-Built Crystal Signal Generator (Chalfin) . . . . . 47 Oct.  
 Low Cost All-Wave Signal Generator (Gould) . . . . . 64 July  
 Low-Cost Multimeter (Siegel) . . . . . 100 Nov.  
 Make a Test Unit for Your Service Kit (Leeper) . . . . . 41 July  
 New Test Equipment Speeds Video Servicing (Liebscher) . . . . . 44 July  
 Sensitive A.F.-R.F. Signal Tracer (Turner, W1AY) . . . . . 38 Aug.  
 Simplified RC Bridge (Parmenter, W1JXF) . . . . . 126 Mar.  
 Simple Simon Signal Tracer (Gruber) . . . . . 146 Oct.  
 Voltage, Current, Capacitance, and Resistance Measuring Devices . . . 112 May

**U.H.F.**  
 Microwave Plumbing Replaces Circuitry (Freedman) . . . . . 35 Sept.

**TELEVISION**  
**MISCELLANEOUS**  
 Microwaves for Relaying TV Programs (Freedman) . . . . . 35 Nov.

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**RADIO & TELEVISION NEWS**

New Mobile Field Strength Equipment for TV.....	61 Aug.
New Television Power Supplies Use Selenium Rectifiers (Eannarino)....	54 Sept.
Something New in Color Television (Crosman).....	40 Sept.
Television—Exclusively! (Alth).....	48 Mar.
Television Grows Up.....	47 Dec.
Television on Wheels (Wakeman & Goldsmith).....	46 July
The Inductuner.....	62 May
1948—Year of Television Progress (Gootée).....	35 Dec.

**RECEIVERS**

Custom-Build Telesets Provide New Video Market (Lescarboura).....	45 Nov.
The Television Kit (Flomenhoft)....	42 Oct.

**SERVICE NOTES (Theory)**

ABC's of Home Television Servicing (Shore).....	35 Aug.
Automatic Frequency Control (Buchsbbaum).....	68 Mar.
How to Use Sweep Generators with TV Receivers.....	46 Nov.
Individualized Television Installations (Taber).....	35 Oct.
Interference Traps for Television (Finley).....	70 Mar.
Modern Television Receivers (Part 1) (Kiver).....	59 Apr.
Modern Television Receivers (Part 2) (Kiver).....	74 May
Modern Television Receivers (Part 3) (Kiver).....	71 June
Modern Television Receivers (Part 4) (Kiver).....	66 July
Modern Television Receivers (Part 5) (Kiver).....	63 Aug.
Modern Television Receivers (Part 6) (Kiver).....	67 Sept.
Modern Television Receivers (Part 7) (Kiver).....	63 Oct.
Modern Television Receivers (Part 8) (Kiver).....	70 Nov.
Modern Television Receivers (Part 9) (Kiver).....	68 Dec.
New Test Equipment Speeds Video Servicing (Liebscher).....	44 July
Simplified Side Band Amplifiers (Burroughs).....	58 Oct.
Stagger Tuned Video I.F. Systems..	55 Oct.
Television Installation (Part 5) (Waye).....	57 Jan.
Television Installation (Part 6) (Waye).....	54 Feb.
Trap Circuits for Television Receivers.....	58 Sept.

-30-

**"TOWN MEETINGS" SET**

**T**WO additional meetings in the current series of Town Meetings of Radio Technicians have been scheduled for Atlanta, Georgia and Los Angeles.

The conference in Atlanta is being held January 31 and February 1 and 2 at the Municipal Auditorium in that city. The meeting in the Roger Young Auditorium, Los Angeles will take place February 28 and March 1 and 2.

The Town Meetings are part of a national program designed to help the radio repairman in major television centers equip himself for television. The meetings have a double purpose, i.e., to make available to the repairman information which will permit him to manage his business more expertly and second to give him the latest and most authoritative information on television.

The meetings are sponsored by the Radio Parts Industry Coordinating Committee made up of members from the RMA, EP & EM, the Sales Managers Club, and the WCEMA.

January, 1949

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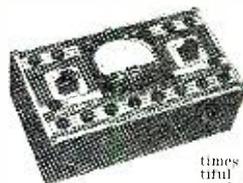
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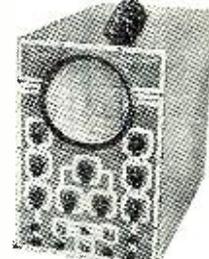
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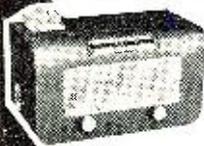


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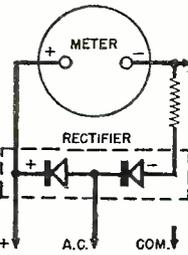
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## ERRATA

In the article "Low-Cost Multimeter" appearing on page 100 of the November issue, there are two errors which should be corrected.



The internal resistance of the Bradshaw Model 30 multimeter should have been given as 50 ohms instead of the 500 ohms mentioned in the article. There is an error in the rectifier circuit in the circuit diagram. This correction should be made according to the appended diagram.

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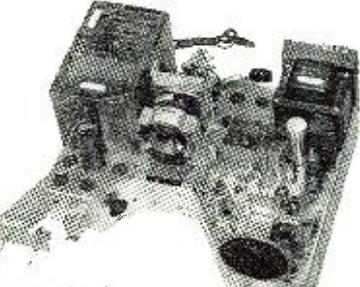


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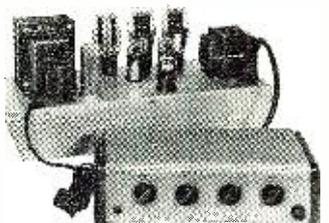
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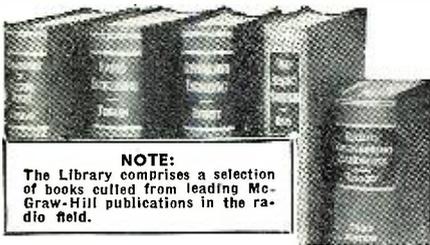
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# Technical BOOKS

**"RADIO INDUSTRY RED BOOK"** compiled by the Staff of Howard W. Sams & Co., Inc. Published by *Howard W. Sams & Co., Inc.*, Indianapolis. 446 pages. Price \$3.95.

While a book of this type presents a real problem to the reviewer, there is no difficulty involved in evaluating this book in terms of the industry.

Since most radio servicemen are confronted daily with the problem of providing correct replacement parts for receivers on their test benches, this helping hand, in the form of a complete and authoritative handbook, should call forth loud huzzahs from the servicing fraternity.

The first edition of the "Red Book" covers receivers manufactured during the years 1938 through 1948. In preparing this manual seventeen companies cooperated with the Sams Staff in presenting up-to-date replacement parts information. Data has been supplied by *Aerovox, Astatic, Burgess, Clarostat, Cornell-Dubilier, Eveready, IRC, Jensen, Meissner, Merit, Quam-Nichols, Radiart, Solar, Sprague, Stancor, Sylvania*, and *Thordarson*.

The material is handled in this manner. The receiver manufacturer and model number appears in a column on the left hand page. Then information on the tube complement and dial light, capacitors, transformers, batteries, i.f. coils, phono cartridges, speakers, controls, and vibrators follows in orderly progression across the double page. The compilers have done an admirable job of supplying a lot of usable data in an easy-to-use yet compact form.

**"MOST-OFTEN-NEEDED 1948 TELEVISION SERVICING INFORMATION"** by M. N. Beitman. Published by *Supreme Publications*, Chicago. 144 pages. Price \$3.00.

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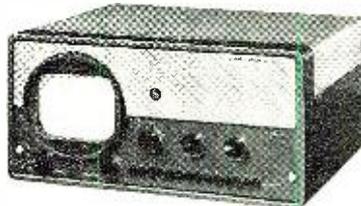
Each section covers circuit functions, a functional block diagram, a brief discussion of each section, alignment data, test equipment needed, response characteristics, a step-by-step alignment procedure, a troubleshooting chart, and a diagram of the receiver.

Included in the text is information about the *Admiral* Chassis 30A1; the *Belmont* Models 22A21 and 22AX22; the *DuMont* Model RA-103; the *Farnsworth* Model GV-260; the *General Electric* Model 803; *Hallicrafters* Models T-54 and 505; *Motorola* Model VT71, Chassis TS-4D; *Philco Corporation* Models 48-700, 48-1000, 48-1001, and 48-1050; *RCA* Model 8TS30; *Sonora* Model 700; and *Stromberg-Carlson* Model TV-12, Series 10-11.

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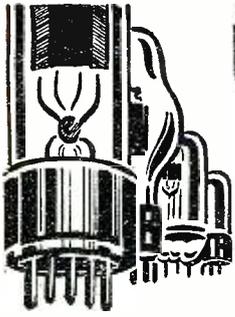
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2J38	8.95	VR78	.68	828	4.55	2051	.95
2J48	6.55	VR90	.70	829B	3.95	7193	.35
2J158	9.85	VR92	.65	830B	3.75	8011	2.55
5J23	4.85	VR105	.70	832	2.75	8012	4.35
5J29	4.95	VR150	.70	832A	3.50	8020	3.25
2C26	.55	VT127 ENGLISH	.35	837	1.25	9001	.70
2C26A	.70	VT127A TRIODE	2.55	838	3.25	9002	.65
2C34	.46	211	.65	841	.55	9003	.55
2C44	1.25	217C	5.95	843	.55	9004	.55
2E22	1.35	218	4.45	860	2.55	9006	.55
2X2/879	.75	282B	4.35	861	34.50	CEQ72	1.55
3C24/24G	.49	250R	7.85	864	.55	FG105	10.95
3AP1/906P1	2.75	304TH	6.55	865	2.55	KU610	7.45
3BP1	2.75	304TL	.90	869	24.95	RK20A	4.95
3CP1	2.75	305A	12.45	869B	28.95	12X825	
3E29/829B	3.95	305B	6.75	872A	2.45	2 AMP TUNGAR	2.95
3FP7	2.95	316A	.55	874	2.15	RK34	.45
3HP7	2.95	350A	2.75	878	2.15	GL471A	.95
5AP1	3.75	350B	2.55	884	1.50	EF50	.70
5BP1	2.85	371A	2.55	885	.85	HY615	1.25
5BP4	3.95	371B	2.55	930	1.10	704A	1.55
5GP1	6.55	388A	6.45	954	.55	705A	2.15
5HP4	5.95	417A	19.85	955	.55	707A	19.95
12HP7	10.95	GL434	2.95	956	.55		
6A6	.90	446A	1.55	957	.55		
6B7	.99	446B	1.55	1005	.45		
6C21	19.95	GL471A	2.95	2050	.75		
6H6	.52	481	4.50	1148	.40		
6J5	.52	WL530	24.95	1201/7ES	.95		
6SL7	.65	WL531	19.95	1616	1.25		
6U5/6G5	.70	532A	3.55				
7A7	.70	GL559	3.75				
7C4/1203	.45	WL681	19.95				
7H7	.75	7CCB	9.95				
7Q7	.70	7CCC	9.95				
10	.52	7CGD	9.95				
10Y	.55	702A	2.95				
12A6	.35	707B	23.25				
12C8	.35	708A	6.55				
12SH7	.45	71CA	2.15				
REL21	3.65	714AY	9.95				
FG17	2.95	715B	7.95				
30/VT67 For Walkie	.95	717A	.90				
33/VT33 J Talkies	.95	721A	3.95				
34	.35	721B	3.95				
RK34	.45	724B	4.25				
39/14	.34	725A	19.95				
41/VT51	.55	726A	19.95				
VT52/45SPEC	.55	726C	19.95				
46	.85	801A	.80				
76	.55	803	7.75				

**Neon Bulbs for Radio Use**  
NE-15 Price Ea.....\$0.06  
NE-48......24  
NE-16......24  
NE-51......06

### Pilot and Flashlight Bulbs

STOCK NO.	MAZDA NO.	VOLTS	WATTS	BULB	BASE	E.A. PRICE
250-40	64	6-8	E 3 CP	G-6	DC Bay	\$0.07
350-50	1820	28	1 Amp	T-3½	Min Bay	.12
350-31	57	12-16	1.5 CP	G4½	Min Bay	.08
350-42	Spec.	12	6 Watts	S-6	Cand Scr	.13
350-20	1446	12	2 Amp	G-3½	Min Ser	.07
350-14	49	2	.06	T-¾	Min Bay	.06
350-15	386	120	3 Watts	S-6	Can Bay	.11
348-22	PR-10	6	.5 Amp	B-¾	Min Flang	.05
350-18	1477	24	.17 Amp	T-3	Min Ser	.16
LB-101	323	3 (AIRCRAFT)		T-1½	953	.22
350-19	Proj. Bulb	120	500 W	T-20	Med Pf	1.45
LB-103	44 (Ruby)	6-8	.25 Amp	T-3½	Min Bay	.04
LB-102	1195	12-16	.50 CP	RP-11	DC Bay	.14
LB-104	313	28	.17 Amp	T-3½	Min Bay	.11
LB-105	1816	13	.33 Amp	T-3½	Min Bay	.12
LB-106	12A	12	.09 Amp 11	T-2	Tel Base	.18
LB-107	24-A2 W E	24	.75 Amp 105	T-2	Tel Base	.18
LB-108	S 14 ARGON	105	2½ Watt	Med	Screw	.22

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Distributors: Our standard jobber arrangement applies. Order directly from this ad.

Manufacturers: Write for quantity prices.



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Aerials Now Brings You The  
"TOPS" In  
TV and FM ANTENNAS

# Radiart



# "Simpli-Flex"

## TELEVISION and FM ANTENNAS

True to Radiart tradition . . . these new Television and FM antennas are the finest available! They are laboratory engineered and designed to deliver peak performance, always! Their top quality construction will produce the finest television picture possible. For just a little more . . . YOU can deliver the best . . . it pays!

"SIMPLI-FLEX" means just what it says! SIMple to install . . . FLEXible for any requirement! Its design allows it to be built up from the basic dipole to multiple stacked all-channel arrays by the addition of reflector kits and additional arrays as required when more stations get on the air.



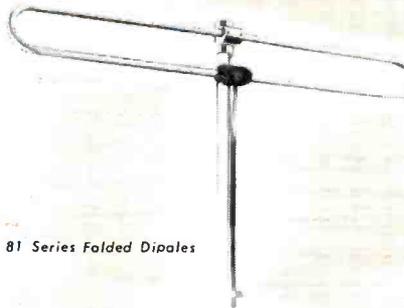
No "assembly puzzles" with Radiart's "SIMPLI-FLEX" design. No degree in engineering or truck-load of tools needed — absolutely no loose hardware. One minute assembly, one man installation!



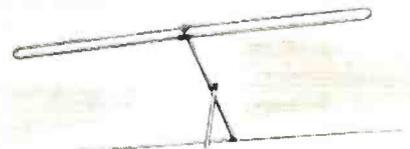
High strength, well engineered design of more than ample safety factor, with simple, sturdy all aluminum castings, elements, and heat-treated support masts for PERMANENT installations.



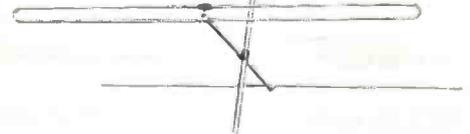
"WEATHER - SHIELD" polystyrene terminal block encloses lead-in connections and protects from all weather conditions! Keeps electrical performance at maximum.



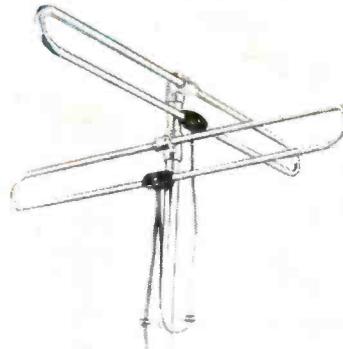
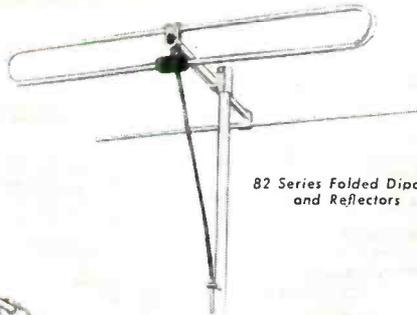
81 Series Folded Dipole



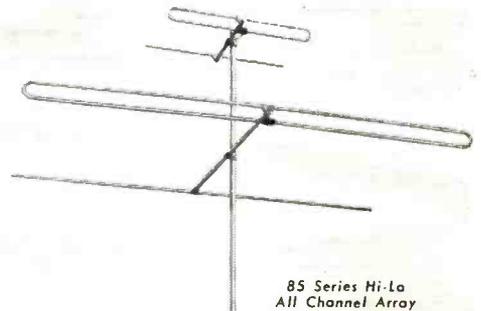
84 Series Double Stacked Arrays



82 Series Folded Dipole and Reflector

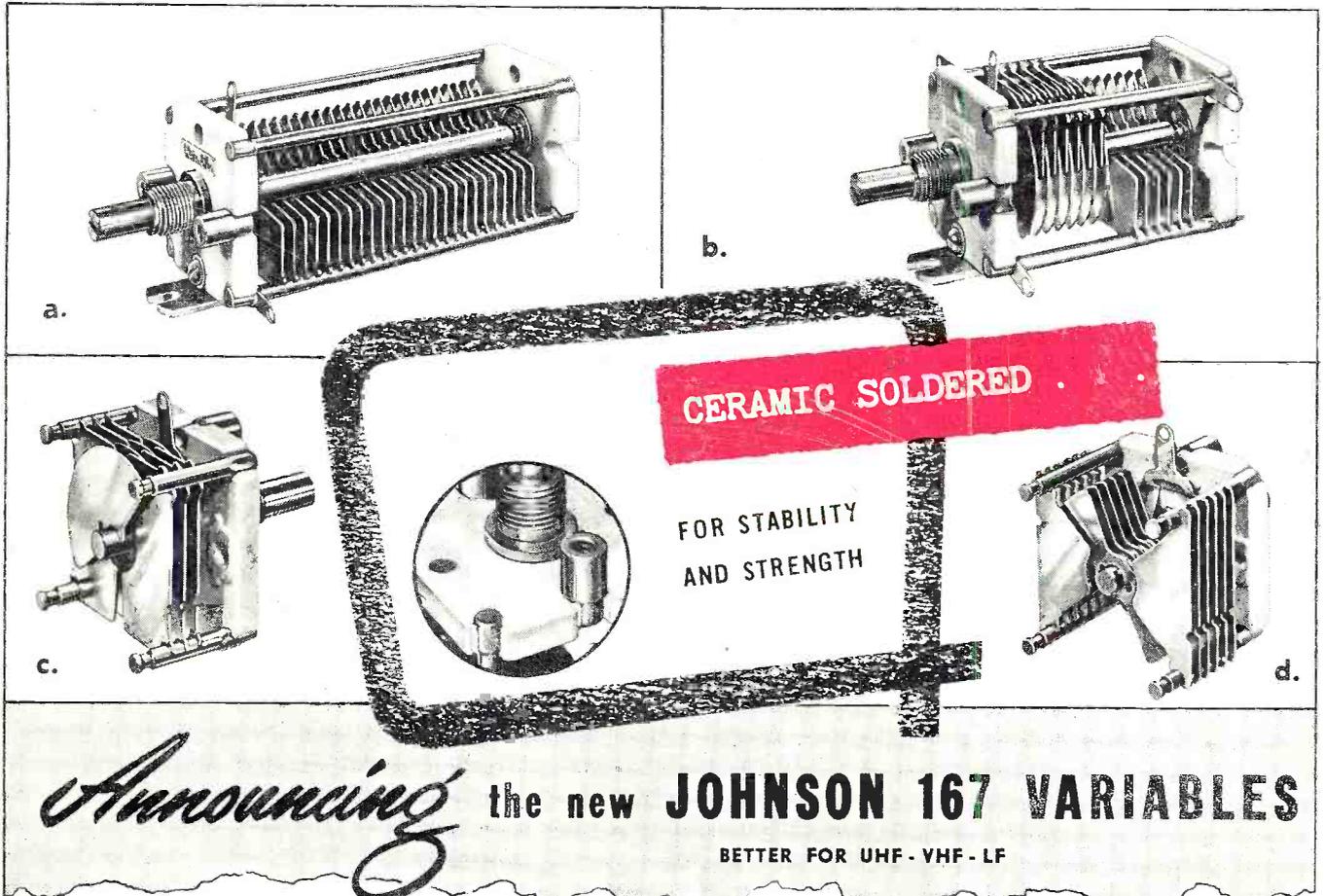


83 Series Turnstile Dipole — Non-directional FM Antenna



85 Series Hi-La All Channel Array

**THE RADIART CORPORATION** CLEVELAND 2 OHIO  
Manufacturers of the Famous "Red Seal" Vibrators



With the introduction of this new line of air variables, JOHNSON brings you many important design advantages never before available.

Outstanding of these is the use of perfected ceramic soldering which assures absolute — and permanent — rigidity and strength, absolute — and permanent — maintenance of capacities!

There are no eyelets, nuts or screws to work loose, causing stator wobble and fluctuations in capacity. JOHNSON ceramic soldering leaves a bond which is stronger than the rugged steatite end plates themselves. There's nothing to come loose, because the stator terminals, mounting posts and rotor bearings are ceramic soldered!

Silent operation on the highest frequencies is assured with a split sleeve tension bearing that also prevents fluctuations in capacity.

These new variables are ideal for peak efficiency even under the severest conditions, such as portable — mobile operation. They are available in .030" and .080" spacings.

Two sets of stator contacts are provided for connecting components to either side of condenser without appreciably increasing inductance of the circuit. New bright alloy plating is used. It has high corrosion resistance, is easily soldered and possesses lower electrical resistance than other common platings.

These variables are available for all types of communications equipment having tuned circuits operating as high as 500 mc.

### Features

1. Ceramic soldered for stability and strength
2. Soldered plate construction, heavy .020" plates, new bright alloy plating
3. Beryllium copper contact springs, silver plated
4. Split sleeve rotor bearings — no wobble to shaft
5. Steatite end plates
6. Long creepage paths
7. Low minimum capacity — maximum tuning range
8. Small size — end plate only 1 3/8" square

Other capacities and spacings available on special order.



**JOHNSON** • • • a famous name in Radios  
E. F. JOHNSON CO., WASECA, MINNESOTA

a. SINGLE SECTION VARIABLES			
.030" Spacing			
Cat. No.	Max. Cap. Per Section	Min. Cap. Per Section	Length Behind Panel
167-101	11	2.8	15/16
167-102	27	3.5	1-9/64
167-103	51	4.6	1-7/16
167-104	75	5.7	1-3/4
167-151	99	6.8	2-7/32
167-152	202	11.6	3-33/64
Also Available In .080" Spacing			
b. DUAL SECTION VARIABLES			
.030" Spacing			
Cat. No.	Max. Cap. Per Section	Min. Cap. Per Section	Length Behind Panel
167-501	27	3.5	1-13/16
167-502	51	4.6	2-27/64
167-503	99	6.8	3-5/8
Also Available In .080" Spacing			
c. DIFFERENTIAL VARIABLES			
.030" Spacing			
Cat. No.	Max. Cap. Per Section	Min. Cap. Per Section	Length Behind Panel
167-301	11	2.8	15/16
167-302	27	3.5	1-9/64
167-303	51	4.6	1-7/16
Also Available In .080" Spacing			
d. BUTTERFLY VARIABLES			
.030" Spacing			
Cat. No.	Max. Cap. Per Section	Min. Cap. Per Section	Length Behind Panel
167-201	10.5	2.8	1-3/64
167-202	26	4.3	1-7/16
167-203	51	6.5	1-15/16
Also Available In .080" Spacing			

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