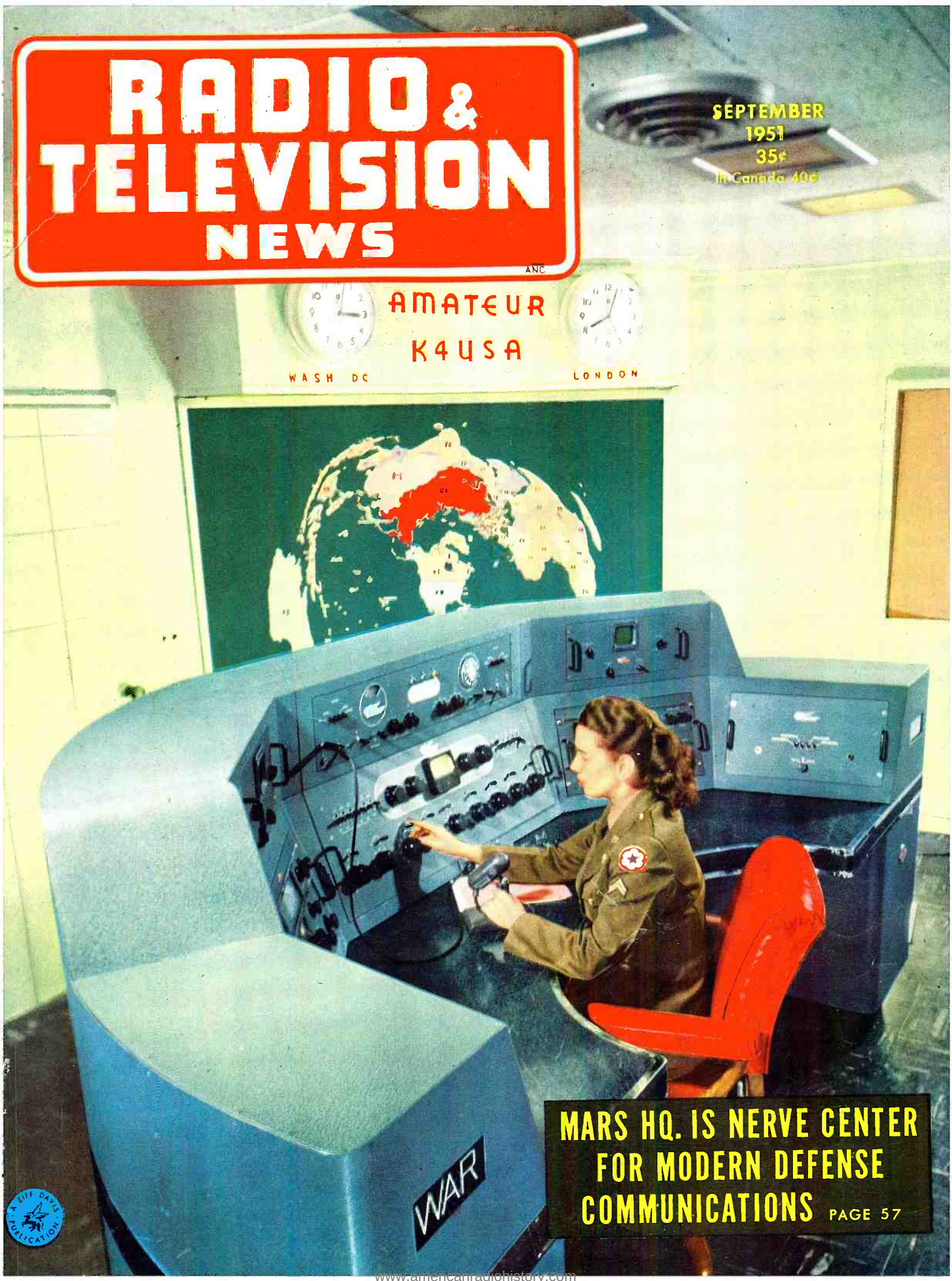
# RADIO & TELEVISION NEWS

SEPTEMBER
1951
35¢
In Canada 40¢




## MARS HQ. IS NERVE CENTER FOR MODERN DEFENSE COMMUNICATIONS PAGE 57

A ZIFF DAVIS PUBLICATION

THE QUALITY OF RCA TUBES IS UNQUESTIONED

# 4,500,000


# Best Sellers!

## *Life expectancy...plus!*

RCA kinescopes incorporate the experience of the oldest mass-producer of picture tubes in the industry

It is a well-established fact that more RCA kinescopes are now in active service than any other brand . . . over 4½ million since the advent of commercial television, when RCA pioneered the first large-scale production of kinescopes.

Significantly, many RCA kinescopes installed *four and five years ago are still giving good performance today*, providing continuous reliable service year after year. Yes, RCA picture tubes of all types have consistently given outstanding performance.

RCA's kinescope quality means substantial savings to dealers and servicemen, in fewer call-backs and "out-of-pocket" replacements. In the long run, it amounts simply to this . . . stocking RCA picture tubes is good business . . . as any long-term user of RCA kinescopes will tell you.

Your local RCA Tube Distributor carries a complete line of RCA picture tubes. See him the next time you buy kinescopes for replacement.

*Keep informed . . . keep in touch with your RCA Tube Distributor*

RADIO CORPORATION of AMERICA
ELECTRON TUBES
HARRISON, N. J.

# NEW PARA-CON ANTENNA COMBINES PARABOLIC & CONICAL PRINCIPLES

Barbara Lee—Rising TV Star, WEWS Cleveland

## Sight Sells It

After all, people buy TV sets to enjoy the picture. It just makes sense that the antenna bringing in the best picture brings in the best entertainment and the most customer satisfaction. Hook a Para-Con onto any set and you'll agree—it sells on sight.

## *Solves 9 out of 10 Installation Problems—Challenges Comparison*

Two best features are incorporated into one BEST antenna. The praiseworthy features conical type aerials possess for supplying full audio and full video bandwidth reception are used with a parabolic design that gives the Para-Con a concentration of signals. Para-Con is engineered to concentrate the maximum wave energy on the antenna by providing all-around, unmatched performance . . . perfect picture clarity . . . long customer satisfaction.

## Any TV Set Performs Better With a Para-Con Antenna

Every set performs better when conditions are better. Install Para-Con when older sets are starving for a stronger signal. Install a Para-Con when any set is being drowned in a sea of local interference. In the majority of set installations, Para-Con makes both old and new sets perform at their peak. To be on the safe side every time, install the sensationally performing new Para-Con antenna and forestall TV troubles at both the reception and the service end.

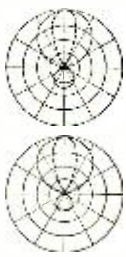
## Proved in Thousands Of Installations

Spectacular success has been achieved in practically every installation. Even in locations far removed and in difficult terrain where other more elaborate arrays were tried and failed, PARA-CON aerials not only bring in brighter, clearer pictures but seize and channel in stations where dependable reception has not been possible with an ordinary antenna. Ward's new PARA-CON Antenna has been field tested in thousands of installations . . . proved far and away better.

## Singles Out The Stations

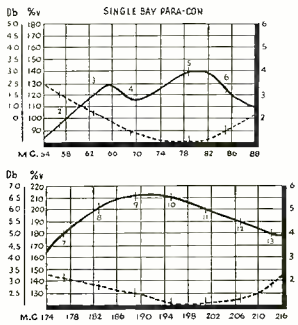
### High Front to Back Ratio

The new Para-Con design achieves an unusual capacity to obtain sharp directivity over all the television spectrum. Para-Con principles afford greater power and less interfering noise on each channel.



## One Antenna Covers All Channels

The Para-Con antenna reaches out and grasps all channels. The Ward Para-Con has an exceptionally low standing wave ratio combined with a spectacular high gain advantage on all channels.




## No Ghost Hunts

No more skeletons in your customer's TV closets. Scientifically determined direct impedance matching characteristics eliminate many ghosts. Para-Con's revolutionary design transfers the maximum power from the antenna to the receiver with a minimum of reflections.

## Profit-Wise Dealers Prefer Para-Con*

The antenna is one of the most important and critical components of a TV receiver. Nearly 20% of all TV service calls result from faulty antennas. The general all-around, high performance of Ward's Para-Con antenna gives customer satisfaction right from the initial installation. Expensive call-backs due to antennas are slashed. Ruggedly built for long lasting trouble-free service Para-Con withstands winds and weather. Easy to handle and quick to install . . . saves time and expense.

See your distributor for Ward's answer to your antenna problems.

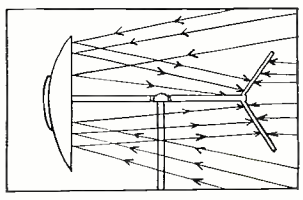
*Trade Mark

## The First In TV To Use Parabolic Principle

Parabolic antennas have long been used in special applications for concentrating weak signals onto driven elements. The brilliant results of Ward Para-Con are now setting new performance standards on all channels and in most every area. Ward's Para-Con Antenna is different. It's new. Now it is possible for one antenna to meet and solve many of the local problems of installation and reception.

## Ideal For All Band Fringe Areas

In fringe areas where selection of a number of channels is available, Ward's stacked Para-Con models provide the ideal compromise antenna for maximum results on all bands. Stacked in either two or four bay arrays, the Parabolic design reflectors reach out, gather and concentrate maximum energy on the antenna elements.



Diagramatic sketch showing how parabolic reflectors gather in and concentrate energy on conical elements.

# WARD PARA-CON

(Combining Parabolic and Conical Principles)

# ANTENNAS

**THE WARD PRODUCTS CORPORATION, Division of The Gabriel Co.**
**1523 E. 45th Street, Cleveland 3, Ohio**
**IN CANADA: ATLAS RADIO CORP., LTD., TORONTO, ONT.**

COVER PHOTO: Cpl. Mary Lafler at the control desk of the Headquarters stations of Army and Air Force MARS. These modern stations are housed in a special building constructed within the Pentagon in Washington. (Signal Corps Photo, U.S. Army)



*First in radio-television-electronics*
Average Paid Circulation over 200,000

# RADIO & TELEVISION NEWS

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VOLUME 46 • NUMBER 3



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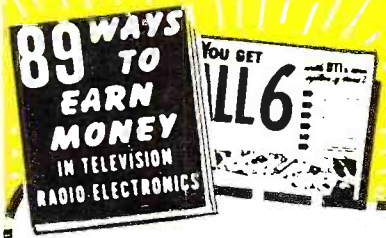


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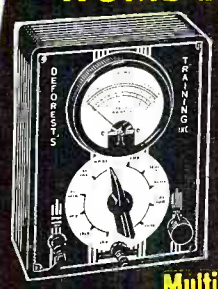
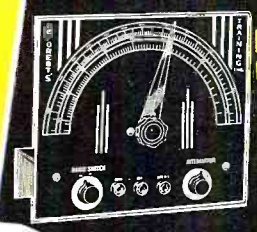


Multimeter

Oscilloscope



R-F Signal Generator

6-Tube Radio

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## HOME MOVIES

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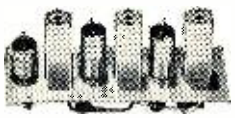
# NEW! COLLINS 'PRE-FABS'

## A NEW AND FASCINATING IDEA IN RADIO TUNERS—

## COLLINS "PRE-FABS" IS SOMETHING ENTIRELY NEW!

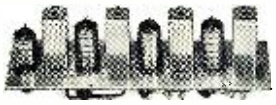
Enjoy the pleasure of constructing your own Collins FM tuner from precision made components which have been wired, tested, and aligned at our factory. Thrill to really high-fidelity reception that only Collins tuners can give you. All that is necessary is to assemble these units into the punched chassis, wire up the power supply, and it's ready to operate! No tedious wiring of miniature tube sockets or special layouts. This has all been done for you. Whatever units you choose, from the selection shown below, will fit into the universal chassis and work perfectly with each other. Any combination selected will outperform other tuners costing many dollars more.

IF-3
I.F. AMPLIFIER



$8.75

IF-4
I.F. AMPLIFIER



$12.25

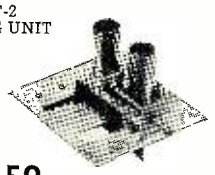
IF-6
I.F. AMPLIFIER

$18.50

THE COLLINS ▽ PRE-FAB ▽ TUNER
ASSEMBLED

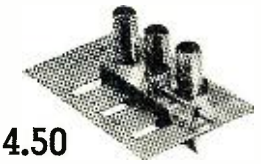
*All Prices Shown Include Tubes*

FMF-2
TUNING UNIT



$11.50

FMF-3
TUNING UNIT



$14.50

UC-1
CHASSIS KIT

$13.50

**QUALITY** **ECONOMY** **RESULTS**

### TUNING UNITS

The FMF-2 and FMF-2 tuning units both employ permeability tuning which is known for its superior performance at FM frequencies. The FMF-2 has two tuned stages using a 6AK5 converter and 6C4 local oscillator. The FMF-3 has three tuned stages which includes a 6J6 RF amplifier, 6AK5 converter, and 6C4 oscillator. Naturally, the RF stage provides great additional gain; and this unit is more sensitive than the FMF-2.

### IF AMPLIFIERS

The IF-3 I.F. amplifier employs three tubes terminating in a new type ratio detector circuit. The IF-4 also employs a ratio detector but has an extra I.F. stage for added gain. The IF-6 is our de luxe I.F. amplifier having three IF stages, two limiters, and a discriminator type of detector. The IF-6 amplifier has, we believe, the highest gain and sensitivity of any such amplifier on the market today. In combination with the FMF-3 tuning unit, the highest order of sensitivity can be attained reaching 6 microvolts or better. All these units have very low distortion and full frequency audio response from 20 cycles to over 20,000 cycles per second. All units are beautifully constructed and will add a professional touch to your receiving equipment.

### CHASSIS KIT

The UC-1 chassis kit comprises a punched chassis, handsome slide-rule tuning dial, oversize power transformer, filter condenser, rectifier tube and socket, hardware, volume control and switch, knobs, terminal strips, AC line cord and plug.

Full instructions are supplied for complete assembly of the tuner and wiring of the power supply.

Think of it—a complete Collins tuner for as little as $33.75!

**ORDERING INFORMATION:** In order to construct one of these Collins pre-fab tuners, you will require the **UC-1 universal chassis kit**, a **tuning unit** (either FMF-2 or FMF-3) and **one** of the IF amplifiers, IF-3, IF-4, or IF-6, making a total of three components. For example, if you select the FMF-3 tuning unit, its cost is $14.50; next, perhaps, the IF-4 amplifier at $12.25, then add $13.50 for the chassis kit, and that's it. A total of $40.25 will bring you a superb tuner, many dollars less than you would expect to pay. Other combinations may be selected at a range in price from $33.75 to $46.50. Can you think of a more practical way to bring the famous Collins tuners into your home?

A detailed instruction manual accompanies each tuner to assist you in making your Collins tuner.

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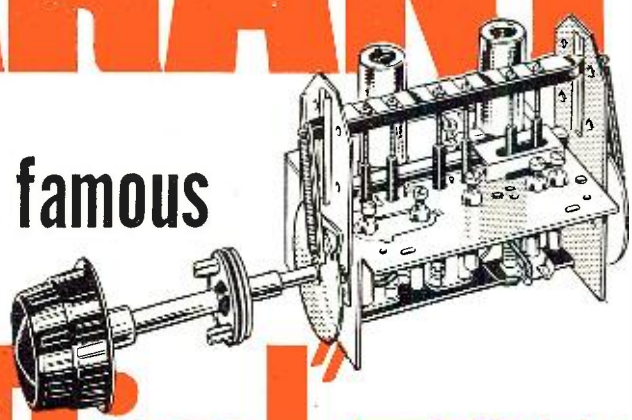
# LIFETIME GUARANTEE*

## on Raytheon's famous "Ray-Dial" TUNER



the HEART of the TV set!

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**THERE'S GOOD REASON** for this offer. Because Raytheon engineered and builds its own "Ray-Dial" Tuner. It's a unique mechanism, designed for trouble-free performance . . . a minimum of moving parts, less things to get out of whack. And it's a *continuous* tuner . . . you tune TV just like you'd dial a radio . . . simply, easily, accurately.

**THE HEART OF THE TV SET,** the tuner is mighty important to any TV buyer. And this lifetime guarantee on the "Ray-Dial" Tuner can be mighty important to you! So tell the story . . . and sell more Raytheon TV. For further information, contact your Raytheon distributor or write us.

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# For the RECORD

BY THE EDITOR

IN A previous editorial (September, 1950) we stressed the need for adequate and accurate construction data to accompany merchandise sold in the electronic field. Recently there has come to our attention a major headache caused by inaccurate and careless preparation of instructions for the assembly and wiring of electronic test equipment in kit form. We are not referring to the large companies who specialize in kits and who are providing the necessary instructions with their kits so that they may be satisfactorily built and used—even by the novice.

Any kit to be popular and simple to build must include not only a complete array of parts, but every hole used for the mounting of parts must be factory drilled and indicated on suitable illustrations.

Having a need for a compact grid dip meter, and having built and used many instruments from kits with good success, we purchased a recently introduced grid dipper kit from a local jobber. One of the opening statements made in the instruction book is "—— —— Dipper is furnished complete with all the material necessary for the construction of the unit." We hadn't gone very far into the construction before we discovered that we would need to purchase a tube of cement, Nos. 24, 41, and 48 drills, and some *Scotch* tape. Many builders of kits do not have a table of drill sizes nor a cross-reference of standard drills in steps of $\frac{1}{32}$" or $\frac{1}{64}$". The schematic, with several inked-over corrections, was checked with the parts list as there appeared to be discrepancies. Resistor $R_5$, for example, across the tube filament, is listed as 300 ohms on the parts list. Reference to a tube manual shows the filament rating for a 9002 tube is 6.3 v. at .15 amp. Hence, a 300 ohm resistor shunted across the filament would operate the tube at about 10 volts, after warm up. This would be most misleading to the novice, and if he did not check the resistors that accompanied the kit, might elect to use a 300 ohm resistor from available supply so that the value would agree with the parts list. Fortunately for us, the kit included a 39 ohm resistor which, according to Ohm's Law, is about right for the circuit.

The jack furnished with the kit had to be replaced with a midget type as it was too large to fit into the assembly. After mounting the meter according to instructions, we found it almost impossible to reach the tube socket pins (even with a skinny soldering pencil) without burning something.

Further discrepancies between instructions and diagrams appeared. If assembled and wired as stated, a direct short would result across the grid resistor. Mention is made to "mount *C* so and so in proper position." We searched for something to indicate this "proper position." No layout drawings are included so reference was made to the planographed photos. Even these were so lacking in detail as to be practically worthless.

At last—and after needless waste of time checking and cross-checking—the wiring was completed. It was then necessary to drill both the top and bottom pieces which complete the mechanical assembly of the case, and the drill sizes previously mentioned used. After carefully assembling the case we found that the plates of the variable condenser were rubbing due to mechanical distortion caused by bending of the thin metal box on which the condenser is mounted. More time was wasted in making correction.

Next came the coils. All one needs is a tube of cement, *Scotch* tape, a hacksaw, No. 24 and No. 48 drills and lots of time and patience. Before the coils are mounted, it is necessary to drill a plain plastic mounting strip and to insert banana jacks which are self-holding. After the cement has set overnight we come to the next step, which is not even mentioned in the instructions. The problem is to solder the coil leads to the banana jacks without melting the plastic or setting fire to the cement. Too much heat obviously would ruin the coils.

After sawing off the condenser shaft to a practical length and after assembling the dial, we calibrated the grid dipper. The performance of the completed meter is satisfactory, but it is unfortunate that the builder must guess all during its initial construction.

The purpose of this criticism, which we intend to be constructive, is to reiterate that any and all instructions, illustrations, and diagrams accompanying a kit, no matter how simple, must be exactly right, especially for the tyro. Large producers of kits have spent much time, money, and effort to make their instructions accurate and easy to follow. They know from long experience that each and every hole must be drilled at the factory. They have learned that their customers will reorder their kits with confidence and will also recommend their products.

But if a customer finds himself spending needless time and money to build an incomplete kit, he soon discovers that for a few dollars more he could have purchased a ready-to-use instrument of a similar type.

The success or failure of the kit business depends almost entirely on the accuracy and clarity of the instructions that accompany the packaged item. . . . . O.R.

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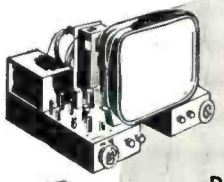

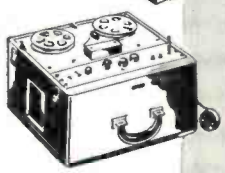

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• • •

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## EARN WHILE YOU LEARN

Many National students pay for all or part of their training with spare time earnings. We'll show you how you can do the same! Early in your training, you receive "Spare-time Work" Lessons which will enable you to earn extra money servicing neighbors' and friends' Radio and Television receivers, appliances, etc.

Signal Generator — Audio Oscillator — T. R. F. Receiver — Superheterodyne Receiver

## National Schools Training Is All-Embracing

National Schools prepares you for your choice of many job opportunities. Thousands of home, portable, and auto radios are being sold daily—more than ever before. Television is sweeping the country, too. Co-axial cables now under construction will soon bring Television to every city, town, and farm! National Schools' *complete* training program qualifies you in all fields. Read this partial list of opportunities for trained technicians:

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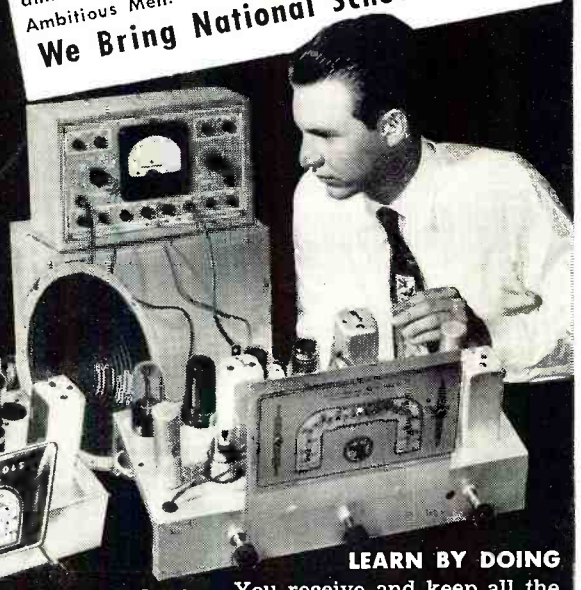

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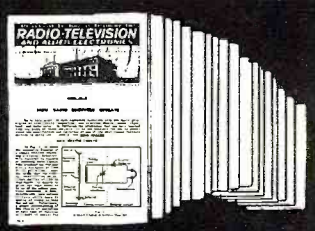

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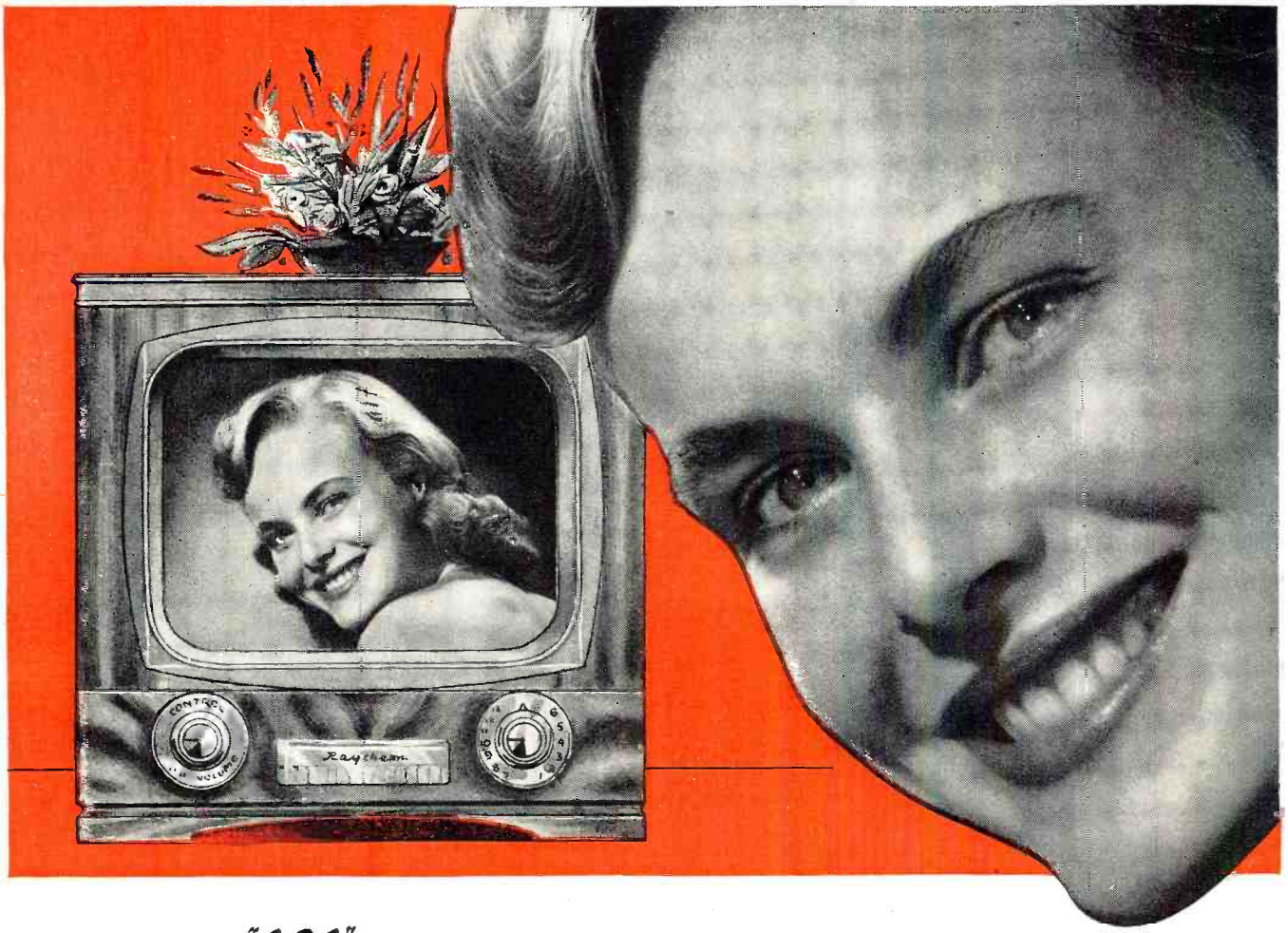


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# Spot Radio News

★ ***Presenting latest information on the Radio Industry.***

By RADIO & TELEVISION NEWS' WASHINGTON EDITOR

**THE FRIGID LOCK** on TV's golden gate to a world of over 2000 stations, which has been on the threshold of removal practically every other month during the past thousand-odd days, will, Congress has now been told, really be cast off, with the early fall set as the historic moment of banishment.

The roaring news, streaking through the famous G-16 hearing room of the Senate, during a session of the Interstate Commerce Committee, was offered by none other than FCC Headman Wayne Coy who was reporting on what the Commission has been doing and intends to do on such matters as color, the freeze, allocations, clear channels, defense, and so on. Noting that not only was it denitely felt that it will be possible to remove all barriers to allocations in September or October, Coy added that there is every indication that in about a year from now, there will be many new stations in operation in the high and low lanes of the ether. To assure the fulfillment of such a program, he declared, the National Production Authority will be asked to provide releases for materials for transmitters and buildings. To save steel, centralized community towers for antennas will be recommended, the five-station Empire State project being offered as an example.

In a reply to a barrage of questions on the approach which would be used to expedite the allocation hearings and insure a speedy removal of the freeze, the Commission's chieftain said that a streamlined attack featuring studies of written statements, in lieu of the lengthy oral procedures, should turn the trick and permit the ice-barrier's removal.

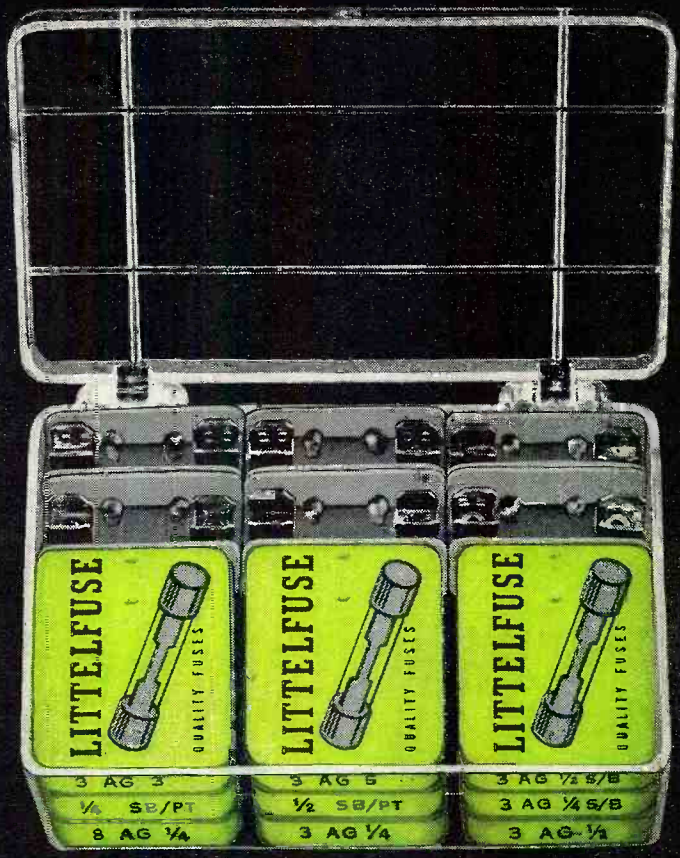
The written testimony plan, originally proposed by the National Association of Radio and Television Broadcasters, was believed by many to be an ideal accelerated technique. Even the fiery Federal Communications Bar Association found merit in the plan which revolved about the elimination of the city-by-city hearings and specific attention to firm applications to minimize the delays caused by oral alternate proposals. In addition, the FCBA said, the plan should bring about wholesale mutual compromises on the normal assortment of conflicting matters, and prevent the usual extensive comparative hearing debates which prevail during these round-the-clock sessions.

All did not feel that the short-cut idea would provide the satisfactory answers to the too-few channel problems cited by many communities. *Du Mont,* for instance, declared that they wanted a full public hearing on their alternate proposal which involved the entire country and foreign areas, as well. A memorandum to the secretary of the Commission disclosed that a detailed oral argument was imperative, in their opinion, since there were too many major factors to consider, which could not be possibly covered in mail transmittals.

The sizzling freeze issue also prompted one of radioland's distinguished citizens, the "father" of the famous Communications Act of 1934, ex-Senator Clarence C. Dill, to scold the Commission for its provoking delays. Said the former member of Congress in a letter to Wayne Coy: "Nearly three years is too long to delay action on at least enough applications to serve regions without television. . . . Surely the Commission could process some . . . applications . . . for use of frequencies . . . available to certain sections. . . . It is not necessary to provide for all small towns immediately. . . . It is highly unjust not to provide for at least one station for thickly populated areas."

Pointing out that the Commission should take immediate action, the former legislator, now a practicing attorney in the state of Washington, declared: "May I respectfully suggest that your Commission seriously consider doing something about this situation by making exceptions to the freeze order at once, for those regions that do not have and cannot have any television stations under the present conditions. Cut down the time of the hearings and act without months of delay." Ending of the freeze, the ex-Senator said, was extremely important. "If I were in the Senate," he declared, "I would address that body on this subject and introduce a resolution that would bring your members (*the Commission*) before the Senate Committee on Interstate Commerce for the purpose of impressing them and Congress with the injustice of the orders of the Commission by the continuation of this freeze order."

**COLORCASTING,** although cited by government statute as officially approved insofar as the wheel method is

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concerned, is still quite an item on the books of the air patrolmen in Washington, and many months, perhaps even a year, may pass before all will be quiet on the hue front. Notwithstanding the regular field-sequential program schedules, most of industry has wrapped itself up in an intensive development project which they feel will bring electronic compatible color to the land and outmode the approved method.

The first step in the campaign, involving the demonstration of prototype equipment with sixteen and twenty-one inch tri-color tube receivers, was initiated in midsummer at *RCA's* exhibition hall in New York City. In a striking exhibition, the press and members of industry saw remote and studio programs, aired by *NBC's* experimental station KF2XJZ. The field program was particularly unique, with a microwave relay, operating on 6962.5 megacycles, picking up diving sequences at Palisades Park, located high up above the Hudson River. The signals were beamed across the river to the *RCA* Building and fed to a color-vision room on the third floor. The results were excellent, according to many leaders in industry. Dr. Allen B. Du Mont pointed out that the picture was good enough . . . "to start commercial operations immediately." Others who waxed enthusiastic were *Philco's* Prexy William Balderston; Dr. W. R. G. Baker, vice-president in charge of *G-E* electronics; Jack Binns, *Hazeltine* president; and R. W. Durst, executive vice-president of *Hallicrafters*.

In a second step, to bring electronic color to the public, there'll be a series of showings, which it is expected will begin shortly before this issue comes off the press and continue for a few weeks.

Subsequent steps in the race to bring tube color to Mr. and Mrs. America are also under way. The panels of the National Television Systems Committee, whose plans were outlined last month, have been holding continuous meetings to discuss their activities in the field and lab. Describing this important program, during a meeting of the National Association of Music Merchants in Chicago, Glen McDaniel, RTMA's new president, said that industry was taking the Commission's comment that the . . . "door is not closed and never was closed" insofar as the possible adoption of any new practical compatible system is involved, at its word, and striving to perfect a color method which meets the requirements set up by the boys in Washington. McDaniel added that the views of Senator Johnson, which cited that . . . "the Commission has no right under the law to foreclose the public from the fruits of progress of the television art and the Commission will not attempt to do so . . ." were also serving as an incentive for industry to press for a more acceptable approach to the color problem.

(*Continued on page* 121)

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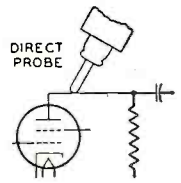
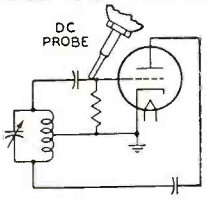
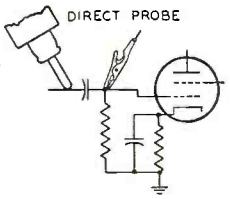



MEASURES AC VOLTS . . . such as signal voltage on plate of af tube.




MEASURES DC VOLTS . . . such as oscillator grid bias. One-megohm resistor in probe prevents circuit loading.

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**Includes DC probe, AC direct probe and cable, ground lead, and alligator clip.**

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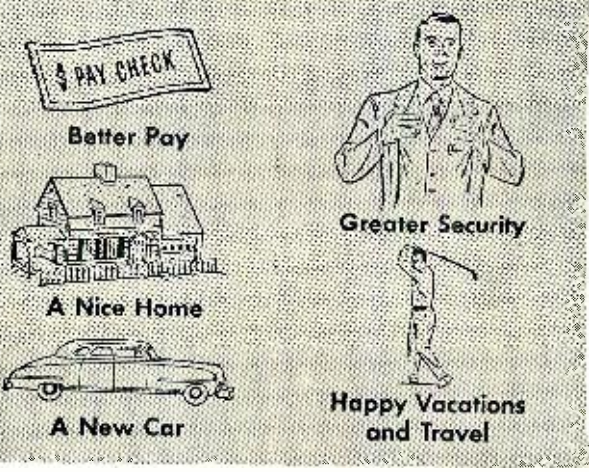


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General Electric Supply Corp., Cincinnati
Holub & Hogg Co., Cincinnati
Hughes-Peters Inc., Dayton
Hughes-Peters Inc., Columbus
Hughes-Peters Inc., Cincinnati
Lifetime Electronics, Toledo
Morrison Radio Supply, Ashtabula
Pioneer Radio Supply Co., Cleveland
Srepco, Inc., Dayton
G. W. Taylor, Cleveland
Warren Radio, Toledo
Whitehead Radio Co., Columbus
Winteradio, Cleveland
OKLAHOMA
Electronic Supply Co., Okla. City
Electronic Supplies, Tulsa
PENNSYLVANIA
A. C. Radio Supply Co., Phila.
A. G. Radio Parts Co., Phila.
Almo Radio Co., Philadelphia
George D. Barbey Co., Inc., Reading
Barnett Bros. Radio Co., Phila.
Barno Radio Co., McKeesport
D. & H. Dist. Co., Wilkes-Barre
D. & H. Dist. Co., Harrisburg
J. V. Duncombe Co., Erie
Eshelman Distributors, Lancaster
Kratz Bros., Norristown
M. V. Mansfield Co., Pittsburgh
Moyer Electronic Supply Co., Inc., Hazelton
Fred P. Purcell, Scranton
Radio Service Co., Wilkes-Barre
Radio Electric Service Co., Phila.
Tydings Co., Pittsburgh
Warren Radio Co., Erie
RHODE ISLAND
Wm. Dandretta & Co., Providence
DeMambro Radio Sup. Co., Prov.
TENNESSEE
Shobe, Inc., Memphis
VIRGINIA
Mattsons, Richmond
Radio Equipment Co., Norfolk
WISCONSIN
Electronic Expeditors Co., Mil.
G. M. Popkey, Green Bay
G. M. Popkey, Marinette
Morley-Murphy Co., Milwaukee
Standard Radio Parts Co., Racine

**OAK RIDGE PRODUCTS**
**37-01 VERNON BLVD., LONG ISLAND CITY 1, N. Y.**
manufacturing division of Video Television, Inc.

# No cuss

Blue Shaft Controls with attached switches are your smartest service buy! Why? Because they save you valuable bench-working time — by being truly your quickest-for-servicing replacements. These factory attached and tested switches are high amperage, universal units. That means they can be used as SPST — DPST or 3 wire.

***For quickest servicing, standardize on Centralab Blue Shaft and Custom Controls.***

# No fuss

# When you use Centralab's®

# Exact Replacement Controls

**Why waste time "tinkering" with kits . . .**

**when you can get exact, quickest-for-servicing, custom replacement controls for TV - AM - FM . . .**

***There's a Centralab Custom Control — or Standard Blue Shaft Unit that's Quickest for Service.***

Service Engineers! Centralab's famous Blue Shaft and Custom Controls are exclusive service items. You'll find Blue Shafts available in a complete line of plain and switch types with resistance ranges from 500 ohms to 10 megs. in a wide variety of tapers and tapped units! All Centralab controls are packaged singly. Blue Shafts are also available in handy plastic boxes of 12 and in a special metal cabinet containing 22 controls. NO EXTRA charge for the cabinet.

**Check These LOW PRICES on Popular Blue Shaft Controls!**

| Cat. No. | Ohms Max. Resistance | Taper | Circuit Location | List Price |
|---|---|---|---|---|
| B-60 | 500,000 | C-2 (audio) | Volume or Tone | $1.00 |
| B-60-S* | 500,000 | C-2 (audio) | Volume or Tone | $1.50 |
| B-70 | 1 megohm | C-2 (audio) | Volume or Tone | $1.00 |
| B-70-S* | 1 megohm | C-2 (audio) | Volume or Tone | $1.50 |

**Switch Type*

**Ask your jobber or write direct for Bulletin 42-106 on Blue Shaft Controls. Send 25c for Centralab's TV and Custom Control Guide.**

**Centralab®**
CRL

**Division of GLOBE-UNION Inc.**
**910 E. Keefe Ave. • Milwaukee 1, Wisconsin**

# Within the INDUSTRY

**DR. JAMES W. McRAE** has been appointed vice-president of *Bell Telephone Laboratories* and succeeds A. B. Clark in charge of the systems development organizations for the laboratories.

Dr. McRae has been associated with the laboratories since 1937 when he received his doctorate from the California Institute of Technology. His early work was concerned with transoceanic radio transmitters and microwave research which brought him into contact with various military projects, including several early radar developments.

In 1942 he was commissioned a major in the Signal Corps and was assigned to the Office of the Chief Signal Officer in Washington. In 1944 he was made chief of the engineering staff of the Signal Corps Engineering Laboratories at Bradley Beach, N. J. Later he became deputy director of engineering and attained the rank of colonel before returning to civilian life at the end of 1945.

* * *

**RALPH T. BRENGLE,** sales manager of *Potter & Brumfield,* has been appointed chairman of the newly-formed 13-man Relay Industry Advisory Committee of the Munitions Board.

Other members of the committee include: Col T. M. Natt, government chairman; H. W. Pfeffer, president of *Struthers-Dunn;* Edward Gillette, president of *Allied Control Company;* Dan Dooley, vice-president of *C. P. Clare & Company;* Emory Howe, *Comar Electric Company;* John Rowell, sales manager of *Guardian Electric Company;* Joseph F. Clark, *Leach Relay Company;* J. Crissinger, *North Electric Mfg. Company;* James Roughan, sales manager of *Price Electric Co.;* Richard Fischer, president of *Sigma Instruments;* A. C. Keller, *Western Electric Co.;* Harold L. Olesen, *Weston Electrical Instrument Corp.;* and F. H. Clark, *Westinghouse Electric Corp.*

* * *

**GLEN McDANIEL,** president of the Radio-Television Manufacturers Association, has announced the addition of two new staff members and the promotion of a third.

Ray S. Donaldson, administrative assistant to Senator Homer E. Capehart, has joined the RTMA staff as attorney. Tyler Nourse, former copy editor of *"Broadcasting Magazine"* has been named assistant to Peter H. Cousins, the recently-appointed director of information for the Association.

Ralph M. Haarlander, who for the past four years has been staff assistant to the RTMA transmitter division, has been given additional duties and the title of assistant secretary. He will assist James D. Secrest, general manager and secretary, in an administrative capacity.

Further additions will be made to the Washington staff and service to members will be expanded when the Association moves its offices to the Wyatt Building, 14th Street and New York Avenue, sometime early in the fall.

* * *

**BRIG. GEN. V. A. CONRAD,** chief of the Army Communications Service Division, Office of the Chief Signal Officer, has been elected chairman of the MARS Advisory Committee, succeeding Major Gen. Frank H. Griswold, USAF.

Serving with Gen. Conrad is Lt. Col. H. H. Moreland, USAF, vice-chairman of the committee.

The MARS Advisory Committee is made up of representatives from the Armed Services, other interested governmental agencies, the ARRL, and the American Red Cross. The group meets quarterly to discuss amateur radio problems.

* * *

**SCOTT MORENCY** has been appointed Washington representative of the War Contracts Division of *Zenith Radio Corporation* of Chicago.

The division, which is under the supervision of L. C. Truesdell, vice-president in charge of household receivers, is responsible for procurement and administration of the company's war contracts with the various divisions of the Armed Services, other governmental agencies, and certain prime contractors.

Mr. Morency, who will make his headquarters in Washington, has been associated with the *Western Automatic Machine Screw Company* of Elyria, Ohio for four years. During the war he joined the Marine Corps as a private and was separated from the Navy in 1946 with the rank of ensign.

* * *

**NATIONAL TELEVISION SYSTEMS COMMITTEE,** which recently released an interim report on a new color television system, has reorganized and established nine new panels, according to Dr. W. R. G. Baker, chairman of the committee.

Dr. Elmer Engstrom, vice-president in charge of research for the *RCA*

# Here's how YOU can sell more Picture Tubes WITH HYTRON'S NEW EASY BUDGET PLAN!




**ANOTHER HYTRON FIRST FOR YOU!**

No need to miss that profitable picture-tube sale — just because the customer doesn't have the cash. The original Hytron Easy Budget Plan saves the sale. Gives you a competitive edge. Hytron has arranged the details for you. A national credit organization, with facilities in all TV areas, stands ready to serve you.

Find out how *you* can put this wonderful, timely Hytron plan to work right now! Write for complete information today.


ANOTHER HELPFUL SERVICE FOR YOU FROM . . .

MANUFACTURERS OF RECEIVING TUBES SINCE 1921

**HYTRON**

**RADIO AND ELECTRONICS CO.**

A DIVISION OF COLUMBIA BROADCASTING SYSTEM INC.

MAIN OFFICE: SALEM, MASSACHUSETTS

**Hytron Radio and Electronics Co.**
**Salem, Massachusetts**

Please rush me details on the Hytron Easy Budget Plan.

*Name* .....
(please print)

*Street* .....

*City* ..... *State* .....

*Laboratories Division,* was named vice-chairman of the committee. The nine new panels and their chairmen include: "Subjective Aspects of Color," Dr. A. N. Goldsmith; "Color System Analysis," Mr. Fink; "Color Video Standards," A. V. Loughren, *Hazeltine Electroncis Corp.;* "Color Synchronizing Standards," D. E. Harnett, *General Electric Company;* "Compatibility," Dr. D. E. Noble, *Motorola Inc.;* "Field Testing," Dr. T. T. Goldsmith, *Allen B. DuMont Labs, Inc.;* "Network," Frank Marx, *American Broadcasting System;* "Coordination," Mr. Smith, *Philco Corporation;* and "Definitions," Dr. R. M. Bowie, *Sylvania Electric Products Inc.*

* * *

**BEN SELSBY,** formerly associated with *South River Metal Products, Inc.,* has joined *Haygren Electronic Mfg. Inc.,* Brooklyn manufacturer of electronic components.

In his new post, Mr. Selsby will be in charge of all sales activities for the company. Coincident with the expanded sales activities the company's existing line of television installation accessories is being revamped and expanded.

To carry out this phase of the expansion program Herbert Dannemann has been added to the staff as design engineer.

* * *

**NATHANIEL B. NICHOLS** has been named manager of the Research Division of *Raytheon Manufacturing Company* of Waltham, Massachusetts. His specialty is servomechanisms and automatic controls . . . **KAREL VAN GESSEL** has been named to the newly-created post of coordinator of foreign manufacturing affiliates for *Sylvania Electric Products Inc.* He will act as liaison between the company's foreign affiliates and its operating divisions in the United States on matters of engineering and manufacturing . . . **DANA W. ATCHLEY, JR.,** is the new coordinator of technical research for *United Paramount Theatres, Inc.* He was formerly associated with *Tracerlab, Inc.,* and *Sylvania Electric Products Inc.* . . . **CHESTER H. LANG,** a vice-president of *General Electric Company* since 1941, has been appointed to a new post in charge of public relations. He will maintain his headquarters at the company's New York office . . . **DALE McFEATTERS** heads the newly-formed Department of Information Services for *Westinghouse Electric Corporation.* All functions of public relations, employe relations, and related activities will be handled by this new department . . . **MARTIN BETTAN** is the new chief engineer for *Radio Merchandise Sales, Inc.* He will be responsible for the technical development of the company's line of antennas, boosters, and other television accessories . . . **DAVID C. PRINCE,**

(*Continued on page* 138)

# Be Sure of Your Installations
# Get the *Aptitude-Tested*
# RG/U TRANSMISSION LINE CABLES

You know what you are doing when you use Belden RG/U Transmission Line Cables—they're aptitude rated. They are designed to provide desirable electrical characteristics, and rigid control assures constant quality.

Specify Belden Radio Wires.

Belden Manufacturing Co.
4681 W. Van Buren Street
Chicago 44, Illinois

**APTITUDE RATING No. 8236**

| Frequency (Mc) | Attenuation per 100 ft |
|---|---|
| 100. | 2.65 |
| 200. | 3.85 |
| 300. | 4.80 |
| 400. | 5.60 |

**APTITUDE RATING No. 8237**

| Frequency (Mc) | Attenuation per 100 ft |
|---|---|
| 100. | 2.10 |
| 200. | 3.30 |
| 300. | 4.10 |
| 400. | 4.50 |

**APTITUDE RATING No. 8238**

| Frequency (Mc) | Attenuation per 100 ft |
|---|---|
| 100. | 1.90 |
| 200. | 2.85 |
| 300. | 3.60 |
| 400. | 4.35 |

**APTITUDE RATING No. 8239**

| Frequency (Mc) | Attenuation per 100 ft |
|---|---|
| 100. | 2.90 |
| 200. | 4.20 |
| 300. | 5.50 |
| 400. | 6.70 |

**APTITUDE RATING No. 8241**

| Frequency (Mc) | Attenuation per 100 ft |
|---|---|
| 100. | 3.75 |
| 200. | 5.60 |
| 300. | 7.10 |
| 400. | 8.30 |

**APTITUDE RATING No. 8240**

| Frequency (Mc) | Attenuation per 100 ft |
|---|---|
| 100. | 4.10 |
| 200. | 6.20 |
| 300. | 8.00 |
| 400. | 9.50 |


**Belden Radio WIRE**

**The *Aptitude-Tested* LINE**

# TV Means Jobs—*Good Paying Jobs*—for Technically Trained Men

★ ENGINEERS

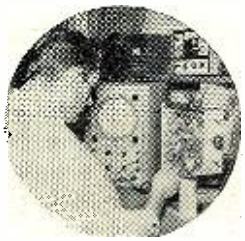
★ OPERATORS

★ CAMERAMEN

★ TECHNICIANS

★ INSTALLERS

## Here's How CREI Home Study Training Prepares You for a Better Job in TELEVISION



★ SERVICEMEN

WHAT YOU DO to keep yourself abreast of new developments is what counts toward advancement in television. Obviously, everyone cannot qualify. *Those who do are well rewarded.* The television industry offers almost unlimited opportunity to trained engineers and technicians. CREI training helps all levels, from novice to experienced engineer, because its specialized individual instruction brings out the best in a man and takes him as far as his own aptitude and effort will let him go.

CREI is an accredited technical institute founded in 1927. Its home study graduates fill important jobs throughout the radio, television and electronics industries. Leading industrial firms—RCA Victor, Pan American Airways, United Air Lines, to name only a few—have used or are now using CREI group training programs. Industry welcomes CREI grads—CREI training is recognized as a respected reference.

Make your own opportunity in television! Add CREI technical training to your present experience—start either at the beginning or at an advanced stage. Get yourself a better TV job—make more money—enjoy increased security. The next two years can be the most important of your lifetime. Write today for complete information. The cost is popular, the terms easy.

**NOTE TO MEN WHO EXPECT TO BE IN UNIFORM SOON:**

TV-Electronics training is excellent background for vitally important radar, communications and navigation work in the Armed Services. If you expect to enter service, prepare now to qualify for a higher rating in interesting technical work via CREI home study.

**THE THREE BASIC CREI COURSES:**

★ **PRACTICAL RADIO ENGINEERING**
*Fundamental course in all phases of radio-electronics*

★ **PRACTICAL TELEVISION ENGINEERING**
*Specialized training for professional radiomen*

★ **TELEVISION AND FM SERVICING**
*Streamlined course for men in "top-third" of field*

**ALSO AVAILABLE AS RESIDENCE SCHOOL COURSES**

**CAPITOL RADIO ENGINEERING INSTITUTE**

*An Accredited Technical Institute Founded in 1927*

Dept. 119C, 16th & Park Rd., N. W., Washington 10, D. C.
Branch Office: San Francisco (2) 760 Market St.

**MAIL COUPON FOR FREE BOOKLET**

**CAPITOL RADIO ENGINEERING INSTITUTE**
**Dept. 119C, 16th & Park Road, N. W., Washington 10, D. C.**

*Gentlemen:* Send booklet, "Your Future in the New World of Electronics," together with details of your home study training, CREI self-improvement program and outline of course. I am attaching a brief resume of my experience, education and present position.

**Check the Field of Greatest Interest:**
☐ Practical Television Engineering.
☐ Practical Radio Engineering.
☐ TV, FM & Advanced AM Servicing.
☐ Aeronautical Radio Engineering.
☐ Broadcast Radio Engineering. (AM, FM, TV).

NAME _____ AGE _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

If Residence School in Wash., D.C. Preferred, Check Here ☐


# You Can't Miss

## with these

# TV PROFIT MAKERS

**The perfect Rotator-Booster combination!**

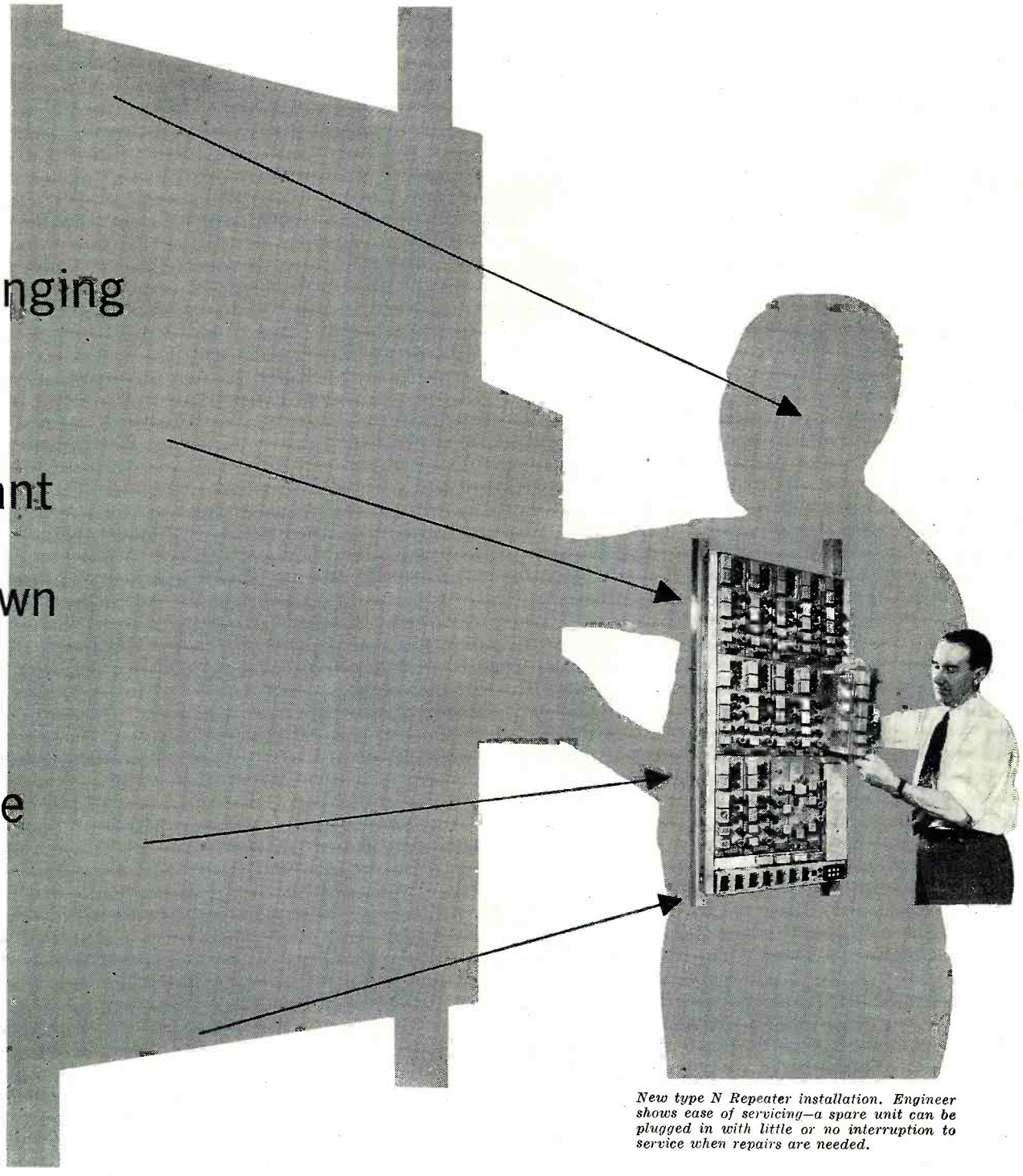

**ALLIANCE TENNA-ROTOR** is in a class by itself! No other TV accessory sold to the consumer can equal Tenna-Rotor in volume of sales, public acceptance or in proved performance in the field! More than 600,000 are in use! The new deluxe Model HIR (illustrated above) is fully automatic.

**ALLIANCE TENNA-SCOPE** is a Booster with one simple control. Gives maximum, uniform high gain on all channels—is instantly installed and makes an ideal companion item to Tenna-Rotor. Incidentally, Tenna-Scope, like Tenna-Rotor, is a favorite everywhere!

**NATIONAL TELEVISION AND NEWSPAPER ADVERTISING PRE-SELLS!** For more than two years, Tenna-Rotor has been backed by a powerful, continuous TV campaign in every major TV area. Hundreds of thousands of future customers see the eye-compelling Alliance TV spots right in their own homes. That's why Tenna-Rotor and Tenna-Scope offer an unbeatable team of profit makers. Preference for them is already established.

**ALLIANC MANUFACTU ING COMPANY · Alliance, Ohio**

# bringing a giant down to size



*New type N Repeater installation. Engineer shows ease of servicing—a spare unit can be plugged in with little or no interruption to service when repairs are needed.*

"CARRIER SYSTEM" telephony is economical, because many voices use the same pair of wires. But the extra equipment needed formerly limited it to the longer distances.

Now Bell Laboratories have developed new short-haul carrier, economical down to 25 miles, sending 12 conversations on two pairs of wires in a cable.

Keys to the new system are new circuits, miniature tubes, pocket-size wave filters and Permalloy "wedding ring" transformer cores that will barely slip over a man's finger. New manufacturing processes were developed in co-operation with the Western Electric Company. Components are pressed into a plastic mounting strip with heat, a score at a time, instead of being mounted separately.

With this new carrier system more service can be provided without laying more cables. Tons of copper and lead can be conserved for other uses. It's another example of how science takes a practical turn at Bell Telephone Laboratories, to improve service and to keep its cost down.

**BELL TELEPHONE LABORATORIES**

WORKING CONTINUALLY TO KEEP YOUR TELEPHONE SERVICE ONE OF TODAY'S GREATEST VALUES

# 2-YEAR ALL-WEATHER TESTS

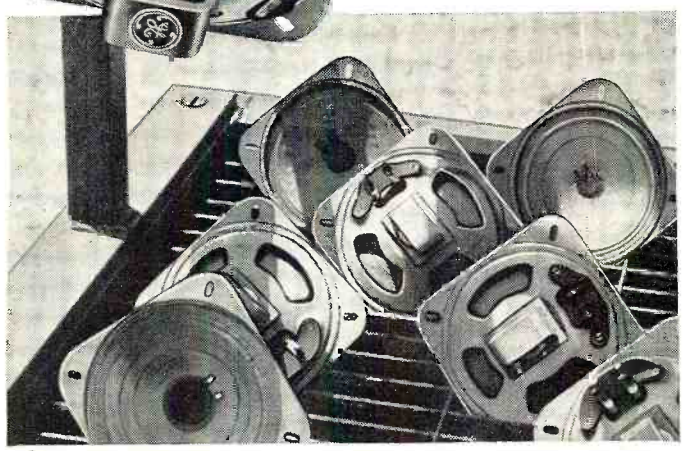
## Show G-E Speakers Unsurpassed for Long-Life!

Twenty-seven sizes to choose from . . . and they're all G-E!

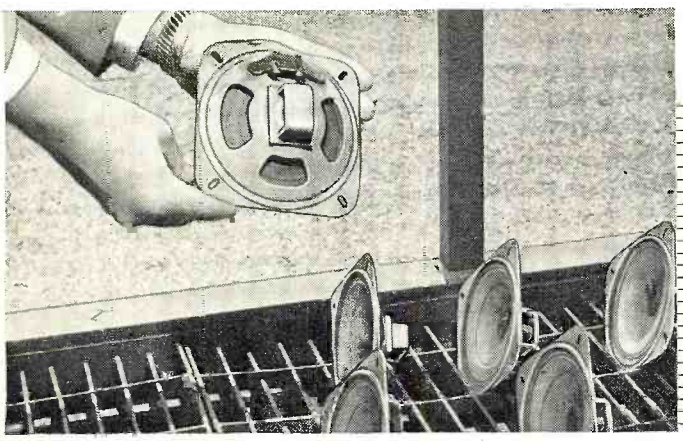
★After two years exposure to hot sun, rain, sleet and snow — with no shelter whatever in any season — 7 out of 8 General Electric speakers played well enough to perform in your radio set!

**These recent tests** at Electronics Park subjected the speakers to many times the abuse they would receive under years of actual playing conditions, indoors or out. It boils down to one more dramatic proof of this fact: *You can depend on General Electric quality — in design, in engineering, in construction.*

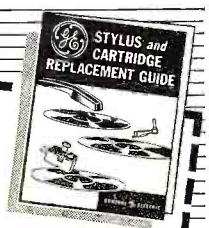
**Your customers** are entitled to this quality. How are your stocks of General Electric speakers?



▲ **Unretouched photo** shows only slight tarnish on speakers. Special G-E plating gives excellent protection to steel frames, none of which were corroded after grueling tests.



◀ **Racked on exposure tray,** speakers were checked at intervals for 2 years, then taken apart and examined for wear. Outdoor-type cones were warped only slightly, G-E aluminum voice coils were like new.




General Electric Co., Section 991
Electronics Park, Syracuse, N. Y.

Yes — send me latest speaker information plus new booklet on G-E Styli and Cartridges.

NAME_____

ADDRESS_____

CITY_____ STATE_____

*You can put your confidence in —*

# GENERAL ELECTRIC

# To Serv cemen
# Who want to protect their future in Television Servicing

MEN who are interested in continuing their careers as TV service technicians and desire to increase their earnings, will find the information in this page calls for serious thought—and for action.

Your future, the future of your business in television servicing depends on what you do about it.

### LICENSING OF SERVICEMEN IS A GOOD REASON WHY YOU SHOULD ACQUIRE TECHNICAL KNOWLEDGE NOW

In New York City, it is proposed that licenses and permits be required of TV contractors, subcontractors, service shops, technicians and apprentices. Once licensing becomes law in New York City this requirement is sure to spread to other municipalities. Licensing and permits mean passing a technical examination. Stiff penalties are cited in the licensing bill upon conviction of a violation. The required technical knowledge can easily and quickly be learned through study of the RCA Institutes Course in Television Servicing. One of the advantages of the RCA Institutes Course, to you as a working serviceman, is that you can study this course at home, in your spare time, and still keep working on your regular job. Now is the time to prepare for license examinations and protect your future in TV servicing.

### TELEVISION SERVICING IS SPREADING TO NON-TV AREAS

The Federal Communications Commission recently announced plans for setting up 1,807 new TV broadcasting stations, most of them in the new UHF channels. This will open up areas that have never been touched by television. Radio servicemen in those locales should take a lesson from servicemen in areas now served by television. In these areas, TV servicing has substantially replaced radio servicing as a means of income. Practical experience in radio servicing is not the important qualification for a successful and profitable career in TV servicing. Practical radio experience *plus* the technical training of the RCA Institutes Home Study Course in Television Servicing, will put you on the right track to be successful in TV servicing.

### PRACTICAL, PRE-TESTED DATA MAKES TV SERVICING EASY

The RCA Institutes Home Study Course in Television Servicing is a "down-to-earth" course in the underlying principles of television. It is printed and illustrated in easy-to-understand, non-mathematical language. You learn pre-tested "How-to-do-it" techniques interwoven with "How-it-works" information. The course is based on the actual experience of the RCA Service Company in servicing thousands of home television receivers. You learn the "short-cuts" in TV trouble-shooting that enable you to do a good job in less time, saving you many hours of on-the-job labor. *This up-to-the-minute course contains material on the latest developments in color TV and UHF.*

### APPROVED BY LEADING SERVICEMEN'S ASSOCIATIONS

Such well-known associations as—National Appliance & Radio Dealers Association; Television Contractors Association; National Alliance of Television & Electronic Service Associations—are already using the RCA Institutes course for upgrading the standing of their members. *Tell the Secretary of your local or State association to write us for low rates for group enrollment.*

RCA Institutes conducts a resident school in New York City offering day and evening courses in Radio and TV Servicing, Radio Code and Radio Operating, Radio Broadcasting, Advanced Technology. *Write for free catalog on resident courses.*

## Send for FREE BOOKLET

Mail the coupon—today. Get complete information on the RCA INSTITUTES Home Study Course in Television Servicing. Booklet gives you a general outline of the course by units. See how this practical home study course trains you quickly, easily. Mail coupon in envelope or paste on postal card.


## MAIL COUPON NOW!

RCA INSTITUTES, INC.
Home Study Department, RN-951
350 West Fourth Street, New York 14, N.Y.

Without obligation on my part, please send me copy of booklet "RCA INSTITUTES Home Study Course in TELEVISION SERVICING." (No salesman will call.)

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(Please Print)

Address_____

City _____ Zone_____ State_____

**RCA INSTITUTES, INC.**
*A SERVICE OF RADIO CORPORATION of AMERICA*
*350 WEST FOURTH STREET, NEW YORK 14, N.Y.*

*Sensationally NEW for 1952!*

# MIDWEST TELEVISION

**A Magnificent New Line of Beautiful CONSOLES and Complete CHASSIS featuring the Mammoth**

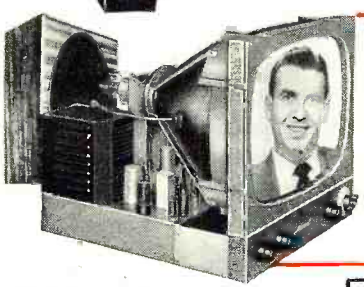
## 20-Inch RECTANGULAR PICTURE TUBE

**FACTORY-TO-YOU**

THE New 1952 MIDWEST **"VIDEO GRAND"**

**20-Inch TELEVISION-RADIO-PHONO CONSOLE**

In addition to its mammoth 20-Inch Rectangular Picture, this luxurious instrument offers a powerful, long-distance AM-FM Radio *plus* the newest-type 3-Speed Automatic Intermix Record-Changing Phonograph.

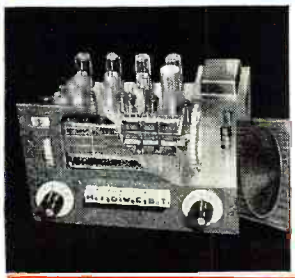


**MIDWEST 20-Inch TELEVISION CHASSIS and SPEAKER**
—for easy installation in your own cabinet.

**30 DAYS TRIAL**

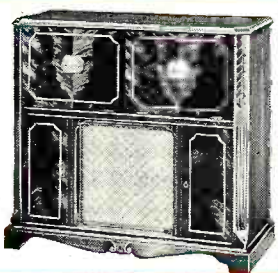
New 1952 MIDWEST **"CONSTELLATION"** 20-Inch TELEVISION CONSOLE

**Also—Powerful New 1952 World-Ranging MIDWEST Series of RADIOS**
For Beautiful Consoles and Complete Chassis



An entirely new line of radios featuring the powerful Series 16 five wave band AM-FM Radio Chassis and the magnificent Symphony Grand Radio-Phonograph with 3-Speed Automatic Intermix Record Player.

*Easy Terms*



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DEPT. 372, 909 BROADWAY, CINCINNATI 2, OHIO

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For This *NEW* 1952
**FREE** MIDWEST TELEVISION RADIO CATALOG


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Dept. 372, 909 BROADWAY • CINCINNATI 2, OHIO

Please send me your new FREE 1952 Catalog.

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ADDRESS_____

CITY_____ ZONE____ STATE_____

# EICO TEST INSTRUMENTS guard CBS-Columbia Inc. COLOR TELEVISION PRODUCTION QUALITY

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

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

## KITS WIRED INSTRUMENTS

**NEW** 555K MULTIMETER KIT $29.95. WIRED $34.95
20,000 ohms/volt

320K SIG. GEN. KIT $19.95. WIRED $29.95

**NEW** 322K SIG. GEN. KIT $23.95. WIRED $34.95

**NEW** 950K R-C BRIDGE & R-C-L COMP. KIT $19.95 WIRED $29.95

**NEW** 1040K BATTERY ELIM. KIT $25.95. WIRED $34.95

511K VOM KIT $14.95 WIRED $17.95

**NEW** 526K MULTI-METER KIT $13.90 WIRED $16.90 1000 ohms/volt

**NEW** 1171K RES. DECADE BOX KIT $19.95 WIRED $24.95

145K SIG. TRACER KIT $19.95 WIRED $28.95

**NEW** 315K DELUXE SIG. GEN. KIT $39.95 WIRED $59.95

**NEW** 625K TUBE TESTER KIT $34.95 WIRED $49.95

360K SWEEP GEN. KIT $34.95 WIRED $49.95

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EICO
ELECTRONIC INSTRUMENT CO., Inc.
276 NEWPORT STREET, BROOKLYN 12, NEW YORK

# DO YOU WANT *MORE* BUSINESS?

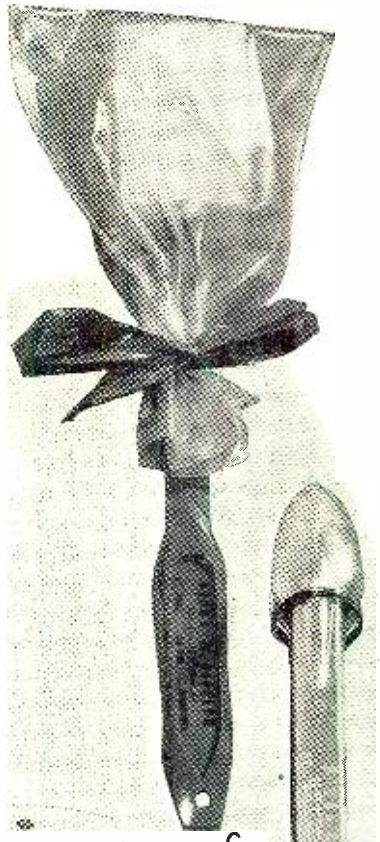
**By**
**H. E. KRANHOLD**
Brown & Bigelow

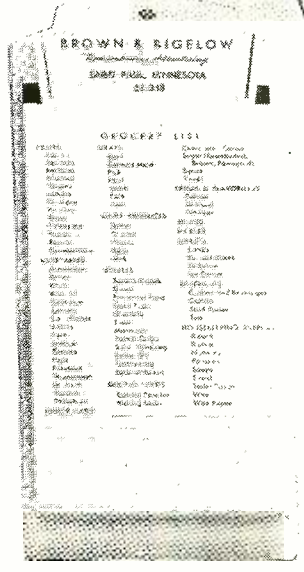
***There are thousands of advertising novelties available. Whether your business is large or small, there are items priced to meet your budget. These novelties, either for Christmas or as a birthday remembrance, are ideal good-will builders. They can mean more business for you. Include your company's name, phone number, and address on each item for maximum results. If you use a slogan, choose one which identifies your business and one that can be easily remembered by all of your customers.***

REGARDLESS of the size of your business, you have three basic advertising jobs which must be accomplished to keep the profit side of the ledger healthy. This basic trio is particularly important in these days of higher taxes, shortages in some lines, and generally higher prices.

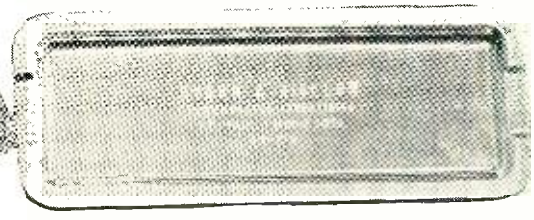
Check your present advertising policies against these fundamental tenets:

1. You must build name identity. You are interested in only those who can use your products or service within your own market.
2. You must hold good customers. These are the ones you will look to for business next year and they are your competitors' best prospects.
3. You must continuously invite more business. You must invite this business from your old customers who are actually your firm's life-blood and you must invite business from new customers to insure your continued growth.

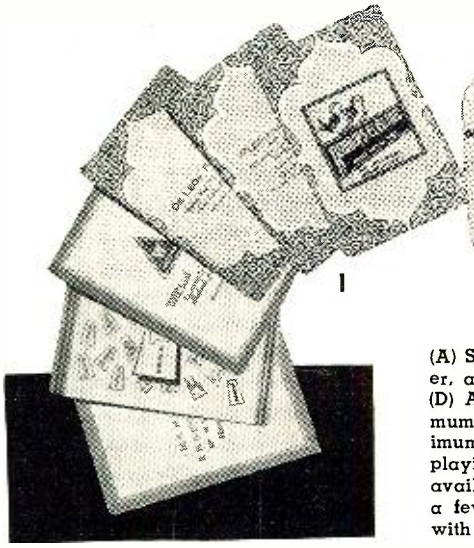












(A) Sport clip "Redipoint" pencil, minimum quantity 50. (B) Mixing spoon, bottle opener, and lid lifter, minimum quantity 100. (C) Speedy sponge, minimum quantity 100. (D) Aluminum "Handitongs," minimum quantity 100. (E) Plastic "Rediclip" pad, minimum quantity 100. (F) Padlock key chain, minimum quantity 100. (G) Spoon tray, minimum quantity 100. (H) Time reminder key chain, minimum quantity 100. (I) Imprinted playing cards, minimum quantity 250. All of the items shown on this page are available from Brown & Bigelow, St. Paul, Minnesota. Obviously, these are only a few of the many hundreds of merchandising items available. For prices check with the nearest Brown & Bigelow representative or write direct to the company.


**The above items are merchandised by Esquire, Inc., of 65 East South Water Street, Chicago, Illinois. Again, these are only a few of the many advertising novelties in their line. The playing cards, available in either pinochle or bridge deck, cost $1.20 per pack imprinted with your name, address, and phone number in minimum lots of 36. The "Esky" pads are available as memo type pads as shown or as canasta, bridge, or gin rummy scoring pads. Minimum quantity is 150 and prices range from 4 to 9 cents per pad, including your personal imprinting.**

Dealers, technicians, jobbers, and distributors vary in size and location, but they have the same problems in building name identity.

The basis of all advertising is a sign telling who you are, where you are, and what you have to sell. It is not enough to place your sign on your building, stationery, and trucks. To build name identity, you must project your sign in such ways as to place it before as many logical prospects and customers as you can at a reasonable cost.

In the advertising specialty field, we usually think of advertising space in terms of space in a man's pocket, on his office walls, on his desk, or in his home. One other highly important advertising space is available to the business firm that wants to reach prospects and customers in a most effective way—advertising playing cards.

A recent independent survey conducted by a large marketing service for *Brown & Bigelow* revealed these facts about card playing:

1. Two out of three families said they played cards regularly.

2. Ninety-five and five-tenths per-cent (95.5%) of all card-playing families said they would be glad to accept and use advertising playing cards.

3. Sixty-five per-cent (65%) of the housewives interviewed recalled correctly the name of the advertiser on their playing cards when asked at the door.

4. Seventy-three and five-tenths per-cent (73.5%), or three out of every four families, said they would like to receive playing cards as a premium.

5. Three out of four families said they would like to do business with a firm that used playing cards as a premium.

Advertising specialties range from calendar cards costing less than a postage stamp to the more expensive items for office, home, and travel, running into as high as the $100 per item bracket. Advertising playing cards, carrying the essentials of a business sign on the back of each card in the pack, telling who you are, where you are, and what you have to sell, can be purchased in reasonable quantities at something less than $1.00 per pack.

Playing cards go into the quiet of a home where there is no competition for attention, when family and friends gather for sessions of their favorite card games. There each pack, actually consisting of 52 or more colorful miniature billboards, claims the attention of your customers and their friends for periods of time ranging from two to three hours, or even more on each of many occasions.

During these intimate family and friends sessions, your sign becomes the center of attention for hours at a time, it invites conversation about your firm and your products and services. Recommendations follow, and new customers are created for you.

In the advertising specialty field, we frequently hear the expression: "We don't give away gadgets." The use of the term, "give away," merits analysis. By presenting a key chain carrying your sign, for example, you are actually helping yourself to space in the pocket of a good customer or prospect—space which would not be for sale under any circumstances.

Many radio and television dealers have found that well-chosen gifts can be a real boon to their businesses.

One Philadelphia technician makes it easy for his top commercial accounts to get in touch with him by sending them a deluxe, automatic telephone index. The user simply presses one of the alphabetically arranged keys and the index opens to the corresponding listing of frequently called phone numbers. Heading the listing on its proper page is the name and phone number of the television service company. Because of the deluxe appearance of this item and because of its utility, this type of gift is a welcome one which always commands desk space.

A Pawtucket, Rhode Island radio and television dealer doesn't let his customers and prospects forget who he is and where he is located. He presents each buyer and good prospect with a unique padlock key chain which carries his name, address, and telephone number.

A manufacturer of television parts was faced with the problem of acquainting his customers with his new address and phone number in New York. He solved the problem by sending attractive and useful bronze letter openers to all his accounts. His name and new address and phone number were stamped on the handle of the letter opener. For some of his top accounts, he used an attractive ash tray with his new location and phone number stamped on the plate of the ash tray.

In Dalton, Illinois, a television sales and service dealer purchased an attractive and useful plastic pad designed to hold a pad of paper for notes. This clever and useful pad will be distributed during the holidays as a "thank you" to his good customers. The top of the clip holding the pad carries his name, address, and phone number for the convenience of his customers in calling for television and radio service work.

It has been demonstrated repeatedly that a handy kitchen item, offered through a post card or an advertisement in a magazine or local newspaper, can pull people into an appliance store. After it has increased store traffic, the specialty goes on indefinitely doing a job of building preference by keeping the store's name and sales story constantly before the housewife.

Consider calendars. When you distribute calendars reproducing exclusive pictures by famous artists, you are utilizing a medium which will hang for a minimum of twelve months on the office or home wall of a good customer or prospect. Are you giving something away or are you helping yourself to valuable advertising space?

As long as one day follows another, clocks will mark the minutes and hours—calendars the days and months.

This is the utility side of the chart on the wall of the kitchen, office, or store. In addition to its utilitarian

function, calendars can provide many extras which are appreciated by your customers. Memo space, recipes, religious and geographical information can be carried, along with your advertising message.

A national survey by this company showed that 93 percent of all homes have calendars and that the urge for calendars is so strong that nearly half (47.4 per-cent) of the housewives made a trip to some business establishment to obtain a calendar. The survey also showed that while the average home has two calendars, the housewives interviewed indicated that if they had additional calendars they would use them.

Many people want and appreciate a pocket calendar with loose-leaf pages. This type of gift is available in several sizes with specialized information for use in city and farm homes. These calendars feature pockets for receipts, grocery slips, milk tickets, etc.; a handy pencil for quick notations; menu suggestions; and practical recipes, while the loose-leaf feature permits the recipes and notes to be saved for future reference.

Wall-type calendars are available with a wide variety of illustrations. Some of the country's top-flight artists supply original paintings which are reproduced on these calendars. Thus in selecting the calendar to carry your advertising message into that home, or office, or store, you are also providing a fine reproduction of a good painting by a well-known artist. Is it any wonder, then, that calendars make such acceptable remembrances for your customers?

Fine leather pieces for pocket or desk, metal or plastic lighters, writing instruments, telephone indexes and similar items can be tangible evidence of appreciation for business from good customers. Used properly, they can be a form of good customer insurance, certainly not a "give away."

An intelligent direct mail series depends for its pull on the interest it creates and the utility it gives. Information on direct mail can be helpful as well as interesting. A blotter can have even more utility if it creates interest through a pleasing picture or a set of pertinent facts.

While the holidays are the commonly accepted time of the year for saying "Thank you, come again" to good customers as well as for inviting potential customers, there now are a number of ingenious plans for distributing remembrances throughout the year.

One of the finest examples of something different is the Birthday Plan. Under this plan, the birthdates of your good customers are obtained in an unobtrusive way. On his birthday, your customer or top prospect receives a fine remembrance like a billfold, lighter, fine etching, or beautiful two-pack set of playing cards.

An important consideration in the selection of the birthday remembrance is this: most businessmen prefer something they can take home and share with their family and friends.

One of the finest ways to insure repeat business is through the use of the playing card premium plan. The plan is simple. A purchase or an order for a fixed amount earns a coupon. An accumulation of coupons over a comparatively short time earns a deck of playing cards. These bear the advertiser's name, location, and identification of product or service.

Under this plan, the continuity of purchases is encouraged, and frequency of purchases is stepped up. Surveys show that the universal appeal of "something for nothing" brings people far out of their way to patronize the firm issuing playing card coupons.

Orders for advertising specialties should be planned months ahead. Advertising specialty manufacturers must prepare their merchandise in large quantities well in advance of the receipt of individual orders. This gives the specialty buyer the advantage of large quantity prices even though he buys in limited quantities.

The specialty buyer has the further advantage of utilizing the big names in the field of illustration and sports, like Norman Rockwell, Richard E. Bishop, Christy Walsh, and many others. All that remains to be done after his order is received, is the imprinting or stamping of his own sign and advertisement.


**Another novel advertising medium, and one that is bound to cause comment, is the "personalized" cigarette pack carrying your ad, your name, your slogan or sales message on the front and the back, and your name, initials, or slogan on each cigarette. Emblems, trademarks, or special artwork can be carried in addition to your printed message. The minimum quantity is 10 cartons (100 packs). Prices vary with quantity ordered. For 250 packs the cost is 29 cents per pack plus the applicable state tax. Your Name Cigarettes, 125 W. Hubbard, Chicago 10.**

Although we have attempted to suggest and illustrate a representative group of advertising novelties, the reader should not infer that this list in any way exhausts the possibilities. There are literally thousands of different types of items that can be used to carry your advertising message to your customers.

Metal ashtrays, always a popular item, have been purposely omitted from this article because as the magazine goes to press many companies have been forced to withdraw these units because of the metal shortage. Keep checking with your supplier as the situation may ease by Christmas.

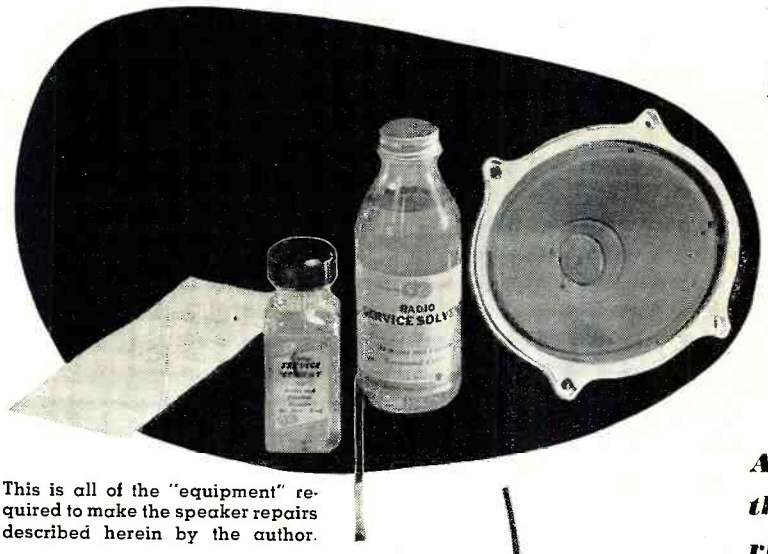
One basic point to remember, no matter what type of gift you select for your customers, is that to be effective and to provide the desired result, every item should carry your message clearly and forcefully. "Remembrance Advertising" is only effective if you constantly remind the recipient of the donor, his product, and his place of business. -30-

**Matchbooks can carry your advertising message far and wide. They can be used the year around or as Christmas greetings. An almost infinite variety of designs is available and range from special "Window-Paks" carrying six books in a specially designed carton to the individual match folder in various sizes. The folders shown are merely representative of the different ways matchbooks can be used to carry your advertising message. Matches with your name or initials can serve as a reminder to your customer even if they do not carry advertising. Such matchbooks are obtainable throughout the country. The assortment shown here is from the Diamond Match Company, N. Y.**

# REPAIR THAT SPEAKER

By
**W. E. LaFARRA**

***A bottle of cement and thinner is all that is required for repairing that rubbing voice coil. It is easy to fix!***




This is all of the "equipment" required to make the speaker repairs described herein by the author.

IN THESE DAYS of shortages, technicians are finding it necessary to repair many units that heretofore have been replaced. Speakers, long a "bugaboo", can be repaired with a little effort and ingenuity and while the speaker market may be good, the ability to repair speakers in special mounts is always desirable.

The ability to make such repairs is not, however, something that can be learned overnight but with practice many of them can be repaired. Taking into consideration the fact that the speaker would have to be replaced anyway, a successful repair job turns into quite a profitable venture.

The real secret of such repairs is in the cement used Such cement is purchased in a very thick state and when dry, will give a very stiff, white colored finish. By diluting this mixture with cement thinner to an almost watery consistency, good results can be obtained. This point can be determined by allowing some of the mixture to dry on an old cone. It should dry clear; if it turns white, it is too thick.

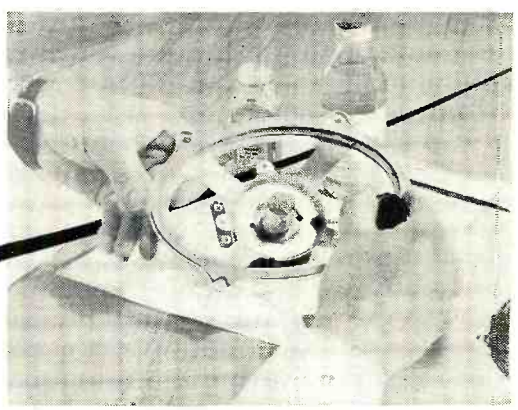
After mixing your cement, remove the speaker from the cabinet or chassis and place it on a perfectly clean workbench. Disconnect the voice coil leads and, using a small brush, saturate the area around the glued portion of the spider with thinner. If this area is not readily accessible, pour your thinner down around the spider, taking care not to allow the thinner to run over the area where the cone and spider are glued together. While this thinner is dissolving the glue, take a sharp single edged razor blade and by using the cushion as a brace, cut completely around the outside edge of the cone. This is done simply because it is virtually impossible to un-cement the cone without tearing it, although, if torn, the cone may be replaced.

Thinner poured carefully around the cone facilitates removal of the cone. To control the amount of thinner, pour from the cap.

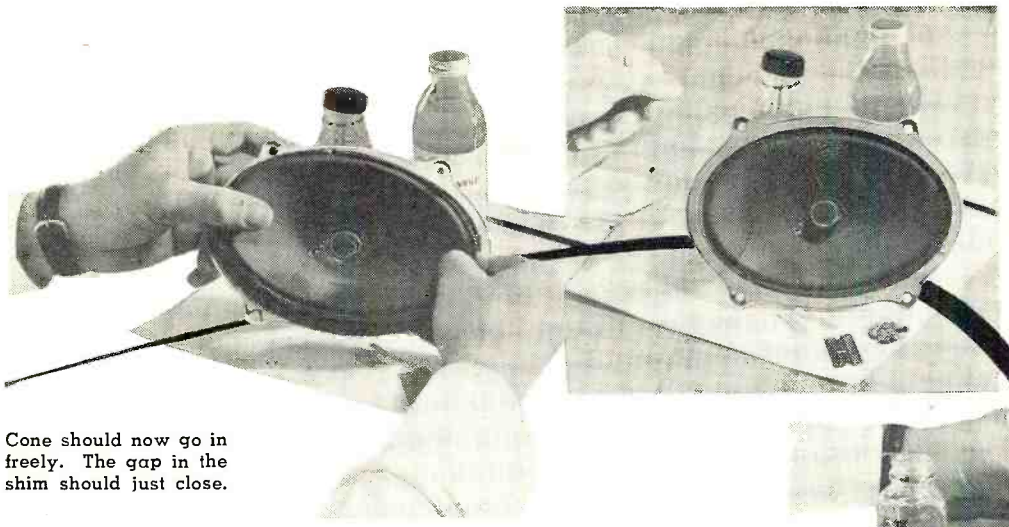
Cut around the cone with a razor blade to save time and to avoid the possibility of damaging the cone. Although this is not a professional method, it is one way in which the same cone can be used, thus eliminating the problems involved in obtaining a replacement. When the cone is replaced, the cement will hold the cone securely to the cardboard ring. Should the cone be badly torn a replacement is obviously necessary

Minor repairs can be made at this stage. A drop of cement is often all that is needed.

Replacing the shim is a simple process. A piece of ordinary paper will do nicely.



Cement is next applied to the area where spider hits. Note the gap left in shim.

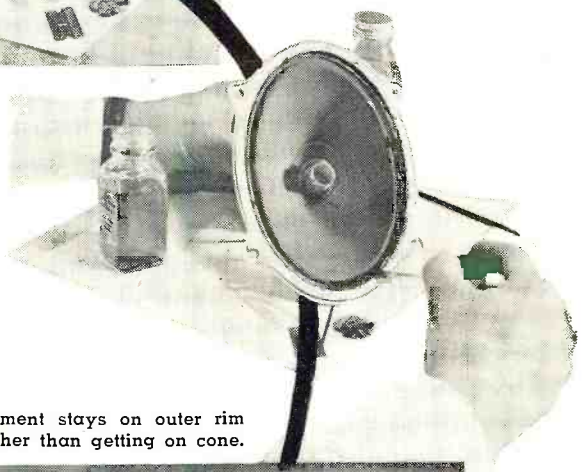


Cone should now go in freely. The gap in the shim should just close.

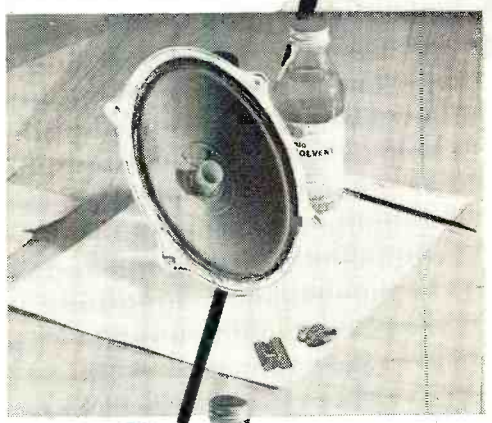
The cone should fit in its original position if job is done right.

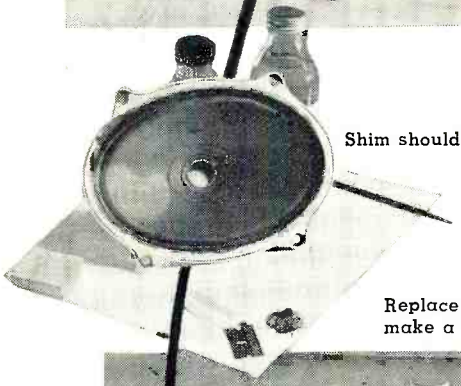
★

Rotating speaker on its rim facilitates cementing the outer rim.



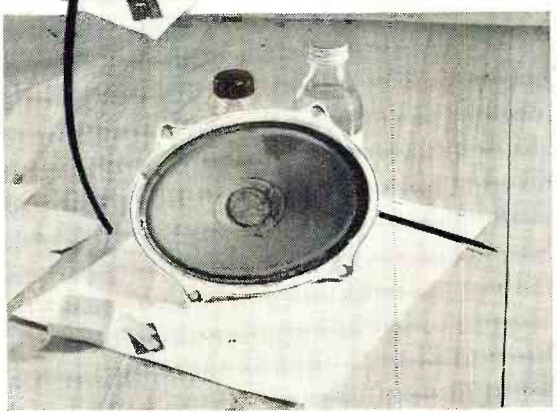
Cement stays on outer rim rather than getting on cone.





Shim should now be removed.

Replace the dust cover and make a test run on speaker.



By now the spider should be loose or ready for a second coat of thinner. Ease up on the cone, taking care not to bend or tear it. If the spider is still stuck, a screwdriver can be of help in easing it away from the frame. Cleaning out around the cone offers a problem since many shops do not have a high pressure air supply. In such case, simply take the unit to a service station and blow it out thoroughly with an air hose. A few filings can be fished out by using a brass shim but if care is taken and a clean spot to work is selected, the chances of picking up filings is slim.

If the paper voice coil form is warped, easing a cork in the paper form will straighten it and by applying a thin coat of glue, it can usually be kept straight.

The dust cover will usually tear off and should be saved as a replacement. Do not try to remove with thinner since this will soften the cone and give trouble. Small rattles can be repaired while the cone is out, these probably originate with tears in the cone, as a result of the spider being loose from the cone, or perhaps the paper form loose from the voice coil wire form. These points should be touched up with a small dab of cement. The latter trouble gives a high-volume rattle that is hard to locate and the paper, if loose, should be pulled away from the wire enough to permit some cement to run down and make good contact between paper and wire. Don't, however, over-do your cementing.

The best shims available can be made from ordinary paper, such as the page you are reading. A small rectangular piece should be cut so that when it is formed into a circle, will just about make a complete loop around pole piece. Put a thick layer of cement around the circle where the spider will hit. When pushing the voice coil over the paper shim around the pole piece, take care that it doesn't buckle. Ease the cone down to its original position, taking care not to force it. The cone should fit exactly where it was originally. Tilting the speaker up on its rim is an aid in cementing the outer edge of the cone. Be careful not to get cement out too far on the corrugated section, but stay close to the edge. Turning the speaker to keep the area being worked on down will keep the cement from running out and on to the cone. After drying, remove the paper shim and hook the unit up. If properly done, the speaker will sound as good as new. If you fail, you can always replace the speaker, something that most technicians would have done anyway.

I have repaired several hundred speakers that would have normally been replaced, once completing five out of six successfully, a feat I consider a pretty fair record. The larger the speaker, the better your chance of repairing it. As a suggestion, you might make a start on six and seven inch models and then proceed to the four and five inch jobs. If you tear them up, just remember that you would have had to replace them anyway!

If the repair job comes off successfully, you have saved one more hard-to-get-speaker and have made another of your customers very happy.

—30—

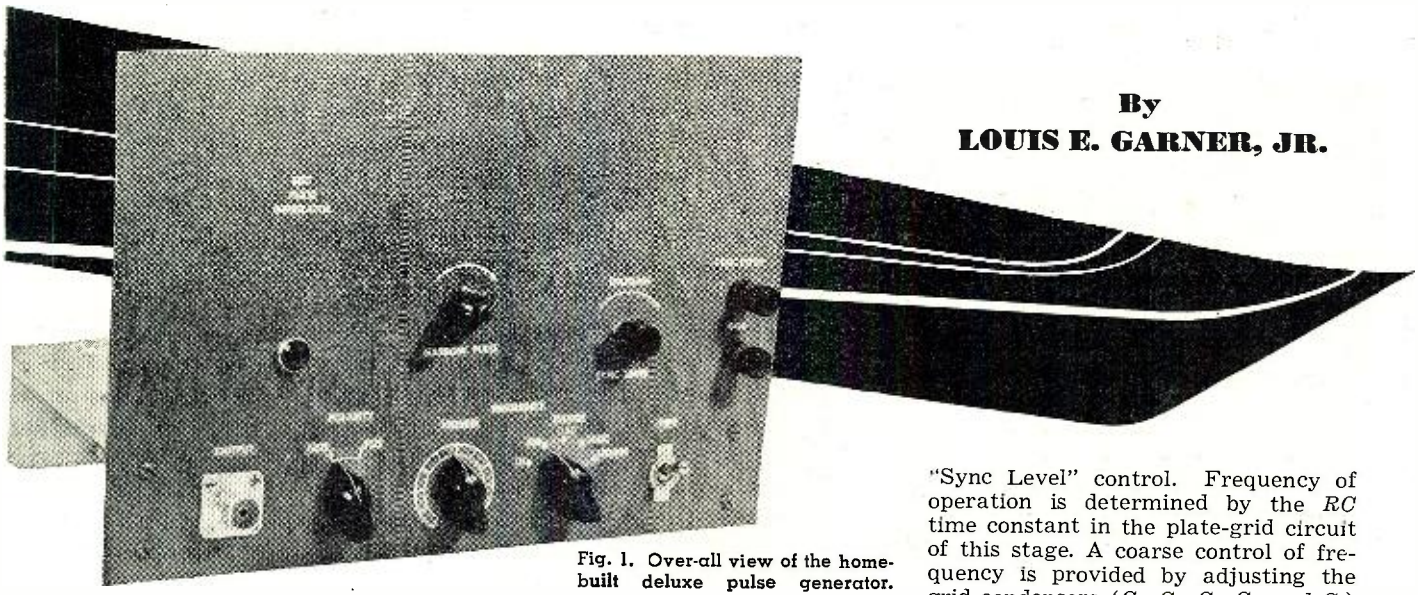


Fig. 1. Over-all view of the home-built deluxe pulse generator.

By
LOUIS E. GARNER, JR.

# A Deluxe PULSE GENERATOR

***Complete construction details on a useful test instrument, including data on delay lines and their use, and basic material on pulse analysis.***

MANY of the basic applications of the pulse generator have been described previously [1, 2], and circuits for a pulse-forming device and an inexpensive pulse generator given. However, as an experimenter works with a pulse generator, he soon finds himself demanding more and more features which contribute to the usefulness of the instrument. Such features include provision for "locking-in" the pulses with an external signal, continuous pulse repetition rate coverage, a pulse width control that will permit maintaining constant pulse width regardless of repetition rate, and an extremely narrow output pulse. An instrument incorporating these features is shown in Figs. 1 and 4, while the complete schematic diagram is given in Fig. 3.

The operation of this pulse generator may best be understood by referring both to the schematic diagram and to the simplified block diagram given in Fig. 2. Signal wave shapes in various parts of the circuit are given in Fig. 2.

A conventional "Potter" cathode-coupled multivibrator is used to supply a fairly broad negative-going pulse signal. This stage ($V_1$) may be "synced" with an external signal fed to its grid from $R_1$, which acts as the "Sync Level" control. Frequency of operation is determined by the *RC* time constant in the plate-grid circuit of this stage. A coarse control of frequency is provided by adjusting the grid condensers ($C_3$, $C_4$, $C_5$, $C_6$, and $C_7$) by means of $S_2$, while exact frequency is determined by changing the grid resistor $R_5$ (*Vernier Frequency Control*). The pulse width of this signal varies with frequency, so the signal is applied through a differentiating circuit consisting of $C_8$ and $R_8$-$R_9$.

Both positive- and negative-going pulses are obtained at the output of the differentiator, with pulse width depending on the time constant of $C_8$ and $R_8$-$R_9$. By adjusting the size of $R_9$, the pulse width can be varied. Thus, $R_9$ acts as the *Pulse Width* control (on the photo, Fig. 1, this is designated *"Narrow Pulse"*).

These pulses are passed through a triode buffer amplifier (½ of $V_2$) and thence through a clipper-amplifier (remaining ½ of $V_2$). The clipper is biased almost to cut-off by means of the large cathode resistor $R_{13}$, and only the positive halves of the applied double pulse cause a change in current flow in the plate circuit. Hence, half of the pulses are "stripped" and only unidirectional pulses appear in the output.

Additional amplification and shaping of the pulses occur in the two stage resistance-coupled amplifier $V_3$, and the pulses are finally applied to the phase splitting circuit $V_4$, where both positive- and negative-going pulses may be obtained in the output. Either may be selected by $S_3$, and passed through d.c. blocking condenser, $C_{17}$, to the output.

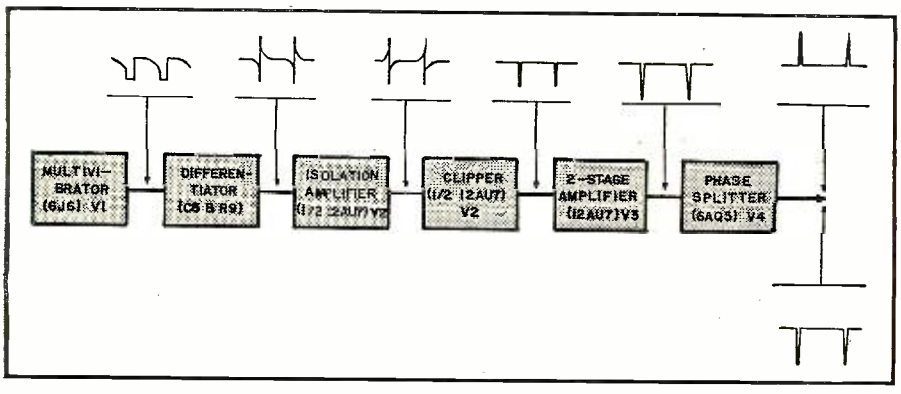
Power to operate the entire device is obtained from a conventional full-wave rectifier and filter type of power supply, which need not be regulated unless desired for maximum stability of operation.

Decoupling filter $R_7$-$C_2$ serves to stabilize the circuit by isolating the oscillator. $R_7$ performs the additional function of limiting the cathode current drawn by $V_1$ thus keeping this tube from operating above its maximum ratings.

An approximate idea of the layout used by the author may be obtained by referring to Fig. 4. Layout is not critical, however, and the builder may use

[1] Garner, Louis E., Jr.; "An Inexpensive Pulse Generator," Radio & Television News, February 1951.
[2] Garner, Louis E., Jr.; "The Pulse-Former," Radio & Television News, August, 1951.

Fig. 2. Simplified block diagram of pulse generator and associated signal wave shapes.



any arrangement that meets his chassis and space requirements as long as normal high frequency precautions are observed.

Wiring is not particularly critical, although certain basic rules should be observed. The input and output of stages should be kept as widely separated as possible. Distributed wiring capacities *must be kept to a minimum* if good pulse waveshape is to be maintained. Long signal leads should not be run, not only because of the increased capacity to ground, but also because lead inductance may lead to "ringing" with its resultant distortion of the output signal.

Provision has been made for a voltage regulated power supply, if such is desired to insure maximum stability of operation. Either two type 0A2 tubes, or two type VR-150's may be used for $V_6$ and $V_7$. In any case, $R_{24}$ should be chosen experimentally so that no more than 30 ma. flows through the voltage regulator tubes with the power transformer used.

The completed instrument may be given a "professional" appearance by using a wrinkle finish on the front panel and applying commercially available decals to mark the various controls and terminals.

### Specifications

The amplitude of the output pulses obtained is about the same, regardless of whether positive- or negative-going pulses are used. However, there is some variation of pulse amplitude with frequency of operation (PPS), with the average being about 8 volts peak.

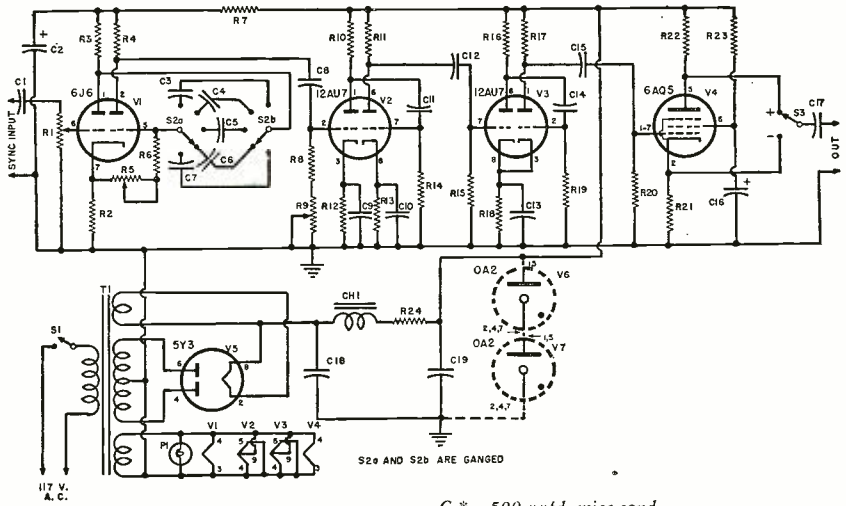
The minimum pulse width at the 70% point is slightly less than 0.2 microsecond, and this may be maintained regardless of pulse repetition rate over the entire range of operation by adjusting the *"Pulse Width"* control. Rise time is about .11 microsecond, while decay time is about .18 microsecond.

Pulse repetition rate depends on the setting of $S_2$ and $R_5$. The approximate ranges of each switch position (minimum and maximum PPS) in pulses-per-second are given in Table 1.

As can be seen from the table, the number of pulses-per-second may be taken from *less than one* to more than *100,000* by adjusting only two controls. There is adequate overlap on each range.

The sharpness of the pulses obtained may be easily seen by referring to Fig. 5A, where a tracing of the 100,000 PPS pulses is given, as observed on a *Tektronix* Model 511AD oscilloscope, using a 50 microsecond sweep. The positive-going pulses are shown here, but the negative-going pulses are almost identical in amplitude and waveshape.

An expanded view of the 100 kc. pulse of Fig. 5A is shown in Fig. 5B, where a 1 microsecond sweep is used (triggered). A .25 microsecond delay is used so the leading edge of the pulse is clearly visible. In Fig. 5B the pulse is shown with maximum pulse width,




$R_1$—50,000 ohm pot ("Sync Level Control")
$R_2$—100 ohm, ½ w. res.
$R_3$—1800 ohm, 1 w. res.
$R_4$, $R_{10}$, $R_{11}$, $R_{16}$, $R_{17}$—1000 ohm, 1 w. res.
$R_5$—2 megohm pot ("Frequency Control")
$R_6$—120,000 ohm, ½ w. res.
$R_7$—22,000 ohm, 1 w. res.
$R_8$—1800 ohm, ½ w. res.
$R_9$—50,000 ohm pot ("Pulse Width Control")
$R_{12}$—200 ohm, ½ w. res.
$R_{13}$—27,000 ohm, 1 w. res.
$R_{14}$, $R_{15}$, $R_{19}$, $R_{20}$—2.2 megohm, ½ w. res.
$R_{18}$—470 ohm, ½ w. res.
$R_{21}$—560 ohm, 1 w. res.
$R_{22}$—820 ohm, 1 w. res.
$R_{23}$—22,000 ohm, 1 w. res.
$R_{24}$—This is an optional part. Size to be determined experimentally to allow no more than 30 ma. to flow through $V_6$ and $V_7$ if voltage regulation is incorporated in instrument.
$C_1$—.01 μfd., 400 v. cond.
$C_2$—40 μfd., 450 v. elec. cond.
$C_3$*—.5 μfd., 400 v. cond.
$C_4$*—.05 μfd., 400 v. cond.
$C_5$*—.005 μfd., 400 v. cond.
$C_6$*—500 μμfd. mica cond.
$C_7$*—50 μμfd. mica cond.
$C_8$—39 μμfd. cond. (Ceramicon)
$C_9$—100 μfd., 25 v. elec. cond.
$C_{10}$—25 μfd., 150 v. elec. cond.
$C_{11}$, $C_{12}$, $C_{14}$, $C_{15}$, $C_{17}$—.1 μfd., 400 v. cond.
$C_{13}$—250 μfd., 25 v. elec. cond.
$C_{16}$—40 μfd., 450 v. elec. cond.
$C_{18}$—20 μfd., 450 v. elec. cond.
$C_{19}$—60 μfd., 450 v. elec. cond.
$S_1$—S.p.s.t. toggle sw. ("Power")
$S_2$—D.p.5-pos. rotary sw. ("Frequency Range") A Mallory 3226J may be used with one position left blank
$S_3$—S.p.d.t. rotary sw. ("Polarity")
$T_1$—Power trans. 325-0-325 v. @ 90 ma.; 6.3 v. @ 3 amps.; 5 v. @ 2 amps.
$CH_1$—Filter choke, 10 hys. @ 90 ma.
$P_1$—6.3 v. pilot lamp
$V_1$—6J6 tube
$V_2$, $V_3$—12AU7 tube
$V_4$—6AQ5 tube
$V_5$—5Y3 tube
$V_6$, $V_7$—0A2 or VR-150 tube (optional, to be used only if regulated supply is desired)

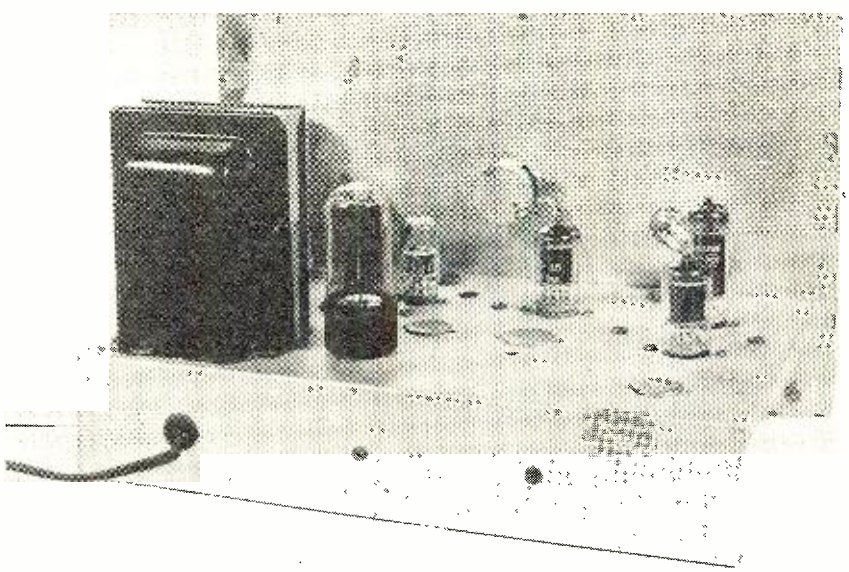
*Frequency determining condensers

Fig. 3. Complete schematic diagram of the deluxe pulse generator built by the author.

| $S_2$ POSITION | CONDENSER | MINIMUM PPS | MAXIMUM PPS |
|---|---|---|---|
| 1 | C3— .5 μfd. | Less than 1 | 20 |
| 2 | C4— .05 μfd. | 10 | 150 |
| 3 | C5—.005 μfd. | 110 | 1600 |
| 4 | C6— 500 μμfd. | 1100 | 16,000 |
| 5 | C7— 50 μμfd. | 11,000 | 140,000 |

Table 1. Approximate ranges of switch positions in pulses-per-second (PPS).

Fig. 4. Rear view of instrument showing recommended layout of component parts.



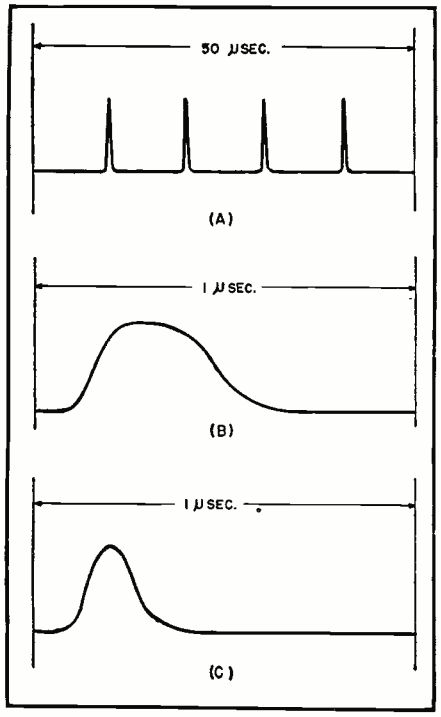


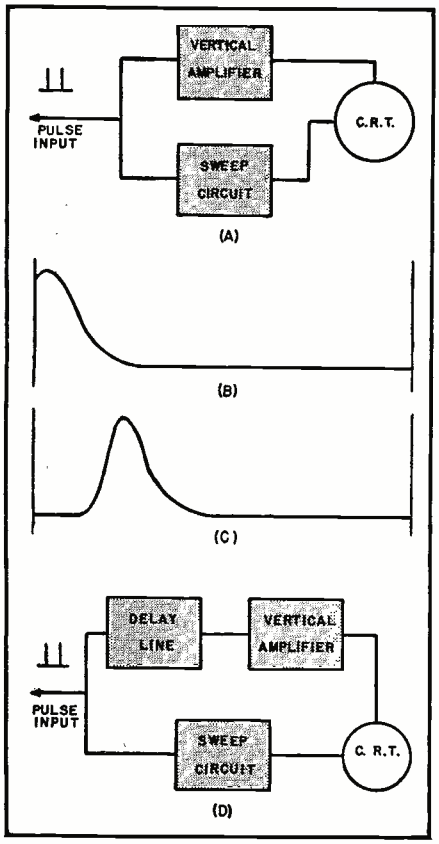

Fig. 5.

while the appearance of the pulse with minimum pulse width (other conditions the same) is given in Fig. 5C.

### Delay Lines

As mentioned previously, a .25 microsecond delay was used to show the leading edges of the pulses shown in Figs. 5B and 5C. The necessity for such a delay can be seen by referring to Fig. 6.

Fig. 6.



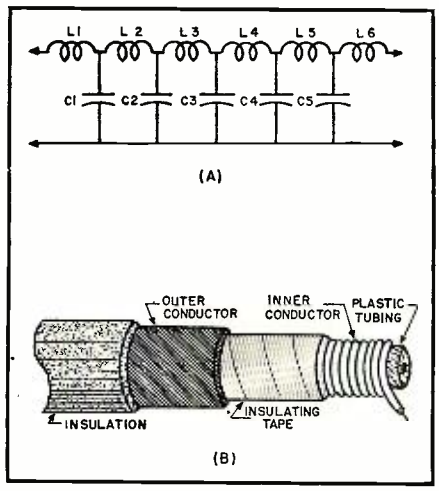




Fig. 7.

A simplified block diagram of an oscilloscope circuit is given in Fig. 6A. When a pulse is applied to the input, as shown, the sweep circuit is "triggered" as the pulse reaches a certain minimum value, and the sweep moves the electron beam across the screen, permitting the pulse passing through the vertical amplifier to be observed on the scope.

If the rise time of the pulse is short, then the leading edge of the pulse may be "lost" and the appearance of the pulse on the screen of the CRO is as shown in Fig. 6B. If it were possible to "delay" the pulse in the vertical amplifier until after the sweep starts, then the entire pulse becomes visible on the screen of the oscilloscope as shown in Fig. 6C.

In practice, this can be accomplished by introducing a "delay line" between the pulse input and the vertical amplifier (or between stages in the vertical amplifier) as shown in Fig. 6D.

The operation of such a "delay line" is comparatively simple. The "delay line" consists of a real or artificial "long" transmission line. The delay introduced in the signal is due to the time of transmission along the "long" line. The longer the line, the greater the delay.

Such lines may consist of "lumped parameters", *i.e.*, inductances and condensers connected to simulate the electrical characteristics of a long line as shown in Fig. 7A, or of "distributed parameters," a long, thin inductance coil wound on a piece of plastic and surrounded by a metallic braid to give capacity, as shown in Fig. 7B. The shielding braid of a commercial "distributed parameter delay line," as shown in Fig. 7B, is generally made up of insulated wire to reduce eddy current losses to a minimum.

Since the delay line is essentially a low-pass filter in form (see Fig. 7A), it may be expected to distort a complex signal waveform. This actually occurs in practice, and a delay line, in addition to introducing a delay in the signal, may also cause a "rounding" of sharp-cornered pulses. Thus, a sharp pulse applied to the input of such a line, as shown in Fig. 8A, may appear as shown in Fig. 8B in the output. This rounding is due to the loss of high frequency signal components in the line.

A certain amount of signal attenuation also occurs in delay lines. Nevertheless, even though attenuation and distortion of complex waveforms may be expected, delay lines must be used if pulses with a short rise time are to be observed on an oscilloscope using a triggered sweep.

### Observation and Analysis

When sharp pulses are to be observed on an oscilloscope, a triggered sweep is almost mandatory, as is the use of "delay lines," if the leading edge of a single pulse is to be studied. In addition, the CRT should have a high accelerating voltage and high spot brightness if an extremely sharp pulse with a comparatively low repetition rate is to be observed.

Otherwise, the pulse may rise and fall so rapidly, compared to the time of sweep duration across the face of the tube, that the pulse "fades out completely."

*Pulse repetition rate* is generally given as the number of pulses-per-second, abbreviated PPS.

The *equivalent frequency* of a pulse may be determined by considering the pulse to be one-half a cycle of a signal, as in Fig. 9. The time of pulse duration (pulse width or $T_p$ in Fig. 9) is equal to ½ the time for a complete cycle ($T_c$ in Fig. 9). Thus, if pulse width is given in microseconds, it is only necessary to multiply by 2 and divide the product into one million to obtain the equivalent frequency of the pulse in cps. A pulse having a width

(*Continued on page* 134)

Fig. 8.

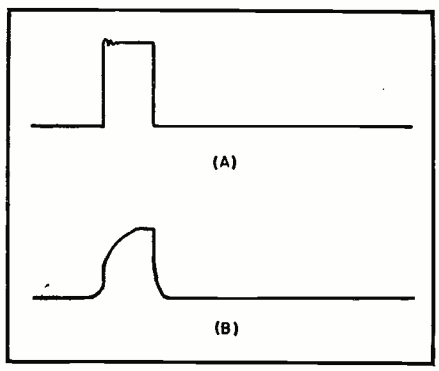
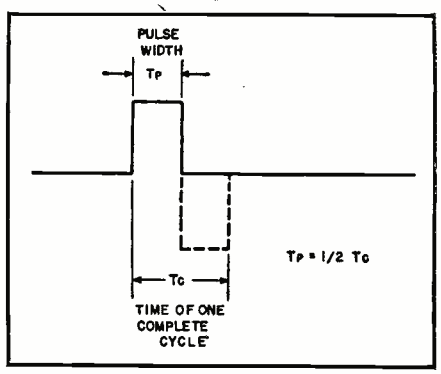



Fig. 9.



# Simulating A CBS COLOR SIGNAL

***Original design or conversion work on color sets need not stop for lack of CBS signals. Equipment described, based on flying spot scanner, produces a suitable color test pattern in your lab or shop as required.***

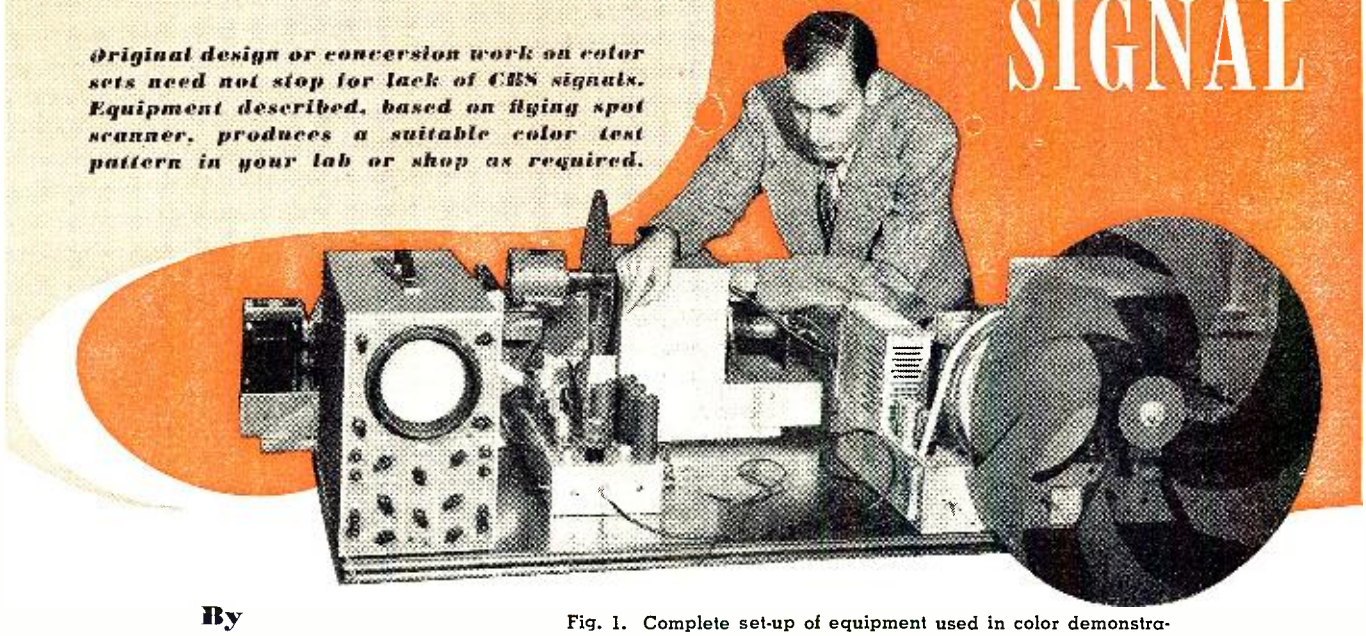


Fig. 1. Complete set-up of equipment used in color demonstration presented at the Radio Electronics School of New York.


**By**
**MURRAY BARLOWE**
Color Development Eng.
Tele-King Television Corp.


THE decision by the FCC to adopt the *CBS* color system was the spark that set off the biggest controversy that the radio-television field has experienced in years. An overwhelming demand for information about color television, both by the public and the technician, resulted. It was in response to this demand that the author, with the full cooperation of the staff of the *Radio Electronics School,* set up a series of public demonstrations and lectures on color television.

Since *CBS* was not transmitting color signals at the time, the problem was solved by constructing a "flying spot scanner" (Fig. 8) to take the place of the color camera.

Basically, the equipment consists of a high intensity CRT with its associated high voltage power supply and deflection circuits, a photoelectric pickup tube, and a high gain video amplifier. The picture to be transmitted is in the form of a transparency which is placed on the face of the CRT. The raster on the face of the CRT is produced by a rapidly moving spot of light. At any one instant, only one spot on the face of the CRT is giving off light. This spot of light passes through the transparency and falls on the photoelectric pickup tube. The phototube converts the light into an electrical voltage proportional to the intensity of the light. As the spot of light moves across the tube, the amount reaching the phototube will increase or decrease, depending upon the density of the different parts of the transparency.

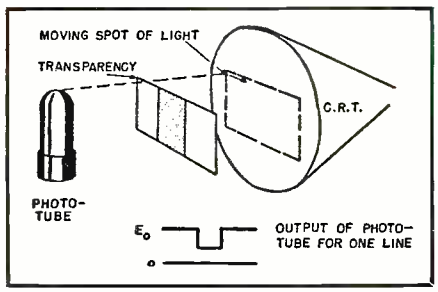
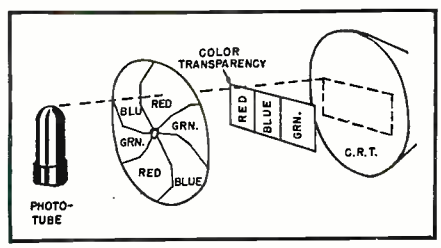



Fig. 2. Intensity of the light from the moving spot, impinging on phototube, varies with any change in transparency density.

EDITOR'S NOTE: *This setup was originally used as a closed-circuit system for demonstrating color television. From the ideas presented it is possible for manufacturers or service organizations who are doing work on color receivers to build a test unit so that work can continue even in the absence of on-the-air CBS signals. For additional details on constructing a flying spot scanner, see J. R. Popkin-Clurman's article "Simplified Ham TV Station" appearing in the May, June, and July 1950 issues of this magazine.*

As each line is scanned, a voltage is generated by the phototube which varies in amplitude directly as the light and dark variations on the transparency, Fig. 2. The output of the phototube is amplified and is the video signal containing all of the picture information. To adapt this principle to produce a color video signal, a color transparency is used in place of the black and white transparency and a color filter wheel is inserted between the transparency and the phototube. See Fig. 3. A simple color transparency, consisting of three vertical bands of color, will be used in place of a full color picture in our analysis of how the system works. As the spot of light moves across the first line from left to right, a section of the color filter wheel moves between the transparency and the phototube. Assuming the first section to be a red filter, which will allow only red light to pass through, the output of the phototube will increase when the spot of light passes through the vertical red strip in the beginning of each line, as indicated in Figs. 4A and 4B. Each filter section of the color wheel will be between the transparency and the phototube for the time required for the light spot to scan an entire field. For a color signal conforming to the *CBS* standards, this time interval would be 1/144th of a second. During this interval, all of the red portions of a color image will pass through the color filter and produce a video signal representing the red image. At the start of the next field, the spot of light will be in the upper left hand corner and a blue section of the color wheel will now be coming into place. It will only allow the blue light to pass through and so the video signal produced during this field will repre-

Fig. 3. To obtain color signal, a color transparency and disc are inserted as shown.



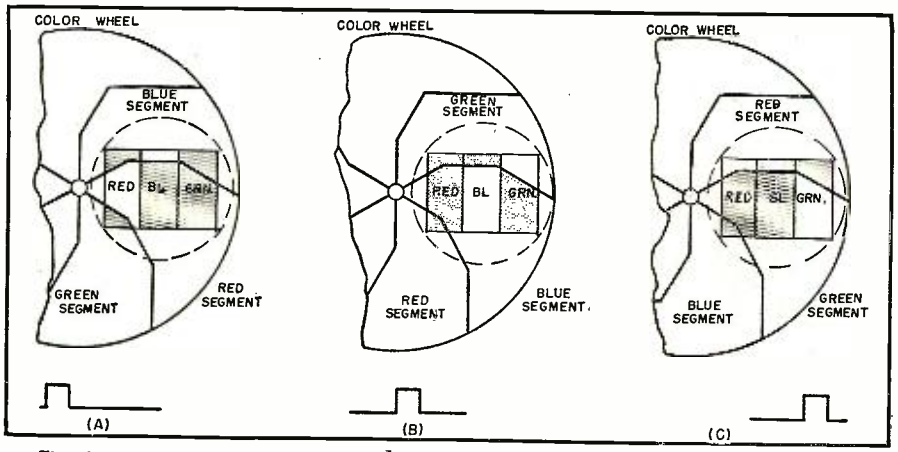



Fig. 4. Scanning sequence. Output of phototube is shown in (A) for red, (B) for blue, and (C) for green. Color disc rotates at a speed of 1440 revolutions per minute.

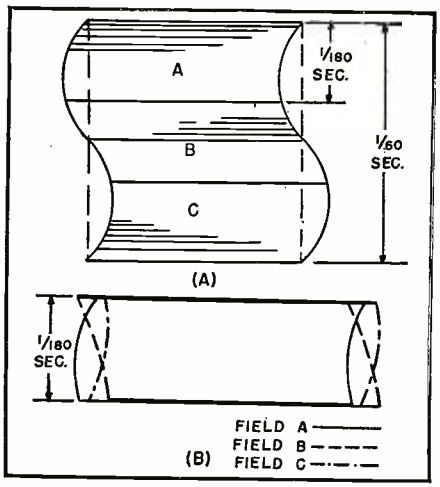



Fig. 5. Curvature caused by a 60-cycle magnetic field when operating at 180 field/sec.

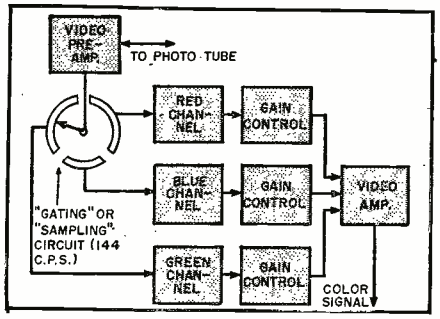



Fig. 6. Block diagram showing how gated circuit is used to select the proper channel.

sent the blue image. Next, the green filter comes into place and the process is repeated, producing the green video signal. In practice, a full color transparency takes the place of the three vertical color bars and the video signals produced during each field would have a more complex waveform.

The output of the video amplifier is applied to the grid of the CRT in a TV receiver.

Sync pulses from the sweep circuits of the flying spot scanner are used to synchronize the sweep circuits of the receiver. During each field a picture is produced on the face of the CRT which is a black and white version of the primary color image being scanned at the time. If we look at this black and white image during the red field through a red filter, we would see a true reproduction of the red information in the transparency. The red filter tints the black and white image to its correct color. By using a color filter wheel at the receiver similar to the one at the flying spot scanner, and having it rotate in synchronism, the full color images are first separated into their primary colors, transmitted as black and white versions of the primary colors, tinted by the color wheel at the receiver, and reproduced in full color.

In the *CBS* system, the color fields are scanned at the rate of 144 per second. A color wheel containing six color filter segments, two each of the three primary colors, is rotated at a speed of 1440 revolutions per minute by a synchronous motor. (Since 1440 rpm synchronous motors are not available, an 1800 rpm motor with a 4 to 5 speed reduction is used to obtain the required speed of 1440 rpm.) This is equivalent to 24 revolutions per second. Since there are six equal segments in the wheel, the time required for a single segment to pass a given point would be one sixth of a 24th of a second, or a 1/144th of a second. This is the time required for a single color field.

By using a horizontal sweep frequency of 29,160 cps, interlaced at 144 fields per second, a 405 line picture is produced.

More than the usual amount of power supply filtering was necessary. This is a problem that technicians making color conversions of transmitting or receiving equipment will have to contend with. In the present black and white system using 60 fields per second, hum in the horizontal deflection circuits could cause the vertical sides of the raster to have a slight curvature as illustrated in Figs. 9A and 9B. This hum may be due to magnetic fields (60 cycle) from the power transformer or to the 120 cycle ripple due to insufficient filtering in the power supply. This curvature is hardly noticeable when the vertical sweep frequency is 60 cps. At sweep frequencies of 144 or 180 per second, the visible effect becomes serious. Figs. 5A and 5B illustrate the effect (intentionally exaggerated) when the interference is from a 60 cycle magnetic field and the equipment is operating at 180 fields per second. Three fields would occur in the time previously required for one field. Superimposing the three fields, as they would appear on the face of the CRT, it becomes apparent that

Fig. 7. Over-all view of the color receiver used by author in his simulated CBS color system. The color wheel consists of twelve segments with every other segment opaque. The sequence is red color filter, opaque segment, blue filter, opaque segment, green filter, opaque segment, etc., with a total of six color filter segments and six opaque segments. In developing the shape of the color filter segments it was apparent that light from the CRT did not pass through every part of the wheel but rather through "half moon" shaped areas. Since this was the case, it was not necessary for the wheel to be entirely transparent. Balance weights and metal strips used for generating the reference sync pulse were mounted on the opaque or unused areas. Opaque segments were finally deemed unnecessary and eliminated on later models.

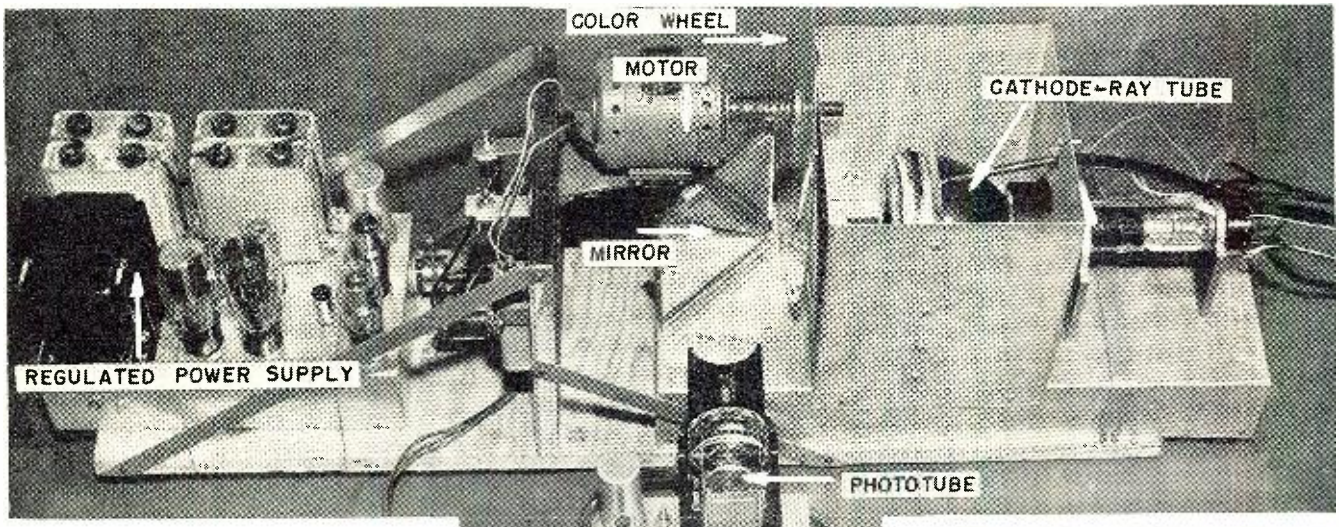



Fig. 8. Over-all view of flying spot scanner.

they are displaced with respect to each other. This makes it impossible for the three colors to "register" properly, producing a picture that is constantly shimmering, and one which has very poor detail.

To keep this from happening it is necessary to thoroughly filter the "B" supply, and protect the CRT against the influence of stray magnetic fields. A mu-metal shield around the picture tube and a heavy copper band around the power transformer are some of the possible solutions to the problem.

### Color Balance

The spectral response of the 931A phototube used as the pickup device drops off rapidly at the red end of the spectrum. To correct this, a thin sheet of very lightly tinted red acetate was permanently fastened to the face of the CRT used in the flying spot scanner. This cut down the intensity of light of the colors other than red to compensate for the lack of sensitivity of the phototube to red. A better method might be to use two or more 931A phototubes feeding the video amplifier with a red color filter permanently mounted in front of one tube thus making it sensitive only to red light. This would boost the level of the video signal produced by the red image. Our equipment is presently being modified to include a "gating" circuit operating at the field frequency which will switch the output of the phototube to a separate video amplifier every time a different color filter segment of the color wheel comes into place (Fig. 6). This will connect the video signal output of the phototube to the red video amplifier for the duration of the red field. Immediately after the red field the signal is switched to the blue video amplifier for the duration of the blue field, and finally to the green video amplifier for the duration of the green field. By adjusting the gain of the video amplifier for each color channel, the relative amplitudes of the color signals can be properly balanced.

### Synchronizing the System

Proper sync and phasing of the complete system is accomplished in the following manner. Six thin pieces of soft iron are fastened along the outside edge of the color wheel at the flying spot scanner (Fig. 11). The pickup coil from a magnetic phonograph pickup is mounted close to the edge of the wheel. As the iron segments move past the pickup coil, a pulse is produced. Since there is a piece of iron for every color segment, the output of the pickup coil will be a series of pulses at the field frequency. These pulses are used to synchronize the vertical sweep circuits and thereby control the timing of the entire system. A phase shifting network is connected between the magnetic pickup coil and the vertical sweep generator. By adjusting this control the start of each field can be varied with respect to the position of the color wheel. Once set, this control usually doesn't have to be readjusted, unless the position of the pickup coil is changed.

Color phasing at the receiver is accomplished by mounting the motor which rotates the color wheel so that it can be rotated through approximately 160 degrees, as illustrated in Fig. 10. The motor is rotated until the segment of the color test pattern marked "blue" becomes blue.

—30—

Fig. 9. An example of the curvature of the vertical edges of the raster caused by (A) 60 cycle and (B) 120 cycle interference.

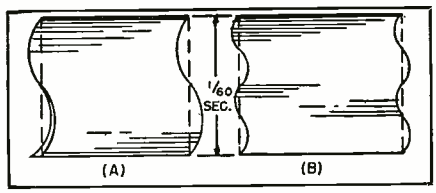



Fig. 10. Provision must be made for rotation of the motor in order to obtain the proper color phasing at the TV receiver.

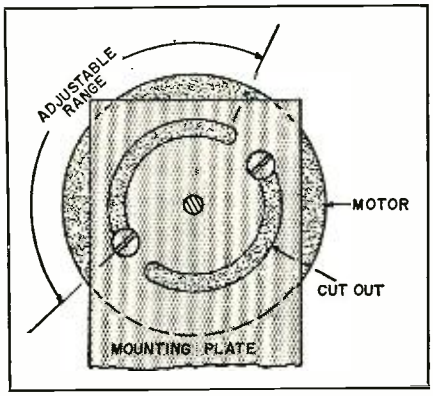
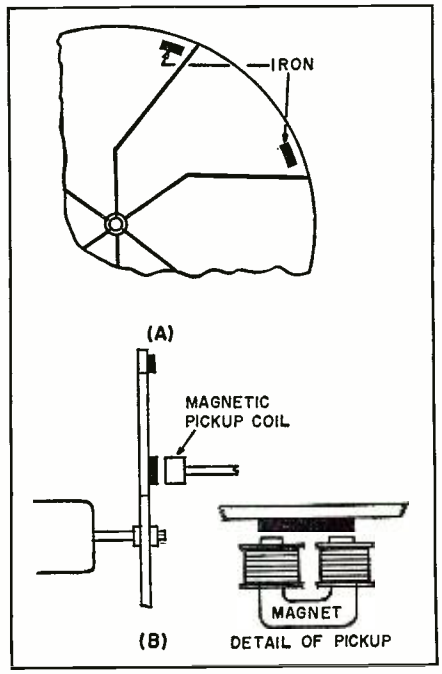



Fig. 11. Mechanical details of synchronizing system. Six pieces of soft iron are fastened to outside edge of color disc.



# A NEW FM COMMUNICATIONS TUNER


Compactness of this new FM communications tuner facilitates mounting under dash or on steering post.

By
**WOODROW SMITH**
Chief Eng., Gonset Co.

***This compact, well-designed tuner covers v.h.f. FM bands. It can be attached to auto receiver for mobile use or home receiver for fixed station use.***

THERE are many applications in the rapidly-growing public safety - - radio services (police, fire, civilian defense), in land transportation radio services (taxicabs, etc.), and in industrial radio services (power, petroleum, etc.) in which the performance of an expensive communications-type FM receiver exceeds requirements and the price exceeds budget limitations. In addition, there are some applications, such as civilian defense, where it is desirable to be able to tune the receiver to two or more stations.

The recently-announced *Gonset* FM communications tuners are designed to provide, in conjunction with an ordinary automobile or house radio or p.a. amplifier, an inexpensive, tunable FM receiver for monitoring applications in which image and adjacent channel interference problems are not unusually severe. Sensitivity approaches that of the more expensive FM mobile communications receivers. Adjacent channel selectivity and image rejection are only fair, as would be expected in a low cost receiver of this type, but in many localities this is not a problem or is a problem in thickly populated areas only when receiving certain channels. If image response should prove troublesome on a desired channel in a certain area, it usually can be corrected by having the i.f. changed at the factory to a frequency slightly higher or lower than the standard 10.7 mc. frequency.

The tuner shown in the photographs measures just 3⅜ inches by 5⅛ inches by 5¾ inches deep over-all and mounts on the steering post or under the dash in mobile applications. Models covering the 30-40, 40-50, 152-162, and 162-174 megacycle bands are available at the present time.

An 88-108 mc. version for FM broadcast reception has been produced in limited quantity but will be produced in volume if the demand warrants. The prototype of the 88-108 mc. broadcast version was demonstrated to a representative of the FCC at their request in 1949, in order to determine the commercial feasibility of mobile reception of FM broadcasts on such a tuner. While the report has not been made public, it may be said that the reaction was favorable as regards over-all performance. Consistent, program-quality reception has been obtained in flat country at distances well over 100 miles from Mt. Wilson (California) stations and well over 50 miles from stations of more modest elevation.

The schematic of the Model 152-162 is shown in Fig. 1. Other models are similar except for slight changes in the front end, which employs a 12AT7 tube in all models. Two stages of 10.7 mc. i.f. are followed by a combination limiter and semi-squelch stage which provides additional gain. Screen voltage, instead of being taken from a conventional divider, is obtained from a high value of dropping resistor. On all except weak signals, the drop in plate current resulting from grid excitation with grid leak bias causes a substantial increase in screen voltage, thus "opening up" the limiter and providing increased gain on signals strong enough to provide complete quieting. Above a critical value of signal input to the limiter, the screen voltage no longer increases, thus providing the instantaneous a.v.c. action inherent in a conventional limiter.

In addition to eliminating a separate tube, thus minimizing size and cost, this form of semi-squelch avoids the possibility of missing weak signals which might not trigger the squelch on a conventional receiver on which the squelch is set too "tight" or a tube has become weak.

With the a.f. gain control adjusted to give normal volume on moderately strong signals, the squelch action in this system is sufficient to drop the no-signal background noise to a level that is not annoying although audible. Weak signals still can be heard, although it may be necessary to advance the volume control for greater intelligibility. Warning of an inoperative receiver is given immediately by a complete lack of background noise, a feature that would not be obtained with complete squelch.

Exhaustive tests with various demodulator circuits, including a ratio detector and a 6BN6 gated beam tube, indicates the superiority of the limiter plus conventional discriminator arrangement for this particular application. Maintenance of proper discriminator adjustment requires only

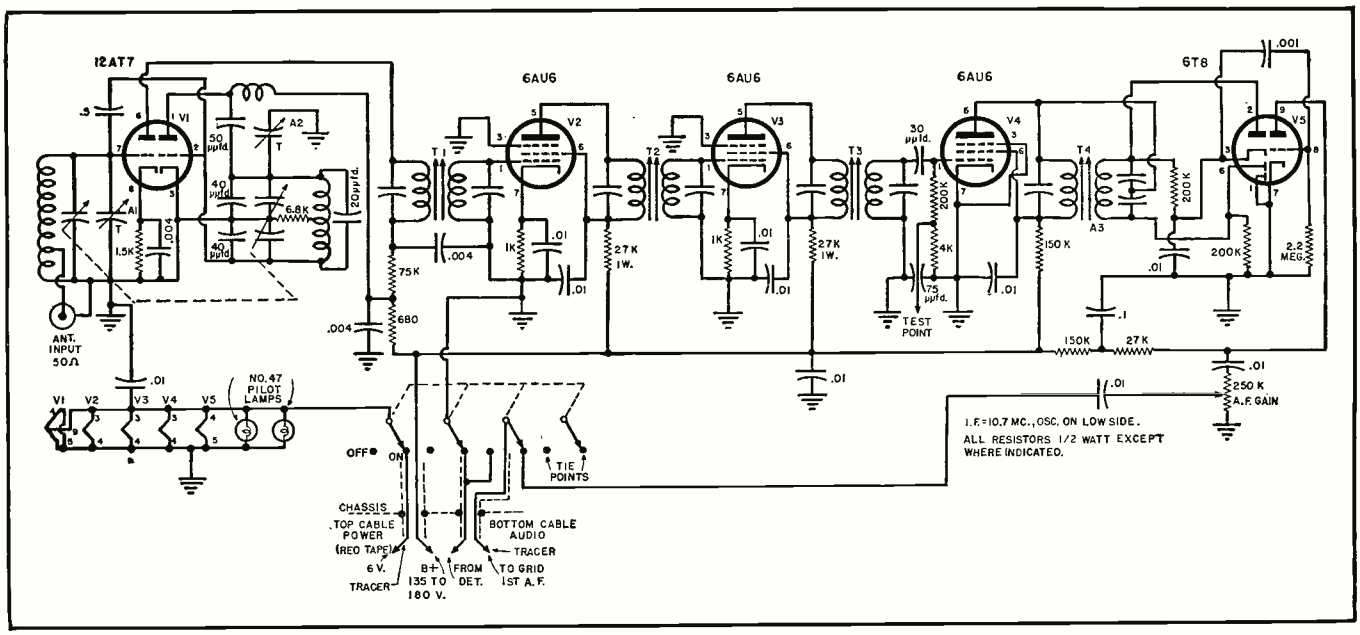



**Fig. 1. Schematic diagram of the Gonset FM communications tuner covering 152-162 megacycles. Models covering other frequency ranges are similar except for minor variations in front end circuitry and component values.**

occasional adjustment of the secondary trimmer for minimum background noise with no station tuned in.

To insure adequate over-all gain even with receivers having low audio gain, a single stage of audio is provided in the tuner by employing a 6T8 for both discriminator and a.f. voltage amplifier functions. The gain of this stage is deliberately held down because the full potential gain of the triode section would never be required.

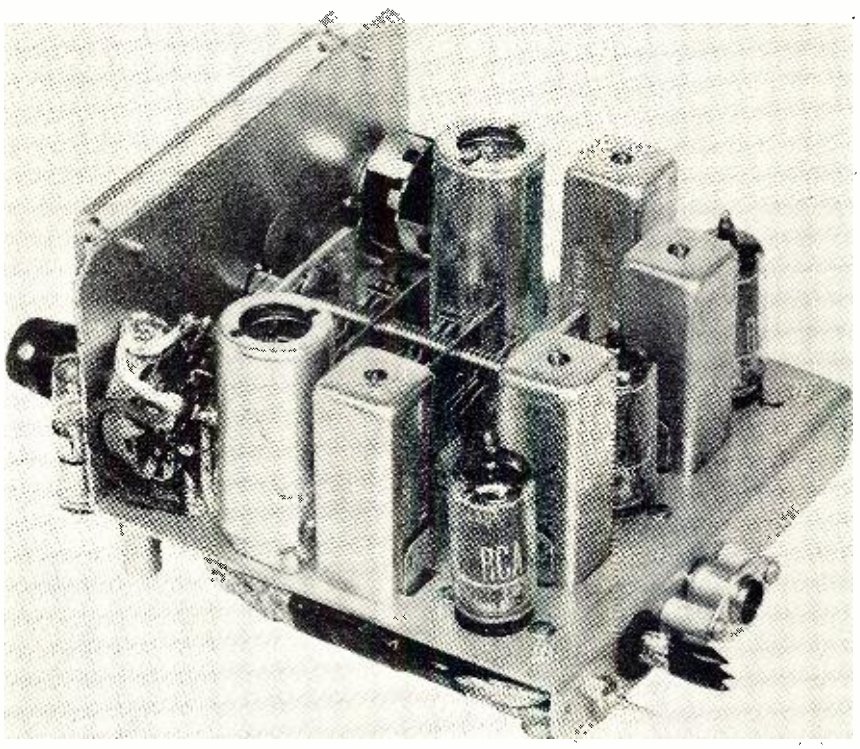
Power for the tuner is taken from the receiver (other than an a.c.-d.c. type) or a.c. amplifier with which the tuner is used. The stability of the oscillator is such that no voltage regulator tube is required. Because of this and by means of careful design, the "B" drain has been held to less than 15 ma. at the plate voltages typically employed. Experience in the manufacture of amateur converters over many years has shown that this amount of additional current may be taken from any well-designed automobile receiver without significantly shortening vibrator life or endangering other power supply components.

Use of a grounded cathode oscillator with negative compensation minimizes warm-up drift and it should not be necessary to "zero in" a station more than once after a cold start. The overall stability of the tuner is such that once a station is logged carefully on the fine increments of the 0-100 scale, the tuner can then be reset at any time to the desired station with the assurance that if the station comes on it is sure to be heard (if within range) even though it may be necessary to touch up the tuning slightly in order to get the station "zeroed in" properly. It was ascertained early in the development of the tuner that any tunable receiver which did not have sufficient stability and "resetability" to assure the operator that he would be certain to hear the station when it came on would be worthless for monitoring communication channels which transmit only intermittently.

A quarter-wave whip antenna of the type employed by police and taxicab services, available from the larger radio parts houses, is connected to the tuner by means of RG-58/U coaxial line. For 30-40 and 40-50 mc. work the whip is mounted on the rear bumper for mobile applications and on the top of the car for 152-162 and 162-174 mc. applications. If the whip is cut to resonate about 3 mc. inside the low end of the band to be covered, the whole band can then be covered with negligible variation in performance.

A test point is provided on the rear lip of the chassis to permit reading the limiter grid current. This permits use of the tuner-receiver combination as a relative-reading field strength meter for making coverage surveys or for use in making adjustments to a transmitting antenna. It also facilitates adjustment of the r.f. (antenna) trimmer to the optimum setting for the particular receiving antenna employed. —30—

**Tuner utilizes miniature components and dual purpose tubes to conserve space. Although the chassis is compact, careful parts placement has precluded undue crowding.**



# AUDIO Simplified

Built-in bookcases and cabinets offer excellent facilities for housing custom audio equipment. In this installation speaker is mounted in upper section of bookcase and is not visible.

By

**DAVID FIDELMAN**

***Part 1. An introduction to the various problems which must be considered when designing or setting up any reproducing system. Future articles will cover the application of these basic principles in the actual design of audio equipment.***

DURING the past few years, many people have begun to realize that their enjoyment of speech and music reproduction can be greatly increased when the program material is faithfully reproduced without appreciable distortion. Until a few years ago, only a relatively small group paid any attention to the quality of the sound which was being produced by their radios, phonographs, and amplifiers. These few were generally audio engineers or technicians whose specialization in the field of sound reproduction had taught them the advantages and increased enjoyment to be gained from good reproduction. The majority of listeners were quite satisfied with the quality of reproduction which could be obtained from small table-model receivers with no appreciable low-frequency reproduction, or from large consoles with very little output above about 4000 or 5000 cycles-per-second.

Since the end of the war, there has been a great increase in public interest in good reproduction of sound, and today every music lover and record collector is anxious to obtain the best reproduction he can get. Now the average layman who is interested in good sound quality can, with relatively little difficulty and expense, have a reproducing system which will compare very favorably with the best that could be built before the war. With the increased programming of classical and light-classical orchestral music in AM and FM radio broadcasting, on records, and in concert halls everywhere, the general public has had a greater opportunity than before to listen and compare good with bad reproduction. This opportunity to listen and compare has probably been the major reason for the increasing interest in good reproduction among discriminating listeners.

Among those interested in good audio are many amateur experimenters —and many engineers and technicians who are not experts in audio—who would like to construct or set up their own sound reproduction systems, and want to take the opportunity to determine for themselves which type of sound reproduction they prefer. This series of articles is intended for these experimenters and is designed to provide some of the information and techniques which are, at the present time, known only to the audio specialist, and to help them attain sufficient background in audio to experiment on their own initiative.

From the engineering and scientific point of view, there are two different problems involved in sound reproduction. One is to develop and perfect equipment which will produce the best sound at the lowest cost. The other is a much more basic and fundamental problem—to discover what good sound reproduction actually is. Almost since the earliest days when it was possible to reproduce the human voice and music with reasonable accuracy, the question arose as to what was most to be desired in the reproduction of sound, and what basis to use for judging the results. This question has been the subject of many experiments which attempt to obtain quantitative data that would represent the quality of reproduction. Closely tied in with this is the additional question of whether to attempt to improve on what may be faults in the original sound.

Any such tests always start with the human ear as the fundamental measuring instrument. The results depend upon statistics obtained from a large number of average listeners, with the preference of the greatest number of listeners representing the best type of reproduction. This is perfectly logical and reasonable, since public acceptance is the ultimate criterion. Earliest measurements tended to indicate that the average listener preferred reproduction having a restricted frequency range, rather than wide-range reproduction. This result was offered as an explanation as to why most radio receivers in the home are found to have the tone-control knob set for minimum high-frequency response, and seemed to justify the manufacturers who designed their receivers with practically no response above 5000 cycles. (However, this inference does not agree with other known facts. Experience has shown that when the tonal quality of a musical instrument does not completely satisfy public taste, it is gradually changed to make it more acceptable. Modern instruments have reached their present form and remain as they are because this is how they are preferred, since they could readily have been changed if it were desired.)

Improved listener-preference tests in

which only the frequency range was changed, *with all other factors kept constant,* show that in the absence of other disturbing factors the listener prefers the widest frequency range in reproduction of sound. These findings confirm the opinion that the best type of sound reproduction is that in which the listener hears, as nearly as possible, an exact reproduction of the original sound, and that it should not be "improved" by the reproduction system.

Close observation of the results of the various listener-preference tests shows that frequency-range is only one of the important factors in the reproduction of sound. Several other factors are involved, some of them considerably more important than frequency range in determining the acceptability and fidelity of reproduction. These other factors are the various forms of *distortion* which may occur in the reproduction process. Distortion is any difference between the reproduced and the original sound. Restricted frequency range in reproduction is one form of distortion, but there are also several others which may occur. The following list includes all the types of distortion which are at present known to have an important effect on the quality of the reproduced sound:

(*a*) Frequency-amplitude distortion
(*b*) Reproduction noise
(*c*) Harmonic distortion
(*d*) Intermodulation distortion
(*e*) Transient distortion
(*f*) Phase distortion
(*g*) Frequency modulation distortion (wow and flutter)

These distortions occur within the electronic system, and are capable of measurement and analysis. However, there are certain other fundamental limitations which are present in any attempt to reproduce sound, and might properly be called *acoustic* distortions:

(*h*) Differences in acoustics between the room in which the sound originates and the room in which it is reproduced
(*i*) Spatial distribution effects
(*j*) Limited dynamic range in reproduction

The acoustic distortions are not strictly defects of the audio system, since they are inherent in any attempt to reproduce sound from one place to another.

At one time the main criterion of good reproduction was thought to be the width of the frequency range. The "high-fidelity" enthusiast would, for example, judge the excellence of a phonograph system by the amount of high-frequency needle scratch he could hear. Thus, the more high-frequency noise and record scratch, the better the quality of reproduction! This type of judgment has by now become more or less obsolete, since it is now pretty well realized that for true high-fidelity reproduction all other forms of distortion must also be eliminated and the original sound reproduced as accurately as possible in all respects. Some of the other distortions are much more distasteful to the ear than loss of high and low frequencies, and when they are present the listener usually prefers the restricted frequency range which reduces their effects. (This explains the results of the earliest tests in which listeners were found to prefer narrow-band reproduction, since in these tests no attempts were made to remove the various distortions which are related to the frequency range.)

The noise introduced by the reproducing system is generally the most obvious form of distortion, and must be kept as low as possible, both because it limits the dynamic range and because of its disagreeable quality. The highest noise level is usually found in the reproduction of phonograph records, due to the record scratch introduced by the surface of the disc. Other parts of a high-quality system should introduce practically no noise.

Harmonic and intermodulation distortion are extremely important factors in most of the equipment in current use. These distortions occur whenever the amplifier is not perfectly linear (that is, the output is not perfectly proportional to the input signal). This "non-linearity" gives rise to spurious harmonics which are not present in the original signal, and causes modulation of the high frequencies by the low-frequency components. It is usually the intermodulation rather than the harmonic distortion which is responsible for the disagreeable quality when a system is overloaded, since the intermodulation products contain frequencies which are generally discordant with the original sounds. At the present time these are perhaps the most important and troublesome forms of distortion since when they are high they tend to mask other distortions because their effects are more unpleasant.

When the noise and distortion of the system are within the limits required for good reproduction, then the various other forms of distortion are not masked and become important. It has been found that two systems with identical frequency and non-linear distortion characteristics may often sound quite different when they are used to reproduce speech or music. This generally occurs when one of the systems has good transient response, and the other has poor transient response. Very few natural sounds (including speech and music) are sustained for any long period of time—the various components generally occurring in bursts of short duration. This can easily be observed by watching an oscilloscope trace (swept at about 20 to 50 times per second) and noticing how the various components are constantly being generated and disappearing. It is, therefore, extremely important that for good reproduction the entire system must have good transient as well as steady-state characteristics, and should have no undamped vibrations which will appear for a dynamic signal and produce undesired hangover that distorts the effect of the sound. This is an important factor which is

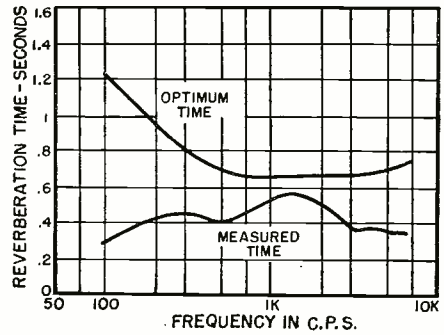



Fig. 1. Optimum and measured reverberation time as a function of frequency for the living room of average home.

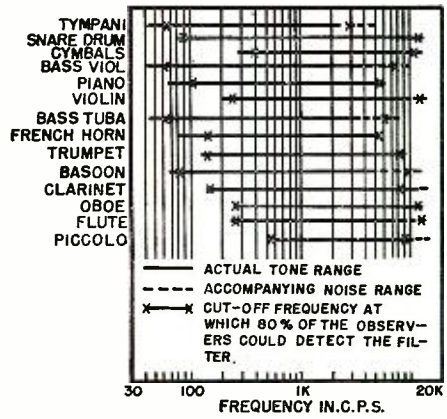
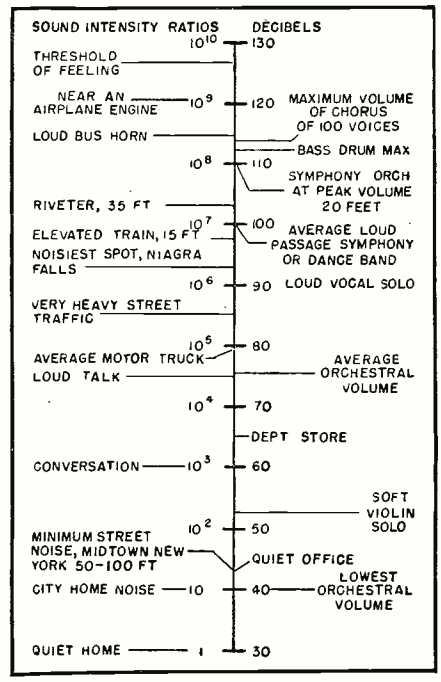



Fig. 2. Audible frequency ranges of various musical and percussion instruments.

generally overlooked by many experimenters and technicians who are not sufficiently familiar with the requirements of good reproduction.

When sound is reproduced from disc or magnetic recordings the frequency of the output sound is determined by the relative speeds of the recording and reproducing drive motors. When these motors do not run at absolutely constant speed, there is heard a *flutter*

Fig. 3. Noise levels in various locations.



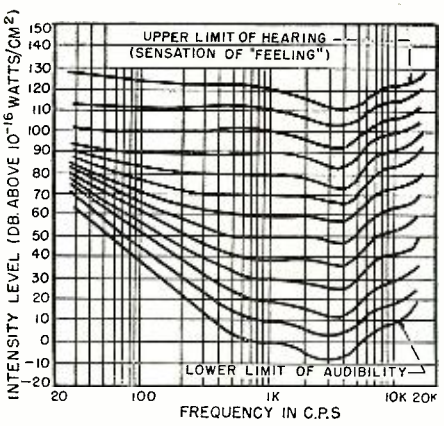



**Fig. 4. Equal loudness contours showing intensity levels at various frequencies required to produce effect of equal loudness.**

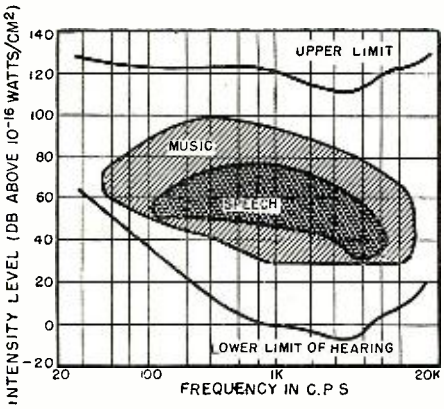



**Fig. 5. Curves showing the frequency and volume ranges of both music and speech.**

or *wow* in the frequency of the reproduced sound which is quite annoying and serious. These effects are apparent in the reproduction of sustained steady tones, where variations in pitch can be most easily detected. Such speed variations can also be heard in the reproduction of percussive tones in disc recordings, where the sharp transients impose very heavy loads upon the driving motor and may cause it to change speed due to this variation in load.

The results of the listener-preference tests show that the various electronic distortions must be kept down to inaudible or barely audible levels for good reproduction. However, the situation is different in the case of the acoustic distortions, since many psychological factors enter into the question of listening to sound in a location different from where it originates. Since listening to the sound of a full orchestra in the average living room is completely different from listening to it in the concert hall, the listener may feel free to go in for considerable experimentation to decide which type of reproduction he prefers for himself. Dynamic range may be increased by the use of volume expanders. Experiments to correct for the difference in spatial distribution of the sound may be performed by several methods which have been tried for obtaining stereophonic reproduction. The reverberation and absorption of sounds of different frequencies can also be controlled by changing the absorptive and reverberant properties of the room, and by means of artificial reverberation systems.

Although the psychological factors involved in the transfer of sound to a new location are often a matter of individual preference, the most logical procedure is to try to make the final effect upon the ear as much as possible like that obtained from the same sound in the location where it originates. The best way to do this can be seen by glancing at some of the curves shown in Figs. 4 and 5.

Normally, the sound heard from an orchestra in the concert hall is considerably louder than is practical for the average listener to obtain from his loudspeaker in the home—especially if he lives close to his neighbors or in an apartment house. However, the ear does not have the same response for different acoustic levels, therefore some compensation must be made for this difference. Fig. 4 shows the effect of the intensity level at various frequencies on the ear. Each curve shows the intensity at different frequencies to give the effect of a certain loudness. A loudness level of 80 to 100 db is heard almost uniformly over the entire audio range, but a frequency of 60 cycles has to be heard at a 60 db level to have the same loudness as 1000 cycles at a 20 db level. Thus there should be considerable bass boost when listening at normal home levels to give the same effect as the actual orchestra's performance.

The physical systems which exist at the present time for the reproduction of sound are, unfortunately, not capable of producing without distortion all the sounds which are required from them. This may be better understood when it is realized that vacuum tube amplifiers are not strictly linear in their response, sometimes cannot be used over the complete frequency range, and can be overloaded. In addition, the electromechanical components of the system, particularly the loudspeaker, are required to duplicate at one time all the sounds which can be produced by every instrument in a large orchestra—which is by no means a simple achievement. Therefore some compromise must be made between the requirement of perfect fidelity of reproduction and the physical limitations of the reproducing system.

The electronically generated distortions must always be kept to an absolute minimum (except in the case of the intentionally introduced frequency-amplitude distortions, such as "tone controls"). There are practically no occasions where it would be desirable to accept such distortions as intermodulation, for example, and these distortions are permitted only to the extent that it is a physical impossibility to eliminate them entirely.

By proper design and setup of the system these distortions can be kept below the level at which their effects can be detected by the average listener. Tests and experience have indicated certain distortion levels which may be accepted as the requirements for good reproduction, and the extent to which a system meets these requirements may be considered a measure of the quality of reproduction.

Complete reproduction of all the fundamentals and harmonics which are present in the music produced by a symphony orchestra would require a frequency range of approximately 20-14,000 cycles. However, for almost all practical purposes a frequency range of 40-10,000 cycles with satisfactory distortion characteristics has been found quite acceptable to about 90 per-cent of the listeners to all types of speech and music. While such a reduction of bandwidth will remove some of the highest frequencies present in the original sound, this difference cannot be detected by large numbers of listeners even on the basis of direct comparison, and is in general felt to be not objectionable.

For a system of good quality the noise and hum level should be of the order of 50 to 60 decibels below full output, whereas the noise level from a phonograph record will generally not be better than about 35 to 40 db below peak signal.

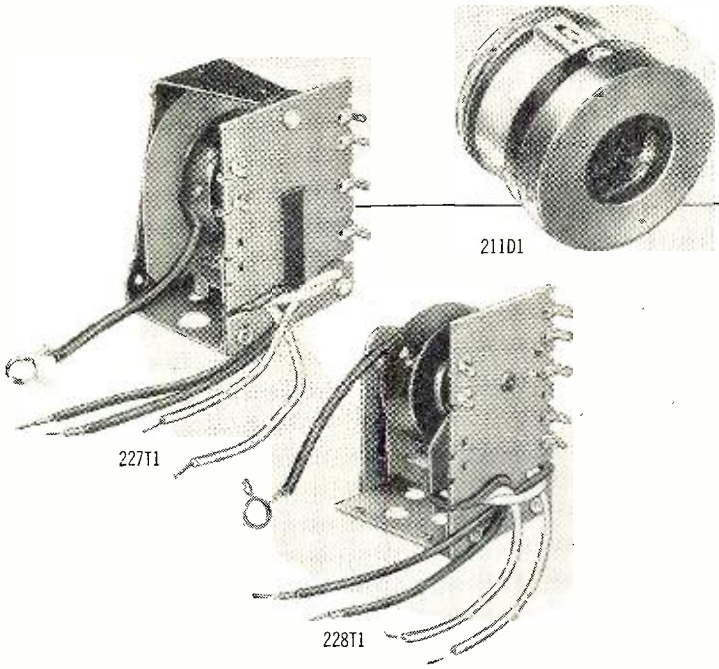
At one time it was believed that 5 per-cent total harmonic distortion was acceptable in a high-quality system, but today it is felt that this figure is too high (especially in amplifiers using beam-power tubes or pentodes, since 5 per-cent total harmonic distortion from them appears to be much more objectionable than 5 per-cent from triodes).

(*Continued on page* 135)

**Table 1. Acceptable limits of various electronic distortions and the type of signal which can be used to detect these distortions.**

| RESPONSE OR DISTORTION BEING MEASURED | TYPE OF SIGNAL WITH WHICH MEASURED | ACCEPTABLE LIMITS | |
|---|---|---|---|
| | | GOOD REPRODUCTION | ACCEPTABLE REPRODUCTION |
| Frequency Response | Steady sine wave | 20-14,000 cps | 40-10,000 cps |
| Noise Level | Zero | —60 db below full output | —50 db below full output |
| Harmonic Distortion | Steady sine wave | 2% total harmonics | 2-5% total harmonics |
| Intermodulation Distortion | Sum of high freq. and low freq. steady sine waves | 5% | 10% |
| Transient Response | Square wave or tone burst | No set standards | |
| Wow and Flutter | Steady sine wave | 0.1% | 1% |

# NEW TV COMPONENTS




***Electrostatically focused tubes will become more popular as shortages of copper and cobalt increase. Here are details on several new parts and their circuitry to be used with these tubes.***

THE Tube Department of *Radio Corporation of America* has recently introduced three new television components which are of particular interest to the service industry. They are of interest in view of the fact that they will be included in many of the television receivers released in the future.

In addition, these components can, in many cases, be used where it is desired to convert receivers from small picture tube operation to large tube sizes.

The 227T1 and the 228T1 horizontal deflection output and high voltage transformers shown in the photographs above will provide high voltage of 14,000 volts (227T1) and 16,0000 volts (228T1). They are designed to be used with any *electrostatic focus* picture tube having a horizontal deflection angle of about 66 degrees. Note particularly that the above refers to *electrostatic focus* picture tubes and not the more common magnetic focus types.

Electrostatic focus picture tubes are not too readily available as yet, however, they are in production and will, no doubt, become quite popular in future video receiver designs.

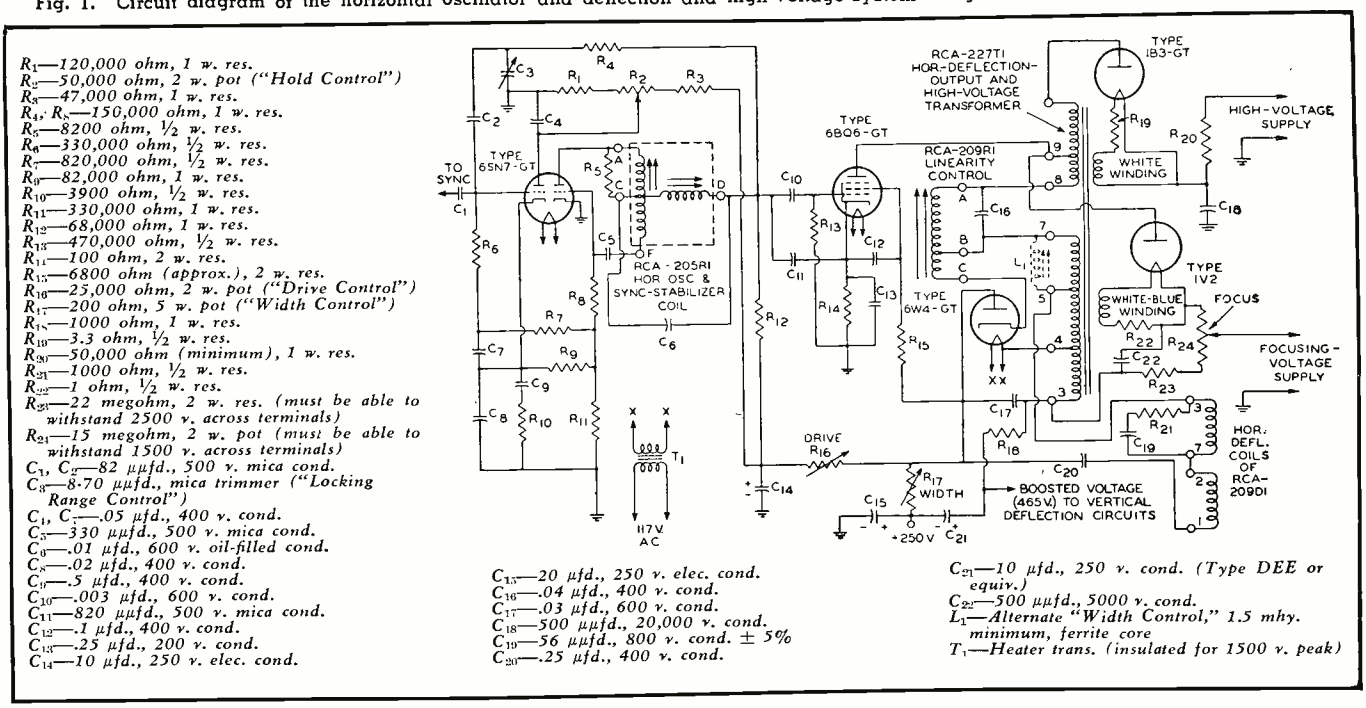
With these tubes the magnetic focus coil is eliminated entirely and in its place a potential of from 3000 to 5000 volts, obtained from an additional rectifier tube, is used on the picture tube for focusing. This technique is in line with the government's conservation of materials program. The more critical the supply of copper wire and cobalt becomes, the sooner sets using the electrostatic focus tubes will hit the market.

Utilizing a ferrite core for high efficiency operation, light weight, and compactness, each of these transformers is designed for use with a single 6BQ6GT horizontal deflection amplifier tube; a single rectifier tube, such as the 1B3GT, for the high voltage supply; a single rectifier tube, like the 1V2, for the focusing voltage supply; the *RCA* 209R1 horizontal linearity control; the 6W4GT damper diode tube; and the *RCA* 209D1 or the 211D1 magnetic deflecting yokes which also have ferrite cores.

Both of these new units have two

(*Continued on page* 136)

**Fig. 1. Circuit diagram of the horizontal oscillator and deflection and high voltage system using the 227T1. 14.000 volts is obtained.**




$R_1$—*120,000 ohm, 1 w. res.*
$R_2$—*50,000 ohm, 2 w. pot ("Hold Control")*
$R_3$—*47,000 ohm, 1 w. res.*
$R_4$, $R_5$—*150,000 ohm, 1 w. res.*
$R_6$—*8200 ohm, ½ w. res.*
$R_7$—*330,000 ohm, ½ w. res.*
$R_8$—*820,000 ohm, ½ w. res.*
$R_9$—*82,000 ohm, 1 w. res.*
$R_{10}$—*3900 ohm, ½ w. res.*
$R_{11}$—*330,000 ohm, 1 w. res.*
$R_{12}$—*68,000 ohm, 1 w. res.*
$R_{13}$—*470,000 ohm, ½ w. res.*
$R_{14}$—*100 ohm, 2 w. res.*
$R_{15}$—*6800 ohm (approx.), 2 w. res.*
$R_{16}$—*25,000 ohm, 2 w. pot ("Drive Control")*
$R_{17}$—*200 ohm, 5 w. pot ("Width Control")*
$R_{18}$—*1000 ohm, 1 w. res.*
$R_{19}$—*3.3 ohm, ½ w. res.*
$R_{20}$—*50,000 ohm (minimum), 1 w. res.*
$R_{21}$—*1000 ohm, ½ w. res.*
$R_{22}$—*1 ohm, ½ w. res.*
$R_{23}$—*22 megohm, 2 w. res. (must be able to withstand 2500 v. across terminals)*
$R_{24}$—*15 megohm, 2 w. pot (must be able to withstand 1500 v. across terminals)*
$C_1$, $C_2$—*82 μμfd., 500 v. mica cond.*
$C_3$—*8-70 μμfd., mica trimmer ("Locking Range Control")*
$C_4$, $C_7$—*.05 μfd., 400 v. cond.*
$C_5$—*330 μμfd., 500 v. mica cond.*
$C_6$—*.01 μfd., 600 v. oil-filled cond.*
$C_8$—*.02 μfd., 400 v. cond.*
$C_9$—*.5 μfd., 400 v. cond.*
$C_{10}$—*.003 μfd., 600 v. cond.*
$C_{11}$—*820 μμfd., 500 v. mica cond.*
$C_{12}$—*.1 μfd., 400 v. cond.*
$C_{13}$—*.25 μfd., 200 v. cond.*
$C_{14}$—*10 μfd., 250 v. elec. cond.*
$C_{15}$—*20 μfd., 250 v. elec. cond.*
$C_{16}$—*.04 μfd., 400 v. cond.*
$C_{17}$—*.03 μfd., 600 v. cond.*
$C_{18}$—*500 μμfd., 20,000 v. cond.*
$C_{19}$—*56 μμfd., 800 v. cond. ± 5%*
$C_{20}$—*.25 μfd., 400 v. cond.*
$C_{21}$—*10 μfd., 250 v. cond. (Type DEE or equiv.)*
$C_{22}$—*500 μμfd., 5000 v. cond.*
$L_1$—*Alternate "Width Control," 1.5 mhy. minimum, ferrite core*
$T_1$—*Heater trans. (insulated for 1500 v. peak)*

# A Miniature H-F Portable TRANSMITTER-RECEIVER

By
**M. KIRCHHOFF,**
**W2FAR**
Columbia Broadcasting System
**and**
**D. D. BULKLEY,**
**W2QUJ**
International Telephone & Telegraph Corp.

Fig. 1. Front and rear views of portable transmitter-receiver. In the front view the audio gain control is located at the upper left while the i.f. gain control is seen in upper right-hand portion of photo. The b.f.o. switch is mounted below speaker. The rear view shows toggle switch (left) which operates filaments and the right-hand switch which controls plate voltage. Mike jack is near top of unit.

***Complete construction details for building a compact unit for portable, mobile, or emergency operations.***

CIVIL DEFENSE activities are taking a more important position in the life of every citizen of our nation today. For the amateur, with his background of technical know-how and operating ability, it is an opportunity to participate in a new phase of his hobby wherein he may perform a real service for his community.

In every local and regional Civil Defense Network, numerous small, dependable, easily-transportable stations are needed which may be set up with a minimum of delay and effort. These portable communication units, in the event of an emergency, are invaluable for relaying information from the scene of the disaster to outlying control stations.

The transmitter-receiver described here provides this communication facility and still retains flexibility which will allow its application to many other low-power high frequency amateur activities.

A dependable and efficient unit, this high frequency companion to "A 2 Meter Transmitter-Receiver for Civil Defense Operation" described in the August, 1951 issue of RADIO & TELEVISION NEWS meets all requirements demanded of Civil Defense communication equipment. It is contained in a small metal cabinet 9½ inches high, 7 inches wide, and 6½ inches deep, and weighs less than 12 pounds. Although the "Miracle Miniature" is designed for 117 volt operation, power consumption is low. A miniature vibrator power converter unit such as the *"Travelectric"* may be utilized for operation away from 117 volt supply lines. The *"Travelectric"* provides an output of 110 volts, 60 cycles at 40 watts, from any six-volt storage battery. This is ample power to operate the transmitter and receiver for portable, mobile, or emergency operations.

The equipment consists of a seven tube, single conversion superheterodyne which provides stable and selective reception in all amateur phone bands from 3 to 30 megacycles, and a two-stage, 25 watt, crystal-controlled transmitter with its associated modulator. Both transmitter and receiver utilize miniature tubes and components. Although certain parts utilized in building this equipment were surplus items, readily available commercial equivalents may be substituted where surplus parts are not obtainable.

The receiver consists of a mixer, three 455 kc. i.f. amplifier stages, a second detector, b.f.o., one audio stage, and a beam power output stage which drives a self-contained two-inch loudspeaker.

Two midget plug-in coils are used for each band. The mixer-grid tank condenser is set at the middle of the band in use, and the oscillator is tuned, providing single dial tuning. An i.f. as well as an audio gain control is included to eliminate overloading of the second detector on strong local signals. The b.f.o. operation is provided for reception of c.w. signals. A simple b.f.o. arrangement is used. Its application is described later.

An r.f. stage was omitted to simplify coil design and to eliminate serious tracking problems.

The transmitter consists of a modified Pierce crystal oscillator driving two parallel 6AQ5 r.f. amplifier tubes. Should one amplifier tube fail during a critical operating period the transmitter will operate with the remaining tube. This arrangement also permits power reduction (through removal of one amplifier tube) where transmission conditions do not demand full power output or when operating away from 117 volt a.c. mains. Use of one final amplifier tube when operating this equipment from the miniature vibrator power supply insures that the power rating of the vibrator supply will not be exceeded.

The first stage of the modulator is a low-impedance, grounded-grid triode. Although this stage provides no appreciable amplification, it eliminates the

necessity of a microphone transformer as well as the necessity for microphone voltage. The input stage feeds a single speech amplifier which drives a pair of push-pull 6AQ5's as modulators. These tubes adequately modulate the final amplifier whether one or two r.f. tubes are used.

As this transmitter was designed for voice operation, only the 75, 20, and 10 meter phone bands were provided. No keying facilities were incorporated, but if c.w. operation is desired the transmitter cathode circuits may be re-returned to ground through a key.

The power supply utilizes a highly efficient voltage doubling selenium rectifier circuit. Simple and compact, it is adequately stable for application in this equipment. If the feature of having the chassis above ground is undesirable, an inexpensive isolation transformer may be used in the 117 volt power input line.

### Chassis Layout

Referring to Fig. 2, the receiver may be seen on the left-hand side of the photograph, and the transmitter on the right. The power supply is in the center portion of the photograph.

The equipment is mounted in the handy metal cabinet formerly housing the surplus ARR-1 u.h.f. test oscillator. This cabinet has two "snaplock" side covers. Removal of the right-hand "snaplock" cover reveals the vacuum tubes, plug-in coils, etc., while removal of the left "snaplock" cover allows access to the under-chassis and wiring. A carrying handle on the top of the cabinet provides convenient transportability. The antenna output terminates in a coaxial fitting which is mounted on the rear of the cabinet.

The receiver line-up starts at the bottom left-hand side in Fig. 2 where the 6BE6 mixer stage will be found. The mixer grid tank condenser may be seen diagonally to the right of the mixer tube. This condenser is provided with screwdriver adjustment. The mixer feeds three stages of i.f. amplification utilizing 6BA6's. Next in order is a 6AV6 second detector/audio amplifier. The triode section of this tube is used as the first audio amplifier which drives the 6AK6 beam power output stage. A two-inch permanent magnet loudspeaker, mounted on the front panel, delivers ample audio output under ordinary conditions. For reception of c.w. signals, a b.f.o. stage with a type 6C4 is used. This stage is located directly to the right of the third i.f. amplifier tube. The two midget receiver plug-in coils may be seen in the lower left hand corner, one below and the other to the right of the mixer tube.

The transmitter tube line-up starts in the lower right-hand corner of Fig. 2 where a type 6AQ5 modified Pierce crystal oscillator may be seen. This drives the final amplifier which consists of two 6AQ5's in parallel for 75, 20, and 10 meter output. As mentioned previously, only one 6AQ5 is used when less than full power output is required. For emergency operation this is necessary for the conservation of battery power and to assure operation within the output rating of the miniature vibrator power supply. The two midget transmitter plug-in coils are located at the left of the oscillator tube and at the left of the amplifier tubes.

The type 6C4 grounded-grid microphone input stage will be found at the upper right corner of Fig. 2. This stage is followed by a type 6C4 speech amplifier. The speech amplifier drives a pair of push-pull 6AQ5's as modulators. The modulation transformer is seen in the photograph directly below the 6AQ5 modulator tubes while the driver transformer for the 6AQ5's is directly above them.

The power supply will be seen in the center of Fig. 2. The large condenser can is a dual 40 μfd. with sections in parallel to provide a completely hum-free filter circuit. The two smaller cans directly above the filter are single 40 μfd. units used in the voltage doubling circuit. It is necessary to insulate $C_{39}$ (Fig. 4) from the chassis or the power supply will be shorted to ground. The selenium rectifier stacks are mounted beneath the chassis; they may be seen in Fig. 3. Above the two voltage doubling condensers appears a three section condenser used for bypassing in the audio cathode circuits and a small can containing the cathode

Fig. 2. Top view of chassis. Removal of the right "snaplock" side cover reveals the vacuum tubes and coils while removal of the left "snap lock" cover permits access to under-chassis.

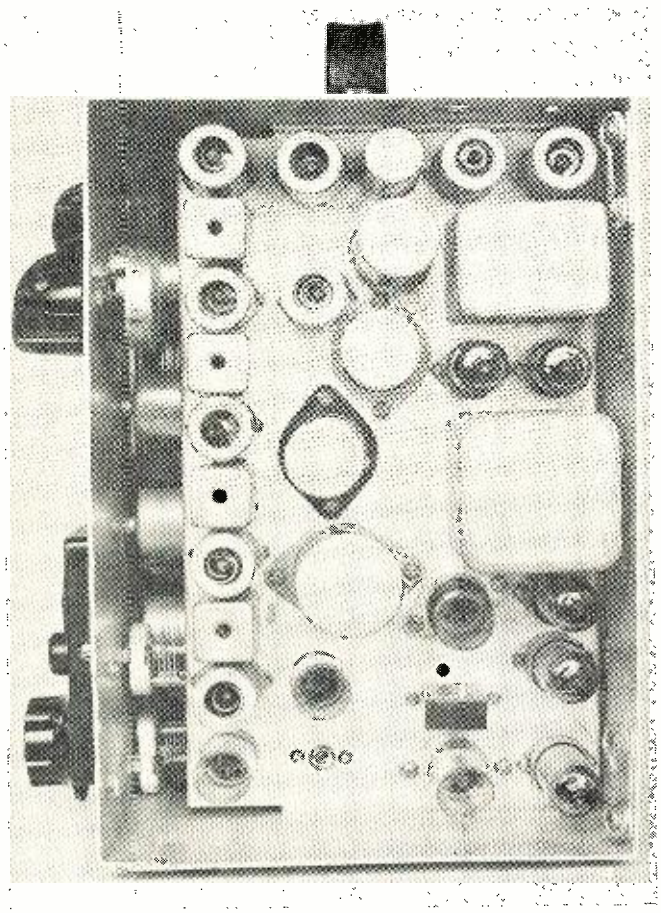
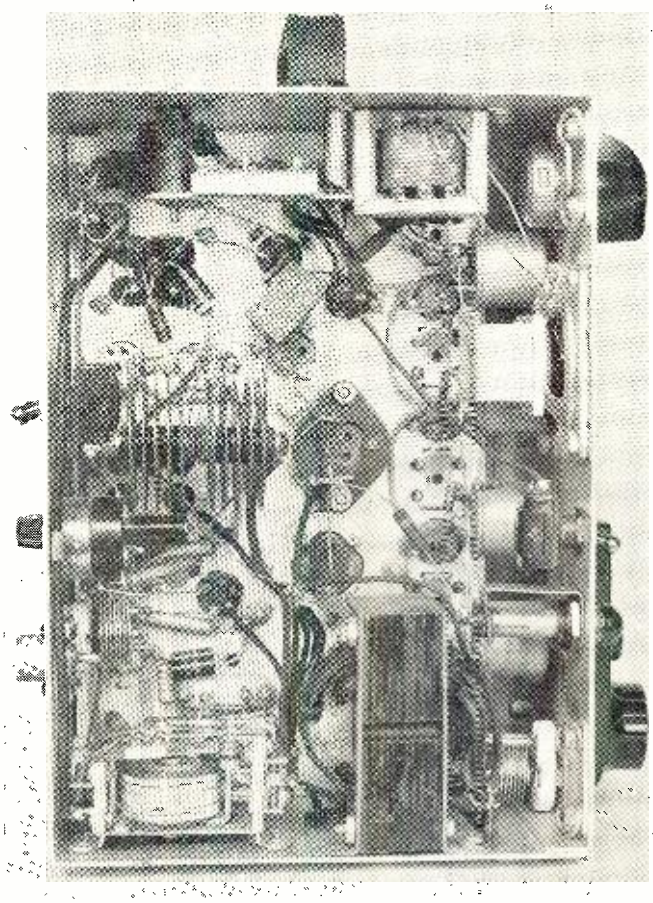
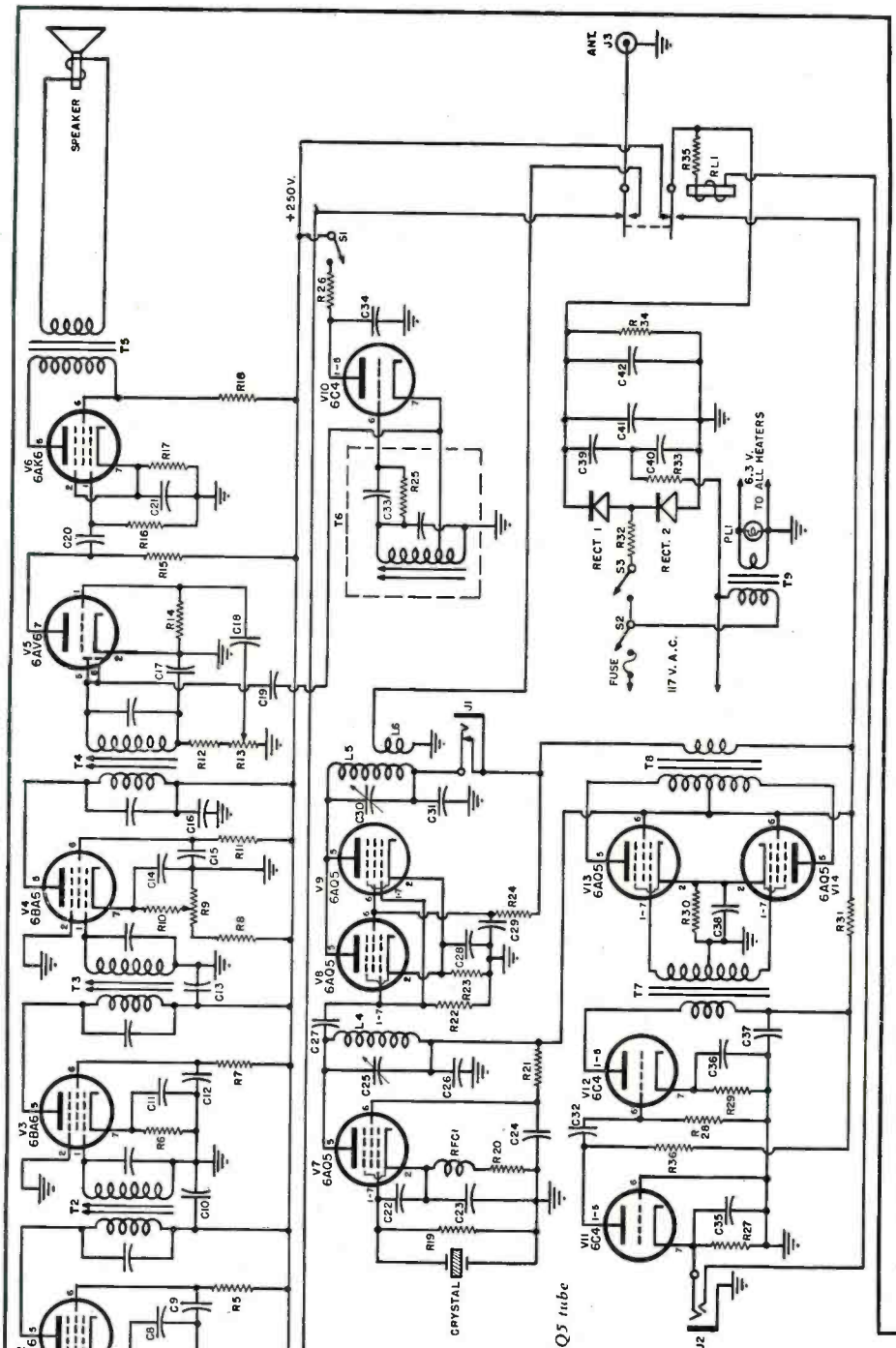


Fig. 3. Bottom view. Note the antenna changeover relay next to filament transformer at bottom of photograph. The b.f.o. assembly can be seen alongside the output transformer at the top.






$R_1$, $R_2$, $R_{29}$—22,000 ohm, ½ w. res.
$R_3$—2200 ohm, ½ w. res.
$R_4$, $R_9$, $R_{10}$—68 ohm, ½ w. res.
$R_5$, $R_7$, $R_{11}$—33,000 ohm, ½ w. res.
$R_6$, $R_{27}$—100,000 ohm, ½ w. res.
$R_8$—10,000 ohm pot.
$R_{12}$—47,000 ohm, ½ w. res.
$R_{13}$—500,000 ohm pot.
$R_{14}$—10 megohm, ½ w. res.
$R_{15}$, $R_{34}$—220,000 ohm, ½ w. res.
$R_{17}$, $R_{37}$—470 ohm, 1 w. res.
$R_{18}$—4000 ohm, 2 w.
$R_{19}$—68,000 ohm, ½ w. res.
$R_{20}$, $R_{30}$—470 ohm, 2 w. res.
$R_{21}$, $R_{31}$—47,000 ohm, 1 w. res.
$R_{22}$—27,000 ohm, 2 w.
$R_{23}$—100 ohm, 2 w. res.
$R_{24}$—6000 ohm, 2 w. res.
$R_{25}$—47,000 ohm, ½ w. res.
$R_{26}$—470,000 ohm, ½ w. res.
$R_{28}$—1500 ohm, ½ w. res.
$R_{32}$—2000 ohm, 1 w. res.
$R_{33}$—20 ohm, 2 w. res.
$R_{35}$—15,000 ohm, 1 w. res.
$C_1$, $C_2$, $C_{29}$, $C_{30}$—50 μμfd. var. cond. (APC50)
$C_3$—25 μμfd. var. cond.
$C_4$, $C_{27}$—75 μμfd. Ceramicon cond.
$C_5$, $C_6$, $C_8$, $C_9$, $C_{10}$, $C_{11}$, $C_{12}$, $C_{13}$, $C_{14}$, $C_{15}$, $C_{16}$—.05 μfd., 400 v. cond.
$C_{17}$—100 μμfd. Ceramicon cond.
$C_{18}$, $C_{26}$, $C_{32}$—.01 μfd., 400 v. cond.
$C_{21}$—1 μμfd. Ceramicon cond.
$C_{22}$—15 μμfd. 25 v. elec. cond.
$C_{23}$—15 μμfd. Ceramicon cond.
$C_{24}$, $C_{36}$—50 μμfd. Ceramicon cond.
$C_{25}$, $C_{28}$, $C_{31}$—.006 μfd., 400 v. cond.
$C_{33}$—100 μμfd. Ceramicon cond. (in $T_6$)
$C_{38}$, $C_{39}$—20/20/20 μfd., 350/350/25 v. elec. cond.
$C_{40}$—40 μfd., 350 v. elec. cond.
$C_{41}$, $C_{42}$—40/40 μfd., 350 v. elec. cond.
$RFC_1$—2.5 mh. r.f. choke
$RL_1$—D.p.d.t. relay, 10,000 ohm coil (Advance Type 1003B—see text)
$PL_1$—6.3 v. pilot light
Fuse—1 amp. fuse (3AG)
$S_1$, $S_2$, $S_3$—S.p.s.t. toggle sw.
$Rect._{1,2}$, $Rect._{3,4}$—200 ma. selenium rectifier
$J_1$—Closed circuit jack (must be insulated from chassis)
$J_2$—3-connector jack
$J_3$—Coaxial connector
Speaker—Permanent magnet (any size)
Crystal—See Table 1
$T_1$, $T_2$, $T_8$—455 kc. i.f. trans. (Miller Type 12-C1)
$T_3$—455 kc. i.f. trans. (Miller Type 12-C2)
$T_5$—Output trans. (Stancor A3856)
$T_6$—B.f.o. trans. (Any 455 kc. trans. will give satisfactory results—see text)
$T_7$—Input trans. (Stancor A4721. Use primary tap combination to give 10,000 ohm impedance)
$T_8$—Mod. trans. (Stancor A3891. Use 10,000 ohm tap combination on primary and 4000 to 5000 ohm tap on secondary)
$T_9$—Fil. trans., 6.3 v. @ 5 amps
$V_1$—6BE6 tube
$V_{2,3}$, $V_4$—6BA6 tube
$V_5$—6AV6 tube
$V_6$—6AK6 tube
$V_7$, $V_8$, $V_9$, $V_{13}$, $V_{14}$—6AQ5 tube
$V_{10}$, $V_{11}$, $V_{12}$—6C4 tube

bypass for the receiver audio output stage.

### Construction

The equipment is constructed with care given to physical layout to provide short connections. This eliminates the possibility of forming v.h.f. oscillatory circuits which may cause annoying spurious emissions.

All bypass condensers should be mounted directly to the point being bypassed or as close to it as possible. This is particularly true with the receiver i.f. stages as they provide high gain and, if bypassed improperly, will oscillate.

Screwdriver adjustment is provided for all but the most necessary tuning controls. This precludes the possibility of knocking either the transmitter or receiver out of adjustment when working in the field.

A unique antenna and power changeover relay circuit is utilized. In order to maintain low power consumption it would not be practicable to utilize the conventional type of relay as this would consume excessive current. Therefore, an *Advance* type 1003B relay with a 10,000 ohm, 115 volt d.c. coil is employed. $R_{35}$ provides the necessary voltage drop to operate the 115 volt d.c. coil of the relay. With this coil less than 10 milliamperes of current is drawn. A microphone switch actuates $RL_1$, transferring the antenna as well as power supply voltages from the receiver to the transmitter. This switch may be of the press-to-talk variety incorporated as an integral part of the microphone or it may be mounted on the front panel of the equipment. The former method is recommended for the sake of operating convenience.

In order to permit employment of a standard b.f.o. transformer without encountering space difficulties, the b.f.o. assembly was removed from its shield can. It was then mounted in the cabinet as shown in the upper left-hand corner of Fig. 3.

A midget multi-match modulation

**Fig. 4. Complete circuit diagram of compact, high-frequency transmitter-receiver unit.**

transformer is used. Primary taps are chosen to give 10,000 ohms impedance and secondary taps to provide 4000 ohms impedance.

### Operation

The i.f. alignment may be accomplished using standard procedures with a 455 kc. signal source, although tuning each i.f. transformer for maximum noise will give satisfactory results.

Receiver r.f. alignment is best accomplished with a grid dip oscillator. If coils are wound to the exact specifications outlined in Table 2 no difficulty will be experienced in r.f. alignment. The 75 meter band should be aligned first as it is the simplest of the three. The appropriate coils are placed in their sockets and the grid dip oscillator is adjusted to a frequency in the center of the desired band. Holding the grid dip oscillator close to $L_2$, tune $C_1$ with a screwdriver for a dip in the meter reading. The r.f. section of the mixer is now adjusted for the center of the band. Indicate the condenser setting by placing a spot of colored pencil (each band to have a different color) on the chassis to facilitate resetting the mixer r.f. condenser when changing bands. It is not necessary to change the tuning of this condenser unless bands are changed. The grid dip oscillator is next used as a field strength meter so the grid dip oscillator plate switch should be turned off. The frequency is then set approximately 455 kilocycles higher or lower than the original or mixer frequency. With the bandspread condenser $C_3$ half-meshed the oscillator padding condenser $C_2$ is tuned with a screwdriver until maximum reading is obtained with the test instrument held near $L_3$. This indicates proper tuning of the oscillator and mixer for the center of the band. Calibration of $C_3$ and the main tuning dial may now be effected using a signal generator or other accurate signal source.

The aforementioned operations are then repeated for each of the other bands.

Initial transmitter tuning should be done with a grid dip oscillator to make certain that the stage is tuned to the correct frequency or harmonic. Changing bands may then be accomplished readily with the use of a ½ watt neon bulb to indicate resonance.

For most efficient operation, the chart in Table 1 indicates the recommended manner of operation for each stage. Refer to this chart before tuning the transmitter.

It might be well to note at this point that an overtone crystal should not be used. The modified Pierce circuit will not operate with anything but a fundamental cut crystal.

With appropriate crystal and coils in the transmitter, set the grid dip oscillator at the crystal oscillator stage output frequency (as noted in Table 1) and hold it near $L_4$. Tune the crystal oscillator tank condenser with a screwdriver for maximum output. The condenser setting should then be noted on the chassis with a spot of colored pencil to enable approximate resetting when changing bands. Next, set the grid dip oscillator on the output frequency as indicated in Table 1. Holding the instrument near $L_5$, tune $C_{30}$ with a screwdriver until a maximum reading is again noted on the meter. The condenser setting should be indicated on the chassis with colored pencil as was done in the case of the crystal oscillator. The transmitter is now in resonance for one band. The two remaining bands may be tuned in the same fashion.

With an antenna connected to the equipment and a milliammeter plugged into $J_1$ the antenna coupling ($L_6$) is adjusted for optimum output. When operating mobile or portable, using a miniature vibrator power source, the final amplifier should not be loaded to a current greater than 35 milliamperes. A half-wave dipole fed with 72 ohm line or a folded dipole fed with 300 ohm line provides the best antenna match. However, any random length of wire will provide satisfactory local communication.

It is probable that results would be improved somewhat if an antenna tuner were used with wires of random length as this would permit the optimum loading and probably result in better over-all performance.

Tuners that would serve satisfactorily have been described in many magazine articles, or may be found in the amateur handbooks.

Another possibility that would permit the feeding of almost any piece of wire is the use of the *Collins* system.

The final tank circuit of the transmitter may be readily converted to this system by using parallel feed on the final, and substituting a 250 $\mu\mu$fd. midget variable for $C_{31}$. The rotor plates of $C_{30}$ should be returned to ground in this case, with the connection to the antenna made to the bottom end of the final tank coil $L_5$. Tuning of this type of network is covered in the amateur handbooks.

Operation with this unique and serviceable transmitter-receiver has given very satisfying results. Although the equipment was designed for short-range operation, exceptional signal reports have been received on all bands. Considerable distances have been covered using the simplest type of antenna installation.

This transmitter-receiver combination is an excellent adjunct to the high power station. Extremely compact and easily portable, the "Miracle Miniature" is an attractive package, not only for use in Civil Defense and emergency operations, but also for Field Day or summer vacation "hamming" away from home.

-30-

Fig. 5. Midget plug-in coils provide full coverage of the 75, 20, and 10 meter bands.

| CRYSTAL OUTPUT | CRYSTAL OSCILLATOR OUTPUT | FINAL AMPLIFIER OUTPUT |
|---|---|---|
| 75 meters | 75 meters | 75 meters |
| 80 meters | 40 meters | 20 meters |
| 40 meters | 20 meters | 10 meters |

Table 1. Recommended transmitter operation for the miniature transmitter-receiver.

Table 2. Complete specifications for winding the plug-in coils for portable unit.

| | 75 METERS | 20 METERS | 10 METERS |
|---|---|---|---|
| $L_1$ | 12 t. #28 en. | 6 t. #24 en. | 3 t. #24 en. |
| $L_2$ | 55 t. #28 en. | 15 t. #24 en. | 7 t. #24 en. |
| $L_3$ | 44 t. #24 en., tap 7 t. from gnd. end | 10 t. #24 en., tap 3 t. from gnd. end | 4 t. #24 en., tap 1 t. from gnd. end |
| $L_4$ | 44 t. #24 en. | 25 t. #24 en. | 12 t. #24 en. |
| $L_5$ | 42 t. #24 en. | 9 t. #24 en. | 5 t. #18 en. |
| $L_6$ | 8 t. #24 en. | 4 t. #24 en. | 3 t. #18 en. |

Notes: All coils are closewound on Amphenol ¾" dia. Type 24-5H coil forms.
$L_1$ is spaced ¼" from $L_2$
$L_6$ is spaced ¼" from $L_5$ (see text)

# TRIPLE YOUR PHONE POWER For Five Dollars

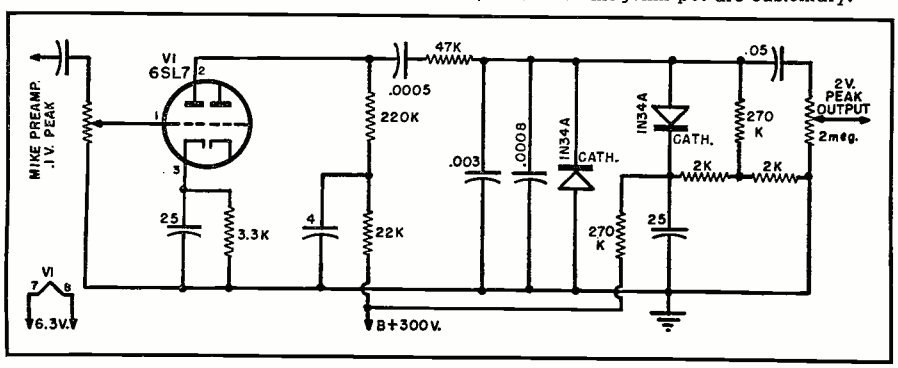
By
**FRED F. EVERETT**
**W9YTY**

***Simplified version of an old idea—a low level peak clipper which can be used with any ham transmitter.***

THE following is not a particularly new idea, but rather a simplified version of an old one. Yes, it's simplified and it works! As seen from the schematic diagram, the idea is a shunt-type, low-level peak clipper and associated filter. The simplification evolves from the use of crystal diode rectifiers and a simple capacitive roll-off filter. The writer has previously shied away from speech clippers, even with their known advantages, mainly because of the rather elaborate sharp cut-off filters believed necessary. Recent articles and experiments have led to considerable doubt as to the need for such sharp cut-off filters, hence it was decided to try the simplest type—a straight capacitive bypass to ground in conjunction with a simple shunt peak clipper. Before continuing, it is pointed out that the circuit as shown has been thoroughly tested for narrow bandwidth, effective increase in modulation level, distortion, etc., in the writer's 100 watt, 10 and 20 meter amateur transmitter, with gratifying results. Local and distant contacts are unanimous in the effectiveness of the clipper.

A few words of caution before trying this, or any other low-level clipper circuit, are in order. The audio stages AFTER the clipper stage must be first rate, with good response, low distortion, and low phase shift, if maximum benefit of peak clipping is to be obtained. This requirement is particularly demanding of audio transformers, so it behooves one to use resistance coupling where possible, to use good driver and modulation transformers, and to use tubes of adequate capacity to prevent overloading at clipping levels. Technical reasons and theory for this are published in various manuals and will not be detailed here, but to sum up: First, if low frequency phase shift is present, and it will be, the flat tops of the clipped wave peaks will be slanted, or canted, to a degree depending upon the amount of phase shift present. The more the cant of the flat top, the greater the output level of the clipper stage must be reduced to prevent overmodulation on peaks. Second, the more the distortion following the clipper stage, the wider the bandwidth taken up by the transmitter output, regardless of the efficiency of the clipper filter constants. Third, if your driver and/or modulator stage is working at maximum peak power output before clipping, there obviously will not be enough audio power available to faithfully reproduce the flat, clipped waveform output from the clipper stage. If you must compromise on any of these basic requirements, expect a similar compromise on the results obtained. If you must compromise on all of them, unsatisfactory results will be obtained with any type of low-level clipping circuit.

Schematic diagram of low level peak clipper. The input coupling condenser and the gain control should be standard values. A .1 μfd. and ½ megohm pot are customary.



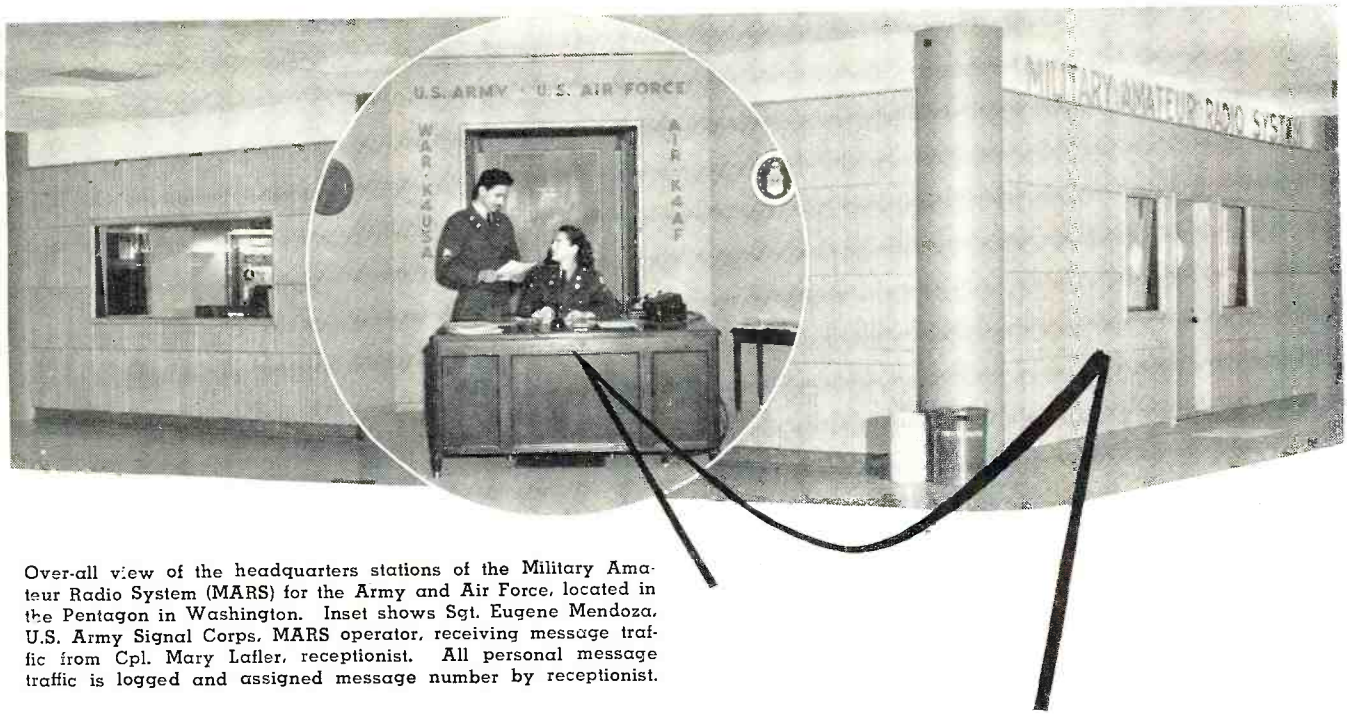

While the schematic of the circuit is more or less self-explanatory, a few points should be emphasized. It will be noted that a .0005 μfd. condenser is used at the input of the clipper stage. There are two primary reasons for using such a small size condenser, the first of which is to reduce the bass response to the clipper and following stages, since that bogey, phase shift, will be most troublesome at the lower audio frequencies. In addition, since the capacitive roll-off filter gives an increasing attenuation above 3000 cycles per second, a reduction in bass response is necessary to prevent bassy sounding modulation. The value chosen, in conjunction with the roll-off constants used, seems to give good balance for the average male voice. In regard to the .003 μfd. filter, the writer used a .003 μfd. paper condenser, paralleled by a .0008 μfd. mica condenser which, in addition to giving the desired audio roll-off, makes the circuit relatively insensitive to r.f., a very desirable condition, need it be said.

The cathode of the first rectifier is biased to about 2 volts positive which is also applied to the plate of the second rectifier. Therefore, it is necessary to apply about 4 volts positive potential to the cathode of the second rectifier as shown. This value of bias will cause clipping and limiting of both positive and negative peaks to about 2 volts maximum. The 25 μfd. bypass condenser from the cathode of the second rectifier to ground was found necessary for good flat top waveform on both peaks and should not be omitted.

It was found that the addition of loading across the output of the clipper, such as too low a value of grid resistor on the following stage, led to an uneven clipping level on positive and negative peaks. Likewise, variations in the crystal rectifiers were found to cause uneven clipping, but this was corrected where it developed by slight adjustment of the bias voltage on one or the other of the crystals. If matched crystals are used (1N35), and reasonable care in handling and soldering (don't overheat the crystals) is exercised, the voltage divider values given will result in well balanced clipping.

The circuit is easy to adjust for the desired amount of clipping and percentage of modulation if the input voltage is adequate and if the audio gain following the clipper is designed for a minimum input of about 2 volts peak. In making the adjustments, it

(*Continued on page* 94)




Over-all view of the headquarters stations of the Military Amateur Radio System (MARS) for the Army and Air Force, located in the Pentagon in Washington. Inset shows Sgt. Eugene Mendoza, U.S. Army Signal Corps, MARS operator, receiving message traffic from Cpl. Mary Lafler, receptionist. All personal message traffic is logged and assigned message number by receptionist.

# MARS' PENTAGON HEADQUARTERS

***MARS' new, custom-built installation is geared to serve present amateur radio needs, yet it can be easily adapted to meet the flexibility requirements of modern warfare and defense.***

THE contributions of amateur radio to national defense and public service are nowhere more in evidence than in the Military Amateur Radio System. MARS is a joint Army-Air Force project designed to: Create interest and further training in amateur radio; coordinate practices and procedures of amateur radio operations with those of military radio communications; and provide an additional source of trained radio communications personnel in the event of a local or national emergency.

The Headquarters stations for Army and Air Force MARS are housed in a single building, specially constructed on the concourse of the Pentagon, Washington, D. C. The custom installation was built by *Transmitter Equipment Manufacturing Company,* according to MARS specifications. Engineered by Al Hart (W3AX), WAR and AIR (military call signs of K4USA and K4AF, respectively) are geared to serve the present needs of amateur radio, but are planned so as to be adaptable to flexibility requirements of modern warfare and modern defense.

Each station has a 1000 watt transmitter and associated equipment, a master console, and two individual operating (QSO) booths.

Two equipment racks, one on either side of the transmitter, are mounted into the wall in each of the master control rooms.

Rack 1 contains an antenna multi-coupler, a *Magnecord* recorder and control panel, a beam control panel, transmitter control panel, and a BC 221 frequency meter. Rack 2 contains a *Hallicrafters* S-36A receiver, a *Hammarlund* SP 600JX receiver, patching panel, *Collins* 32-V1, and a *Plex*-10 (expander compressor) amplifier.

The Master Control consists of a nine-position, two-channel audio mixing amplifier capable of utilizing imputs from microphones, turntables, remote lines and recorders; two *Collins* 75-A receivers, each with its own "Pan-adaptor"; a *Collins* 32-V2, used as driver for the local transmitter; single sideband selector which may be used with either of the receivers; and a control panel with controls providing beam rotation and indication, speaker selection, speaker volume control, transmitter control, remote control of tape recorder; and associated items such as "mike" receptacles, plug receptacles for keys, etc.

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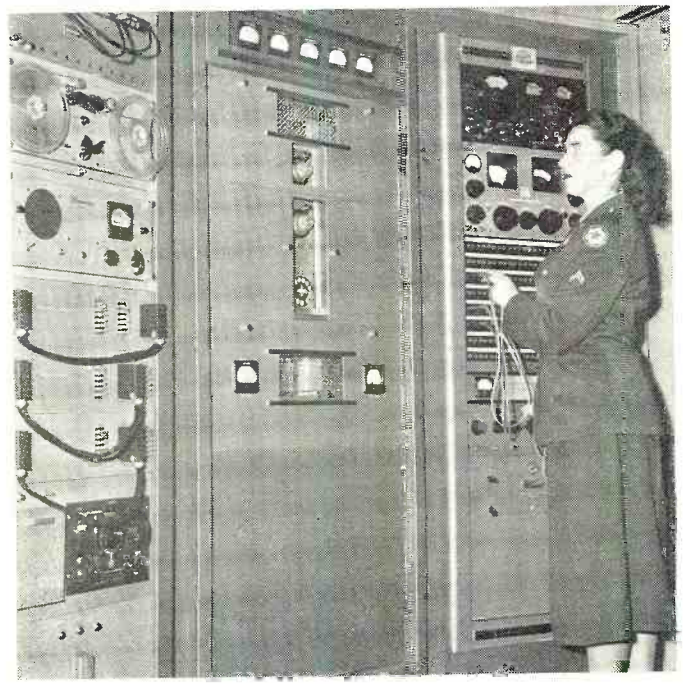
Cpl. Lafler patches a keying line from the local transmitter (center bank) into an adjoining studio at headquarters station.



# Proportional RADIO CONTROL

By
**HOWARD G. McENTEE,**
**W2SI**

This 55" span plane carries the proportional equipment. Power is .199 cu. in. engine. A vertical antenna works well in this case.

***Construction details on the radio control equipment for a model airplane. Precision flying is possible with this novel, 50 mc. transmitter and control unit.***

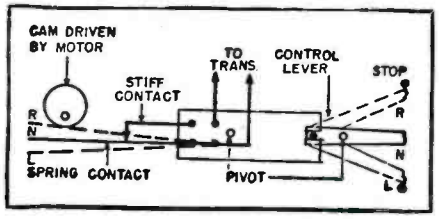
RADIO control of remote objects, particularly model airplanes, has increased by leaps and bounds since 1945, but even today, with all the radio control activity, most builders stick to the rubber-driven magnetic escapement to operate their model control surfaces. While the escapement is simple and reliable, it has several drawbacks, one of which is that the control is an "all or nothing" proposition (some escapements allow a halfway position, although not many modelers make use of it)—you either have neutral or 'hard over." Also, of course, there is the disadvantage of remembering the escapement sequence; it must be stepped from neutral to right, back to neutral, to left, then back to neutral, right again, and so on.

While many hundreds of model plane fliers have mastered the escapement and flown beautifully with it, some of them have wished for something more flexible—a system, for example, where you could get a little right rudder, lots of left, then a little left, etc.—in other words, right or left rudder in any desired degree, and not in any predetermined sequence. Well, there is such a system. It's called proportional control, and the action is simply that the controlled surface exactly follows the movement of the ground station control stick. If you hold the stick at center, the plane rudder will remain neutral; move the stick a little to the left and the rudder follows; push it way over to the left and the rudder flaps over to its limit. It hardly needs to be pointed out that this allows real precision flying. This smooth and accurate control is appreciated when you are trying your hand at "aerobatics."

You can have all this and it isn't too difficult either. The main equipment difference between escapement control surface operation and proportional control is that a motor driven control box is required at the transmitter, and a special device is needed to move the rudder or other control surface in the airplane. The radio link, that is, the transmitting and receiving equipment are the same in either case, and proportional control can be adapted to almost any existing radio control system. Even the motor-driven ground control box might not be included as an extra requirement in the shift from escapement to proportional control; many advanced fliers are already using what is generally called a "beep box" for their escapement operation. This unit is a "motor-driven memory" which automatically counts out pulses to the escapement. It still doesn't allow the infinite variation of control positions as does proportional operation, however.

A control system, affording an approach to proportional action, was described in the August, 1950 issue of RADIO & TELEVISION NEWS. The author pointed out that his system would give right or left rudder at will, and the rudder could be held in neutral or any other position as desired. This arrangement could be advanced to true proportional control by a simple addition to the rudder drive, and by changing the transmitter pulsing system so that the length of "on-signal" to "off-signal" pulses might be varied at will. One extreme would be a steady signal and the other no signal, while neutral would be pulses and spaces of equal length as in the arrangement referred to above. A simple motor-driven pulser similar to that outlined in Fig. 1 would do the trick. Pushing the control lever full right or left would give full rudder motor speed in either direction; placing the stick at any intermediate point between neutral and hard-over would give various slower speeds of rudder motor action.

Fig. 1. Simple motor-driven pulser.




To change over to true proportional action, the rudder motor and gear train require the addition of a pair of springs, so arranged that as the rudder moves farther away from neutral in either direction, the spring pressure tending to push the arm back to neutral increases. (It's best to have no worm gears in the train, as the back pressure causes a binding action.) When the springs are properly tensioned this system will give you real

proportional control. Move the stick a little left and hold it there—the rudder will move a little left and stop, returning to neutral when you center the stick. The springs can be set so that the rudder follows the stick very closely.

The motor-driven and geared down rudder-operating unit has been used successfully by several experimenters with proportional control. In fact, Jim Walker, who holds several patents on proportional equipment, won the Radio Control event at the Nationals in 1946 with a geared-down motor drive rudder control, and almost repeated again in 1947. However, a much simpler and lighter control unit for model airplanes was developed by George Trammel, who used it with great success at the 1948 Nationals. George calls his development simply an "actuator." It can be likened to a permanent magnet motor without a commutator. For ease of construction, the position of magnet and winding is usually reversed, so that the rotor is a magnet and the winding is placed on the stationary field core. Such a gadget will turn about 180° with a complete reversal of current direction. Its action is naturally much faster than that of a geared-down motor, and although its power is not as great, it is adequate for control surface operation, even with very low input power. The unit we use is shown in simplified sketch form in Fig. 3. A frame of iron (*F, G*) has a winding (*H*) on an iron core, and semi-circular iron pole pieces (*D, E*) above. A disc permanent magnet (*C*), magnetized across the diameter, turns freely with shaft (*B*), supported in two brass bearings (*J, I*). Arm (*A*) has several holes along its length to drive the rudder through a wire link.

This actuator has been found more than adequate to drive a rudder of about 6 sq. in., when supplied with only 100 ma. current. It is quite a bit heavier than need be, and in fact, was made in a great rush out of available parts. The basic element was the disc magnet (*C*) which had a bronze center bushing; the unit was built around this magnet and weighs 2.9 oz.

Although the photograph of Fig. 3 shows separate magnet coils, and would normally be used with two batteries, we felt it more practical to use two windings as shown by (*H*) in the drawings (Fig. 3); this way only one battery is needed. Two sets of batteries seldom "run down" evenly in use, and if they are uneven, the center or neutral position will drift badly. The single battery (two medium flashlight cells) with double-coil actuator gets around this nicely, and with the 100 ma. intermittent current drain, lasts a long time.

Full dimensions are also given in Fig. 3. The iron parts of the unit are all of special magnetic core iron, but any soft iron should work well. Before you start work on such a unit, procure the magnet disc (*C*) first. Be sure your disc is magnetized with only two poles —some of these discs have as many as six poles! The pole pieces should fit the disc closely with only 1/32" to 1/64" clearance. If you can get a disc with a center hole, you are lucky—these Alnico discs can't be drilled. A plain disc with no center hole can be used by fastening a stub shaft to a brass disc soldered on each side of the magnet. Suitable disc magnets ¾" x ¼" can be obtained (from Ronald Eyrich, Box 849, Milwaukee, Wisc.) for about 25c each. They have no center hole, but make up into an actuator of ample power. Be sure to use only brass for the bearing pieces.

We fastened all joints of the unit shown with 2–56 screws, and after assembly, when all parts were adjusted satisfactorily, every frame joint was made permanent with soft solder.

The bakelite coil form (*H*) came from a defunct relay. The double winding is put on a form built up from 5/16" i.d. bakelite tube with three fiber washers held on by *Duco* cement. Each coil has 780 turns of #32 enamel wire and both are wound in the same direction.

The disc magnet (*C*) is soldered to the shaft, but the arm should be left loose until you have checked the actuator to find out the exact center posi-

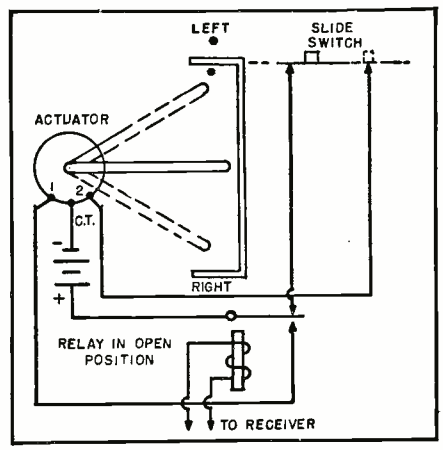
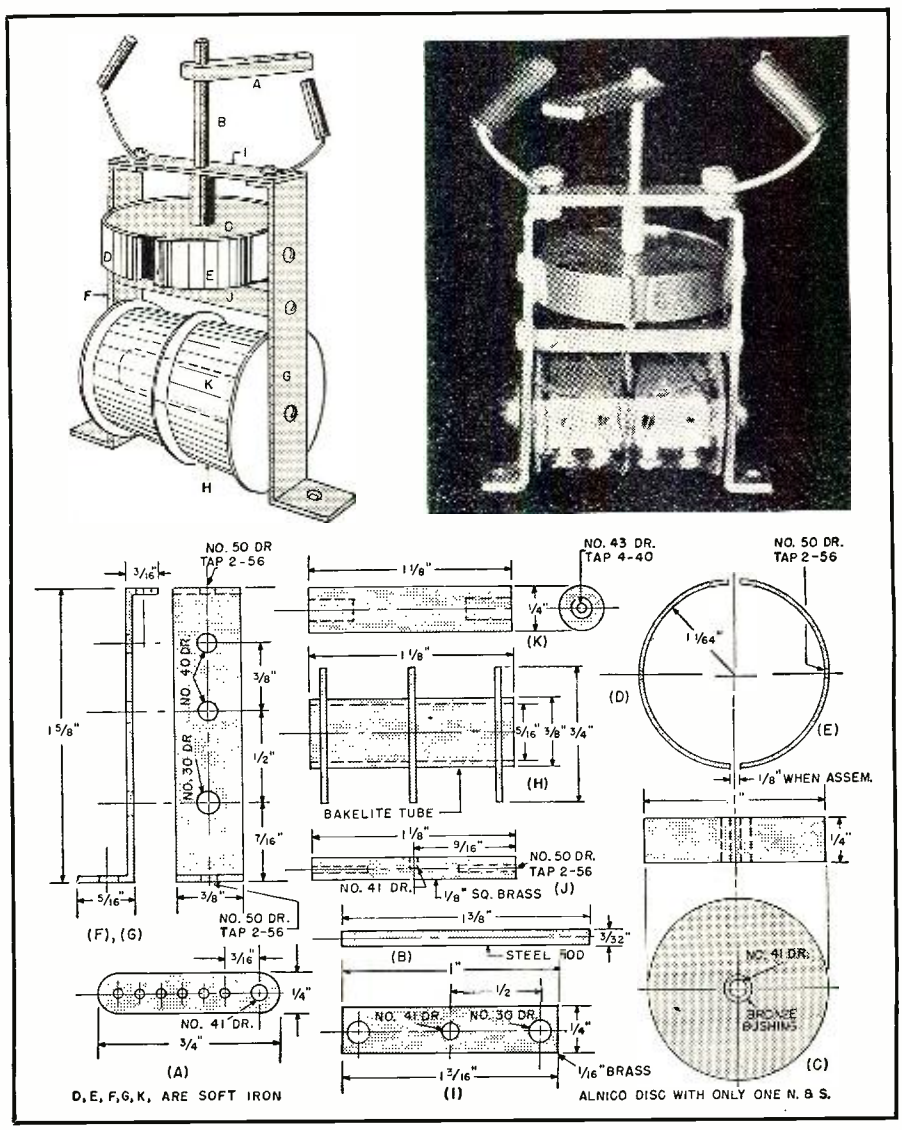



Fig. 2. Actuator wiring diagram. A 3-volt battery is suggested; however, depending on size of plane, this may or may not be too high. To obtain smooth rudder action a resistor of 10 to 20 ohms may be tried in series with the battery. The relay shown is the same as $RL_1$ in Fig. 6.

Fig. 3. Complete details on construction of actuator built by the author. The stop arms are made of soft copper wire with rubber tubing bumpers.



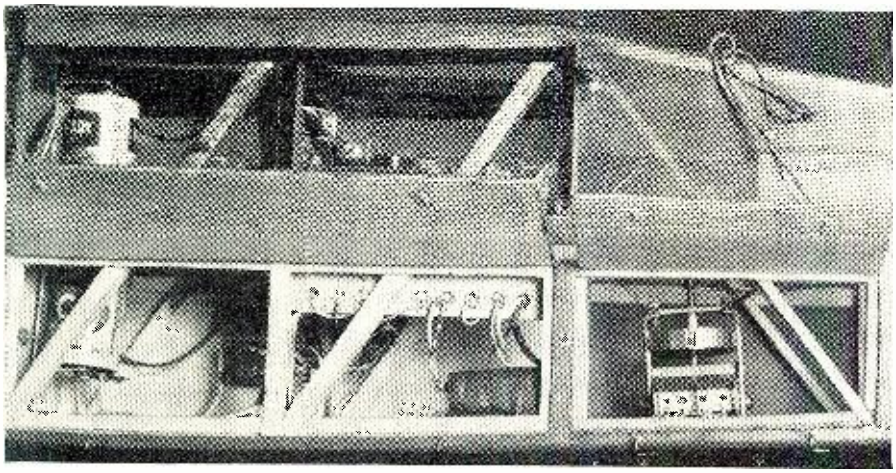


**Fig. 4. Side view of plane looking into the hull. The actuator is mounted on the plywood cabin floor. Its power supply consists of the flashlight cells shown at left. Receiver is just visible above the large hatch cover of unit.**

tion; then it can be soldered fast. To locate center, remove the winding (*H*) and its core (*K*) and you'll find the rotor (*C*) snaps to one position—this is neutral, or center rudder; this position is not as pronounced with the winding core in place, for the latter acts as a sort of magnetic shunt.

Two stops are held by the 2-56 screws on the top bearing. These stops are bent back so that they are not touched by the arm during its normal range of movement. They simply prevent the arm from snapping around to the wrong side.

As noted before, this is a heavy duty unit and would swing a much larger model plane rudder, or even a boat rudder. We drive it with a 3 volt battery (see Fig. 2). The two windings (*H*, Fig. 3), of course, must be connected to give opposite reaction as the relay (Fig. 2) shifts.

It is only fair to warn the reader that proportional control has one bad feature. If some link in the radio system fails, the rudder immediately assumes a hard-over position. In boats or cars this might be nothing but an annoyance; in model aviation it is usually fatal! When proportional control is fitted, model airplanes are normally rigged with more than ample rudder action. When a plane is flying under power, however, if the rudder is held hard over—especially to the left—the plane usually winds up in a screaming spiral dive that can have but one ending—utter disaster! There is a way out of this, though, and Fig. 2 shows you how. The most dangerous condition in most model planes is full left rudder, as propeller torque accentuates the left turn. We set the system up so that loss of signal will cause the sensitive relay to open, as will any failure in the receiver circuit. The actuator arm will fly over to the full left position, forcing the yoke against the upper (left) pin and mechanically opening the slide switch, which is always closed under normal operating conditions. No power reaches either actuator winding now, and the normal centering action of the actuator, plus airstream on the rudder, will force the latter to a near-center position and save the ship from spinning-in. Should control be regained, full right on the stick will restore the yoke to normal (downward) position and control may then be resumed. Of course, with this type of safety device you must take care not to push the control stick to the full left limit, or the device will operate even though your control system is functioning satisfactorily. Unexpected operation of the safety cut-off could be very disconcerting if you were engaged in some tight maneuvers. This can be prevented by setting up your control box stops so that you cannot reach the full no-signal position.

The actuator type of proportional control is self-centering. After you have the system properly balanced, the rudder will always return to neutral if the ground control stick is centered. This makes flying a real thrill and is a safety feature, too. If your plane gets into some unwanted maneuver, you just let the control stick snap to center position, and, with its rudder neutral, the ship's inherent stability will right it. This feature is great for beginners suffering from "pilot trouble"!

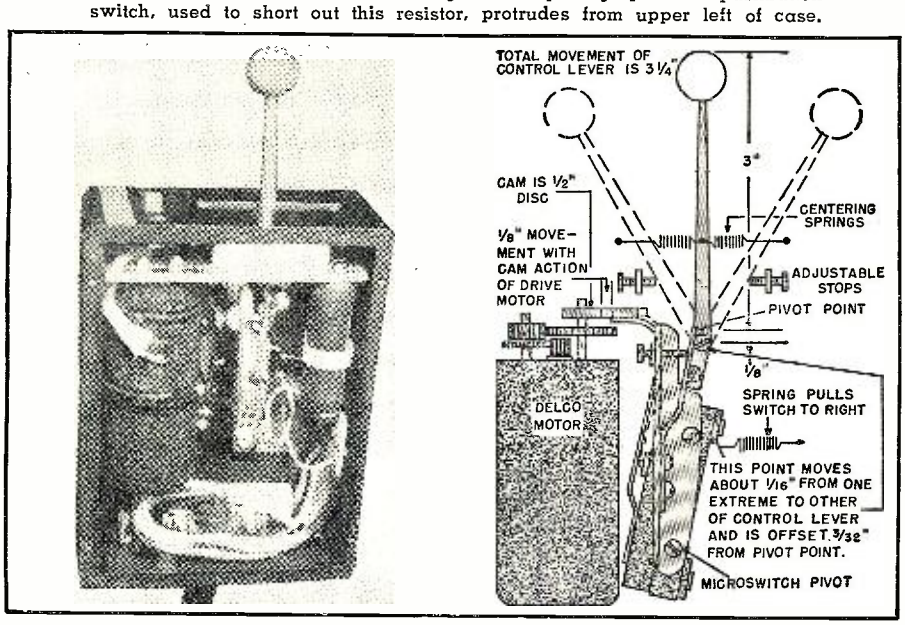
It must be admitted that most fliers using proportional control—the writer not excepted—don't use the safety system we have described. However, *our* particular ship is grounded until the arrangement shown in Fig. 2 can be added. We feel it's foolish to tempt fate any longer!

Now, let's see what kind of a control box is needed to pulse the transmitter and provide variable pulse width and spacing as required. The control box is illustrated in Fig. 5. The drive motor is a surplus job labelled "*Delco* 5069625—120 rpm—27 v. d.c.." It's a series type motor with a governor system designed to hold speed constant over a wide voltage range. The governor doesn't operate below about 15 volts but we left it intact. The motor runs nicely on as low as 4¼ volts and we use it this way in the control box pictured; some experiments were made with different pulse speeds which were secured by the wirewound resistor at the right of the unit. The pushbutton to left of the "stick" shorts out the resistor and applies 5¾ volts to the motor. The motor turns at about 5000 rpm on the normal 4¼ volt input, giving about 380 pulses per minute; when the resistor is shorted out, the pulse rate goes up to about 690. A rate of from 300 to 400 pulses per minute is adequate. The rudder can be seen to wiggle a little, though the movement is so fast the plane doesn't follow it, but pursues a perfectly smooth course.

The output shaft with bearing and gear was discarded, as was the next gear in the train; this left two gears in the case, and the final ratio was about 13 to 1. On the shaft of the larger gear a brass disc ½" diameter and ⅛" thick was pressed. The hole in the disc was bored 1/16" off-center, so the disc acts as a cam with ⅛" total movement.

A *Micro-Switch* provides the contacts; the one we used came with a

**Fig. 5. Complete details on constructing the control unit. The resistor for varying the speed is shown at the right in the photograph. The pushbutton switch, used to short out this resistor, protrudes from upper left of case.**



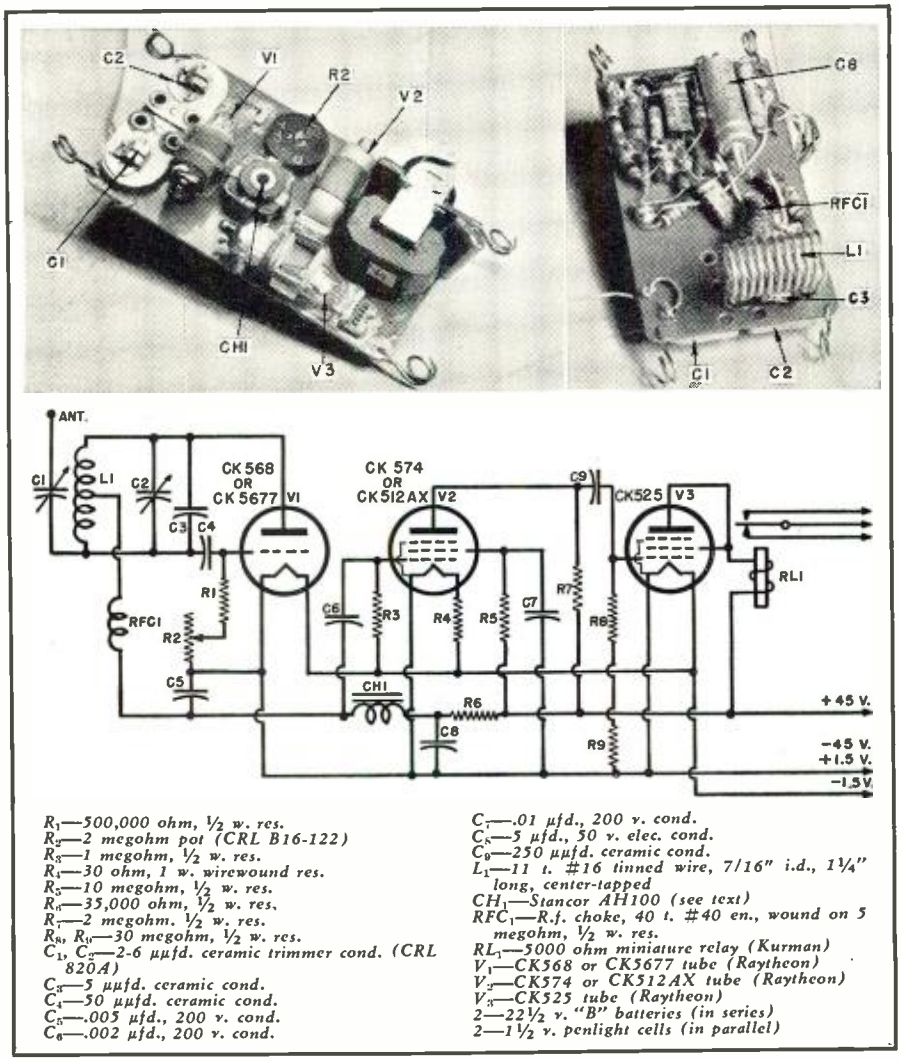
long spring bronze arm that projects about an inch beyond the end of the switch case. This arm was bent over at the end and a ½" diameter ball-bearing riveted on. The ball-bearing rides on the brass cam. This *Micro-Switch* is pivoted by a close-fitting pin through one of the mounting holes (the lower of the two screws in the photo, Fig. 5). Bolted firmly to the *Micro-Switch* is an adjustable arm bearing upon the control lever. A light spring keeps them in contact at all times.

Since this control box was intended for experimental purposes, every possible part was made adjustable or movable. We certainly wouldn't suggest that anyone copy this unit exactly. However, as a guide to other builders, Fig. 5 gives the essential details and ranges of movement. It will be noted that the cam action between control lever and *Micro-Switch* is "off-center" —the contacts are moved much more on one side of center than on the other. It was found, with the original set-up where the movement was equal both sides of center, that right rudder could be had in any degree from just off-center to full-over. Left rudder, however, was pretty abrupt and virtually jumped from just off-center to hard-over. Offsetting the action cured this nicely, although we intend to find out just where in the system the lag, or whatever causes the effect, is located. It's in the radio system somewhere, and all r.f. systems will probably differ in this respect—so just remember the offset trick.

It goes without saying that all moving parts of the control box must be well fitted, with minimum "sloppiness." If they are not, you will find your neutral position shifts every time you move the lever, a positive preventative to accurate or even enjoyable flying.

While a s.p.s.t. contact arrangement is all you need in the control box, it's helpful to have s.p.d.t. contacts, for then you can check results with an actuator connected directly to the control box and a battery, without wasting radio batteries. The proportional system will work with any radio equipment now on the market for radio control purposes, although we presume most readers of these columns will dream up their own radio apparatus. The point is, you can adapt any existing radio plane and r.f. equipment to proportional control; just substitute the control box and actuator for the present pushbutton and escapement.

Having used the RK-61, and its predecessor, the RK-62, for some years, we have often thought of going back to a receiver system that was popular before the miniature gas triodes were developed. It was felt that with "hard" tubes we could obtain the desired control action with less critical adjustment, less sensitivity to dropping battery voltages, and greatly extended tube life. A receiver we had built back in 1939 was dragged out and put through its paces again. The second a.f. tube has a rather high grid leak,




*$R_1$—500,000 ohm, ½ w. res.*
*$R_2$—2 megohm pot (CRL B16-122)*
*$R_3$—1 megohm, ½ w. res.*
*$R_4$—30 ohm, 1 w. wirewound res.*
*$R_5$—10 megohm, ½ w. res.*
*$R_6$—35,000 ohm, ½ w. res.*
*$R_7$—2 megohm. ½ w. res.*
*$R_8$, $R_{10}$—30 megohm, ½ w. res.*
*$C_1$, $C_2$—2-6 μμfd. ceramic trimmer cond. (CRL 820A)*
*$C_3$—5 μμfd. ceramic cond.*
*$C_4$—50 μμfd. ceramic cond.*
*$C_5$—.005 μfd., 200 v. cond.*
*$C_6$—.002 μfd., 200 v. cond.*
*$C_7$—.01 μfd., 200 v. cond.*
*$C_8$—5 μfd., 50 v. elec. cond.*
*$C_9$—250 μμfd. ceramic cond.*
*$L_1$—11 t. #16 tinned wire, 7/16" i.d., 1¼" long, center-tapped*
*$CH_1$—Stancor AH100 (see text)*
*$RFC_1$—R.f. choke, 40 t. #40 en., wound on 5 megohm, ½ w. res.*
*$RL_1$—5000 ohm miniature relay (Kurman)*
*$V_1$—CK568 or CK5677 tube (Raytheon)*
*$V_2$—CK574 or CK512AX tube (Raytheon)*
*$V_3$—CK525 tube (Raytheon)*
*2—22½ v. "B" batteries (in series)*
*2—1½ v. penlight cells (in parallel)*

**Fig. 6. Top and bottom views and the complete schematic diagram of the receiver.**

and the normal rush noise of the detector, amplified by the first audio stage, is sufficient to drop the plate current of this last tube to a low value. When a signal comes in, the rush stops, the bias is reduced, and the last tube draws much higher current, closing a relay in the plate circuit.

An up-to-date version (Fig. 6) of this old idea was worked up using modern subminiature tubes and other midget components, and is illustrated here. Using the lightweight *Kurman* sensitive relay, and the tiniest parts available from the usual radio supply sources, the finished job measures 3¼" x 2" x 1½" and weighs only 3 oz. These figures are not much higher than those of current commercial one-tube radio control receivers, and the little 3-tuber has worked without a hitch.

Besides the advantages mentioned above, this receiver ties in with proportional control particularly well, since, unlike most present day radio control receivers, the plate current is low with no signal. Thus the relay, $RL_1$, is open (or making on the upper contact) until the transmitter goes on, whereupon it closes. This is ideal for the safety system in Fig. 2; the actuator is connected so that no-signal gives left rudder. The rudder also moves left if either the transmitter or receiver (also batteries, wiring, etc.) fails, thereby actuating the left cut-off switch and allowing the rudder to return to neutral.

The tube sockets (Fig. 6) are cemented into oblong slots, and the tubes themselves are held in small fuse clips. Eyelets are employed to hold on many parts, including the fuse clips, ceramic trimmers, $L_1$ and $CH_1$, etc.

Inductance $CH_1$ is a hearing aid output choke with the entire core removed. Four of the "I" strips from the discarded core are inserted through the winding bobbin and bent around the outside; thus providing four individual closed cores.

To save the last fraction of an ounce, we even removed the mounting bracket on the *Kurman* relay and tapped into the iron core to fasten it to the "chassis." This work wasn't worth the trouble, but another modification is definitely required. The two curved contact arms are rather flexible, and under certain conditions of receiver operation, a strong audio vibration could be noted in the relay. A strip of brass, soldered from the lug end of each contact and running out to as near the end as possible, completely cured this difficulty.

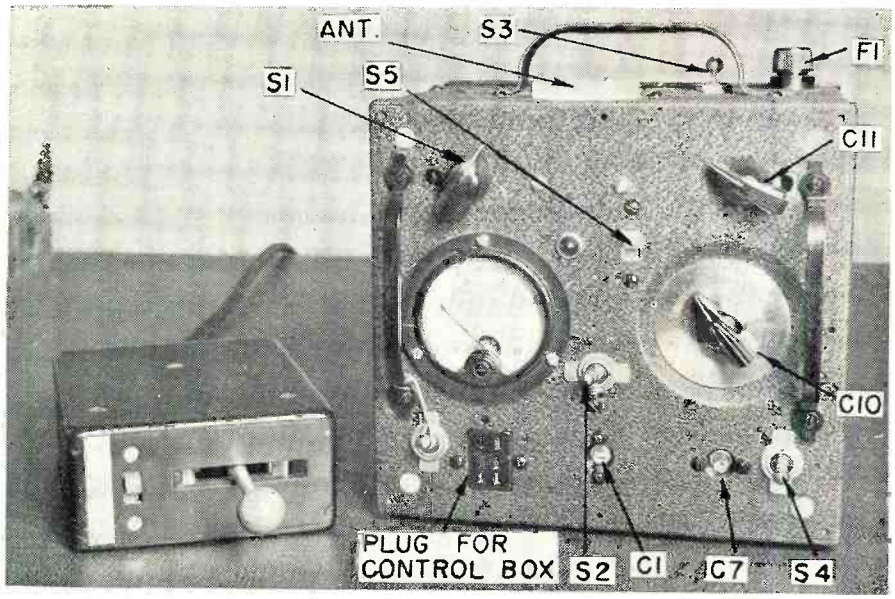



Fig. 7. Over-all view of transmitter with the control box shown at left. The vertical antenna plugs in through the plastic disc at the top of the case. For identification of component parts see transmitter schematic, page 90.

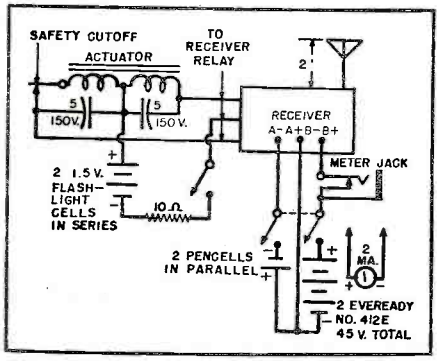



Fig. 8. Wiring diagram showing how miscellaneous equipment in plane is connected.

It will be seen that an electrolytic condenser, $C_8$, is incorporated; this was found necessary to cure a.f. oscillation when the "B" battery internal resistance increases with age. Unfortunately the leakage current of $C_8$ is as high as the whole current drain of the receiver under the no-input condition. However, as the receiver was intended to be relatively unfussy over lowering battery voltage, this condenser is a necessity; $R_6$ drops the leakage current considerably. It was found that if $R_2$ (which establishes operating conditions for the whole receiver) were set properly, the "B" voltage could drop to 38 from the original 45 volts, and the "A" to 1 volt from 1.5, and the set would still operate reliably. The plate current for the entire receiver normally is set at .4 ma. by adjusting $R_2$ and $C_1$; the latter never requires change once it is set properly. The relay is adjusted to operate at about .7 ma. and open at .9; the plate current goes up around 1 to 1.7 ma. depending upon transmitter proximity. Distance checks up to ¼ mile on the ground have proved entirely successful.

There are no tricks required to put the receiver into use. After the input is tuned to the transmitter (the latter operating with very low output and no antenna), condenser, $C_1$, is decreased until it tends to cause a rather rapid plate current rise; a 0–2 ma. meter is used in the receiver "B+" lead for convenience—not in the plate circuit of $V_3$. The antenna may have to be altered in length so that $C_1$ will cause the proper loading at mid-range. $R_2$ is then varied to bring the plate meter to .4 ma. That's all there is to it. If $R_2$ is set to raise the plate current too high, the meter needle will waver quite a bit, while if too low, the plate current with signal will not increase enough to work the relay reliably.

This receiver has proven very satisfactory, and has given no trouble whatever. It has survived several crack-ups that tore it loose from its mountings (it is suspended by rubber bands as is common radio control practice). We feel sure it will work well on the higher ham bands, as $V_1$ is rated by the manufacturer as operable up to "several hundred mc." $V_1$ can be replaced by *Raytheon's* CK5676, a very similar tube using a 120 ma. filament, which is said to be usable as high as 350 mc. Total filament drain of the receiver, as we show it, is about 100 ma.

The three tubes in this receiver total up to considerably more in cost than a single RK61, as used in the majority of radio control receivers, but their life is measured in hundreds of hours, rather than the under-ten hour life of the 61. Furthermore, they have recently appeared on the surplus market at around $1.50 each! (*TAB*, N.Y.C.).

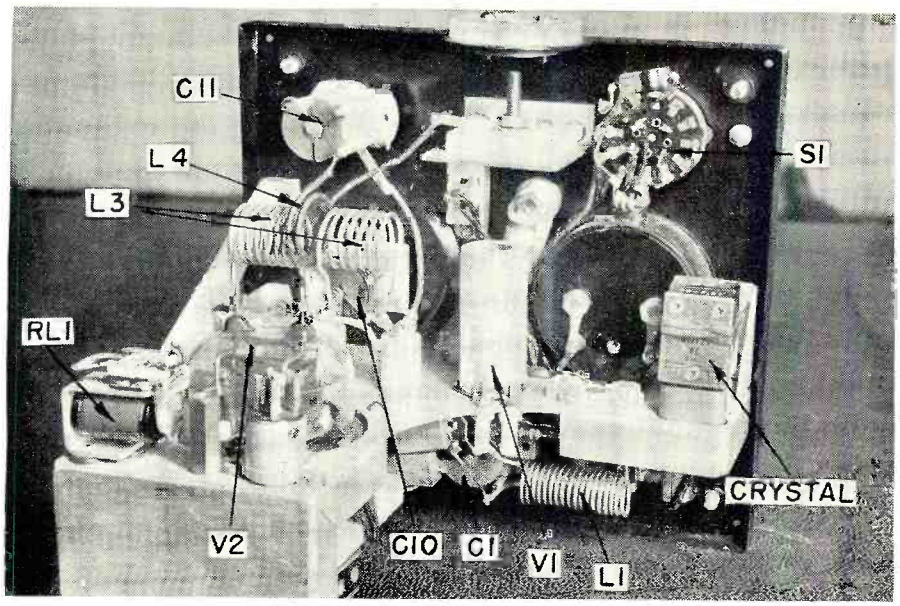
The complete circuit of the airplane equipment is seen in Fig. 8. The only unusual feature is the use of 5 μfd., 150 volt electrolytic condensers across the relay contacts. The relay requires quite a sensitive setting and during first trials it would often unaccountably "stick." No arcing could be seen at the contacts, nor did they show any pitting. The inductive kick of the actuator coils was the cause, and the electrolytics cured the trouble. They must be properly polarized, of course.

The transmitter (Figs. 7, 9, and 10) does not require a great deal of description as it follows regular amateur practice. It is entirely self-contained in a case 7¼" wide by 7½" high by 6½" deep. Practically every part in it was gleaned from the surplus markets, including the dynamotor—a 9 volt type that gives 275 volts under full load of the set, with about 5½ volts at the input brushes. It measures about 3¼" diameter by 6" long and is placed vertically in the case on small shock mounts. The chassis is cut out to fit and it must be admitted that some juggling was needed to get the transmitter parts in the space left!

All components associated with $V_1$ are under the chassis except the crys-

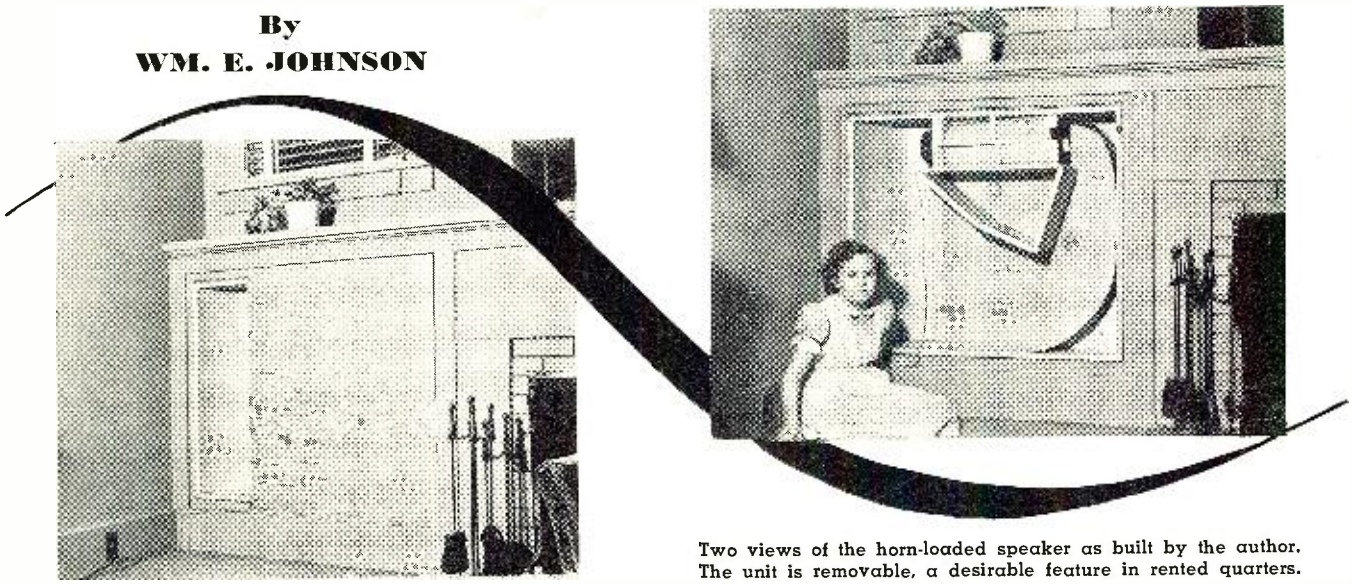
(*Continued on page* 90)

Fig. 9. The large cutout in the chassis is provided to permit clearance of vertically mounted dynamotor. Note two crystals in double socket at right. See transmitter diagram, Fig. 10, page 90, for identification of parts.



# A Novel HORN-LOADED SPEAKER

By
**WM. E. JOHNSON**



Two views of the horn-loaded speaker as built by the author. The unit is removable, a desirable feature in rented quarters.

***For those who have a fireplace-bookcase combination of this type, it is an easy task to build this inconspicuous unit. Add a horn to your present speaker to provide smoother performance. It will extend the unit's low frequency response considerably.***

AS MOST of you know by now, there is no substitute for a horn for true sound reproduction. The corner horn has been developed to achieve the necessarily heroic dimensions while providing something you can stuff in your living room.

I had to be convinced of the value of a corner horn, but after listening to two of them, the convincing was done. All I had to do was find a corner to put one in. We recently moved, and one of the things I looked for in our house-hunting was a corner in which to put a speaker. Houses aren't usually built with such specifications in mind so we had to settle on a house that met our other requirements.

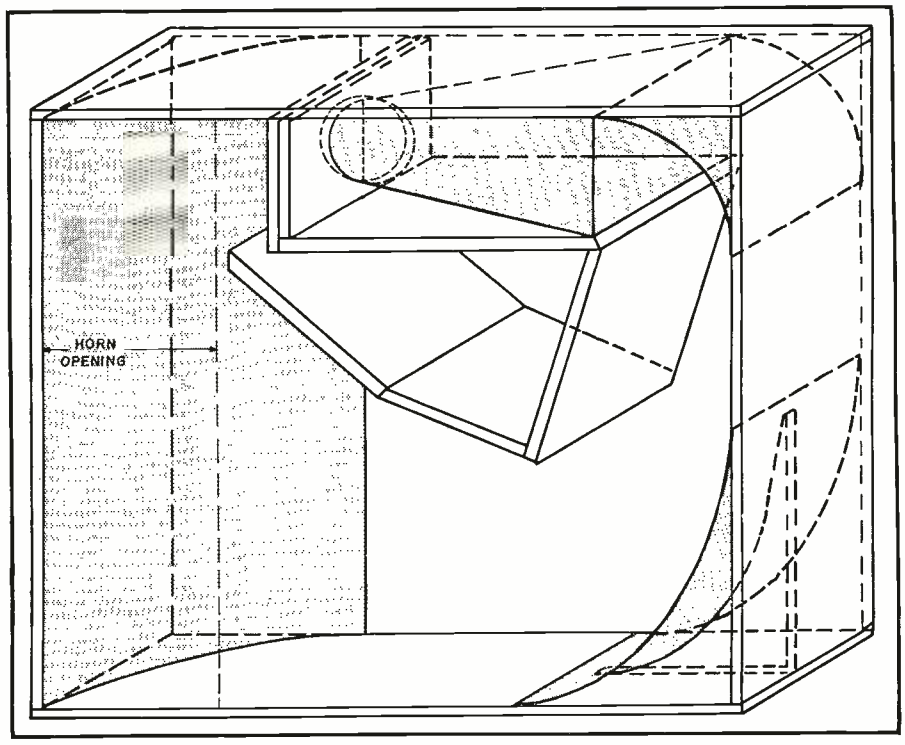
We now had a house that was unsuited for a conventional corner type horn and, in addition, we didn't have the money to spend on the high-priced woofer and tweeters for a two- or three-channel system. We did have a fireplace at one end of our living room with bookshelves on each side that extended to the corners and we also had a very fine eight-inch speaker, the *Western Electric* 755-A. A little plywood, a little linoleum, a little imagination, and a lot of work, and there was our corner horn.

It probably isn't the master, or even the equal, of the more elaborate jobs but it provides substantial improvement for an already fine speaker. Horn loading smooths and greatly extends the bass response. High frequency radiation is largely from the rear, through the center pole piece, and wide dispersion is accomplished by reflection from the curved, vertical piece of linoleum. Those of you who are familiar with this speaker know that its normal high frequency radiation is confined to quite a tight beam directly on its axis. The difference in various parts of the room is now almost undetectable. Tests with the younger members of the family show very good response well beyond my cut-off of about 14,000 cycles. As shown in the photograph, the high frequency source is above chair height, so furniture arrangement is quite independent of sound considerations.

Room appearance and flexibility of furniture arrangement were important considerations in designing this system. It was decided that a compromise in sound quality would be more desirable than a perfect sound-

(*Continued on page* 144)

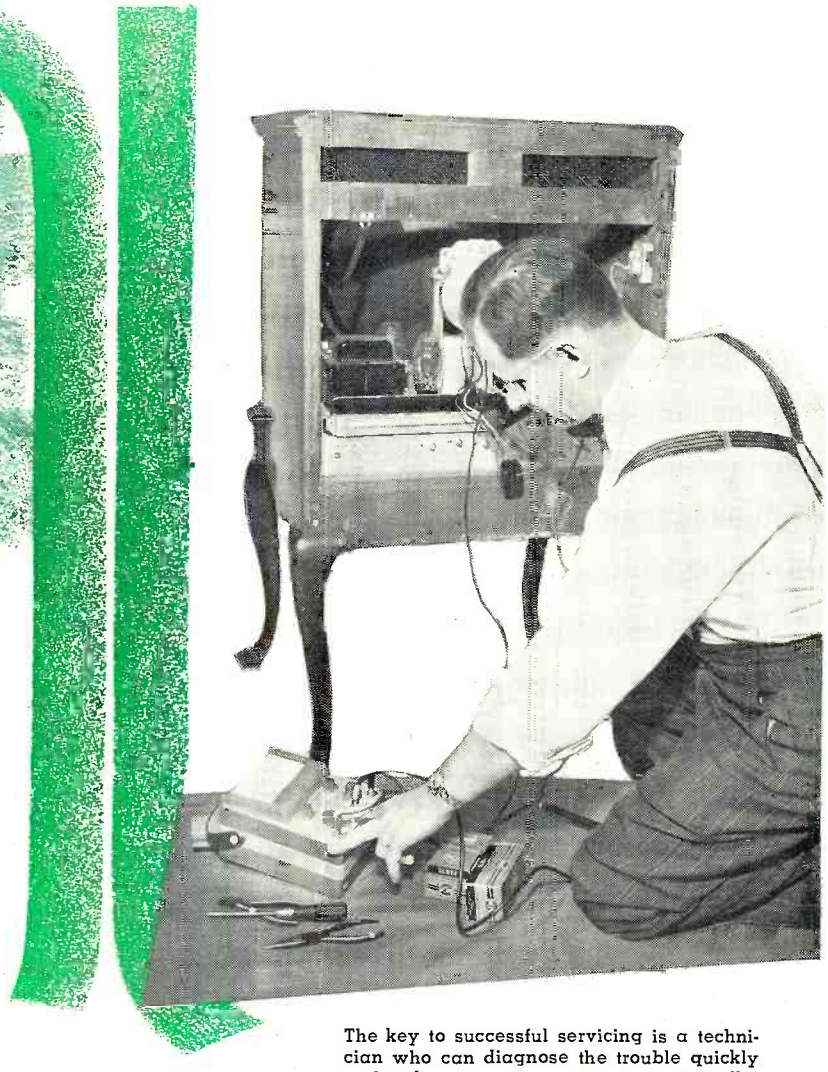
Details of construction. Linoleum and plywood are the only materials required.



# TV TEST EQUIPMENT For Outside Service Work

By
**M. B. LONG**

***About 75% of all house calls involve tube replacement. For the balance, a 20,000 ohms-per-volt voltmeter or a v.t.v.m. is the most practical unit.***



The key to successful servicing is a technician who can diagnose the trouble quickly and make necessary repairs systematically.

MOST outside television service work can usually be handled with just a tube replacement kit. It can be fairly stated that approximately 75 per-cent of all TV service calls are a result of tube failure. As for the 25 per-cent that do not respond to the tube "treatment," these are the ones that cause the grey hair. To service these sets efficiently in the customer's home, since the removal of a set is both time consuming and costly, a good vacuum tube voltmeter or at least a 20,000 ohms-per-volt meter is a necessity.

A v.t.v.m. is the ideal instrument to cope with sets exhibiting characteristics of component part failure, where condensers short or open, resistors burn or change value, etc.

Let's discuss a few typical examples. A particular set boasts of a bright horizontal line across the center of the picture tube; the rest of the screen is dark. Obviously this is an indication of "no vertical sweep." After replacing tubes the technician should turn his attention to the vertical sweep circuits. What are the possible sources of this trouble? The parts of the circuit involved are the vertical sweep oscillator, the vertical amplifier, the vertical output transformer, or the vertical coils in the deflection yoke. With sets having electrical centering controls, a quick check can be made before the chassis is removed from the cabinet to determine whether the trouble is in the vertical output transformer or deflection yoke. The centering control is used to vary the amount of d.c. flowing through the deflection yoke, which produces the centering action. If either the secondary of the vertical output transformer or the vertical coils in the deflection yoke are open, there won't be any vertical sweep, nor could the amount of centering current through the yoke be varied. As a result, when the centering control is turned, it won't affect the position of the bright horizontal line. If the line moves up and down when the control is turned, this indicates that the output circuit is complete and that the technician can go on to the vertical oscillator and amplifier.

A quick test to see if the vertical oscillator is working would be to check for negative voltage between grid and cathode. All oscillators—whether vertical sweep, horizontal sweep, local oscillator, Hartley, Colpitts, etc.—have one important characteristic in common. When oscillating, they always produce a negative voltage on the grid with respect to the cathode. To measure this voltage a meter that will not load the circuit and upset it is required. This means a 20,000 ohms-per-volt unit or a vacuum tube voltmeter. Loading the circuit with a 1000 ohms-per-volt meter may cause the circuit to stop oscillating as long as the meter leads are connected, thereby giving the impression that the circuit is inoperative.

A word of caution—be sure to check between grid and *cathode,* rather than to ground, because quite often the grid and cathode may be tied to a point that is negative with respect to ground and, as a result, a negative reading would be obtained whether the circuit was working or not. If the oscillator is not working, a few quick checks with the voltmeter for plate or screen voltage would probably indicate the source of trouble. Assuming the oscillator is working, the next step would be to trace the signal to the vertical amplifier. Since the signal generated by the vertical oscillator is low in frequency (60 cycles) it can be measured and traced with the a.c. ranges of the v.t.v.m. This signal must eventually be applied between the grid and cathode of this stage, so the ground lead of the v.t.v.m should be clipped to the cathode. Moving the test lead from the plate of the oscillator through the coupling circuits and then to the grid of the vertical amplifier permits actual "signal tracing" of the complete vertical sweep circuits with the v.t.v.m. Loss of signal along the line might indicate an open coupling condenser. So much for the vertical sweep circuits.

Suppose the complaint indicates trouble in the sync circuits. If replacing tubes doesn't cure the fault, the

average outside technician is inclined to pull the set in to the shop, because trouble in the sync circuits usually requires signal tracing with a scope. Actually, a good percentage of these troubles could be located and repaired in the customer's house with the aid of the v.t.v.m. Most sync clippers, sync levelers, and sync separator stages are grid-leak biased. That is, the grids of the tubes used in these stages are usually driven positive by the signal, causing grid current to flow, thereby producing a bias which adjusts itself to the amplitude of the applied signal. No signal—no grid current—no negative bias voltage! Simply check for negative bias voltage with the v.t.v.m. It is as easy as that! To be sure that the voltage being measured is due to the signal, the preceding tube should be removed. If the voltage disappears, we can be reasonably certain that it is produced by the signal. This method permits the "signal tracing" of the sync circuits and the location of open coupling condensers or stages that aren't working.

Horizontal automatic frequency control circuits are usually serviced with a scope in the shop, but they can be handled quite easily in the home with a v.t.v.m. Fig. 1 is a block diagram of a typical "syncrolok" circuit containing three stages. Basically, these stages function as follows. The horizontal oscillator generates the sweep signal. Some of this signal is applied to a discriminator or "comparer" circuit. Horizontal sync pulses received from the transmitter are also applied to this circuit. The two signals are compared as to their frequency and phase. If they are "in step," the output of the discriminator is zero. If the frequency of the oscillator is higher than that of the sync pulses, the discriminator output is a small negative voltage. If the oscillator is lower, the output voltage is positive. These "control" voltages are applied to the grid of the control tube. This control tube acts as a variable inductance in parallel with the oscillator coil. If the grid is made positive, its effective inductance is increased. If it is made negative, its inductance would appear to decrease. This change in effective inductance varies the frequency of the horizontal oscillator. If the horizontal oscillator frequency were to drift from its correct value, the discriminator would produce a control voltage which would affect the control tube which, in turn, would correct the frequency of the oscillator. As a result, the frequency of the horizontal oscillator is kept locked in step with that of the sync pulses.

A breakdown in the discriminator or control tube circuits would result in "no horizontal sync." Now let's see how the v.t.v.m. could be used to localize trouble in this circuit. Referring to Fig. 2, it will be noticed that the grid of the control tube has two volts of negative bias applied from the negative power supply. This, then, would be the normal operating voltage if the discriminator output was zero. Assuming that the system isn't operating and that the picture can't be "locked" horizontally—the first problem would be to isolate the defective stage. Since there is a picture, the horizontal oscillator is operating. Thus, the trouble must be either in the discriminator or control tube circuits. The first step would be to short the grid of the control tube to ground and note the effect on the picture. Let's stop to see what shorting the grid to ground does. Normally there should be two volts negative on the grid. Shorting it drops this voltage to zero. The control voltage on the control tube has been changed and this should produce a change in the horizontal oscillator frequency. The visible effect on the picture should be the same as if the setting of the horizontal hold control were changed. If a change is noticed, it indicates that the control tube circuit is working and the trouble lies in the discriminator circuit. No visible change would indicate that the control tube circuit is at fault. Now the v.t.v.m. can be used to verify these findings. The v.t.v.m. should be connected from the control tube grid to ground. Set the horizontal hold control to the middle of its range. Note the voltage on the grid. Then rotate the hold control from one extreme to the other. Doing this increases the frequency in one direction and decreases it in the other direction. This should produce a changing control voltage at the output of the discriminator, which should appear on the grid of the control tube. If the grid voltage changes when the control is rotated, it indicates that the discriminator circuit is operating and the trouble lies in the control tube circuit. If

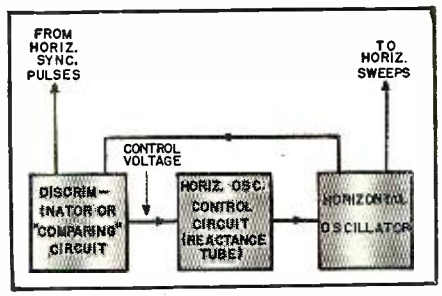



Fig. 1. Block diagram of conventional automatic frequency control circuit.

the voltage doesn't change, the trouble is in the discriminator circuit. Once the defective stage is isolated a few quick checks with the v.t.v.m. "plate voltage, screen voltage, bias, resistance" should spot the defective component.

These are just a few examples of what can be done in TV service work in the home with just a replacement tube kit and a v.t.v.m. The 20,000 ohms-per-volt unit has one possible advantage over the v.t.v.m. in which the outside service man might be interested. It is self-powered. Whether or not this is a real advantage would have to be decided by the individual, bearing in mind the cost and inconvenience of battery replacement.

Additional service equipment that the outside technician might want to carry, which could be classed as "not absolutely necessary, but nice to have," would be a scope. With a scope he could actually see the picture signal and trace from the video detector, through the video amplifiers, right up to the grid of the picture tube. He

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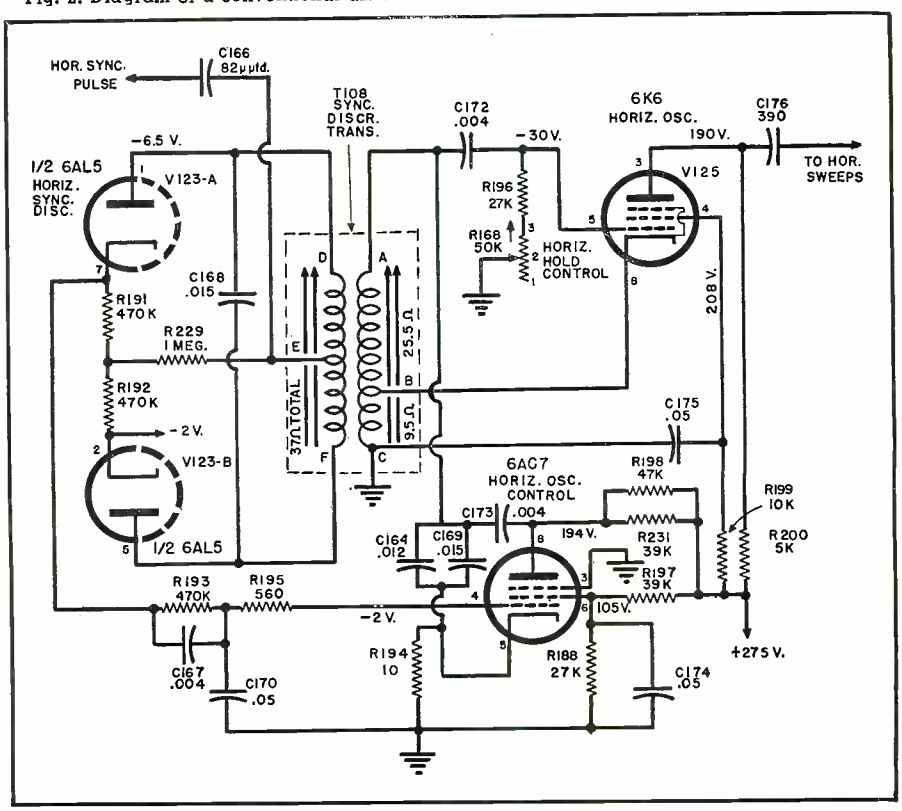
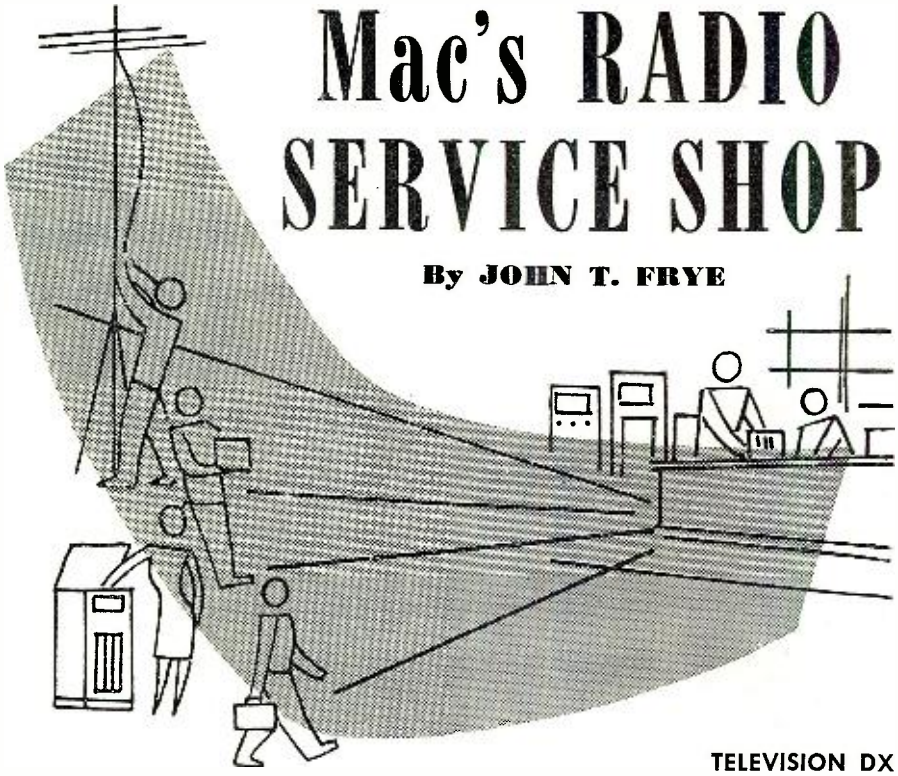
Fig. 2. Diagram of a conventional discriminator and horizontal oscillator of a TV receiver.



# Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



TELEVISION DX

SUDDENLY Barney, the "hired hand" of Mac's Radio Service Shop, slammed his solder gun down on the bench and demanded of his boss: "Mac, what's so doggone funny? You've been grinning like a television toothpaste commercial ever since you came back from lunch."

"Well," Mac explained, "by the time I got over to the Dutchman's this noon, all of the counter stools were taken, and I had to sit in a booth. While I was eating I couldn't help but overhear a hot antenna argument going on between a couple of rabid TV fans in the booth behind me. Each guy was whooping it up for his antenna system and using as evidence the distant television stations he pulled in during that 'opening' we had around last Decoration Day. Number One gave all the credit to his battery of yagis, while Number Two was convinced that his colinear array was what enabled him to yank in the DX."

"And that's side-splittingly funny?" Barney questioned with arched eyebrows.

"In a way it is. I kept thinking how amusing it would be if I butted in and related my own experience during that period. You will remember that I had just received my new television chassis at the time and was waiting on a cabinet. However, I was so eager to try out the high-fidelity amplifier on a couple of speakers I had at home that I unpacked the chassis and set it on top of the shipping carton, cut a twin-lead folded dipole roughly for the FM band and tossed it on a desk beside the set, slid in a picture tube, and turned on the set.

"While I was adjusting the ion trap on the seventeen inch tube I was using, I began to notice pictures on the screen. In the next couple of days, using that very poor antenna, a yardstick for an antenna tower, without any booster of any sort, and at this Northern Indiana location seventy miles from the nearest TV transmitter, I logged Cuban stations on Channels 4 and 6; Miami and Jacksonville, Florida, stations on 4; Chicago stations on 4, 5, 7, and 9; San Antonio, Texas, on 4 and Houston on 2; Milwaukee on 3; Louisville, Kentucky, on 5; and Indianapolis on 6. While there was fading on some of the signals, both sound and picture were received in each case with sufficient clarity to make identification easy and positive. In many cases, the reception was perfect, without the slightest snow or noise."

"You don't suppose you could have stumbled on some kind of a super antenna in that twin-lead job, do you?" Barney suggested hopefully.

"Not a chance," Mac replied with a chuckle. "Just to make sure, while Cuba was rolling in on Channel 4, I took off the antenna and touched one of the terminals with a screwdriver. 'Television Para Todo' came in almost as well as it had with the antenna.

"No," he continued, "the point of the whole thing is that the antenna efficiency seems to mean little during these periods of freak reception. In fact, a low antenna may actually do a better job of picking up DX at such a time than will an antenna mounted on top of a high tower. Either refraction or reflection causes the distant signals to come in at pretty steep angles. The fact I could pick them up down in the bottom of this river valley proves that. Signals from fairly close stations, on the other hand, are usually not subject to so much distortion and continue to be picked up better by more elevated antennas. As a result, an antenna that is really up in the air picks up enough signal from a nearby station to interfere seriously with a DX signal. A low antenna, on the other hand, gets the distant signal just as strongly and without the interference from the close station."

"Then you think that when one of these freak DX periods start, the thing to do is to start looking for faraway stations with a tuning knob in one hand and a folded dipole in the other."

"It's worth a try, anyway," Mac said, smiling at the graphic picture Barney's words evoked. "One thing in favor of such a system is that it allows you to switch the antenna around much quicker than can be done with a rotating motor, and that is a distinct advantage in this freak reception. The signals from Texas were received best with the ends of my folded dipole pointing southwest and northeast—exactly opposite to what a person would normally expect and indicating that the signal was arriving by way of a most devious route. Furthermore, I counted as many as five separate ghost images on the signal from Houston, some displaced from the main signal by as far as three inches on the sixteen-inch screen. These ghosts kept moving back and forth behind the main signal, and by turning the antenna, the chief signal and one of the ghosts could sometimes be made to exchange roles. Often the signal arrived in the form of closely-spaced waves of strength, and being able to whirl the antenna about quickly during the peak of the wave permitted the best position to be readily determined.

"Next time, though, I intend to use a special antenna I am making up just for freak DXing," Mac continued. "It consists of a folded dipole with end sections that telescope like the slide on a slide-trombone. A telescoping reflector is also used, and both units are mounted so that the space between them can be easily varied without upsetting their relative alignment. The element sections and the 'boom' are marked so that the array can be quickly set up for any channel."

"Why go to all that trouble when you say the efficiency of the antenna is unimportant when the DX signals are really piling in?"

"I'm not trying to increase the efficiency of the antenna," Mac explained. "What I want is an antenna that is more one-directional to help in establishing more accurately from just which direction the signal arrives; furthermore, by being able to tilt the simple array, I hope to get a rough idea of the angles at which the signals come in. Still another hoped-for advantage lies in the possibility of doing a better job of separating several stations likely to be found occupying a single channel during one of these unusual periods. You should have heard five different stations battling it out on Channel 4 like cats fighting over a fishhead as I did last May 30th. That

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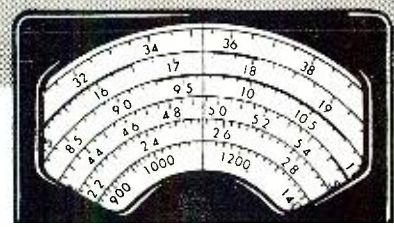
# International SHORT-WAVE



***Compiled by* KENNETH R. BOORD**

'T IS A pleasure this month to dedicate the *ISW DEPARTMENT* - - to radio in Canada. Thanks go to F. P. Johnson, Senior Engineer, International Service, *Canadian Broadcasting Corporation,* for this fine data.

In November 1936, when the newly-formed *Canadian Broadcasting Corporation* took over the Canadian Radio Broadcasting Commission facilities, with its establishment of 20 employees in Montreal, network broadcasting consisted of six hours of programming daily. Today, less than 15 years later, the *CBC's* new Radio-Canada Building in Montreal, Quebec, represents the latest link in one of the largest radio systems in the world. From its 26 ultra-modern studios flow programs in 14 different languages to Canada and the world 18 hours a day.

In an average year, the Radio-Canada Building supplies nearly 6000 hours of network programming within Canada—more than any other *CBC* production center. These are carried on the *CBC's* Trans-Canada and Dominion Networks to *English*-speaking Canadians across Canada, and on the French network (which has its headquarters in the building) to French-speaking Canadians.

The International Service also has its headquarters in the Radio-Canada Building and shares studios with the National Service. From these studios, then, the *Voice of Canada* is carried over 600 miles of land line to the two powerful IS transmitters at Sackville, New Brunswick, which sends it around the world. The total output from the 26 studios goes to eight separate transmitters.

Out of the Radio-Canada Building, too, come recordings of *CBC* programs for a number of French-language stations across Canada and for foreign countries.

Soon the new building will be the center of still another service—television. In the building's five-story television wing, TV programs from three studios for *English* and French audiences in the Montreal area will be produced. These programs will be broadcast from atop Mount Royal.

In addition to all of these outgoing services, the Radio-Canada Building also is the center of seven incoming radio networks.

These are the radio activities which make *CBC's* new Radio-Canada Building one of the busiest—as well as the most modern—radio centers on the North American continent.

Despite problems of scattered population and vast distances, the *CBC* has established itself as the largest operating entity of its kind in the world. Today, the *CBC* operates more extensive networks and broadcasts in more time zones (6½ of the world's 24 are in Canada) than any other radio system in the world.

The *CBC* operates a total of 55 transmitters for its National and International Services. In Canada alone, these transmitters help to make it possible for more than 95 per-cent of the country's population to hear network radio programs. Of these 55 transmitters, 20 are standard band AM stations (8 with a power of 50 kw. to give adequate service in rural areas); five FM stations are operated (in Montreal, Toronto, Ottawa, and Vancouver). Four short-wave transmitters (on 11 frequencies) carry service to remote areas in Canada, and 24 low-power relay transmitters have been installed to serve listeners in sparsely-populated sections along the Trans-Canada network. Four more of these relays now are being installed. The International Service employs two 50 kw. transmitters (on 15 frequencies) to beam programs abroad. These transmitters broadcast the strongest signal reaching Europe from this side of the Atlantic, *CBC* reports.

The short-wave transmitting station at Sackville, New Brunswick, is a modern two and a half story structure of reinforced concrete. The main equipment—for the two short-wave transmitters and for the standard broadcast band station CBA—is installed in separate rooms on each side of the main control room and the standby power supply enclosure. In the right

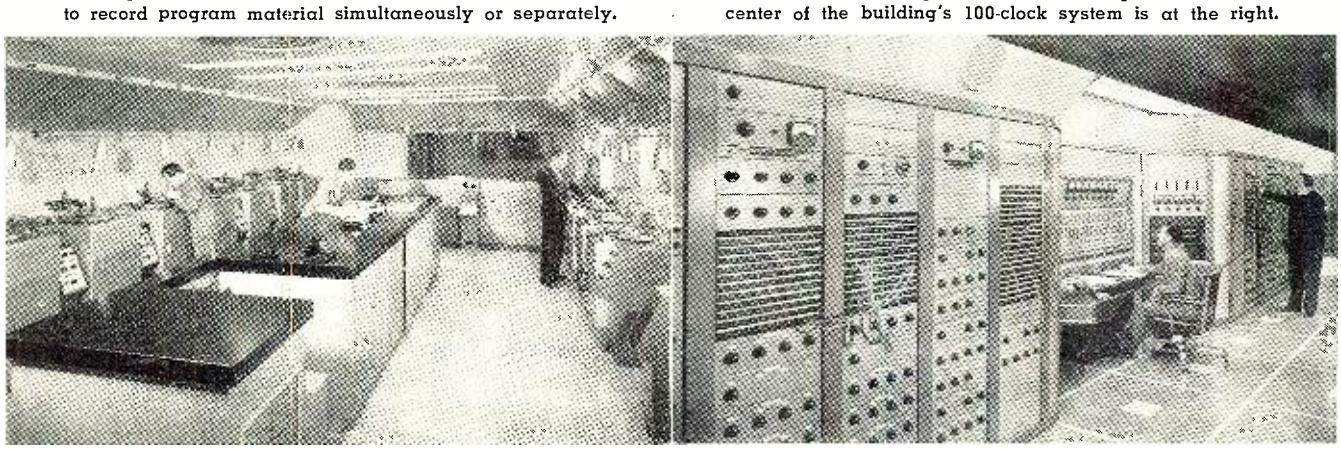
(*Continued on page* 127)

(Note: Unless otherwise indicated, all time is expressed in American EST: add 5 hours for GCT. "News" refers to newscasts in the English language. In order to avoid confusion, the 24 hour clock has been used in designating the times of broadcasts. The hours from midnight until noon are shown as 0000 to 1200 while from 1 p.m. to midnight are shown as 1300 to 2400.)

The symbol "V" following a listed frequency indicates "varying." The station may operate either above or below the frequency given. "A" means frequency is approximate.

**Radio-Canada's modern soundproof recording room where any of 50 programs passing through master control can be chosen automatically for recording. Each recorder (disc or tape) has its own control panel, clock, light, and overhead speaker. All fourteen of these machines can be used to record program material simultaneously or separately.**

**Acknowledged as one of the most modern on the continent, the new master control at CBC's Radio-Canada Building also carries the heaviest load. Capable of handling 5 transmitters, 8 outgoing networks, 7 incoming networks, and 26 studios, it is designed for operation by one man. The center of the building's 100-clock system is at the right.**



# VOLTAGE REGULATORS

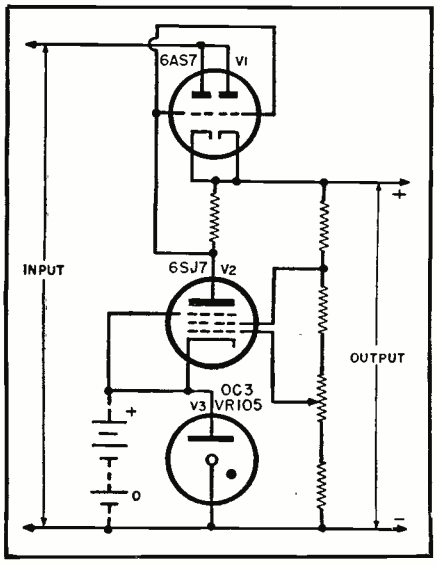
By JOSEPH E. WILLIAMS, W8AME

***Ideas on designing your own voltage regulators. There is a choice of designs that will handle reasonable loads at any desired output voltage.***

IN COMMON with many radio amateurs and experimenters who enjoy trying out new electronic circuits, the writer has often required power supplies for different voltages. Often, when the right voltage was obtained, the regulation was so poor that the characteristics of the circuit under test were severely affected. A power supply capable of handling a reasonable load with good regulation over a continuously variable, wide-range choice of output voltages would have been particularly valuable during such experimentation. A review of the subject indicated that such a unit was both possible and practical. This article has been written with the thought that others might get useful ideas from the writer's attempts to answer this problem, even though they do not actually construct either of the two units described.

Among the power supplies having regulation of a sort, one has a choice of batteries, ballast tubes, choke input filters, voltage regulator tubes, and electronic voltage regulators. Of these, the electronic voltage regulator showed the most promise. Actual use of this type of equipment produced amazing stability. Voltage variations of less than 1% are usually realized and the power limits can be quite high, depending on the number and type of regulator tubes used. The main trouble encountered was the voltage range available, usually from 150 to 350 volts, or from 250 to 450 volts. If the unit is capable of covering these ranges why not regulation for voltages below 150?

Fig. 1. Basic diagram of an electronic voltage regulator. See text for explanation.



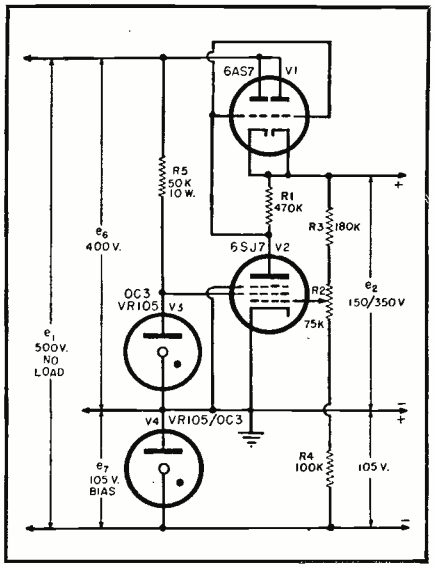



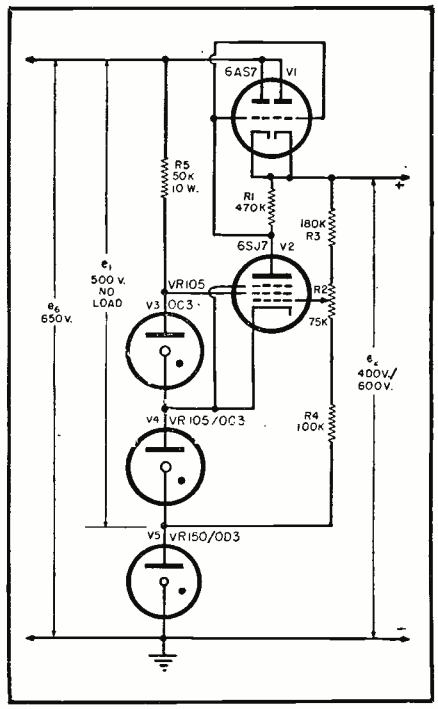

Fig. 2. Modified form of the electronic voltage regulator circuit shown in Fig. 1.

The basic circuit for the electronic voltage regulator is shown in Fig. 1 while a modification is shown in Fig. 2. In these circuits the regulation and choice of output voltage are obtained through changes in the series resistance of the low-mu regulator tube, $V_1$, which occur with changes in grid bias. The grid bias of $V_1$ is controlled in turn by a high gain, sharp cut-off pentode, $V_2$, which is connected so that any variation in the output voltage of the regulator is reflected on the grid of that tube. The control tube, $V_2$, has its cathode held at a fixed reference potential by a battery, or as in this circuit, a voltage regulator tube. Any tendency for the output voltage to rise swings the grid of the control tube in the positive direction, causing it to draw more plate current thereby increasing the voltage drop through resistor, $R_1$. $R_1$ is in the regulator tube $V_1$ grid circuit and the resulting increase in bias increases the series resistance of that tube and opposes the tendency for the output voltage to rise. The tendency for the output voltage to drop below the chosen setting causes reverse action. The action takes place either with changes in supply voltage or in load.

The factors which determine the voltage range of the circuit in Fig. 2 work out as follows:

1. The maximum output voltage, $e_2$, will generally be 50 volts less than the input voltage, $e_1$, due to the minimum voltage drop through the regulator tube, $V_1$.
2. The maximum range for the output voltage, $e_2$, is limited by the maximum plate voltage which can be applied to the regulator tube, $V_1$. This will be around 250 volts for tubes ordinarily used in this service.
3. The minimum output voltage, $e_2$, is limited to the total of the reference voltage, $e_4$, plus the bias voltage, $e_5$, necessary for cut-off bias for the regulator tube, $V_1$. It will be around 250 volts if a VR105 is used for $V_4$.
4. The maximum input voltage, $e_1$, is limited to the total of the minimum output voltage plus the maximum plate voltage for the regulator tube, $V_1$. It will be around 500 volts for this circuit. Also, it should check reasonably close to the total of the reference

Fig. 3. Voltage regulator design for 650 volt input. The input voltage ($e_6$) is the sum of $e_1$ plus voltage rating of $V_5$. More than one VR tube can be used in series with $V_5$ for higher voltage. Circuit is grounded at its lowest negative point.



voltage, $e_4$, plus the maximum rated plate voltage for the control tube, $V_2$, plus the minimum voltage drop through $V_1$. If a 6SJ7 is used for $V_2$ that total is also 500 volts.

5. The maximum load current is limited to the maximum rated plate current for the regulator tube, $V_1$, and its plate dissipation. The 6AS7 is designed specifically for this service. It is very low-mu and will deliver from 125 ma. continuous service to 200 ma. for short periods. These limits may be increased by connecting additional regulator tubes in parallel as required. The input power supply must have a corresponding power capability.

The circuit of Fig. 2 is a unit which can be inserted in series with the load and across the output of a power supply to obtain a regulated 250 volt adjustable variation in the output voltage. If the power supply delivers 500 volts it is a natural match for the regulator as that total voltage is required by the circuit with the components ordinarily used.

If the power supply is rated at more than 500 volts it becomes necessary to make up the difference by adding a stabilized voltage element, such as a voltage regulator tube, in series with the regulator unit across the power supply. Fig. 3 shows the regulator unit adapted for use with a 650 volt supply by the addition of a VR150 regulator tube. A 200 volt regulated range can be obtained from higher voltage supplies by adding more voltage regulator tubes in series with the regulator unit.

The same principle applies for power supplies of lower voltage. The difference between the 500 volts required by the regulator unit and the power supply voltage must be made up by a stable voltage element.

The circuit of Fig. 4 is a familiar one which can be found in most texts and manuals. A 400 volt supply is used with the negative lead connected to the cathode of the control tube, $V_2$. The additional 100 volts required for the regulator circuit is supplied from an auxiliary bias supply. The output voltage is regulated over a range from

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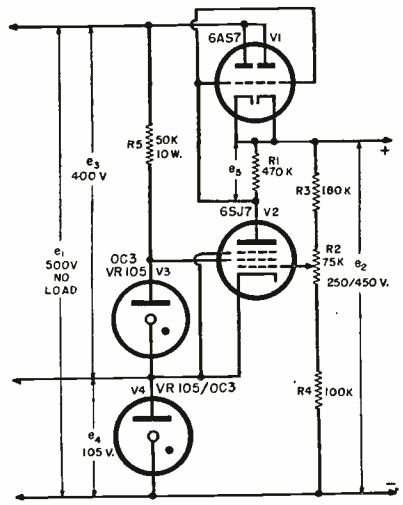



Fig. 4. Circuit diagram of a voltage regulator grounded at the control tube level. Both power and bias supplies are required.

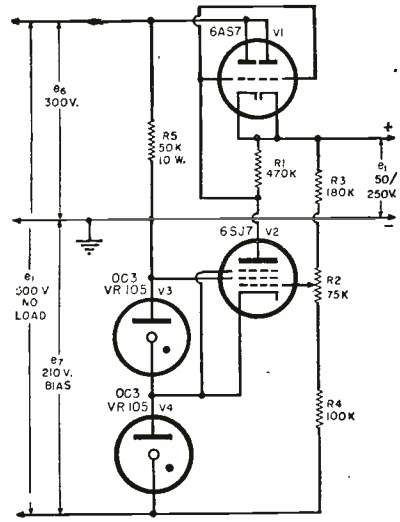



Fig. 5. Voltage regulator grounded at the control tube screen level. Output voltage range is 100 volts below that of Fig. 4.

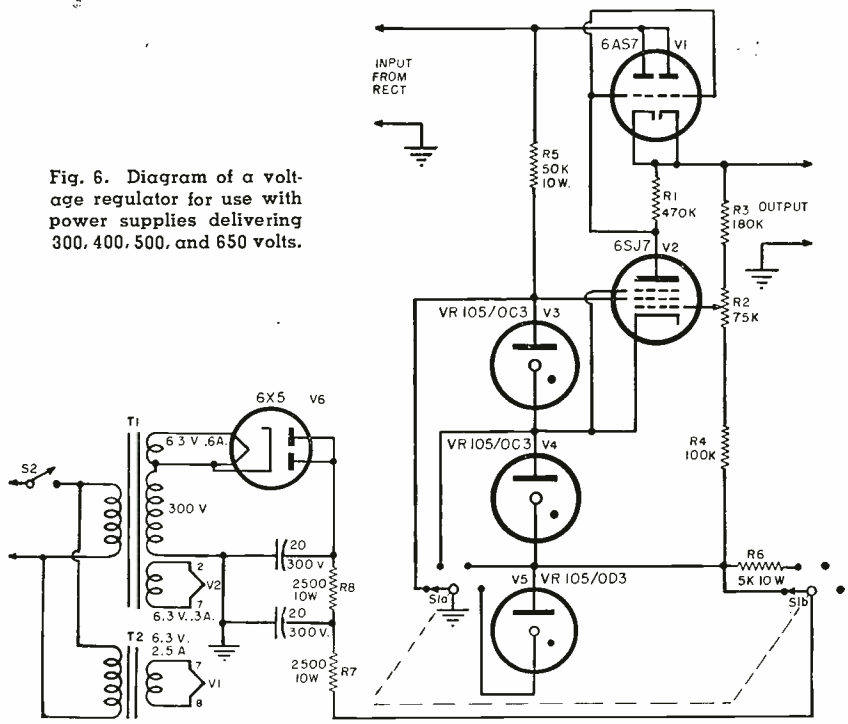



Fig. 6. Diagram of a voltage regulator for use with power supplies delivering 300, 400, 500, and 650 volts.

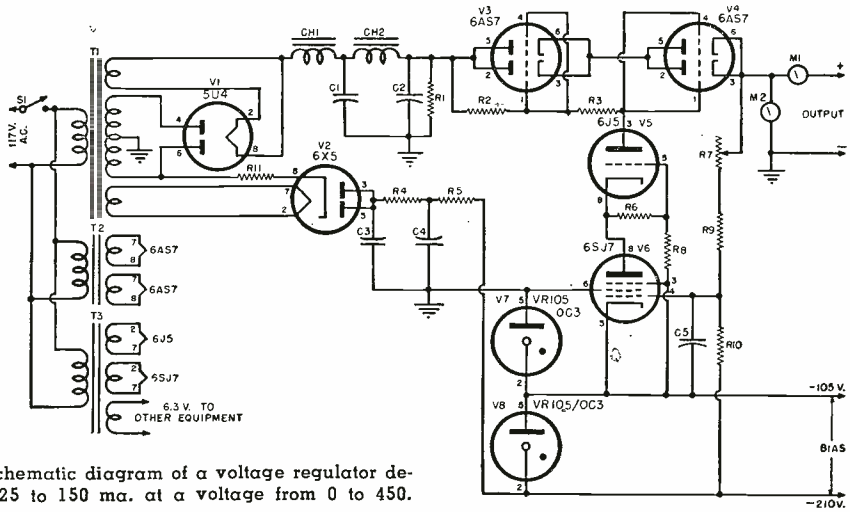
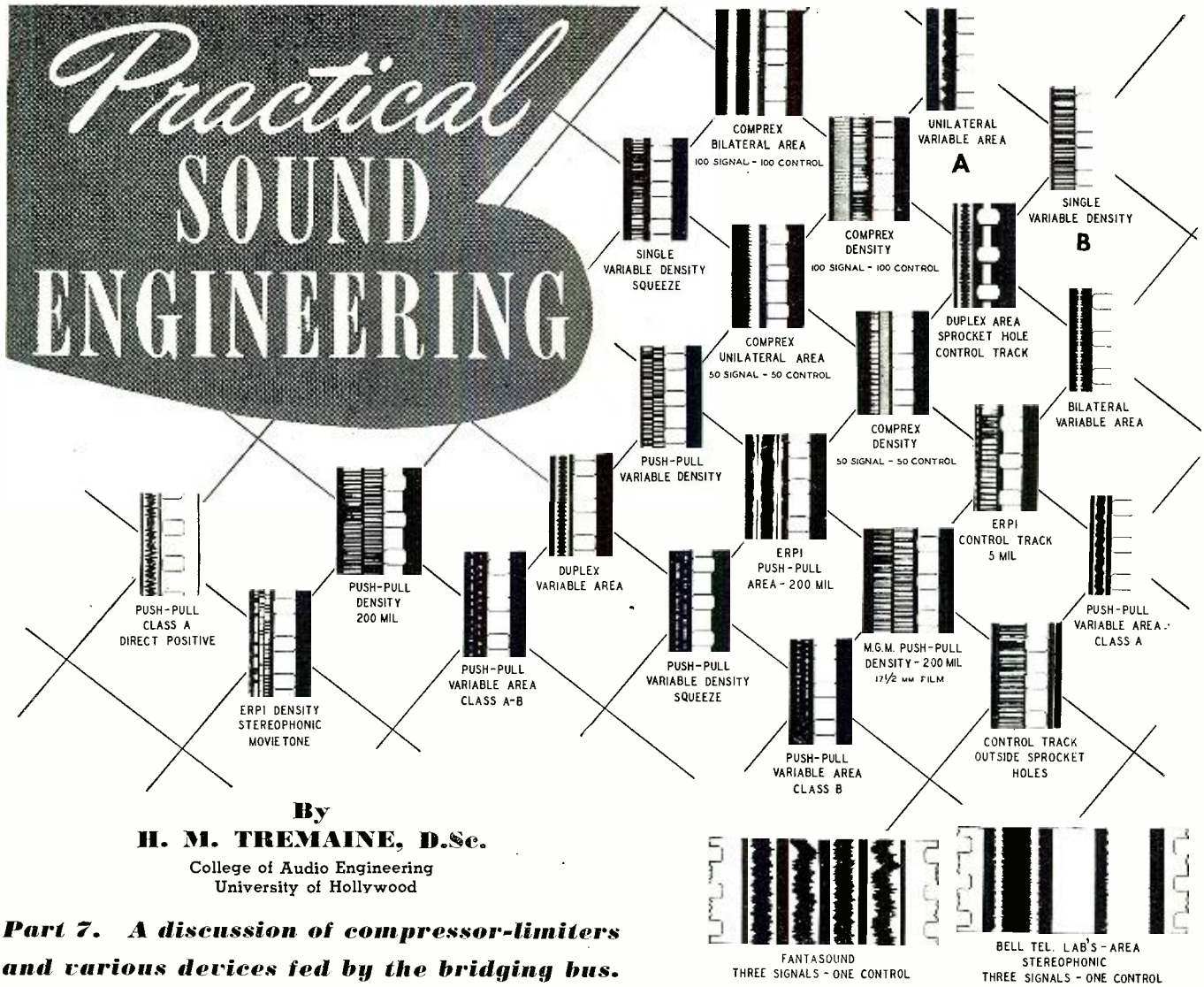



Fig. 7. Schematic diagram of a voltage regulator delivering 125 to 150 ma. at a voltage from 0 to 450.

*$R_1$—50,000 ohm, 10 w. res.*
*$R_2$, $R_8$—470,000 ohm, ½ w. res.*
*$R_3$, $R_5$, $R_{11}$—2500 ohm, 10 w. wirewound res.*
*$R_6$—150,000 ohm, ½ w. res.*
*$R_7$—200,000 ohm rheostat*
*$R_9$—2.5 megohm, ½ w. res.*
*$R_{10}$—50,000 ohm, ½ w. res.*
*$R_{10}$—75,000 ohm, ½ w. res.*
*$C_1$, $C_2$—8 μfd., 525 v. elec. cond.*
*$C_3$, $C_4$—16 μfd., 450 v. elec. cond.*
*$C_5$—.1 μfd., 200 v. cond.*
*$S_1$—S.p.s.t. toggle sw.*
*$CH_1$—8-30 hy., 150 ma. filter choke*
*$CH_2$—30 hy., 150 ma. filter choke*
*$T_1$—Power trans. 450-0-450 v. @ 250 ma.; 5 v. @ 3 amps.; 6.3 v. @ .6 amp.*
*$T_2$—Fil. trans. 6.3 v. @ 2.5 amp.; 6.3 v. @ 2.5 amps.*
*$T_3$—Fil. trans. 6.3 v. @ .3 amp.; 6.3. v. @ .3 amp.; 6.3 v. @ current to be determined by equipment used*
*$M_1$—250 ma. d.c. milliammeter*
*$M_2$—500 v. d.c. voltmeter*
*$V_1$—5U4 tube*
*$V_2$—6X5 tube*
*$V_3$, $V_4$—6AS7 tube*
*$V_5$—6J5 tube*
*$V_6$—6SJ7 tube*
*$V_7$, $V_8$—VR105/0C3 tube*

# Practical SOUND ENGINEERING




**By**
**H. M. TREMAINE, D.Sc.**
College of Audio Engineering
University of Hollywood

***Part 7. A discussion of compressor-limiters and various devices fed by the bridging bus.***

EARLY in the development of the art of sound recording it was recognized that certain types of recording, such as dialogue or sound effects, are of such a volume range that they cannot be reproduced to the best advantage. When reproduced, the loud passages are too loud, and the low passages too low. Under such conditions, the low level sounds are lost in the surrounding ambient noise level of the auditorium, and the high level passages appear to be exaggerated, thus giving unnatural reproduction.

Manual compression of the program material by the mixer during the recording has not been too successful. This led to the development of an automatic electronic device for controlling the gain of recording circuits. Such devices are known as "compressors", or "electronic limiters." Experience has proved that when a compressor is properly adjusted and used, a definite improvement in the intelligibility of the dialogue and volume range is obtained. This is the result of the smoothing effect of the compressor.

A compressor will allow a higher average level to be recorded, thus improving the signal-to-noise ratio. Although the compressor restricts the volume range, it also flattens out peaks and dips in the program material.

A block diagram of a typical compressor-limiter amplifier used by the motion picture industry is shown in Fig. 1. A compressor amplifier may be likened to an automatic volume control in a radio set, and accomplishes its purpose in a similar manner. The compressor consists of two push-pull stages in tandem. The first stage is a pair of 6SK7 tubes operating as a variable gain stage. This is followed by a fixed gain stage using two 6SJ7 tubes. Across the output of the fixed stage is bridged a single triode stage which drives a diode rectifier. This stage rectifies the audio signal which is then used to bias the first push-pull stage.

As the input audio signal varies in amplitude, so will the bias on the first stage. Therefore, the gain of the first push-pull stage is made to vary in accordance with the amplitude of the incoming signal. An initial adjustment of the bias will allow the gain to be set to a point where the output signal level will not increase as much proportionately with an increase of input signal level, *i.e.*, the signal will be "compressed." The point where compression starts is called the "breakaway" point. A fixed amount of bias is always present in the first push-pull stage to prevent an increase in plate current until the signal voltage exceeds the initial bias.

The d.c. voltage obtained from the rectifier circuit is filtered to reduce the ripple voltages. The acting and release time of the compressor is controlled by the amount of capacity in the filter circuit. Since it is necessary that the output reduction in gain take place in the shortest possible time, the filter capacity must be kept small. The average operating time is 1 to 10 milliseconds, and approximately 100 milliseconds for release.

Balancing pots are included in both push-pull stages to reduce the effect of ripple voltages from the rectifier circuit. It is imperative that the tubes in both push-pull stages have *identical* electrical characteristics, and be aged at least 50 hours before being put into use.

Two types of compression are in general use, gradual and limiting. See Fig. 3. Gradual compression is set to give a slope of 2 to 1 as shown by the curve *A,B,E*. A limiting curve is generally set for a slope ratio of 4 to 1,

similar to curve *A,C,F*. A switch is provided in the circuit to remove the compressor action if desired, allowing the device to be operated as a conventional amplifier. This is shown as the "manual" curve, *A,B,C,D*.

Compression ratios are expressed by stating the breakaway point, as shown by the points *B* and *C*, which are relative to 100 per-cent modulation of the system.

The 100 per-cent modulation of the system is defined as being the level for 100 per-cent modulation of the light valve, recording galvanometer, cutting head, or magnetic recorder when the bridging bus is a plus 4 dbm.

The compressor breakaway point is defined as the point where compression can just be detected, or where it affects the system 0.50 db.

Curve *A,B,E* of Fig. 3 represents a compression ratio of 20 db into 10 db at an output level of plus 4 dbm. Curve *A,C,F* represents a compression ratio of 17 db into 3 db at an output level of plus 4 dbm. The expression "20 db into 10 db" means that the output signal level will increase only 10 db above the breakaway point for an increase of 20 db at the input of the compressor.

Compressors are generally of the *no gain* type, and may be inserted in the system without disturbing previously set levels. However, some manufacturers provide means for increasing the gain if required, thus eliminating the line amplifier and combining both into one unit. This is quite satisfactory if the device is to remain a permanent part of the system. Due to the flexibility required in a large installation, it is better to keep it a separate piece of equipment.

When compression is used with dialogue recording, equalization of high frequencies may be desirable to prevent extreme sibilance. Compressors used without equalization show an excessive amount of sibilants. This is caused by the fact that the sibilants, due to their low inherent energy, do not actuate the compressor to the same extent as do the vowels or consonants. Therefore, equalization is included in the rectifier circuit to increase the high frequency response, thus increasing the compression above 1000 cps where the greatest sibilance occurs. This results in a smoother recording. The required equalization will fall between 3 and 8 db at 6000 cycles.

When recording straight dialogue with the compressor, the low and high-pass filters are placed after the compressor, to prevent a change in their frequency characteristics, caused by the action of the compressor. This is accomplished by patching from the master gain control to the compressor, to the filters, and then to the line amplifier, which will then feed the bridging bus.

The low frequency equalization used with dialogue recording provides protection for the compressor, as it suppresses the low frequencies and prevents thumping due to any unbalance in the compressor push-pull stages.

Compressors have a tendency to smooth out the frequency characteristics of the system, resulting in an automatic effort equalizer, because when voices are raised in volume, the amount of low frequency attenuation is reduced, thus helping to prevent the voices from becoming harsh.

A variable pad referred to as a "ceiling control" is connected in the output of the compressor to provide a convenient means of controlling the compression ratio. Increasing the loss in the ceiling control changes the gain following the compressor and will control the amount of compression to the recording system. As the loss of the ceiling control is increased, the signal at the input of the compressor has to be increased to obtain the same output level at the bridging bus; thus the amount of compression is increased. The ceiling control is generally placed at the mixer console for convenience of operation.

Most compressor amplifiers may also be operated as limiter amplifiers. This characteristic is obtained by the adjustment of the bias control to the first push-pull stage, and the gain control of the rectifier amplifier. As a rule compression is not used when recording straight music, as it restricts the dynamic range; however, limiting may be used to a good advantage.

When dialogue is to be recorded and only one compressor-limiter amplifier is available, the compressor may be patched ahead of the mixer as shown in Fig. 2. The line amplifier then feeds the bridging bus.

It will be noted the compressor is placed *after* the mixer pot and followed by the ceiling control, which is patched into the mixer combining network in place of the mixer pot. Connecting the compressor in this manner

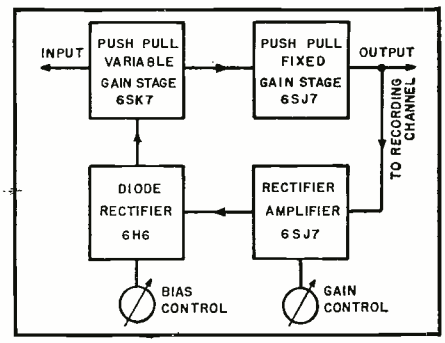



**Fig. 1. Simplified block diagram of a typical compressor-limiter amplifier as used by the motion picture industry.**

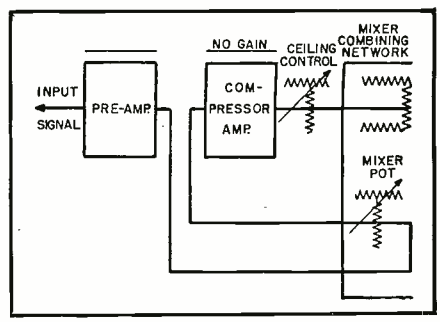
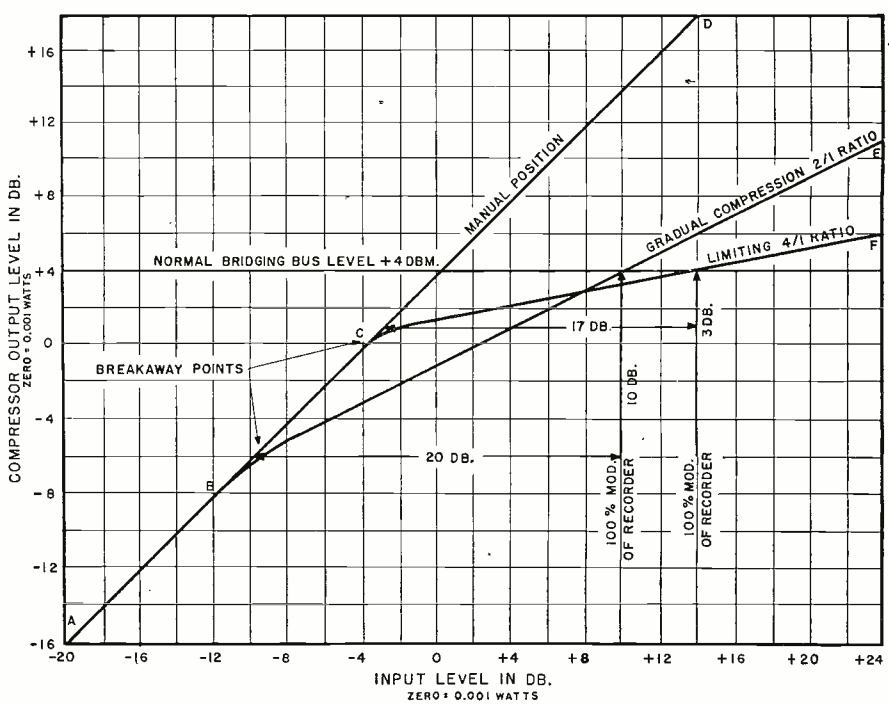



**Fig. 2. Arrangement for recording dialogue when only one compressor is available.**

prevents the mixer pot from acting as a ceiling control, which would be the case if the compressor output was fed directly into the mixer pot.

This connection requires that at least one of the mixer pots in the mixer console be connected through "normal" jacks so that the pot may be "lifted" out of the network for use with the compressor. When the compressor is used in this manner, low frequency attenuation is supplied by the low frequency attenuators in the mixer network as shown in Fig. 5. If a sec-

**Fig. 3. Graph showing the two types of compression generally used—gradual and limiting.**



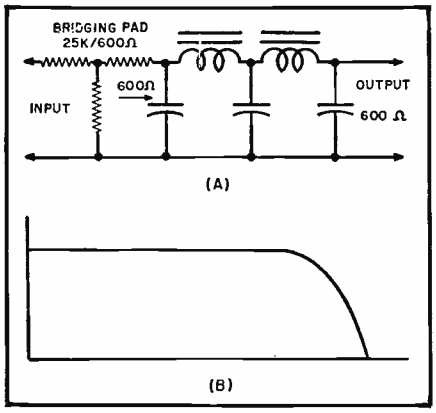



**Fig. 4. (A) Circuit diagram and (B) frequency roll-off characteristics of the monitor low-pass filter network.**

ond compressor amplifier is available it may be set for limiting, and patched in a normal manner.

Referring again to the block diagram, Fig. 5, leaving the compressor output we now come to the "bridging bus," the point of signal distribution for the system. Here the signal takes two routes, one to the monitoring equipment and one to the recording equipment.

The bridging bus is, in reality, a load impedance for the amplifier driving the bus. This load consists of the several devices to the right of the bus, and the two vu meters to the left. In parallel with these devices is a bridging bus terminating resistor. The value of this resistor is such that when it is paralleled with the devices constituting the load, the correct load impedance is seen by the device driving the bus.

Devices designed for bridging purposes generally use an input impedance of 25,000 or 30,000 ohms, which has been standardized by the industry. The bridging bus terminating resistor is calculated for the *minimum* bridging load requirements. This will then allow several more pieces of equipment to be paralleled across the bus without lowering the load impedance to a dangerous value. If the device driving the bus requires a load impedance of 600 ohms, a terminating resistor is used that will present a load of 600 ohms with the minimum bridging load. When additional equipment is paralleled across the bus, the impedance presented by the bus should not be allowed to drop more than 10 per-cent of normal, or 540 ohms. The use of 30,000 ohm input circuits will allow quite a latitude. Devices of higher impedance may be patched across the bus if desired, but not lower.

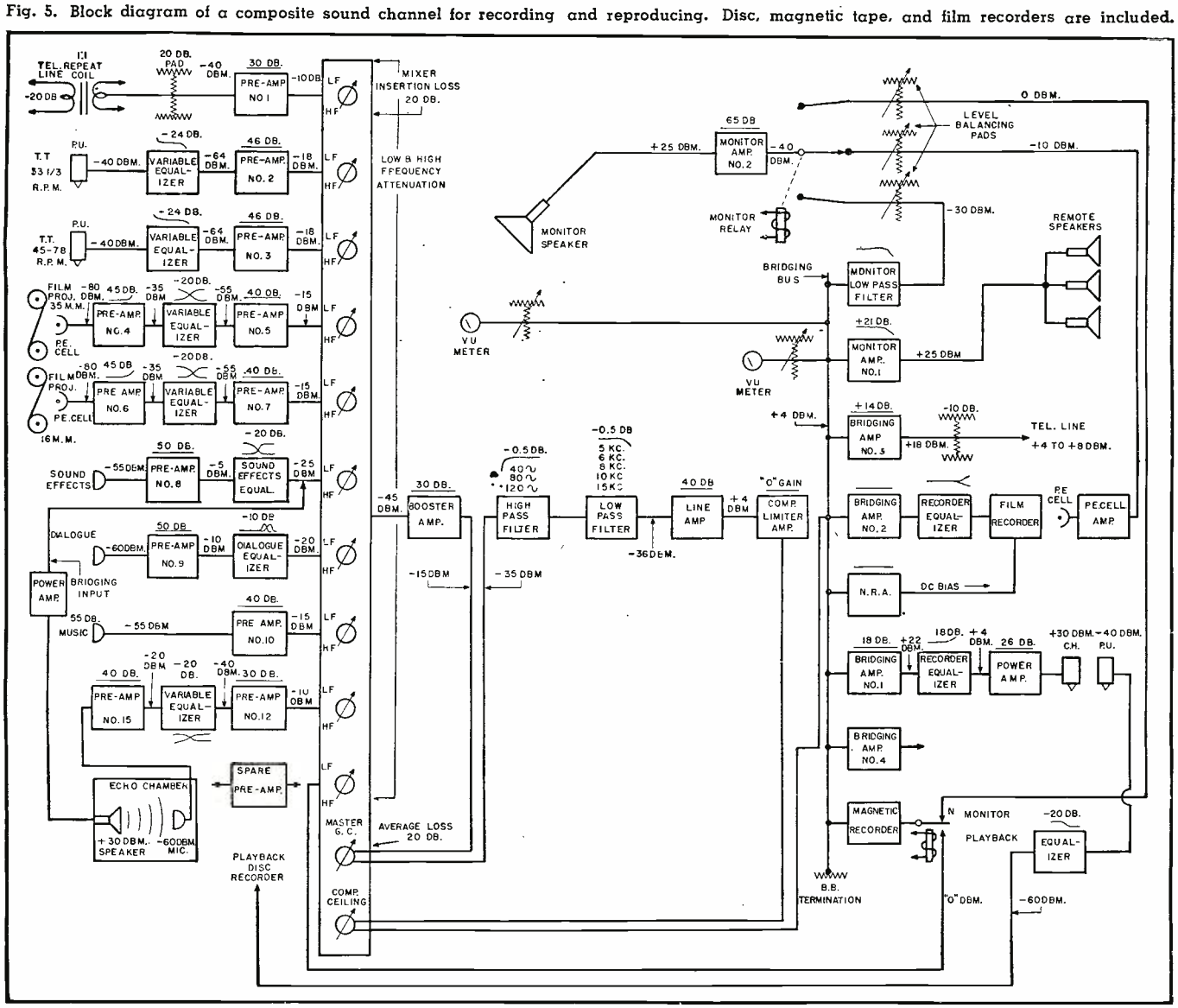
One device shown connected across the bus requires special mention relative to its input impedance. This is the monitor low-pass filter. This filter is employed when monitoring directly from the bridging bus, and is desirable if certain definite listening characteristics are required. It can be used to establish the average listening characteristics for whatever product is being recorded.

At the input of this filter is a bridging pad with an impedance ratio of 25,000 to 600 ohms, which allows it to be connected directly across the bridging bus. Of course this introduces a loss ahead of the filter, but is compensated for by increasing the monitor amplifier gain. The circuit for this device is shown in Fig. 4A, and its frequency characteristics in Fig. 4B.

Although an ungrounded bridging

(*Continued on page* 158)

**Fig. 5. Block diagram of a composite sound channel for recording and reproducing. Disc, magnetic tape, and film recorders are included.**



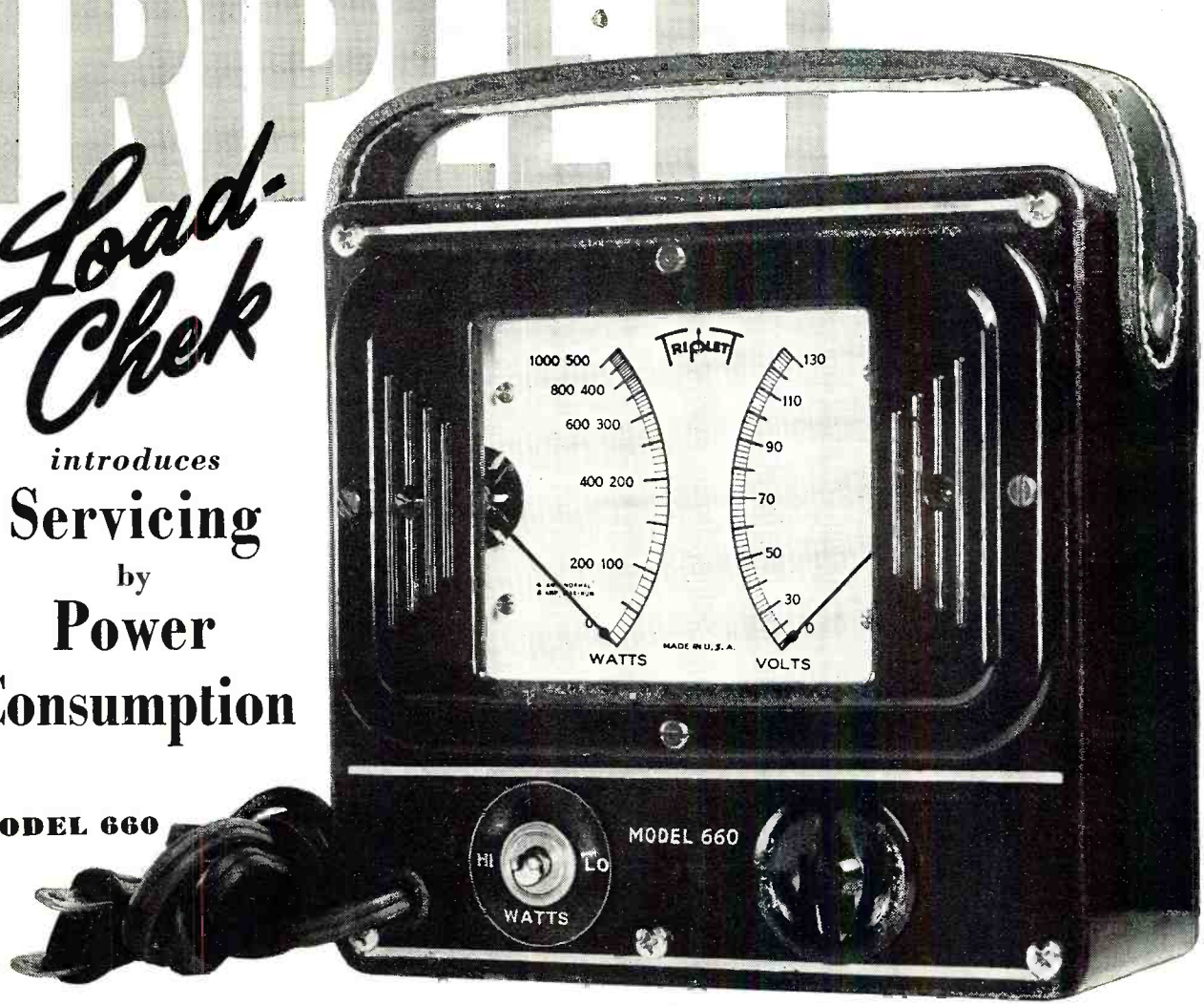
# TRIPLETT

# Load-Chek

*introduces*

## Servicing by Power Consumption

**MODEL 660**




**LOAD-CHEK** *for the first time* makes it possible for every technician to utilize what is perhaps the simplest and quickest of all service methods—Servicing by Power Consumption Measurements.

Power consumption measurement has long been proved by auto-radio servicemen as a rapid method of localizing troubles in auto radios. But Triplett's new LOAD-CHEK is the *first* Wattmeter to be produced *at moderate cost*, and with the *proper ranges*, to bring this short-cut method within the reach of *every* radio and TV service man.

Basis of the LOAD-CHEK method is the tag or label on every radio and TV chassis which shows the normal power consumption. The following examples are only two of many time-saving uses of this new instrument.

**LOCATING A SHORT**—The chassis tag may show a normal consumption of 225 Watts. Simply plug the power cord of the chassis into LOAD-CHEK (there are no loose ends to connect or be in the way). Note the reading—which should be possibly 350 Watts. By removing the rectifier tube you can determine at once which side of the tube the short is on. With a soldering iron and long-nosed pliers you can check through the chassis, locate and correct the trouble without having to lay down tools or to check with lead wires!

**REPLACING BURNED OUT RESISTORS**—With the chassis to be repaired plugged into a LOAD-CHEK MODEL 660, note the wattage reading with the burned out resistor circuit open. Now replace the resistor. Should the increase in watts be greater than that of the resistor rating being installed, it indicates that an extra load has caused the trouble which has not been cleared.

**LOAD-CHEK** is made-to-order for the busy service man and can help stop costly "come back" repair jobs. It's a profit-maker because it's a Time-Saver. And at its moderate cost LOAD-CHEK can be standard equipment on *every* service bench. *By all means*, inspect this versatile instrument at your distributor and place your order, for under present conditions we must fill all orders on a basis of "First Come, First Served."

**SEE MODEL 660 LOAD-CHEK AT YOUR DISTRIBUTOR'S**

FOR THE MAN WHO TAKES PRIDE IN HIS WORK

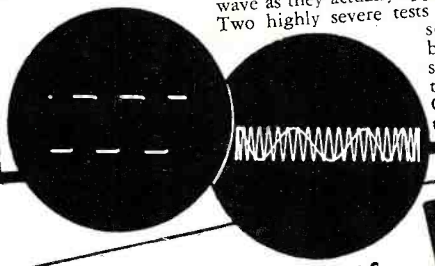
**Triplet**

TRIPLETT ELECTRICAL INSTRUMENT COMPANY - BLUFFTON, OHIO, U.S.A.

# *Features* OF THE NEW 1952 Heathkits

## PROOF OF THE NEW O-7 OSCILLOSCOPE'S OUTSTANDING PERFORMANCE

Below are actual, unretouched photographs showing the outstanding frequency response characteristics of the NEW 1952 HEATHKIT OSCILLOSCOPE, MODEL O-7. To the left is a 10 KC square wave — to the right a 4 MC sine wave as they actually appear on the screen. Two highly severe tests to make on any scope (only the best of scopes will show traces like these) — and the O-7 really comes through.



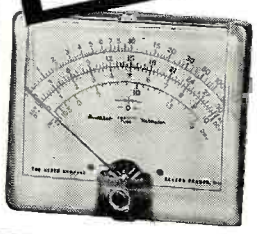
## COMPANION VACUUM TUBE VOLTMETERS

Here are the two NEW 1952 VACUUM TUBE VOLTMETER COMPANION PIECES. Matched instruments of new design to open up the whole field of DC, AC, and resistance measurements for you. The new greatly reduced size combines style, beauty, and compactness — The V-5 and AV-1 have the new panel and cabinet construction as shown on the right. A tremendous pair of voltmeters. Small in size but virtual giants in the range of measurements they make.

## NEW STYLE AND BEAUTY

Style that's modern, yet functional — that's the trend of today — and Heathkits are right up to the minute. Note the cut showing the new V-5 and AV-1 cabinet and panel construction. The front panel and rear cover slide right over the recessed flange of the case thereby eliminating sharp edges and pointed corners. The voltmeter kits aren't "shelf" or "mounted" instruments — they're moved about on the bench a lot and thus the new compact size and specially designed cabinets — Another 1952 Heathkit feature.

## A STATEMENT FROM SIMPSON ELECTRIC CO.



In choosing Simpson Meters for their Heathkit VTVM, the Heath Co. has set a new high standard of kit meter quality. The same high quality of material, workmanship and design that has given Simpson the reputation for building "Instruments That Stay Accurate" is found in the Heathkit Meter Movement.

SIGNED
SIMPSON ELECTRIC CO.

## A STATEMENT FROM CHICAGO TRANSFORMER

It is indeed gratifying to note the outstanding sales records you are building with you Heathkits.

This sales success is readily understandable, since we are cognizant of the high quality standards you have established for your component suppliers.

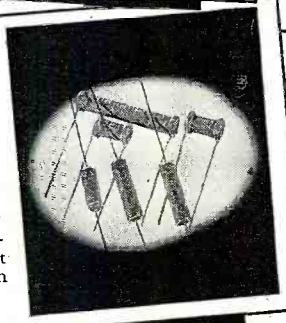
We at Chicago Transformer are proud that our product has contributed to the recognized quality and increasing popularity of Heathkits.

CHICAGO TRANSFORMER DIVISION
Essex Wire Corporation

L. S. RACINE
Vice-President and Sales Manager

## HEATHKIT PRECISION RESISTORS

Where exact resistance values are required for instrument accuracy, the Heath Co. has spared no effort in supplying the finest resistors available. Precision resistors as manufactured by Continental Carbon Inc., and Wilcor Corp., meet the rigorous JAN (Joint Army-Navy) specifications and are small in size, extremely non-inductive, highly stable, have a low temperature coefficient, and can be held to great accuracy. You'll find quality components in Heathkits.



## COLLEGES USE HEATHKITS

Colleges and Universities throughout the country are using Heathkits in their electrical engineering, radio, and physics laboratories — Heathkits are the answer to good test equipment at low cost, plus being rugged, dependable, and accurate. Trade schools are having their students build Heathkits to obtain a first hand working knowledge of test equipment and to get the practical experience gained by construction. Heathkits fill school needs.

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

# New LABORATORY LINE HEATHKITS

## NEW Heathkit A.C. VACUUM TUBE VOLTMETER KIT

MODEL AV-1
Shipping weight 5 lbs.

**$29.50**

Now — as a Heathkit — at a price anyone can afford, an AC VTVM.
A new kit to make possible those sensitive AC measurements required by audio enthusiasts, laboratories, and experimentors. Here is the kit that the audio men have been looking for. Its tremendous range of coverage makes possible measurements of audio amplifier frequency response — gain or loss of audio stages — characteristics of audio filters and attenuators — hum investigation — and literally a multitude of others. Ten ranges consisting of full scale .01, .03, .1, .3, 1, 3, 10, 30, 100, 300 volts RMS assure easy and more accurate readings. Ten ranges on DB provide for measurements from −52 to +52 DB. Frequency response within 1 DB from 20 cycles to 50 KC.

The ingenious circuitry incorporates precision multiplier resistors for accuracy two amplifier stages using miniature tubes, a unique bridge rectifier meter circuit, quality Simpson meter with 200 microampere movement, and a clean layout of parts for easy wiring. A high degree of inverse feedback provides for stability and linearity.

Simple operation is accomplished by the use of only one control, a range switch which changes the voltage ranges in multiples of 1 and 3, and DB ranges in steps of 10.

The instrument is extremely compact, cabinet size — 4⅛" deep x 4-11/16" wide x 7⅜" high, and the newly designed cabinet makes this the companion piece to the VTVM. For audio work, this kit is a natural.

## NEW Heathkit AUDIO FREQUENCY METER KIT

MODEL AF-1
Shipping weight 12 lbs.

**$34.50**

A NEW Heathkit Audio Frequency Meter — the ideal instrument for determining frequencies from 20 cycles to 100 KC. Set the selector switch to the proper range — feed the signal into the input terminals — and read the frequency from the meter — completely simple to operate, and yet dependable results.

Quality Simpson 200 microampere meter has two plainly marked scales (0-100 0-300. These scales, read in conjunction with the seven position selector switch, give full scale readings of 100, 300, 1000, 3000, 10,000, 30,000, and 100,000 cycles. Convenient ranges for fast and easy readings.

For greatest accuracy, the 1-3-10 ratio of ranges is maintained and each range has individual calibrating control.

Input impedance is high (1 megohm) for negligible circuit loading. A signal voltage anywhere between 2 and 300V can be fed directly into the instrument and a change in signal voltage between these limits will not affect the meter reading. In addition, input wave shape is not critical (the unit will read the frequency of either sine wave or square wave input).

The tube complement consists of a 6SJ7 amplifier and clipper, 6V6 amplifier and clipper, 6H6 meter pulse rectifier, 6X5 power supply rectifier, and OD3/VR150 voltage regulator.

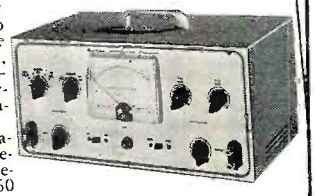
Construction is simple, and quality components are used throughout.

## NEW Heathkit INTERMODULATION ANALYZER KIT

Intermodulation testing of audio equipment is rapidly being accepted by more and more engineers and audio experts as the best way to determine the characteristics of audio amplifiers, recording systems, networks, etc. — shows up those undesirable characteristics which contribute to listening fatigue when all other methods fail.

The Heathkit Intermodulation Analyzer supplies a choice of two high frequencies (3000 cycles and a higher frequency) and one low frequency (60 cycles). Both 1:1 or 4:1 ratios of low to high frequencies can be set up for IM testing, and the ratios are easily set by means of a panel control and the instrument's own VTVM. An output level control supplies the mixed signal at the desired level with an output impedance of two thousand ohms. The Analyzer section has input level control and proper filter circuits feeding the instrument's VTVM to read intermodulation directly on full scale ranges of 30%, 10% and 3%. Built-in power supply furnishes all necessary voltages for operating the instrument.

You won't want to be without this new and efficient means of testing



MODEL IM-1
Shipping wt. 18 lbs.

**$39.50**

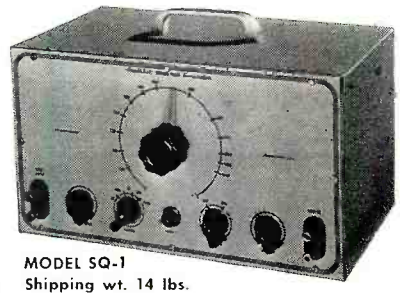
## NEW Heathkit SQUARE WAVE GENERATOR KIT

The new Heathkit Square Wave Generator Kit with its 100 KC square wave opens an entirely new field of audio testing. Square wave testing over this wide range will quickly show high and low frequency response characteristics of circuits — permit easy adjustment of high frequency compensating networks used in vidio amplifiers — identify ringing in circuits — demonstrate transformer characteristics, etc.

The circuitry consists of a multivibrator stage, a clipping and squaring stage, and a cathode follower output stage. The power supply is transformer operated and utilizes a full wave rectifier tube with 2 sections of LC filtering.

As a multivibrator cannot be accurately calibrated, a provision is provided to allow the instrument to be accurately synchronized with an accurate external source when extreme accuracy is required.

The low impedance output is continuously variable between 0 and 25 volts and operation is simple. You'll really appreciate the wide range of this instrument, 10 cycles to 100 kilocycles — continuously variable. Kit is complete with all parts and instruction manual, and is easy to build.



MODEL SQ-1
Shipping wt. 14 lbs.

**$29.50**

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*Heathkit*

# SIGNAL GENERATOR KIT

Model SG-6
Shipping Wt. 7 lbs.

**$19.50**

The new Heathkit Signal Generator Kit has dozens of improvements. Covers the extended range of 160 Kc to 50 megacycles on fundamentals and up to 150 megacycles on useful calibrated harmonics; makes this Heathkit ideal as a marker oscillator for TV. Output level can be conveniently set by means of both step attenuator and continuously variable output controls. Instrument has new miniature HF tubes to easily handle the high frequencies covered.

Uses 6C4 master oscillator and 6C4 sine wave audio oscillator. The kit is transformer operated and a husky selenium rectifier is used in the power supply. All coils are precision wound and checked for calibration making only one adjustment necessary for all bands.

New sine wave audio oscillator provides internal modulation and is also available for external audio testing. Switch provided allows the oscillator to be modulated by an external audio oscillator for fidelity testing of receivers. Comes complete, all tubes, cabinet, test leads, every part. The instruction manual has step-by-step instructions and pictorials. It's easy and fun to build a Heathkit Model SG-6 Signal Generator.

*Heathkit*

## CONDENSER CHECKER KIT

*Only*

**$19.50**

Model C-2
Shipping Wt. 6 lbs.

Checks all types of condensers — paper — mica — ceramic — electrolytic. All condenser scales are direct reading and require no charts or multipliers. Covers range of .00001 MFD to 1000 MFD. A Condenser Checker that anyone can read. A leakage test and polarizing voltage for 20 to 500 V provided. Measures power factor of electrolytics between 0% and 50% and reads resistance from 100 ohms to 5 megohms. The magic eye indicator makes testing easy.

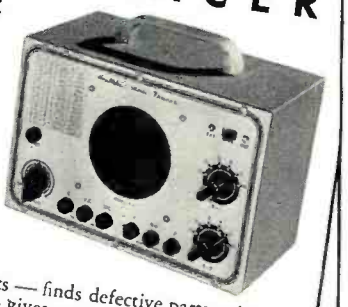
The kit is 110V 60 cycle transformer operated and comes complete with rectifier tube, magic eye tube, cabinet, calibrated panel and all other parts. Has clear detailed instructions for assembly and use.

NEW *Heathkit*

## SIGNAL TRACER AND UNIVERSAL TEST SPEAKER KIT

**$19.50**

Model T-2
Shipping Wt. 7 lbs.



The popular Heathkit Signal Tracer has now been combined with a universal test speaker at no increase in price. The same high quality tracer follows signal from antenna to speaker — locates intermittents — finds defective parts quicker — saves valuable service time — gives greater income per service hour. Works equally well on broadcast, FM, or TV receivers. The test speaker has an assortment of switching ranges to match either push-pull or single output impedances. Also tests microphones, pickups and PA systems. Comes complete: cabinet, 110V 60 cycle power transformer, tubes, test probe, all necessary parts, and detailed instructions for assembly and use.

Model TC-1
Shipping Wt. 12 lbs.

**$29.50**

*Heathkit*

## TUBE CHECKER KIT

The Tube Checker is a MUST for radio repair men. Often customers want to SEE tubes checked, and a checker like this builds customer confidence. In your repairing, you will have a multitude of tubes to check — quickly. The Heathkit tube checker will serve all these functions — it's good looking (with a polished birch cabinet and an attractive two color panel) — checks 4, 5, 6, 7 prong Octals, Loctals, 7 prong miniatures, 9 prong miniatures, pilot lights, and the Hytron 5 prong types. AND IT'S FAST TO OPERATE — the gear driven, free-running roll chart lists hundreds of tubes, and the smooth acting, simplified switching arrangement gives really rapid set-ups.

The testing arrangement is designed so that you will be able to test new tubes of the future — without even waiting for factory data — protection against obsolescence.

You can give tubes a thorough testing — checks for opens, shorts, each element individually, emission, and for filament continuity. A large BAD-?-GOOD meter scale is in three colors for easy reading and also has a "line-set" mark.

You'll find this tube checker kit a good investment — and it's only $29.50.

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NEW *Heathkit* T.V.

# ALIGNMENT GENERATOR KIT


Model TS-2
Shipping Wt. 20 lbs.

Here is an excellent TV Alignment Generator designed to do TV service work quickly, easily, and properly. The Model TS-2 when used in conjunction with an oscilloscope provides a means of correctly aligning television receivers.

The instrument provides a frequency modulated signal covering, in two bands, the range of 10 to 90 Mc. and 150 to 230 Mc. — thus, ALL ALLOCATED TV CHANNELS AS WELL AS IF FREQUENCIES ARE COVERED.

An absorption type frequency marker covers from 20 to 75 Mc. in two ranges — therefore, you have a simple, convenient means of frequency checking of IF's, independent of oscillator calibration.

Sweep width is controlled from the front panel and covers a sweep deviation of 0-12 Mc. — all the sweep you could possibly need or want.

And still other excellent features are: Horizontal sweep voltage available at the front panel (and controlled with a phasing control) — both step and continuously variable attenuation for setting the output signal to the desired level — a convenient instrument stand-by position — vernier drive of both oscillator and marker tuning condensers — and blanking for establishing a single trace with base reference level. Make your work easier, save time, and repair with confidence — order your Heathkit TV Alignment Generator now!

NEW *Heathkit*
## SINE AND SQUARE WAVE AUDIO GENERATOR KIT

Model AG-7
Shipping Wt. 15 lbs.

**$34.50**

Designed with versatility, usefulness, and dependability in mind, the AG-7 gives you the two most needed wave shapes right at your fingertips — the sine wave and the square wave.

The range switch and plainly calibrated frequency scale give rapid and easy frequency selection, and the output control permits setting the output to any desired level.

A high-low impedance switch sets the instrument for either high or low impedance output — on high to connect a high impedance load, and on low to work into a low impedance transformer with negligible DC resistance.

Coverage is from 20 to 20,000 cycles, and distortion is at a minimum — you can really trust the output wave shape.

Six tubes, quality 4 gang tuning condenser, power transformer, metal cased filter condenser, 1% precision resistors in the frequency determining circuit, and all other parts come with the kit — plus, a complete construction manual — A tremendous kit, and the price is truly low.

THE NEW *Heathkit*
## HANDITESTER KIT

**$13.50**

Model M-1
Shipping Wt. 3 lbs.

A precision portable volt-ohm milliammeter. Uses only high quality parts — All precision 1% resistors, three deck switch for trouble-free mounting of parts, specially designed battery mounting bracket, smooth acting ohm adjust control, beautiful molded bakelite case, 400 microamp meter movement, etc.

DC and AC voltage ranges 10-30-300-1000-5000V. Ohms range 0-3000 and 0-300,000. Range Milliamperes 0-10 Ma, 0-100 Ma. Easily assembled from complete instructions and pictorial diagrams.

NEW *Heathkit*
## BATTERY ELIMINATOR KIT

A few auto radio repair jobs will pay for the Heathkit Battery Eliminator Kit. It's fast for service. The voltage can be lowered to find sticky vibrators or raised to ferret out intermittents. Provides variable DC voltage 5 to 7½ Volts at 10 Amps. continuous or 15 Amps. intermittent.

Also serves as storage battery charger. A well filtered, rugged power supply uses heavy duty selenium rectifier, a husky choke, and a 4000 MFD electrolytic condenser for clean DC. 0 - 15V voltmeter indicates output which is variable in eight steps. Better be equipped for all types of service — it means more income.

**$22.50**

Model BE-2
Shipping Wt. 19 lbs.

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# Heathkit IMPEDANCE BRIDGE KIT

Model 1B-1B
Shipping Wt. 15 lbs.

**$69.50**

This Impedance Bridge Kit is really a favorite with schools, industrial laboratories, and serious experimenters. An invaluable instrument for those doing electrical measurements work. Reads resistance from .01 Ohms to 10 meg., capacitance from .00001 to 100 MFD, inductance from 10 microhenries to 100 henries, dissipation factor from .002 to 1, and storage factor from 1 to 1000. And you don't have to worry about selecting the proper bridge circuit for the various measurements — the instrument automatically makes the correct circuit when you set up for taking the measurement you want. Bridge utilizes Wheatstone, Hay, Maxwell, and capacitance comparison circuits for the wide range and types of measurements possible. And it's self powered — has internal battery and 1000 cycle hummer. No external generator required — has provisions for external generator if measurements at other than 1000 cycles are desired. Kit utilizes only highest quality parts, General Radio main calibrated control. Mallory ceramic switches, excellent 200 microamp zero center galvanometer, laboratory type binding posts with standard ¾ inch centers, 1% precision ceramic-body type multiplier resistors, beautiful birch cabinet and ready calibrated panel. (Headphones not included.)

Take the guesswork out of electrical measurements — order your Heathkit Impedance Bridge kit today — you'll like it.

## Heathkit LABORATORY RESISTANCE DECADE KIT

**$19.50**

Shipping Wt. 4 lbs.

An indispensable piece of laboratory equipment — the Heathkit Resistance Decade Kit gives you resistance settings from 1 to 99,999 ohms IN ONE OHM STEPS. For greatest accuracy, 1% precision ceramic-body type resistors and highest quality ceramic wafer switches are used.

Designed to match the Impedance Bridge above, the Resistance Decade Kit has a beautiful birch cabinet and attractive panel. It's easy to build, and comes complete with all parts and construction manual.

## Heathkit LABORATORY POWER SUPPLY KITS

*Limits:*

| | |
|---|---|
| No load | Variable 150-400V DC |
| 25 MA | Variable 30-310V DC |
| 50 MA | Variable 25-250V DC |

Higher loads: Voltage drops off proportionally

**$29.50**

Model PS-1.....Ship. Wt. 20 lbs.

Every experimenter needs a good power supply for electronic setups of all kinds. This unit has been expressly designed to act as a HV supply and a 6.3 V filament voltage source. Voltage control allows selection of HV output desired (continuously variable within limits outlined), and a Volts-Ma switch provides choice of output metering. A large plainly marked and direct reading meter scale indicates either DC voltage output in Volts or DC current output in Ma. (Range of meter 0-500V D.C., 0-200 Ma. D.C.). Instrument has convenient stand-by position and pilot light.

Comes with power transformer, filament transformer, meter, 5Y3 rectifier, two 1619 control tubes, completely punched and formed chassis, panel, cabinet, detailed construction manual, and all other parts to make the kit complete.

## Heathkit ECONOMY . . . 6 WATT AMPLIFIER KIT

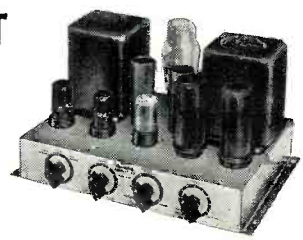
Model A-4
Ship. Wt. 8 lbs.

**$12.50**

No. 304 12 inch speaker . . . **$6.95**

This fine Heathkit Amplifier was designed to give quality reproduction and yet remain low in price. Has two preamp stages, phase inverter stage, and push-pull beam power output. Comes complete with six tubes, quality output transformer (to 3-4 ohm voice coil), husky cased power transformer and all other parts. Has tone and volume controls. Instruction manual has pictorial for easy assembly. Six watts output with response flat ± 1½ db from 50 to 15,000 cycles. A quality amplifier kit at a low price. Better build one.

## Heathkit HIGH FIDELITY . . . 20 WATT AMPLIFIER KIT



**$33.50**

Shipping Wt. 18 lbs.

Our latest and finest amplifier — the model A-6 (or A-6A) is capable of a full 20 Watts of high fidelity output — good faithful reproduction made possible through careful circuit design and the use of only highest quality components. Frequency response within ± 1 db from 20-20,000 cycles. Distortion at 3 db below maximum power output (at 1000 cycles) is only .8%. The power transformer is rugged and conservatively rated and will deliver full plate and filament supply with ease. The output transformer was selected because of its exceptionally good frequency response and wide range of output impedances (4-8-16-150-600 ohms). Both are Chicago Transformers in drawn steel case for shielding and maximum protection to windings. The unit has dual tone controls to set the output for the tonal quality desired — treble control attenuates up to 15 db at 10,000 cycles — bass control gives bass boost up to 10 db at 50 cycles.

Tube complement consists of 5U4G rectifier, 6SJ7 voltage amplifier, 6SN7 amplifier and phase splitter, and two 6L6's in push-pull output. Comes complete with all parts and detailed construction manual. (Speaker not included.)

**MODEL A-6:** For tuner and crystal phono inputs. Has two position selector switch for convenient switching to type of input desired.

**MODEL A-6A:** Features an added 6SJ7 stage (preamplifier) for operating from variable reluctance cartridge phono pickup, mike input, and either tuner or standard crystal phono pickup. A three position selector switch provides flexible switching.
Shipping Wt. 18 lbs. **$35.50**

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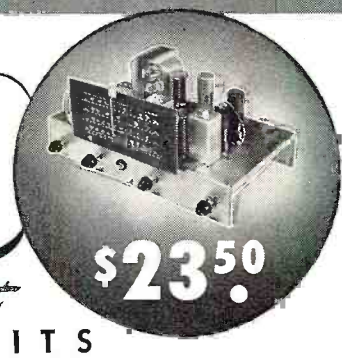
Model BR-1 Broadcast Model Kit covers 550 to 1600 Kc. Shipping Wt. 10 lbs.

Model AR-1 3 Band Receiver Kit covers 550 Kc. to over 20 Mc. continuous. Extremely high sensitivity. Shipping Wt. 10 lbs.



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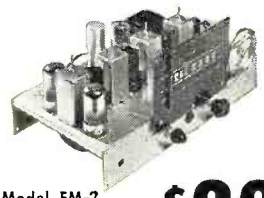
## TWO HIGH QUALITY Heathkit SUPERHETERODYNE RECEIVER KITS

Two excellent Heathkits. Ideal for schools, replacement of worn out receivers, amateur and custom installations.

Both are transformer operated quality units. The best of materials used throughout — six inch calibrated slide rule dial — quality power output transformers — dual iron core shielded. I.F. coils — metal cased filter condenser. The chassis has phono input jacks, 110 Volt output for phono motor and there is a phono-radio switch on panel. A large metal panel simplifying installation in used console cabinets is included. Comes complete with tubes and instruction manual incorporating pictorials and step-by-step instructions (less speaker and cabinet). The three band model has simple coil turret which is assembled separately for ease of construction.



Model FM-2
Ship. Wt. 9 lbs.

$22.50

## TRUE FM FROM Heathkit FM TUNER KIT

The Heathkit FM Tuner Model FM-2 was designed for best tonal reproduction. The circuit incorporates the most desirable FM features — true FM.

Utilizes 8 tubes: 7E5 Oscillator, 6SH7 mixer, two 6SH7 IF amplifiers, 6SH7 limiter, two 7C4 diodes as discriminator, and 6X5 rectifier.

The instrument is transformer operated making it safe for connection to any type receiver or amplifier. Has ready wound and adjusted RF coils, and 2 stages of 10.7 Mc IF (including limiter). A calibrated six inch slide rule dial has vernier drive for easy tuning. All parts and complete construction manual furnished.

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# A HIGH-FREQUENCY DOUBLE CONVERSION SUPERHET FOR I.F. FREQUENCIES ABOVE 500 KC.

***Instead of rewinding coils the author simply used the second harmonic of the BC-453 local oscillator as the mixing frequency.***


By

**FRED J. LINGEL, W2ZGY**


MANY amateurs have wanted to use a Q5'er but have hesitated because their receiver's i.f. frequency was beyond the range of the BC-453. The obvious answer is to rewind the r.f. amplifier, the oscillator, and the mixer coils of the BC-453 to cover the higher intermediate frequency, but this is quite a job. It is not only difficult but it also makes the BC-453 unsuited for its original range, should it later be necessary to work at a lower intermediate frequency.

A simple solution to this difficulty is to use the second harmonic of the local oscillator in the BC-453 as the mixing frequency. To do this connect a lead from the last i.f. stage of your amateur band receiver to a 7-45 $\mu\mu$fd. ceramic trimmer condenser. Connect the other end of the condenser to the top cap of the 12K8 mixer in the BC-453 as shown in Fig. 1. Leave the regular contact to the 12K8 tube cap in position to provide a grid return. Unplug the 12SK7 r.f. amplifier tube located right next to the 12K8 in order to reduce stray pickup from the antenna terminal of the BC-453. Wire the tube filaments in parallel for 12 volt operation, otherwise removing the 12SK7 will also disconnect the filament on the 12K8 mixer tube.

To adjust the BC-453 for second harmonic operation on your particular intermediate frequency, proceed as follows:

1. Tune your regular receiver in the usual way to a strong phone signal.

2. Disconnect the headphones from the output of your regular receiver and connect them instead to the output terminals of the BC-453.

3. Tune the BC-453 until you hear the phone signal in the headphones.

If your receiver has an i.f. of 915 kc., the dial setting on the BC-453 will be around 415 kc. You may also hear the signal at 2 or 3 other spots because of 3rd or 4th harmonic mixing, but the 415 kc. point will be the strongest.

It works like this: With the dial of the BC-453 set at 415 kc. its local oscillator is running at 415 plus 85 or 500 kc. (The i.f. frequency of the BC-453 is 85 kc.) The second harmonic of the oscillator is two times 500 kc. or 1000 kc. When your 915 kc. intermediate frequency beats against this 1000 kc. you get 1000 minus 915 or 85 kc. This is the intermediate frequency of the BC-453. Be sure to use the rated 275 volts on the BC-453 to insure ample second harmonic output of its local oscillator.

This system has been used very successfully on my custom-built ham installation using a 2 to 10 mc. ARB aircraft receiver. Here the i.f. is picked off the last i.f. tube by wrapping a wire around the plate tube pin. A volume control is brought to the panel from the BC-453. This, in addition to the regular control from the receiver, gives better control of signal-to-noise ratio. The c.w. oscillator in the BC-453 is shorted out at all times and the regular beat oscillator in the main receiver is switched on or off as necessary.

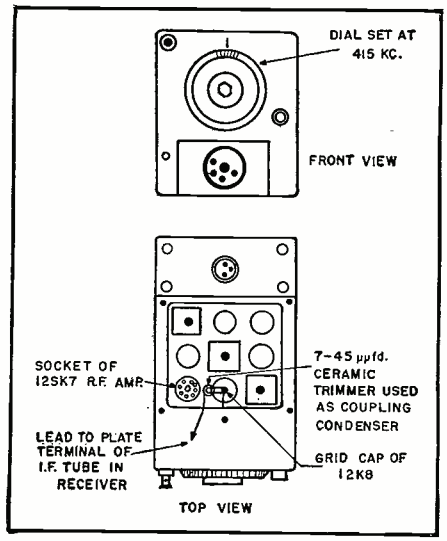
The BC-453 does not have a.v.c. and as the normal receiver i.f. is not in use in this application, the reception on phone signals leaves something to be desired.

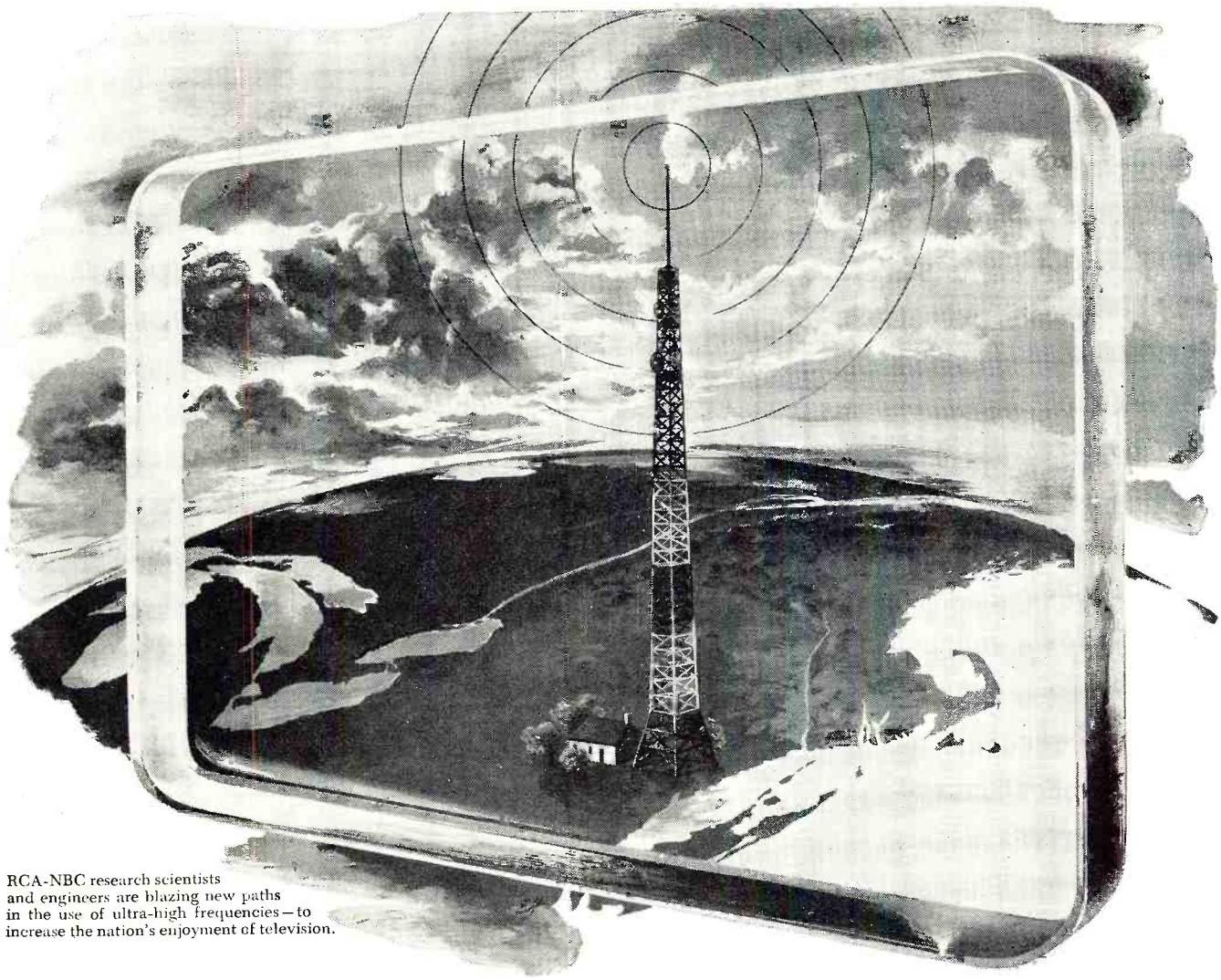
A worthwhile change is the addition of a.v.c. to the BC-453. An examination of the circuit will show that this may be easily accomplished. Briefly the operation consists of using the 12SR7 second detector to furnish the a.v.c. bias in the conventional manner.

For exact details as to the method for accomplishing this refinement the reader is referred to the article, "Conversion of SCR-274N Receivers," which appeared in the June, 1948 issue of RADIO & TELEVISION NEWS.

—30—

Fig. 1. The correct method for connecting Q5'er (BC-453) for a receiver i.f. of 915 kc.





RCA-NBC research scientists and engineers are blazing new paths in the use of ultra-high frequencies—to increase the nation's enjoyment of television.

# World's first custom-built **UHF** station —points the way to more **TV** for more people

Although television now reaches 45 million people in more than 12 million homes, thousands of communities are still too far from existing stations to be reached by *any* programs. Moreover, under present conditions, many cities with limited program service want, but can't have, additional TV stations.

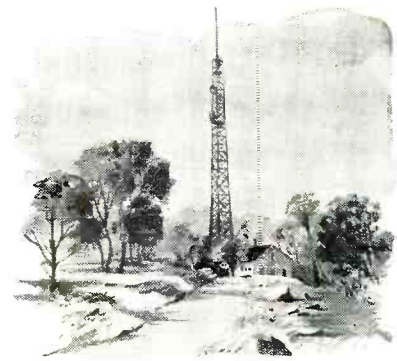
In preparation for the establishment of a country-wide television service, RCA has pioneered for many years in ultra-high-frequency (UHF) research.

Today—an experimental station built by RCA at Bridgeport, Conn., is supplying the practical experience and engineering facts needed to design the best UHF equipment—including transmitters, receivers, and converters. NBC programs on the air during the full broadcast day are used by RCA—and other manufacturers, too—for large-scale field tests.

**From results of this pioneering, RCA engineers have determined that practical UHF equipment can be built to serve the public, and that present RCA Victor television sets can be readily adapted to give equally fine performance on both UHF and VHF.**

* * *

*See the latest in radio, television, and electronics at RCA Exhibition Hall, 36 W. 49th St., N. Y. Admission is free. Radio Corp. of America, RCA Building, Radio City, N. Y. 20, N. Y.*



Built by RCA at Bridgeport, Conn.,—first UHF transmitter to operate on a regular schedule.

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5Y3GT, 6J5, 6N7GT, 35W4 — **59¢**

0Z4, 6AR5, 6AV6, 35Z5 — **69¢**

1U5, 6AL5, 6AU6, 6BA6, 6K6GT, 6S4, 6W4GT, 12SA7, 12SK7, 12SQ7, 50L6 — **79¢**

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6K7GT, 6SN7, 7N7 — **99¢**

1B3GT, 1X2, 6AG5, 12AU7 — **$1.19**

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| 5U4G | $0.74 |
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Kit contains one each of the following:

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Buy popular tubes this easy way and save loads of money. Tubes are brand new fresh stock, famous brands. Packed in handy carton. Order No. AS-11. per kit..... **$3.85**

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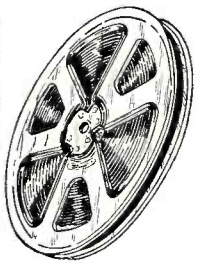

Get the buy of your life. Save up to 64% on high quality RECORDING TAPE. A large manufacturer had to sell his inventory and he unloaded the whole deal. Olson now offers you this high grade recording tape at prices which defy competition. Standard ¼" wide, 1200 ft. long. Frequency response 50 to 8,000 cy. Plastic Reel included with each.

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**25 WATT DRIVER UNIT** No. S-165 **$14.70** each

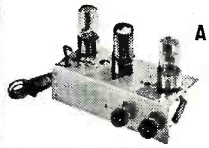
Unit is breakdown proof, will handle 25 watts continuously and is guaranteed for 1 year. Hermetically sealed, complete protection from outdoor exposure. Has dural 16 ohm voice coil and genuine bakelite diaphragm. Fits trumpet shown below or any other standard trumpet. Brand new factory sealed cartons. Shpg. wt. 6 lbs.

**REFLEX TRUMPET** No. S-164 **$14.41** each

Trumpet is heavy gauge metal finished with corrosion resistant paint. Equipped with famous adjustable UNIVERSITY "U" BRACKET. Mounts in any position. 16½" diameter. Has heavy rubber rim for improved tone. Brand new factory sealed cartons. Shpg. wt. 15 lbs.

Get both Driver Unit and Reflex Trumpet. Genuine University matched set..... **$29.11**

## BUILD YOUR OWN RECORD PLAYER



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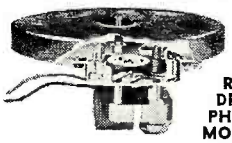
SET OF TUBES FOR AMPLIFIER 12SQ7 50L6 35Z5 No. AS-22..... **$2.64**



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Nationally famous brand. Self starting, complete with turntable. Operates on 115 volt AC 60 cy. Shpg. wt. 5 lbs.

SINGLE SPEED 78 RPM Stock No. M-52 **$3.79**

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**PICKUP ARMS**

For 78 RPM discs. With Astatic cartridge. Shpg. wt. 2 lbs. M-58 **$2.99**

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Cartridge flips by means of a lever. Equipped with dual cartridge, one side plays 33⅓ and 45 and other 78 RPM. Double needle included. M-64. Each..... **$4.95**

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Universal replacement for Astatic L-70, L-72, L-82, etc. 3 volts. Fresh Stock. XC-30 single each..... $1.79 **$1.29**
Lots of 10, each.....

**HIGH OUTPUT CARTRIDGE**

Similar to above but delivers 9 volts. Can be used on 33⅓, 45, and 78 RPM discs. XC-47 single each..... $2.19 **$1.99**
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High output crystal mike for PA systems and recorders. Equipped with handle base and 7' shielded cable. Shpg. wt. 5 lbs.

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M-71 **$4.29** Olson's Special

## NEW CRYSTAL MIKE

Nationally famous make. Smart New Design, easy to hold. Used in many tape, wire and disc recorders. Can be used on P. A. systems, amplifiers, etc.

**10 WATT RESISTOR KIT**

We mean to move 80,000 fine 10 watt wire wound resistors during this sale. REGULAR LIST PRICE OF THIS KIT IS $15.00. Each kit contains 20 popular insulated resistors, with tinned copper leads. Shpg. wt. 2 lbs. AS-46. Kit of 20..... **$2.49**

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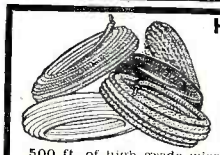
Assortment of 15 popular FP condensers, double and triple sections. Capacities from 10 mfd to 50 mfd; from 25 to 450 volts. Shpg. wt. 3 lbs. AS-24, **$3.98** each



**HOOKUP WIRE KIT** AS-19 **$4.95**

500 ft. of high grade wire, various insulations: plastic, rubber, cotton, etc. Contains 5 rolls, each 100 ft., solid and stranded. Shpg. wt. 5 lbs.

**OUTPUT TRANSFORMERS**

Matches 50L6, 35L6, 25L6, etc. to any 3.2 ohm V.C. Size 1⅝" x 1¼". Shpg. Wt. 1 lb

No. T-92 Single each ....69c
Lots of 10, ea. **49¢**

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| 20 MFD. 150 V STOCK NO. C-628 | 25¢ |
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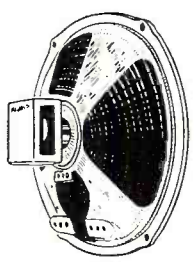

Think of it! Genuine Magnavox and RCA Speakers at a fraction of their real value. Yes—Olson really made a deal—a good deal—and you can cash in. These speakers are brand new, equipped with Alnico 5 magnets and dust-proofed 3.2 ohm voice coils.

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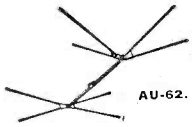
**OLSON RADIO WAREHOUSE • 73 E. Mill St., Akron 8, Ohio**

# TV ANTENNAS



AU-62.

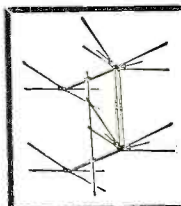
$3.83 Ea., in lots of 6

SOLD ONLY IN BOXES OF 6 ANTENNAS

$22.98

Carton of 6, wt. 25 lbs.

Here is a real bargain for TV installation men. Genuine Conical TV Antennas scientifically designed to give optimum reception. Highest grade aluminum tubing is used. Complete with antenna mmebers, reflector elements, cross arm and cross arm brackets. Less mast and 300 ohm twin-lead line. Take any size masts up to 1⅜" O.D. Packed in factory-sealed cartons of 6 Antennas to a box.



## TV INSTALLATION MEN

If you install TV Antennas, Olson wants you to take advantage of this terrific Antenna Value. High gain Stacked Conical Array with high frequency stubs. Ideal for "Fringe" Area Reception. Sturdily constructed, elements are aluminum. Easily assembled.

## THIS IS A TERRIFIC VALUE!

Each Antenna consists of two conical bays plus a pair of matching Q bars. Less mast. Packed—3 Antennas to a carton. This gives you six bays and 3 pairs of Q bars.

**Sold Only in Boxes of 3 Antennas**

AU-66. In lots of 3, each ..... $8.66

Carton of 3 ..... Weight 25 lbs. $25.98

# TV PARTS AT LESS THAN JOBBERS' COST

## GE TYPE FLYBACK

RTO-085 (77J1)

$3.49 Each, Lots of 3

STOCK NO. T-94

Single, each. $3.99

Regular list price is $11.50 for this brand new universal high voltage sweep transformer for all picture tubes up to 20". For all power tubes like 19BG6, 6AU5, 6BQ6 or 6BG6G. Sweeps from 54° to 70°. Delivers up to 14,000 volts. Size 2⅞ x 2 x 4". Latest FERRITE core. Individually boxed. Shpg. Wt. 3 lbs.

## 70° DEFLECTION YOKE

LOTS OF 3

$2.99 each

Stock #T-93

Replacement for RCA 206D1. Powdered iron ferrite Yoke gives sharp, clear pictures. Can be used on all kinescopes up to 24". Fully equipped with resistors and 50 mfd. condensers and long leads. Lists at $9.00. T-93. Single, each..... $3.49

## 55° DEFLECTION YOKE

Deflection Yoke for use with 10BP4, 12LP4, 16AP4 and all similar kinescopes, same RCA 205D1, WT. 2 lbs. T-84. Ea. $2.79.

Lots of 3 ea. $2.29

$2.29 Ea., Lots of 3

**Hi-Voltage Flyback** output transformer for 10" and 12" kinescopes. Provides 9KV. Same as RCA 211T1. Wt. 4 lbs.

T-82. Olson's Price, only.... $2.99

$1.99 100 Ft. Coil Stock No. W-73

## 300-Ohm Lead-in

High grade, low loss. For all TV installations. Shpg. wt. 3 lbs.

# MAGNAVOX RECORD PLAYER ASSEMBLY

$79.95 No. RA-65

Plays 33⅓ and 78 RPM Discs

Look what you get! Magnavox tone arm with flip crystal cartridge and dual needle for regular and LP discs. 2 speed Alliance Motor and turntable, volume control and switch. All mounted on board 11" x 14½". Shpg. wt. 10 lbs.

## OLSON'S NEW AKRAD KIT —WITH 4-DRAWER STEEL CABINET FREE

Reg. List Price $18.38. AS-36

$6.95

We have a limited quantity of Olson Akrad "Super Sealed" by-pass condensers available in 4 drawer steel cabinets, size 6¼x5¾x8⅛. Drawers have compartments. Condensers are designed to give long, dependable service even in the tropics. Kit Contains 42 Condensers. You get the 4 drawer steel cabinet and the following 42 Olson Akrad "Super Sealed" by-pass condensers.

| Qty. | Cap. | Volts | Qty. | Cap. | Volts |
|---|---|---|---|---|---|
| 2 | .001 | 600 | 10 | .05 | 600 |
| 2 | .002 | 600 | 10 | .1 | 600 |
| 2 | .005 | 600 | 2 | .005 | 1600 |
| 5 | .01 | 600 | 2 | .008 | 1600 |
| 5 | .02 | 600 | 2 | .01 | 1600 |

## PANEL LAMPS

Westinghouse, GE, and Tung-Sol bayonet panel lamps. 100 of a type to the box.

| Stock No. | Type No. | Price per 100 |
|---|---|---|
| X-161 | 47 | $5.59 |
| X-174 | 44 | |
| PL-25 | 51 | $4.29 |

## Build a Receiver Set of Basic Components

Kit of 5 parts .... AS-38 $1.89

You get this kit of 5 basic parts to build an AC-DC set or portable:

| Parts | Reg. List Price |
|---|---|
| Loop | $0.95 |
| R. F. Coil | 1.10 |
| I.F. Transformer (456 KC) | |
| Input | 1.60 |
| Output | 1.60 |
| Oscillator Coil | .75 |
| List Price of Set | 6.00 |

Use any 365 mfd variable for tuning. Covers 535-1625 KC.

# FOR GOOD TV INSTALLATIONS

## ALLIANCE TENNA-ROTORS

The Alliance Tenna-Rotor makes it possible for you to "beam" or turn your antenna in the direction best suited to pick up any TV station within range. When so turned the signal delivered by the antenna to the TV set is increased by giving you a better, clearer picture. The rotator unit is fully enclosed in a moisture-proof housing, factory lubricated for life. Bearings are stainless steel. Works in any weather. Guaranteed for a full year. Approved by Underwriters' Laboratories. Can be used on all masts up to 1⅜" diameter. Takes up to a 20 lb. antenna. For heavier antennas also order the Thrust Bearing Bracket shown below. Operates on 115 V. 60 cy AC 30 watts. Rotates clockwise or counter-clockwise full 360° at 1 RPM. **Available in 3 models.** Shpg. wt. 15 lbs.

**AU-15. MODEL ATR.** Tenna-Rotor with control box which shows end of 360° rotation by means of an indicator lamp on control box. Does not show direction of antenna. Each..... $20.53

**AU-12. MODEL DIR.** Tenna-Rotor with control box which employs an indicator dial showing direction antenna is beamed. Each..... $26.43

**AU-21. MODEL HIR.** Tenna-Rotor with automatic control box. You set the pointer for direction desired and antenna turns to that direction and stops automatically. Each..... $26.43

## 4 CONDUCTOR CABLE

For use with all Alliance Tenna-Rotors.

W-62, 100 ft. Coil, ea. .... $4.00

## THRUST BEARING BRACKET

For use with any above Alliance Tenna-Rotors where extremely heavy antenna is to be used. Supports up to 200 lbs.

AU-13. each ..... $2.91

## TV-FM ANTENNAS

Exceptionally high gain on all channels. Efficient for "fringe" areas. Low standing wave ratio permits use with 72, 150 or 300 ohm lines. Special conical section design minimizes noise, reduces "ghosts" — results in sharp, clear picture. Easily assembled. Double bay with 10 ft. mast. Shpg. wt. 16 lbs.

AU-61 ..... $12.99

Same antenna with single bay and 5 ft. mast. Shpg. wt. 10 lbs.

AU-60 ..... $6.99

## ALLIANCE TV BOOSTER

$17.97

STOCK NO. RA-62

Alliance Booster offers electronic features in design for maximum reception in fringe TV areas. Gives the signal a real boost. One control for all channels. Automatic switch turns Booster on with set. Shpg. wt. 7 lbs. $17.97

RA-62.....

# IT'S EASY TO ORDER FROM OLSON'S

How to order: Order directly from this ad. For convenience use this order blank. Fill in columns below with quantity desired, stock number, description and price. You may send remittance with order (include enough for postage or parcel post shipment), or if you prefer SEND NO MONEY. Olson will ship C.O.D. and you may pay mail or expressman for merchandise and postage.

**MONEY BACK GUARANTEE:** *Everything you order from Olson is guaranteed as advertised. If you are not more than satisfied, you may return merchandise for cash refund.*

Please Minimum Order $3.00

| QUANTITY | STOCK NUMBER | DESCRIPTION | PRICE EACH | TOTAL |
|---|---|---|---|---|
| | | | | |
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NAME _____ TOTAL

ADDRESS _____ ADD. POSTAGE

CITY _____ ZONE ____ STATE _____ TOTAL AMOUNT

RN951

## CLEVELAND, OHIO

**2020 Euclid Ave.**

If you live in or near Cleveland visit our store, get these and many more bargains.

## CHICAGO, ILLINOIS

**623 W. Randolph Street**

If you live in or near Chicago visit our store, get these and many more bargains.

MAIL ORDERS SHOULD BE SENT TO AKRON, OHIO

OLSON AKRAD

**OLSON RADIO WAREHOUSE • 73 E. Mill St., Akron 8, Ohio**

# An Improved TONE CONTROL CIRCUIT

***Simple and easy to install—provides 15 db boost at either or both bass and treble frequencies.***

**By JOSEPH A. SZABO**

RESISTANCE-capacity tone control circuits are used almost universally because of their many advantages over *L-C-R* networks.

The advantages are cost, size, weight, freedom from induced hum, and absence of ringing and transient effects.

In spite of the many advantages, their performance usually leaves much to be desired. Considerable investigation and development has brought out the following facts.

It is desirable to provide a true bass and/or treble boost. The usual "cut" or "droop" action of the typical *R-C* network fails to provide the true psychological effect of "boost." Often this factor is overlooked and yet it seems to be extremely important. Objective operating and listening tests by nontechnical listeners have proved this point. However, the answer seems to lie in human engineering and not in audio engineering. Technicians and engineers may love to argue the point but the bald fact is that people like boost-type tone control circuits.

It is desirable to provide separate adjustment of bass and treble boost without interaction between the two controls. But several common circuits that provide for separate adjustment have annoying interactive effects.

It is desirable that the input impedance be reasonably high. Several of the well known circuits will cause severe loading of normal vacuum tube amplifiers and they may require special circuits to drive them.

It is desirable that the resultant response curve be smooth and free from "steps." Many common circuits cause a step in the response curve when they are adjusted for flat response.

It is desirable that the tone control circuit provide an easily identified flat position. This factor is often overlooked but cannot be over-emphasized. Twin tone controls can lead to an almost infinite combination of settings that leave the operator hopelessly confused.

The circuit presented in this article has been designed with all these points in view and meets all of the requirements to an unusual degree. The circuit values shown allow a boost of up to 15 db for both bass and treble. The bass and treble controls are independent and do not interact. The response is flat when both controls are set at the full counter-clockwise position. The response curve is free from steps. A true boost effect is noted when one or both of the boost controls are advanced. The input impedance is around 100,000 ohms and the circuit can be driven easily by any of the common low-mu triodes. The circuit values shown are for a maximum boost of 15.6 db and for high and low boost frequencies of 200 and 2000 cycles respectively.

The following relations may be used to design the circuit for any specific application.

Choose the desired amount of boost in decibels. This will also equal the insertion loss of the network.

Next, a reasonably large value of $R_1$ should be chosen. The input impedance over most of the range will be very nearly equal to $R_1$.

Then $R_2$ is calculated from the desired amount of boost and the chosen value of $R_1$.

$$R_2 = \frac{R_1}{(Antilog_{10}\frac{db}{20}) - 1}$$

$F_L$ is the low frequency at which the boost will be 3 db from maximum and $F_H$ is the corresponding high frequency.

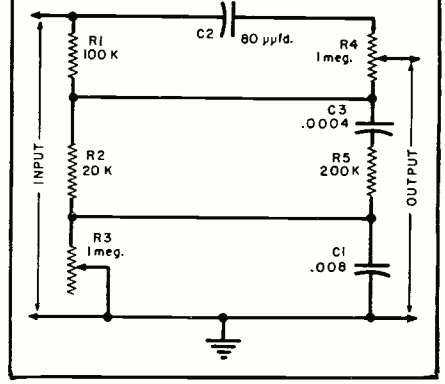
$$C_1 = \frac{1}{2\pi R_1 F_L} \qquad R_3 = \frac{10}{2\pi C_1 F_L}$$

$$R_4 = 10 R_1 \qquad R_4 C_2 = C_3 R_5$$

$$C_2 = \frac{1}{2\pi R_4 F_H} \qquad \frac{R_4}{R_1} = \frac{R_5}{R_2}$$

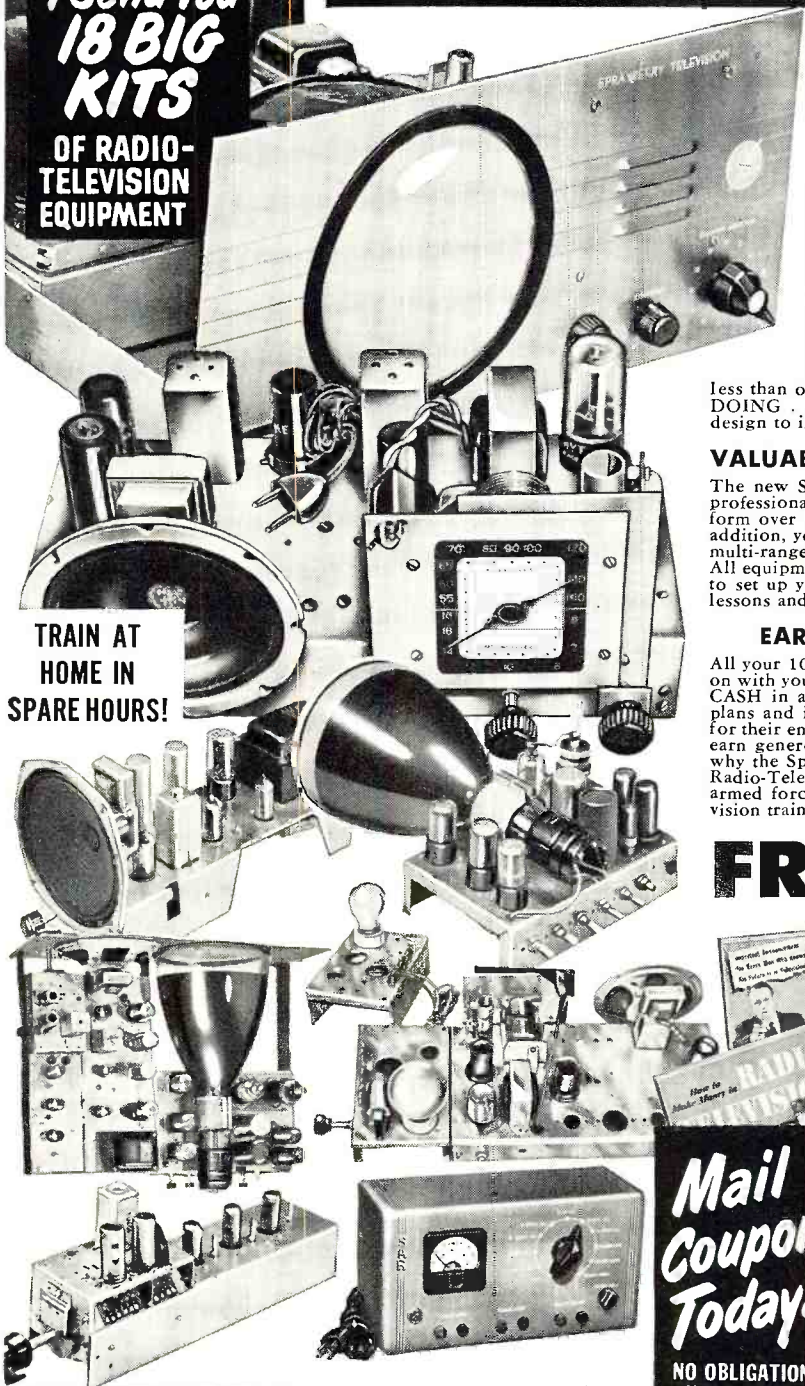
-30-

Circuit diagram of tone control.



# NOW–Be a Fully Trained, Qualified RADIO TELEVISION TECHNICIAN IN JUST 10 MONTHS OR LESS

**I Send You 18 BIG KITS OF RADIO-TELEVISION EQUIPMENT**



**TRAIN AT HOME IN SPARE HOURS!**

## New "Package" Unit Training Plan
## PAY AS YOU LEARN—YOU SET THE PACE!

**No Monthly Payment Contract to Sign!**

Now . . . be ready for Radio-Television's big pay opportunities in a few short MONTHS! Frank L. Sprayberry's completely new "Package" training unit plan prepares you in just 10 MONTHS . . . or even less! Equally important, there is NO monthly payment contract to sign . . . thus NO RISK to you! This is America's finest, most complete, practical training—gets you ready to handle any practical job in the booming Radio-Television industry. In just 10 months you may start your own profitable Radio-Television shop . . . or accept a good paying job in this fascinating expanding field at work you've always wanted to do. Mr. Sprayberry has trained hundreds of successful Radio-Television techincians—and stands ready to train you in less than one year, even if you have no previous experience. You learn by DOING . . . actually working with your hands with equipment of special design to illustrate basic theory instead of relying on books alone.

### VALUABLE EQUIPMENT INCLUDED WITH TRAINING

The new Sprayberry "package" plan includes many big kits of genuine, professional Radio-Television equipment. While training you actually perform over 300 demonstrations, experiments and construction projects. In addition, you build a powerful 6-tube standard and short wave radio set, a multi-range test meter, a signal generator, signal tracer, many other projects. All equipment is *yours to keep* . . . you have practically everything you need to set up your own service shop. The interesting Sprayberry book-bound lessons and other training materials . . . all are yours to keep.

### EARN EXTRA MONEY WHILE YOU LEARN!

All your 10 months of training is AT YOUR HOME in spare hours. Keep on with your present job and income while learning . . . and earn EXTRA CASH in addition. With each training "package" unit, you receive extra plans and ideas for spare time Radio-Television jobs. Many students pay for their entire training this way. You get priceless practical experience and earn generous service fees from grateful customers. Just one more reason why the Sprayberry new 10 MONTH-OR-LESS training plan is the best Radio-Television training in America today. If you expect to be in the armed forces later, there is no better preparation than good Radio-Television training.

## FREE 3 BIG RADIO TELEVISION BOOKS


I want you to have ALL the facts about my new 10-MONTH Radio-Television Training—without cost! Act now! Rush the coupon for my three big Radio-Television books: "How to Make Money in Radio-Television," PLUS my new illustrated Television Bulletin PLUS an actual sample Sprayberry Lesson—all FREE with my compliments. No obligation and no salesman will call on you. Send the coupon in an envelope or paste on back of post card. I will rush all three books at once!

**SPRAYBERRY ACADEMY OF RADIO**
**Dept. 25-A, 111 North Canal St., Chicago 6, Ill.**

**Mail Coupon Today!**
**NO OBLIGATION**
**No Salesman Will Call.**

**SPRAYBERRY ACADEMY OF RADIO, Dept. 25-A**
**111 North Canal St., Chicago 6, Ill.**

Please rush to me all information on your 10-MONTH Radio-Television Training Plan. I understand this does not obligate me and that no salesman will call upon me.

Name.....Age.....

Address.....

City.....Zone.....State.....

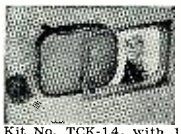
Please check Below About Your Experience

☐ Are You Experienced? ☐ No Experience

**IF YOU ARE EXPERIENCED IN RADIO** Men already in Radio who seek a short intensive 100% TELEVISION Training with FULL EQUIPMENT INCLUDED are invited to check and mail the coupon at the right.

# 17" T.V. CONVERSION KIT $29.95

McGee's Main Store and its Warehouses Were not in the Kansas City Flood Area—Business as Usual—Prompt Shipments.



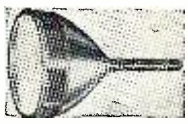
## CONVERT TO A RECTANGULAR PICTURE

With each conversion kit you get a plastic mask, 70 degree deflection yoke, 90 day guaranteed black face picture tube, plus our new 77J1-X 14,000 Volt Universal fly-back and horizontal output transformer that works on any output tube and any single rectifier (1B3 or 1X2). A suggested diagram is furnished for use of the transformer with several different output tubes and rectifiers. We think this is the finest and best priced conversion kit in the country. Shipped Truck or Express, only.

Kit No. TCK-14, with 14BP4A 14" rectangular tube. Net price.....$27.95
Kit No. TCK-16, with 16RP4A 16" rectangular tube. Net price.....34.95
Kit No. TCK-17, with 17BP4A 17" rectangular tube. Net price.....29.95

## PICTURE TUBE SALE

### Values like this 12LP4, $17.95



Look over these picture tube prices and you will see, that for set replacement and conversion use, McGee offers you more for your money. Every picture tube guaranteed full replacement for 90 days. Every tube is a tremendous value. These tubes are not seconds, but 1st quality.

**NOTE: 10MP4 Replaces a 10BP4 Without Any Circuit Changes.**

| Tube No. | Deflection Angle | Overall Length | Neck Length | Envelope | Face Type | Ion Trap | Net Price |
|---|---|---|---|---|---|---|---|
| 10M P4 | 10" 54 | 17" | 7-9/16" | Glass | Clear | Single | $16.95 |
| 12L P4 | 12" 50 | 18¾" | 8¼" | Glass | Clear | Double | 17.95 |
| 12Q P4 | 12" 55 | 17⅛" | 7" | Glass | Clear | Single | 17.95 |
| 14B P4A | 14" (R) 70 | 16-13/16" | 7½" | Glass | Filter | Double | 19.95 |
| 15D P4 | 15" 60 | 20¾" | 7⅞" | Glass | Clear | Double | 29.95 |
| 16A P4 | 16" 53 | 22-5/16" | 7-9/16" | Glass | Clear | Double | 29.95 |
| 16G P4A | 16" 60 | 20¾" | 7½" | Glass | Clear | Double | 22.95 |
| 16L P4 | 16" 70 | 17-11/16" | 6⅞" | Metal | Filter | Single | 24.95 |
| 16L P4 | 16" 52 | 22¼" | 7⅜" | Glass | Clear | Double | 29.95 |
| 16R P4A | 16" (R) 70 | 18¾" | 7½" | Glass | Filter | Single | 24.95 |
| 17B P4A | 17" (R) 70 | 18⅜" | 7½" | Glass | Filter | Single | 22.95 |
| 19D P4A | 19" 60 | 20¾" | 7½" | Glass | Filter | Double | 39.95 |
| 20C P4A | 20" (R) 70 | 21¾" | 7" | Glass | Filter | Double | 39.95 |

**Note:** (R) Designates a rectangular type tube. 10M P4 perfect for 10B P4.

# TUBES

These very low tube prices are made possible by our purchasing from set makers in bulk quantities and boxing tubes in plain white cartons. Each tube has brand and type stamped on carton. Nationally advertised brands shipped you: Sylvania, National Union, RCA, Crosley, Tung-Sol, Jewel, etc.. 6 months' guarantee. All firsts, no throw-outs or seconds. You must be satisfied.

| Popular TV Rectifiers | | 6BQ6gt | $1.29 | 35C5 | $ .89 | Misc. Receiving Types | | Loctal 1½ Volt Types | |
|---|---|---|---|---|---|---|---|---|---|
| 1X2A | $ .99 | 6J6 | 1.19 | 35Z5 | .59 | 6SA7 | $ .82 | 1LA6 | $1.17 |
| 1B3 | 1.19 | 6K6gt | .69 | 50C5 | .89 | 6SH7 | .79 | 1LB4 | 1.17 |
| 5U4G | .69 | 6SN7gt | .90 | 50L6gt | .87 | 6SK7 | .82 | 1LC5 | 1.17 |
| 6W4 | .74 | 6V6gt | .85 | 14A7 | .99 | 6SL7 | .79 | 1LC6 | 1.17 |
| | | 12AC7 | .99 | 14B6 | .99 | 6X4 | .64 | 1LD5 | 1.17 |
| | | 12SN7gt | .89 | 14Q7 | .99 | 6ZY5 | .59 | 1LE3 | 1.17 |
| Popular TV Receiving Types | | | | 35Y4 | .89 | 7A7 | .89 | 1LG5 | 1.17 |
| 5Y3GT | $ .59 | Popular Receiving Types | | 50A5 | 1.09 | 7B6 | .89 | 1LH4 | 1.17 |
| 6AG5 | .89 | | | 1R5 | .89 | 7H7 | .89 | 1LN5 | 1.17 |
| 6AL5 | .69 | 12SA7gt | $ .79 | 1S5 | .89 | 7T4 | .81 | | |
| 6AU6 | .79 | 12SK7gt | .79 | 3S4 | .79 | 12SH7 | .89 | | |
| 6BG6G | 2.10 | 12SQ7gt | .73 | 3V4 | .89 | 12SJ7 | .79 | | |
| | | | | 0Z4 | .59 | 117L7 | 1.49 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1H5 | $ .88 | 6AC7 | $1.42 | 6K7 | $ .98 | 6W6 | $1.08 | 7V7 | $1.29 |
| 1L4 | .98 | 6AG7 | 1.57 | 6K8G | 1.57 | 6Y7G | 1.57 | 7Z4 | .88 |
| 1N5 | .98 | 6AH6 | 1.91 | 6L7G | 1.57 | 7A5 | 1.08 | 12A8gt | 1.08 |
| 1S5 | 1.29 | 6AK5 | 1.91 | 6Q7gt | .88 | 7A6 | .88 | 12BA6 | .88 |
| 1T5 | 1.29 | 6AQ5 | .98 | 6S8 | 1.29 | 7A8 | .88 | 12BA7 | 1.18 |
| 1U4 | .98 | 6AT6 | .73 | 6SD7 | 1.42 | 7AF7 | .88 | 12BE6 | .88 |
| 1V2 | .73 | 6BA6 | .88 | 6SF5 | .81 | 7AH7 | 1.08 | 12BD6 | .98 |
| 3A4 | .98 | 6BA7 | 1.18 | 6SF7 | .98 | 7B4 | .88 | 12J5gt | .73 |
| 3LF4 | 1.29 | 6BC5 | .98 | 6SG7 | .98 | 7E7 | 1.29 | 12J7 | 1.08 |
| 3Q4 | 1.08 | 6C5 | .81 | 6SJ7 | .88 | 7L7 | 1.29 | 12K8 | 1.29 |
| 5AZ4 | .66 | 6C6 | 1.08 | 6SQ7 | .73 | 7N7 | 1.08 | 12Q7 | .88 |
| 5W4 | .81 | 6CB6 | .98 | 6SS7 | .98 | 7Q7 | .98 | 12SF7 | .98 |
| 5X4 | .88 | 6CD6G | 2.94 | 6SR7 | .88 | 7R7 | 1.08 | 12SJ7 | .88 |
| 5Y4 | .73 | 6F5 | .81 | 6ST7 | 1.29 | 7S7 | 1.29 | 12SL7 | 1.18 |
| 5Z4 | 1.29 | 6F7 | 1.57 | 6SV7 | 1.42 | 7W7 | 1.29 | 12SR7 | 1.08 |
| 6AB4 | .98 | 6K5gt | 1.18 | 6T8 | 1.57 | 7X6 | 1.08 | 14A4 | 1.29 |


## 100 MOLDED COND. $9.95

Nationally advertised brand. 85 degree, 600 volt, finest quality.

| | | | | | |
|---|---|---|---|---|---|
| 10 | .001 | 10 | .002 | 20 | .005 |
| 20 | .01 | 20 | .02 | 10 | .05 |
| 10 | .1 | | | | |

Deal No. RN-202. Shipping wt. 2 lbs. Net price.....$9.95

## 25 8MFD 450 V. PLANET $7.95

Deal RN-84, 25 8MFD. alum. tubular electrolytics. 1951 production, paper sleeves with solid leads. Shipping weight 2 lbs. 20 50-30 Mfd 150 Volt. Planet Deal No. RN-204.....$10.50

## RED HOT SPEAKER VALUES

McGee has a tremendous stock of 100,000 speakers to fill your needs. Every speaker is fully guaranteed. Order your speakers now.

| | | | | | |
|---|---|---|---|---|---|
| MN-8. | 8 mfd 450 volt | 35c | 4 inch, square | 1 oz. magnet | $1.69 |
| MN-16 | 16 mfd 450 volt | 45c | 5 inch, pincushion | 1 oz. magnet | 1.79 |
| MN-30. | 30 mfd 450 volt | 55c | 6 inch, pincushion | 1.47 oz. magnet | 2.79 |
| MN-20. | 20 mfd 150 volt | 35c | 4 x 6 inch | 1 oz. magnet | 2.29 |
| MN-40 | 40 mfd 150 volt | 45c | 5 x 7 inch, oval | 1.47 oz. magnet | 2.49 |
| MN-220. | 20-20 mfd 150 volt | 55c | 7 inch, pincushion | 2.15 oz. magnet | 3.49 |
| MN-53. | 50-30 mfd 150 volt | 55c | 8 inch, pincushion | 2.15 oz. magnet | 3.49 |
| MN-442. | 40-40-20 mfd 150 volt | 69c | 6 x 9 inch, oval | 2.15 oz. magnet | 3.49 |

All cond. guaranteed one year.

## LOOK AT THESE BARGAINS!

### TRAV-LER 3-WAY PORTABLE — $18.95

A lucky purchase makes this value possible. Model 5022 Trav-Ler 3 way portable. Operates on 105 to 125 volts AC or DC, or self-contained batteries. A full 2 gang superhet with Alnico V dynamic speaker. Tube component: 1R5, 1U4, 1U5, 3V4, plus rectifier. Has vernier airplane dial. A smartly styled two-tone portable with ivory plastic front panel and Tan or Red leatherette covered case. Compact size 9 x 5¼ x 5¼". Loop antenna is built in. Receives broadcast 550 to 1600 kc. A powerful set with 6 tube performance. Shipping weight, less batteries, 6 lbs. (7 lbs. with batteries). Trav-Ler Model 5022, portable less batteries $18.95 ea. Lots of 3 $18.50 ea. Battery kit for Model 5022 $1.75 extra. (consists of one 67½ volt 'B' and 2 No. 2 flashlight cells.)

### VM 3-SPEED AUTOMATIC—$44.95

Another special purchase offer! VM-975, 3 speed portable automatic record changer. Housed in a deluxe brown leatherette case: 14½ x 17¼ x 8¾" high. Famous VM Tri-O-Matic changer, plays all 3 speed and all 3 sizes automatically. 10 and 12" records of the same speed can be inter-mixed. Flip-over crystal cartridge provides the correct needle size for the record you are playing. Has good quality 3 tube amplifier, a tone and volume control and heavy magnet PM speaker. Regular dealer net is $85 ea. Now, a limited number are available at the special sale price of only $44.95 each. Shipping weight 22 lbs.

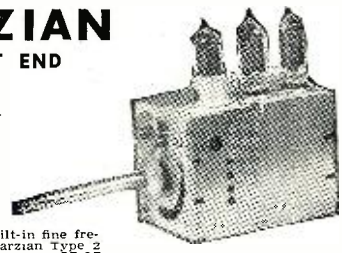
### TRAV-LER 3-SPEED PORTABLE—$18.95

Trav-Ler Model 7033, deluxe 3-speed electric portable record player. Powerful 3 tube amplifier, (12SQ7, 50L6, and 35Z5 rectifier). Full size Alnico V magnet, dynamic speaker. Plays all records: 7", 10" and 12", 33⅓, 45 and 78 RPM. Crystal pickup, with all purpose trumcated permanent needle. Luggage style case, 12½ x 10½ x 6¼", expertly covered with simulated Tan, Green, or Red leatherette. Shipping weight 11½ lbs. Trav-Ler Model 7033, 3-speed portable electric record player. Net price only $18.95. Lots of 3, $18.50 each.

# SARKES-TARZIAN

## 13-CHANNEL T.V. FRONT END

### WITH TUBES AND DIAGRAM $79.95



This popular Sarkes-Tarzian television front end is widely used today. The 13 channel rotary switch type with individually tuned coils. Price includes a schematic diagram and 3 tubes, 6C4 osc, 6BH6 RF and 6AG5 mixer. Regular factory cost is twice our price. Each tuner and its own tube sockets are wired, ready to hook up to a video and sound IF strip. May be used with either intercarrier or separate sound IF circuits. Built-in fine frequency control. Ship. weight 3 lbs. Sarkes-Tarzian Type 2 TV tuner with tubes net.....$7.95
Combination deal. Sarkes-Tarzian TV tuner and 205-XX video coil kit. both for...$14.95
Sarkes-Tarzian Type 3—Same as Type 2 only has input IF coil built-on. Tapped for sound IF channel. Net.....$9.95
Sarkes-Tarzian Type 3 tuner and 205-XX coil kit both for.....$16.95

### BRAND NEW GENERAL INST. TELEVISION FRONT END-TUNERS

Sale Price $7.95

All completely wired, brand new and prealigned. 13 channel selector incorporating fixed inductance and variable capacitance. Converter output transformer is attached to be coupled direct to separate sound and video I.F.'s. 3 6J6 tubes are required. Shaft length 2¼". Built in fine frequency control. Original factory cost over $20.00. Weight 4 lbs. Stock No. GI-13P, less tubes. Net price $7.95.

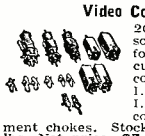
Stock #GI-13PX Same as above only not in new condition. Have been in sets, but guaranteed a good value—less tubes. G. Inst. Tuner—G1-13PX, net $2.95.

### NEW 2-TUBE SARKES-TARZIAN T.V. TUNER LESS TUBES $7.95

Sarkes-Tarzian new two-tube model, type TT-3A, 12-channel television tuner. This is the new two-tube model requiring a 6J6 plus 6AK5 or 6AG5, or 6CB6, or 6AU6 RF tubes. Pre-factory aligned by trained factory personnel. Input feeds 21 M.C. broad-band. Fine tuning control is over the channel selector shaft. Power requirements 120 to 140 Volts D.C. at 17 Mills plus 6.3 Volt filament. This tuner is offered at a terrific saving to you. Stock No. TT-3A. Net price, $7.95; two for $15.00, less tubes. Specify shaft length desired.

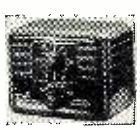
Stock #TT-3A—with 2⅞" shaft, net $7.95. With 5½ or 7½" shaft $1.00 extra. 6J6 and 6AU6 Tubes for above $2.39 ea.

### Video Coil Kit $7.95



20 matched TV video and sound I.F. coils. Intended for use with the RCA circuit. You get 6 peaking coils, 4—25.75 mc picture I.F.'s, 2—21.25 mc sound I.F.'s, discriminator and converter coil and 5 filament chokes. Stock No. 205-XX, weight 3 lbs. Net price, $7.95, $6.95 if purchased with ANY TV tuner: all coils identified.

### T.V. BOOSTER REGENCY $19.10



Regency DB-410 television booster. A real engineered unit, small and compact. Slug tuned, using 1—6J6 tube as neutralized push-pull amplifier. Dollar for dollar, your best booster buy. 5¾x 4¾x 4¾". For 110 volt AC operation. Weight 6 lbs. Net price $19.10.

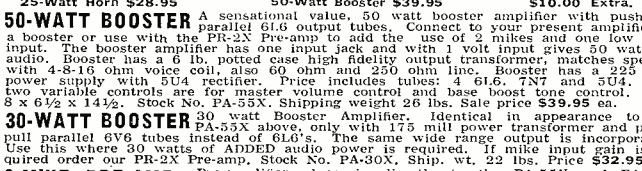
## SCOOP

## 7-TUBE FACTORY-BUILT VIDEO STRIPS—$5.95 EACH KIT OF 7 TUBES $4.95 EXTRA

7 tube, wired, sub-assembly with separate I.F. Stock No. 15C577. Admiral sub-assembly for Model 24D1, etc. Any picture tube from 14" to 20". A completely wired sound and video IF strip. This is the most delicate portion of a TV receiver and offered at less than factory production cost. Requires 7 tubes. 4 6AU6, 6AG5, and 2 6AL5. Only a few connections necessary to any make 12 channel tuner such as Sarkes Tarzian, G. I., or R. C. A., etc. Sub-assembly has 1st sound IF (21.25 mc), 3rd video IF cathode trap, 2nd video IF (25.3 mc), 4th video IF (23.15 mc) 2nd sound IF, peaking coil, and ratio detector transformer. Requires 6AL5 video detector and sync clamper, 6AU6 1st sound IF, 6AU6 2nd IF, 6AL5 ratio detector, and three 6AU6's, 1st, 2nd, and 3rd video IF's. Printed diagram furnished. Stock No. 15C577. Shipping weight 2 lbs. less tubes $5.95. Kit of 7 tubes $4.95 extra.

This 7 tube video sub-assembly was intended for use in Admiral intercarrier type, Model No. 20A1, etc. May be used with any size picture tube up to 20". Offered at less than factory production cost. Requires 7 tubes: 5 6AU6, and 2 6AL5. Now if you want to build a TV set here is the hardest part already finished for you. Used with 10" to 20" picture tube sets. Has ratio detector transformer, sound IF transformer, 2nd video IF (25.3 mc), 3rd video IF (23.1 mc), and 4th video IF (25.13 mc). Requires 6AL5 ratio detector, 6AU6 sound IF amplifier, 6AU6 video amplifier, 6AL5 video detector AGC, and three 6AU6 for 1st, 2nd, and 3rd video IF stages. Printed diagram furnished. Chassis measures 7⅛ x 3¾". Stock No. 5-LA7. Shipping weight 1½ lbs. less tubes $5.95. Kit of 7 tubes $4.95 extra.

## 50-WATT BOOSTER AMPLIFIER—$39.95



25-Watt Horn $28.95 — 50-Watt Booster $39.95 — 2-Mike Pre-Amp. $10.00 Extra.

**50-WATT BOOSTER** A sensational value, 50 watt booster amplifier with push-pull parallel 6L6 output tubes. Connect to your present amplifier as a booster or use with the PR-2X Pre-amp to add the use of 2 mikes and one low level input. The booster amplifier has one input jack and with 1 volt input gives 50 watts of audio. Booster has a 6 lb. potted case high fidelity output transformer, matches speaker with 4-8-16 ohm voice coil, also 60 ohm and 250 ohm line. Booster has a 225 mill power supply with 5U4 rectifier. Price includes tubes: 4 6L6, 7N7 and 5U4. The two variable controls are for master volume control and base boost tone control. Size 8 x 6½ x 14½. Stock No. PA-55X. Shipping weight 26 lbs. Sale price $39.95 ea.

**30-WATT BOOSTER** 30 watt Booster Amplifier. Identical in appearance to the PA-55X above, only with 175 mill power transformer and push-pull parallel 6V6 tubes instead of 6L6's. The same wide range output is incorporated. Use this where 30 watts of ADDED audio power is required. If mike input gain is required order our PR-2X Pre-amp, Stock No. PA-30X. Ship. wt. 22 lbs. Price $32.95 ea.

**2-MIKE PRE-AMP.** Pre-amplifier plugs in directly to the PA-55X and PA-30X amplifier. It enables use of 2, Crystal or Dynamic Mikes plus one low level input. Furnished with 4 foot cables and plugs for remote control of the 55 or 30 watt Booster Amplifier. Small chassis size 5 x 3¼ x 4". Stock No. PR-2X, with tubes 7F7 and 7N7. Net price $10.00 ea.

**25-WATT HORN** standard type trumpet and driver you see the most. Drivers are 100% weatherproof, horn is spun aluminum, offered to you at a considerable savings. Stock No. MA-33. Shipping weight 20 lbs. Net price $28.95.

## McGEE RADIO COMPANY

Prices F.O.B. K.C. Send 25% Deposit with Order, Balance Sent C.O.D. With Parcel Post Orders, Include Postage

TELEPHONE VICTOR 9045. WRITE FOR FLYER
1422 GRAND AVE., KANSAS CITY, MISSOURI

# SENSATIONAL NEW 2-BAND RADIO KIT ONLY $14.95

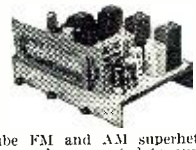
## 7-TUBE FM-AM TUNER

**MODEL RAL-8**

★ **AC SELF POWERED**

★ **3 GANG TUNING** ★ **A COMPLETE KIT**

**$29.95**



McGee has ready for delivery, this self powered AC, 7 tube FM and AM superhet tuner kit. Build yourself a professional looking tuner that may be connected to any audio amplifier. Receives broadcast 550 to 1650 kc and FM 88 to 108 mc. A 3 gang tuning condenser is used on both FM and AM. This extra stage of TRF makes a smoother working tuner. 2 IF stages on FM and one IF stage on AM (I.F. frequency 456 and 10.7 mc). Lighted slide rule dial with metal escutcheon plate. Our own lab designed and wired an original tuner using these parts. Chassis is ready punched and painted. Everything furnished including tubes and diagrams. Shipping weight 12 lbs. Stock No. RAL-8, net price $29.95.

## MODEL ME6-2 $14.95

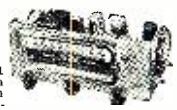
**NEW MODEL 6-TUBE, 2-BAND RADIO KIT**

**A FULL 2-GANG SUPERHET KIT**

**RECEIVES 550-1600 KC PLUS 6-18 M.C.**

McGee's new 1951, 6 tube; AC-DC 2 band radio kit. Receives broadcast, 550 to 1600 kc and short wave, 6 to 18 mc. A straight forward superhet circuit with 2 gang tuning condenser, 456 kc I.F. transformers, etc. 5" speaker illuminated slide rule dial. Everything furnished, including tubes, diagram and a photo showing view of underside of completely wired chassis. The chassis pan and dial parts are factory production. With this kit, you can build a commercial looking and factory quality 2 band radio, housed in a streamlined plastic cabinet. Size: 13 x 6¾ x 6¼". Stock No. ME6-2, shipping weight 10 lbs. Net $14.95.

## SELF POWERED AC Broadcast Tuner Kit. 3-Gang Tuning. Complete Kit, $12.95



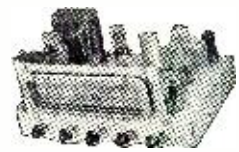
A self-powered, 3-gang superhet tuner kit with R.F. stage. When wired according to our diagram will make a top quality broadcast tuner (550 to 1650 kc), for use with any amplifier. Don't class this with ordinary tuners; this has its own power transformer. This complete kit is furnished with a diagram, photos and tubes: 6SH7 R.F., 2—7E5 converter-mixer oscillator, 6SF7 I.F. detector, and 6X4 rectifier. Connect to any audio amplifier. Ideal for use with our S-2020, TM-16 or 7X5 amplifier kits. Chassis size, 9¼x4x 4¼" high. Shipping weight, 7 lbs. Broadcast tuner kit Model BT-38X. Net price, **$12.95.**

## 8-TUBE 22 WATT Wide Range Amp. Model 7x5 Kit Only $37.95

A complete kit, including tubes (3-7E5, 2-7F7, 2-6A3, plus rectifier), diagram and photos. All triode circuit makes for minimum harmonic distortion. Inputs for radio tuner any kind of phono pickup (crystal or G.E. variable reluctance) and either crystal or dynamic mike. Output transformer matches 8 ohm voice coil. Twin electronic tone controls, bass and treble with range selector switch for either juke box quality with heavy bass response or brilliant symphonic range. The best quality amplifier kit we know how to make. Has a very wide range output and heavy power transformer. Response 18 to 20,000 CPS. 8 tube all triode amplifier kit, complete with tubes. Weight 25 lbs. Net **$37.95.**

## 10-TUBE RADIO KIT $29.95

**3-GANG TUNING**
**MIKE INPUT**
**12 WATT**
**HI-FI AUDIO**
**BASE-TREBLE BOOST**



**A NEW 1951 ALL-PURPOSE RADIO KIT**

10-Tube Broadcast (550 to 1700 kc) Radio Kit for custom builders. Features 3-gang superhet circuit with A.V.C., high gain IF circuit, 8" slide rule dial. Chassis size 12½" long, 10" front to back, 6½" high. Audio inputs for a crystal or dynamic mike, and record changer or player. Tone compensation for standard crystal pick-up or General Electric variable reluctance. Push-pull 6V6 output tubes, shielded high fidelity output transformer matches 8 ohm PM speaker, husky power transformer, 2 tone controls for separate base and treble boost. A complete kit, including tubes (3—7E5, 6SH7, 6SF7, 2—7F7, 2—6V6, plus rectifier), diagram and instructions. Shipping weight 18 lbs. Stock No. BK-R10. Net price **$29.95.** 10" PM speaker. **$6.95** extra. Crystal mike and desk stand, **$4.95** extra. VM-406 3-speed automatic record changer, **$22.95** extra.

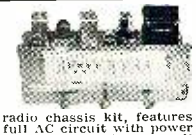
## 5-Tube Broadcast SUPERHET RADIO KIT $12.95

Model RS-5 tube AC-DC superheterodyne radio kit. Has loop antenna and 2 gang condenser, with lighted slide rule dial and attractive plastic cabinet. Receives broadcast, 550 to 1650 kc. Full size dynamic speaker, matched 456 I.F.'s, automatic volume control. This is a complete radio kit. Everything furnished, including diagram, photos and tubes: 12K8, 12SH7, 2—7E5 and 70L7. Shipping weight 7 lbs. Stock No. RS-5. Net price **$12.95.**

## Build Your Own Phono-Mike Broadcaster $7.95

Kit Model DE-6R. With this simple kit, you can build a 3-tube phono oscillator that also has a mike input. Will broadcast over any radio, within your home, (about 75 feet) from 1000 to 1500 kc. Inputs for crystal mike or crystal phono pickup. Fader control from mike to record. Ideal for a home P.A. system, baby listener and home entertainment. A complete kit of parts including tubes. Kit Model DE-6R. Net price, **$7.95.** DE-6RWT, wired and tested. Net price, **$9.95.** Crystal mike and desk stand. **$4.95** extra. Concealed microphone unit, only 1" in diameter and ¼" thick. Specify hidden mike when ordering. Stock No. T-001. Net. **$3.95** extra.

## 6-TUBE AC-2-BAND KIT $16.65



A New 2-band radio chassis kit, features 3-gang tuning, full AC circuit with power transformer, complete with diagram, all parts and tubes, 6SA7, 2 7A7, 7B6, 6K6, and 5Y3. Chassis size, 7" deep, 6" high, 12½" long, 7½" slide rule dial. Very ideal for schools, etc. A straight forward superhet circuit complete except for speaker and cabinet. Output transformer is part of radio kit. Stock No. AA-61. Shipping weight 9½ lbs. Net price **$16.95.** 6" PM speaker **$2.79** extra, 8" PM **$3.49** extra.

## 5-STATION INTERCOM MASTERS $16.95

**SUB-STATIONS $3.95**

Model 2700 5-station intercom master, in an attractive walnut cabinet 10x5½x6". Push-button for each sub and talk-listen switch and volume control. AC-DC amplifier with lots of power and full size Alnico V PM speaker. 1950 production of a famous factory. Only 300 left, weight 7 lbs. Model 2700, net, **$16.95.**

Model MG-300 molded walnut plastic substation with call-back switch and heavy PM speaker. 5½x8½x3½", for wall or desk. Weight 2 lbs. Net, **$3.95** each; 5 for **$18.95.**

3 wire intercom cable, plastic, **$1.95** per 100 ft.; 500 ft., **$9.50.**

## 4-PRONG VIBRATORS $1.29

**IN ALUMINUM SERRATED CANS**

**10 FOR $11.90**

4 MILLION AUTO RADIOS BUILT IN 1950 AND HERE IS THE PERFECT REPLACEMENT VIBRATOR FOR MOST OF THEM.

Latest 1951 production by a top quality manufacturer. Fully guaranteed six months. Quiet running. A result of modern vibrator engineering and research. Replaces Motorola, Chrysler and any standard 4 prong non-sync Vibrator. McGee contracts for a tremendous quantity to take care of your 1951 needs. Stock #V-53 Standard 4 Prong Vibrator **$1.29** each. 10 for **$11.90;** 50 for **$55.00.**

### NEW HEAVY DUTY 4-PRONG VIBRATOR $1.95

**For 7-8 Tube Auto Sets $1.95**

A standard 4 prong vibrator that lists for $4.90 costs service men $2.94. But, you can buy this 8 point heavy duty vibrator at McGee for only $1.95 each, or 10 for $17.50. If you have had trouble with vibrators that don't hold up in the 7 and 8 tube original equipment auto radios, this is the vibrator that you should buy. Vibrator can is standard diameter and length. Fits Mopar, Chrysler, etc. Unit is a heavy duty, 8 point, non-sync type; especially designed for auto sets that draw more than 60 mils 'B', such as 7 and 8 tube sets with push-pull 6V6's, 6K6's, etc. A long life vibrator offered to you at a saving. Fully guaranteed for 6 months. Stock No. V-90, **$1.95** each, 10 for **$17.50.**

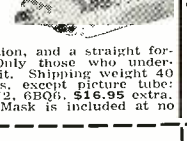
## WEBSTER CHICAGO 3-Speed Changer $24.95

**A Regular $47.50 List**

Webster Chicago Model 100-16 3 speed automatic record changer with crystal cartridge and all speed Sapphire needle. (1 needle plays all records). Base size 12x 12¾". Shipping weight 14 lbs. This offer good only as long as our stock lasts. A special purchase makes this offer possible. Webster Chicago 3 speed changer, Model 100-16, Sale price **$24.95.**

## NEW 17-INCH TELEVISION KIT

**TUNER AND VIDEO READY WIRED $59.95 LESS ALL TUBES**



A complete kit of parts to build a transformer operated AC Television chassis for use with a 16" or 17" Rectangular or Round picture tube, with a 12 channel wired Sarkes Tarzian tuner. The 7 tube video strip for sound and picture IF stages is already wired, this makes for much less work in building your TV set. Circuit features latest ceramic flyback, full 225 mil power transformer, ready punched chassis, and 70 degree deflection, and a straight forward circuit. A complete schematic diagram is furnished. Only those who understand TV and can follow a schematic diagram should buy this kit. Shipping weight 40 lbs., Model WII-19 price, less all tubes, **$59.95.** Kit of tubes, except picture tube: 6AT6, 6V6, 6W4, 6J6, 2 6AL5, 5 6AU6, 5 6AC6, 4 6SN7, 5U4, 1X3, 6BQ6, **$16.95** extra. 16" or 17" Blackface Rectangular picture tube **$22.95** extra. Mask is included at no extra cost when kit is ordered with tubes.

## 12" 32 OZ. PM. SPEAKER $7.95

12", 32 oz. magnet, 20 watt PM speaker, with 8 ohm voice coil. A regular $17.00 list Consolidated speaker. Weight 8 lbs. No. CN-1232. $7.95 each, 4 for **$29.95.**

### SELENIUM RECTIFIERS

65 mil Selenium Rectifier, net ..... 64c each
100 mil Selenium Rectifier, net ..... 74c each
150 mil Selenium Rectifier, net ..... 89c each
200 mil Selenium Rectifier, net ..... $1.09 each
250 mil Selenium Rectifier, net ..... 1.29 each
350 mil Selenium Rectifier, net. 1.59 each
450 mil Selenium Rectifier, net. 1.79 each

McGee offers you the finest in Selenium rectifiers. All standard 130 volt.

## WRITE FOR FLYER

Get on McGee's Mailing list and receive our bargain flyers. Why pay more than McGee's prices. Send postcard today.

## TREMENDOUS SALE ON AUTOMATIC CHANGERS

### GENERAL INSTRUMENT 78 R.P.M. Record Changer SCOOP PRICE $10.95

**TWO FOR $21.00**

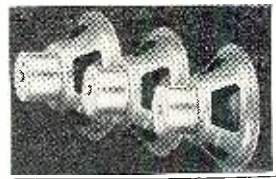
General Instrument 78 RPM automatic record changer. Plays 10- or 12-inch records automatically. One of the latest models made. Beautiful golden brown hammertone finished base. 12x12⅞". Equipped with an Astatic L-70 crystal cartridge. Heavily flocked turntable and plastic fittings are deep maroon colored. This may be our last chance to offer a 78 RPM changer at this price. Comes packed two to a master carton, just like they would be shipped to a set manufacturer. Order 2 changers for an additional saving. Shipping weight for 2 changers, 20 lbs. Stock No. IT-SGI. Net price, **$10.95** each; two for only **$21.00.**

### V.M. 3 SPEED Record Changers $22.95

VM Model 406 deluxe 3 speed automatic record changer—plays them all—intermixes records of the same speed—equipped with a flip over crystal pickup with twin needles—base size 12¼x13. Ship. weight 12 lbs. VM-406. Net, **$22.95.**

Buy the VM-950 changer with or without base. Choice of G.E. VR or crystal cartridge. We think the VM-950 record changer is the finest in America. It automatically plays all records all speeds and all sizes; 12 10-in., 33⅓ or 78 rpm, 10 12-in., 33⅓ or 78 rpm and 12 and 10-in. records of the same speed intermixed, 12 7-in. 33⅓ or 12 7-in. 45 rpm. Automatically shuts off after the last record. Size 13 13/16x11⅞x7¼ in. high. Offered with crystal cartridge, G.E. VR cartridge, or either with a base. VM-950, 3 speed changer with standard crystal cartridge and needles for 1 and 3 mil. (78 rpm, 33⅓, 45 rpm.) Net **$29.62.** VM-950GE, 3 speed changer with the new RPX-050 magic, all-in-one variable reluctance cartridge with stylus. Net **$32.80.** VM-955, 3 speed changer with crystal cartridge on a base. Net **$32.01.** VM-955GE, 3 speed changer with RPX-050 VR cartridge with base. Net **$35.19.**

## SUPER HEAVY DUTY 10" PM $6.95



We made a special purchase on several hundred 20 watt, 10", 32 oz. Alnico 3 magnet PM speakers. Deep throat and easy moving cone. Ideal for all high fidelity sound systems and radio replacement. The magnet on this speaker is usually used on a 15" size. Very efficient, good high and bass response. You'll appreciate it when you get your hands on this speaker. Attractive copper finish. 8 ohm voice coil. Stock No. 1025PS. Weight 7 lbs. Net price **$6.95** each.

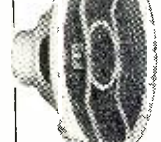
Order three of these and use them in a cluster of three. They will take 60 watts of audio and have more cone area than any 15" speaker. For high power, top quality P.A. work. Think this over. 3 No. 1025PS speakers for only **$19.95.**

## BUY YOUR WIDE RANGE COAXIAL SPEAKER AT McGEE

### 12" COAXIAL PM $12.95

A $32.50 retail value, 20 watt 12" coaxial PM speaker of quality used on radios of the $300 to $500 bracket. Hook up like any PM speaker. High pass filter is built on speaker. Matches 8 ohm output of radio or amplifier. Wide range response, 20 to 17,500 CPS. Model No. CU-14X. Ship. wt. 9 lbs. Special sale price, **$12.95.**

### 15" COAXIAL PM $19.95



Only $19.95 buys a full 15". 20 watt coaxial PM speaker, with built-in high pass filter. Hook to any 8 ohm output on radio or amplifier. Response below 20 to above 17,500 CPS. Good bass response. A lucky purchase makes this price possible. Full 32 oz. magnet in the woofer. 5" tweeter. Model P15-9. Ship. wt. 11 lbs. Sale price. **$19.95.**

## Proportional Control

(*Continued from page 62*)

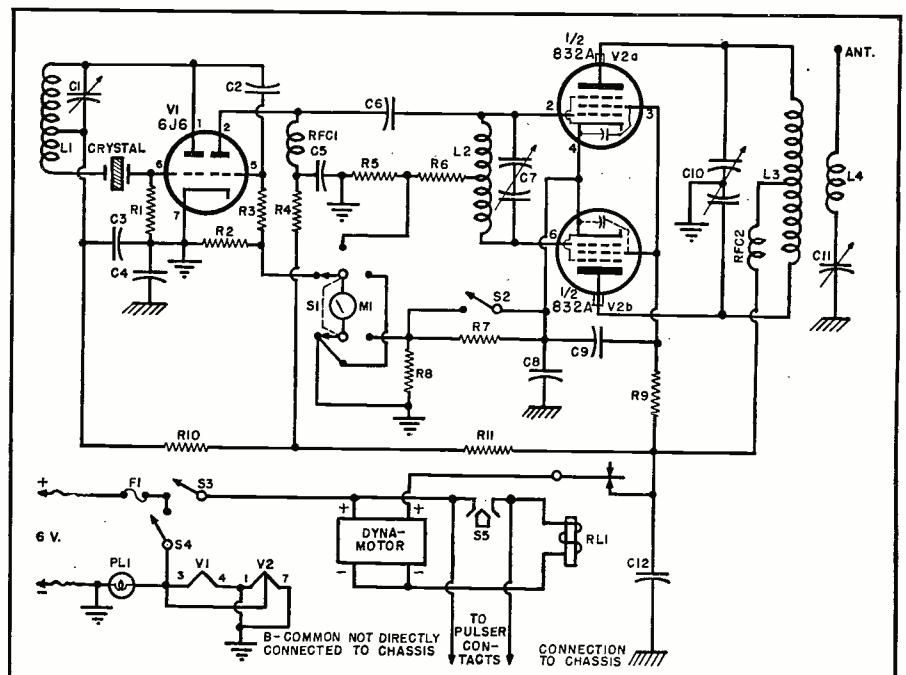
tals (there are two of them with a selector switch not shown on Fig. 10. The second crystal is used as a spare to permit operation on another frequency in case of interference by another operator), while $L_3$, $L_4$, $C_{10}$, and $C_{11}$ are above deck. The crystal oscillator is of the harmonic type and the frequency output is triple the crystal frequency; the second section of $V_1$ doubles this and the final works straight-through. The only tricky points in getting $V_1$ to operate are in setting the tap on $L_1$, and making sure you are feeding the *3rd* crystal harmonic to the doubler. If the tap is too near the plate end, the tube will self-oscillate without benefit of the crystal; if too far the other way, harmonic output will be low or the crystal will refuse to oscillate. The unbalanced input to $V_2$ works perfectly *if* the rotor of $C_7$ is left floating. Purists can add capacity to the lower end of $L_2$, to balance it up, but this isn't really necessary. A shield was fitted around the lower part of $V_2$ as the tube people recommend. The 832A works nicely and is perfectly stable.

Switch $S_1$ puts the 1.5 ma. meter in the doubler grid return (scale is 1.5 ma.), in the final grid return (shunted to read 3 ma. full scale), or the final cathode. $R_8$ was made of rheostat wire, of the proper length to give 75 ma. full scale reading, and the meter indicates combined grid, screen, and plate current of $V_2$ in the third position.

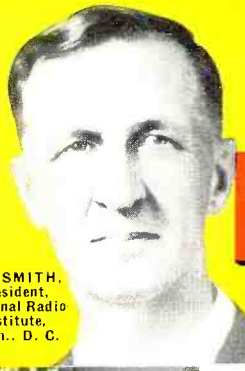
$S_2$ is a "Hi-Lo" power switch that puts $R_7$ in series with the $V_2$ cathode; power output is practically nil, but still is plenty to check the receiver within a hundred feet or so. Incidentally, it will be noted the entire transmitter is keyed; attempts to key only the final, or the final and doubler, didn't pan out. Enough 50 mc. output leaked through to operate the receiver at quite a distance. The regenerative crystal circuit keys very nicely, though, even at a rate as high as 600 ppm.

The transmitter operating characteristics are: Osc., 155 v. at 10 ma.; doubler, 180 v. at 8 ma. on plate, 1 ma. grid current; final grid current 2 ma. (These figures with no plate or screen voltage on $V_2$.) With the final showing 60 ma. cathode current—as it is normally run—the total battery drain is 9.2 amperes. Actual final plate current is about 50 ma., giving a final plate input of 13 watts. No close checks of power output have been made, but it has proven ample for our purposes.

**Fig. 10. Complete schematic diagram and parts list for radio-control transmitter.**




$R_1$—3300 ohm, ½ w. res.
$R_2$—1000 ohm, ½ w. res.
$R_3$—100,000 ohm, 1 w. res.
$R_4$, $R_{10}$—5000 ohm, 1 w. res.
$R_5$—40 ohm, ½ w. res.
$R_6$—20,000 ohm, ½ w. res.
$R_7$—7500 ohm, 10 w. wirewound res.
$R_8$—See text
$R_9$—10,000 ohm, 10 w. wirewound res.
$R_{11}$—5000 ohm, 2 w. res.
$C_1$—50 μμfd. var. cond.
$C_2$—50 μμfd. ceramic cond.
$C_3$, $C_9$—500 μμfd. ceramic cond.
$C_4$, $C_8$—.001 μfd., 500 v. mica cond.
$C_5$—200 μμfd. mica cond.
$C_6$—75 μμfd. ceramic cond.
$C_7$, $C_{10}$—15/15 μμfd. var. cond.
$C_{11}$—100 μμfd. var. cond.
$C_{12}$—2 μfd., 450 v. elec. cond.
Crystal—8800-8900 kc. crystal
$M_1$—1.5 ma. d.c. meter
$F_1$—30 amp. fuse
$RL_1$—40 ohm midget relay
$PL_1$—6.3 v. pilot lamp
Dyn.—Webster 9 v. input (Type No. 35X056) dynamotor
$S_1$—D.p. 3-pos. meter sw.
$S_2$—S.p.s.t. sw. ("Low Power Switch")
$S_3$—S.p.s.t. heavy-duty sw. ("Dynamotor Switch")
$S_4$—S.p.s.t. toggle sw. ("Heater Switch")
$S_5$—S.p.s.t. pushbutton sw.
$L_1$—18 t. #16 en., ½" i.d., 1½" long, tapped at 6½ t.
$L_2$—12 t. #16 en., ½" i.d., center-tapped
$L_3$—14 t. #14 en., center-tapped, ¾" i.d., each half 7/8" long, ⅜" space between for $L_4$
$L_4$—3 t. #16 insulated, adjustable
$RFC_1$, $RFC_2$—35 t. #24 d.s.c., wound on 1 megohm, 1 w. res.
$V_1$—6J6 tube
$V_2$—832A tube



J. E. SMITH, President, National Radio Institute, Wash., D. C.

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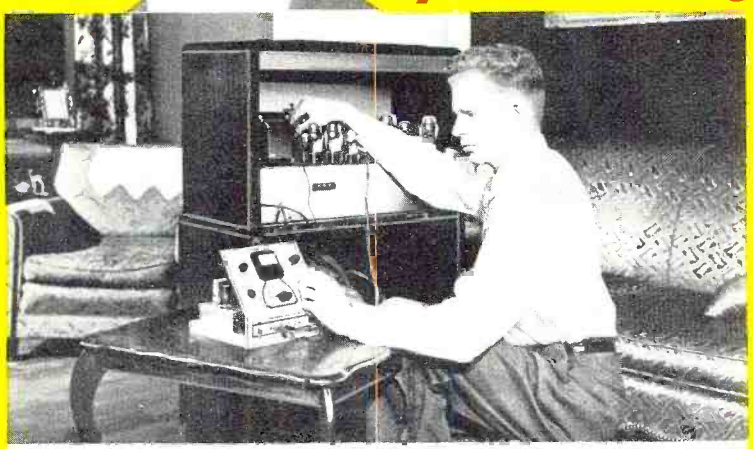


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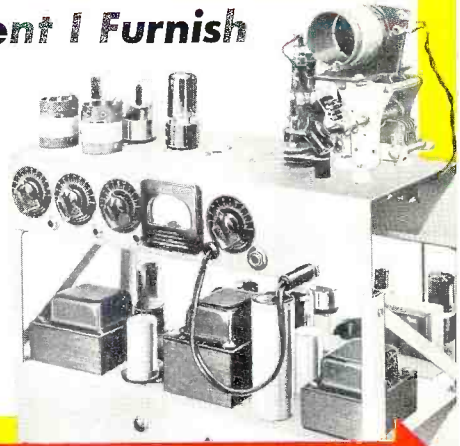

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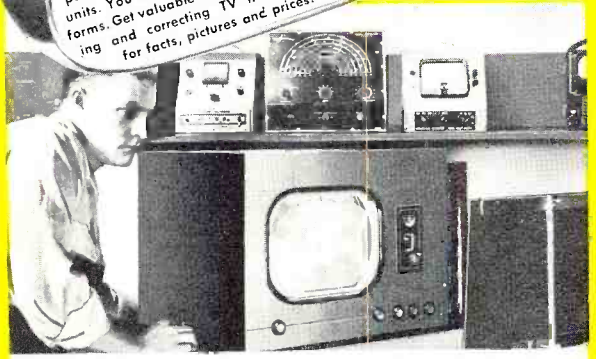

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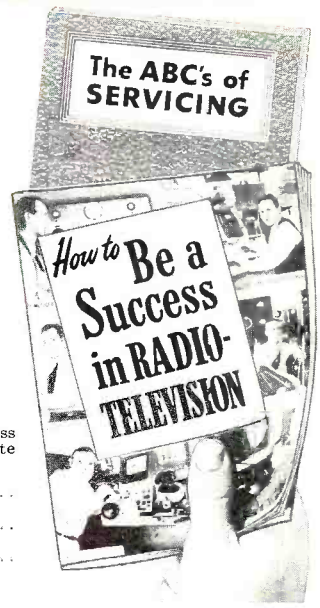

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J. E. SMITH, President,
National Radio Institute,
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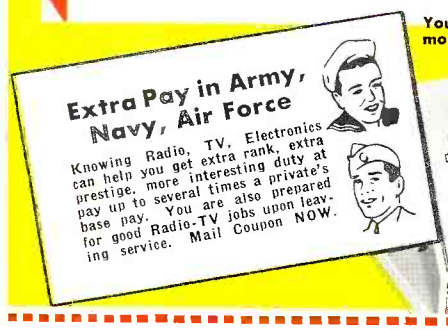

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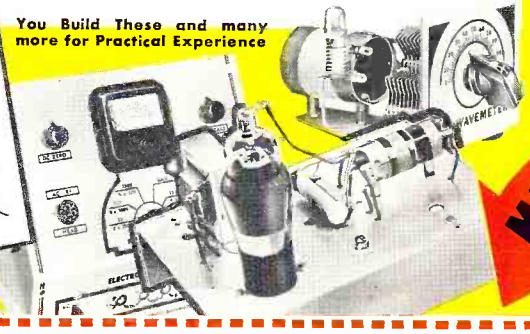

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"When I enrolled with N.R.I., was a laborer. Now I have a position paying over $10 a day."—R. Ford, Phila., Pa.

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**$10 Week In Spare Time**

"Before finishing your course, I earned $10 a week in Radio servicing in my spare time."—S. J. Petruff, Miami, Fla.

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"Got laid off. Best thing that ever happened as I opened a Radio shop."—E. T. Slate, Corsicanna, Texas.

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Keep your job while training. Learn Radio-Television principles from illustrated lessons. Get Practical Experience experimenting with circuits common to Radio and Television. Many students make $5, $10 a week extra fixing neighbors' Radios in spare time while learning. I send you special booklets that start teaching you the day you enroll.

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

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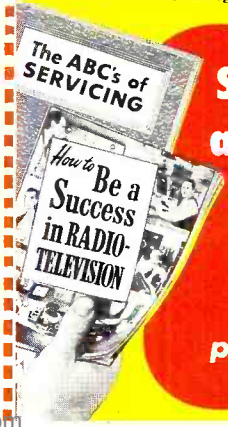


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A vertical antenna about 55" long loads the final nicely. Loading can be adjusted by variation of $C_{11}$. While many radio control enthusiasts frown on the use of vertical antennas, we find them very convenient, and have not experienced any dead spots with the airplane directly overhead.

The entire radio system has operated very well. While it is considerably more complicated than the average radio control rig, its stable operation is a revelation, and enabled us to focus full attention on the proportional control problems. It seems odd, but very, very few model plane fliers, even those with shop equipment and the necessary know-how, have tried proportional control. Just why, we cannot imagine, for once you fly a well adjusted plane with proportional, you won't again be satisfied with escapements or any other "all or nothing" form of control. Maybe the notes we have given here will persuade experimenters to try this system, not only on model planes, but for boats, cars, and other uses as well.

—30—

## HAM LICENSE RENEWALS

THE FCC has requested that we call your attention to the fact that hams who have filed timely applications for renewal of their operator and station licenses may continue operating their amateur stations beyond the normal date of expiration of these licenses pending receipt of formal Commission notice of action on their renewal applications.

This privilege is of importance to insure that hams can continue to participate in civil defense drills, field days, and other activities while the FCC processes pending applications. This general notice is issued in lieu of replying to individual inquiries that would divert personnel from the work of processing applications.

The procedure is as follows: Any ham who files, in accordance with the requirements of Section 12.27 of Part 12, an appropriate and timely application for renewal of station or operator license and prior to the normal date of expiration of the license does not receive a new license or notification from the Commission that action has been taken on the application, may continue to operate in accordance with the terms of the license to be renewed until such a time as a new license or notification of action on the renewal application is received. Persons who file application for renewal after expiration of license but during the grace period provided by Section 12.27 are governed by that rule and may not operate pending action on the renewal.

Amateurs are cautioned to make an appropriate notation in the station log at the time the application for renewal is filed, to keep a copy of the application, or to keep a copy of the letter transmitting the application with the station records as evidence of the timely filing, in good faith, of an appropriate application for renewal.

The Commission will process all applications as expeditiously as possble in order of their receipt. In order to avoid lapse of operating authority, hams are urged to file for renewals at the earlest permissible date. —30—

## Triple Phone Power

(*Continued from page 56*)

is necessary to have available an accurate method of indicating overmodulation. An oscilloscope is the best instrument, but is not imperative. To set up for operation, the input gain control should be opened first to a fairly advanced position. Then the output control is opened until test voice peaks are reaching the desired percentage of modulation. Next, using your own monitor, or better yet, utilizing the help of a local ham, advance, or decrease the input gain control as required, until a discernible, but not too objectionable, distortion is heard. This will give, in the broadest of terms, 10 to 15 db of clipping. More or less clipping can be used as desired merely by changing the input gain control. Readjustment of the output control will probably be necessary to realize the desired modulation level which then will not be exceeded no matter how loud a signal enters the clipper stage. Although not tested, this limiting feature should be of value for frequency modulated rigs, in holding the deviation to the optimum level. —30—

## TV Test Equipment

(*Continued from page 65*)

could check the actual gain-per-stage in the video amplifiers, trace the sync pulses through the sync circuits and check to see if the sync clippers are actually clipping the sync. No doubt about it, a scope is a handy thing to have around. Now, of course, the sixty-four dollar question becomes: "What kind of a scope?" Since this unit has to be carried from the car to the customer's home, we can immediately cross off the list the 7 inch models with "cast iron" chassis. Portability is the most important factor. This automatically eliminates all types but the 3 inch or 2 inch "pocket-scope" variety. The smaller and more compact the unit is, the more attractive it is for this particular application. The deflection sensitivity should be good enough to produce a satisfactory picture of the signal at the video detector. This calls for a deflection sensitivity of at least one-half volt-per-inch at the vertical input terminals. Naturally, the greater the deflection sensitivity, the more desirable the unit, especially if the scope is also to be used in the shop for alignment work. The frequency response of the vertical amplifier is controversial. For about 90% of all TV service work, a scope having a vertical amplifier frequency response out to 100 kc. is adequate. Its only failing is in accurately reproducing the waveform of the horizontal sync pulses and some of the waveforms in the horizontal deflection circuits. Since the scope is going to be used for maintenance and not for design work, very accurate reproduction is not absolutely necessary. —30—

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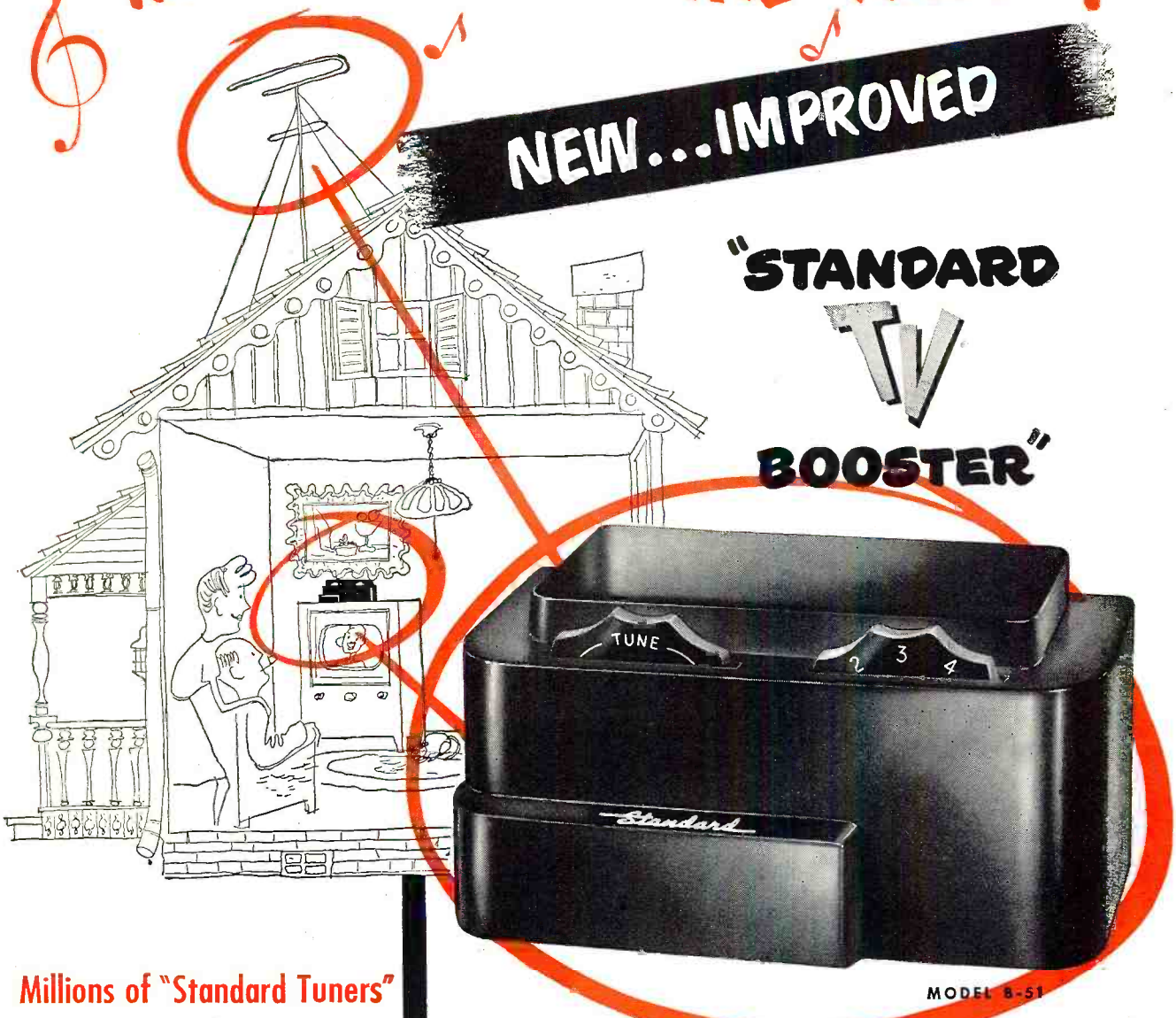


MODEL B-51

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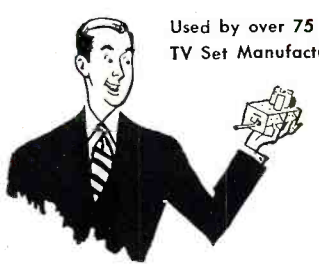

**The new "Standard Booster"** will increase the TV signal strength to a degree that will make possible "city" reception in areas remote from the TV transmitter. It reduces the "snow" or noise and interference to give a clearer, sharper picture and improved sound reception. It also makes possible receiving a picture in very remote areas or "blind" areas in close-to-transmitter locations where the TV set alone will not —makes a TV set a real enjoyment!

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Coaxial relay K-101—SPDT—24v DC.....$ 6.59
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RG59U coaxial cable—75 ohm
150′ roll.....$11.95 300′ roll..... 22.50
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ATC 100 mmfd air trimmer screwdriver shaft.... .29
Centralab 850 S 50MMF 5KV button cond..... .39
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| 0B3/VR90 | 1.29 | 3C31/C1B | 3.49 | 249C | 3.95 | 813 | 8.95 | 8020 | 1.29 | 0A4G | 1.35 | 6A3 | 1.35 | 6SQ7 | 1.15 | 12SN7 | 1.35 |
| 0C3/VR105 | 1.49 | 3C45 | 19.95 | 250R | 12.95 | 814 | 3.95 | 8025 | 5.95 | 0B2 | 2.95 | 6A4LA | 1.45 | 6SR7GT | 1.10 | 12SQ7 | 1.25 |
| 0D3/VR150 | 1.29 | 3CP1 | 2.25 | 250TH | 22.50 | 815 | 2.95 | 9001 | 2.25 | 0Z4 | .85 | 6A6 | 1.25 | 6SS7 | 1.15 | 12SR7 | .98 |
| 1B22 | 3.45 | 3CP1S1 | 2.95 | 250TL | 21.50 | 816 | 1.30 | 9002 | 2.25 | 01A | .90 | 6A7 | 1.10 | 6ST7 | 1.45 | 12Z3 | 1.10 |
| 1B23 | 12.50 | 3DP1 | 4.95 | 274A | 5.50 | 826 | .98 | 9003 | 2.25 | 1A3 | 1.32 | 6A8 | 1.25 | 6SU7GTY | 2.25 | 14A4 | 1.20 |
| 1B24 | 9.95 | 3DP1A | 6.95 | 274B | 2.65 | 828 | 12.75 | 9004 | .75 | 1A4P | 1.30 | 6AB7 | 1.49 | 6SV7 | 1.45 | 14A7 | 1.15 |
| 1B26 | 3.95 | 3DP1-S2A | 8.95 | 276A | 9.95 | 829 | 12.95 | 9005 | 2.95 | 1A5GT | 1.05 | 6AC5GT | 1.40 | 6T7G | 1.65 | 14B6 | 1.15 |
| 1B27 | 24.95 | 3DP1A | 1.98 | 293A | 2.98 | 829B | 14.95 | 9006 | .49 | 1A6 | 1.15 | 6AC7 | 1.65 | 6T8 | 1.65 | 14E7 | 1.15 |
| 1B29 | 2.75 | 3E29 | 14.95 | 294A | 5.75 | 830B | 3.95 | C1JA | 9.95 | 1A7GT | 1.35 | 6AD7GT | 1.45 | 6U5G | 1.25 | 14F8 | 1.30 |
| 1B32 | 8.95 | 3FP7 | 3.95 | 300B | 9.95 | 832 | 12.95 | C5B | 9.95 | 1AB5 | .98 | 6AE6G | 1.05 | 6U6GT | 1.25 | 14H7 | 1.20 |
| 1B36 | 24.96 | 3GP1 | 4.75 | 304TH | 27.50 | 832A | 12.95 | C6A | 7.95 | 1B3/8016 | 1.85 | 6AF6G | 1.45 | 6U7G | 1.05 | 14J7 | 1.25 |
| 1B38 | 32.50 | 3HP7 | 3.95 | 304TL | 29.95 | 833A | 35.95 | C6J | 6.95 | 1B4 | 1.30 | 6AG5 | 1.35 | 6V6GT | 2.00 | 14N7 | 1.30 |
| 1N3 | Xtal 1.25 | 465A | 14.21 | 307A | 34.91 | 836A | 3.95 | C100D | 1.49 | 1B5/25S | 1.55 | 6AG7 | 1.55 | 6W6GT | 1.50 | 14Q7 | 1.15 |
| 1N21A | " 2.25 | 4-125A | 26.95 | 307A/RK75 | 5.95 | 837 | 1.69 | CK502AX | 2.95 | 1B7GT | 1.75 | 6AH6 | 2.10 | 6W4 | 1.15 | 14R7 | 1.20 |
| 1N21B | " 4.25 | 4-250A | 29.95 | 310A | 8.95 | 838 | 2.95 | CK503AX | 2.95 | 1C5GT | .98 | 6AJ5 | 2.65 | 6W7G | 1.30 | 19 | 1.30 |
| 1N22 | " 1.35 | 4API0 | 4.95 | 316A | .65 | 841 | .45 | CK505AX | 2.25 | 1C6 | 1.05 | 6AK5 | 2.25 | 6X4 | 1.05 | 24A | 1.20 |
| 1N23 | " 2.25 | 4B32/EL5B | 9.95 | 323A/B | 24.50 | 842 | .39 | CK506AX | 2.25 | 1C7G | 1.05 | 6AK6 | 1.85 | 6X5GT | 1.05 | 25L6GT | 1.10 |
| 1N23A | " 3.25 | 4B24/EL3C | 7.95 | 327A/5C37 | 4.95 | 845 | 4.95 | CK507AX | 2.25 | 1D5GP | 1.15 | 6AL5 | .98 | 6Y6G | 1.48 | 25Z5 | 1.05 |
| 1N23B | " 6.95 | 4B25/6CF | 8.95 | 328A | 13.95 | 849 | 29.50 | CK512AX | 2.25 | 1D7G | 1.15 | 6AQ5 | 1.20 | 6Y7G | 1.55 | 25Z6GT | 1.05 |
| 1N27 | " 1.69 | 4B26/2000 | 8.95 | 331A | 12.95 | 851 | 69.50 | CK517AX | 8.45 | 1D8GT | 1.15 | 6AQ6 | 1.20 | 6Z15G | 1.20 | 26 | .98 |
| 1N34 | " 1.40 | 4B28 | 4.95 | 350A | 8.95 | 852 | 29.95 | CK1005 | .89 | 1E5GT | 1.65 | 6AR5 | 1.25 | 7A4/XXL | 1.10 | 27 | .95 |
| 1N34A | " 1.40 | 4B32 | 9.95 | 350B | 4.95 | 860 | 6.95 | CK1006 | 2.25 | 1E7G | 1.55 | 6AT6 | 1.05 | 7A5 | 1.10 | 28D7 | .98 |
| 1P23 | 7.95 | 4C27/CV92 | 49.50 | 351A | 7.95 | 861 | 29.50 | EI148 | .35 | 1F4 | .95 | 6AU5 | 2.35 | 7A6 | 1.10 | 30 | .89 |
| 1P24 | 1.79 | 4C35 | 34.50 | 371A | 1.49 | 864 | .39 | EF50 | .69 | 1F5G | .98 | 6AU6 | 1.10 | 7A7 | 1.10 | 31 | .89 |
| 1P36 | 2.95 | 4E27/257B | 17.95 | 371B | .98 | 865 | 1.45 | F123A | 8.75 | 1G4 | 1.10 | 6AV6 | 1.05 | 7A8 | 1.80 | 32 | 1.05 |
| 1S21 | 6.95 | 5AP1 | 3.69 | 388A | 2.75 | 866A | 1.39 | F127A | 22.50 | 1G6GT | .95 | 6B6G | 1.25 | 7AG7 | 1.65 | 32L7GT | 1.15 |
| 2AP1 | 11.95 | 5AP4 | 3.69 | 393A | 6.95 | 866JR | 1.29 | F128A | 89.50 | 1G6G | .95 | 6B7 | 1.25 | 7B4 | 1.10 | 33 | 1.15 |
| 2AP5 | 6.95 | 5BP1 | 5.95 | 394A | 4.95 | 869B | 49.50 | F606 | 37.60 | 1H5GT | 1.05 | 6B8G | .85 | 7B5 | 1.10 | 34 | .98 |
| 2C21/RK33 | .69 | 5BP4 | 5.95 | 417A | 12.95 | 872A | 2.95 | F660 | 79.50 | 1H6GT | 1.48 | 6BA6 | 1.05 | 7B6 | 1.10 | 35/51 | .98 |
| 2C22/7193 | .49 | 5CP1 | 4.95 | 434A | 4.95 | 874 | 1.49 | FG17 | 3.95 | 1J6 | 1.35 | 6BC5 | 1.25 | 7B7 | 1.10 | 35A5 | 1.10 |
| 2C26A | .49 | 5CP7 | 4.95 | 446A | 4.95 | 876 | .59 | FG27A | 8.75 | 1L4 | .98 | 6BE6 | 1.15 | 7C4 | .79 | 35B5 | 1.10 |
| 2C34/RK34 | 4.95 | 5CP22 | 55.00 | 450A | 4.95 | 878 | 2.25 | FG32 | 7.95 | 1LA4 | 1.15 | 6BF5 | 1.15 | 7C5 | 1.10 | 35C5 | 1.20 |
| 2C39 | 24.50 | 5D21 | 24.50 | 450TH | 47.50 | 884 | 1.85 | FG57 | 14.95 | 1LA6 | 1.35 | 6BG6G | 2.45 | 7C6 | 1.25 | 35L6GT | 1.30 |
| 2C40 | 8.95 | 5FP7 | 1.95 | 450TL | 47.50 | 885 | 1.49 | FG81A | 3.95 | 1LB4 | 1.30 | 6BH6 | 1.20 | 7C7 | 1.20 | 35W4 | 1.25 |
| 2C43 | 14.95 | 5GP1 | 4.95 | 527 | 12.75 | 902 | 11.95 | FG105 | 22.95 | 1LC5 | 1.10 | 6BJ6 | 1.48 | 7E5 | .89 | 35Y4 | 1.05 |
| 2C44 | 1.49 | 5JP1 | 24.45 | 559 | 1.39 | 903 | .59 | FG172 | 34.50 | 1LC6 | 1.18 | 6BQ6 | 2.50 | 7F6 | .89 | 35Z3 | 1.05 |
| 2C46 | 7.50 | 5JP2 | 24.45 | 563 | 97.50 | 905 | 12.95 | FG146 | 8.95 | 1LD5 | 1.35 | 6C4 | 1.40 | 7E7 | 1.05 | 35Z4 | 1.05 |
| 2C51 | 6.95 | 5JP4 | 24.45 | 575A | 13.95 | 918 | 1.69 | FG434A | 4.95 | 1LE3 | 1.18 | 6C5 | .85 | 7F7 | 1.10 | 35Z5 | 1.05 |
| 2D21 | 1.79 | 5J23 | 12.95 | 701A | 5.95 | 919 | 2.79 | FG451 | .89 | 1LG5 | 1.15 | 6C6 | 1.10 | 7H7 | 1.10 | 36 | 1.05 |
| 2E22 | 1.95 | 5J29 | 12.95 | 702A | 3.95 | 922 | .98 | FG502A | 1.85 | 1LH4 | 1.75 | 6C8G | 1.10 | 7K7 | 1.49 | 37 | .89 |
| 2E24 | 4.89 | 5J30 | 49.50 | 703A | 7.95 | 923 | 1.95 | FG562 | 97.50 | 1LN5 | 1.30 | 6CB6 | 1.45 | 7L7 | 1.10 | 38 | .98 |
| 2E26 | 3.95 | 5J31 | 99.50 | 705A | 1.05 | 927 | 1.59 | FG592 | 14.95 | 1N5GT | 1.05 | 6D6 | 1.10 | 7N7 | 1.65 | 39/44 | .98 |
| 2E30 | 2.29 | 5LP1 | 15.95 | 705A | 2.95 | 930 | 1.20 | HF125 | 14.95 | 1P5GT | 1.05 | 6D8 | 1.15 | 7Q7 | 1.10 | 41 | .98 |
| 2J21A | 9.95 | 5NP1 | 5.95 | 706BY | 39.50 | 931A | 4.95 | HF300 | 19.95 | 1Q5GT | 1.18 | 6F5 | 1.15 | 7R7 | 1.15 | 42 | .98 |
| 2J22 | 8.45 | 6AS6 | 3.69 | 706CY | 39.50 | 954 | .39 | HY114B | .79 | 1R4 | 1.05 | 6F6 | 1.25 | 7S7 | 1.35 | 43 | .98 |
| 2J26 | 29.50 | 6C21 | 24.50 | 706FY | 42.50 | 955 | .45 | HY115 | .79 | 1R5 | 1.15 | 6F7 | 1.05 | 7T7 | 1.35 | 45 | 1.10 |
| 2J27 | 21.50 | 6P4 | 5.95 | 706GY | 42.50 | 956 | .45 | HY615 | .29 | 1S4 | 1.50 | 6F8G | 1.35 | 7W7 | 1.45 | 45Z3 | 1.05 |
| 2J30 | 99.50 | 6J4 | 6.95 | 707B | 17.95 | 957 | .45 | KC4 | 37.50 | 1S5 | 1.50 | 6G6G | 1.35 | 7X7 | 1.69 | 45Z5 | 1.05 |
| 2J31 | 39.50 | 7BP7 | 8.95 | 708A | 4.95 | 958 | .45 | KU610 | 6.95 | 1T4 | 1.50 | 6H6 | 1.25 | 7Y4 | .98 | 46 | 1.10 |
| 2J32 | 39.50 | 9GP7 | 14.95 | 709A | 3.95 | 959 | .69 | ML101 | 69.50 | 1T5GT | 1.18 | 6H6GT | 1.15 | 7Z4 | .98 | 47 | 1.10 |
| 2J33 | 39.50 | 9JP1 | 14.95 | 711A/8011 | 1.75 | 991/NE16 | .39 | REL21 | 3.95 | 1U4 | 1.30 | 6J5 | .89 | 12A | .79 | 48 | 2.15 |
| 2J34 | 39.50 | 9LP1 | 19.95 | 713 | 1.45 | 1603 | 5.25 | RK20 | 9.95 | 1V | .89 | 6J5GT | .79 | 12A6 | .75 | 49 | 1.10 |
| 2J36 | 97.50 | 9LP7 | 14.95 | 714AY | 6.95 | 1613 | 1.25 | RK25 | 4.49 | 1X2 | 1.60 | 6J6 | 1.75 | 12A7 | 1.25 | 50A5 | 1.10 |
| 2J37 | 12.75 | 10BP4 | 22.50 | 715A | 7.95 | 1614 | 2.25 | RK33 | .69 | 2A3 | 1.65 | 6J7 | 1.40 | 12A8GT | 1.05 | 50B5 | 1.25 |
| 2J38 | 12.75 | 7DP4 | 17.95 | 715B | 9.75 | 1616 | .98 | RK34 | .89 | 2A4G | 1.40 | 6K5GT | 1.35 | 12AH7GT | 1.85 | 50C5 | 1.25 |
| 2J39 | 39.50 | 10 | .49 | 715C | 29.95 | 1619 | .35 | RK48A | 4.49 | 2A5 | 1.05 | 6K6GT | 1.30 | 12AL5 | 1.35 | 50L6GT | 1.15 |
| 2J40 | 39.50 | 12DP7 | 16.95 | 717A | 1.69 | 1622 | 3.25 | RK59 | 1.49 | 2A6 | .98 | 6K7 | .98 | 12AT6 | 1.05 | 50Y6 | 1.25 |
| 2J46 | 39.50 | 12GP7 | 16.95 | 721A | 2.59 | 1624 | 1.98 | RK60/1641 | 1.69 | 2A7 | .98 | 6K8 | 1.35 | 12AT7 | 2.25 | 53 | 1.35 |
| 2J48 | 29.50 | 12HP7 | 16.95 | 722A | 2.95 | 1625 | .45 | RK65 | 24.50 | 2B7 | 1.20 | 6L5G | 1.25 | 12AU6 | 1.35 | 56 | .98 |
| 2J49 | 39.50 | 12LP4 | 22.50 | 723A | 9.95 | 1626 | .45 | RK72 | .59 | 2V3G | .98 | 6L6 | 3.00 | 12AU7 | 1.45 | 57 | 1.05 |
| 2J50 | 22.50 | 13E | 1.19 | 723A/B | 14.95 | 1629 | .35 | RK73 | .59 | 2X2 | 1.55 | 6L6G | 2.65 | 12AV6 | 1.10 | 58 | 1.05 |
| 2J54B | 39.50 | 15R | .89 | 724B | 3.89 | 1630 | .98 | RK120A | 2.95 | 2X2A | 1.95 | 6L6GA | 2.65 | 12BA6 | 1.25 | 59 | 1.25 |
| 2J55 | 97.50 | 16AP4 | 42.50 | 725A | 7.95 | 1631 | 1.29 | RX120 | 8.95 | 3A4 | .69 | 6L7 | 1.25 | 12BE6 | 1.25 | 70L7 | 1.30 |
| 2J61 | 49.50 | 16CP4 | 42.50 | 726A | 6.95 | 1632 | .79 | V70D | 6.95 | 3A5 | 1.95 | 6L7G | 1.25 | 12C8 | 1.05 | 71A | 1.25 |
| 2J62 | 49.50 | 19T8 | 2.90 | 726B | 29.50 | 1633 | .75 | VR78 | .69 | 3B7/1291 | .95 | 6N7 | 1.05 | 12F5GT | .98 | 75 | 1.25 |
| 2K25/ 723AB | 29.50 | 23D4 | 49.50 | 726C | 49.50 | 1634 | .75 | VR91 | 1.49 | 3D6/1299 | .69 | 6Q7 | 1.45 | 12H6 | .98 | 76 | .89 |
| 2K28 | 36.25 | 28D7 | .98 | 730A | 12.95 | 1636 | 3.25 | VR92 | .98 | 3LF4 | 1.10 | 6R7 | 1.20 | 12J5GT | .79 | 77 | .89 |
| 2K29 | 24.50 | 30 Special | .59 | 750TL | 79.50 | 1638 | .65 | VT127A | 3.95 | 3Q4 | .95 | 6S7G | 1.59 | 12J7GT | 1.05 | 78 | 1.10 |
| 3AP1 | 12.95 | 35TG | 4.95 | 800 | 1.95 | 1641 | .98 | VT158 | 14.95 | 3Q5GT | 1.25 | 6S8GT | 1.35 | 12K7GT | 1.05 | 80 | 1.20 |
| 3B22/Elic | 4.95 | 45 Special | .49 | 801A | 3.95 | 1644 | .98 | VU29 | 2.95 | 3S4 | 1.10 | 6SA7 | 1.15 | 12K8 | 1.05 | 82 | 1.20 |
| 3B23/RK22 | 4.85 | 53A | 5.95 | 802 | 4.49 | 1654 | 2.39 | WL111 | 1.49 | 3V4 | 1.25 | 6SC7 | 1.75 | 12Q7 | .98 | 83 | 1.35 |
| 3B24 | 5.95 | 75TL | 6.95 | 803 | 4.49 | 1665 | 1.45 | WL468 | 12.95 | 5U4GY | 3.75 | 6SD7GT | 1.50 | 12SA7GT | 1.15 | 83V | 1.35 |
| 3B24W | 7.95 | 100R | .89 | 804 | 9.95 | 1851 | 1.89 | WL530 | 12.75 | 5T4 | 1.95 | 6SF5 | 1.10 | 12SC7 | 1.45 | 84/6Z4 | 1.10 |
| 3B25 | 4.65 | 100TH | 9.95 | 805 | 4.49 | 1961 | 4.99 | WL531 | 12.75 | 5U4G | .98 | 6SF5GT | 1.20 | 12SF5 | 1.20 | 85 | 1.10 |
| 3B26 | 5.96 | 121A | 2.98 | 806 | 29.95 | 2050 | 1.25 | WL532 | 2.95 | 5V4G | 2.40 | 6SF7 | 1.25 | 12SF7 | 1.05 | S9Y | .89 |
| 3B27 | 3.95 | 203A | 8.95 | 807 | 1.98 | 2051 | 1.45 | WL578 | 1.29 | 5W4 | 1.10 | 6SG7 | 1.50 | 12SG7 | 1.05 | 117L7/M7 | 1.75 |
| 3B28 | 8.95 | 204A | 69.50 | 808 | 7.25 | 8005 | 5.95 | WL616 | 37.50 | 5X4G | 1.28 | 6SH7 | 1.10 | 12SH7 | 1.05 | 117N7 | 1.75 |
| 3BP1 | 8.95 | 211 | .69 | 809 | 2.45 | 8011 | 1.75 | WL619 | 18.95 | 5Y3GT | .89 | 6SJ7 | 1.30 | 12SJ7 | 1.15 | 117P7 | 1.75 |
| 3C22 | 64.50 | 212E | 49.50 | 810 | 9.95 | 8012 | 3.95 | WL677 | 34.50 | 5Y4G | .98 | 6SK7 | 1.50 | 12SK7 | 1.50 | 117Z3 | 1.05 |
| 3C23 | 9.95 | 215A | .19 | 811 | 3.25 | 8013 | 2.95 | WL681 | 22.50 | 5Z3 | 1.05 | 6SL7GT | 1.50 | | | 117Z6 | 1.25 |

### FULL-WAVE SELENIUM RECTIFIER STACKS

| Max. A.C. Input Volts RMS | Max. D.C. Volts Output | Cell Size in Inches | Max. D.C. Amps. Output Continuous | Order by This Number | Price |
|---|---|---|---|---|---|
| **SINGLE PHASE BRIDGE** | | | | | |
| 0-18 0-14.5 | 1¾″ | x1¾″ | 1.3 | 18B4D1S1 | $ 3.95 |
| " " | 2-3/16″ | x2-3/16″ | 2.4 | 18B4E1S1 | 4.95 |
| " " | 3⅜″ | x3⅜″ | 6.6 | 18B4F1S1 | 7.95 |
| " " | 4½″ | x5″ | 13.0 | 13B4K1S1 | 12.95 |
| " " | 5″ | x6″ | 17.5 | 18B4J1S1 | 15.45 |
| " " | 4½″ | x5″ | 26.0 | 18B4K1S2 | 22.50 |
| " " | 4½″ | x5″ | 39.0 | 18B4K1S3 | 37.50 |
| " " | 4½″ | x5″ | 52.0 | 18B4J1S3 | 47.50 |
| " " | 4½″ | x5″ | 70.0 | 18B4J1S4 | 54.50 |
| 0-40 0-34 | 1¾″ | x1¾″ | 0.60 | 40B4D1S1 | 4.95 |
| " " | 2-3/16″ | x2-3/16″ | 1.2 | 40B4EW1S1 | 6.95 |
| " " | 3⅜″ | x3⅜″ | 3.2 | 40B4FW1S1 | 9.75 |
| " " | 4½″ | x5″ | 6.0 | 40B4K1S1 | 14.95 |
| " " | 5″ | x6″ | 9.0 | 40B4JW1S1 | 17.50 |
| " " | 4½″ | x5″ | 12.0 | 40B4K1S2 | 28.75 |
| " " | 5″ | x6″ | 18.0 | 40B4JW1S2 | 34.50 |
| " " | 4½″ | x5″ | 25.0 | 40B4J1S3 | 42.50 |
| " " | 4½″ | x5″ | 34.0 | 40B4J1S4 | 54.25 |
| " " | 5″ | x6″ | 36.0 | 40B4JW1S4 | 62.25 |
| 0-120 0-100 | 1¾″ | x1¾″ | 0.60 | 40B4D3S1 | 12.45 |
| " " | 2-3/16″ | x2-3/16″ | 1.2 | 40B4EW3S1 | 14.95 |
| " " | 3⅜″ | x3⅜″ | 3.2 | 40B4FW3S1 | 24.50 |
| " " | 4½″ | x5″ | 6.0 | 40B4K3S1 | 32.50 |
| " " | 5″ | x6″ | 9.0 | 40B4JW3S1 | 42.50 |
| **CENTER-TAP** | | | | | |
| 10-0-10 0-8 | 1¾″ | x1¾″ | 1.2 | 20C2D1S1 | 2.35 |
| " " | 2-3/16″ | x2-3/16″ | 2.4 | 20C2EW1S1 | 3.10 |
| " " | 3⅜″ | x3⅜″ | 6.4 | 20C2FW1S1 | 4.25 |
| " " | 4½″ | x5″ | 12.0 | 20C2K1S1 | 6.95 |
| " " | 5″ | x6″ | 16.0 | 20C2J1S1 | 8.95 |
| " " | 4½″ | x5″ | 24.0 | 20C2K1S2 | 14.75 |
| " " | 4½″ | x5″ | 36.0 | 20C2K1S3 | 19.65 |
| " " | 4½″ | x5″ | 48.0 | 20C2J1S3 | 27.50 |
| " " | 4½″ | x5″ | 64.0 | 20C2J1S4 | 34.50 |
| " " | 4½″ | x5″ | 80.0 | 20C2J1S5 | 42.50 |
| " " | 4½″ | x5″ | 84.0 | 20C2KW1S7 | 49.50 |
| " " | 5″ | x6″ | 96.0 | 20C2J1S6 | 55.50 |
| " " | 4½″ | x5″ | 128.0 | 20C2J1S8 | 67.50 |
| **3 PHASE BRIDGE** | | | | | |
| 0-120 0-150 | 1¾″ | x1¾″ | 0.90 | 40B6D3S1 | 24.50 |
| " " | 2-3/16″ | x2-3/16″ | 1.8 | 40B6EW3S1 | 29.50 |
| " " | 3⅜″ | x3⅜″ | 4.75 | 40B6FW3S1 | 42.50 |
| " " | 4½″ | x5″ | 9.0 | 40B6J3S1 | 79.50 |
| " " | 5″ | x6″ | 12.5 | 40B6J3S1 | 86.75 |

SPECIAL RECTIFIERS ON REQUEST

### TRANSFORMERS—115V 60 CY HI-VOLTAGE INSULATION

2700v @ 2 MA; 6.3v @ .6A; 2.5v @ 1.75A..$ 4.45
2500v @ 15 MA..... 3.45
2440v @ 5 MA; 340-0-340 @ 300 MA..... 4.35
925v @ 10 MA; 525-0-525v @ 60 MA; 2X5v @ 3A; 6.3v @ 3.6A; 6.3v @ 2A; 6.3v @ 1A 4.85
415-0-415v @ 60 MA; 5v CT @ 2A; 115/230 Dual Pri..... 4.25
400-315-0-100-315v @ 200 MA; 2x6.3v @ 9A; 5v @ 3A; 2.5v @ 2A..... 5.35
325-0-325v @ 12 MA; 255-0-255v @ 240 MA. 4.25
300-0-300v @ 65 MA; 6.3v @ 2.5A; 6.3v @ 1A; 2x5v @ 2A..... 3.25
0-17.4/21.6/25.8v @ 400 MA; 6.4v @ .5A; 2.6v CT @ 2.5A Pri 115/230..... 3.85
12.6v CT @ 10A; 11v CT @ 6.5A..... 6.35
3x10v @ 7A..... 6.95
6.3v @ 12A; 6.3v @ 2A; 115v @ 1A..... 3.50
6.5v @ 8A; 6.5v @ 6A; 2.5v @ 1.75A..... 4.17
6.3v @ 1A; 2.5v @ 2A..$2.29 4-0-4v @ 1A .87
6.3v CT @ 1A..... 1.29
5v CT @ 20A; 10 KV INS..... 8.95
.6v @ 15A RMS..... 1.47

### TRANSFORMERS—220v 60 Cyc

512.5-0-512.5 @ 427 MA.....$ 5.35
3x5v @ 6A; 4v @ .25A..... 2.95
3x6.3v CT @ 3A; 6.3v CT @ 1.6A..... 2.95
10v CT @ 6.5A; 6.3v CT @ 2.5A; 6.3v CT @ 1.8A 220/440 Pri..... 3.95
Step Up/Down 110/220, 500 watt..... 10.95

### FILTER CHOKES HI V INS

.025 HY @ 1.36A..$1.98
3 HY @ 50 MA... .39
5 HY @ 70 MA/.2 HY @ 350 MA Dual..... 2.39
10 HY @ 55 MA.. .89
10 HY @ 250 MA.. 3.95
10 HY @ 100 MA.. 1.29
13 HY @ 130 MA.. 1.59
15 HY @ 70 MA.. 1.39
10/20 HY @ 85 MA..... $1.49
15 HY @ 100 MA.. 1.69
5.3 HY @ 225 MA. 2.79
6.6 HY @ 175 MA. 2.10
8 HY @ 150 MA.. 1.79
200 HY @ 10 MA. 2.95
325 HY @ 2 MA.. 2.95
600 HY @ 1 MA.. 2.95

### OIL CONDENSERS—DC RATINGS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3X.1 | MFD | 600v | $ .59 | .1 | MFD | 2500v | $1.15 |
| .25 | " | " | .35 | .25 | " | " | 1.25 |
| .5 | " | " | .45 | .5 | " | " | 1.35 |
| 1 | " | " | .69 | 2 | " | " | 3.45 |
| 2 | " | " | .85 | .01 | " | 3000v | 1.25 |
| 2X2 | " | " | 1.15 | .05 | " | " | 1.30 |
| 4 | " | " | 1.29 | .1 | " | " | 1.35 |
| 6 | " | " | .98 | .25 | " | " | 2.75 |
| 8 | " | " | 2.49 | .5 | " | " | 2.85 |
| 10 | " | " | 2.79 | 1 | " | " | 2.95 |
| 3X.1 | " | 1000v | .85 | 2 | " | " | 4.25 |
| .5 | " | " | .89 | 4 | " | " | 6.95 |
| 1 | " | " | .67 | 1 | " | 3600v | 3.98 |
| 2 | " | " | 1.75 | .25 | " | 4000v | 3.49 |
| 4 | " | " | 1.85 | .5 | " | " | 3.75 |
| 8 | " | " | 3.55 | 1 | " | " | 3.95 |
| 20 | " | " | 4.25 | 2 | " | " | 5.75 |
| .5 | " | 1500v | 1.02 | 3 | " | " | 5.89 |
| 1 | " | " | 1.19 | .1 | " | 5000v | 2.75 |
| 2 | " | " | 1.69 | .25 | " | " | 2.95 |
| 4 | " | " | 2.69 | 1 | " | " | 3.10 |
| .1 | " | 2000v | 1.75 | .1 | " | 7000v | 3.75 |
| .25 | " | " | 1.92 | .01 | " | 7500v | 2.25 |
| .5 | " | " | 1.95 | .02 | " | " | 2.25 |
| 1 | " | " | 2.09 | .03 | " | " | 2.35 |
| 2 | " | " | 2.85 | .05 | " | " | 2.35 |
| 4 | " | " | 4.45 | .1 | " | " | 4.95 |
| 8 | " | " | 4.95 | 2X.1 | " | " | 7.95 |
| | | | | .02 | " | 12000v | 12.95 |

### HIGH CAPACITY CONDENSERS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2X3500 | MFD | 25v | $3.47 | 200 | MFD | 35v | $ .57 |
| 2500 | " | 3v | .35 | 100 | " | 50v | .45 |
| 3000 | " | 25v | 2.45 | 4000 | " | 30v | 3.25 |
| 650 | " | 80v | 1.29 | 2350 | " | 24v | 2.25 |
| 2000 | " | 15v | 1.69 | 10000 | " | 25v | 4.57 |

## WANTED! WANTED!

ATTENTION colleges, schools, hams, industrials!! Highest prices paid for surplus equipment, parts, and tubes. We are especially looking for test equipment TS-12, 13, 35, 14/AP, 15/AP, 146/UP, 173, 174, 175, 239, 259, 263. Any types with TS prefix. Write, wire or call.

**R-H-S**
SPECIALS OF THE MONTH

## WANTED! WANTED!

APR-4, 5, 7 and tuning units. ARC-1, 3. ART-13, ATC, APS-10, microwave equipment in S, K, X-band. APS-15, APQ-13, ASP-32. SCR-300. 284, 694, etc. BC-221. 342, 348. BC-1016 tape recorders. Write, wire or call.

# RADAR—COMMUNICATIONS AND TEST EQUIPMENT

TS-35/AP X-band Signal Generator. Pulsed and C.W. freq. range. 8400-9600 mcs. This unit will measure power and frequency. 115v 60-2600 cyc.

TS-3/AP S-band Frequency and Power Meter. Portable. Battery operated. Complete with all cables.

TS-33/AP X-band Frequency Meter. 8500-9600 mcs. Contains crystal detector and indicating meter. Output to scope will indicate pulse wave shape.

TS-62/AP X-band Echo Box. 8400-9600 mcs. tuned and untuned input. Will indicate resonance on meter. Complete with pick up antenna and cable.

TS-268/UP Crystal Diode Test Set. Used to check 1N21, 1N22, 1N23, etc. Battery operated. Portable. Complete with spares.

TS-89/AP Voltage Divider. 1:10 and 1:100 ratios. Wide band for true pulse shape. Output to scope.

TS-10/APN Altimeter Test Set. Good condition. Complete with cables and dummy antenna **$35.00**

TS-12/AP V.S.W.R. Test Set for X-band. Complete with amplifier, slotted line, termination, adaptors, etc. In 2 carrying cases. Excellent.

TS-45/APM-3 X band signal generator. 8400-9600 mcs pulsed & CW output. Used to check APS4 and similar sets.

TS-36/AP X-band Power Meter. Consists of power measuring circuit. Horn antenna, co-ax to wave guide adaptor, connecting cable and probe. Will measure either absolute or relative power. Nominal band of usefulness is approx. 8.5-9.7 KMC. Excellent condition.

TS-118/AP R.F. Wattmeter for the range of 20-750 mcs. Will measure power up to 500 watts. Complete.

TS-174/U Freq. Meter. Freq. range is 50-250 mcs. High freq. version of BC-221. Excellent Condition ..... **$385.00**

TS-16 Altimeter Test Set. Used to check various altimeters or as an accurate wavemeter. New ..... **$29.95**

TS-61/AP S-band Echo Box. Using meter provided it is possible to maximize the XMTR adjustment and determine relative power output. Complete with probe and cable. Very good condition. **$140.00**

TS-13/AP Xa band signal generator, wave meter, wattmeter. Precision lab microwave. Test set. Will provide either pulsed or CW output in Xa band. Input 115v 60-800 cyc.

TS-226/AP used to measure peak power output of any xmitter in the range of 200-1000 mcs. Has provision for oscilloscopic signal observation and built in calibration. Part of AN/APM-29. Excellent.

TS-14/AP consists of S-band signal generator, freq. meter, wattmeter and cables. Power input is 115v 50-2600 cyc. Used to check various S-band radars and beacons.

TS-170/ARN-5 XTAL controlled test osc. with the following freq. ranges: 332.6, 333.8, 335.0 depending on XTAL in use. This set is used to align glide path receivers. Batteries and antenna are self contained. Excellent condition.

### OTHER TEST SETS

| | | |
|---|---|---|
| TS-278/AP | TS-184/AP | TS-19/APQ-5 |
| TS-100/AP | TS-189/U | TS-92/AP |
| TS-102/AP | TS-110/AP | TS-40/CNR-2 |
| TS-47/APR | TS-164/AR | TS-348/AP |

AN/APS-3 Airborne X-band Search and Homing radar. Complete. Contains RF head, modulator, synchronizer, control boxes, plugs, antenna, etc. 115v 400 cyc. Excellent condition. . . . **$875.00**

ASB-5 L-band Search and Homing radar. Complete. Contains xmitter, receiver, power unit, control box, plugs, etc. 115v 400 cyc. Excellent condition ..... **$125.00**

SCR-518 Radar Altimeter. 500 mcs. equipment. Complete with xmitter, receiver, control box, power unit, junction box with all cables, racks, etc. Unit will indicate altitude up to 50,000 ft. Power input is 28v. New condition. . . . **$99.50**

AN/APS-15 R.F. Head and Modulator. X-band. Complete with all tubes. Good condition. . . **$99.50**

AN/APA-23 Automatic Signal Strength and Time Recorder. Unit will scan a receiver thru its range and record all signals on electrosensitive paper. Input is 115v 60-2600 cyc. and 28v DC. Excellent condition ..... **$175.00**

### DYNAMOTORS AND POWER UNITS

| Type | Input Volts | Output Volts | Output Amps | Price |
|---|---|---|---|---|
| DM-19 | 12 | 500 | .200 | $ 6.95 |
| PE-125 | 12v/24v | 475 | .200 | 14.50 |
| DM-32 | 28 | 250 | .060 | 1.75 |
| DM-33 | 28 | 570 | .160 | 2.95 |
| DM-34 | 12 | 220 | .080 | 8.95 |
| DY-12 | 12 | 275 | .110 | |
| | | 500 | .50 | |
| PE-73 | 28 | 1000 | .350 | 10.00 |
| PE-94 | 28 | 300 | .260 | |
| | | 150 | .010 | |
| | | 14.5 | .5 | 2.25 |
| PE-97 | Vibrator Power Supply | | | 8.95 |
| PE-98 | 12v | 300v | | 35.00 |
| PE-101 | 28 | 400 | | |
| | | 800 | | 5.75 |
| PE-103 | 6 & 12 | 500 | .160 | 35.00 |
| PP-18-AR | Vibrapack | | | 15.95 |
| RA-42 | (for BC-639 Receiver) | | | 29.95 |
| ATR | Inverter 12v | 110v AC 125 watts | | 14.95 |

**PHONE DIGBY 9-0347**

WRITE FOR QUANTITY PRICES

**Prices subject to change without notice. F.O.B., NYC minimum order $10.00. 20% deposit required. All merchandise guaranteed.**

AN/CRT-3 Victory Girl. Dual frequency emergency lifeboat xmitter. Complete with xmitter, kite hydrogen generator, etc. New in knapsack. C.A.A. approved ..... **$69.50**

AN/APR-5 Radar Search Receiver. Freq. range 1000-3100 mcs. Will detect signals up to 10,000 mcs. with reduced sensitivity. Contains oscillator and mixer cavity, IF strip, power supply. Input 60-2600 cyc. 115v. Excellent condition. . **$375.00**

T-50 Radiotelegraph Transmitter complete with power supply and all accessories with spares. Portable. New in cases ..... **$275.00**

AN/APT-5 300-1500 mcs. xmitter cavity oscillator using 3C22 lighthouse tube. Power output 30 watts. Noise modulated. Excellent condition. Complete with all tubes ..... **$149.50**

SK-1M Radar Receiver Indicators. Freq. 195 mcs. 2 R.F. stages, 3 IF stages. 1 video, etc. New condition ..... **$125.00**

AN/TPS-1 SEARCH RADAR. This is a pack portable ground search radar for the detection of aircraft up to 100 miles. Range and azimuth data is displayed on a 7" P.P.1 and a 5" "A" scope. This set was called the G.I.'s radar because of its ruggedness, dependability and ease of servicing. Complete tech data is as follows:

Range Max. 100 Mi. Min. 25 Mi. — P.R.R. 200 Per Sec.

Azimuth Mech. 360° Automatic 360° Accuracy ±30 Scanning Manual Automatic — Pulse Width 2 Micro Sec. Beam Width 3° Horiz. 13° Vert.

Presentation 7" P.P.I. 5" A Scope

I.F.F. not provided but has provision for. Frequency 1074-1086 Mcs. — Power Input 1100 W at 115V 400 Cyc. and 180 W at 27V D.C.

Power output 150 K.W. — Weight: 1,518 Lbs.

AN/PPN-1 EUREKA! Ground portable. beacon responder. Unit will work into the AN/APN-2 transponder for purposes of homing. C.W. communication can also be carried on between plane and ground. Unit comes complete with xmitter, receiver, power pack, phones, etc. Brand new in knapsack. AN/APN-2 EQUIPMENT CAN BE SUPPLIED ON ORDER.

SCR-269/G Automatic Radio Compass. Freq. range 200-1750KC. Complete with BC-433-G receiver, BC-434, LP-21, 1-81, 1-82, BK22, etc. Very good condition ..... **$129.95**

SCR-300 Frequency Modulated Transceiver. Freq. range 40-48 mcs. complete with 18 tubes, handset and antenna. Powered from self contained battery pack. Excellent condition. Weight approx. 35 lbs. with battery, each ..... **$275.00**

TCS Marine Radio Telephone and Telegraph Xmitting and Receiving Equipment. Freq. range 1500-12000KC. Consists of xmitter, receiver, antenna loading coil, remote control box, power unit, cables, etc. Power input is 12 or 32v DC. We can supply an 110v AC power supply for stationary use at additional cost. Excellent condition.

SCR-536 Xmitter-Receiver (handy talkie). Freq. range 3885-5500KC. Complete with coils, tubes, crystals. Very good condition ..... **$89.95**

AN/APA-10 Panoramic Adaptor for use with any receiver with following IF's: 455KC. 5 mcs, 30 mcs. Unit will give panoramic presentation (1 mc wide for 455KC input) (100KC for 5MC input) (2MC for 30 mcs input). Power input 115v 400 cyc. but can be changed with the addition of a proper power transformer. Excellent condition ..... **$175.00**

10 CM R.F. package. 2700 mcs. Consists of BC-1007 modulator & BC-1091 RF head. Power output approx. 40 KW. Complete with tubes ..... **$195.00**

RT-39/APG-5 10 CM LHTR R.F. head & modulator. Low power approx. 2 KW. Lighthouse tube rec & trans w/T.R. tunable. New ..... **$135.00**

SCR-510 Freq. Modulated Portable Transceiver. Covering range of 20.0-27.9 mcs in 80 channels 100KC apart. Complete equipment consisting of BC-620 transceiver, power supply PE-97A, T-17 mike, handset, AN-45 antenna, battery operated or 6 or 12v input. Excellent condition. . **$69.95**

SCR-610 similar to SCR-510 except for freq. range which is 27.0-38.9 mcs. Excellent condition ..... **$79.95**

AN/APA-11 Pulse Analyzer to work with Search Receiver for analysis of received pulsed signals. PPS, pulse width, wave shape, can be displayed on an CR tube. Unit can also be used as a standard oscilloscope for general servicing work. Input is 115v-400-2600 cyc. but can be changed with the addition of a 60 cyc. transformer. Very good condition.

SCR-694 Field Radio. Light weight version of SCR-284. Freq. range is 3.8-6.5 mcs. Power output is A1-20, A3-5; comes with transceiver BC-1306, GN-45 or 58 hand generator, antenna system, microphone, headset, etc. In excellent condition.

CY-30/TRC-1 antennas. Freq. range 70-100 mcs. Complete with antenna, poles, wires, etc., in carrying case.

### COMMAND EQUIPMENT

**ARC-5 274N OTHERS**

#### RECEIVERS

| | |
|---|---|
| ARA 500-1500KC. New | $24.95 |
| R-28/ARC-5 | 29.95 |
| 455B 6-9 mcs. Good | 19.95 |
| 433 200-1750KC. Good | 29.95 |
| ARR-2 234-258 mcs. New | 19.95 |

#### TRANSMITTERS

| | |
|---|---|
| T-23/ARC-5 | $49.95 |
| 696-A 3-4 mcs. New | 29.95 |
| TYPE O 5.3-7 mcs. New | 9.95 |
| AVT-23 3000-13,000KC complete w/control box, manual, etc. C.W. or phone. 14 or 28v input. Brand new. Original cases. . . | 79.50 |
| BC-950A 100-156 mcs. New | 59.95 |

#### ACCESSORIES

| | |
|---|---|
| BC-456 Modulator. Good | $2.25 |
| BC-450 Control Box (3 rec). Used | 1.25 |
| BC-451 Control Box (xmitter). Used | .98 |
| BC-442 Relay Unit (ANT.). Used | 1.95 |

Flexible Shafting Available

### MISCELLANEOUS SPECIALS!

| | |
|---|---|
| Sound Powered Chest and Headsets MI-2454-B type O, mfg. RCA. Brand new in original boxes. Pair | $ 29.95 |
| Trailing Wire Antenna Feed Tube. New | 5.95 |
| Goniometer for SCR-277 Direction Finder. Excellent | 39.95 |
| RL-7 Interphone Control Box. New | 1.95 |
| FT-154 BC-348 Shock Mounts | 2.98 |
| AN/CRW Receiver for Remote Control | 5.95 |
| BC-1206 Beacon Receiver 200-400KC, 28v in. Excellent | 4.95 |
| MN/26-Y Compass Receiver. Very good | 24.95 |
| BC-433G Compass Receiver, 200-1750KC in 3 bands. Excellent | 39.95 |
| BC-778 Gibson Girl 500KC. Good condition | 3.95 |
| BC-1016 Tape Recorder. Complete. New | 459.50 |
| CFI Unit with 200KC Xtal. New | 14.95 |
| BC-733D receiver with tubes | 29.95 |
| BC-329 Transmitter. Excellent | 89.95 |
| QBG-1 Sonar complete with Hydrophone. Excellent | 125.00 |
| BC-608 automatic keyer for SCR522 | 5.95 |
| AN/104A Antenna for SCR-522, ax handle. New | 3.95 |
| BC-1284 Lighthouse Tube Preamplifier. Excel. | 69.95 |
| ASB 500 mcs YAGI Antenna Dual 6 Element | 14.95 |
| Single 5 Element | 8.95 |
| AN/APA-17 Radar Direction Finding Antenna, back to back parabola, freq. range 300-1000 mcs. Horizontally and vertically polarized. Excellent | 59.00 |
| BC-996 Interphone Amplifier. Good | 9.95 |
| ART-13 Loading Condenser. Excel | 4.95 |
| CW-3 less coil & crystals. New | 29.50 |
| CU-25 Loading Box for ART-13 | 49.95 |
| AS-27/ARN5 Antennas. Very good | 4.95 |
| SA-1/ARN-1 Part of ARN-1. Very good | 2.95 |
| 1D-80/APA-17 Indicator. Excel | 129.95 |
| RBM-4 Receiving Central. Complete with all power supplies, carrying case and cables. New | 325.00 |
| AVR-15 Aircraft Receiver. Very good | 19.95 |
| BC-923 Receiver. Very good | 39.95 |
| BC-800 Xmitter/Receiver. Very good | 39.95 |
| RA-300 FM Exciter (Mfg. Tempco). New | 32.50 |
| A-55 Dummy Antennas. Very good | 2.25 |
| BC-1365 Control Box. Good | 3.95 |
| FL-8 Filter | 3.95 |
| FL-5 Filter. Less cables. Fair | 2.65 |
| 3C-16-D GSAP Gun Camera Computers with all access. In carrying case. Excel | 19.95 |
| AT-2A/APN-2 Antenna. Fair cond. | 4.95 |
| Spares for ARC-5 and 274/N, APX-1, ASG-10. We have a large stock of TS-34A/AP Spares. | |

### CORDS AND PLUGS

| | |
|---|---|
| CG-(172/173) CPN-8 CM Coax Patch Cable. New | $4.95 |
| CX-548/CRD-3 Cable. New | 1.25 |
| CX-546/CRD-3 Cable. New | 1.25 |
| CD-508A w/SW 14-U & 2 Cord Attachments with JK-48 Jack & PL-68 Plug. New. . | .75 |
| CD-307A with PL-55 and JK. New | 1.29 |
| PL-55 Plug. New | .49 |
| 83-168 Adapter. New | .17 |
| 83-1SP Connector. New | .69 |
| 83-1R Coax Connector. New | .69 |
| 83-1AP Angle Coax Connector. New | .22 |
| 83-1J Feed Thru. New | 1.10 |
| 83-1F Feed Thru. New | 1.55 |

**SCR-522 VHF Airborne Command Equipment.** Freq. range 100-156 mcs. in 4 channels receiver and transmitter. Crystal controlled. Complete equipment. Consists of trans/rec, control box BC-602, dynamotor PE-94, AN104A antenna, plugs, etc. Power input with PE-94 is 28v. Excellent condition. We can supply PE-98 dynamotor for 12v input at additional cost.

**RADIO HAM SHACK Inc.**
**189 GREENWICH STREET . NEW YORK, N. Y.**

Optical comparator is used to check mica disc specifications to thousandth-inch accuracy.



# WHAT'S New in Radio

For additional information on any of the items described herein, readers are asked to write direct to the manufacturer. By mentioning RADIO & TELEVISION NEWS, the page, and the issue number, delay will be avoided.

### LOW-COST MULTIMETER

To meet the demand by service technicians for low-cost test equipment, *Electronic Instrument Co., Inc.*, of 276 Newport Street, Brooklyn 12, New

York, has recently introduced a new multimeter which is available in both kit form and factory wired.

The Model 526 (Model 526-K in kit form) has 31 different ranges with a zero-to-one volt range on both its a.c. and d.c. voltage ranges. The 3½" meter has a 400 microampere movement and all resistors have 1 per-cent or better accuracy. The integral dual rectifier has separate low and high voltage calibration on a.c. ranges while the ohm ranges are specifically designed to insure minimum battery drain. There are separate jacks for high current and high voltage positions.

### GEIGER COUNTER

*Precision Radiation Instruments, Inc.*, 4113 W. Jefferson Blvd., Los Angeles 16, California, is currently marketing a low-priced Geiger Counter unit which has been designated "The Snooper."

Small enough to fit in the palm of the hand or in a hip pocket, the counter is easy to use and maintain. The instrument is powered by an ordinary

flashlight battery and comes complete with earphone, radioactive sample, and operating instructions.

A miniature amplifier gives a loud audible signal whenever the instrument comes near radioactivity whether from uranium ore, cosmic rays, radium, x-rays, or atomic explosion.

"The Snooper" measures 1½"x3"x5" and weighs 1¼ pounds. The company will furnish additional details on request.

### NEW TERMINALS

The *Thomas & Betts Co., Incorporated* of 28-A Butler Street, Elizabeth 1, New Jersey, has developed a new line of terminals that effectively ends the risk of short circuits between closely spaced wires.

Known as Self-Insulated Sta-Kon Terminals, the new units are integral, one-piece assemblies combining a metallic portion that grips both the wire and the wire insulation tightly and permanently with a single staking operation, and a translucent, firmly anchored terminal insulator of specially formulated nylon.

Engineering data bulletin No. S4, giving complete mechanical details on these new terminals, is available from the company on request.

### 50-WATT AMPLIFIER

*Newcomb Audio Products Co.* of 6824 Lexington Ave., Hollywood 38, California, has recently added a new low-cost utility amplifier to its E-Series line.

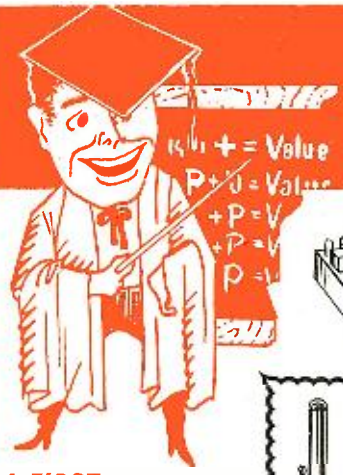
The new Model E-50D provides two individual 25-watt output channels on separate controls for a total of 50 watts of undistorted audio power. The unit's flexibility makes it suitable for installations in which individual control is desirable for two different size areas with varying volume requirements. It has inputs for three microphones and one phonograph. Distortion is less than 5 per-cent for each 25-watt channel.

### DIPOLE ANTENNAS

*Communication Products Company, Inc.*, Broadway and Clark Streets, Keyport, New Jersey, is in production on a new line of half-wave dipole antennas which have been especially designed for both transmitting and receiving.

The power handling capacity of these units is limited only by the power rat-

# School's in and Prof Platt's BARGAINS ADD UP to Real Value!




## AIRBORNE EQUIPMENT DESIGNED FOR AIRCRAFT

### T-85/APT-5 UHF TRANSMITTER

Radar Set AN/APT-5 operates on 80 or 115 volts A.C. at 400 to 2600 cycles requiring 640 volts amperes at 0.90 power factor. Complete with all tubes. Brand new in original packing.

A TERRIFIC BUY AT ONLY **$99.50**

## RADIO COMPASS AN/ARN-7

Primarily used for aircraft navigation. Frequency range: 100 KC to 1750 KC in 4 bands. Operates on 115 volts, 400 cycles A.C. Complete installation consists of the following: Radio Compass Receiver R-34/ARN-7, Radio Control Box C4/ARN-7, Loop LP-21, Loop Dehydrator, Indicator I-81-A and I-82-A, Relay BK-22, Coupling MC-203, Cord CD-365. Plugs PL-112, 118, 122. Thoroughly tested and reconditioned by experienced personnel presently engaged in manufacturing for defense.

ONLY **$149.50**

## A FIRST WITH PLATT!!

### RADIO SET SCR-583

Has following 3 installations: **on pack animal, on the ground, in a motor vehicle.** Designed to provide 2-way communication. Frequency Range: Transmitter 2.2 to 4.6 Mc. Receiver 2.2 to 4.6 Mc. Types of Signals emitted CW and Voice. Types of Modulation A.M.

| Distance Range | Phone Miles | CW Miles |
|---|---|---|
| Low Power | 10 | 15 |
| High Power | 35 | 65 |
| Auxiliary Power Supply | 40 | 80 |

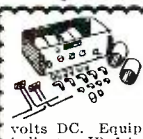
Complete, brand new, equipped for immediate installation. **$429.00**

## BOMBSIGHT Used Exclusively with B29 Planes

This bombsight is a buy-of-a-lifetime! It was developed by Sperry Gyroscope Co. in conjunction with other leading U.S. firms. Here is a veritable gold mine of costly parts! Excellent for experimenters, schools, and for advanced development. **Consists of 3 Assemblies.** Total shipping weight—350 lbs.

SPECIALLY PRICED..... **$299.00**

## APN/1 Radio Altimeters



Was used in conjunction with automatic pilot system, providing direct measurements of attitude by a radio beam. Designed to operate from 28 volts DC. Equipped with double range altitude indicator ID-14 and ID-14A, power switch and range switch.

DC operation—22 to 29.5 volts, consuming approximately 2.6 amperes with 27 volts delivered to the battery input receptacle of radio transmitter receiver. Weight—24 lbs. BRAND NEW and complete in original government cases with operating instruction manual.

FOR IMMEDIATE SHIPMENT..... **$49.95**

**AN80A Antenna for BC-645 49c**

## ALSO AVAILABLE!

### SCR-284

Brand new, ready for installation..... **$329.00**

### BC-348 RECONDITIONED GUARANTEED LIKE NEW

All letters. Frequency Range 200 to 500 KC. 1½ to 18 meg. OLD RELIABLE OF WORLD WAR II.

SPECIAL! **$165.00**

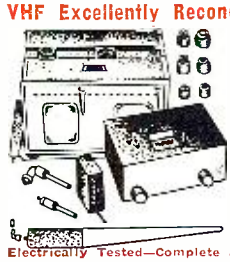
## UNSURPASSED VALUE!

### SHIP-TO-SHORE BC-223 TRANSMITTER

A 30 watt Transmitter, ideal for ship-to-shore or Ham Rig. Crystal or MO control on four preselected channels. 2000 to 5250 KC. Use of 2 plug-in coils, five tubes: 2—801 and 3—46, and TU 17-18-25 tuning units.

| | |
|---|---|
| TRANSMITTER | $39.95 |
| TUBES | $5.95 |
| TUNING UNITS | Each $4.25 |
| PE-125 VIBRATOR POWER SUPPLY FOR BC-223 | $18.95 |

## VHF Excellently Reconditioned Guaranteed SCR-522 AIRBORNE COMMAND EQUIPMENT



Frequency Range 100 to 156 mcs. in 4 channels receiver and transmitter. Crystal controlled. Complete equipment. Consists of trans/rec, control box BC-602, dynamotor PE-94, AN104A antenna, plugs, etc. Power input with PE-94 is 28 v.

Electrically Tested—Complete as Shown. Only **$99.50**

BRAND NEW—PRICES ON REQUEST

## RADIO SET SCR-694C

Presently manufactured complete ready for installation—**pack, ground and mobile.** Operating range 15 miles voice, 30 miles CW. Frequency Range 3800 KC to 6500 KC. As supplied to the Government, outlined in Manual, less spare parts..... **$1250.00**

## TRANSMITTER-RECEIVER

Navy Model ABA-1 (CG-43AAG)
Army Model SCR-515A, known as the BC-645
**450 MC 15 Tubes**

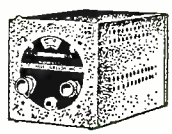
BRAND NEW — ORIGINAL CARTON.

Can be easily converted for phone or CW 2-way communication. Covering for the following bands: 420-430 MC ham band, 450-460 MC for fixed or mobile, 460-470 MC for citizens, 470-500 MC television experimental. Size 10¼x13¼x4¾. Contains 15 tubes: 4—7F7, 4—7H7, 2—7E6, 2—6P6, 2—955, 1—WE-316A Tuner knob. Complete as shown above.

ONLY **$24.95**

## BEACON RECEIVER BC-1206-C

**Manufactured by Setchell-Carlson**



Frequency Range—195 KC to 420 KC, IF Frequency—135 KC, Receiver Sensitivity—3 Microvolts for 10 Milliwatts output, Output Impedance—300 Ohms and 4000 Ohms to be selected internally, Power Output—230 Milliwatts, Volume Control—RF Gain Control, Power Supply—24-28 Volts Aeroplane Battery, Current—.75 Amperes.

BRAND NEW—ONLY **$10.95**

## Multitester Foundation BIAS METER I-97A

Contains a zero center 3½" round Marion voltmeter calibrated 0-100 volts each side. Movement is one mill each side of center. The unit is mounted in a steel box 7"x5"x4½" and contains 8 contact push button. line cord dual 100 MFD at 200 V DC condenser, a potentiometer 6 1RC 1% wire wound nonductive resistors: one 400 ohm, two 2500 ohm, one 5000 ohm, one 10,000 ohm, one 15,000 ohm. Excellent for building a zero center multitester with ranges of 1, 10, 100, 1000 volt.

COMPLETE BRAND NEW **$7.95**

## ARC-5/R-28 2 MTR RCVR

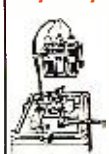
**$29.95**

Here is the 2-meter superhet you have been looking for! Absolutely one of the BEST available today! Tunes from 100 to 156 Mcs. in four crystal channels. (Easily converted to continuous tuning.) Tube lineup is as follows:

717A—R.F., 717A—Mixer, 2-12SH7—1st and 2nd K.F. 16.9 Mc.
12SL7—Det. AVC Squelch, 12SL7—1st audio-speich amplifier.
12A6—2nd audio, 12SH7—R.F. Osc.—4th Harmonic Gen.
717A—Trip. 12th Harmonic Gen., 717A—Dblr.—12th Harmonic.
Sealed Cartons..... **$29.95**

FREE one copy of Vol. 2 "Surplus Radio Conversion Manual" (Reg. price $2.50). This volume contains circuit diagram and full description of above receiver.

## NOW! Fill Your Battery Only Twice a Year with Automatic Battery Filler



Made by leading Detroit Auto Mfr. Doubles battery life over ordinary care, prevents battery breakdowns, fits all cars, instantly installed.

ONLY **$1.95** complete

## DUAL PURPOSE EMERGENCY UNIT

- Fire Extinguisher
- Tire Inflator

Made by leading Detroit Auto Mfr. Especially recommended for oil, gas and electrical fires. Tested and stamped in accordance with I.C.C. regulations. Guaranteed by mfr. against defects.

Order two — one for your home; one for your car in case of flats or fires.

ONLY **$2.29** each

## ARC-5/T23 XMTR $49.95

**FAMOUS AIRCRAFT 2MTR EXTR. COMPANION TO ABOVE RECEIVER**

Order Your Pre-amplifier NOW!

WRITE FOR OUR FREE CIRCULAR!

## FIELD TELEPHONES

Army surplus, completely reconditioned and electrically tested, using 2 flashlight cells and a pair of interconnecting wires. GUARANTEED—like new.

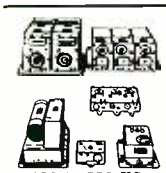
ONLY **$16.95**

## PRE-AMPLIFIER MODEL K-1

The K-1 is used to amplify output level for microphones and phonographs. Operates on 24-28 VDC, can be converted to 110 AC. Comes complete with PL-55 plug and 2 foot 119-B cord, 2 terminal blocks and instruction book.

BRAND NEW SPECIAL **$4.95**

## SCR-27N COMMAND and ARC-5 Equipment



### RECEIVERS

| | USED | NEW |
|---|---|---|
| BC-453—190 to 550 KC | $17.95 | $37.50 |
| BC-454—3 to 6 MC | 11.95 | 18.95 |
| BC-455—6 to 9 MC | 8.95 | 11.95 |

### TRANSMITTERS

| | | |
|---|---|---|
| BC-457—4 to 5.3 MC | 7.95 | 12.95 |
| BC-458—5.3 to 7 MC | 8.95 | 13.95 |
| BC-696—3 to 4 MC | 16.95 | 29.95 |
| BC-459—7 to 9.1 MC | 16.95 | 27.50 |

### ADDITIONAL EQUIPMENT

| | | |
|---|---|---|
| BC-456 Modulator | 3.95 | 6.95 |
| BC-450 Control Box (3 Receiver) | 1.49 | 2.95 |
| BC-451 Control Box (Transmitter) | 1.29 | 2.49 |
| BC-442 Relay Unit (ANT) | 2.95 | 3.95 |
| Plugs: PL-147, 148, 151, 152, 153, 154, 156—EACH | 1.25 | |
| Flexible Shafting with gear to fit Receivers | | 1.69 |
| 3 Receiver Rack | 2.25 | |
| 2 Transmitter Rack | 1.69 | |

## BC-221 Frequency Meter

Real Value! QUANTITY IS LIMITED — so first come, first served. They are just like new, with original calibration charts. Range 125-20,000 KC with crystal check points in all ranges. Complete with crystal and tubes.

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## HEADSETS

| | |
|---|---|
| HS-33 low impedance with cord and plug, used, fine condition | $1.89 |
| HS-23 high impedance, BRAND NEW with ear pads | 3.95 |
| HS-33 low impedance, BRAND NEW with ear pads, cord and PL54 plug. | 4.95 |
| HS-30 with ear plugs, low impedance, used, good condition | 1.69 |
| CD-307A Cords, 6 ft., NEW | .89 |

**Minimum Order $2.00**

Immediate Delivery — Send 25% deposit on C.O.D. orders. All shipments F.O.B. N.Y.C. (N.Y.C. residents add sales tax to your remittance.)

## PLATT ELECTRONICS CORP.

DEPT. A, 489 BROOME ST., NEW YORK 13, N. Y.
PHONES: WO 4-0827 and WO 4-0828

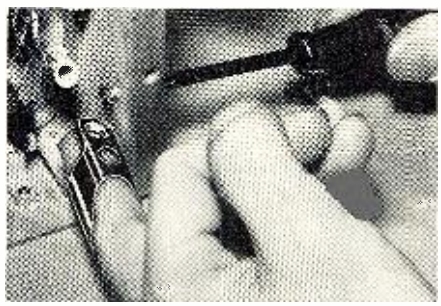
ing of the transmission line feeding them. They consist of two coaxially arranged elements, each cut to approximately one-quarter wavelength and center fed with 72 ohm transmission line.

Bulletin 106, containing complete construction data, detailed specifications, and operational information, is available from the company on request.

### FINGERTIP WRENCHES

The Tube Department of *Radio Corporation of America* is offering a unique set of fingertip wrenches which have been especially designed to aid the radio and television technician in working "tight spots" in chassis.

Offered as part of the Tube Department's new promotion campaign, these



new tools are practical time-saving devices which help solve the problem of holding, placing, and adjusting nuts in receivers. The wrenches are worn on the finger and are used to steady the nut or bolt as it is tightened or loosened. Each set consists of five wrenches for the most commonly used nut and bolt sizes: 3/16", 1/4", 5/16", 11/32", and 3/8". The wrenches are made of steel and are nickel-plated for rust resistance. They are adjustable to individual finger sizes.

Local *RCA* tube distributors are handling these wrench sets.

### METAL CUP CERAMICS

*Herlec Corporation* of 422 N. 5th Street, Milwaukee 3, Wisconsin, a subsidiary of *Sprague Electric Company*, is currently in production on a new line of metal cup ceramic condensers which are especially designed for applications requiring rigid frequency control.

According to the company, the outstanding advantages of these new units include capacitance stability, high "Q," and excellent retrace characteristics. They are small in size, hermetically sealed against atmospheric humidity, and are easy to mount securely against the effects of vibration and shock.

Bulletin No. 603, which provides complete details on these new ceramics, is available from the company without charge.

### AMPLIFIER SYSTEM

*Altec Lansing Corporation* of Beverly Hills, California, is currently in production on a new amplifier system which has been designed especially for use in home music installations.

The new system consists of the A-433A preamplifier and the A-333A power amplifier. These units are arranged so that all operating controls are located on the small, compact, portable preamplifier which connects to the power amplifier by 6 foot flexible cables. These controls include a three-step selection of record crossover frequencies, control of the rise and droop in both treble and bass, equalization for variable reluctance pickup, filter for 33⅓ rpm recording characteristic rise, a three input selector switch, and a continuously variable volume control.

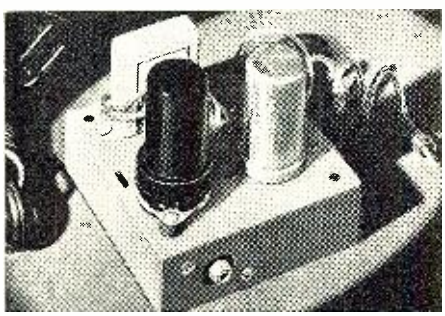
Frequency response is flat to plus zero, minus 1 db from 20 to 20,000 cycles and is within 3 db of flat response up to 100,000 cycles. The system will deliver 27 watts of audio power at less than 5 per-cent harmonic distortion, 20 watts at less than 2 per-cent harmonic distortion, and 15 watts at less than ½ per-cent harmonic distortion.

### NEW PREAMPLIFIER

*Fisher Radio Corporation*, 41 East 47th Street, New York, New York, has designed a new quality preamplifier which can be used with *G-E, Pickering, Audax, Clarkstan*, and other low-level magnetic pickups. It can also be used as a microphone preamplifier.

The unit uses two stages of triode amplification and features a novel feedback circuit to produce low frequency equalization. The preamplifier is self-powered and comes in a completely enclosed chassis which measures 3¾"x3⅝"x3⅝".

It features a hum level of better than 60 db below 1 volt output on phono



and microphone. Frequency response is uniform within 2 db from 30 to 20,000 cycles on both phono and microphone. An installation and service manual is furnished with each of these units.

### METALLIZED PAPER TUBULARS

*Cornell-Dubilier Electric Corporation* of South Plainfield, New Jersey, has introduced an improved and complete metallized paper tubular line for general purpose use.

Among the features of this new line are compactness and light weight, combined with high insulation resistance, low power factor, and self-healing characteristics.

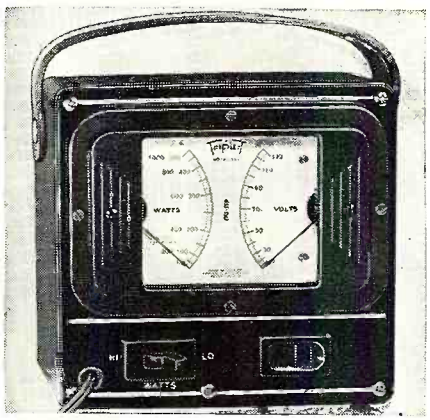
The new line is available in three basic types, the "Pup," "Sealpup," and "Metapup" which come in a wide range of capacities and operating voltages. Bulletins covering these units are available from the company. Ask for

No. 142 on the "Pup" tubulars, No. 143 on the "Sealpup" units, and No. 144 for the "Metapup" condensers.

### "LOAD-CHEK"

*The Triplett Electrical Instrument Co.* of Bluffton, Ohio, has recently introduced a new test instrument, the "Load-Chek" Model 660.

This unit facilitates servicing by



means of power consumption measurements. The instrument indicates shorts or opens in the circuit, localizes the trouble, yet requires no involved interconnections between the unit and the appliance being tested.

The Model 660 has ranges of 0-500-1000 a.c.-d.c. watts and 0-130 a.c.-d.c. volts. It is housed in a portable case which measures 6"x5½"x2½" and comes with a leather strap handle. The unit weighs just 2 pounds.

A data sheet on the Model 660 is available on request.

### PORTABLE SCOPE

*The Hickok Electrical Instrument Company,* 10677 Dupont Avenue, Cleveland 8, Ohio, has announced a new portable 3" oscilloscope, the Model 380 "Miniscope."

The new instrument has a frequency coverage to 2.5 mc. and features a sensitivity of .1 r.m.s. volts per inch. The unit has direct connection to the cathode-ray tube elements, provision for Z-axis modulation, and a telescopic

light shield. It is shock mounted and housed in a strong moisture-proof aluminum case which measures 6" wide, 9" high, and 13½" in depth. The scope weighs 14 pounds and comes complete with leads.

### COIL FORM KIT

Of interest to design engineers, laboratory technicians, and experimenters is a new coil form kit just released by *Cambridge Thermionic Corporation* of 463 Concord Avenue, Cambridge 38, Massachusetts.

The kit contains representative samples of ceramic coil forms manufactured by the company. It contains three each of five different ceramic coil forms, each coil form in each group being provided with a different powdered iron slug. Extra slugs of silver-plate brass for each coil form are provided as alternates to the iron slugs.

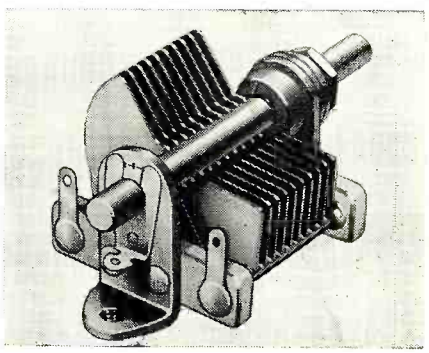
Coil forms vary in diameter from 3/16" to ½" and in over-all mounted heights from 1 9/32" to 1 11/16". Types included are LST, LS5, LS6, LS7, and LS8.

### VARIABLE CONDENSER

*The E. F. Johnson Company* of Waseca, Minnesota, has announced the availability of a new, small-sized variable condenser which has been designated as the Type "R."

Plates are of brass with a highly corrosion resistant bright alloy plating. Standard spacing is ordinarily .0245" for maximum capacitance ranges up to 325 μμfd. Other spacings up to .0715" can be obtained. Dimensions of the unit are 1⅝" wide by 1 11/16" high with the plates extended.

Although these new units are cur-



rently available only on special order in production quantities, full details may be secured from the company.

### CLAROSTAT CONTROLS

*Clarostat Mfg. Co., Inc.* of Dover, N. H., has developed a volume control replacement unit with a 15/16" diameter shaft.

Prior to the release of these new units the company's Series G and AG controls have been available in the 15/16" size but the "Ad-A-Switch" unit has not. Now the Series SWB or 15/16" "Ad-A-Switch" is obtainable in s.p.s.t.; three-way no "off" position s.p.d.t.; and d.p.s.t. A T-shaped section of the control's dust cap is simply pried off, turned 90 degrees and removed, exposing the switch-throwing mechanism.

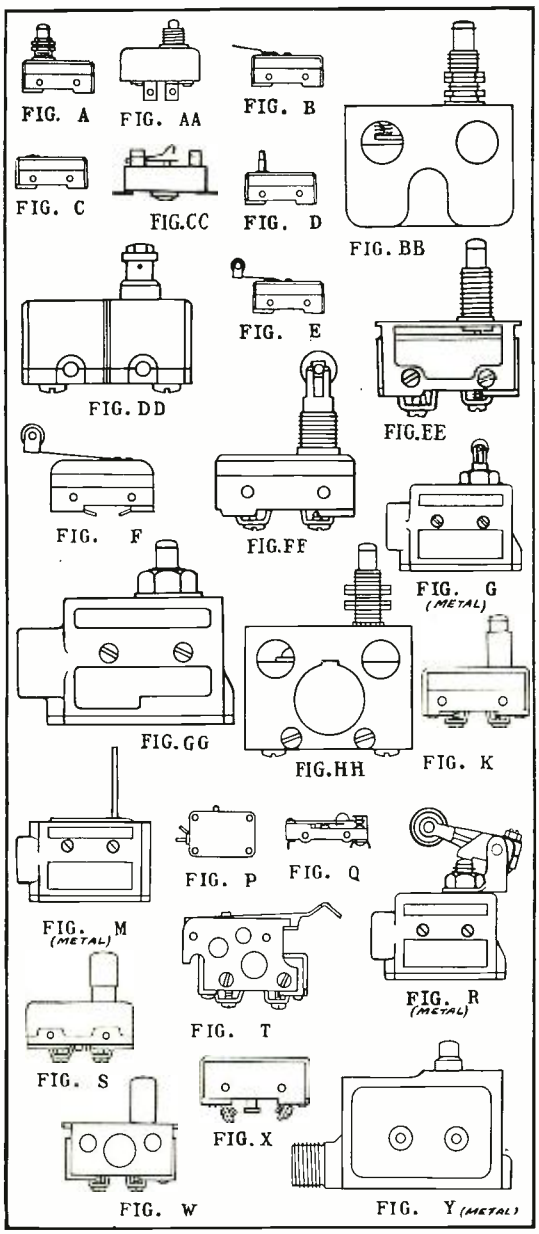
### FM TUNER CHASSIS

*Collins Audio Products Co., Inc.,* P.O. Box 368, Westfield, New Jersey is in production on a new FM tuner chassis, the RD-1C.

The tuner comes mounted on an aluminum plate measuring 7¼" x 4½" which can be fitted into any chassis of the user's choice. By proper placement

IMMEDIATE DELIVERY OF

# Top Quality MINIATURE SWITCHES




**This list of brand new standard brand miniature switches represents only a few of many types in stock at Wells. Large quantities of most types are on hand for your immediate requirements. Write or wire for quotations on switches not listed.**

| Stock # | Mfr. | Type # | Contact | Fig. | Price |
|---|---|---|---|---|---|
| 41MC2 | ACRO | 2MO3.1A | NO | P | .50 |
| 41MM2 | MU | ACZ101BB | SPDT | W | .85 |
| 41MC6 | MU | APB236 | SPDT | A | 1.15 |
| 41MC26 | MU | APG210 | NO | A | .80 |
| 41MC17 | MICRO | B-1 | NC | Y | 1.45 |
| 41MC16 | MICRO | B-1T | NC | DD | .90 |
| 41MC7 | MICRO | B-14 | NO | HH | 1.70 |
| 41MD62 | MICRO | B-R | SPDT | C | .70 |
| 41MD46 | MICRO | B-RL18 | SPDT | B | .95 |
| 41MD63 | MICRO | B-RS36 | SPDT | D | 80 |
| 41MD23 | MICRO | BD-RL32 | SPDT | B | 95 |
| 41MLH | MICRO | BZRQ41 | SPDT | W | .85 |
| 41MD51 | MICRO | BZ-R37 | SPDT | C | .70 |
| 41MD2 | MICRO | BZE7RQT2 | SPDT | GG | 1 70 |
| 41MD21 | MICRO | BZ-7RST | SPDT | D | .80 |
| 41MD38 | MICRO | BZE2RQ9TN1 | SPDT | G | 2.65 |
| 41MD6 | MU | CUM 24155 | NO | E | .80 |
| 41ML1 | MU | D | NO | BB | 1.50 |
| 41MC12 | MICRO | D in case | NC | Y | 1.45 |
| 41MD34 | KLIXON | ES692070 | NC | CC | .50 |
| 41MD65 | MICRO | G-R26 | NO | C | .60 |
| 41MD60 | MICRO | G-RL | NO | B | .80 |
| 41MC11 | MICRO | G-RL 5 | NO | B | .80 |
| 41MD61 | MICRO | G-RL35 | NO | B | .80 |
| 41MD41 | MICRO | G-RL43 | NO | B | .80 |
| 41MD64 | MICRO | G-RS | NO | D | .55 |
| 41MD66 | MICRO | G-RS36 | NO | D | .60 |
| 41MC32 | ACRO | HRO 7.1P2TSP1 | NO | K | .65 |
| 41MC19 | ACRO | HRO 7.4P2T | NO | S | .60 |
| 41MD8 | ACRO | HRRC 7.1A | NC | C | .55 |
| 41MD27 | ACRO | HRRO 7.1A | NO | C | .60 |
| 41MC31 | MICRO | LN-11 HO3 | SPDT | M | 1 70 |
| 41MC18 | MU | MLB 321 | SPDT | B | 95 |
| 41MD1 | MU | MLR 643 | NC | B | .70 |
| 41MD55 | PHAO. | PS 2000 | SPOT | C | .85 |
| 41MC28 | ACRO | RC71P2T | NC | A | .70 |
| 41MD45 | ACRO | RO1P2T | NO | A | .80 |
| 41MD22 | ACRO | RO2M | NO | E | .80 |
| 41MD28 | ACRO | RO2M12T | NO | E | .80 |
| 41MC25 | MICRO | R-RS | NC | D | .50 |
| 41MO47 | MICRO | R-RS13 | NC | D | .50 |
| 41MD9 | MICRO | SW-186 | NC | D | .50 |
| 41MC10 | MICRO | WP3M5 | NC | AA | .50 |
| 41MC4 | MICRO | WP5M3 | NC | AA | .50 |

| Stock # | Mfr. | Type # | Contact | Fig. | Price |
|---|---|---|---|---|---|
| 41MD53 | MICRO | WP5M5 | NC | AA | .50 |
| 41MC27 | MICRO | WZ2RST | NC | D | .55 |
| 41MD48 | MICRO | WZ2RT | NC | C | 65 |
| 41MD33 | MICRO | WZ3PW2 | NC | F | .80 |
| 41MD16 | MICRO | WZ7R | NC | C | .55 |
| 41MD43 | MICRO | WZ7RQ1T | NC | A | .70 |
| 41MC15 | MICRO | WZ7RQT2 | NC | A | .70 |
| 41MD36 | MICRO | WZ7RST | NC | D | .55 |
| 41MC24 | MICRO | WZE7RQTN | NC | Y | 1.45 |
| 41MC23 | MICRO | WZE7RQTN | NC | R | 3.75 |
| 41MD54 | MICRO | WZR8X | NC | X | .80 |
| 41MC9 | MICRO | WZR31 | NC | C | .65 |
| 41MD57 | MICRO | WZR31 | NC | T | .70 |
| 41MD31 | MICRO | WZRD | NC | C | .55 |
| 41MD19 | MICRO | WZRL8 | NC | B | .70 |
| 41ML3 | MICRO | WZRQ41 | NC | W | .65 |
| 41ML2 | MICRO | WZV7RQ9T1 | NC | G | 2 25 |
| 41MC21 | MICRO | X757 | NC | C | .55 |
| 41MD37 | ACRO | XC1A | NC | C | .55 |
| 41MC5 | ACRO | XD45L | SPDT | B | .95 |
| 41MD4 | MICRO | YZ | NO | C | .75 |
| 41MD40 | MICRO | YA2RLE4D13 | NO | B | .70 |
| 41MD24 | MICRO | YZ2YLTC1 | SPDT | B | .95 |
| 41MC1 | MICRO | YZ2YST | SPDT | D | .60 |
| 41MD13 | MICRO | YZ3R3 | NO | C | .60 |
| 41MO56 | MICRO | YZ3RLTC2 | NO | B | 80 |
| 41MC14 | MICRO | YZ3RW2T | NO | F | .90 |
| 41MO49 | MICRO | YZ7RQ9T6 | NO | FF | .85 |
| 41MD32 | MICRO | YZ7RST | NO | D | .60 |
| 41MC13 | MICRO | YZ7RA6 | NO | EE | 1.00 |
| 41MD25 | MICRO | YZRQ1 | NO | A | .80 |
| 41MC20 | MICRO | YZRQ4 | NO | S | .60 |
| 41MO59 | MICRO | YZRQ41 | NO | W | .75 |
| 41MD20 | MICRO | YZ7RQT | NO | K | .65 |
| 41MD42 | MICRO | YZRTX1 | NO | X | .95 |
| 41MC22 | MU | Z | NC | Y | 1.45 |
| 41MD44 | ACRO | Blue Stripe | SPDT | C | .70 |
| 41MD52 | MU | Blue Dot | SPOT | E | .90 |
| 41MC8 | MU | Red Dot | NC | C | .65 |
| 41MD18 | MICRO | Open Type | SPDT | Q | .50 |
| 41MD39 | MU | Green Dot | NO | B | .80 |
| 41MC29 | MU | Green Oot | NO | D | .55 |
| 41MD26 | MAXSON | Precision | SPDT | B | .95 |

## SWITCHETTE

All Rated 10A-230 VAC

| Stock # | Mfr Type # | Contacts | Terminals | Price |
|---|---|---|---|---|
| 41SF3 | CR1070C103-A3 | N.C. | SIDE | $0.53 |
| 41SF2 | CR1070C103-B3 | N.O. | END | .53 |
| 41SF8 | CR1070C103-C3 | 1-N.O. 1-N.C. | END | .53 |
| 41SF7 | CR1070C103-E3 | N.O. | SIDE | .53 |
| 41SF9 | CR1070C103-F3 | 1-N.O. 1-N.C. | SIDE | .53 |
| 41SF12 | CR1070C123-B3 | N.O. | END | .53 |
| 41SF10 | CR1070C123-C3 | 1-N.O. 1-N.C. | END | .53 |
| 41SF5 | CR1070C123-D3 | N.C. | SIDE | .53 |
| 41SF4 | CR1070C123-J2 | SPDT | END | .53 |
| 41SF11 | CR107 C124-M4 | SPDT | SIDE | .53 |
| 41SF1 | CR1070C128-C3 | | | |

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**WELLS SALES, INC.**

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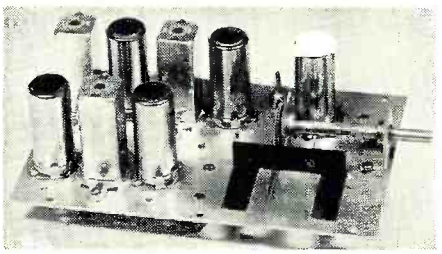
and mounting it may be directly coupled to a tuning dial assembly such as those manufactured by *National* or *Millen*, or used independently.

One feature of particular note is the fact that no separate i.f. amplifier is



required. The tuner is complete with only filament and plate voltages required to put the tuner into operation with an amplifying system.

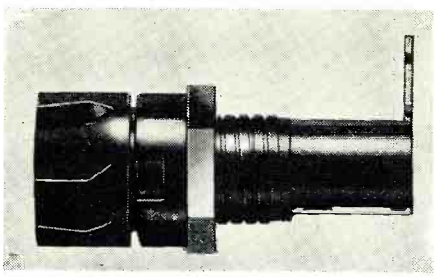
The set uses five tubes, has an antenna input of 300 ohms, an average sensitivity of 20 microvolts, permeability tuning, and an audio output of approximately 1 volt. A convenient terminal board is supplied under the chassis to which antenna and other energizing voltages may be connected.

Full details on the RD-1C are available from the company on request.

### FUSE EXTRACTOR POST

*Littelfuse Inc.* of 4757 N. Ravenswood, Chicago, Illinois has developed a new fuse extractor post for 3AG fuses which is said to offer seven distinct advantages to the user.

According to the company, the new unit features a reduction in behind-the-panel distance of 1 inch, bakelite construction, leaf-spring tension lock which reduces voltage drop between



the knob contact and the fuse, an all-purpose terminal, a knife-edge bottom contact, a side terminal and internal metal ring made in one piece, and ease of testing by means of a special hole in the top of the knob.

### MINIATURE SWITCHES

*Centralab,* Division of *Globe-Union Inc.,* 900 E. Keefe Avenue, Milwaukee, Wisconsin has recently introduced a new line of miniature rotary switches.

Available in a variety of multi-pole, multi-position, and multi-section types, the new units are also obtainable in combination with a.c. line switches and variable resistors.

Two groups are currently being offered. The Series 20 is available in bolted construction with phenolic or grade L-5 steatite insulation and staked construction with a maximum of two sections in phenolic insulation only.

The second group is the Series 30

with dual concentric shaft and staked construction which can be furnished with a variable resistor in front, rotary switch in between, and an a.c. line switch in the rear. Variations on this arrangement are also available.

### EXTENSION SPEAKERS

*Permoflux Corporation,* 4916 W. Grand Avenue, Chicago, Illinois has added two new rear seat auto extension speaker assemblies to its line.

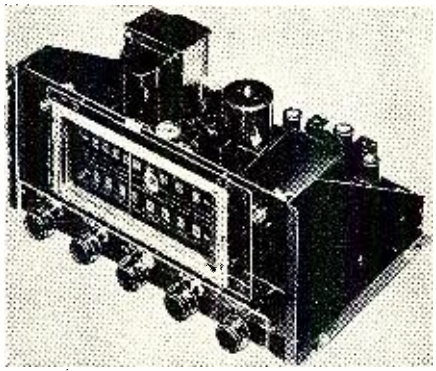
The Model RS46A is a 4 x 6 inch speaker and the Model RS69J is a 6 x 9 inch unit. Both models are furnished as complete assemblies, ready for installation. The three-way switch supplied with the speakers is prewired at the factory and the assembly includes all necessary mounting hardware, an attractive metal grille in a neutral shade, and complete installation instructions.

### HI-FI TUNER

*The Sargent-Rayment Co.,* 212 Ninth Street, Oakland 7, California has begun the national distribution of a high fidelity tuner which has been especially designed for custom installation.

Designated the SR51, the new unit is a 14 tube tuner which covers both the AM and FM bands. The AM section consists of a pre-stage tuned r.f. section and a broadband stage of i.f. terminating in a new low distortion detector. A "Null T" type 10 kc. filter eliminates adjacent station whistle without impairing maximum frequency response.

The FM section employs a tuned r.f. stage preceded by an input coupling tube for added sensitivity and stability. An a.f.c.-controlled triode oscillator and two stages of permeability-tuned i.f. are included for improved performance in addition to a fully-balanced, static-free ratio detector.

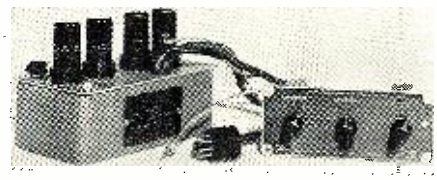


A data sheet giving complete specifications on this new tuner is available from the company on request.

### DYNAURAL PREAMP

*Herman Hosmer Scott, Inc.,* 385 Putnam Avenue, Cambridge 39, Massachusetts has recently announced the availability of a new Type 112-B "Dynaural" preamplifier.

The new unit, which features improved circuits and controls, includes such features as a "Dynaural" noise suppressor which reduces record surface noise without sacrificing musical quality, a preamplifier for low-level magnetic pickups, a variable turnover control to compensate for different recording characteristics, an adjustable



record distortion filter, and an input level adjustment for use with the noise suppressor and external automatic loudness controls.

The remote control panel is bronze with an antique etched finish. The unit can be attached to most existing installations by means of three simple plug-in connections. The frequency response is flat from 30 to 15,000 cycles and the usable response is from 20 to 20,000 cycles. A bulletin covering the Type 112-B is available on request.

### BASIC CHASSIS

*Alden Products Company* of 117 N. Main Street, Brockton 64, Mass., has introduced a basic chassis which permits circuit elements to be laid out and fabricated as unit sub-assemblies.

The new unit has been designed for maximum accessibility to all components, for wiring and assembly using high speed production methods, and for easy servicing of completed equipment by even inexperienced personnel.

The basis of the chassis is a terminal mounting board system whereby tube sockets and all associated circuitry are mounted and interwired as an individual sub-assembly for mounting in basic chassis. Mounted on both sides of the chassis, the terminal boards are accessible for inspection or removal. Hundreds of prepunched holes on the terminal boards permit an almost unlimited number of circuit patterns to be wired without modification.

Manufacturers may obtain full details by writing N. Curtis at the company address given above. —30—

## RCA SERVICE AID

**As a service to the television technicians of the country the RCA Service Company has turned over to the industry's independent television service organizations the field-tested methods for conserving critical materials and the data on the use of alternate parts and tubes which it has developed during its own materials conservation program.**

**This material has been compiled into a compact booklet which has been entitled "Handbook on Conservation of Materials." One of the outstanding features of the handbook is a listing of alternate receiving tubes and component parts for use in the operation and maintenance of TV receivers. More than 300 pre-tested and approved alternates are listed for approximately 50 different uses.**

**Copies of this booklet are being mailed to all television service associations and individual technicians can receive their copies through their service groups.** —30—

# Preview ...THE NEW 1952 FALL LINE OF TV CHASSIS AND CABINETS

**Lic. Under RCA Pat.**

**Chassis Mounting Brackets $4.95**

**RMA Guarantee**

**Factory Wired, Aligned & Tested Before Shipment**

**Caveat emptor—Let the buyer beware!**

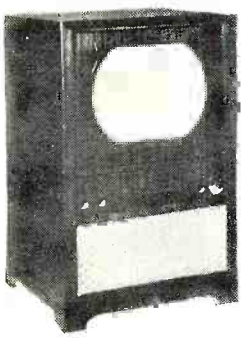
**There are many different qualities of 630 chassis and TV tubes. All our merchandise is 1st quality, factory new. No seconds, no rebuilts and no rejects. You get honest dollar value!**

## THE AMAZING NEW SUPER DX-2 "630" 30 TUBE CHASSIS! PERFECT FOR FRINGE AREA RECEPTION

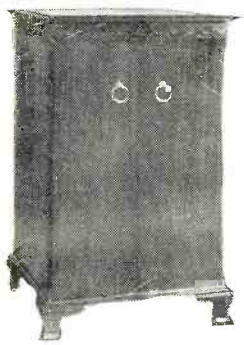
WILL HANDLE ALL TUBES FROM 16" TO 24". Thousands of our Super DX sets are giving new viewing thrills to TV watchers all over the country. Now . . . the NEW Super DX-2 extra powerful chassis brings you sharper, clearer pictures than ever before because it is designed with fringe areas in mind. Has improved, keyed AGC; 15 KV output; 3 stage Sync separator and clipper; moulded. plastic condensers; uses new, improved high voltage system; 5 hour minimum heat run at factory; high gain front end—down to 5 microvolts; synchro lock; freedom from arcing and corona leakage; Armstrong FM sound system; improved linearity adjustment and second horizontal linearity control; phono connection and switch on chassis. DIRECTLY ADAPTABLE FOR COLOR. Available with Dumont Inputuner, includes FM Radio and 12" Speaker—**$149.95.**

**$139.95**

**With Hi-gain Standard Coil Tuner and RCA HI-FI 12" Speaker Complete with Fed. Taxes LESS CATHODE TUBE**

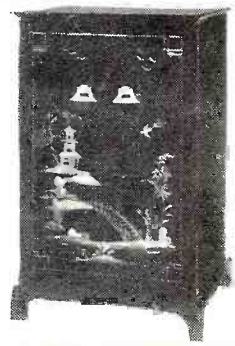


ECONOMY—41x25x23. 16" to 20" Tube. Mahogany—**$59.95.** For 24" —**$71.95.** Blond—**$10** Additional.

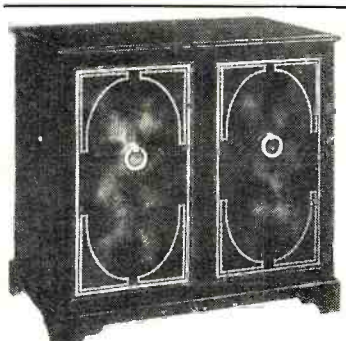


HAMPSHIRE—42x26x26. Beautiful Mahogany grain—**$74.95.**

STRATFORD—40x28½x23½. Genuine crotch mahogany doors—**$79.95.**



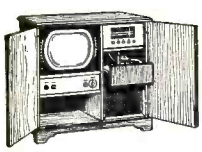
MANDARIN—42x24x24. Ebony finish. Gold & colored raised hand painting—**$84.95.**

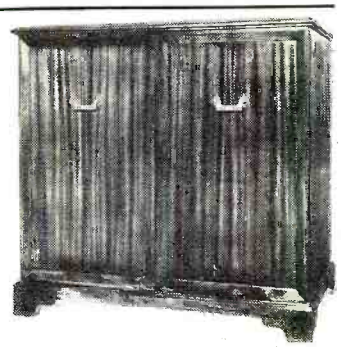


ELITE (combination)—39x40x23½. Red antique gen. leather. Gold leaf hand tooling—**$149.95.** Above in limed oak, gold colored leather—**$159.95.**

## PRICE SMASHING VALUES IN TV CABINETS FOR THE "630"

Beautiful, richly piano finished, hand rubbed genuine mahogany cabinets to suit every taste. They are designed to house the "630" Chassis, 12" speaker and up to 20" TV tube. The combination cabinets will hold up to a 20" TV tube, radio and Webster record changer, with ample record storage space. All cabinets, except the Economy, come with gold plexiglass mask. The Economy has an open type mask. Complete with all brackets and instructions. The perfect chassis deserves a perfect cabinet. It will be a focal point of beauty in your home. Other models in stock. Send for FREE circular.





REGENT (combination) 39x40x23½. Selected, grained mahog. picture box doors—**$129.95.** Above in limed oak—**$139.95.**

### TV TUBE SCOOP

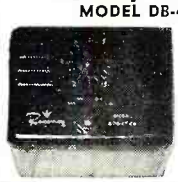
**THOMAS-SHELDON-ZETKA**
**1st Quality**

| | |
|---|---|
| 12½" round | $22.50 |
| 14" rectangular | 23.95 |
| 16" rect. or round | 29.95 |
| 17" rectangular | 32.95 |
| 20" rectangular | 42.95 |
| 24" round, metal | 79.95 |
| Ring & sleeve for 24" | 7.50 |

**Also Dumont in Stock**
**All tubes carry 6 mos. mfrs. guar.**

### Regency Booster

**MODEL DB-410**



Improves reception in Low Signal Areas. All channel tuning. 1knob control Turns set on and off.

**$18.95**

### SPECIAL VALUES

- Dumont Inputuner, for FM & TV bands ..... $23.85
- Standard Coil Tuner ..... 19.95
- TV Masks—16&17" $4.95; 20" ....$7.95; 24" ..... 14.95
- 300 OHM TV Wire, 100 feet. 2.89
- Standard Coil Booster..... 18.95
- Espey FM-AM Radio, 12 tubes, push-pull output.... 74.95

***We carry a complete line of 630 component parts. Write for price list.***

### RECORD CHANGER SALE

**WEBSTER 3-SPEED SERIES 100** **$29.95**

Plays 12 records automatically. All sizes. All speeds. 33⅓-45-78 RPM. Permanent point needle. In original carton. Reg. $48.00

All merchandise is brand new, factory fresh & fully guaranteed. Mail & phone orders filled upon receipt of certified check or money order for $25 as deposit on TV chassis. 20% on other items. Balance C.O.D., F.O.B., N. Y. Prices subject to change without notice. No Fed. taxes to pay. Prices lower than OPS Regs.

**Send Post Card with Name and Address to Be Put on Our Mailing List**

# AIREX RADIO CORP.

**171 Washington St. New York 7, N. Y.**
**Phone WORTH 2-4029**

# ELECTRONIC DEFINITIONS

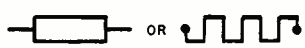
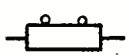
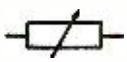
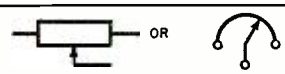
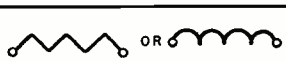
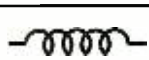
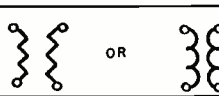
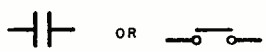
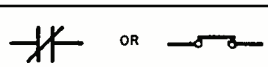
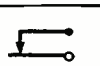
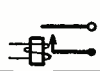
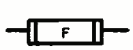
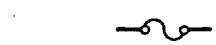
***The unfamiliar terminology of industrial electronics should not deter technicians. Here are the equivalent radio terms.***


**By ED BUKSTEIN**
Northwestern Vocational Inst., St. Paul


THE increased use of electronic controls in industry has aroused the interest of many technicians. More and more, the radio service technician is encountering this type of equipment. It may be brought into his shop for repair, or he may be requested to construct an electronic device for a specified application. At this point, the service technician usually decides to check into the literature of industrial electronics. When he does, he is often unpleasantly surprised by the profusion of unfamiliar terms. Even the symbols on the circuit diagrams differ from those with which he is acquainted. The less-persistent technician often becomes discouraged by the prospect of wandering over unfamiliar ground. Such discouragement is not at all necessary. Actually, the principles, the parts, and even many of the circuits of industrial electronics are "old friends" of the service technician. The difficulty lies in the fact that they are presented in a slightly different terminology. This confusion is rapidly dispelled when the technician learns to correlate the differing terminologies. He learns, for instance, that *pliotron* is the industrial name for an amplifier tube, that a gas-filled diode is called a *phanotron,* and that an induction heater is nothing but an r.f. oscillator.

The following is a listing of terms from the vocabulary of the industrial electronics technician. The radio service technician will recognize in these definitions many familiar concepts and

Symbols used in radio diagrams and their industrial electronic equivalents.

| COMPONENT | INDUSTRIAL SYMBOL | EQUIVALENT RADIO SYMBOL |
|---|---|---|
| FIXED RESISTOR |  |  |
| TAPPED RESISTOR |  |  |
| RHEOSTAT |  |  |
| POTENTIOMETER |  |  |
| FIXED CAPACITOR |  |  |
| VARIABLE CAPACITOR |  |  |
| COIL OR INDUCTOR |  |  |
| TRANSFORMER |  |  |
| NORMALLY OPEN CONTACTS |  |  |
| NORMALLY CLOSED CONTACTS |  |  |
| MAGNETIC CONTACTOR (RELAY) |  |  |
| FUSE |  |  |

circuits. Familiarity with these terms will enable him to approach this field with confidence.

*Amplitude Controlled Rectifier:* A circuit employing thyratron tubes as rectifiers and whose output can be varied by changing the d.c. bias on these tubes.

*Back-to-Back Circuit:* Two tubes connected in parallel but in opposite directions, *i.e.*, the cathode of one tied to the anode of the other and *vice versa*. This arrangement is used to control the flow of alternating current and is popular in resistance welding circuits.

*Black Light:* Ultraviolet is referred to as black light because the eye does not respond to its wavelength. An ultraviolet source is sometimes used in conjunction with a phototube in burglar and intrusion alarms.

*Carrier Current Control:* A remote control system in which the output of an r.f. oscillator is fed into the power lines. A receiver, located at a distance and operating from the same power lines, picks up the r.f. signal and actuates a relay.

*Capacity Operated Relay:* An oscillator containing a relay in its plate circuit. The grid circuit is connected to a pickup electrode such as a door handle, bank vault, metal plate, etc. When anyone approaches the pickup electrode, the grid circuit capacity is altered and the plate current is changed sufficiently to actuate a relay.

*Dielectric Heating:* An electronic method of heat treating any material which is a nonconductor of electricity. The material to be heated is placed between two metal plates so that it becomes the dielectric of a condenser. The output of a high power r.f. generator is applied to the metal plates. The rapidly alternating electric field produces molecular agitation in the work, causing it to heat. This technique is used for heating and molding plastics, curing rubber, drying lumber, bonding plywood, etc.

*Electric Eye:* Popular name for the phototube. The current flow through this tube depends upon the amount and color of the light striking its cathode. It is used for counting objects passing on a conveyer belt, opening garage doors when an automobile approaches, inspecting beverages for the presence of foreign particles, color matching, etc.

*Electronic Micrometer:* A thickness measuring device in which the material to be measured is held between two metal plates. These plates serve as the tank condenser of an oscillator circuit. With this arrangement, the frequency of the oscillator is determined by the spacing between the plates, which in turn depends upon the thickness of the material. A frequency meter connected in this circuit can be calibrated to read material thickness.

*Electronic Sewing:* A method of "welding" thin sheets of plastic for book-jackets, aprons, raincoats, pouches, etc. This is a form of dielectric heating.

# NEW FALL ITEMS AT LOWEST PRICES

RADIO STANDARD SURPLUS ELECTRONICS

### MODEL GO-9 TRANSMITTER

All brand New. 100 Watts CW. or MCW. emission. Operates from 110 V., 800 Cycle, easily converted to 60 Cycle operation. Low frequency range, 300 KC. to 600 KC. High frequency 3,000 KC. to 18,000 KC. using an E.C.O. We furnish complete conversion data with each transmitter. Complete with schematics. **$59.95**

### SOUND POWERED HAND SETS

TS-10 type—Various manufacturers. No batteries needed for operation. Use in pairs with wire. Audible up to 10 miles. Ideal for TV antenna installations, etc.
Excellent condition ..... Pair **$17.95**

### SOUND POWERED HEAD AND CHEST SET

Use same way as Hand Set except you have freedom of hands. No Batteries or Power source required for operation.
Excellent Condition ..... **$11.95**

### RU 16 RECEIVERS

RU 16 RECEIVERS ..... **$5.95 Ea.**
Plug-in Coils.
9 Ranges 190-13570 KC ..... **1.50 Ea.**
BC 430 Transmitter ..... **5.95 Ea.**
Plug-in Coils for Trans.
2 MEG-9 MEG ..... **1.50 Ea.**
12 Volt Dynamotor for above.
330 Volt @ 170 MA. ..... **7.95 Ea.**
RU-19 Control box ..... **1.00 Ea.**

### METERS

**Westinghouse—G.E. Weston**

#### MILLIAMPERE D.C.

| | |
|---|---|
| 2"—0 to 15.. | $3.50 Ea. |
| 2"—0 to 100.. | 3.50 Ea. |
| 2"—0 to 300.. | 3.50 Ea. |
| 3"—0 to 500.. | 3.95 Ea. |
| 3"—0 to 9RF Amp | 3.50 Ea. |
| 3"—0 to 50.. | 3.95 Ea. |
| 3"—0 to 100.. | 3.95 Ea. |
| 3"—0 to 150.. | 3.95 Ea. |
| 3"—0 to 200.. | 3.95 Ea. |
| 3"—0 to 250.. | 3.95 Ea. |
| 3"—0 to 500.. | 3.95 Ea. |

#### VOLT METERS

| | |
|---|---|
| 2"—0 to 15 V., A.C. | $2.95 |
| 3"—0 to 8AC.. | 2.95 Ea. |
| 3"—0 to 15 AC.. | 2.95 Ea. |
| 2"—0 to 30 DC. | 3.95 Ea. |
| 3"—0 to 150 DC. | 3.95 Ea. |

#### TIME HOUR METERS

99999.9 Hrs.
10-12 Volts, 60 Cycle 3 Inch ..... **$6.95 Ea.**

#### KILOVOLT D.C.

| | |
|---|---|
| 3"—0 to 400 DC. | $3.95 Ea. |
| 3"—0 to 500 DC. | 3.95 Ea. |
| 3"—0 to 4 ... | 3.95 Ea. |

**(All are 1 Ma. full scale, require external multiplier.)**

#### 2" WESTON SPECIAL

0 to 30 V. DC and 0 to 120 Amps. DC **$3.95 Ea.**
0 to 30 V. DC and 0 to 240 Amps. DC **3.95 Ea.**

### GIBSON GIRL

The Emergency Radio Transmitter. Send S O S signals automatically on 500KC. 150-mile range. No batteries required. Has handdriven generator, tubes, carrying case. New. It's only.... **$4.95**

### BC 456 MODULATION UNIT

Part of SCR274N. Equipment contains Relays, Transformers and 1225, 1625 and VR 150 (OD3) Tubes.
Less Tubes ..... **$1.50**
With Tubes ..... **2.95**

### 2 VOLT WET CELL RADIO BATTERY

NEW. Uncharged (Appr. wt. 4 lbs.) TYPE 20-2 ..... Ea. **$1.45**
Complete set of three with Box and Connections to make a 6 volt, 20 Amp. Hrs. Battery Uncharged (Approx. wt. 15 lbs.) ..... Set **$5.95**

### MG-149F INVERTER

Input 24 Volt DC 36 Amps. 110 v. 400 Cy. AC. 500 V.A. Output at 90% P.F. Used, excellent condition ..... **$8.95 ea.**

### MIDGET SELSYNS

AY type operates from 6-12 Volts 60 Cycl. Use as both transmitter and receiver. These compact little units draw almost no current and work fine for all remote position indicating applications, OD 2¼x2¼x2". All New (Appr. wt. 1 lb.) ..... Each **$2.50**

### 3" TRIUMPH OSCILLOGRAPH

Complete Test Scope, with built-in Wobbulator, so as to be used on TV or FM servicing. Operates from 110 Volt, 60 Cy. A.C. Limited Supply. All these units have been carefully checked and are in excellent condition. A Real Buy. SPECIAL **$34.95 Ea.**

### REVERSIBLE MOTOR

1/40 H.P. Ball-bearing 3450 R.P.M. in Blast-proof case. Needs only a capacitor for starting. All Brand New. 110 V., 60 Cy.
Special Low Price ..... **$3.95**

### TANK PERISCOPES

Type M9 Contains 2 glass prisms, one at each end of the periscope. Use them for looking over crowds, at parades, ball games, races, etc. or use prisms separately for optical work. Low priced. All Brand New .. **$1.95**

### PROP PITCH MOTORS

For your Beam Antenna: 20 Volt to 32 Volt, A.C. or D.C. ½ H.P. Motor: 1¼ RPM Gear Reduction 7000 to 1.
ALL BRAND NEW ..... **$13.95 ea.**

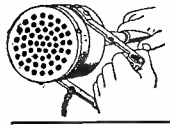
**¼ H.P. PROP PITCH MOTORS**
20 to 32 Volt A.C. or D.C. Gear Ratio: 9000 to 1. All Brand New ..... **$17.95**

### GYRO MOTOR UNITS

Dual gyro unit. Both gyro motors mounted on single base. Wired in parallel for 12 or 24 volts. Excellent condition. (Please specify if you wish the 12 or 24 volt) ..... Set **$4.95**

### G.P.7 TUNING UNITS

5 Ranges: A-350-800 KC., B-800-1500 KC., D-3000-4525 KC., E-4525-6500 KC., F-6200-9050 KC.
Also contains Capacitors, Resistors, Vernier Dials and many other parts. A REAL BUY while they last. Each unit range ..... **$4.95**



### HAND SIRENS

All New, with canvas cover carrying strap. Can be heard for many miles. Ideal for Civil Defense, Camps, etc. A bargain at ..... **$9.95**

### ALTIMETERS

Sensitive type—Ideal for planes or automobiles. 0 to 40,000 ft. Operate from Barometric pressure. No special hookup needed. Excellent condition. Low priced at ..... Ea. **$7.95**

### BRASS SELSYNS

Heavy Duty Bendix Selsyns. 110 volts 60 Cycles AC..... Pair **$9.95**

### PE 110 POWER SUPPLY

This unit was used as part of BC669 transmitter. Input 110 volts 60 watts: Output 545 volt @ 455 ma. for transmitter and low voltage supply for Receiver and Filaments. Uses 4-5Z3 tubes for high voltage and 1-80 tube for low voltage. Also contains a 12 volt Vibrator pack for Receiver voltages. This supply is well filtered and regulated and is ideal for your Ham transmitter. Low priced at .... **$34.95**

### INTERVALOMETERS

This unit was used to release bomb loads at different time intervals and now can be used ideally for dark room timers, etc. Complete with two 2050 tubes; four sensitive relays and other related parts. Excellent Condition ..... Each **$4.95**

### 2 VOLT VIBRATORS

VB8A Synchronous Type. Used in all portable radios having 2 Volt wet cell supply.
All new ..... Ea. **$1.50**

### TG-5 CODE OSCILLATOR

Battery operated Code Practice Oscillator. Use singly for practice or can be used in pairs for practice or sending messages over wire between two points. Uses a 22½ volt dry cell battery and 2 flash light cells. Contains keying relay and 1000 Cy. tone buzzer and head set. All brand new, with canvas carrying case ..... Ea. **$9.95**

### CAPACITORS • FIXED • OIL FILLED

**Solar, Pyranel, C. D., Etc.**

| | | |
|---|---|---|
| 2 MFD. | 400 V., D.C. | $0.79 |
| 1 MFD. | 600 V., D.C. | .75 |
| 4 MFD. | 600 V., D.C. | 1.25 |
| 8 MFD. | 600 V., D.C. | 1.95 |
| 10 MFD. | 600 V., D.C. | 2.25 |
| 1 MFD. | 1000 V., D.C. | 1.00 |
| 2 MFD. | 1000 V., D.C. | 1.25 |
| 4 MFD. | 1000 V., D.C. | 1.75 |
| 1 MFD. | 1500 V., D.C. | 1.50 |
| 2 MFD. | 2000 V., D.C. | 1.95 |
| 3 MFD. | 2000 V., D.C. | 3.50 |
| 4 MFD. | 2000 V., D.C. | 3.95 |
| 2 MFD. | 4000 V., D.C. | 5.95 |

### CAPACITORS • TRANSMITTING • VARIABLE

| | | |
|---|---|---|
| K | 1 MMFD. To 75 MMFD. ¼" Spacing | $1.95 |
| *D | 12 MMFD. To 125 MMFD. 3000 V. Peak | 3.50 |
| I | 28 MMFD. To 110 MMFD. 5000 V. Peak | 3.95 |
| *P | 12 MMFD. To 150 MMFD. 3000 V. Peak | 3.50 |
| A | 7 MMFD. To 80 MMFD. 1500 V. Peak | 1.00 |

* With National "Velvet Vernier" Dial.
All New, Hammerlund, Cardwell, Etc.

### MINE DETECTOR, AN/PRS-1

Easy to operate, easy to carry. Can be used for detecting ore deposits, both metallic and non-metallic. Now being used extensively by Miners, Prospectors. Beachcombers, and Explorers. These sets are brand new and come complete with Detector head with antenna; Reflector meter and housing and exploring rod; a bag for carrying equipment while operating and a wooden case for storing or transporting unit when not in use. These units contain Tubes, and instruction books. Shipping weight is 125 lbs. Weight when operating unit is 22 lbs. All New—Complete with Batteries and ready to operate ..... Set **$29.95**

### DYNAMOTORS

5DY 81A B12 Input 14 V. @ 46 Amp. Output 515V./1030 V./2V./8V. @ 215-260 MA. All Brand New Original Cartons ..... **$17.95**

### RU-19 RECEIVERS

For the first time on surplus, we can now offer this versatile Receiver. All complete and ready for 24 volt operation. These units are ideal for ship-to-shore receivers, ADF, and mobile operation. They come complete with 9 coils covering frequency range of 195 KC to 13570 KC. 24 volt Dynamoto, all cable connectors, remote tuning head and cables, spare tubes, tuning meter, instruction manual, junction box, mounts, etc., etc.
NOTHING ELSE TO BUY.
ALL BRAND NEW, COMPLETE ..... **$34.95**

### COMMAND RECEIVERS

3 MC to 6 MC ..... **$ 9.95 ea.**
6 to 9 Meg. ..... **11.95 ea.**
Approx. weight of each 12 lbs.
Excellent condition complete with tubes.

### COMMAND TRANSMITTERS

4 to 5.3 Meg. **$8.95** ea. 5.3 to 7 Meg.... **$4.95 ea.**
7 to 9 Meg. ..... **$14.95 ea.**
Complete with Tubes and Crystals, excellent condition.
ARC 5 VHF Transmitter Chassis Less Tubes and Crystals. Used, fair condition ..... **$14.95**

### FL-8 FILTER

Range or Voice for 1020 cycles Audio. Switch mounted on Filter. Excellent for C W..... Ea. **$1.25**

### WALKIE TALKIE BATTERIES

BA 37—1½ volt—A ..... **50c**
BA 38—103½ volt—B ..... **$1.29**
Both for ..... **$1.50**

### SOLDERING IRONS

**Famous Name Manufacturer.** 85 watt Iron. Only special purchase permits this low price, which is much less than standard advertised price.
All brand new ..... each **$2.95**

### DC GENERATOR

12 Volt DC Output @ 4 Amp. Must be belt-driven @ Approx. 2000 RPM. In good condition ..... Ea. **$4.95**

### JEEP GENERATORS

12 Volt DC Output @ 60 Amp. Complete with Voltage Regulator and Ammeter. Ideal for Boats, Trucks or Mobile Radio use. Excellent condition ..... **$49.95**

### 12 VOLT WET CELL BATTERY

Aircraft Type, 12 Volt, 34 Amp. HR. Made by Exide. Completely inclosed with removable top. Dry Charged, All Brand New ..... **$14.95**

### 12 VOLT BLOWER MOTOR

Trade Winds Blower—Operates from 12 Volts DC @ 6.6 AMPS. Diameter of cage 7". Ideal for Boats or Trucks. In good condition ..... **$4.95**

### POLE INSULATORS

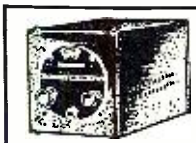
Glass 2" Insulator with 3" screw overall length 5" for telephone use **$10.00** Hundred

### MISCELLANEOUS SPECIALS

| | |
|---|---|
| 9 Channel Push Button Switch, spring back type | $1.00 |
| 300 OHM Twin Lead | .04 per Ft. |
| 67½ Volt Radio "B" Batt. | 1.00 Ea. |
| 1 Lb. Roll Rosin Core Solder | .95 Roll |
| BC606G Interphone Switch Box | .59 Ea. |
| RG 7U COAX 950 OHM | .06 per Ft. |
| J-5A Hand Keys, Flameproof, New | .69 Ea. |
| RG 59U COAX 52 OHM | .08 per Ft. |

### TUBES

| | | | |
|---|---|---|---|
| 8025 | $4.95 | 8020 | $2.95 |
| 3FP7 | 1.95 | 6SL7 | 1.25 |
| 5FP7 | 1.25 | 6V6 | 1.25 |
| 5BP4 | 2.50 | 6U5 | .75 |
| 6SJ7 | 1.00 | 6B8 | .75 |
| 12SR7 | .90 | 83V | 1.25 |
| 6AG5 | 1.50 | 6SH7 | .50 |
| 6AK5 | 1.75 | 7193 | .50 |
| 6AC7 | 1.50 | 6SN7 | 1.75 |
| 4E27 | 12.95 | 304TL | 7.95 |



### BC-438 BEACON RECEIVERS

Similar to BC 1206, Manufactured by Detrola Radio. 200 to 500 KC. For Direction Finder. Contains 2—25L6. 1—6SA7, 1—6SF7, 1—6SK7, 1—6K7. Excellent condition.
Complete ..... **$7.95**

BC-357 FREQUENCY RANGE. 60 to 80 Meg. Operates from 24 Volts D.C. Complete with Tubes..... **$3.95**

### STEEL STORAGE BOXES

Heavy Duty Boxes to be used for foot lockers or storage boxes or for safe keeping of valuable items. Hinged Top with Hasp for padlock. 2 Sizes: All Brand New.

| L | W | H | |
|---|---|---|---|
| 18" | x 12" | x 12" | $4.95 |
| 24" | x 15" | x 12" | 6.95 |

### FRICTION TAPE

Army Surplus ¾" Tape in Vacuum Sealed Cans. 6 Rolls to the can ..... **$1.25** per can

All Mail Orders Promptly Filled, F.O.B. San Francisco . . . All California Orders—Add 3% Sales Tax . . . Do not send postage stamps. Write for our free booklet listing our stock and prices on Radio, Electronics, Tools, Hardware, Motors, Wire, Meters, Batteries, Aluminum Sheets, etc. 20% Dep. on all C.O.D. orders. All items subject to prior sale.

# STANDARD SURPLUS

1230 Market St., San Francisco 3, Cal.
Telephone HEmlock 1-3106

*Electrostatic Precipitation:* A method of controlling small particles of matter by endowing them with an electric charge so that they will be attracted to a collector plate bearing an opposite charge. This type of equipment is used to clear the air of dust, soot, cigarette smoke, etc. It is also used to reclaim minute particles of valuable chemicals that might otherwise pass up through factory chimneys.

*Energy Storage Welding:* A welding system in which energy is stored for a period of time, and then the stored energy is released to produce the weld. The energy is stored either in a bank of condensers or in the magnetic field of an inductance (see *"Resistance Welding"*).

*Flame Failure Control:* An electronic device used in conjunction with oil or gas burning furnaces. This device shuts off the fuel supply if the pilot burner should accidentally become extinguished, preventing a dangerous accumulation of unburned fuel. One type of flame failure control uses a phototube to "watch" the pilot burner. In another type, the resistance of the flame is used as part of the circuit. If the flame should go out, the circuit constants are changed sufficiently to actuate a magnetic valve.

*Fluoroscope:* An x-ray unit in which the image is formed on a fluorescent screen. This unit is used to detect the presence of foreign particles in packaged foods, to check the alignment of the conductor in insulated wire, etc.

*Gas Amplification:* The ratio between the current flow through a gas-filled phototube and the current through an equivalent vacuum phototube operating under the same lighting conditions. Gas amplification makes the former type more sensitive than the latter.

*Grid Controlled Rectifier:* A variable output power supply employing thyratrons as the rectifying elements. The output is controlled by changing the grid voltage of the thyratrons. Grid controlled rectifiers fall into two classes: (1) the magnitude controlled types which use d.c. grid voltage and (2) the phase controlled types which use a.c. grid voltage.

*Ignitron:* A high-current type of tube capable of carrying hundreds, even thousands, of amperes. This tube uses a pool of liquid mercury as its cathode. The envelope of the ignitron is a double-walled steel jacket. The tube is cooled by circulating water between these walls. The ignitron can be used as a rectifier or, when connected in a back-to-back circuit, to control the flow of alternating current. Many types of resistance welding machines employ this tube.

*Induction Heating:* An electronic method of heat treating metals. The metal to be heated is placed inside a copper coil, and the output of an r.f. generator is applied to this coil. The coil thus acts as a primary and the metal as a secondary of a transformer. The currents induced in the metal raise its temperature. Induction heating is

used for soldering and brazing, tempering steel springs, degassing electron tubes, etc. At higher frequencies, skin effect causes the surface of the metal to heat while the interior remains relatively cool. This feature makes the equipment useful for surface hardening operations.

*Kenotron:* A vacuum diode rectifier tube.

*Magnitude Control:* Same as "Amplitude Control."

*Motor Speed Control:* A circuit for varying the speed of an electric motor. Most types employ a grid controlled rectifier to supply the motor's armature current. Such speed controls are used in conjunction with wire reeling and drawing, precision grinding, governor testing, etc. If a small generator is coupled to the motor shaft and the output of this generator used to bias the thyratrons, the motor will maintain a constant speed under varying load conditions.

*Peaking Transformer:* A transformer designed to saturate at low values of current. This transformer is used to convert a sine wave into a narrow pulse waveform.

*Phanotron:* A gas-filled diode rectifier tube.

*Phase Controlled Rectifier:* A circuit employing thyratron tubes as rectifiers and whose output can be varied by shifting the phase of the a.c. applied to the grids.

*Photocathode:* The type of cathode used in phototubes. This cathode is covered with a light-sensitive material which emits electrons when illuminated.

*Photoelectric Pyrometer:* A temperature measuring device which utilizes the color-sensitive properties of the phototube. The phototube "looks" into the furnace through a special window. As the metal inside heats, its color changes through various shades of red and white. The output of the phototube, as indicated by a meter, is therefore proportional to the temperature of the heated metal.

*Photomultiplier:* A tube in which electrons emitted from a photocathode strike, in sequence, a number of plates known as dynodes. Each dynode emits secondary electrons, and the total plate current is therefore greatly increased. The type 931 photomultiplier employs nine dynodes and is capable of amplification in the order of a quarter of a million.

*Phototube:* A light-sensitive tube employing a photocathode (see *"Electric eye"*).

*Pin-Hole Detector:* A photoelectric device used to detect and mark the location of small holes in sheet steel.

*Pliotron:* An amplifier tube.

*Pool Tubes:* Those tubes employing a pool of liquid mercury as the cathode.

*Radiography:* X-ray inspection in which the image is formed on a photographic film. This technique is employed to locate internal flaws in metal castings, to check the alignment of the elements in electron tubes, and to inspect the quality of welds.

*Register Control:* A device used to maintain the correct relative position of a strip of cloth, paper, metal or other material passing through a machine. A phototube is used to detect changes in the position of the material. The output of the phototube is then amplified and fed to a positioning motor which restores the material to its correct position. Register control is used in conjunction with multicolor printing presses to assure alignment of successive colors.

*Resistance Welding:* The joining together of metals by passing a high current through them. The heat developed as a result of this current melts the metals together. Ignitron tubes, connected back-to-back, are often used to control the intensity and duration of the welding current. The metals to be welded are held between a pair of electrodes. If these electrodes are rod-shaped, the result is a spot weld. A seam weld is produced by using a pair of roller electrodes and passing the work between these rollers.

*Saturable Core Reactor:* An iron-core inductor containing two windings. Direct current is passed through one of these windings in order to saturate the core. The inductive reactance of the other winding depends upon the degree of core saturation. As the core becomes more saturated, the inductive reactance decreases. The saturable reactor is used in many control applications, in light dimming circuits for instance. In this application, the reactor is connected in series with the lighting system. The lights are dimmed by decreasing the current through the d.c. winding. This increases the inductive reactance of the other winding and limits the current to the lights.

*Sequence Timer:* An electronic timing circuit which automatically applies and disconnects power at a controllable rate and for preset lengths of time. In resistance welding, for instance, the power should be disconnected for the length of time required to bring the work into position. Power is then applied for the duration of time required to produce the weld. This is followed by another "power off" interval during which the work cools while still under the pressure of the electrodes. The timing accuracy is extremely critical; in some cases, the welding current is allowed to flow for only a few cycles. The sequence timer accurately and automatically controls the "power on" and "power off" intervals (see *"Time Delay Relay"*).

*Stroboscope:* A device which facilitates the study of rotating or reciprocating machinery by making it appear stationary. It consists basically of a high intensity light source which flashes on and off at a controllable rate. If the flashing rate is properly adjusted, the machine will always be in the same position when the light comes on. Since the machine is always seen in the same position, it appears to be stationary. This device is extremely useful for vibration studies.

*Temperature Control:* A device for maintaining a constant temperature in a furnace or oven. In one type of temperature control, a thermocouple located in the furnace develops a voltage proportional to the temperature. This thermocouple voltage changes the bias on a tube whose plate current saturates the core of a saturable reactor. The altered reactance of the saturable reactor changes the value of current flow through the heating element of the furnace. In another type of temperature control, a material whose resistance varies with temperature is used as one arm of a bridge. When the temperature changes, the bridge is unbalanced and the resulting voltage is amplified and used to control the heating mechanism.

*Thickness Control:* A device for maintaining a constant thickness of a strip of manufactured material such as paper or steel. The material passes between two plates which serve as the tank condenser of an oscillator circuit. Variations of material thickness change the plate spacing and consequently the frequency of the oscillator. An FM type discriminator detects this change of frequency, and its output controls the thickness-determining portion of the machinery.

*Time Delay Relay:* A circuit in which a relay is actuated a predetermined length of time after a switch is opened or closed. Most types operate on the condenser charging principle. A condenser, charging through a resistor, varies the bias of a tube until the plate current has changed sufficiently to operate a relay. The length of the time delay depends upon the time required to charge the condenser which, in turn, depends upon the values of capacitance and resistance. Some types of time delay relays employ an initially charged condenser which is then discharged in the required length of time. The sequence timer is made up of a number of time delay circuits connected in cascade.

*Vane Controlled Oscillator:* An oscillator containing a relay in its plate circuit. A metal vane inserted between the coils impairs feedback and stops oscillation. When oscillation ceases, the plate current increases and energizes the relay. Some types employ a detuned tuned-grid, tuned-plate oscillator, and the metal vane passes between the turns of one of the tank coils. This changes the inductance sufficiently to bring the circuit into oscillation. The vane controlled oscillator can be used to sound an alarm when the liquid in a tank has reached a certain level. In this application, the vane is floated so that it will rise and fall with the liquid level, and the coils are mounted on the wall of the tank. The vane controlled oscillator can also be used in elevator leveling equipment. The metal vane is mounted under the elevator platform and coils are mounted at each floor level. When the elevator is properly leveled, the vane passes between the coils. At this time, the relay operates to release the door opening mechanism. —30—

# ARROW "The Home of Values!"

## COMMAND (SCR 274 N) EQUIPMENT

| | Used | New |
|---|---|---|
| **ARA** (same as command receiver) 1.5 to 3 MC, like new with tubes, less dynamotor, black crackle finish | | $19.95 |
| **BC-455** 6-9 mc receiver | $7.95 | 14.95 |
| **BC-457** 4-5.3 mc transmitter | 4.95 | |
| **T-19 ARC 5,** 3-4 mc transmitter | 10.95 | |
| **T-22 ARC 5,** 7-9.1 mc transmitter | 7.95 | |
| **BC-496,** 2 position Rec. Control Box | | 1.95 |
| **MC-215** Mechanical Drive Shaft, per length | | 2.45 |
| **BC-450** 3 Receiver Remote Control | | 1.95 |
| **BC-451** Transmitter Control Box | .69 | 1.50 |
| **BC-442** Antenna Relay, complete | | 2.95 |
| 3 Receiver Rack | 1.95 | |

## TUBES!

**39¢**

| | | | | |
|---|---|---|---|---|
| 01A | 1E7GT | 2C26A | 33 | 954 |
| 01B | 1F4 | 3B7 | 34 | 1619 |
| 01C | 1F5G | 3D6/1299 | 38 | 1625 |
| 1A6 | 1G1 | 10Y | 39/44 | 1626 |
| 1B4P | 1G6GT | 15R | 49 | |
| 1B5/255 | 1H4G | 19 | CRP 72 | |
| 1C6 | 1H6G | 30 spec. | 843 | |

**49¢**

| | | | | | |
|---|---|---|---|---|---|
| 0Z4A | 6J7G | 6Z7G | 12F5 | 12J5GT | 211 |
| 2V3G | 6T7G | 12A6 | 12H6 | 77 | 957 |

**69¢**

| | | | | |
|---|---|---|---|---|
| CK1005 | 2X2 | 6L7G | 6ST7 | 705 A |
| 1A5GT | 6J5GT | 6R7GT | 6W7G | |

**89¢**

| | | | | |
|---|---|---|---|---|
| 1B26 | 1S4 | 6AC7 | 6K8G | 717A |
| 1B32 | 2A4G | 6AL5 | 6SH7 | 1613 |
| 1LD5 | 3S4 | 6C4 | 6V6GT | 9002 |
| 1LN5 | 5W4 | 6K6GT | VR90 | 9003 |

**$1.59**

| | | | | | |
|---|---|---|---|---|---|
| 6AG5 | 6L6G | 100TH | 9.95 | 805 | $3.29 |
| 6AK5 | 1624 | 304TH | 14.95 | 807 | 1.89 |
| 6AK6 | | 304TL | 14.95 | 813 | 9.95 |
| | | 307A | 4.95 | 866A | 1.69 |
| | | 803 | 2.89 | | |

## CATHODE RAY TUBES

| | | | | | |
|---|---|---|---|---|---|
| 3FP7 | $1.95 | 5GP1 | $3.95 | 16JP4 | $19.95 |
| 4AP10 | .95 | 5BP4 | 3.95 | 16DP4 | 19.95 |
| 5FP7 | 1.95 | 5CP1 | 4.95 | | |

## CABINET CH-118

Olive drab in color, this cabinet has a full length interlock access door on the rear. The front takes the standard 19" panels with 60 inches of height and 20 inches deep. It is shock mounted on a heavy steel platform and has a two-inch protrusion fully covering one side to accommodate wave trap and wiring. Louvered vents allow air circulation top and bottom.
Each F. O. B. Chicago **$34.50**

## RA 52-RECTIFIER

A transtat controlled rectifier to produce high voltage DC from 110 VAC 60 cycle source. Up to 11,500 volts DC at 50 watts. Metered high voltage (0-15KV) and current (0-20 MA). New **$74.50**

## BC 768

**Radio Receiver Chassis.** Complete except for 13 tubes. This chassis with standard 19" panel front contains the receiver for 493.5 MC complete with power supply and an additional low voltage power supply that originally supplied the keyer BC 770.

110 VAC 60 cycles is the primary voltage.

Five 10 mfd—600 VDC oil filled GE condensers are used as filters. Five stages of 49 MC IF's. Two of 10.4 MC, 6.3 VAC Transformer and of course power transformers—chokes and miscellaneous parts.

All units are in good condition as removed from new equipment. Even the salvage value is a great deal more than the low price of **$9.95**

## MN 26Y COMPASS RECEIVER

Twelve stage superhet covering frequencies of 150 to 325 KC; 325 to 695 KC; and 3400 to 7000 KC in three bands. These units are brand new but with Dynamotor, Band Switch motor and tubes removed. Schematic Furnished. While they last, ea. **$4.95**

## MIKES and HEADSETS

| | | |
|---|---|---|
| **HS 23** High Impedance Headset | new | $4.95 |
| **HS 33** Low Impedance Headset | new | 4.95 |
| **HS 30** Miniature Headset | new | 1.50 |
| | used | .75 |
| **CD-307** Ext. cord for HS 23-33 | like new | .59 |
| **J41** Key | new | .98 |

**T-32** Desk Stand microphone. Good used cond. **$2.95**

**Throat Mike**—T 30—New **98c**
**Lip Mike**—Navy Type—New **98c**
**Extension Cord** and Switch Assembly for lip and throat Mikes—New **98c**
**CW 49505 High impedance headset** complete with leather headband and rubber cushions. Used **98c**

## SCR 625 Famous Army Mine-Detector

**For Prospectors, Miners, Oil Companies, Plumbers, Etc.**

This unit is being offered now at a considerable reduction in price. Recently advertised at $79.50 it is now available in the same brand new wrappings in suitcase style carrying case (less batteries) at

**$59.50**
**WHILE THEY LAST!**

## MONTHLY SPECIALS!

**BX 769** Transmitter. Part of RC 100 equipment **$5.50**

**BC 770** Keyer Part of RC 100 **$3.95**

These items, described in previous advertisements, are being offered this month only at these prices on an "as is" basis, less tubes. An excellent parts value, both items may be purchased at a combination price of **$8.25**

## OIL FILLED CONDENSERS

.00025 mfd. 25,000 VDC, oil-filled, new **$2.95** ea.

1.75 mfd. 330 VAC, 60 cycle, G. E. Pyranol motor starting condenser with mounting bracket, NEW **59c** ea.

| | | | |
|---|---|---|---|
| 4 mfd | 500 VDC | 39c | 3 for $1.00 |
| 1–1–1 mfd | 1200 VDC | 59c | 2 for 1.00 |
| .5 mfd | 750 VAC | 39c | 3 for 1.00 |
| .5 mfd | 1500 VDC | 39c | 3 for 1.00 |
| .25 mfd | 600 VDC B/T | 24c | 5 for 1.00 |
| 40 mfd | 25 VDC Electrolytic | 24c | 5 for 1.00 |

50 mmfd 5000 VDC vacuum condenser, NEW **$1.29**

## SURPRISE PACKAGE

20 pounds assorted radio parts. A real value at **$1.95**

## RECORD PLAYER

Original Government cost $150.00. Contains husky three tube Amplifier, Large PM Speaker and two speed (33⅓ & 78 RPM) 110 Volt AC and DC motor. In portable leatherette carrying case.

Good operating condition **$19.95** each
Or with repairs required, as is **12.95** each

Also available straight AC with one speed 33⅓ RPM motor.

Good operating condition **$17.95** each
Repairs required **11.95** each

**AM 61** Indicator amplifier—New with blower and all parts except tubes **$7.95**

## BC 709

Battery operated lightweight interphone amplifier. Complete with tube and shock mount, but less battery. New **$3.95** ea.

## AS-138/ARN

10 inch streamline loop as used with direction finding receivers. Fixed position, it is ideal for planes, boats, automobiles. New **$1.95**

**AD-1 MOTOR** 24 VDC—1/12 HP 6000 RPM Intermittent Duty **98c**

**PE 97 or PE117 Vibrator Power Supply** for BC 620 and BC 659. Used—Less Tubes, Vibrator and Condenser **$2.95**

**PE 120 Vibrator Power Supply** for BC 620 and BC 659 with Tubes, etc.—Complete for 6 or 12 Volt operation Used **$6.95**

**PE 218** Inverter, 24VDC input; output 115 VAC, 400 CPS at 13 amps. (1.5 KVA) new $15.00, like new 12.50

## CHOKES

10 Henry 20 MADC **29c** 4 for **$1.00**
10 Henry 50 MADC **39c** 3 for **1.00**

## MISCELLANEOUS SPECIALS!

| | Used | New |
|---|---|---|
| **RA 10 DA** Receiver | $17.50 | $24.95 |
| **BC 347** Interphone Amplifier | | 2.95 |
| **BC 442** Less Condenser | 1.49 | 1.95 |
| **APS 13 UHF** Antenna, Pair | | .98 |
| **I-97** Bias Meter | 3.95 | 4.95 |
| **RL 42** Antenna Gearbox Motor and Reel | 4.95 | 7.50 |
| **Circuit Breaker** 40 Amps | | .59 |
| **Collins VFO Dial**—5 calibrated ham bands form 3.2 Mc to 32 Mc; complete with pointer, gears, logging dial and flywheel. Scale 6" on 8" plate, each | | .95 |
| **I 82 F** Five Inch 360 degree compass indicator and Selsyn receiver | | 4.95 |
| **A-81-2** Transmitters Selsyn for I82 indicator (both I82F & Trans. Selsyn for $7.00) | | 2.45 |
| **PE-101** Dynamotor | | 2.75 |
| **Model 507,** Thermal-converter Weston Type D, range .12 amp | | .59 |
| **BC-1023** Marker Beacon Receiver, complete with tubes, shock mount and instruction manual | | 9.95 |
| **BC-923** 27-38 MC. FM Receiver, complete with tubes | 24.50 | |
| **BC-924** 27-38 MC. FM Transmitter, complete with tubes | 19.95 | |
| **BC-684** 27-38 MC. FM Transmitter, less dynamotor | 19.95 | |
| **BC-610** 10 meter modification kit | | 3.95 |
| **SCR-183** complete 12 volt set with all coils, tubes, dynamotor and control units | | 49.50 |
| **ARB** Control Box | | 1.95 |
| **ARR2** Control Box | | .89 |

## COMPASS INSTALLATION

**MN-26C**—Remotely controlled commercial type navigation receiver. Freq. range 150 to 1500 KC in three bands. Has twelve 6 volt tubes, 24 V dynamotor and band switch motor, NEW **$39.95**

| | |
|---|---|
| **MN-28C** Control box for above, New | $9.95 |
| **MN-52** Loop control unit, New | 4.45 |
| **MN-20E** Loop (manually rotatable), New | 9.95 |
| Loop transmission cable 168" long, new | 9.95 |
| **MC-124** Mechanical cabling, New per lgth. | 2.45 |
| **IN-4D** Left-right indicator, New | 9.95 |
| Plugs, set of three, New | 3.75 |
| Manual, covering complete set, New | 1.95 |

## SCR 508 EQUIPMENT

| | | |
|---|---|---|
| **BC 603** Receiver e/dyn | $24.95 | Exc. Used |
| **BC 604** Transmitter e/dyn | 12.95 | Exc. Used |
| **BC 605** Amplifier e/dyn | 4.95 | New |
| **BC 606** Control Box | .95 | Exc. Used |
| **FT 237** Mounting | 9.95 | Exc. Used |
| **MP 48** Mast Base | 2.95 | Exc. Used |
| **DM 34,** Dynamotor | 10.95 | Exc. Used |
| **DM 35,** Dynamotor | 14.95 | Exc. Used |
| **DM 37,** Dynamotor | 14.95 | Exc. Used |
| **TM 11-600** Tech Manual | 1.95 | |
| Crystals, Set of 80 | 19.95 | |

## PE 206 INVERTER

**24 VDC** to **80 VAC** at 800 CPS **500 VA** Used **$3.95**

## SCOTT HI-FI OUTPUT TRANSFORMER

Made for Scott Navy Receiver. Fully Potted. Primary 5000 ohms. Secondary: 600 ohms center tapped and 60 ohms center tapped with inverse feedback. New **$1.49**

**TS-10** Sound powered phones.
Brand New, each **$9.95**
Used **$5.95** ea.

## VIBRATORS

2 Volt—7 Prong Synchronous **69c** 10 for **$6.00**
6 Volt—4 Prong Non'synchronous **98c** 10 for **9.00**

**Shipments FOB warehouse. 20% Deposit on orders. Minimum order $5.00. Illinois residents, add regular sales tax to remittance. Prices subject to change without notice.**

**ARROW SALES, Inc.** Dept. N, 1712-14 S. Michigan Ave., Chicago 16, Ill. PHONE: HArrison 7-9374

# RADIO-TV Service Industry News

**AS REPORTED BY THE TELEVISION TECHNICIANS LECTURE BUREAU**

DURING the spring and summer months while inventories of completed television receivers mounted as the slack market for new TV sets continued, trade association officials, manufacturers, and dealers all looked forward to the coming of the fall months for a resurgence of consumer interest in new video receivers.

The lack of buying interest was largely attributed to the restrictions on credit terms as imposed by Regulation W which, coupled with the sharply rising cost of necessities, dried up the market represented by the "average income" family. Those families that were financially able to pay cash for new TV sets already owned one or more receivers and no radical change in cabinet styling nor noticeable improvement in picture quality had come along to impel them to trade in their old sets for new models.

Excess inventories plagued set distributors, dealers, and parts distributors and many businessmen had good cause to ponder over the surplus stocks they acquired in 1950 in anticipation of the "critical" shortages of tubes, parts, equipment, and supplies expected in 1951.

In June the *Columbia Broadcasting System* inaugurated the first commercial color television broadcast which originated in New York City and was networked to stations in Boston, Philadelphia, and Washington. Since practically all manufacturers had taken a "wait and see" attitude on *color* television while the issue was in the courts, not many color-equipped receivers nor conversion and adaptation parts and accessories were available when the color telecasts started.

The Bureau has been in an unique position to gauge the extent of the interest in color television as more and more service operators were exposed to color telecasts.

### Color TV Problems

It is obvious that color television will pose more problems for the independent servicing industry than any previous development in the radio or television industry. True, back in 1945, '46, and '47, the general opinion was that the independent servicing industry would be unable to cope with the problems of monochrome television installation, adjustment, and service. Yet the record shows that it was the independent television service operators, most of whom were previously radio service operators, who rapidly became the backbone of the television installation and service business. Many former radio service dealers who expanded their businesses to retail television receivers wisely developed their own TV installation and service departments, and have been able to weather the slump in set and appliance sales with income from their service departments.

But color is a new dimension in television that will present some distinctly new problems.

Neither color receivers nor adapter and conversion equipment will be available in quantity until late September or October. Once enough sets and conversion equipment become available to permit aggressive promotion of color video and public interest develops there will be a greater demand for color receivers than the manufacturers can supply. It is possible that there will be consumer "pressure" on television service companies for the adaptation and conversion of receivers. For instance, the successful color televising of one outstanding football game during September might create a demand that would swamp the industry with orders for color receivers. The general buying public is like that—they want what they see and like, and want it immediately.

### Color TV Lecture Programs

In anticipation of the need for practical instruction in color television receiver circuitry, the Bureau, in cooperation with the Editors of RADIO & TELEVISION NEWS, has developed an extensive program of instruction both through general lectures and individual instruction which will be made available to the radio-television servicing industry beginning in September.

Starting in those areas where color telecasts are being given regularly, a series of lectures on the adaptation and conversion of present sets to reproduce color TV pictures will be given by the Industry's foremost service lecturers. It is planned to show actual color TV receivers in operation so that seasoned TV technicians can get the "feel" of color TV receiver operation and main-

# OUTSTANDING VALUES NOW AVAILABLE

## PRE-AMPLIFIER for RELUCTANCE CARTRIDGE

Made by Magnavox. Complete with tubes 6SG7, 6SQ7, 6J7. All wired, ready for use. A remarkable value!

ONLY.....**$2.95**

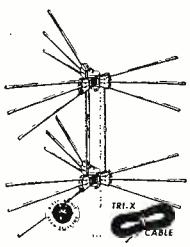
## HARD-TO-GET TUBES

**Fully Guaranteed**

**Quantities Limited—Subject to Prior Sale.**

| | | | |
|---|---|---|---|
| 1B3GT... | **$1.06** | 6K6GT... | **$ .59** |
| 5Y3GT... | **.49** | 6BC5.... | **.79** |
| 6AK5.... | **1.47** | 6CB6.... | **.79** |
| 6AL5.... | **.79** | 6BH6.... | **.89** |
| 6AQ5... | **.79** | 6BJ6..... | **.79** |
| 6AU6.... | **.79** | 12AT7... | **1.29** |
| 6AV6.... | **.65** | 12AU6... | **.79** |
| 2X2A.... | **$ .55** | | |

## SNYDER DIRECTRONIC MOTORLESS TV AERIAL SYSTEM




Receive fine signal from all directions. No longer necessary to use Yagi antennas for each band. No longer necessary to use antenna rotors. SWITCH AT SET CONTROLS ELEMENTS IN EFFECT. Simple to install, easy to use.

- All channels for ultra-fringe areas.
- Hi-tensile 3/8" aluminum alloy elements.
- 1 set connecting stubs.
- Universal U clamp for masts up to 1½".
- Directronic Beam Selector.
- 75 feet of TRI-X cable.

COMPLETE....**$16.95**

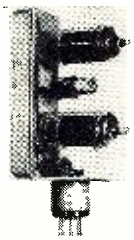
**PHONO CARTRIDGES**—Brand New —Will replace 95% of all cartridges.
1 volt—Standard Mounting.**$1.75** ea.
3½ volt—Standard Mounting.**$1.85** ea.

## MOST AMAZING SPEAKER MADE! THE "JUNIOR TWELVE"

Size: 5¼". Standard Mounting. 2.15 oz. Alnico V Magnet. ¾" Voice coil impedance 3.2 ohms. Get 12" speaker performance in smaller radio sets, phonographs, TV sets, and sound systems! —at 5" speaker prices! Fundamental resonance of the "Junior Twelve" centers around 85 cycles. Response of the "Junior Twelve" is that of the conventional 12" PM.

NOW ONLY....**$2.79** ea.

## REDUCE YOUR TV RECEPTION TROUBLE



**THE TURRET BOOSTER**

- Fully concealed within set.
- Comes on when receiver is turned on.
- No wiring necessary—simple as removing a tube.
- Improves reception—increases video output at least 15%.

Just the thing for fringe area boost or in local areas where antennas are not allowed. PRICE.....**$9.95**
(Special discount to dealers)

## BUFFER CONDENSERS

.005 —2000 V...
.006 —1600 V...
.0075—2000 V...
.01 —2000 V...

**25c** each
10 for **$2.25**
100 for **$19.50**

OZ4 Tubes. Fully Guaranteed.
**69c** each. 10 for **$6.50**

## SPEAKER BUYS OF THE YEAR

4" PM Alnico V Magnet
5" PM Alnico V Magnet

**$1.49 each**
**10 assorted for $14.25**

## THE PERFECT SPEAKER FOR REPLACEMENT OR SOUND WORK

10" PM 3.15 oz. Alnico V Magnet. Rated at 15 watts.....**$3.95** each.
6 for **$3.75** each.

## TUBE CARTONS

Made of heavy red stock. For miniature tubes.

**$1.25** for 100.
**$11.00** for 1000.
GT OR METAL TUBES
100 for **$1.50**
1000 for **$12.50**

## CUSTOM BUILT AUTO RADIOS

Easily installed. Fine, top quality. Ready to place in your car. Designed for each specific car.

**All sets—6 tube.** 3 gang; super heterodyne. Extra sensitive circuit. Low battery drain. Beautiful finish and dial. These models now available:

1951—Ford
1949-50—Ford
1951—Chevrolet
1949-50—Chevrolet
1950-51—Studebaker
1948-49-50-51—Hudson
1951—Henry J
1951—Dodge, Plymouth
1949-50—Dodge, Plymouth

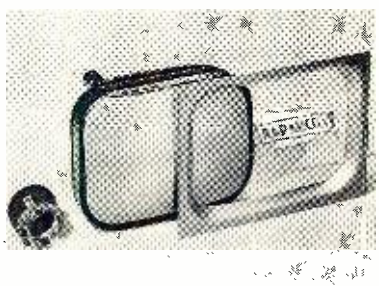
List Price, **$59.95**
YOUR PRICE.....**$41.95**

## HERE'S A REAL TOOL BUY

This handy, useful 6-piece set with unbreakable, shockproof, nonflammable amber handles, with flange aluminum screw chuck. Blades hardened, tempered and fully polished. In attractive leatherette pouch. NOW ONLY **$1.11** each.

Case of 12 sets.....**$12.00**

## NOW! 20" PICTURE FROM YOUR SMALLER SCREEN SETS



Raparco 20" conversion kit at an all-time low price!

Includes 20CP4 tube, 20" gilt edged mask, matching 70° yoke and 15KV HV transformer. All finest quality components. COMPLETE for.....**$69.95**

**CHIMNEY MOUNTS**—2 piece heavy-duty, rust-proof brackets. No drilling or guy wire needed. Includes strapping. **$1.30** each 12 for **$1.20** each

# Radio Parts Company, 614 RANDOLPH ST., CHICAGO 6, ILL.

tenance problems while they are being discussed.

However, many technicians will want a chance to work on color circuits under the supervision of expert, qualified instructors, instruction which is not possible in an open lecture presentation. So, for experienced technicians an intensive three-day course of practical work and instruction in color circuitry will be provided in all of the major TV areas as rapidly as color telecasts spread and the necessary instructional equipment can be procured.

It is hoped that through the medium of these programs the independent servicing industry will be adequately prepared to cope with the technical problems involved in the conversion, installation, and maintenance of color television receivers.

As was pointed out in this department in last month's issue, color television will be available to users in three ways!

First, by adding the necessary component parts to present monochrome receivers to *adapt* them to the *CBS* system scanning rates and then adding a color *converter* to reproduce the pictures in color.

Second, by adding a second unit which is equipped with and operates as a *slave* to the present receiver. This slave set is attached to the master receiver by means of tube adapters and is used only in viewing color television pictures. The user can view black-and-white pictures on the master receiver.

And the third method, of course, is by means of a complete, factory-built color television receiver.

The first method will add a tremendous dollar volume to the business of qualified television service contractors who have the facilities, personnel, and "know-how" to adapt and convert receivers for color.

The second will probably require more installation time than present black-and-white receivers while the third will be handled about the same as a good installation of a monochrome receiver.

In the independent service industry we are prone to consider new developments only in the light of the new technical problems they will present. Naturally, we must have available in any radio or television shop, men who possess the technical knowledge and practical servicing "know-how" to handle the technical requirements in the installation, maintenance, and servicing of receivers.

### TV Service Business

The growing dollar volume of business in installation and service adds increasing emphasis to the *business operating* aspects of a service shop. Television service is now important, big business. The successful management of a television service business requires the practical operating "know-how" that is essential to the continued existence of any good retail business.

The numerous business "squeezes" that have been applied to the TV serv-

ice industry in major television areas during the past four years have washed out the bulk of the inefficient TV service contractors and service shop operators. The "shoe-string" television technician still poses many problems but only as a nuisance in causing user complaints against the service industry and not as a factor in the over-all service business handled by competent service business operators.

**New Areas to be Opened by U.H.F.**

It is in the new areas that will be created by u.h.f. television that many of the mistakes made by the service industry in the early days of television will be repeated—unless present independent service shop operators and service dealers prepare themselves in advance to cope with the problems of installation and service when telecasting starts.

The same pattern of almost non-interest in TV seems to prevail in potential u.h.f. television areas that was observed in present television areas prior to the start of telecasting. In almost all of the present major television areas there existed an attitude of "wait until television arrives and then we'll learn all about it." However, when the first station announced its official date to start telecasting and dealers started to sell receivers there arose a loud hue and cry from the independent service operators over their failure to study this new giant before he moved in.

When telecasting actually starts in a new area the business moves too fast for a dealer or technician to stop and study anything that he could have learned previously.

Recent announcements from the Federal Communications Commission indicate that the station freeze may be lifted early in the fall. Although many predictions state that the first u.h.f. stations probably won't be on the air until late in 1952, it is well to remember that v.h.f television moved ahead about three times as fast as was anticipated after it got started in 1946.

**Licensing of TV Service**

Efforts to pass legislation to license television servicing keep popping up in various parts of the country. In Milwaukee there has been a determined attempt to put through a service licensing ordinance that would require the payment of an annual license fee of from $100 to $500 to engage in television servicing. And in Pennsylvania two state bills seeking the creation of a State Board of Examiners for service technicians are before the House of Representatives.

The mad scramble of local and state politicians for new tax monies may result in some abortive legislation that would effectively close the door of television service to men who have the will, perseverance, and technical and business know-how to start in a small way and build up successful small businesses for themselves. And it wouldn't solve any of the problems of service—it

would only add to the consumers' cost of service.

### Reconditioned TV Receivers

There has always been considerable speculation as to whether a "reconditioned TV receiver" business might develop along the lines of the "reconditioned used car" industry. The American public has been conditioned to "want" new things and it has seemed reasonable to assume that someday receiver manufacturers would develop trade-in plans that would keep TV sets from becoming heirlooms in homes that could afford to have the latest and best in television reception.

Recently a distributor for one of the larger receiver manufacturers launched a program to encourage the trade-in of small screen sets for the later model large screen units. They reported an exceptionally good response from set owners.

The traded-in sets are reconditioned, with the exception of the cabinet and picture tube. Sales efforts in selling the reconditioned sets are directed toward placing them as second sets in TV-equipped homes.

The practice of trading in monochrome receivers may become a factor in color television areas when the supply of color television receivers requires aggressive retail selling campaigns. Such receivers may be reconditioned and channeled into non-color TV areas where they would become an important competitive influence to the sale of new monochrome TV sets.

### Set Conversions for U.H.F.

It appears that the conversion of present monochrome receivers for the reception of programs telecast in the new u.h.f. channels will not present any serious problems.

In a recent demonstration sponsored by the RTMA for the benefit of the FCC Commissioners and staff members, eight of the leading set manufacturers demonstrated u.h.f. converters they have developed for their own receivers.

Unfortunately, however, receiver manufacturers are still tied to the philosophy that the service technician must be eliminated from the picture in order to interest buyers in new equipment. Far too much of the u.h.f. converter publicity reads like this, "The unit can be installed by the customer in just a few minutes," even though the chassis may have to be removed from the cabinet and the conversion strip mounted in the tuner assembly.

### Service Organization News

The television service industry was well and ably represented at the recent annual meeting of the RTMA Service Committee in Chicago. Officers of recognized national and local associations were invited to attend the sessions of the Committee and to present papers on problems of the servicing industry, together with suggestions for their solution.

Service organization officers who at-

tended the meetings and delivered papers on problems of the servicing Industry included Albert M. Haas, president of TCA of Philadelphia; Frank Moch, president of TISA of Chicago and NATESA; E. J. Barton, president of the Television Service Contractors Association of Detroit; and Dave Krantz, representing the National Electronic Technicians & Service Dealers Associations.

NATESA recently announced the formation of a new service association in St. Louis—the "Association of TV Service Companies of Greater St. Louis." Officers of this new association are Vincent Lutz, president; Jay Brown, vice-president; Dave Allen, secretary; and Art Monnig, treasurer.

**NARDA Certified Service**

One of the best programs for stimulating set owner interest in reliable, capable service shops that has come to the attention of the editors of this department is the one prepared and sponsored by the National Appliance & Radio Dealers Association (NARDA).

The NARDA plan is based on a Code of Ethics in service business operation to which each cooperating service dealer or contractor must agree before he is permitted to participate in the plan described as "Certified Television Installation and Service." The promotional and publicity material that is furnished to focus the attention of the TV set owning public on organizations participating in the NARDA program is excellent.

Information on the "Certified Television Installation and Service Program" may be obtained from: The National Appliance & Radio Dealers Association, Merchandise Mart, Chicago 54, Ill. —30—

**Spot Radio News**
(*Continued from page* 18)

Reviewing the possibilities of color set production, RTMA's new leader said that . . . "It is only to be expected that large scale color cannot be achieved overnight. The situation is similar to the inauguration of black and white television. The standards for black and white TV were authorized on July 1, 1941. After only five months of work, Pearl Harbor came. The war ended in August, 1945. Yet, in the entire year of 1946, only 6476 sets were produced. And in 1947, only 178,000 sets were made. Even by 1948, the industry had failed to produce as many as a million sets. In the light of this experience, the estimate of 50,000 (*color sets*) would seem to be a remarkable feat of production (*for the remainder of the year*), if it is realized."

**WITH THE APPEARANCE OF COMMERCIAL** disc color, there has also appeared a revived interest in the patents, covering the techniques used in the *CBS* methods, and the royalty schedules set up for reimbursement to *Columbia*.

According to the exhibits filed with the Commission, five transmitter and two receiver patents were cited as basic to the system. In the sending methods are involved a swept back segment color filter disc, color mixing, and color control for correct or desired color rendition, scanning so that color carryover or undesired color mixing does not occur in pickup tubes, multiple lens motion-picture film scanner and non-multiple relationship between number of colors and interlaced fields scanned. The receiver patents also involve the disc and color relationship factors.

The royalty plan provides for payments of twenty-five cents on receivers retailing at less than $100; fifty cents on chassis priced at between $100 and $180; seventy-five cents on sets selling between $180 and $250; and one dollar on models selling for more than $250.

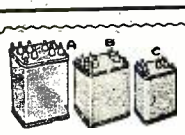
**FCC's** legal authority to assign channels on a geographical block basis, challenged by the FCBA, has been upheld by the Commission who declared the prerogative was within their jurisdiction. The FCC noted that they had the right to classify stations, prescribe the nature of the service to be rendered by each class of stations, determine the location of classes of stations or individual stations, and establish areas or zones to be served by any station. This authority, they said, is expressly directed to be exercised from time to time as public convenience, interest, or necessity requires.

The argument that the proposed assignment plan was different and could be distinguished from other types of rule making activity was without merit, the Commission pointed out. In their opinion, the proposed table is clearly applicable generally to all persons wishing to establish a station in any given community. The fact that the assignment made to one city would not be applicable to persons wishing to apply for some other city was cited as no more depriving the rule of its general nature than the fact that rules relating to those applying for standard broadcast licenses on clear channels would not be applicable to persons wishing to apply for local stations on different channels.

Historic testimony on the floor of the Senate by ex-Senators Dill and White, who were chiefly responsible for the enactment of the Radio Act of 1927 and the '34 Communications Act, was also cited by the Commission to support their official decision on the allocation table. According to the report on these sessions, White had declared: ". . . One of the most difficult problems we had to deal with was whether there should be any preferences written into the law with respect to any particular character of service. At the time we were working on the legislation, the agricultural land-grant colleges were very insistent that they should have a privileged status. There were various other groups that were just waiting to advance their claims if we gave any recognition to a prior right. We had to write it in very general terms, vesting discretion in authority in the Radio Commission to make the best distribution they could or we had to undertake to make an allocation to services in the legislation, which would be rigid, and which would be fruitful of interminable discussion in the legislative body. It was hopeless to try and work it out in the legislation."

Commissioner Jones did not agree with his colleagues and in a dissenting opinion pointed out that the 82 channels allocated do not meet any of the five priorities substantially. (Priorities are: 1. To provide at least one television service to all parts of the United States. 2. Provide each community with at least one television broadcast station. 3. Provide a choice of at least two television services to all parts of the United States. 4. Provide each community with at least two television broadcast stations. 5. Any channels which remain unassigned under the foregoing priorities will be assigned to the various communities depending on the size of the population of each community, the geographical location of such community, and the number of television services available to such community from television stations located in other communities.) Jones noted that there are many communities without any service according to the plan: 909 cities have one station; 169 cities, two stations; 74 cities, three stations; 46 cities, four stations; 25 cities, five stations; 11 cities, 6 stations; and 11 cities, 7 or more. It is obvious, he declared, that the Commission violated its table of priorities so materially that by its own proposed criterion, it cannot be sustained in court. The Commissioner felt that the two- three- and four-channel cities, as compared to the five or more channel cities, spell mediocrity, if not doom, for two or more networks. "Although networks, according to the Act have no bearing on the grants of licenses," Jones added, "the television art and the expense of construction, maintenance, and operation has made networking the backbone of TV station operation. . . . The Commission in its licensing policies has recognized this in the proposals of licenses to affiliate with networks rather than serve the communities in which they are located as local outlets of communications. . . . It is clear that an inflexible geographical assignment plan does not meet the criteria of the Commission asserted as a basis for it, and therefore it is illegal."

Continuing his blast at the ruling, Jones noted that the Commission's problem of assigning channels . . ." is based on factors so varying in nature that they are too difficult to be captured within the boundaries of a hard and fast pattern." Therefore, he said, if the geographical allocation plan can qualify as a general rule . . ." television is so specialized and its characteristics so varying in nature when applied city by city, with varying factors



## TRANSFORMERS

These XFRMRS are Army Spec. All Underrated.

Comb. Transformers—115V/50-60 cps input.

| Item | H.V. | Amp. | Filaments | Price |
|---|---|---|---|---|
| CT-142 | 645VCT | .050 | 5V/2A, 6.3V/12A | $ 4.25 |
| CT-825 | 360VCT | .340 | 6.3VCT/3.6, 6.3VCT/3A | 3.95 |
| CT-626 | 1500V | .160 | 2.5/12, 30/.100 | 9.95 |
| CT-15A | 350VCT | .070 | 6.3/.6, 6.3/1.8, 3 lbs. | 2.95 |
| CT-071 | 110V | .200 | 33/.200, 5V/10, 2.5/10 | 4.95 |
| CT-378 | 2300V | 4 MA | 2.5/2 | 6.95 |
| CT-367 | 580VCT | .050 | 5VCT/3A | 2.25 |
| CT-721 | 550VCT | .100 | 6.3/1, 2.5VCT/2 | 2.95 |
| CT-99A | 2x110VCT | .010 | 6.3/1A, 2.5VCT/7A | 3.25 |
| CT-91A | 726V | .100 | 5V/3A, 6.3/3.5 | 3.25 |
| CT-441 | 50V | .200 | 5V/2.4, 5V/1.2 | 2.29 |
| CT-403 | 350VCT | .026 MA | 5V/3A | 2.75 |
| CT-931 | 585VCT | .036 | 5V/3A, 6.3V/6A | 4.25 |
| CT-610 | 1250 | .002 MA | 2.5V/2.1A, 2.5V/1.75A | 4.95 |
| CT-137 | 350VCT | .026 MA | 5V/3A | 2.75 |
| CT-866 | 330V | .065 | 6.3V/1.2, 6.3V/600 MA | 1.75 |
| CT-319 | 330VCT | .085 | 5V/2, 6.3/7.5, 6.3/3 | 3.25 |

Filament Transformers—115V/50-60 cps input.

| Item | Rating | Each |
|---|---|---|
| FT-781 | 866 Trans. 2 x 2.5/5A | $ 2.25 |
| FTG-31 | 2.5V/2.5, 7V/7A (Tape @ 2.5V/2.5A), 16 lbs. | 9.95 |
| FT-674 | 8.1V/1.5A | 1.10 |
| FT-157 | 4V/16A, 2.5V/1.75A | 2.95 |
| FT-418 | 6.3VCT/1A, 6.3VCT/7A | 1.95 |
| FT-735 | 6.3VCT/5A, 6.3VCT/1A | 1.79 |
| FT-101 | 6V/.25A | .79 |
| FT-738 | 6.3VCT/1A, 5V/2A | 1.66 |

Plate Transformers—115V/50-60 cps input.

| Item | Rating | Each |
|---|---|---|
| PT-976 | Auto: 120VCT/10 MA | $ 0.69 |
| PT-31A | 2 x 300V/5 MA | .79 |
| PT-46A | 4080VCT N.L. 3% to 18" H x 6" W x 7" L 20 lbs. | 29.95 |
| PT-033 | 4150V/400 MA 11½ x 9¼ W x 9" D 70 lbs. | 49.95 |
| PT-75-2 | 3780/3446/3112VCT/77 MA | 10.95 |
| PT-28-1 | 4600VCT/.077 | 12.95 |
| PT-403 | Auto: 70V/1A | 2.29 |
| PT-160 | 1120VCT/770 MA, 590VCT/82 MA, 25 lbs. | 24.95 |
| PT-170 | Auto: 156/146/137/128—71A | 3.29 |
| PT-139 | 42V/46V/50V/55V/15.2A 7⅞ x 7" Wx6¾" H | 10.95 |
| PT-31A | 2 x 300V/5 MA | .79 |
| PT-976 | 120VCT/10MA | .79 |
| PT-12A | 280VCT/1.2A | 2.95 |

| Item | Pri. | Output | Price |
|---|---|---|---|
| STF-946 | 210/220/230 | 25V/4A 3½" Hx2¼" x 2¼" D | $2.39 |
| STF-638 | 230 | 5V/9A 5½" H x 4½" x 3¾" | 1.25 |
| STF-05A | 115/230 | 2 x 5V/7.57" H x 7" x 5" D | 4.25 |
| STF-682 | 220 | 30-25-20V/1 MA | .69 |
| STF-968 | 230 | 2.5V/6.5A | 1.45 |
| STF-405 | 230/115 | 5V 12/9A | 2.95 |
| STF-370 | 220/440 | 3 x 2.5V/57, 2.5V/15A, 5½ x 5 x 4½ | 5.25 |
| STF-11A | 220 | 2 x 40V/.05/2 x 5V/6A, 12.6/1A | 2.95 |
| STF-631 | 230 | 2 x 5V/27A 2 x 5V/9A 103/4H x 5 x 7 30 lbs. | 24.95 |
| STF-96B | 230 | 2.V/6.5A | 1.95 |
| STF-608 | 220 | 24V/600, 5V/2A, 2 x 6.3V/1A | 2.25 |

### SPECIAL PLATE TRANSFORMERS

| Item | Pri. | Output | Price |
|---|---|---|---|
| STP-945 | 210/20/30 | 1100VCT/300 5¼ x 4 x 3½ | $7.95 |
| ST-643 | 230V | 2 x 230/.05 | 1.29 |
| STP-780 | 82V | 4000V/.002 | 1.29 |
| STC-627 | 230V | 1500/160, 110V/.200, 3.3V/.200, 5V/10, 2.5-1.4/10 | 12.95 |
| STC-611 | 230V | 200V/200, 4 x 6.3V/9 | 2.95 |
| STC-16A | 220V | 260V/.03, 100V/1, 6.3V/4.2 | 2.95 |
| STC-607 | 220V | 700VCT/75 MA, 40VCT/.100, 15/10/15V100 MA | 3.95 |
| STC-612 | 230V | 400V/.30, 190/.30, 2 x 5V/2.5 w/2-866 Socket | 3.95 |

### FILTER CHOKES

| ITEM | RATINGS | PRICE |
|---|---|---|
| CH99A | 9/60HY 50/400MA | $15.95 |
| CH488 | 10HY .030A | .79 |
| CH791 | Dual 1.75-.125HY 100MA | .59 |
| CH86C | Dual .01-3.5HY 950-75MA | 1.10 |
| CH981 | 15HY .110A | 1.59 |
| CH22-1 | 1HY .100A | .49 |
| CH779 | .6HY .490A | 1.25 |
| CH25A | SW .09/.018HY 3/.3A | 8.95 |
| CH922 | 10000HY .0MA | 2.75 |
| CH043 | 2.2HY 80MA | .59 |
| CH047 | 2HY 200MA | 1.25 |
| CHC29 | SW15/29HY 150A | 3.25 |
| CH867 | 1.8HY .180A | .95 |
| CH323 | 2.1HY .200A | 1.95 |
| CH360 | 15HY 15MA | .98 |
| CH7A-1 | .577HY 7.7MA | 1.79 |
| CH791 | 1.75HY .100A | .59 |
| CH161 | Dual 30HY .020A | 1.45 |
| CH373 | 11.5HY 90MA | 1.39 |
| CH21-A | .045HY .900A | 1.69 |
| CH045 | 5HY .040A | .79 |
| CH136 | 25HY 80MA | 2.25 |
| CH702 | 6HY .150A | .99 |
| CH163 | 25HY .070A | 1.25 |
| CH756 | 30HY 25MA | .79 |
| CH67-1 | .35HY .35A | 2.49 |
| CH38A | Dual 20HY .100A | 2.95 |
| CH064 | SW .3/6HY .570/.130A | 8.95 |
| CH366 | 20HY .300A | 7.95 |
| CH110 | 25HY .065 | 1.00 |
| CH189 | 120HY 17MA | 2.49 |

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|---|---|
| 18 VAC In. | 14 VDC Out. |
| 2A | $ 2.95 |
| 4A | 4.89 |
| 6A | 6.90 |
| 8A | 7.49 |
| 12A | 9.79 |
| 24A | 18.34 |
| 36 VAC In. | 28 VDC Out. |
| 1A | $ 3.95 |
| 2A | 5.79 |
| 4A | 9.89 |
| 8A | 13.69 |
| 12A | 19.49 |
| 24A | 34.53 |
| 54 VAC In. | 42 VDC Out. |
| 2A | $ 6.95 |
| 4A | 14.49 |
| 120 VAC In. | 100 VDC Out. |
| 2A | $14.45 |
| 8A | 42.50 |
| 12A | 65.15 |

SPECIAL RECTIFIERS ON REQUEST

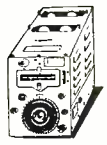
**Hi-Current Chokes**

.1 HY—12 Amp.—46 Ohms. $14.95
.01 HY—2.5 Amp.—Cased. 2.25

**LOW-VOLTAGE TRANSFORMERS**

Primaries 115V, 60 Cycle

36V—40V at 3.5 Amps. $3.75
24V—1.5A 1.95
8V—1.5A .98



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274N (ARC5) Used Good Cond.

## PE 157 VIBROPACK FOR BC 745

Runs on 2V DC. Obtained from small Willard Rechargeable battery contained in case which is charged from 6 Vac or DC. Also contains 5" PM Speakers & Jacks for Mike Hdsets. Used, excellent $9.95

## AUDIO TRANSFORMERS

| | | |
|---|---|---|
| AT 666 | INTERCOM INPUT: SPKR (-4-8 OHMS) TO GRID (250,000 OHMS) | $0.69 |
| AT 415 | PLATE (18,000 OHMS C.T.) TO LINE (125 OHM) 175 WATTS—500-600 CY | 1.95 |
| AT 858 | PLATE (10,000 OHMS C.T) TO LINE & V.C. (500/125/30 OHMS) HI-FI—50W | 6.95 |
| AT 070 | MIKE—OR—LINE (250 OHMS) TO GRID (250,000 OHMS C.T.) | 1.29 |
| AT 765 | MIKE—OR—LINE (600 OHMS) TO GRID (50,000 OHMS C.T.) | .89 |
| AT 449 | HI-FI DRIVER (5000 OHMS) TO P.P. OUTPUT GRIDS (4,000 OHMS) 100-10,000 CY. 10 WATTS, 6V6 to PP 805's | 2.39 |

Dual 1.52HY .167A $1.95
.100HY 1.4A 1.95
5HY .300A 1.95
5HY .150A 1.45
15HY .100A 1.39
Dual 7—11HY 75—60MA 1.29
Dual .22—.44HY .6—.4A 1.75
.033HY 7A 15.95
.116HY .150A 19.95
.5HY .100A .79

### A-62-PHANTOM ANTENNA

This antenna is a Signal Corps type, and may be used for pre-tuning rigs for either single wire, doublet, or co-axial fed antennas. Unit consists of two coils, two resistors, variable condenser and indicating lamps, completely enclosed in circular can, 3" in diameter, 6½" high, having bracket for wall mount, or rear of can. Used chiefly by Signal-Corps for tuning mobile equipment.

### MOBILE MODULATION KIT

T-103 Mike to 6J5 grid.
T-102 6J5 to Modulators, PP 6V6 or PP 6L6.
T-104 Mod. Trans. PP 6V6 or PP 6L6 to 829, 832 or 2E26.
KIT & DIAGRAM $2.98

B-19 MK II Trans-Receiver, less Power Pack $32.50
B-19 Power Pack 8.95

**1D—24ARN—9**

Dual 0-200 Microamp. movement in 3" case. ILS equipment. $9.95

**ARC 5 MODULATOR**

MD7/ARC5 Plate Modulator w/ dynamotor complete w/ Tubes 1—12J5, 2—1625, 1—VR50. Good cond. Price $6.95
BC456 Screen Mod. $2.25

### VARISTORS

| | |
|---|---|
| D-167176 | $0.95 |
| D-172155 | 2.25 |
| D-172307 | 1.75 |
| D-167208E | 1.85 |
| D-172175 | 1.65 |
| D-168687 | .95 |
| D-171812 | .95 |
| D-171528 | .95 |
| D-165593 | 1.25 |
| D-162356(308A) | 1.50 |

### THERMISTORS

| | |
|---|---|
| D-166288 | $1.50 |
| D-167332 (tube) | 1.50 |
| D-170396 (head) | 1.50 |
| D-167613 (button) | 1.50 |
| D-164699 for MTG "X" band Guide | 2.50 |

## INVERTERS

PE 218-E: Input: 25 28 vdc. 92 amp. Output: 115 v. 350-5000 cy 1500 volt-amperes. Dim: 17"x6½"x10". New $49.50
PE 218-H: Same as above except size: 10½" x 6" x 10". New $49.50
PE 218H, used, good cond. $22.00
PE 206: Input: 28 vdc, 38 amps. Output: 80 v. 800 cy. 500 volt-amps. Dim: 13" x 5½" x 10½". New $12.50

## DYNAMOTORS

| | Input | | Output | | Radio | |
|---|---|---|---|---|---|---|
| Type | Volts | Amps. | Volts | Amps. | Set | Price |
| PE86 | 28 | 1.25 | 250 | .060 | RC 36 | $ 2.95 |
| DM416 | 14 | 6.2 | 330 | 170 | RU 19 | 6.95 |
| DM33A | 28 | 7 | 540 | .250 | BC 456 | 4.95 |
| DM42 | 14 | 46 | 515 | 110 | SCR 506 | 4.95 |
| | | | 1030 | .050 | | |
| | | | 2/8 | | | |
| PE101C | 13/26 | 12 6 | 400 | 135 | SCR 515 | 5.95 |
| | | 6.3 | 800 | .020 | | |
| BD AR 93 | 28 | 3.25 | 375 | 150 | | 4.45 |
| 23350 | 27 | 1.75 | 285 | 075 | APN-1 | 3.50 |
| 35CO458 | 28 | 1 2 | 250 | .060 | | |
| ZA-085 | 12/24 | 4/2 | 500 | .050 | | |
| ZA-056 | 12/24 | 8/4 | 12/275 | 3/110 | | |
| B-19 pack | 12 | 9.4 | 275 | 110 | Mark 11 | 8.75 |
| | | | 500 | .050 | | |
| D-104 | 12 | | 225 | .100 | | 12.69 |
| | | | 440 | .200 | | |
| DA-3A | 28 | 10 | 300 | .060 | SCR 522 | 8.45 |
| | | | 150 | .010 | | |
| | | | 14 5 | 5 | | |
| 5053 | 28 | 1 4 | 250 | 060 | APN-1 | 3.95 |
| PE73CM | 28 | 19 | 1000 | .350 | BC 375 | |
| CW21AAX | 13 | 12 6 | 400 | 135 | | 9.95 |
| | 26 | 6.3 | 800 | .020 | | |
| | | | 9 | 1 12 | | |
| BD 77KM | 14 | 40 | 1000 | .350 | BC 191 | 12.95 |
| PE94 | 28 | 10 | 300 | .200 | SCR | |
| | | | 150 | .010 | 522 | |
| | | | 14.5 | .5 | | |

## MICROWAVE TUBES

### MAGNETRONS

| Tube | Frq. Range | Pk. Pwr. Output | |
|---|---|---|---|
| 2J27 | 2965–2992 mc. | 275 KW | $25.00 |
| 2J31 | 2820–2860 mc. | 265 KW | 38.50 |
| 2J21-A | 9345–9405 mc. | 50 KW | 12.50 |
| 2J22 | 3267–3333 mc. | 265 KW | 25.00 |
| 2J26 | 2992–3019 mc. | 275 KW | 37.50 |
| 2J32 | 2780–2820 mc. | 285 KW | |
| 2J38 Pkg. | 3249–3263 mc. | 5 KW | 39.50 |
| 2J39 Pkg. | 3267–3333 mc. | 87 KW | 39.50 |
| 2J49 | 9000–9160 mc. | 58 KW | 75.00 |
| 2J61 | 3000–3100 mc. | 35 KW | 75.00 |
| 2J62 | 2914–3010 mc. | 35 KW | 75.00 |
| 3J31 | 24,000 mc. | 50 KW | 85.00 |
| 5J30 | | | |
| 718DY | 2720–2890 mc. | 250 KW | 35.00 |
| 720BY | 2800 mc. | 1000 KW | 75.00 |
| 720CY | 286 mc. | 1000 KW | 75.00 |
| 725-A | 9345–9405 mc. | 50 KW | 50.00 |
| 730-A | 9345–9405 mc. | 50 KW | 50.00 |
| 700 | A, B, C, D | | 35.00 |
| 706 | AY, BY, DY, EY, FY, GY | | 55.00 |

### KLYSTRONS

723A—723A/B—707A

### "CW" MAGNETRONS

QK 62 3150-3375 mc.
QK 59 2675-2900 mc.
QK 61 2975-3200 mc.
QK 60 2800-3025 mc.

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### CR—TR—PULSE TUBES

| | | |
|---|---|---|
| 705A | 724 | 3EP1 |
| 3DP1 | 3FP7 | 5J30 |
| 3GP1 | 5CP1 | 15R |

MANY OTHER TYPES AVAILABLE. SEND YOUR REQUIREMENTS.

## PULSE EQUIPMENT

MIT. MOD. 3 HARD TUBE PULSER: Output Pulse Power 144 KW (12 KV at 12 Amp. Duty Ratio: 001 max. Pulse duration: 5, 1.0, 2.0 microsec. Input voltage: 115 v. 400 to 2400 ops. Uses: 1-715B, 4-829-B, 3-'72's, 1-'73. New $110.00
APQ-13 PULSE MODULATOR. Pulse Width .5 to 1.1 Micro Sec. Rep. rate 624 to 1348 Pps. Pk pwr. out 35 KW. Energy 0.018 Joules $49.00
TPS-3 PULSE MODULATOR. Pk. power 50 amp. 24 KW (1200 KW pk); pulse rate 200 PPS. 1.5 microsec. pulse line impedance 50 ohms. Circuit—series charging version of DC Resonance type. Uses two 705-A's as rectifiers. 115 v. 400 cycle input. New with all tubes $49.50
APS-10 MODULATOR DECK. Complete, less tubes $75.00

## PULSE NETWORK

15A—1-400-50; 15 KV, "A" CKT 1 microsec 400 PPS, 50 ohms imp. $42.50
G.E. #6E3-5-2000-501P2T, 6KV "E" circuit, 3 sections .5 microsecond, 2000 PPS, 50 ohms impedance $6.50
G.E. #3E (3-84-810) (8-2.24-405) 50P4T; 3KV "E" CKT Dual Unit: Unit 1, 3 sections, 84 Microsec. 810 PPS, 50 ohms imp.; Unit 2, 8 Sections, 2.24 microsec. 405 PPS, 50 ohms imp. $6.50
7.5E3-1-200-67P. 7.5 KV, "E" Circuit, 1 microsec 200 PPS, 67 ohms impedance, 3 sections $7.50
7.5E4-16-60.67P, 7.5 KV, "E" circuit. 4 sections 16 microsec. 60 PPS, 67 ohms impedance $15.00
7.5E33-200-6FT, 7.5 KV, "E" Circuit, 3 microsec 200 PPS, 67 ohms imp, 3 sections $12.50

## PULSE TRANSFORMERS

G.E.K.-2745 $39.50
G.E.K.-2744-A. 11.5 KV High Voltage, 3.2 KV Low Voltage @ 200 KW oper. (270 KW max.) 1 microsec. or 1/microsec. @ 600 PPS $39.50
W.E. #166173 Hi-Volt input transformer, W.E. impedance, ratio 50 ohms to 900 ohms, Freq. range: 10 kc. to 2 mc. 2 sections parallel connected, potted in oil $36.00
W.E. KS 9800 Input transformer. Winding ration between terminals 3-5 and 1-2 is 1.1:1, and between terminals 6-7 and 1-2 is 2:1. Frequency range: 380-520 c.p.s. Permalloy core $6.00
W.E. #D169271 Hi Volt input pulse Transformer $27.50
G.E. K2450A. Will receive 13KV, 4 micro-second pulse on pri. secondary delivers 14K4. Peak power out 100KW. G.E. $34.50
G.E. #K2748A. Pulse Input line to magnetron $36.00
Ray. UX7896. Pulse Output pri. 5V, sec. 41V $7.50
Ray. UX8442. Pulse Inversion: — 40V + 40V $7.50
Ray. UX7350-7307. PRF 1 MC. .05 microsec. $7.50

### OIL CONDENSERS

| Mfd. | Volt | Price |
|---|---|---|
| 5 | 50 | $0.45 |
| 650 | 80 | 1.95 |
| 15 | 220 | 2.20 |
| 1 | 500 AC | .40 |
| 0.5 | 750 | 1.59 |
| 0.5 | 1000 AC | .69 |
| 2x0.5 | 1000 | .70 |
| 1 | 1000 | .75 |
| 1.5 | 1000 | .85 |
| 2 | 1000 | .90 |
| 4 | 1000 | 1.75 |
| 3x.01 | 1200 | 1.35 |
| 1 | 1500 | 1.30 |
| 1.5 | 1500 | 1.40 |
| 2 | 1500 | 1.45 |
| 2x0.1 | 2000 | 1.10 |
| 1 | 2000 | 1.45 |
| 2 | 2000 | 2.25 |
| 3 | 2200 | 2.45 |
| 0.5 | 2500 | 1.35 |
| 1.5 | 2500 | 1.35 |
| 0.15 | 4000 | 1.20 |
| 2x0.1 | 4800 | 1.20 |
| 0.1 | 6000 | 2.39 |
| 2x0.1 | 7000 | 1.75 |
| 0.1 | 7500 | 1.25 |
| 2x0.15 | 8000 | 4.75 |
| .015 | 16000 | 8.95 |
| .0016 | 15000 | 5.95 |
| .25 | 20000 | ..... |
| 1 | 25000 | ..... |
| .5 | 25000 | ..... |
| 1 | 7500 | ..... |

### CAPACITORS CERAMICON

| MMF. | MMF. | MMF. |
|---|---|---|
| 3 | 35 | 82 |
| 3.1 | 47 | 125 |
| 4 | 50 | 200 |
| 11 | 51 | 240 |
| 13 | 60 | 250 |
| 14 | 62 | 345 |
| 15 | 65 | 350 |
| 20 | 70 | 500 |
| 220 | | 1000 |
| 25 | | |

$7 PER 100

### SILVER MICA BUTTONS

| MMF. | MMF. | MMF. |
|---|---|---|
| 40 | 175 | 500 |
| 50 | 180 | 2000 |
| 100 | 185 | |

$7.50 PER 100

### TEST SETS

TS 102/AP
TS 62/AP
TS 36/AP
TS 12 UNIT 2
TS 69/AP
TS 33/AP
CW60-ABM
LU-1
LU-3
TS-159
TS 226
TS 250/APN
T-589
I-203-A
TS 10/AP
BC 438
CS60-ABW
TS268U

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of terrain, tropospheric transmission, and areas of development of communities, the Commission cannot reasonably foresee their solution in the public interest." There is not sufficient scientific data on the books on reception or transmission in every city, he felt, to warrant . . . "rigidifying . . . tentative judgment into a hard and fast rule."

**IF CONGRESS HAS ITS WAY,** TV programs may be subjected to minute scrutiny in the future. During a recent hearing on a bill calling for the creation of a National Citizens Advisory Board on radio and television, one of the fathers of the bill, Senator William Benton, declared that he believed that now . . . "at the time when television is still in its resilient infancy, would be the best time to do some wise and thorough thinking about what we are going to do with television, so that we can now lay down the optimum guide-lines for its development. If we miss it now, we may not only miss it for a generation, but for keeps." Congress, he felt, should arrange for this planning through the offices of a special board, whose advice . . . "would include an annual review of how the licensees of radio and television stations are living up to their responsibilities for public service and education, on how they are performing in line with promises made when they applied for the licenses and how they can better perform . . ." Noting that there is no listeners' and viewers' lobby in Washington and that the FCC . . . "has neither the time nor the authority actively to seek out, marshal, and crystallize public opinion . . ." it is important that authority to provide such policing be provided by Congress.

An address before the NARTB program standards committee in Washington by FCC's boss, Wayne Coy, revealed that many others also were concerned about the content of programs and were considering steps which might have to be taken to provide control. Reviewing the contents of numerous reports he has received from groups throughout the country, Coy declared that the bulk of the opinions presented were not only extremely critical of the types of shows now being offered, but vowed that something will have to be done. The views were not being offered by inexperienced or biased persons, it was said, but rather by those charged with the responsibility of maintaining public health and general welfare. For instance, he declared, James V. Bennett, director of the Federal Bureau of Prisons, who is also secretary of a section on criminal law of the American Bar Association, recently noted in a letter, describing the section's campaign for improvement in television programming, that the amount of crime material should be reduced and that its timing . . . "be such so as to occur during a period when juvenile viewers will not be sitting by their sets." He also said that much of the . . . "more gory incidents can be eliminated entirely . . ." and

that . . . "any broadcast which blueprints crime in such form that it can be imitated, must be stopped."

Quoting from a survey on the program situation, made by the Southern California Association for Better Radio and Television, representing 200,000 persons, Coy said that the listeners and viewers reported that . . . "the average child in the television home sees death inflicted by violence more than 40 times every single week." In addition, the survey noted that . . . "the effects of this immoderate viewing of crime and violence follow one of two courses: Some children are upset emotionally; others become immune, callous, and indifferent to the sight of death, injury, and suffering inflicted upon others."

It was the opinion of this group and many others, too, that both radio and television stations are . . . "operating with a complete disregard for the welfare of the child audience . . . Children are being exploited at the expense of the security, dignity, and good taste which should be a part of every American home." . . . Solemn views which should be studied diligently by every broadcaster and sponsor from coast to coast, with immediate steps taken to remedy this extremely unpleasant situation . . . . . L.W.

## VERMONT HAMFEST

THE Fifth Annual Vermont Hamfest and State ARRL Convention will be held Sunday, September 16, in the Community Bldg., Main Street, Brattleboro, Vermont.

Sponsored by the Tri-County Amateur Radio Club, with members from Windham County (Vt.), Cheshire County (N.H.), and Franklin County (Mass.), a diversified program has been planned.

Advance registration is $4.50 with a September 10th deadline. Tickets are $5.00 at the door. Write Hamfest, P.O. Box 78, Brattleboro for details. —30—

## NEW G.D. METER USE

By MELVIN H. DUNBRACK, W1BHD

I HAVE a Millen grid dip meter and have found that in addition to its numerous "conventional" functions it may be used as a secondary frequency standard employing crystals.

A study of the circuit diagram reveals that if the crystal is conncted to the two coil jacks the unit becomes a form of the old Pierce oscillator. No coils are required, just the crystal. A crystal adapter may be made up from a 5-prong tube socket and two coil pins. Most crystals fit a socket of this type but special adapters may be made if required.

Tests made with numerous amateur and commercial crystals, ranging from 2 to 15 mc., indicated that almost all of them oscillated with ease. The tuning condenser is adjusted for best stability. The meter will show readings and may be used to peak tune the oscillator. Using a frequency standard crystal of 1000 kc., the tuning condenser will allow adjustment to zero-beat with WWV.

Don't overlook the possibility of using the grid dip meter as a low-powered, crystal-controlled transmitter for short haul and possible emergency work. —30—

section are the program and line control facilities, the master control and recording rooms, CBA talk studio, and three separate control booths. An office section at the front completes this floor. Further expansion is possible by extending the building on the left, thus lengthening the main control room and providing space on each side of it for additional transmitter units.

The two short-wave transmitters operate from a primary power supply of 2300 volts, 3-phase, 60-cycles and deliver at least 50 kw. of carrier power into the transmission line at any frequency between 6 and 21.75 mc. The transmitters are capable of full modulation by any audio frequency in the range of 30 to 10,000 cycles per second. The power amplifier of each transmitter uses two Type 880 tubes connected push-pull in a high efficiency class C circuit. Amplitude modulation of the carrier is accomplished in the plate circuit, using a class B modulator which also employs Type 880 tubes. The final amplifier operates at 10,000 volts d.c. with a current of 7.1 amperes. All transmitter tubes, except the 880's in the r.f. amplifiers and modulators, are air-cooled. The Type 880 tubes are water-cooled—using a closed distilled water system.

The antenna arrays used at Sackville are all of the multi-element curtain type; the European array is composed of four vertical stacks of four horizontal elements. Each element has an electrical length of one half wavelength and each element is provided with a reflector. The reflectors are identical to the radiators so that it is possible to interchange the two by means of a switch, thus reversing the radiated beam by 180 degrees in the horizontal plane. Furthermore, these arrays are all arranged for slewing or changing the direction of the beam by a limited amount on either side of its normal position. This is done by shifting the phase of the current in the two vertical bays of the radiating curtain. The European beam uses five distinct arrays—one array for each of the five frequency bands—6, 9, 11, 15, and 17 megacycles.

A separate antenna array is used to cover Africa which, in its reversed direction, covers Western Canada and Australia. A third antenna array is used to cover South America. Both the African-Australian and South American arrays consist of two vertical stacks of four horizontal elements and, with the exception of the 6 mc. array, are of the dual-frequency type; that is, one for 9 and 11 mc. and one for 15 and 17 mc. Separate antennas of the 4/4 type are used to cover Africa and South America on the 21 mc. band.

The European antenna has a length of 1220 feet and is supported between four steel towers, two of which are 379 feet high, one 217 feet, and one 175 feet. The towers rest on tapered rein-

forced concrete bases, the largest of which measures 19'x19'x11'6" and weighs 185 tons. The whole system, including both the towers and curtains, was designed with a minimum safety factor of three to meet a wind pressure corresponding to an indicated velocity of 120 miles per hour and an ice coating of half an inch thickness on all members.

Each array may be reversed or slewed either side by remote control from the main transmitter room by means of motor-driven switches mounted in weatherproof enclosures, erected on poles at the base of each array. Either of the two short-wave transmitters can be connected to any one of the transmission lines by means of manually-operated four-pole, double-throw switches of special design, assembled on frames in the antenna-switching room at the rear of the transmitter building.

While for normal operation, the programs of the International Service of the *CBC* are fed to the Sackville station by wire lines from Montreal, as a measure of protection, in case of line failure, sufficient studio facilities have been provided to permit program originations from the transmitter station itself.

Although Canada "aims" her short-wave broadcasts primarily at certain countries or areas, letters arrive at the Radio-Canada Building in Montreal from the earth's four corners, testifying to the strength of Canada's voice and the international interest in Canadian affairs.

Six years ago (in 1945), the late Prime Minister, Mr. Mackenzie King, inaugurated the *CBC* International Service and his first remarks were addressed appropriately to Canada's armed forces "serving on and beyond the seas." Mr. King spoke of the historic importance of the nation's new short-wave service, neatly summing up the reasons why it was brought into being: "It will bring the voice of Canada to her own sons and daughters in other lands. It will also bring Canada into closer contact with other countries. . . . Tonight, Canada enters the world radio arena."

More than 150,000 letters from listeners the world over have been received since the International Service began; and the letters arrive regularly now at a rate of between 3000 and 4000 a month.

The amount of news, political commentaries, semi-political talks and general informative material varies with the country for which the broadcast is intended. This applies to musical and dramatic content, as well; but few of these straight entertainment programs go out. In the over-all picture, 30 per-cent of programs sent out daily by *Radio Canada* is news; 20 per-cent political commentaries; about 13 per-cent semi-political talks, and approximately 26 per-cent general programs projecting Canada and Canadians. The remainder, roughly 10 per-cent, is composed of programs for young people and children, music, drama, and audience-mail programs.

*CBC's* National Service depends chiefly on radio license fees for its livelihood, while the International Service depends entirely on special appropriations by Parliament. The International Service works closely with the Department of External Affairs.

Each month, *Radio Canada* publishes a program schedule—one for European listeners in *English,* French, Dutch, Danish, Norwegian, Swedish, Finnish, German, Italian, Czech, and Russian; the other for Latin-American and Caribbean listeners in Spanish, Portuguese, *English,* French, and Dutch. The combined circulation of this free schedule is nearing the 100,000 mark and is still growing. The program schedule is available direct from International Service, P.O. Box 7000, Montreal, Quebec, Canada.

Latest schedule of the International Service of *CBC,* effective September 2, 1951, is as follows:

*European Service*—0850-1130, CKNC,

**Transmitter building of Radio-Canada's International Service, located at Sackville, New Brunswick, is a modern two and a half story structure of reinforced concrete. Two 50 kw. short-wave transmitters are used and the antenna arrays are all of the multi-element curtain type. For normal operation, the programs of the International Service of the CBC are fed to the Sackville station by wire lines from Montreal. As a measure of protection, in case of line failure, sufficient studio facilities have been provided in the transmitter building so that programs can originate on the spot.**

CKCX; 1130-1515, CKNC, CKCS; 1515-1530. CKCS; 1530-1545, CKCS, CHOL; 1545-1600, CHOL; 1600-1630, CHOL, CKLO; 1630-1645, CHOL; 1645-1835, CKCS, CHOL. *Caribbean and Latin American Service*—1950-2050, CKCX, CKRA; 2050-2105, CKRA; 2105-2240, CKRA, CKLO (*English* at 2105-2135). *Australasian Service*—2300-2335 (*except* Sat., Sun.), CHOL, CKLO; 0340-0450 (Sun. and Wed. *only*), CHOL, CKLO. Stations are CKNC, 17.82; CKCS, 15.32; CKCX, 15.19; CKRA, 11.76; CHOL, 11.72, and CKLO, 9.63.

Our best wishes for the future go to the International Service as it sends the *Voice of Canada,* sounding loud and clear along the international channels of short-wave broadcasting, carrying a definite, emphatic message from a Western democracy—our Good Neighbor to the North!

* * *

### Good Reports

Arne Skoog, DX Editor, *Radio Sweden,* recently asked for comments from listeners in answer to the question: "What makes one reception report better than the other?" The first reply quoted by *Radio Sweden* was from the secretary of the Danish DX Club, Mr. Rabe.

First of all, according to Mr. Rabe, the report should be readable—whether written in pen and ink or on a typewriter. And it also should be easy to survey. Another important point of the question, says Mr. Rabe, is the extent of a report. He points out that it should not be longer than necessary, as the staffs of radio stations seldom have the time to read "long novels" written by DX-ers. However, there should be adequate details concerning the date, time, frequency or wavelength, and some excerpts from the program itself to prove reception of the station reported; and some comments as to the technical quality, such as strength, readability, and interference. There also should be reference to the type of receiver used and number of tubes, and kind of antenna. Finally, Mr. Rabe believes radio stations also like comments on the program content heard, and probably also "suggestions and proposals."

Mr. Skoog cited on a broadcast that in Sweden almost every DX club issues printed report forms (in Swedish and *English*) which "make all reports from their members readable, easy to survey, complete in details, and yet limited in length; in other words, these printed forms will make 'perfect' reports, according to Mr. Rabe's outline," Mr. Skoog commented.

Anyone else having views on this subject can express them by writing direct to DX Editor, Radio Sweden, Stockholm 7, Sweden.

* * *

### "Berne" List

By this time, the 16th Edition of the Frequency List (commonly known as "the Berne List") should have been published by the International Telecommunication Union, Palais Wilson, Geneva, Switzerland. For price and other details, write direct to the Union.

Cost should be around 120 Swiss francs, the Union estimated to me recently.

* * *

### Club Notes

*USA*—DX enthusiasts in Piketon, Ohio, have started a *new* club known as *"The United Short Wave Listeners of the World"* (*USWLW*); when this was compiled, the club had upwards of 20 members. Harold Buchert is president of the group and Patrick Crandell is treasurer. QRA is USWLW, Box 76, Piketon, Ohio.

The *United 49-ers Radio Society* recently held its annual meeting at the home of President Edward Broome, Vincentown, N. J.

At the recent annual convention-outing of the *Newark News Radio Club,* "The Man of the Year" award was made to Vice-President John W. Reichert by Les Kraemer, chairman of the club's awards committee. The award is in the form of a handsome, engraved plaque, donated each year by Vice-President Harold Robinson. It goes to the member who, in the committee's opinion, has done the most for the club during the past year. Irving R. Potts, editor of *NNRC's* Bulletin, says: "Vice-President Reichert, one of the founders of the *NNRC* back in 1927, as a member, director, and officer has been an indefatigable worker for the club ever since its inception. John is the type of tireless and loyal member responsible for the club's success down through the years." Incidentally, *NNRC* has just announced the appointment of Ernest L. Norman, Pompton Lakes, N. J., and LeRoy Waite, Ballston Spa, N. Y., to the club's editorial staff; Ernest will assist Editor Carroll H. Weyrich of the Broadcast Band Section and will be in charge of members' reports, while Roy will cooperate with Editor Sheldon Dunham of the Amateur or Ham Section.

* * *

### This Month's Schedules

*Albania—Radio Tirana* is reported heard on 5.825 relaying m.w. service to closedown 1700; bad modulation (*Short Wave News,* London)

*Anglo-Egyptian Sudan*—A Swedish listener in *NATTUGGLAN,* Sweden, reports hearing *Radio Omdurman* on 17.950 around 1400.

*Argentina* — LRX, 9.660, Buenos Aires, heard after TGNA signs off 2230. (Cox, Ala.) This one noted around 1900 announcing "LRU, LRX, LRX1, Radio El Mundo." (Machwart, Mich.) LRT, 11.84, Tucuman, can be heard mornings to 0900 or later. (Stark, Texas) LRA, 17.720, noted with SIRA program in Spanish when tuned 1020. (Ferguson, N.C.) LRA, Radio del Estrado, 6.065, Buenos Aires, has been logged to closing 2355 with signature tune "Lights Out," followed by the Argentina National Anthem. (Cushen, N. Z.)

*Azores*—Ponta Delgada, 4.845, noted signing on 1600 with clock chiming the hour. (Pearce, England) Noted on the 11.090 channel from tuning 1439 to 1500 sign-off. (Machwart, Mich.)

Signs on 1400. Fairs, England, informs *Radio Australia* that the callsign CSA93 has been assigned to 4.845; CSA92 is the callsign on 11.090.

*Belgian Congo*—OTC2, Leopoldville, appears to have settled down on 9.767 again for its evening (*EST*) programs (*English* news at 2200), but at times may use approximately 9.745 during certain broadcasts.

OTM1, 6.295, Leopoldville, heard signing on 0000; news in French at start; weak lately. (Cox, Ala.)

*Bolivia*—La Paz, 9.497, recently was noted with *English* announcement, by woman, at 2115 closedown. (Stark, Texas)

*British Guiana* — Although ZFY, Georgetown, still lists its frequency as 6.000, it actually is heard on 5.985.

*Bulgaria — Radio Sofia* announces *English* for Europe for 1500-1515 and 1600-1630 on 6.070, and for North America 1900-1930, 0000-0015 on 15.330. (Pearce, England, others) Asks for reports to English Announcer, Radio Sofia, Sofia, Bulgaria. (Cox, Ala.) Has strong signal evenings (*EST*) when relaying Moscow's North American (*English*) programs over 15.330.

*Burma—World Radio Society,* Sweden, says Rangoon is heard on 6.035 around 0030-0050 with QRM from London, Monte Carlo, and Stuttgart.

*Cape Verde Islands*—Noted moved from 5.928 to approximately 5.885; signs on 1530 and closes 1700; news in Portuguese 1630. (Pearce, England)

*Ceylon*—Commercial Service of *Radia Ceylon*, 11.975, noted with "Voice of America" relay 1030-1100. (Pearce, England; Rosenauer, Calif.) Noted on the 15.12 channel 0100 with music. (Pearce, England) The 15.12 outlet signs on 2045 with recording of "Strike Up the Band;" good level in Wisconsin. (Shanahan)

*Chile*—CE1190 has moved from 11.900 to 11.938, heard mornings, afternoons, evenings (*EST*); has QRM at times from harmonic of the Dominican Republic station, 11.940; also CWQRM. (Stark, Texas; Bellington, N. Y.)

CE1174, 11.7435, Santiago, noted around 0730 with music and announcements in Spanish; CE960, 9.593, Santiago, heard 2050 with concert; identified in Spanish 2115. (Russell, Calif.) CE1515, 15.15, Santiago, noted 2058 with announcement of "Radio Corporacion, Santiago de Chile." (Machwart, Mich.)

*China—Radio Peking* sent letter and full schedule by airmail; schedule was listed *English* 0430-0500, 640 kc., 700 kc., 720 kc., 6.100, 10.260, 11.690, 15.060; 0830-0900, 700 kc., 11.690, 15.060; 1700-1730, 640 kc., 700 kc., 720 kc., 10.260, 6.100, 11.690, 15.060. Listed standard Chinese at dictation speed 1030-1200 on 640 kc., 700 kc., 720 kc., 6.100, 7.500, 9.040, 10.260, 11.690, 15.060. (Pearce, England)

Dilg, Calif., others, have noted a Communist Chinese on 15.17 (probably old Chungking?) . lately in parallel with *Radio Peking* with *English* 0430-0500; however, during the 0835-0900 *English* period, the 15.17 outlet has Chinese. Dilg reports the 9.040 channel recenly was at good level when tuned 0735; North Shansi?

Russell, Calif., reports a Communist Chinese on 5.989 (Nanking or Shanghai?) with woman commentator in Chinese 0800.

Chungking, 6.155, has fair signal 0800. (Dilg, Calif.) Nanking's 31-m. outlet was measured recently as 9.733. (Hutchins, Radio Australia) Unidentified Communist Chinese station noted recently on 10.670 at 0800-0950 sign-off; some CWQRM but had good level in Calif. (Rosenauer)

*Colombia*—HJEX, 7.054, Cali, "Radio Pacifico," heard recently 2200-2230 with recorded music; identified 2200; verified by card in 30 days; usually has excellent signal. (Whitman, Ill., others) Relays m.w. HJER, 1030 kc.; QRA is Radio Pacifico, Apartado Nacional 559, Cali, Colombia, South America; is on until 0000 or later. (Sklenar, Cuba)

HJCX, 6.02, noted signing off 0302 with *English* announcement by man, followed by short announcement in Spanish, then anthem; strong and with no QRM. (Bellington, N. Y.)

*Curacao*—PJC, 5.010, Willemstad, noted on a Monday 2000 with Dutch folk songs and *announcements in English.* (Ferguson, N. C.) The 2.46 outlet, PJC2, is heard but at weak level. QSL lists frequencies as 2.46 and 5.017, both with 3 kw. (Bellington, N. Y.)

*Czechoslovakia* — Prague, 11.875, heard 1930-1958 with *English.* (Patterson, Ga.) Noted with *English* in progress 1607 on 9.55, 11.875. (Bellington, N. Y.) Prague is on a *new* channel of 6.095 at 1200 in German. (Radio Australia, others)

*Dominican Republic*—HI2T, 9.740, noted recently on a Wednesday with *English* in progress 2220. (Ferguson, N. C.) And on a Friday on both 5.97, 9.735; may also be on Mondays. (Bellington, N. Y.) This *English* feature usually starts 2200.

*Ecuador*—Officials of HCJB, Quito, write—"At present, HCJB is in the

midst of an Advance Program, which we trust will greatly alter the technical picture by giving us an increased power to a total of 100 kw. output." (Baughn, Ky.) Saylor, Va., says HCJB is *announcing* 15.100 for its 19-m. outlet instead of (listed) 15.115.

*Egypt*—Cairo, 10.055, appears to have a religious (Arabic) service on Thursdays around 1915-2030; other days, too? (Bellington, N. Y.) Also heard by Oskay, N.J. SUX, 7.866, Cairo, heard 1618 by Cox, Ala., with native chanting; weak and much QRM.

*Falkland Islands*—Port Stanley is operating on 3.440 at 1300-1400; output is 300 watts. (*WRH Bulletin*) *Can anyone confirm this and is the station actually ever "heard?"*—KRB.

*France*—Paris noted signing off nightly 2030 or 9.560. (Lucas, N. Y.) Noted on 7.24 and 11.70 with Arabic 1700-1730; best on 11.70. (Bellington, N. Y.)

*French Equatorial Africa*—"Radio AEF" can be heard on 17.845 and 9.960 at 1300-1500 sign-off; programs consist of music and news in French. (Lundin, Sweden)

*French Guinea*—Overseas sources report *Radio Guinea,* Conakry, heard on 10.230 weekdays *only* at 0715-0730. *Short Wave News,* London, says has bad CWQRM.

*French West Africa*—Schedules from *Radio Dakar* lists 11.885 and 15.346 at 1400-1600 beamed to France; lists news in French for 0215, 0245, 0700, 0730, 1415, 1515, 1755; *English* for 1400-1415; lists morning program as 0200-0300, 0600-0830; evening program as 1300-1800. (Talbert, Australia) Machwart, Mich., says *English* news is now 1410-1420 instead of 1400-1410.

*Germany*—Baden-Baden, 6.320, noted 0020 with symphony music; weak, high noise level. (Cox, Ala.)

*Radio Free Europe,* 6.130, noted with call 1700 followed by broadcast in an Eastern European language; noted another day 1345 with bell tolling, call, then program in Bulgarian. Stuttgart, 6.030, heard with closing announcements in *English* and German 1809. "Hier ist Deutschlandsender Berlin," 6.115, noted 0045, German news 0100, at 1400 with symphony music; is heard parallel on 7.150 but that channel is jammed at times; is in Russian Sector and gives news and views of "the Deutsche Demokratische Republik." Hamburg, 7.29, noted 0810-0900 with light music; another day 0110 with early morning music; often has programs from Cologne when gives call "Nordwestdeutscher Rundfunk Cologne;" ordinarily, call is "Nordwestdeutscher Rundfunk Hamburg." (Pearce, England) Hamburg, 7.29, and Osterloog, 11.795, noted parallel 1810 with piano music; 11.795 strong around 2300. (Bellington, N. Y.) Wants reports, especially on the 11.759 (Osterloog) outlet. (Pearce)

Leipzig, 9.728, seems to sign on regularly now around 2227; good level. (Ferguson, N. C.; Bellington, N. Y.)

(*Continued on page* 149)

**Pulse Generator**

(*Continued from page* 42)

of 0.2 microsecond is equivalent to a signal of 2 x .2 or

1,000,000/.4 = 2,500,000 cps

If the pulse is rectangular, as shown, it may contain harmonics as high as the tenth or twentieth, or to *25 or 50 megacycles,* respectively, depending on the "sharpness" of the pulse.

*Rise time* is the time it takes a pulse to rise from 10% to 90% of its peak value, as shown in Fig. 10A.

*Decay time* is the time it takes a pulse to fall from 90% to 10% of its peak value, and thus is similar to "rise time" (see Fig. 10A).

*Pulse width* is the time of duration of the pulse, or of a rectangular pulse whose energy and peak power equal those of the pulse. (See Fig. 10B). For rounded pulses, such as those obtained from the pulse generator, the pulse width may usually be taken as the time of duration between the 70% points on the slopes of the pulse.

*Pulse bandwidth* is the bandwidth in a circuit necessary to transmit the pulse. As we have seen, if the pulse is considered to be a half-cycle of a square wave, this bandwidth may be equal to the tenth or twentieth harmonic of the equivalent frequency of the pulse, and may be quite high if the pulse width is small. Pulse bandwidth may also be determined by the following relationship:

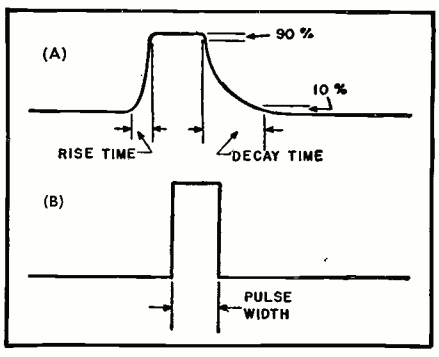
$$F_{bw} = \frac{1}{2}t$$

where $F_{bw}$ is the bandwidth in megacycles and $t$ is the rise or decay time. Either rise or decay time may be used, whichever is smaller.

Although considerable advanced mathematics may be required for a detailed analysis and study of pulsed waveforms, a basic understanding is quite easy to obtain without advanced mathematical explanations. Experimental work with pulses and pulse shaping and forming circuits offers a fertile field for the interested experimenter, and a pulse generator capable of delivering pulses suitable for even advanced experimental work is not too difficult to construct.

Construction details on a waveform clipper that can be used separately or in conjunction with this generator will be given next month. —30—

Fig. 10.



## Audio Simplified

(*Continued from page 50*)

Present thinking is that the total harmonic distortion should not exceed 2 per-cent. From general experience it seems reasonable to rate an amplifier having 10 per-cent intermodulation with 2 per-cent harmonic distortion as fair quality, and one having 5 per-cent intermodulation with 2 per-cent harmonic distortion as good.

Although no standards have as yet been determined, it is known that a good system should have good transient as well as steady-state characteristics, and should have no undamped vibrations when a square-wave is applied to the input of the system. In general the system should have a smooth response with a minimum number of peaks and dips in the response curve, for good reproduction of transients. This factor is especially important in the electromechanical components of the system (particularly in the loudspeaker).

Flutter and wow in the reproduction of disc and magnetic recordings can be serious and annoying—the ear being quite sensitive to this type of distortion, since it seldom occurs in nature. Under some conditions the ear can detect the presence of as little as 0.001 per-cent flutter. The best systems which are being used in broadcast and recording studios at the present time maintain constant speed to about 0.1 per-cent or better. About 1 per-cent flutter or wow is acceptable for a home reproducing system.

The above distortion information is summarized in Table 1, which gives a list of the various electronic distortions and their acceptable limits, and also the type of signal with which the amount of this distortion may be detected. When these factors are taken into account in the design and setup of the reproducing system, and the various distortion limits carefully considered, the audio experimenter's aim of almost-perfect sound reproduction will have come a long way toward realization.

(*To be continued*)


"I merely stated that my client would appear!"

## New TV Components

(*Continued from page 51*)

separate filament windings. One of these provides power to the filament of the rectifier tube for the high voltage supply and the other furnishes the power to the filament of the rectifier tube for the focusing voltage supply.

The 227T1 produces a maximum of 14,000 volts at no load and has been especially designed for use with the 14GP4 and 17GP4 picture tubes. It could be used, as mentioned before, with any other electrostatic focus picture tubes having a horizontal deflection angle of approximately 66 degrees. Fig. 1 is the circuit of the horizontal oscillator and deflection and high voltage system which uses this coil. The focusing voltage d.c. output obtained at no load, with the beam current and potentiometer adjusted for maximum output, is approximately 3800 volts.

The 228T1 operates at 16,000 volts at no load and is designed for the 17GP4, 20GP4, or other electrostatic focus types having a horizontal deflection angle of approximately 66 degrees. Fig. 2 shows the required changes in wiring when this unit is used instead of the 227T1. However, in this case the focusing voltage d.c. output at no load is 4400 volts.

The horizontal deflection output tube may be either a 6BQ6GT or a 6AU5GT in this circuit. When the 6BQ6GT is used, the "B" supply must be 280 volts. When the 6AU5GT is employed, a 300 volt "B" supply is required.

The third new unit in this recently-introduced series of components is the 211D1 deflecting yoke. It is a magnetic type which has been developed for use with rectagular picture tubes having neck diameters of $1\frac{7}{16}$", horizontal deflecting angles of 66 degrees, and diagonal angles of 70 degrees. A wiring diagram of this yoke is shown in Fig. 3.

Among the features claimed for this yoke is improved side and corner res-

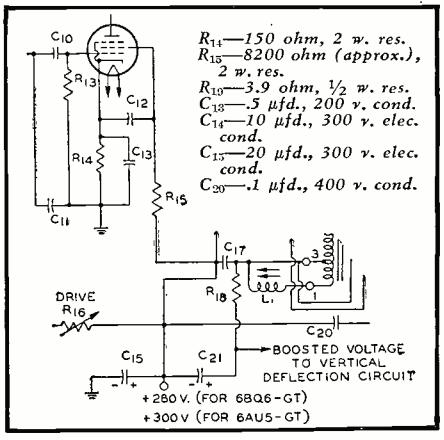



**Fig. 2. Wiring diagram using the 228T1 horizontal deflection output and high voltage transformer. The balance of the diagram is identical with that shown in Fig. 1. The high voltage output obtained from this unit is 16,000 volts. Parts list shows the additions and changes in component values over those shown in Fig. 1.**

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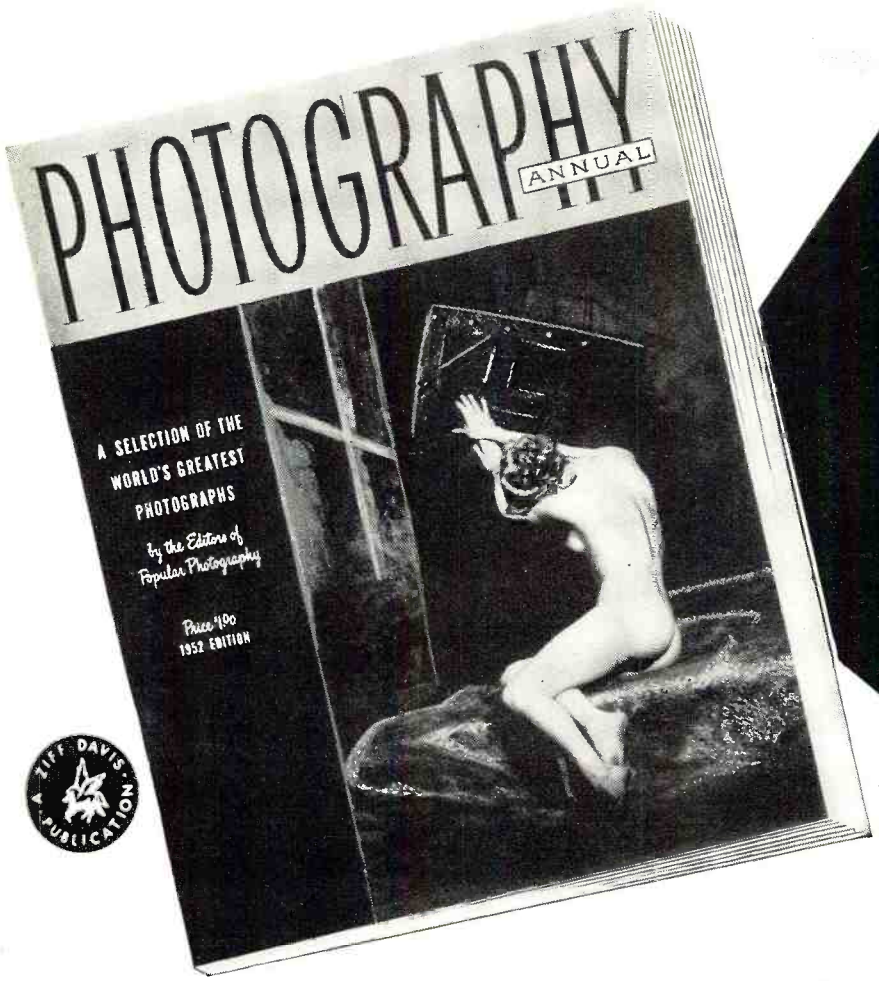


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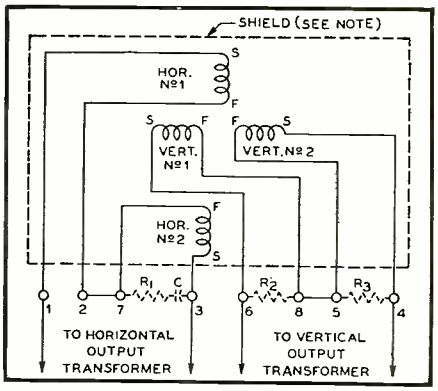



**Fig. 3. Wiring diagram for the 211D1 deflecting yoke. Provision should be made for grounding the shield which is internally connected to the mounting bracket. The resistors and condensers shown are not supplied with the unit but the following values are suggested. $R_1 = 1000$ ohm, ½ w. res. ±10%; $R_2, R_3 = 560$ ohm, ½ w. res. ±10%; and $C = 62$ μμfd., 1500 v. cond. ±5%.**

olution without sacrificing the ability to reproduce vertical and horizontal lines with a small amount of bowing. By utilizing a ferrite core, the yoke has both high deflection sensitivity and compactness.

It has been designed specifically for use with magnetic focus type horizontal deflection output and high voltage transformers (the 224T1 for 13,000-14,000 volt operation and the 225T1 for 15,000-16,000 volt use) and for the new electrostatic focus types described in this article. —30—

## Within the Industry

(*Continued from page 26*)

a vice-president of the *General Electric Company* on the president's staff and formerly head of the company's General Engineering and Consulting Laboratory, has retired after 32 years of service. He will enter the consulting engineering field with headquarters in Schenectady . . . **FRED ABRAMS** has been appointed head of the national Parts Sales-Service Division of *Emerson Radio and Phonograph Corporation . . . Jerrold Electronics Corporation* has named **SYDNEY J. MASS** to the post of sales manager and appointed **EDMUND D. LUCAS, JR.** as manager of advertising and public relations. Mr. Lucas was formerly associated with *Philco Corporation* where he was manager of publicity . . . **CARL E. SMITH,** formerly supervisor of equipment sales service for the Radio Tube Division, has been appointed supervisor of factory sales service for *Sylvania Electric Products Inc.* . . . **LT. GEN. ALBERT C. WEDEMEYER** has retired after 32 years of military service and has been named a vice-president and director of *Avco Manufacturing Corporation* . . . **PAUL V. GALVIN,** president of *Motorola Inc.,* was awarded an honorary Doctor of Laws degree by Loyola University, New Orleans for his service to his community and for operating his business in accordance with the "highest social principles" . . . **L. B.**

**CALAMARAS,** executive secretary of the National Electronic Distributors Association, has been named executive vice-president of the Association by the board of directors. In his new position he will represent NEDA in all government activity affecting the radio and television replacement parts industry . . . *Kay Electric Company* has promoted **LOUIS A. GARTEN** to the post of sales manager. He was formerly associated with *RCA International* . . . **OSCAR S. TYSON,** founder and chairman of the board of *O. S. Tyson and Company, Inc.,* passed away recently . . . **WILLIAM T. RAPP** is the new assistant vice-president of *Federal Telecommunication Laboratories, Inc.,* the research unit of the *International Telephone and Telegraph Corporation* . . . **RAY A. MORRIS** has been named chief engineer for *I.D.E.A.* of Indianapolis, manufacturers of the "Regency" booster. He was formerly associated with *Meissner, Ferrocart,* and *Guthman* . . . **PHIL NARDELLA,** formerly branch manager of *Harrison Radio's* Jamaica, N.Y. branch, has joined the industrial sales department of *Chanrose Distributors, Inc.* of Jamaica. He has been associated with the electronics distributor field for over fifteen years.

* * *

**FREDERICK W. TIMMONS, JR.** has been appointed sales manager for the Cathode-Ray Tube Division of the *Allen B. Du Mont Laboratories, Inc.*

He has been associated with *Du Mont* since 1946 and is well-known in the cathode-ray tube sales field. Since 1947 he has been active in the introduction and sale of large screen cathode-ray tubes to major television receiver manufacturers.

A native of Cambridge, Massachusetts, Mr. Timmons will make his headquarters at the company's cathode-ray tube plant in Allwood, New Jersey.

* * *

**RAYTHEON MANUFACTURING COMPANY** is building a $2,000,000 factory at Waltham, Mass., which will house facilities for the manufacture of the company's line of power tubes. The new factory will permit the company to double its output of this type of tube . . . **EDWIN I. GUTHMAN & COMPANY, INC.,** has opened a new plant in Attica, Indiana for the manufacture of coils and other electronic components . . . **GENERAL ELECTRIC COMPANY** has announced that construction has begun on a new $6,000,000 receiving tube plant in Anniston, Alabama. Over 2000 people will be employed when the plant's 150,000 square feet of floor space is fully activated . . . **TEL-A-RAY ENTERPRISES, INC.,** has purchased the Stemming District Tobacco Association Building in Henderson, Kentucky, and will use it for the production of television and FM antennas and

boosters. The company's previous plant was destroyed by fire in May of this year . . . **HYTRON RADIO & ELECTRONICS CO.,** is building a new plant in Danvers, Mass., for the manufacture of receiving tubes. Operation is expected to begin early in 1952 . . . **GENERAL ELECTRIC COMPANY** has announced plans to build a 20,000 square foot manufacturing building near Springfield, New Jersey to house **PRECISION LABORATORIES, INC.,** now located in Irvington, New Jersey. The firm is the manufacturing unit of the company's components division . . . **SYLVANIA ELECTRIC PRODUCTS INC.,** has selected the city of Nelsonville, Ohio, as the site of a plant for the manufacture of welded lead-in wires for lamps, radio tubes, and other electronics devices. The company is presently operating in a rented factory.

* * *

**DR. C. J. BREITWIESER** has been named executive assistant to Dr. F. R. Hensel, vice-president in charge of engineering at *P. R. Mallory & Co., Inc.*

He joins the company after serving as chief of electronics and head of the engineering laboratories for *Consolidated Vultee Aircraft Corporation,* Lindbergh Field, San Diego.

Dr. Breitwieser, who is a graduate of the California Institute of Technology, has been associated with *United Sound Products Company, DeForest Research, Inc.,* and *Memovox Corporation* in addition to holding several academic posts and consulting engineering positions.

* * *

**NEW ERA TELEVISION COMPANY** has been formed recently to handle the national sale of custom-built television-radio-phonograph units with glass and mirror combined with wood, fabrics, and bamboo. The new firm, which is located at 315 East 47th Street, New York 17, New York, will serve as the sales organization for the **NEW ERA GLASS COMPANY . . . CONTROL INSTRUMENT COMPANY, INC.,** of Brooklyn, New York, designers and manufacturers of electronic instruments, has been acquired by **BURROUGHS ADDING MACHINE COMPANY.** The instrument company will continue to operate as a separate corporation.

* * *

**JOHN H. CASHMAN,** president of *The Radio Craftsmen, Inc.* of Chicago, has been elected chairman of the Association of Electronic Parts and Equipment Manufacturers at the organization's annual meeting.

Francis F. Florsheim, president of *Columbia Wire and Supply Co.,* was named vice-chairman, and Helen Staniland Quam, *Quam-Nichols Co.,* was re-elected for her sixteenth term as treasurer.

Kenneth C. Prince, Chicago attorney, was renamed executive secretary of the association. —30—

## Voltage Regulators

(*Continued from page* 69)

150 to 350 volts. This particular circuit has the added advantage that the heater supply for the control tube is at ground potential and can be used for other purposes.

The circuit of Fig. 5 carries the trend of the above modification one step lower in output voltage range. A 300 volt power supply can be used if its negative lead is connected to the screen of the control tube, $V_2$. An auxiliary 200 volt bias supply is needed to supply the over-all total of 500 volts for the regulator unit. The output voltage in this case will be from 50 to 250 volts. This is a very useful range for testing and for use with any of the present-day low voltage miniature tubes.

It will be noticed that the basic circuit of Fig. 2 appears without internal change in the circuits of Figs. 3, 4, and 5. This suggests the possibility of a practical voltage regulator unit capable of being used with various power supplies. Fig. 6 diagrams such a unit. It combines a bias supply integral with the regulator unit. It will deliver up to 150 ma. from 50 to 600 volts with appropriate power supplies, in four ranges. Power supplies with reasonably good regulation should be used.

While the regulator unit of Fig. 6 would serve many uses, it fails to accomplish the original requirement. It would not cover the full range without switching and it required several power supplies. It seemed that a unit which would have a single control and include its own power supply should be possible. It would be if the limiting factor of the maximum rated plate voltage of the regulator and control tubes could be raised. Series arrangements suggested themselves and the circuit of Fig. 7 was worked out. In this circuit two 6AS7 regulator tubes are used in series. The voltage divider, $R_2$ and $R_3$, applies proportionately bias voltages on the regulator tubes so that the voltage drop across them is divided equally. A 6J5 is added in the control branch. Equal division of the plate voltage between the 6J5 and the 6SJ7 is obtained by the use of resistors $R_6$ and $R_8$. Control of this circuit uses a variable resistor, $R_7$, instead of the potentiometer, $R_2$, in Fig. 2. This was considered necessary because the output voltage now varies over a range of some 450 volts.

The voltage regulated power supply shown in Fig. 7 was constructed and tested. It was found to have a useful range from almost zero to a little over 450 volts and it can be set anywhere within that range by adjusting a single control. True, it is wasteful of power in the low voltages but that feature is more than offset by the flexibility of the unit. It should prove to be a very handy piece of equipment on the test bench. —30—

# Technical BOOKS

**"THE RADIO AMATEUR'S HANDBOOK"** by the Headquarters Staff of the ARRL. Published by *The American Radio Relay League*, West Hartford, Conn. 768 pages including catalogue section and index. Price $2.50. Paper bound. 28th Edition.

This perennial favorite of hams and experimenters is now available in a new and revised edition which covers the field of amateur radio from every angle.

The early chapters in the manual cover radio and electrical fundamentals which form the basis for all ham operation. Other chapters in the book discuss and describe such topics as high frequency receivers and transmitters; the design and construction of single-sideband suppressed carrier radiotelephone transmitters; mobile techniques; antennas; transmission lines; v.h.f., u.h.f., and microwave techniques and equipment; and data on building and adjusting all types of ham equipment.

An up-to-date vacuum tube data section and a new and expanded catalogue section complete this edition.

This "bible" of the ham fraternity is even bigger and better than previous editions and amateurs will want to add this latest volume to the reference shelves in their ham shacks.

* * *

**"MUSICAL ACOUSTICS"** by Charles A. Culver. Published by *The Blakiston Company*, Philadelphia. 210 pages. Price $4.25. Third Edition.

This is a basic text written for the musician or the technician concerned with the recording and/or the reproduction of sound.

Written in easy-to-understand style, this book is based on a course in musical acoustics offered music students at Carleton College. The author has deliberately avoided the use of involved mathematics and highly technical terminology with the result that the subject matter may be easily grasped by the veriest tyro.

The book covers the nature and transmission of sound, interference, hearing, resonance, pitch, quality, musical intervals and temperament, consonance and dissonance, musical strings, stringed instruments, vibrating air columns, wind instruments, vibrating rods and plates, the acoustics of rooms, electronic musical instruments, and the recording and reproduction of music.

Since increased knowledge of the "why's" and "how's" of sound can only engender an increased appreciation of music this book should appeal to the active musician as well as the passive music lover.

* * *

**"TELEVISION ANTENNAS"** by Donald A. Nelson. Published by *Howard W. Sams & Co., Inc.*, Indianapolis. 223 pages. Price $2.00. Paper bound.

This handy, pocket-size manual contains information on the design, construction, installation, and trouble-shooting of various television antennas. This second edition has been brought up-to-date and includes all of the latest information needed by the installation technician.

The book is divided into five sections dealing with antenna principles, antenna construction, commercially-built antennas, installation, and trouble-shooting. The material presented is of a practical nature and covers situations most often encountered by the technician. On the subject of installation, the text goes into some detail on roof and wall structures, mast construction, methods of securing mounting brackets to various types of construction materials, etc.

A brief introductory chapter gives important information on television transmission, the video receiver, frequency allocations, and the networks. The text material throughout the book is well illustrated with line drawings and photographs of commercially-available antenna equipment.

Technicians will undoubtedly find this a practical aid when tackling some of those extra-troublesome antenna installations.

* * *

**"ELEMENT VIII—SHIP RADAR TECHNIQUES"** by Milton Kaufman. Published by *John F. Rider Publisher, Inc.* 30 pages. Price $0.78. Paper bound.

This little book is a supplement to the publisher's "Radio Operator's License Q & A Manual" (Second Edition), and covers the material included in Element VIII of the FCC examinations.

In accordance with the usual practice in such examinations, the answers to the various questions in this element have been kept as brief as possible and explanatory material is held to a minimum.

This book is not intended to be a text book on the subject of ship radar and the student will have to seek elsewhere for his background material. However, as an aid in preparing for the license exam, this handbook is excellent and should be of real assistance to the candidate.

* * *

**"ELECTRICAL-RADIO WIRING DIAGRAMS"** (Automotive Manual). Compiled by the E. I. Electrical School Staff. Published by *E. I. Electrical Press,* Hinsdale, Illinois. 87 pages. Price $2.00. Paper bound.

Service technicians who specialize in or work on auto radios will find this manual particularly helpful as the compilation includes electrical wiring diagrams and radio schematics on all of the leading postwar automobiles, with particular emphasis being placed on 1949 and 1950 models.

Prepared in cooperation with the manufacturers, the book contains information on *Chrysler, DeSoto, Dodge, Plymouth, Crosley, Ford, Lincoln, Mercury, Buick, Cadillac, Chevrolet,*

*Oldsmobile, Pontiac, Hudson, Kaiser-Frazier, Nash, Packard, Studebaker,* and *Willys* cars, and radios manufactured by *General Electric, Motorola, Philco, RCA,* and *Zenith.*

The information is presented in easy-to-use form and there is no extraneous material to clutter up the pages or distract the user. —30—

## NEW BELL TRANSISTOR

THE Bell Telephone Laboratories has recently announced the development of a new type of transistor which operates with exceedingly small power consumption.

According to the company, in audio oscillator applications the unit requires a power supply of only 6 microamperes at .1 volt. The power handling capacity and particularly the efficiency of these transistors is high. The design can be varied to permit the required amount of power dissipation up to at least 2 watts. The static characteristics are such that class A efficiencies of 48 or 49 out of a possible 50 per-cent can be realized. The efficiencies for class B and class C operation are correspondingly high, reaching as much as 98 per-cent.

The new type of transistor is compact and rugged. It is enclosed in a hard plastic bead about 3/16 inch in diameter. Inside the bead three electrical connections are fastened to the germanium and are brought out as pigtails through the bead. This gives a sturdy unit which withstands severe shock tests. The input and output impedances are always positive, whether the transistor is connected grounded-emitter, grounded-base, or grounded-collector. This permits a wide latitude in circuit design and makes it possible, by choosing the appropriate connection, to obtain a considerable variety of input and output impedances.

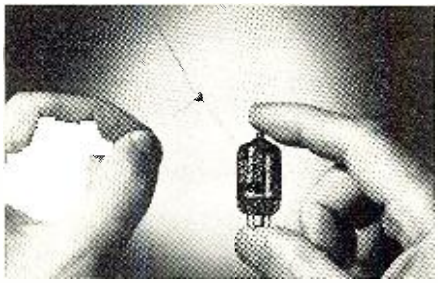
Vibration tests in the audio frequency range produce no measurable microphonic noise.

Other salient characteristics of the new junction-type transistor are its relatively low noise figure (1000 times less than that of its predecessor) and its high gain.

While early tests indicate that collector capacitance limits the frequency response at full gain to a few kilocycles, it is possible by using a suitable impedance mismatch to maintain the frequency response flat to at least one megacycle while securing a useful amount of gain.

At 1000 cps, most of the units measured in the laboratory have a noise figure between 10 and 20 db. Power gains in the order of 40 to 50 db per stage have been obtained. —30—

Over-all view of the new Bell Telephone Laboratories' transistor. The miniature vacuum tube, which performs about the same job, is included to permit size comparison.



## Horn-Loaded Speaker

(*Continued from page 63*)

ing, obnoxious looking, bulky contraption. Of course, the "Better Half" had some influence in that decision! In this design, most of the construction errors are hidden. As it turned out, there wasn't much compromise. It is a source of considerable satisfaction to have other high-fidelity enthusiasts listen to it, then start figuring how they can build one like it.

The horn is made as a unit in a box. It slips in the opening where the shelves slipped out. Thus restoration of the original bookshelves is a simple matter when we move, an item that deserves consideration. Actual construction is really quite simple. Being anything but a master wood craftsman, it won't be hard to improve on my model. The size of the available opening in which the assembly is to be built will determine the length of horn which can be enclosed. That in turn will determine the rate of opening. In my case, the cross section area was doubled every two feet. This provides loading to 32 cycles. Intermediate cross sections were gauged by eye, and some improvement could probably be made by expending more effort to get more accuracy. For example, the basic unit could be divided by 3, then the rate of opening would be as follows:

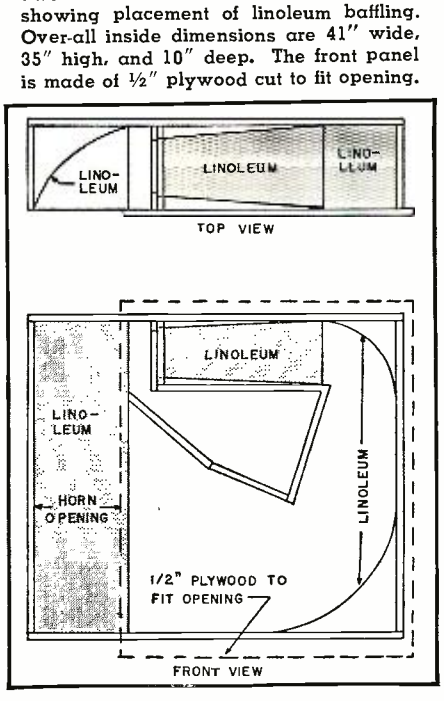
| UNITS OF LENGTH | MULTIPLICATION CROSS-SECTION AREA |
|---|---|
| 1 | 1.26 |
| 2 | 1.59 |
| 3 | 2.00 |
| 4 | 2.51 |
| 5 | 3.16 |
| 6 | 3.98 |
| 7 | 5.01 |
| 8 | 6.31 |
| 9 | 7.94 |
| 10 | 10.00 |

Considerable care should be used in forming the curves of linoleum to insure good results. If this is not done, very objectionable reflections will occur and the results will be poor. Linoleum was chosen to form the curves because it is inexpensive, easily worked, and quite inert. Scrap pieces can usually be picked up at a furniture store at very low cost.

As would be expected, there is some interference between front and back radiation of the single speaker. This can be practically eliminated by loosely forming cotton around the rear of the speaker frame, being careful not to cover the central core opening.

The *W.E.* 755-A, now made by *Altec-Lansing,* is not the only speaker adaptable to this design, but whatever unit is used it must have an opening in the core for high frequency radiation from the rear. —30—

Two views of the horn-loaded speaker showing placement of linoleum baffling. Over-all inside dimensions are 41" wide, 35" high, and 10" deep. The front panel is made of ½" plywood cut to fit opening.




## SERVICE TIP

By NICHOLAS B. COOK

**THE inner conductor of a 25-foot, nearly-new mike cable was open. Inspection of terminal connectors showed no trouble at these points. Removal of connectors revealed nothing but apparently perfect mechanical continuity. Yet the line was open. Where?**

**The open was quickly found by the use of an ohmmeter, a needle-pointed probe, and a technique learned from the celebrated Greek philosopher Zeno, who "proved" that Achilles could never overtake the tortoise.**

**The method is as follows: Call the ends of the line "A" and "B." Clip one probe on end "A." Push the sharp needle of the other probe through to the inner conductor at a point halfway between "A" and "B."**

**Assuming that there is only one "open," this test shows either open or closed and eliminates one half of the entire length. If open, the fault lies in the "A" half; if closed, in the "B" half.**

**The next test is taken in the bad section at a point halfway between test point No. 1 and the end. The probe clip may be left at "A." However, an open test from the "A" end can be verified as a closed test from the "B" end. The double check is conclusive and takes very little more time.**

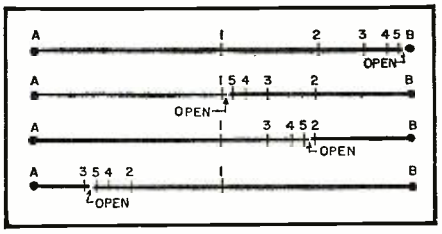
**In this manner, halving the remainder each time, only five tests are required in a 25-foot cable to narrow the faulty section down to 9 inches.**

**In the actual case that inspired this "Service Tip," the open was found at a distance of 7 inches from the end. Lucky!**

**But the method works equally well if the open is near the middle. See Fig. 1 for details on how the operation is performed.**

—30—

Rapid method for locating an "open" in a length of microphone or similar cable.



# 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.

### PICTURE TUBES

*Zetka Television Tubes, Inc.* of 131-137 Getty Avenue, Clifton, New Jersey is now offering a 12-page, two-color catalogue covering its line of 16, 17, 19, and 20 inch picture tubes.

Every tube described in the new catalogue is thoroughly detailed with descriptive copy and diagrammatic drawings.

Requests for the catalogue should be addressed to Murray Shindel, sales manager of the firm.

### TIMER CATALOGUE

*The Sessions Clock Company* of Forestville, Conn., is currently offering copies of its new catalogue covering clock movements and switch timers.

Designed as a buying and engineering guide for specialty clock manufacturers, design engineers, and all users of clock timing movements, this 12-page bulletin gives complete specifications and dimensional drawings on all of the units in the company's line.

Copies of Bulletin No. CM-11 are available from Dept. 16 of the company.

### NEW NEWARK CATALOGUE

*Newark Electric Company,* 323 W. Madison Street, Chicago, Illinois has just published a comprehensive parts catalogue which lists only current and readily available items.

The catalogue carries listings of test equipment; industrial equipment and supplies; high fidelity systems and components; television chassis; tape, wire, and disc recorders; phonographs; tools; books; p.a. and intercom systems; transcription players; and a large selection of ham equipment.

### TV REPLACEMENT GUIDE

*Cornell-Dubilier Electric Corporation* of South Plainfield, New Jersey has just issued a comprehensive manual listing over 400 of the most important TV twist-prong electrolytics.

Known as the "Television Replacement Guide TVR 7", the new guide is divided into sections covering manufacturer, model number, and *C-D* replacement numbers in various forms for easy reference. Other listings show the physical and electrical characteristics of over 400 *C-D* replacements and a cross index of older twist-prong electrolytics and their present equivalent part numbers.

The guide is available from the com-

pany's jobbers or direct from the company's Jobbers' Division. The price is 50 cents.

### TELEVISION COMPONENTS

*Standard Transformer Corporation,* 3580 Elston Avenue, Chicago 18, Illinois has announced the availability of a new television catalogue and replacement guide which lists more than 1500 models and chassis built under 79 brand names.

In addition to listing all replacement items by model number, manufacturer's part number and *Stancor* stock number, the guide identifies each part by code number which indicates the unit's function in the television circuit.

### SHURE REPLACEMENT MANUAL

*Shure Brothers, Inc.,* 225 West Huron, Chicago, Illinois has issued its replacement manual No. 66 which lists over 1500 phonographs, radio-phonograph combinations, and radio-television-phono combinations using *Shure* crystal and ceramic cartridges.

The manual refers to sets by manufacturer's name and model number with the *Shure* model number for each cartridge replacement. In addition to all the current models, the listing includes brands dating back to 1938.

### AUDIO EQUIPMENT

*Cinema Engineering Company,* 1510 West Verdugo Avenue, Burbank, California has recently issued a 32-page catalogue covering its line of attenuators and related audio accessories.

The information included in the catalogue is concise but complete, in many instances the material is presented in tabular form for quick reference. The products are pictured and described and include such items as volume indicator units, db and vu meters, decade resistance boxes, jacks, patch cords, plugs, relay racks, terminal blocks, miscellaneous parts and supplies.

### CONDENSER REPLACEMENTS

A new 16-page catalogue recently issued by *Sprague Products Company,* North Adams, Massachusetts contains a comprehensive listing of condensers for practically every radio and television service, amateur radio, experimental, laboratory, and other needs.

Of particular interest to television technicians are the sections covering the company's "Telecap" molded tubulars, the "Twist-Lok" prong mounting dry electrolytics, "Ceramite" disc ceramics, "Bulplate" multiple ceramics, and "Doorknob" high voltage ceramics.

Copies of Catalogue C-607 are available either from the company or from the company's parts distributors.

### TUBE TESTING DATA

*The Hickok Electrical Instrument Company,* 10677 Dupont Avenue, Cleveland 8, Ohio is currently offering copies of a new 16-page booklet which illustrates and describes the different theories and the four basic methods of tube testing.

The publication includes circuit dia-

grams and formulas, a summary of a survey on the nature of failures of TV receiver tubes, and information about the company's line of tube testers. Copies of the booklet are free of charge.

### VIBRATOR REPLACEMENTS

*James Vibrapowr Company,* 4036 N. Rockwell Street, Chicago 18, Illinois now has available a new vibrator replacement guide which is being offered to technicians and others interested in the application of vibrators.

The listing includes the company's complete line of vibrators, base wiring diagrams, and other pertinent information.

### TUBE CHARACTERISTICS

*Raytheon Manufacturing Company,* 55 Chapel Street, Newton 58, Massachusetts has just issued a new 8-page bulletin covering special purpose tube characteristics.

Information on subminiature, magnetron, klystron, rectifiers, voltage regulators, radiation counter, transmitting, etc. type tubes is presented in easy-to-use tabular form. A terminal and basing connection chart is also included for reference.

### MAGNECORD CATALOGUE

*Magnecord Inc.,* 360 N. Michigan Avenue, Chicago, Illinois now has available for distribution copies of its new illustrated catalogue which describes the company's line of magnetic tape recording equipment and the facilities available for building special equipment to individual requirements.

### "SLIDE-RULE" GUIDE

*Jensen Industries, Inc.,* 329 S. Wood Street, Chicago, Illinois has developed a simplified phonograph needle chart and replacement guide for use by the retail and jobbing trade.

Designed to fit either pocket or service kit, the new needle guide provides the answer to the problem of the proper needle replacement for every make of phonograph and cartridge.

The guide resembles a graphic calculator type of slide rule and includes all the necessary variables and characteristics required in the absence of the exact model or replacement number.

### RECORDING RATE CARD

*Audio & Video Products Corp.,* 1650 Broadway, New York 19, New York is offering a pocket-size card covering its facilities and rates for tape recording editing, multiple tape recording, instantaneous, and master disc recording.

Copies are available without charge to those using recording media.

### NEEDLE REPLACEMENTS

*Electrovox Co., Inc.,* 60 Franklin Street, East Orange, New Jersey is currently offering copies of its new "Walco" phonograph needle replacement chart to jobbers and dealers.

The 11"x17" chart shows not only all of the phonograph needles in use by leading record player manufacturers, but cartridge makers as well. The

chart gives the name of the maker, the needle model by maker's number, a picture of the needle, and the "Walco" replacement number and list price.

### G-E REPLACEMENT GUIDE

The Receiver Division of *General Electric Company,* Electronics Park, Syracuse, New York is currently offering copies of a new publication, "Stylus and Cartridge Replacement Guide," which has been designed especially for dealers and technicians.

The new guide charts the complete use of styli and cartridges in *G-E* as well as competitive phonograph combinations and depicts the advantages of the company's variable reluctance cartridge with the baton stylus.

Copies of this guide are now available from the company's parts distributors.

### "HAM NEWS"

The Tube Divisions of *General Electric Company* have announced the availability of a cloth-bound volume of "Ham News" containing a copy of every issue published from May-June 1946 up through the November-December 1950 issue.

Hams and experimenters may obtain copies by writing the Tube Divisions of the company at Schenectady, New York. The price is $2.00 per copy.

### ASTATIC CATALOGUE

*The Astatic Corporation* of Conneaut, Ohio has recently published a general catalogue which covers all of the products manufactured by the company for the civilian market.

Included are illustrations of the products, descriptive information, and performance data on TV and FM boosters, microphones and stands, phonograph pickups and cartridges, needles, recording heads, and related equipment.

Copies of Catalogue 51 are available from the company's Sales Department.

—30—

**The success of this year's convention of the Audio Engineering Society and The Audio Fair was uppermost in the minds of these gentlemen who met recently to lay plans for these events. As in previous years the three-day session will be held at the Hotel New Yorker, beginning November 1st. Meeting with Harry N. Reizes, Fair manager (left), were (from left to right): F. Sumner Hall, acting secretary; C. J. LeBel, past president; C. G. McProud, executive vice-president; John D. Colvin, president; and Ralph A. Schlegal, AES treasurer. The Audio Fair will be open to the public but convention sessions will be closed.**

## International Short-Wave

(*Continued from page 134*)

Noted at fair level in German with music around 2300. (Hoogerheide, Wisc.)

*Greece*—Greek station noted near 7.580 with recordings 1330; signs off 1531 with Greek National Anthem. May be Kavala, (Pearce, England) Cushen, N. Z., lists Kavala on 7.580, 250 watts, scheduled 0000-0130, 0500-0515, 1130-1500. (Radio Australia) Larissa, 6.745. noted 0100; *no English heard* lately on Thursday 1530 as scheduled, but has had recordings to closedown 1600. (Pearce, England)

Current schedules from *Radio Athens* are 2000-2100 on 11.718 to USA; 2330-0830 on 7.300 Greek; 0915-0930 on 15.345 news in Russian; 1030-1300 on 7.300 Greek; 1300-1400 on 7.300 in Balkan languages; 1430-1445 on 11.718 *English*; 1445-1500 on 11.718 French, and 1530-1700 on 7.300 Greek; power remains 7.5 kw.; news in *English* nightly is around 2040 on 11.718. (Lucas, N. Y.) No longer uses 6.177 or 9.607. (Radio Sweden)

*Guatemala*—TGNA has moved from 6.040, by official permission, to 5.955 where is parallel with 9.660A; would like reports, especially on the *new* 5.955 outlet. (Boice, Conn., others) Has *English* 2200-2230.

*Haiti*—4VRW, 9.838, is heard with *English* Mon., Wed., Fri., around 2130 (may vary); announces "Voice of the Republic of Haiti;" bad CWQRM around 2130. (Lucas, N. Y.) 4VN noted on about 6.013, strong 2100 tune-in when gave call letters in French; classical music started 2101 (Bellington, N. Y.)

*Holland*—In the North American (*English*) transmission 2130-2210, "Letterbox" is Tuesdays 2200; frequencies are 9.59, 11.73. (Shanahan, Wisc., others)

*Hong Kong*—ZBW3, 9.525, fair signal with Chinese 0645; BBC news relay 0700. (Stein, Calif., others)

*Hungary*—Budapest has *English* for Europe 1600-1630; 1710-1740 for North America; frequencies currently are 11.910, 9.833, 7.220. (Pearce, England) Relays *Radio Moscow* widely—afternoons and evenings (*EST*).

*India*—AIR, 15.29, noted with news 1045. (Russell, Calif.) This channel is widely reported with news 1930, good level. The 15.16 frequency continues with good signal in all-native musical program 2030-2200 daily. (Fuller, R. I., others)

Delhi sent these current schedules via airmail: *General Service*—To East and Southeast Asia. Australia, 1930-2015, 15.290, 11.850; 2030-2200, 17.830, 15.160; 0200-0330, 21.510, 17.830; 0600-0815, 17.740, 15.190; 0830-0945, 17.740, 15.290. To Middle East, Central Europe, United Kingdom, 0200-0330, 21.510, 17.830; 0230-0330, 17.740, 15.190; 0600-0700, 17.740, 15.190; 0830-0945, 17.740, 15.290. To Burma, Philippines, 0200-0330, 21.510, 17.830. To China,

Japan (on Sat., Sun. *only*), 0530-0600, 17.760, 15.160. To East and South Africa, Mauritius, 2300-0015, 17.740, 15.160; 1045-1215, 15.290, 11.830. To West Indies, 1830-1930, 15.290, 11.850, 9.550, 7.155. *Eastern Service*—To Burma, 1945-2000, 11.710, 9.720; 0615-0700, 21.660, 15.160. To China, 0430-0545 (to 0530 *only* on Sat., Sun.), 17.760, 15.160. To Indonesia, 1745-1800, 11.790, 9.720; 0700-0730, 21.660, 15.160. To East and Southeast Asia, 1930-2015, 15.290, 11.850; 2030-2200, 17.830, 15.160; 0200-0330, 21.510, 17.830; 0600-0815, 17.740, 15.190; 0830-0945, 17.740, 15.290. *Western Service*—To Fiji, 0200-0330, 21.510, 17.830. To West Pakistan, 2245-2300, 11.850, 9.670, 7.120, 6.190; 0945-1000, 7.155, 6.010. To Afghanistan, 2215-2230, 9.565, 7.225; 0030-0130, 9.565, and (Fri. *only*) 7.225; 0845-0930, 6.010; 1130-1230, 9.720, 7.155, 5.990, 4.940. To Persia, Afghanistan, 1230-1330, 9.720, 7.155, 5.990, 4.940. To Saudi-Arabia, Egypt, Lebanon, Syria, North Africa, Trans-Jordan, the Sudan, 2230-2315, 15.130, 11.760; 0000-0045, 17.830, 15.210; 1230-1430, 9.550, 7.120. To East and South Africa, Mauritius, 2300-0015, 17.740, 15.160; 1045-1215, 15.290, 11.830. To Europe, 1400-1500, 9.720, 7.155; 0230-0330, 17.740, 15.190. *English* News Service is listed 1400-1410, 9.720, 7.155; 1930-1945, 15.290, 11.850; 2315-2330, 17.740, 15.160; 0300-0310, 17.740, 15.190; 0830-0840, 17.740, 15.290; 1045-1100, 15.290, 11.830.

*Indo-China (Vietnam)—Radio France-Asie*, 11.83, Saigon, noted with news recently 0500-0515 sign-off; fair level. (Rosenauer, Calif.) When this was compiled, *Radio France-Asie* listed its current channels as 11.78, 11.83, 7.23, 9.524, 9.754. (Gay, Calif.) Although listed 9.754, had been using 9.74 for the two weeks prior to this compilation. Is a "wanderer" lately. (Balbi, Calif.) Listed *English* broadcasts for 1730-1745 on 9.524; 1900-1915, 2030-2045 on 9.800; 0500-0515 on 11.830; 0900-0915 on 11.780; French for 1715-1730 on 9.524, 1815-1845, 1915-1930 on 9.524, and 9.800; 2045-2100, 2345-0000, 0615-0630, 0700-0730,1015-1030 on 9.800.

## GETTING A.V.C. FROM A BIASED DETECTOR

By CHARLES E. COHN

THE advantages of the biased detector family, which includes the plate detector and the infinite impedance detector, have long been recognized. Both types have the major advantage of high input impedance, meaning that unlike the ubiquitous diode, they do not ruin the selectivity of their tuned circuit. In addition, the infinite-impedance detector has less distortion than the diode on highly modulated signals.

Given these major benefits, why is it that this type of detector has not been used more extensively? The answer is that it has always had a major drawback, which was the apparent impossibility of making it produce a signal for automatic volume control. Since a.v.c. is regarded as a necessity in the modern receiver, this has precluded the use of the biased detector in the majority of sets. Attempts have been made to overcome this obstacle, but the arrangements involved have either ruined the inherent selectivity of the system or necessitated unacceptable circuit complication.

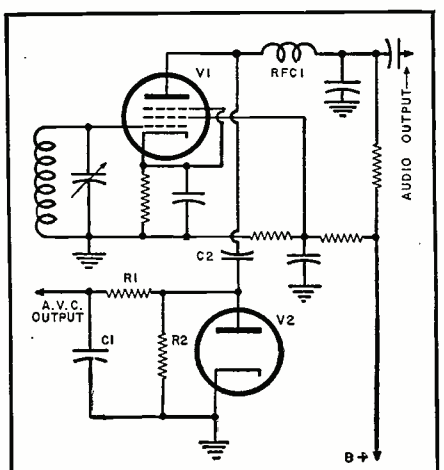
However, the solution to this problem becomes quite simple if we merely remember that the biased detector is nothing but a form of r.f. amplifier. It is a very poor one, to be sure, but it is still an r.f. amplifier. Therefore, there should be r.f. voltage at the plate. In that case, why not use this r.f. voltage to provide a.v.c., instead of bypassing it uselessly to ground, as is usually done?

A circuit for utilizing this idea in the case of a plate detector is shown in the diagram of Fig. 1. It will be noted that the greater part of the circuit is conventional, with a few important additions. The r.f. choke, $RFC_1$, placed between the plate and the audio load resistor, acts as a load impedance for the r.f. component of the detector output. The r.f. voltage developed across $RFC_1$ is capacitively coupled by means of $C_2$ to an ordinary a.v.c. rectifier circuit. The rectifier ($V_2$) diode can be either the thermionic or crystal type. Many plate detectors already have in the position of $RFC_1$ an r.f. choke or resistor bypassed at both ends for the purpose of r.f. filtering. In such a case, this can be used for the r.f. load impedance, with the plate bypass removed. The case of the infinite-impedance detector is also easily handled, the choke $RFC_1$ being placed between plate and "B+", with $C_2$ connected to the plate. If a set already has a biased detector with a separate a.v.c. circuit operating from an r.f. or i.f. plate, an improvement in performance can be realized by transferring the a.v.c. connection to the detector plate, in the manner here described.

Despite the simplicity of this circuit, it is an excellent performer. Not only does it maintain the high input impedance of the detector, but it also gives improved a.v.c. action, due to the amplification of the r.f. signal. In short, this system appears to be the key to effective utilization of the biased detector.

—30—

Fig. 1.




*$R_1$, $R_2$—1 megohm, ½ w. res.*
*$C_1$—.1 μfd., 400 v. cond.*
*$C_2$—.001 μfd., 400 v. cond.*
*$RFC_1$—2.5 mhy. r.f. choke*

(Cushen, N. Z.) Still noted with news 0900 on 11.780.

"Voice of Vietnam" noted on measured 9.619 concluding *English* session 0925, followed by native music to 0930 sign-off. (Russell, Calif.)

*Iran—Radio Tabriz* sent letter and schedules via registered mail; frequency is approximately 6.095; schedule is 2115-2315, 0315-0715, 1015-1315; on Fridays, second session starts 0015. (Pearce, England) *Radio Teheran* noted on 15.100 in parallel with 6.155 with news. (Pearce, England) Seems to have dropped the Russian news period at 1515 (which was jammed) and often closes now around 1508 to 1510 following *English* newscast. (Bellington, N. Y., others) EQB, 9.660, has been logged 0300 relaying the Home Service. (Radio Sweden)

*Israel*—Israeli Forces, 4X4EA, Tel Aviv, heard 1330 with recordings; woman announcer; signs off with bugle sounding "Lights Out" at 1400 (was 1500 earlier this year). Tel Aviv, 9.010A, still has "Voice of Zion" session in *English* daily 1615-1700 closedown; on some days, ends this period with a Hebrew Lesson. (Pearce, England, others) When this was compiled the new 50 kw. transmitter (due to have opened in May) was not yet reported on the air.

*Italy*—Rome's 11.905 and 15.420 channels heard with news 1900-1915; also news 2145 over 17.800, 15.420, 15.120, 11.905, 11.810. (Lucas, N. Y.)

*Japan*—AFRS, Tokyo, has moved its 25-m. channel from 11.800 to 11.815 where it has improved signal, is in the clear now; noted around 0300; sign-off time is 0430. (Rosenauer, Calif.) In the 49-m. band has moved from 6.175 to 6.080, still parallels 4.86, and schedule is unchanged. (Balbi, Calif.) JKJ, 7.285, strong signal early mornings with NHK network programs; JKM2, 9.695, is especially strong mornings (*EST*). (Stein, Calif.)

*Kashmir—The Indian Listener* lists *Radio Kashmir* at 2130-2330 on 989 kc. and 4.860, news daily 2130 (presumably relayed from AIR, Delhi); 0100-0230 on 989 kc. and 7.270; and 0700-1200 on 989 kc. and 4.860, news 1030 (also probably an AIR relay). Location is Srinagar. Has talk in *English* scheduled 0900 on Thursdays.

*Kenya Colony*—Nairobi, 4.855, noted with orchestra music and closing 1400. (Pearce, England) Dary, Kans., has received this data from D. J. L. Garbutt, Capt., R. Signals, Station Commander, Forces Broadcasting Station Number 2, P.O. Box 116, Mackinnon Road, East African Command, Kenya—"Lately we have not been using 7.180 but we are using 6.115 and we are on the air at the following times—2200-0000, 0430-0630, 0900-1400 weekdays; 0900-1500 on Sats., and 0100-1400 on Suns. The language in use is *English* with the exception of two 30-minute periods of Swahili each week."

*Korea (South)*—At the time this was compiled, HLKA, Seoul, was reported back on the air on 7.935; heard weakly 0715-0815; at 0730-0800 organ music,

call at 0800 in Korean, but with call letters in *English*—"HLKA, Seoul." (McPhadden, Calif.)

*Lebanon*—Beirut, 8.035, is scheduled 0000-0115, 0515-0800, and 1000-1600; *English* 1000-1100. (ISWC, London)

*Madagascar — Radio Tananarive,* 9.515, still noted signing on 2233 with "La Marseillaise." (Machwart, Mich.) Sent schedule of 6.172 and 9.515 in French weekdays 2230-0030, 0400-0600, 1000-1430, Sundays 2300 (Sat. *EST*)-0245, 0330-0600, 0915-1430; on 7.374 and 9.693 in Malgache weekdays 2230-0000, 0330-0531, 0900-1200; Sundays 2330 (Sat. *EST*)-0000, 0330-0530, 0900-1200. (Kroll, N. Y.)

*Malaya*—At the time this was written, *Radio Malaya,* Singapore, Blue Network, had just moved from 7.200 to 7.210 where had fair level 0800 with news. (Balbi, Calif.) BFEBS, 15.300, noted recently 1030-1100 with strong signal; announced as coming on 17.755 at 1045 but this one could not be located. (Boice, Conn.) The 9.690 channel noted recently 0600 with BBC news relay. (Ferguson, N. C.)

*Mexico*—Call on short-wave of the 15.205A Mexican is definitely XESC; XEMC is the m.w. call. (Rastorfer, Bellington, N. Y.; Stark, Texas, others)

Received QSL card from XEBT, 9.625; power output listed 10 kw.; m.w. outlet is XEB on 1220 kc. with 100 kw.; QRA is Calle Buen Tone 6, Apartado Postal 7944, Mexico, D. F., Mexico. Also received QSL card from XEXE, 11.900; pictured transmitter and antennas; said "Many thanks for an amiable report." (Kroll, N.Y.)

*Mozambique* — Lourence Marques noted near 4.820 with recordings, chimes and call 1445 followed by news in Portuguese; closed down 1500. Heard over CR7BU, near 4.92, with sponsored *English* program 1515; at 1555 gave closing announcements in *English,* times of re-opening, followed by playing of Ted Lewis' "Good Night Song;" after announcement in Portuguese, closed 1600 with "A Portuguesa." (Pearce, England) The outlet on approximately 9.840 has been good lately in Portuguese programs around 0000-0100. This one noted in Texas to after 0630; the 9.775 channel heard in *English* to after 0630. (Stark) The 11.764 channel still heard with *English* (commercial) programs from 2300 but is much weaker now; 4.92 which should parallel not audible lately. (Cox, Ala.)

*New Caledonia* — Noumea, 6.035, noted signing off 0530 with "La Marseillaise." (Stein, Calif.)

*New Zealand*—Wellington noted recently 0200 on 9.620 and 11.780, good signals in Ky. (Baughn) Heard signing off 0552 on 9.54 and 9.62; weak. (Guentzler, Ohio) ZL4, 15.28, noted recently 1800-1845 with music; seldom audible that early. (Sutton, Ohio)

*Northern Rhodesia*—Lusaka is now on the air daily 1100-1430 and Sundays 0600-0800 on 3.914, 7.220. (Radio Sweden)

*Norway*—Oslo uses 9.61, 11.735, 15.17, and 190 meters daily 2000-2100

for North America in Norwegian with *English* announcements; on Sundays an *English* program called "Norway This Week" extends the broadcast 2100-2115, sometimes to 2120. (Bellington, N. Y., others)

*Outer Mongolia*—Stations noted on 5.265 and 6.390, in dual, around 0700, are believed Ulan-Bator. (Dilg, Calif.)

*Pakistan—Radio Pakistan* noted with news 0110-0120 and 0210-0220 on 17.770; at 1015-1030 on 11.725; also news at dictation speed 1210-1230 on 11.725; recently said that (*announced*) 11.726 is now being used instead of 11.650 but that there is no change in the 41-m. band (possibly 7.010 or 7.263?) for the Overseas Service. (Pearce, England)

*Panama*—HOJA, 9.650, Chitre, "Radio Provincias," noted 2147-2203 sign-off with all-Spanish program. (Patterson, Ga.) The outlet on 9.607 opens 0700. (Stark, Texas) Bellington, N. Y., reports *Radio Programas Continental* on a *new* channel of 5.995A, noted around 2100 to 2359 sign-off with anthem.

*Peru*—OAX4J, Lima, still noted on old channel of 9.330; heard on a Sunday 0014 and again 0215; announces "Radio Colonial" after almost every musical number. OAX4W, 9.405, also Lima, heard 2340 to 0001 when left air abruptly without announcement; this one announces "Radio America, La Voz del Nuevo Mundo." (Machwart, Mich.)

*Philippines*—DZH8, 15.300, Manila, noted 0500-0515 with news. (Rosenauer, Calif.) DZH7 was measured recently as 9.736. (Hutchins, Radio Australia) Manila, 9.500, seems to have Tagalog at 0650 but by 0750 is buried by XEWW, Mexico City, same channel. (Stark, Texas)

*Poland*—Warsaw has *English* for North America 1745 on 11.815, repeated 2315 on 9.570; at 1930 on 11.815, repeated 0030 on 9.570; sent attractive QSL from Polskie Radio, English-Language Transmission, Aleja-Stalina 21, Warsaw, Poland. (Drittler, N. Y., others)

*Portugal*—Lisbon is now on 15.130 (moved from 15.380), noted closing there 0900 and opening again 0915; uses 11.995 at 1230-1530 and 11.958 at 1600-1800. (Pearce, England)

*Portuguese China—Unconfirmed* reports continue on a *new* station "Radio Villa Verde" on 9.500, located at Macau; details lacking.

*Portuguese India*—When this was written, Graham Hutchins, DX Editor, *Radio Australia,* informed me that he believes *Radio Goa* is still using 9.610 instead of 9.260 where it had been reported as heard by (*unconfirmed*) overseas sources.

*Roumania* — Bucharest, 9.250 and 6.210, heard 1500-1530 in French; 1530-1600 in *English.* (Radio Australia)

*Sao Tome*—The 17.677 channel noted on Sundays around 0735-0800 when closes with "A Portuguesa." (Pearce, England) Heard opening 0702; faded out by 0730 in N. C. (Ferguson) The 4.8075 outlet noted 1500

with news in Portuguese, then music; at 1557 gave call, closing announcements in Portuguese, interspersed with guitar music; off 1559 with "A Portuguesa." (Pearce, England)

*South Africa*—ISWC, London, reports Johannesburg, 9.870, has news 1500 prior to closing 1505. Bluman, Israel, in an ISWC bulletin, says that Pretoria, 17.748, is scheduled 0330-0700, 0900-1045 (Sat, and Sun. 0330-1045); also 1100-1505 on 11.940.

QSL card from SABC lists ZRH as call for its 11.937 outlet; power 10 kw. (Oskay, N. J.)

*Southern Rhodesia*—Salisbury, 3.320, heard with dance music 1445; at 1501 said end of transmission "until morning at 7:55" (local time); gave no frequencies; closed with anthem. (Pearce, England)

*Spain—Radio SEU,* Madrid, is now noted around 1630 on about 7.145 with Spanish program. (Pearce, England) *Radio Nacional de Espana,* Madrid, listed 9.369, has been varying in frequency a great deal; noted low as 9.335. (Wilson, Ill., others)

*Sweden* — SBT, 15.155, Stockholm, noted with much improved signal in "Sweden Today" (*English*) 2000-2015. (Ferguson) Currently, Stockholm lists *active* channels as SBT, 15.155; SBP, 11.705; SDB2, 10.780; SBO, 6.065. (Kroll, N. Y.)

*Syria*—Damascus calling Europe noted 1630-1730 in *English;* 1730-1830 closedown in French; frequency is 11.915. (Pearce, England) Heard in USA with some QRM from Budapest, 11.910, relaying *Radio Moscow.* Measured by Oskay, N. J., as 11.913. An-

# A LOW-COST SINGLE-TUBE AM RECEIVER

***This unique circuit makes use of a special tube property which manifests itself when tube is operated below normal voltages.***

**By CHARLES ERWIN COHN**

DESPITE the vast amount of research that has been done on vacuum tubes, one field seems to have been neglected, *i.e.*, an investigation of the properties of tubes with lower-than-normal electrode voltages. During such an investigation on a small scale, the author developed the circuit shown in the diagram and it has proven to be quite efficient.

The circuit voltages shown have been determined experimentally to be optimum and these values should be adopted. The "A" battery, of course, is made up of two dry cells. Either flashlight cells or the larger "A" batteries can be used, the latter living longer and giving more consistent performance. The "A" drain is about .1 ampere. At this heater voltage, the only perceptible glow is the one seen at the top of the tube. The tube takes a couple of minutes to come to operating temperature after the heater is switched on.

The optimum "B" voltage is 13-15 volts. This can be obtained, for example, from two 7½ volt "C" batteries or three 4½ volt "C" batteries. The "B" current drain is quite low, being about 20 microamperes with no signal or weak signal. Strong signals increase this drain to about 100 microamperes.

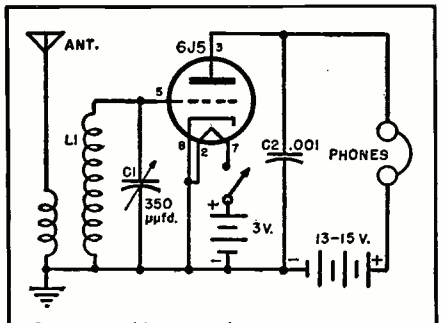
The tuned circuit, $L_1C_1$, is made up of a standard broadcast antenna coil and a 350 $\mu\mu$fd. variable condenser. Be sure to get the best coil you can afford as the quality of the coil is the factor which determines the selectivity of this receiver. Shielded coils should be avoided, however, since the shields reduce the efficiency. Any of the standard crystal set tuners described in the literature can also be used. The phone bypass, $C_2$, is not absolutely necessary but does provide some increase in volume.

As yet I have not been able to figure out a complete and logical explanation as to why this circuit works as it does but it seems to result from some grid-blocking action. However, explainable or not, the performance is excellent. With a 15 foot indoor antenna I can receive and separate six of the major Chicago stations with good headphone volume.

The selectivity characteristics of this set seem to be similar to those of the plate detector which makes it more sensitive and selective than most nonregenerative one-tubers. The circuit is not at all tricky and provides a good quality of reproduction.

It is an excellent first set for the beginner or a nice unit for the crystal set fan. The application of regeneration might improve this set even further. Since identical results were obtained from two 6J5GT's of different makes, this circuit doesn't seem to be critical as to tube choice. —30—

**Circuit diagram of a compact AM radio which provides unusually good reception.**




*$C_1$—350 $\mu\mu$fd. var. cond.*
*$C_2$—.001 $\mu$fd., 400 v. cond.*
*$L_1$—Standard b.c. ant. coil*
*1—3 v. "A" battery (two 1½ v. dry cells in series)*
*1—13-15 v. "C" battery*
*1—6J5 tube*

nounces "This is the S.B.S., the Syrian Broadcasting Service."

Current schedules of *Radio Damascus* are daily on 6.167 at 2330-0200, 0630-0800, 1100-1630; on 9.555 at 2330-0200, 0430-0830, 1100-1300, 1315-1415, 1430-1600; on 11.915 for Europe in *English* 1630-1730, and in French 1730-1830 sign-off; on 17.865 at 0945-1045 (may be Sundays *only*); output of these channels is 20 kw.; there also is a 7.5 kw. transmitter used on 15.395 at 0430-0640 on Sundays *only* for programs in *English* and French. (Radio Sweden)

*Tahiti—Radio Tahiti,* 6.135, Papeete, continues on schedule of 2300-0130. (Bellington, N. Y., others)

*Taiwan* — Recently received verie from "The Voice of Free China Calling the World, Taiwan Broadcasting Station Operated by the Broadcasting Corporation of China." The front of Taipeh's card has a Great Circle Map of the world centered on Taiwan. It is printed in blue, yellow, and white. Back of card had this data—BED6, 11.735; BED7, 7.130; BED29, 6.095; BED2, 670 kc.; BED3, 15.235, and BED4, 11.725. (Guentzler, Ohio; Stein, Calif.)

*Tangiers — Radio Sweden* reports *Pan-American Radio* logged on a *new* channel of 7.520 or 7.525 signing off 1700; however, *WRH Bulletin* lists this one currently as on 7.400 at 0700-1100, 1500-1900.

*Trans-Jordan*—The Hashimite Jordan Broadcasting Service, Ramallah, on 7.110, is scheduled daily 0000-0100 in Arabic; 0600-0630 in *English;* 0630-0730 in Arabic; 1000-1100 in *English,* and 1100-1530 in Arabic. (Radio Sweden)

*Turkey*—TAT, 9.515, Ankara, continues with strong signal in North American Service (*English*) 1815-1900; TAU, 15.165, heard 1430-1445 with Arabic music; 1500-1545 in *English* (some days to 1600). (Whitman, Ill., others)

*USI* — Menado, Celebes, noted on 9.840 with music 0812; identified in Indonesian 0815; *no English noted.* (Cox, Ala.)

*USSR* — Soviets noted 1657 with chorus singing on 7.245, 11.755, 11.78, then left air. (Bellington, N. Y.) Tiflis, 5.040, Georgia, noted 0900-1605 sign-off. Kiev, Ukraine, noted on 9.665 at 1215 in Sweden. Asjhabad, Turkmenian, 6.180, noted 1200-1300 with native program and later with relay from Moscow. (*NATTUGGLAN,* Sweden) Stalinabad on 7.200 begins its broadcast 2000 with relay from *Radio Moscow,* but has own program *after* 2030. (Radio Sweden)

*Vatican*—HVJ now noted on 15.120 with news in *English* 1000. (Pearce, England)

* * *

### Press Time Flashes

Dilg, Calif., notes an AIR outlet, location not definite, on 7.170A; seems to sign on 0815; identifies as "AIR" at 0900; has CWQRM.

A *clandestine* station, probably Bulgarian, is heard daily 1300-1400 on 6.300A. *Radio de la Grece Libre* is heard in French 1200-1212 on 9.455.

(Radio Sweden) The *Yugoslav Station* is being heard on approximately 6.280 at 1700. (Radio Australia)

*WRH* Bulletin says the Western Service (Home Service) of *Radio Ceylon* has begun relay of the Commercial Service programs on 6.075; scheduled there 2030-0030, 0130-0330, 0600-1230; the Commercial Service programs are relayed 0145-0030, 0130-0230.

The Home Service of the Israel Broadcasting Service (Kol Israel) is radiated on 6.830 and from 1245 (Mon., Fri. 1200, Wed. 1300) to 1430 on an additional frequency of 9.000 (actually 9.010A); news in Hebrew 2300, 0530, 1230, 1425; in *English* 0600, 1415; in Arabic 0000, 0615, 1115; in French 0700. Kol Israel also broadcasts a special program for new immigrants daily on 9.000 at 1100 in Yiddish, at 1120 in Juede-Spanish, and at 1140 in French. A program for overseas listeners called "The Voice of Zion" can be heard on 9.000 at 1515-1600 in French and 1615-1700 (sign-off) in *English*. (*WRH Bulletin*)

Dilg, Calif., flashes that the 4.775A South Korean outlet —believed Pusan—relays "Voice of America" program in Korean language 0745; that outlet is now parallel with 7.935, believed Seoul back on the air, signing off 0830; last 30 minutes is news in Korean at dictation speed; both transmitters have fairly good signals in Calif. A station heard by Dilg mornings (*EST*) on 4.285A is believed to be North Korea.

*WRH Bulletin* says "A station with callsign ZCQ on 5.770 is operated by the Seychelles Government; schedule not yet known; if anyone can favor us with further details about this station, it will be much appreciated." (Seychelles is a group of British islands in the Indian ocean; 153 square miles; capital is listed Victoria.—KRB)

A station heard with weak signal on 8.800A may be Indo-China; signs off 0830. One heard around 6.270A at 0800, weak to fair level, may be *Radio Kashmir*. A Communist Chinese outlet, location unknown, is noted on 6.650A at 0630 and later. (Dilg, Calif.)

*Radio International Red Cross* noted testing on 7.210 in several languages—including *English*—at 1700; reports requested to International Red Cross, Geneva, Switzerland.

*Radio Australia* reports Mauritius now on 24.75 m. (approximately 12.120) with general programs weekdays 2200-0015, 0300-0430, 0930-1230; Sundays 0115-0300, 0930-1230; Indo-Urasian programs weekdays 0800-0930, Sundays 0300-0345 (Thurs. 0430-0515), and "other" programs for Thursday 0730 to closedown 1230.

By this time, *Radio France-Asie,* Saigon, Indo-China (Vietnam), should have effected a series of "French by Radio" lessons on Tuesdays, Fridays 0515 on 11.83 and 0800 on 11.780; "guides" for the lessons are available on request (preferably via airmail) to the station. (Radio Australia) At press time, Stark, Texas, noted *RFA* signing on with French and *English* identification 0800 on 11.830.

At press time, I learned direct from Korea that HLKA, 800 kc., 500 watts, and HLKG, 4.7775, 300 watts, are the only two stations operating in the Pusan area of South Korea; scheduled 1530-1730, 2100-2330, 0300-0530; *Radio Korea* has *no English* programs. However, West Coast listeners report South Korea is heard lately on 7.933 (old Seoul channel for HLKA) in parallel with 4.7775A to 0830 sign-off.

At the time this was compiled, *Radio Damascus, Syria,* had just concluded satisfactory tests to North America on 11.915 (measured 11.913 by Oskay, N. J.) and 15.395 (measured 15.3636 by Oskay, N. J.) at 1900-2000 and on (announced) 15.395 for South America at 2000-2100. *May soon have regular service to the Americas.* During tests, the 19-m. channel was best, in the clear except for light CWQRM; the 25-m. outlet was good strength but had bad CWQRM and some QRM from Budapest on 11.910. Reports are desired by the Directorate-General, Syrian Broadcasting Service, Damascus, Syria.

*Radio Teheran* seems to have "reinstated" the Russian news period 1515-1530 sign-off on 15.100; *English* still at 1500. (Ferguson, N. C.; Bellington, N. Y.)

*Radio Australia* says that Samoa (probably Western Samoa) is to test shortly on 3.41 and 6.03.

"Choice of Vietnam," Saigon, Indo-China (Vietnam), has moved from 7.105 to 7.090; noted parallel with 9.620 in

English 0830, may close 0900 now in-
Brazil,
of listed
o Guapore;
Brazilian outlet
stead of fourth
QRA is c/o Go-
rio do Guapore, Porto
rio do Guapore, Brazil;
strong QRM from HJCQ,
channel, around 1900. To be on air soon is *Radio Relogio Federal* in Niteroi, Brazil, 4.905, with call ZYZ21 and 1 kw. power; will transmit *only* correct official time, every minute, and short commercials in Portuguese; on the air 24 hours a day; office QRA is Avenida Presidente Vargas, 417-A, 22 Andar, Rio de Janeiro, Brazil. ZYK21 is call of *Radio Tamandare,* 3.265, Recife. (Serrano, Brazil)

At press time, Dilg, Calif., had just noted that *Radio Peking,* for the first time, was giving POW messages during the "late" (0830-0900) *English* period over 11.69A and 15.06A.

The "Mailbag" program of *Radio Ankara,* Turkey, on Sundays, now seems to be 1530 for Europe over 15.165 and 9.465; for North America on 9.515 around 1845; is *English.* (Ferguson, N. C.)

4VEH, Haiti, is now verifying with a nice QSL card; uses 9.75 at 0600-1830 and from 1830 is on 9.756.

*WRH Bulletin* says a *new* "powerful" short-wave transmitter at Seville, Spain, will begin test transmissions in the near future.

In a recent newscast, *Radio Australia* said a *new* high-frequency transmitter is to be built at Suva, Fiji Islands, 500 watts, to be ready next year (1952). (Richards, Sask.)

An Indonesian outlet on 4.840, heard mornings (*EST*), is believed to be Denpasar, Island of Bali. (Dilg, Calif.) Rosenauer, Calif., reports a *new* Djakarta, Indonesia, outlet on 6.135 around 0630-0800; all-Indonesian programs; good signal.

Djeddah, Saudi-Arabia, noted with fair level 2300-2350A on 11.850. (Lucas, N. Y.)

4V2S, 5.957, Port-au-Prince, Haiti, has *English* Mon., Wed., Fri., around 2130-2150. (Russell, Calif.) Managua, 6.055, Nicaragua, by now should have *English* at 2230-2400. (Callarman, Ore.)

Direct from Tokyo, NHK confirms that JK14 has moved from 11.815 to 11.800. (Russell, Calif.)

Bucharest, Roumania, noted 1535-1555 with music on 6.215. (Rodger, Scotland)

*Radio Sweden* reports Belgrade, Yugoslavia, has dropped 9.505 and is using only 6.100 now. *WRH Bulletin* gives *new* schedule as 2215-2315, 0000-0045, 0430-1630.

* * *

**Acknowledgement**

Thanks, fellows, for the continued fine cooperation. As better reception comes along this autumn, keep those FB reports coming to 948 Stewartstown Road, Morgantown, West Virginia, USA. . . . . KRB.

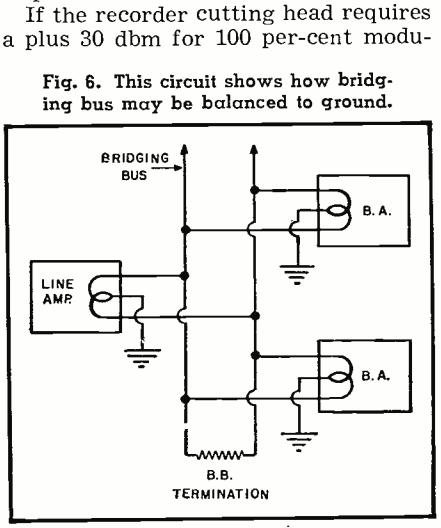
bus is shown in the diagram, the bus may be operated with a ground on one side, providing the inputs of the various devices patched across the bus are designed to work in such a manner. As a rule, large installations use an ungrounded bridging bus and *symmetrical* bridging input circuits to increase the flexibility of the system. If desired, the bridging bus may be balanced to ground as shown in Fig. 6. However, this again complicates the situation as each piece of equipment paralleled across the bus must have a symmetrical input or be balanced to ground. Circuits balanced to ground reduce the flexibility of the system and increase the possibility of the wrong type input circuit being patched across the bus, which may short out the bus completely or introduce an unbalance, resulting in a high noise level.

Below the monitor low-pass filter is shown a second monitor amplifier feeding additional monitor speakers. This monitor network may be set up with a series of switches and terminating resistors similar to a selective paging system, as the speakers are only used for general monitoring and cueing. The frequency response of this monitor amplifier is set for a characteristic that is acceptable for all purposes.

Bridging amplifier number 1 has a twofold purpose; first to isolate the recording equalizer for the disc recorder, and second to compensate for the insertion loss of the equalizer. The gain of the bridging amplifier when working from the bus must be equal to the insertion loss of the equalizer, which is 18 db for this problem. However, the output stage of the bridging amplifier must have sufficient power output to raise the signal level high enough to overcome the loss of the equalizer. As the bridging bus level is plus 4 dbm, the output level of the bridging amplifier will be a plus 22 dbm. Generally, bridging amplifiers will produce a power output in excess of plus 30 dbm.

If the recorder cutting head requires a plus 30 dbm for 100 per-cent modu-

**Fig. 6. This circuit shows how bridging bus may be balanced to ground.**



...ates the ...re a gain of ...d NARTB re... ...c is to be used, the ... will require a mini... ... output of 40 watts. It ...d be capable of producing this ... at the higher frequencies. As ...s leaves no safety factor, an ampli... fier of at least 60 watts' power output should be used.

Shown near the cutting head is a pickup unit for making playbacks from the recorder. This is a standard pickup with an equalizer using a characteristic to compensate for the recording characteristic. The playback is patched directly into the main monitor amplifier, thus avoiding the compressor, filters, etc.

Bridging amplifier number 2 is also followed by an equalizer, which compensates for the light modulator characteristics in the film recorder. This equalizer may have one of two characteristics, one with a rise at the high end and the other with a drop at the high end, depending on the characteristics of the modulator unit. The level at the recorder input will vary from a plus 9 dbm to a plus 18 dbm, again depending on the light modulator design.

At the right of the film recorder is shown a "photocell amplifier," commonly known as a "P.E.C." monitor. This monitoring system is incorporated in the film recorder and consists of a photocell placed at the rear of the film where it picks up the modulations of the light valve directly through the film, or in the case of the galvanometer, the photocell picks up the modulations by a system of mirrors before it reaches the film.

The output of the photocell is amplified by a preamplifier which terminates at the monitor relay. The signal is then picked up by the monitor amplifier and passed on to the mixer monitor loudspeaker. The P.E.C. preamplifier is generally equalized for a response that will be comparable to that taken from the bridging bus.

Below bridging amplifier 2 is a "noise-reduction-amplifier," (N.R.A.) used in conjunction with the film recorder. This amplifier supplies a variable d.c. bias to the light modulator for reducing the exposure on the film during periods of low or no modulation. The gain of this amplifier will vary depending on the output level of the photocell.

Among the many problems of the sound engineer in the early days of film recording was the problem of "background noise." This was due (and still is) to small particles of dirt, scratches, and small pin point specks in the sound track. This problem indicated that some system of reducing the noise during periods of low or no modulation should be devised, and resulted in the development of the noise-reduction-amplifier.

Two methods of recording on film are in use at the present time. They are the variable area and the variable density systems. In the variable area

system, the exposure of the sound track is held constant and the *area* of exposure varied. In the variable density system, the area is held constant and the *exposure* varied. The principles of noise reduction to be discussed are applicable to both methods of film recording.

Several different types of sound tracks are illustrated on page 70. The two we are most concerned with are the "basic" variable area at *A* and the variable density at *B*. These sound tracks are shown without noise reduction.

An elementary schematic of a noise reduction amplifier for variable density recording is shown in Fig. 7A. At the left, the signal from the bridging bus is applied to a bridging amplifier, which drives the light valve. The noise reduction amplifier below receives the signal at the same instant, which it rectifies to d.c. and uses to control the opening and closing of the light valve during periods of low or no modulation, thus reducing the exposure of the film. A centertapped transformer matches the low impedance of the light valve "ribbons" to the output impedance of the bridging amplifier. The resistor *R* is equal to the light valve ribbon resistance and is connected in series with one side of the light valve to balance the circuit and reduce interaction between the audio signal and the bias current.

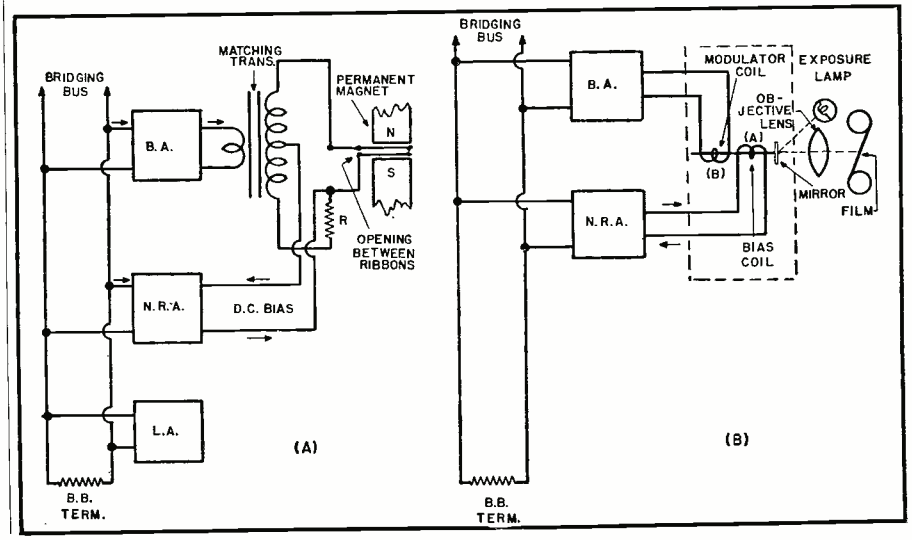
During periods of no modulation, a fixed d.c. bias is applied to the light modulator ribbons to reduce their opening to some predetermined amount. The rectified signal voltage is polarized to cancel a portion of this fixed bias, relative to the amplitude of the applied audio signal. This causes the light modulator to open wider, to accommodate a greater signal amplitude. In the rectifier circuit is a resistance-capacity filter for removing the ripple components of the rectified signal voltage. The time constant of the filter circuit will control the opening and closing time of the noise reduction system.

T... ductio... the ini... distortio... squaring ... noise reduc... opening time ... as it may cau... the reproduction ... ing time be made ... clip the last few m... closing time is too ... ground noise will be in... develop a "hush-hush" s... particularly noticeable w... density recording. The atta... both the variable area and de... tems is on order of 18 to 32 ... milliseconds at 1000 cps for an 80% opening of the light modulator. The closing time at 100 cps for variable density system will be approximately 50 milliseconds, and 250 milliseconds for the variable area types.

The circuit of the N.R.A. in Fig. 7B is used with variable area recording, and is similar to that described for variable density except that it supplies the bias voltage to coil *A* in the recording galvanometer. The second coil, *B*, carries only the audio signal which actuates the recording mirror in the galvanometer. In some type variable area recorders, the N.R.A. bias voltage is applied to a pair of "shutters" placed in the path of the optical system in such a manner that they reduce the area of exposure during the periods of low or no modulation, thus obtaining a reduction in exposure of the film. When shutters are employed, the bias coil in the galvanometer is not used.

Figs. 8A and 8B are plots of the opening and closing times for a typical variable area noise reduction system using galvanometer bias. It will be seen why it is so necessary for the noise reduction system to get out of the way of the modulation to prevent clipping of the initial and closing modulations. However, regardless of the design or how the N.R.A. is adjusted, some clipping of the initial and closing modulations will take place.

**Fig. 7. (A) Elementary schematic of noise reduction amplifier for variable density recording. (B) Noise reduction amplifier for use in variable area recording.**



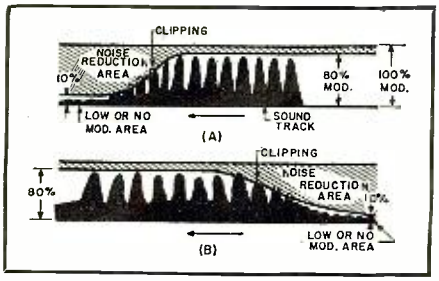



**Fig. 8. Plots of the opening (A) and closing (B) times for a variable area noise reduction system using galvanometer bias.**

When the N.R.A. is initially set up, the amount of fixed bias is adjusted to bring the light valve ribbons or galvanometer to about 10 per-cent of full track with no modulation. The gain of the N.R.A. is then set to cancel the fixed bias when the track is about 80 per-cent modulated.

Because of the time lag in noise reduction systems, a "margin" of safety must be included in the initial adjustment. After the fixed bias and the gain of the N.R.A. have been set, the gain of the N.R.A. is increased slightly to operate the noise reduction element a greater amount than required by the signal, or given a "lead." The amount of margin will vary with the type system and program material. Generally, a margin of 2 to 3 db is used with variable area systems. For variable density, the margin for dialogue will approximate 3 db and for music and sound effects, 4 to 6 db. The frequency response of the N.R.A. should be uniform over the recording range.

The purpose of the margin setting is to prevent the clipping of the signal peaks thus causing distortion of the more staccato tones. During periods of no modulation in the variable density system, the light valve ribbons, being about 10 per-cent open, result in a light grey exposure of the film. This exposure is often referred to as "silent sound track." In the variable area system during periods of no modulation, a thin line of exposure approximately one-half mil in width appears and is known as the "bias line." This line of exposure is created by the setting of the fixed bias current, which allows a small amount of light to reach the film. The average signal-to-noise ratio is 40 db for 35 mm film and 38 db for 16 mm film.

Phasing is quite important for the proper operation of a film noise reduction system, therefore, manufacturers of complete film recording systems mark one terminal of the input and output circuits with a plus-minus mark to indicate that for an instantaneous voltage of a given polarity at the input, a corresponding voltage will result at the output terminals. If the recorder is to be used with existing equipment, the proper phasing between the N.R.A. and the light modulator will have to be determined by experiment. Complete phasing of the system from microphone to the light modulator is recommended to facilitate substitution of equipment.

Above the bridging amplifier No. 2 is bridging amplifier number 3, which is used to transmit signals from the bridging bus to a remote point. At the output of the bridging amplifier is the line "isolation" pad described in Part 6.

The magnetic recorder input is patched directly across the bus and requires no bridging amplifier, as the majority of such recorders are supplied with a bridging input. A relay operated from the mixer console is connected in the output of the recorder playback circuit for switching to either the monitor system or through the mixer, for re-recording purposes. The output level from the average magnetic recorder is zero dbm.

Two vu meters are provided, one at the mixer console for monitoring the levels, and a second at the bridging bus for "lining up" the channel. It is the practice in large installations to check the noise reduction system twice daily, and the levels at the disc and magnetic recorder before each recording session.

It has been assumed in the block diagram that the bridging bus level is plus 4 dbm. A 1000 cps signal of approximately minus 20 dbm is applied to the mixer through one of the pots and adjusted until the level indicated by the vu meters indicates a plus 4 dbm or, if the meter scale is calibrated in percentage modulation, at the 100 percent mark. (See November 1950 RADIO & TELEVISION NEWS, "Power Level and Volume Indicator Meters.")

After the bus level has been set, the levels are read at the recorders. If any variation in level is noted, the gain of the various amplifiers driving the recorders is adjusted. It is necessary that such measurements be made at the same frequency of 1000 cps each time, to avoid errors due to equalizer and filter characteristics.

With the signal still on the bridging bus, the level at the output of the monitoring amplifier is measured by patching a vu meter across its output. The level of each monitoring system is then adjusted for the same output within plus-minus 0.50 db. It is quite important that the monitoring level be measured daily if *quality* checks are to be made from day to day. Setting the levels to within 0.50 db will allow the monitoring system to be switched from one source to another during takes without disturbing the level. The monitor amplifier feeding the auxiliary speakers is not critical and is set for the best listening level.

A talkback system between the mixer console and the recording department should also be provided. This may be made a part of the auxiliary monitoring system, utilizing the speakers only; however, a separate system is desirable. The talkback system should be so arranged that "selective talking" is provided; that is, when the mixer talks to the recording department the talkback speaker to the stage is off, and *vice versa*. This is generally accomplished by the use of key switches and a group of relays.

*(To be continued)*

## Mac's Service Shop

(Continued from page 66)

certainly makes you want something to help unscramble them."

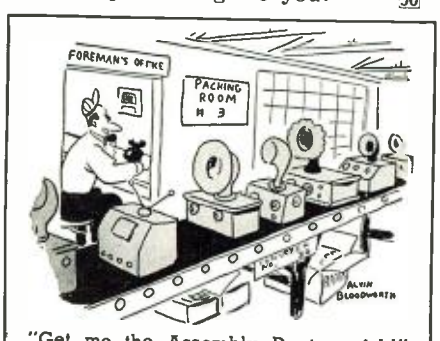
"What produces DX like that, anyway?" Barney asked.

"I don't know," Mac readily admitted. "As a ham, you are, of course, familiar with the theory that clouds of ionization frequently appear about fifty miles above the earth and reflect back to earth high frequency signals that ordinarily would never be returned. This 'Sporadic-E Ionization' as it is called may happen any time, but it occurs most frequently during May, June, and July. That could explain my experience except for one thing: that the signals from Texas seemed to be arriving from either the southeast or northwest—exactly opposed to the southwest direction in which Texas lies from here.

"Some of my friends," he went on slowly, "who know a lot more about such things than I do, tell me that there is a growing theory that under certain favorable circumstances a current of air under exactly the right conditions of moisture, barometric pressure, and temperature can actually act as a huge waveguide and 'pipe' a high frequency signal from one part of the earth to another. Maybe that is the answer. At least it would permit the signal path to have a bend in it, as that one from Houston seemed to have.

"At any rate," he continued, "I'm going to do all the 'observing' I can every time one of these openings occurs. Hams have been doing that for years, but their numbers are very small compared to the millions looking at TV screens every day. If only a small percentage of these TV fans become interested in noting some of the factors that affect abnormal DX signals, perhaps we can learn enough about them to enable us to control these conditions."

"Could be," Barney agreed with a shrug. "Today's miracle is tomorrow's normal occurrence. I keep remembering that at one time they gave the whole spectrum above two hundred meters to the hams because they thought these frequencies would never be of any practical value—the Indian givers! Next time the TV channels get hot, just let Old Barney know, and he will be right in there waving a folded dipole alongside you!" —30—




"Get me the Assembly Dept., quick!"

# NEW TV PRODUCTS on the Market

## PLASTIC PROTECTION

*Krylon, Inc.* of Philadelphia, Pa. is currently packaging "Krylon," an acrylic plastic, under a special label for use in the television service field.

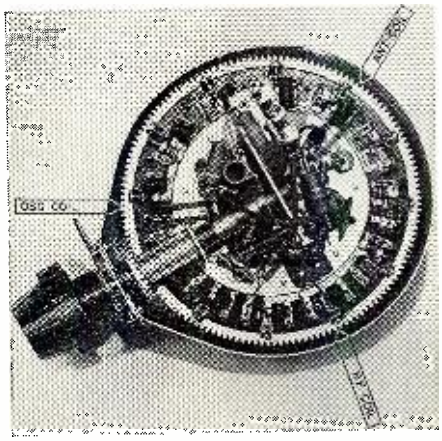
The material, which is sprayed by fingertip control from a pressurized can, forms a durable, transparent coating which protects television antennas against rust, corrosion, and pitting, and eliminates corona from high voltage connections.

The company also suggests the use of this plastic on all metal antenna parts which might rust and discolor outside paints.

## NEW TV TUNER

*Kingston Products Corporation* of Kokomo, Indiana has announced the development of a new type of television tuner which differs mechanically from existing tuners.

While classified as a turret type tuner, the new unit retains the economy features of the switch type tuner. The basic mechanical design permits



the oscillator to be isolated from the r.f. and antenna circuits in order to reduce oscillator radiation.

The television switch has twelve indexed positions with continuous rotation, each index having its individual preset coils for the channel corresponding to the position. The tube complement includes a 12AT7 dual-triode used as a converter oscillator and a 6CB6 employed as an r.f. amplifier. The output i.f. transformer is included in the tuner which is completely shielded in a drawn metal case.

Manufacturers may obtain full details on this new tuner by writing the company.

## SQUARE WAVE GENERATOR

*Electro-Mechanical Research, Inc.* of Ridgefield, Conn. has developed a new square wave generator which is designed for testing audio, video, and r.f. amplifiers and networks.

The Model 43A includes a wide-range variable frequency multivibrator which drives a two-stage clipper circuit to produce negative-going square

waves. No external driving voltage is required although a synchronizing input circuit and buffer amplifier are provided to allow the generator to be operated synchronously with other equipment. A separate output sync signal is also available for triggering purposes. It covers a frequency range of from 6 cycles to 1 mc. with the self-contained generator.

For full details on the Model 43A, write direct to the company.

## COLOR RECEIVER

*Chromatic Television Laboratories, Inc.*, 1501 Broadway, New York 18, New York has announced the development of an automatic black and white color television receiver which incorporates a 16" or 21" direct view tricolor "Chromatron" picture tube.

According to the company, the receiver will automatically tune for reception of either color television transmissions based on the *CBS* type color field sequential standards or standard black and white transmissions.

The heart of the new receiver is the tri-color "Chromatron" picture tube which features a single gun, standard-shape cathode-ray tube containing a color grid capable of displaying television pictures or other electronic signals in color.

The company claims that the new tube will work in conjunction with any known color television system but that its use in color receivers operating on the *CBS* standard is significant inasmuch as it eliminates the need for the color disc or drum.

## TV TUBE RECOVERY

*H & A TV Picture Tube Co.*, 3547 West Montrose Avenue, Chicago 18, Illinois is now offering a new service to television technicians on a nationwide basis.

The new service involves the electrical repair of burned out picture tubes. According to the company, approximately 65% of the tubes formerly discarded as "dead" can be recovered and put into operation. The repaired

tube carries with it a guarantee that the tube life will meet RTMA specifications.

Prices vary according to the size of the tube being serviced. The company will supply cost information and other data on request.

### FRINGE AREA TV

*Mattison Television and Radio Corporation,* 893 Broadway, New York 3, New York has recently introduced a

new television chassis which has been designed especially for super-fringe areas.

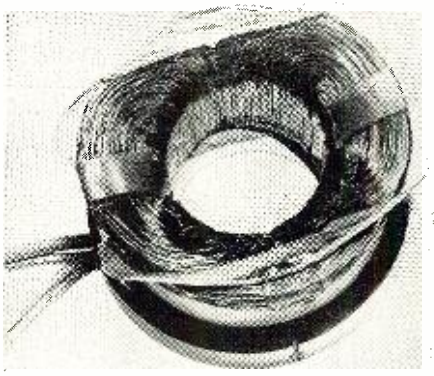
Known as the "Super Rocket Super Rural Chassis," the new set features a built-in booster which is designed to increase the signal strength on Channels 2 to 13 by a ratio of up to 10:1 without increasing noise or reducing the picture quality.

This chassis is available either with or without a cabinet and full details will be supplied by the company on request.

### COSINE YOKES

*Merit Transformer Corporation,* 4427 N. Clark Street, Chicago, Illinois is currently in production on two new cosine yokes, the MDF-70 and the MDF-30.

The MDF-70 is a newly designed unit with distributed winding for edge-to-



edge picture focus. A high efficiency ferrite core permits its use with all 70 degree picture tubes up to and including 24" sizes. It it recommended for use with the HVO-6 and HVO-7 ferrite core flybacks.

The MDF-30 has the same design features as the MDF-70 but has high

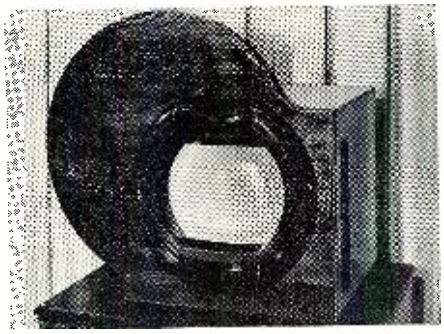
horizontal and low vertical inductance which permits its use with the HVO-8 air core flyback in direct drive systems.

Both yokes are equipped with networks and leads.

### CROSLEY COLOR CONVERTER

*The Crosley Division* of *Avco Manufacturing Corporation* has recently demonstrated a color converter designed to be used with the company's standard television receivers.

The new unit is housed in a mahog-



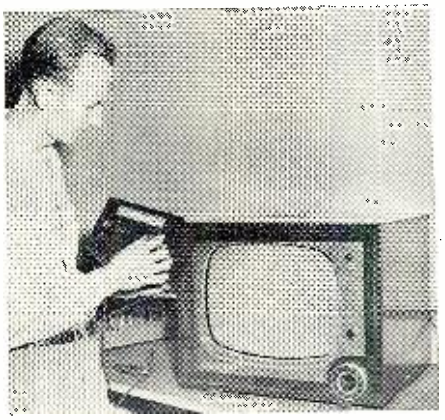
any finished cabinet and employs a 10" picture tube. The picture is enlarged by a magnifier to about the size of those seen on a 12½" tube. The color wheel is 22½" in diameter and is constructed of laminated plastic. Sound for the color reception is received through the master set.

Production of these converter units will be started when public demand and program schedules warrant it.

### TARZIAN U.H.F. TRANSLATOR

The Tuner Division of *Sarkes Tarzian, Inc.,* Bloomington, Indiana has developed a u.h.f. translator which is adaptable to any set now in use.

The full-band UT1 tuning unit does not interfere with the v.h.f. channels. It is self-powered and is easily connected to the receiving set by means



of a piece of 300 ohm line. The translator covers the full band from 460 to 900 mc. (Channels 14 to 52).

### 21" TRI-COLOR TUBE

*Radio Corporation of America* recently demonstrated a 21" tri-color picture tube at a technical symposium held in New York for 231 radio and television manufacturers.

The new tube was used to back up *RCA's* contention that there are no external limiting factors to picture size

in the company's compatible, all-electronic color TV system.

The company also announced the availability of samples of the 16" basic developmental model of the tri-color tube and kits of associated circuit components and parts for use by *RCA*-licensed manufacturers in laboratory work on color tubes and receivers.

### COLOR CONVERTER KIT

*Celomat Corporation,* 521 W. 23 St., New York, New York is marketing a color converter kit which will permit the reception of *CBS* color television pictures.

Known as the "Vue Scope," the kit contains parts and instructions for home assembly. A deluxe kit which will produce a 12½" picture will also be available shortly.

The converter kit, which is intended for use with receivers which have been adapted to the *CBS* system, contains a color disc, a manual synchronizing unit, a fractional horsepower motor, assembly brackets, and complete instructions for assembling the unit.

### TV BAR GENERATOR

*Superior Instruments Co.,* 227 Fulton Street, New York 7, New York is currently marketing a television bar generator for servicing applications.

According to the company, it is only necessary to connect the bar generator to the antenna post of any TV receiver, plug the line cord into an a.c. outlet,


and throw the switch. The receiver under test will have a stable vertical or horizontal pattern projected on the screen which can be used for servicing when no station pattern is on the air.

The new unit is supplied with shielded leads and detailed operating instructions.

### TV ROTATOR

*Trio Manufacturing Company,* Griggsville, Illinois has just put a new television rotator on the market which is capable of supporting the heaviest TV arrays, according to the company.

Designed for trouble-free and dependable operation, the rotator utilizes two heavy-duty 24 volt motors, one for clockwise and the other for counter-clockwise rotation. This feature prevents motor burnout even if the rotator is left on accidentally. A positive acting electrical stop at each end of the 360 degree turn eliminates lead damage.

Other features of the new rotator

include a cast aluminum mast holder and a 11/16 strut shaft that withstands 4500 pounds bending movement, an automatic electromechanical brake that reduces coasting to a minimum, an all-aluminum case, numbered terminal boards on rotator and indicator, and ball bearing end thrusts on the shafts. The unit may also be used for 10, 6, and 2 meter amateur antennas.

### U.H.F. TRANSLATOR

*General Electric Company,* Syracuse, New York has demonstrated its new u.h.f. translator for the FCC.

The Model UHF 101 provides continuous tuning, covering the u.h.f band

from 475 to 890 mc. The translator is housed in a compact wood cabinet constructed of mahogany veneers. The dial scale is in a semi-circular design. Below the megacycle numerals is a logging scale for added convenience in tuning. One of the features of this unit is a traveling dial light which automatically spot-illuminates each numeral on the dial face when the station pointer is rotated and can be turned off when the set is in operation.

### COLOR TV TRANSFORMERS

*RAM Electronics Sales Company,* South Buckhout Street, Irvington-on-Hudson, New York has begun production of color television flyback transformers and deflection yokes. These new components are designed and constructed in conformance with the latest *CBS* color specifications and come complete with all circuit and conversion information.

The new units are designed for both original installation and as replacement units for set conversion.

### INDOOR ANTENNA

*Spirling Products Co.,* 62 Grand Street, New York 13, New York is now marketing two new indoor antennas, the "Super-Phantom" and the "Phantom-Tenna".

Both of these units feature an impedance matching stub which matches the 300 ohm impedance of the antenna to any TV set and an "Adjusta-Knob" which permits fine tuning of the antenna by means of a fingertip control.

The "Super-Phantom" (Model TV

503) has telescopic dipoles and the "Phantom-Tenna" (Model TV-501) has fixed dipoles. Information on either or both of these units is available from the company.

### WESTINGHOUSE CONVERTER

The Television-Radio Division of *Westinghouse Electric Corporation* recently demonstrated a u.h.f. converter for use with the company's standard television receivers.

The converter is housed in a mahogany finished wood cabinet and in-

corporates a continuous tuner which provides for reception of any u.h.f. telecast in any area without additional modification while permitting reception of all standard channels.

The unit has a horizontally-mounted u.h.f. dial and a three-position switch for converting to u.h.f reception. The circuit is a single superheterodyne circuit operating into a 44 mc. i.f. system.

—30—

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### ERRATA

In the article "Converting the RCA-730 TV1 and TV2" by Roland Kempton, appearing on page 46 of the August issue, one of the part numbers covering suitable 70 degree replacement deflection yokes was listed incorrectly. The Merit number should be an MD-70 unit.

* * *

In the article "The 'Childs' Custom-Built Amplifier" the circuit (Fig. 3, page 40, July 1951 issue), except for the loudness control and the cathode follower output stage, is identical to the "Drisko" preamplifier and equalization circuit which was first used in 1947 and described in 1949 by P. W. St. George and B. B. Drisko in their article "Versatile Phonograph Preamplifier" appearing in the March 1949 issue of "Audio Engineering" and reprinted in the "Audio Anthology" for the year 1950.

The cross coupled phase inverter incorporated in the diagram, Fig. 1 on page 38, first appeared in the article "A Cross Coupled Input and Phase Inverter Circuit" by J. N. Van Scoyoc which was published in the November 1948 issue of the Radio-Electronic Engineering Edition of RADIO & TELEVISION NEWS.

The omission of these references from the original article was unintentional and the authors of the abovementioned articles deserve more than passing recognition for their excellent designs.

# INDEX OF Advertisers

SEPT. 1951

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

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**39c ea.**
843 864 956 991

**49c ea.**
5Y3 6X4 6X5 10Y 32 35W4 REL36 955

**59c ea.**
5U4 6AT6 6AV6 6J5 12AT6 12SF7 33 35Z5 38 39/44 CRC40 117Z3 9004

**69c ea.**
1L4 1F4 1U4 2A5 2A6 2A7 2C34 2X2 3B7 3D6 6AL5 6AQ5 6AU6 6BC5 6C4 6SR7 6U7 6V6GT 6W4 7Y4 7Z4 12AV6 12J5 19 25L6 25Z6 27 34 35C5 35Y4 35Z4

**69c ea.**
45Z3 50L6 53 77 6653

**79c ea.**
0Z4 1A4 1A5 1C6 1F5 1G6 1H6 1J6 1LC5 1R5 1S5 1T4 1U5 1V 2Q4 3S4 3V4 5X4 5Y4 6AB4 6AR5 6AS5 6AX5 6BA6 6BE6 6BF5 6C5 6C6 6F5 6F6 6K6 6K7 6S4 6SN7 6SQ7 7A6 7B4 7B5 7B6 7C5 7Q7 12A8 12AU7 12BA6 12BA7 12F5 12Q7 12SJ7 12SL7 12SQ7 25Y5 25Z5 26 30 35A5 35B5 35L6 35Z3 50B5 50Y6 50Y7 57 58 71A 75 76 85 HY115

**89c ea.**
1A7 1B3 1B4 1C5 1C7 1D7 1D8 1J4 1H5 1LC6 1LH4 1Q5 6AG5 6AQ6 6B6 6BD6 6BH6 6C8 6CB6 6D6 6D8 6E5 6H6 6P5 6Q7 6S7 6SA7 6SF5 6SF7 6SJ7 6SK7 6SL7 6T7 6U4 6W6 6Y6 6ZY5 7A8 7AF7 7B7 7B8 7E6 7E7 7H7 12AU6 12AX7 12BE6 12K7 12SA7 12SG7 12SK7 12SN7 12Z3 14B8 25W4 35/51 45Z5 46 50X6 78

**99c ea.**
1B5 1D5 1LA6 1LD5 1LE3 1N5 1T5 1X2 5Z3 6AC7 6BJ6 6F6 6K8 6R7 6S8 6SD7 6SH7 6U5 7A5 7A7 7C6 7R7 12J7 12K8 14A7 14B6 14E6 14H7 14Y4 47

**$1.09 ea.**
6A8 6AC5 6B8 6J7 6K5 6SS7 7F7 7J7 7S7 12AT7 12AV7 9I8

**$1.19 ea.**
16A4 1S4 2A3 2A4 6AQ7 6B5 6B7 6BA7 6BG6 6BQ6 6J8 6L7 6SB7 7AH7 7L7 7N7 7W7 7X7 25BQ6 50A5 82 117Z6

**$1.29 ea.**
1LB4 1LG5 1R4 3LF4 3Q5 5Z4 6AV5 6AL7 6F8 6K7 6U6 6X7 7G7 7K7 12A7 12BH7

**$1.39 ea.**
5V4 6A7 6AB7 6AK5 6B4 6SC7 6SG7 7V7 117P7 117Z4

**$1.49 ea.**
1A6 6AD7 6AK6 6AU5 6BN6 6SV7 7C7

G, GT or M Types Shipped As Stocked.

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2 Tubes, Sckts, xfmr 115v 60cyc Input, output 2.5vct/10a. **SPECIAL** . . . . . **$6.98**
**DIODE PROBE TUBE!**
Unexcelled for **NO-LOSS UHF** Testing. Ultra-Sensitive Sub-Miniature—Envelope App. 1¼"x3⅜". Element & Probe at Tip. Low Pwr. Htr. BRAND NEW w/Data. VR92 . . **25c; 5 for $1**

**SNOOPERSCOPE**
Image-Converter Tube HiSensitivity simplified design 2" dia., Willemite screen—Resolution up to 350 lines/in. Complete data & tube. SPECIAL . . . . . **Each $4.98; 2 for $9.49**

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|---|---|
| 0-50 ua. Weston 3" sq. Model 301. | 16.98 |
| 0-150 ua. 2" McClintock . . . . . | 8.49 |
| 0-500 ua. 2½" DeJur. . . . . | 6.98 |

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| | |
|---|---|
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| 0-10 Ma & 0-1KW (Basic 1 Ma), 3½" | 4.98 |
| 0-25 Ma, Weston 3" sq., Mod. 301. | 6.98 |
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|---|---|
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| 0-10A, 2½" Triplett. . . . . | 3.49 |
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| 0-15A, 2½" Triplett . . . . . | 3.49 |
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| 0-30A, 2½" Gen. Elec. . . . . | 3.49 |
| 0-60A, 2½" Int. Shunt, WECo. . . | 3.49 |
| 0-120A, 2½" Ext Shunt WE/Wstg. | 3.98 |
| 0-240A, 2½" Less Shunt. . . . . | 3.98 |
| 0-240A, 3" Less Shunt, WECo. . . | 4.49 |
| 30-0-30A, 2¾", Weston 203P&Wstg | 4.98 |
| 60-0-60A, 2½", W/Shunt, WE/Wstg | 4.98 |
| 120-0-120A, 2½" Shunt, WE/Wstg. | 5.98 |
| 240-0-240A, 2½" Shunt, GE. . . . | 3.69 |
| 480-0-480A, 2½" Shunt, Wstg. . . | 3.69 |

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|---|---|
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| 0-800 Volts, Weston 3" sq., Bilt-in Mult. Model 301 . . . . . | 12.98 |

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| | |
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| 0-8A, 3" Triplett Hi-Freq., Int. Couple | 4.98 |
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| | |
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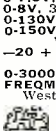

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50 mf/350vdc FP. . . . . **3 for 98c**
30-15-10mf/250vdc . . . . . **3 for 98c**
40-20mf/250 vdc . . . . . **4 for 98c**
30-2x20mf/450-25vdc FP. . **2 for 98c**
10-2x20mf/450-25vdc FP. . **3 for 98c**
4mf/450vdc "Tynee-Dry". . **2 for 98c**
6000mf/15vac. SPECIAL . . . . **$2.29**

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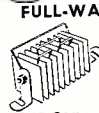

| 18 VAC Input | 14 VDC Output |
|---|---|
| 2 Amps $2.45 | 12 Amps $7.98 |
| 4 Amps 3.98 | 24 Amps 12.98 |
| 8 Amps 5.98 | |
| **36 VAC Input** | **28 VDC Output** |
| 2 Amps $2.95 | 8 Amps $7.95 |
| 4 Amps 5.95 | 12 Amps 11.45 |

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**230V, 50/60cyc, 1ph Input**
**No. 216U:** Brand new Bench or Wall mtg. Output: 0-270 Volts, 3 amps, 810VA. Can operate from 115volt single phase source to deliver 0-270 Volts output—UnCsd. Less Cord. Complete with Indsb. Dial Plate & Instructions. 11 lbs. . . . . **$19.95**

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**M299** Mike Adapter, Good Cond. . . . **.69**
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**BC457** Xmtr (4-5.3Mc), LT*, As Is. . **3.49**
**BC458** Xmtr (5.3-7Mc). LT*, As Is. . **3.98**
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(Bottom) **FEELA Spring Adjuster &** Switch-Bd Tool Slot takes up to .022". WEC No. 293. . . . **98c**
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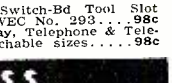

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| 0.42 | 425 | 1740 | 6160 | 8253 | 58333 |
| 0.425 | 426.9 | 1770 | 6175 | 8300 | 60000 |
| 0.607 | 427 | 1800 | 6180 | 8410 | 61430 |
| 0.7 | 440 | 1818 | 6190 | 8420 | 62000 |
| 1.03 | 450 | 1830 | 6200 | 8450 | 64000 |
| 1.3 | 452 | 1865 | 6210 | 8500 | 65000 |
| 1.75 | 460 | 1892 | 6220 | 8550 | 66600 |
| 2.5 | 470 | 1894 | 6230 | 8650 | 66650 |
| 3 | 475 | 1895 | 6240 | 8700 | 67500 |
| 3.83 | 478 | 1896 | 6250 | 8710 | 68000 |
| 4 | 480 | 1897 | 6260 | 8765 | 70000 |
| 4.35 | 487 | 1898 | 6270 | 8770 | 72000 |
| 5 | 500 | 1899 | 6280 | 8800 | 73500 |
| 5.025 | 510 | 1900 | 6290 | 9000 | 75000 |
| 6.25 | 520 | 1901 | 6300 | 9100 | 80000 |
| 6.5 | 525 | 1902 | 6310 | 9445 | 82000 |
| 7 | 540 | 1903 | 6320 | 9500 | 84000 |
| 7.8 | 550 | 1904 | 6330 | 9710 | 85000 |
| 7.9 | 560 | 1905 | 6340 | 9800 | 85750 |
| 8 | 575 | 1906 | 6350 | 9900 | 88000 |
| 10.38 | 580 | 1907 | 6360 | 9902 | 90000 |
| 11.25 | 588 | 1908 | 6370 | 10000 | 91000 |
| 12 | 600 | 1909 | 6380 | 10400 | 93000 |
| 13.52 | 610 | 1910 | 6390 | 10500 | 95000 |
| 14.2 | 612 | 1911 | 6495 | 10600 | 100000 |
| 14.25 | 620 | 1912 | 6500 | 10900 | 110000 |
| 14.5 | 625 | 1913 | 6510 | 10936 | 115000 |
| 15 | 630 | 1914 | 6530 | 11400 | 116657 |
| 16 | 633 | 1915 | 6540 | 11400 | 120000 |
| 17 | 640 | 1916 | 6550 | 11500 | 130000 |
| 19 | 641 | 1917 | 6560 | 11690 | 135000 |
| 19.2 | 645 | 1918 | 6570 | 11800 | 140000 |
| 20 | 649 | 1919 | 6580 | 12500 | 141000 |
| 22 | 650 | 1922 | 6590 | 12800 | 145000 |
| 23 | 657 | 1924 | 6800 | 13000 | 147000 |
| 24 | 660 | 1926 | 6820 | 13100 | 150000 |
| 25 | 665 | 1932 | 6840 | 13500 | 156000 |
| 26 | 668 | 1980 | 6860 | 13550 | 160000 |
| 28 | 670 | 2000 | 6880 | 13600 | 165000 |
| 30 | 673 | 2045 | 6890 | 14000 | 166750 |
| 31.5 | 675 | 2080 | 6930 | 14250 | 167000 |
| 37 | 680 | 2095 | 6950 | 14400 | 169200 |
| 48 | 681 | 2141 | 6960 | 14500 | 175000 |
| 49 | 684 | 2142 | 6970 | 14550 | 180000 |
| 50 | 689 | 2145 | 6980 | 14600 | 180600 |
| 51.78 | 690 | 2150 | 6990 | 14800 | 182000 |
| 55 | 697 | 2160 | 7000 | 16000 | 186600 |
| 56.7 | 699 | 2180 | 7010 | 16500 | 190000 |
| 60 | 700 | 2187 | 7020 | 16800 | 198000 |
| 62 | 710 | 2195 | 7030 | 17000 | 200000 |
| 68 | 711 | 2200 | 7040 | 17500 | 201000 |
| 74 | 720 | 2250 | 7050 | 17977 | 205000 |
| 75 | 730 | 2300 | 7060 | 18000 | 210000 |
| 80 | 733 | 2400 | 7070 | 18300 | 215000 |
| 81.4 | 745 | 2450 | 7080 | 18380 | 220000 |
| 88 | 750 | 2463 | 7090 | 18500 | 225000 |
| 89.8 | 760 | 2485 | 7100 | 18800 | 229000 |
| 95 | 770 | 2490 | 7110 | 19000 | 230000 |
| 100 | 780 | 2500 | 7125 | 19500 | 232000 |
| 101 | 790 | 2525 | 7125 | 20000 | 238000 |
| 105 | 800 | 2600 | 7140 | 20441 | 240000 |
| 105.7 | 806 | 2625 | 7150 | 20500 | 245000 |
| 107 | 810 | 2635 | 7160 | 21000 | 250000 |
| 120 | 820 | 2700 | 7180 | 21500 | 255000 |
| 121.2 | 830 | 2750 | 7200 | 22000 | 268000 |
| 125 | 840 | 2850 | 7240 | 22500 | 270000 |
| 130 | 850 | 2860 | 7260 | 22950 | 275000 |
| 135 | 854 | 2870 | 7290 | 23000 | 294000 |
| 147.5 | 860 | 2900 | 7300 | 23150 | 300000 |
| 150 | 870 | 3000 | 7320 | 23325 | 307500 |
| 160 | 880 | 3100 | 7350 | 23400 | 311000 |
| 165 | 890 | 3163 | 7360 | 23500 | 314000 |
| 170 | 899 | 3225 | 7375 | 24000 | 316000 |
| 175 | 900 | 3290 | 7380 | 24600 | 325000 |
| 179 | 910 | 3333 | 7385 | 25000 | 330000 |
| 182 | 917 | 3384 | 7390 | 25250 | 333500 |
| 182.4 | 920 | 3500 | 7400 | 25400 | 335000 |
| 200 | 930 | 3509 | 7420 | 25833 | 353500 |
| 209.4 | 940 | 3700 | 7440 | 26000 | 375000 |
| 216 | 946 | 3730 | 7460 | 26500 | 380000 |
| 220 | 950 | 3760 | 7480 | 26950 | 390000 |
| 220.4 | 960 | 4000 | 7500 | 27000 | 402000 |
| 225 | 978 | 4030 | 7520 | 27500 | 420000 |
| 230 | 1000 | 4200 | 7540 | 28000 | 422000 |
| 235 | 1030 | 4220 | 7550 | 28400 | 425000 |
| 240 | 1050 | 4280 | 7580 | 28500 | 425000 |
| 245 | 1059 | 4300 | 7600 | 29000 | 458000 |
| 245.4 | 1067 | 4314 | 7610 | 29500 | 478000 |
| 250 | 1100 | 4440 | 7650 | 30000 | 500000 |
| 260 | 1110 | 4444 | 7680 | 31000 | 521000 |
| 271 | 1150 | 4500 | 7700 | 31500 | 525000 |
| 275 | 1155 | 4720 | 7710 | 32000 | 543000 |
| 280 | 1162 | 4750 | 7710 | 32000 | 543000 |
| 286 | 1200 | 4850 | 7725 | 35000 | 550000 |
| 289 | 1225 | 4885 | 7740 | 36000 | 555000 |
| 299 | 1250 | 4900 | 7740 | 37000 | 575000 |
| 300 | 1260 | 5000 | 7760 | 38140 | 600000 |
| 310 | 1300 | 5100 | 7770 | 38585 | 620000 |
| 311.5 | 1350 | 5210 | 7800 | 39000 | 625000 |
| 320 | 1355 | 5235 | 7820 | 39500 | 654000 |
| 325 | 1400 | 5270 | 7835 | 40000 | 660000 |
| 340 | 1488 | 5300 | 7850 | 42000 | 690000 |
| 350 | 1495 | 5500 | 7860 | 45000 | 750000 |
| 360 | 1500 | 5600 | 7880 | . . . . . | 761300 |
| 366.6 | 1510 | 5730 | 7900 | 47500 | 800000 |
| 370 | 1518 | 5770 | 7930 | 47900 | 813000 |
| 375 | 1600 | 5910 | 7950 | 48660 | 825000 |
| 380 | 1640 | 6000 | 8000 | 49000 | 900000 |
| 389 | 1646 | 6100 | 8094 | 50000 | 930000 |
| 390 | 1650 | 6110 | 8140 | 50000 | 950000 |
| 400 | 1670 | 6120 | 8160 | 55000 | . . . . . |
| 410 | 1680 | 6130 | 8225 | 56000 | . . . . . |
| 414.3 | 1710 | 6130 | 8240 | | |

Any size Above, Each 35c; Ten for $3.29

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|---|---|---|---|---|---|
| 1. | 1.57 | 2.25 | 3.673 | 6. | 8.02 |
| 1.1 | 1.579 | 2.5 | 3.75 | 6.5 | 8.5 |
| 1.2 | 1.65 | 2.7 | 3.9 | 6.6 | 9.05 |
| 1.25 | 1.75 | 2.75 | 4 | 6.7 | 9.5 |
| 1.3 | 1.8 | 2.8 | 4.23 | 7 | 10 |
| 1.5 | 1.9 | 2.855 | 4.25 | 7.5 | 11.55 |
| 1.39 | 2 | 3 | 4.5 | 7.62 | 12 |
| 1.4 | 2.11 | 3.3 | 5 | 7.74 | 13.83 |
| 1.5 | 2.2 | 3.5 | 5.5 | 8 | 13 |
| | | | | | 13.85 |

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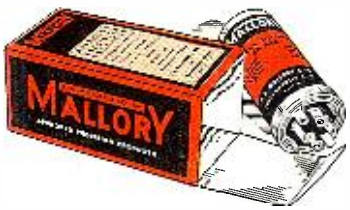


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