RADIO & TELEVISION NEWS

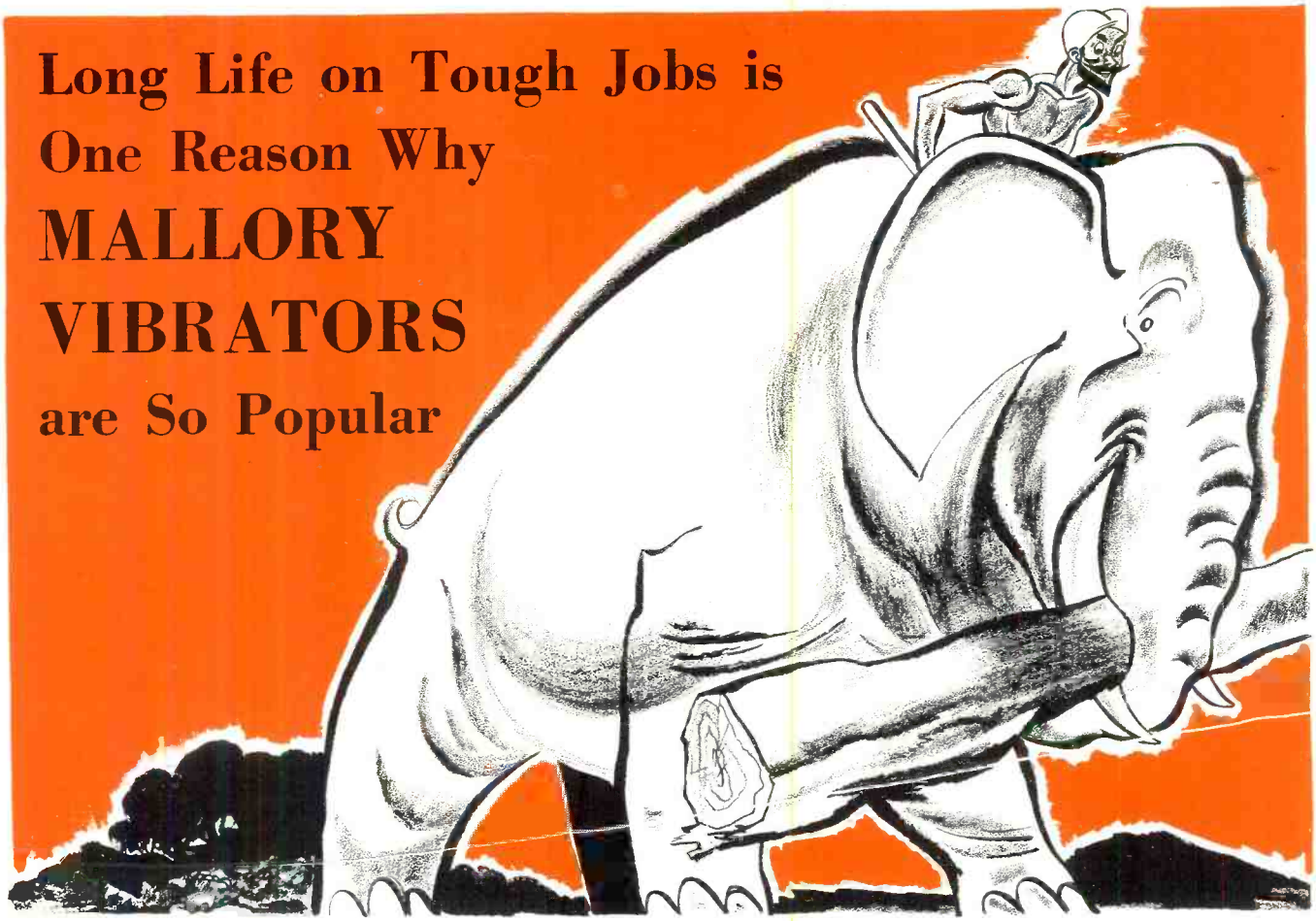
APRIL
1949
35¢

ANC

PROJECTION TELEVISION *for* LARGE AUDIENCES

PAGE 52

Long Life on Tough Jobs is One Reason Why MALLORY VIBRATORS are So Popular



Long life in a vibrator results from a combination of good design and careful production.

The design of Mallory Vibrators is a product of an unusual combination of engineering talent and resources in electronics, electrochemistry and metallurgy.

For example, the contacts in Mallory Vibrators are Mallory-specified and Mallory-made. And a patented Mallory design insures a perfectly balanced mechanism.

Convincing proof that Mallory maintains careful production is the fact that more Mallory Vibrators are in use as original equipment than all other makes combined.

You get not only *long life*, but *dependable starting*, and *high output efficiency* from Mallory Vibrators. No wonder they are so popular with radio service men everywhere—Mallory Vibrators are best for replacements. See your Mallory Distributor.

Mallory "2448" Vibrator Deal

This deal gives you a handsome storage and display cabinet for your stock of vibrators, together with a selection of vibrators and buffer capacitors that will answer 75% of your requirements.

You pay only the service man's net price for the six vibrators and twelve buffer capacitors. There is no charge for the attractive, convenient cabinet. Your Mallory distributor has them in stock for immediate delivery.

MORE MALLORY VIBRATORS ARE USED IN ORIGINAL EQUIPMENT THAN ALL OTHER MAKES COMBINED

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CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
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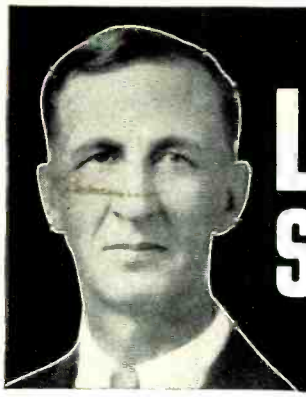
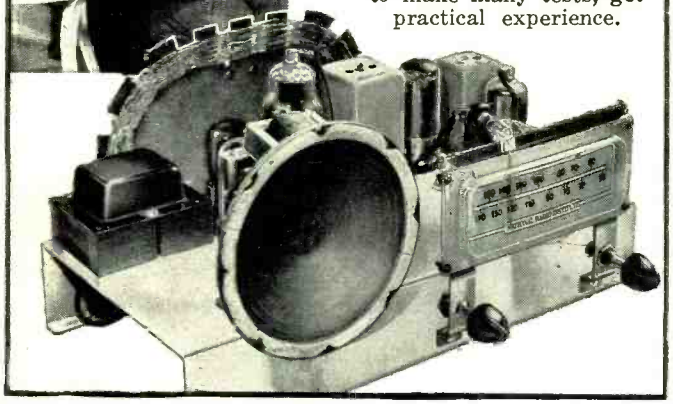


I Will Show You How to LEARN RADIO-TELEVISION SERVICING OR COMMUNICATIONS by Practicing in Spare Time

YOU PRACTICE RADIO SERVICING

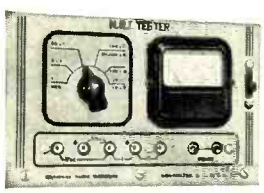
You build the modern Radio shown below as part of my Servicing Course. I send you the speaker, tubes, chassis, transformer, loop antenna, EVERYTHING you need to build this modern Radio Receiver. Use it to make many tests, get practical experience.



YOU PRACTICE RADIO COMMUNICATIONS

I send you parts to build the Transmitter shown below as part of my new Communications Course. Conduct actual procedure of Broadcast Operators, practice interesting experiments, learn how to put a transmitter on the air.

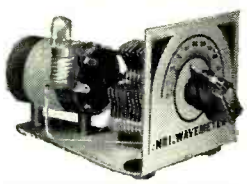
YOU BUILD THIS TESTER



as part of my Servicing Course, with parts N.R.I. sends. It soon helps you EARN EXTRA MONEY fixing neighbors' Radios in spare time.

YOU BUILD THIS WAVEMETER

as part of my NEW Communications Course. Use it with Oscillator you also build that furnishes basic power to transmitter and determines transmitter frequency.



I Will Train You at Home with MANY KITS of Parts I Send

Want a good-pay job in the fast-growing Radio and Television Industries, or your own money-making Radio-Television shop? I've trained hundreds of men WITH NO PREVIOUS TRAINING to be Radio technicians. Or now you can enroll in my NEW practical course in Radio-Television COMMUNICATIONS—learn to be a Broadcasting and Communications technician. You get practical Radio experience with MANY KITS OF PARTS I send you in my train-at-home method. All equipment yours to keep.

MAKE EXTRA MONEY IN SPARE TIME

As part of my Radio Servicing Course, I send SPECIAL BOOKLETS starting the day you enroll. Make EXTRA MONEY fixing Radios in spare time while training. Then start your own Radio sales and service shop or get a good-pay job in Police, Aviation or Marine Radio, Broadcasting, Public Address work, etc. Or think of amazing Television opportunities. Already manufacturers are producing over 100,000 sets a month. New stations going on the air everywhere! Television is America's fastest-growing industry and men who know it will be in demand.

GET ACTUAL LESSON AND BOOK FREE

My DOUBLE FREE OFFER entitles you to actual SAMPLE LESSON and my 64-page book, "HOW TO BE A SUCCESS IN RADIO — TELEVISION — ELECTRONICS," both FREE. Mail coupon now. See how quickly, easily you can start. J. E. SMITH, President, Dept. 9DR, National Radio Institute, *Pioneer Home Study Radio School*, Washington 9, D. C.

VETERANS

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Good Job In Radio Station

"Am Chief Engineer of Radio Station WORD in charge of four men. Owe all I know about Radio to NRI."—CLYDE J. BURDETTE, Spartanburg, South Carolina.

Has Own Radio Business

"Now have two Radio shops servicing about 200 sets a month. Have largest service establishment in Southeastern Missouri."—ARLEY STUDYVIN, De-Soto, Missouri.

A TESTED WAY TO BETTER PAY

Good for Both—FREE

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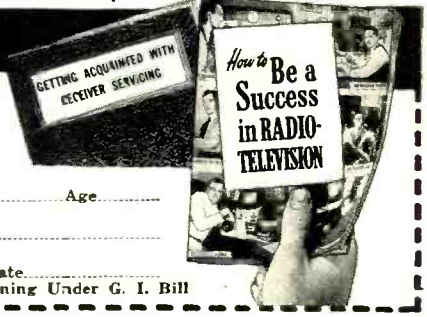

RADIO & TELEVISION NEWS

First in radio-television-electronics

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CONTENTS — APRIL, 1949

DEPARTMENTS

185 North Wabash Ave., Chicago 1, Ill.
VOLUME 41 • NUMBER 4

Member Audit Bureau of Circulations

RADIO & TELEVISION NEWS is published monthly by the Ziff-Davis Publishing Company, 185 N. Wabash Ave., Chicago 1, Ill. Subscription Rates: in U. S. and Canada $4.00 (12 issues), single copies 35 cents; in Mexico, South and Central America, and U. S. Possessions, $4.00 (12 issues); in British Empire, $5.00 (12 issues)—all other foreign countries $5.00 (12 issues). Subscribers should allow at least 2 weeks for change of address. All communications about subscriptions should be addressed to: Director of Circulation, 185 N. Wabash Ave., Chicago 1, Ill. Entered as second class matter July 21, 1948, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Entered as second class matter at the Post Office Dept., Ottawa, Canada. Contributors should retain a copy of contributions and include return postage. Contributions will be handled with reasonable care but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions and by-line changes that are necessary. Payment made at our current rates, covers all authors', contributors' or contestants' rights, title, and interest in and to accepted material, including photographs and drawings.

COVER PHOTO: Custom installation to harmonize with the interior is a feature of Television Assembly Co.'s Model P-520 projection TV receiver. (Photo courtesy of F. B. Arthur, Modern Interiors)

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Greater Security

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Get Your FCC Ticket Jobs worth $3,000 to $7,500 are opening up right now for FCC Licensed Radiomen.

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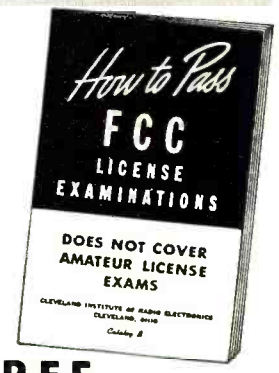
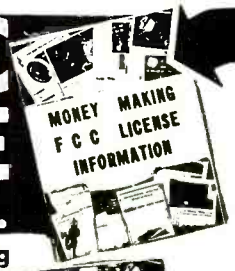
EDW. H. GUILFORD,
Vice-president.



FREE

Tells where to apply for and take the examinations, location of examining offices, scope of knowledge required, approved way to prepare for FCC examinations, positive method of checking your knowledge before taking the examinations.

Add Technical Training to Your Practical Experience & Get Your FCC COMMERCIAL RADIO OPERATOR LICENSE *in a Few Short Weeks...*



It's EASY if you use CIRE Simplified Training & Coaching AT HOME in SPARE TIME

Get your license easily and quickly and be ready for the $3000 to $7500 jobs that are now open to ticket holders. CIRE training is the only planned course of coaching and training that leads directly to an FCC license.

Your FCC ticket is always recognized in all radio fields as proof of your technical ability

CIRE Graduates Find FCC License Pays Off

"I now hold ticket Number P-10-3787, and holding the license has helped me to obtain the type of job I've always dreamed of having. Yes, thanks to CIRE, I am now working for CAA as Radio Maintenance Technician, at a far better salary than I've ever had before. I am deeply grateful."
Student No. 3319N12.

"I was issued license P-2-11188 on November 4. The next day I was signed on board a tanker as Radio Operator-Purser. Besides radio operating, I handle the payrolls, etc., which is all over-time and brings my monthly pay up to between $400 and $650."
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TECH DATA

D.C. VOLTS: 0-3-12-60-300-1200-6000, at 20,000 Ohms/Volt
A.C. VOLTS: 0-3-12-60-300-1200-6000, at 5,000 Ohms/Volt
D.C. MICROAMPERES: 0-60, at 250 Millivolts
D.C. MILLIAMPERES: 0-1.2-12-120, at 250 Millivolts
D.C. AMPERES: 0-12, at 250 Millivolts
OHMS: 0-1000-10,000; 4.4 Ohms at center scale on 1000 scale; 44 Ohms center scale on 10,000 range.
MEGOHMS: 0-1-100 (4400-440,000 at center scale).
DECIBELS: −30 to −4, −16, −30, −44, −56, −70.
OUTPUT: Condenser in series with A.C. Volt ranges.

MODEL 630. . . . . . U.S.A. Dealer net price **$37.50**
Leather Carrying Case, $5.75. . . Adapter Probe for TV and High Voltage Extra.

MODEL 666-HH. This is a pocket-size tester that is a marvel of compactness and provides a complete miniature laboratory for D.C. and A.C. voltages, Direct Current and Resistance analyses. Equally at home in the laboratory, on the work bench or in the field . . . its versatility has labeled it the tester with a thousand uses . . . housed in molded case . . .

TECH DATA

D.C. VOLTS: 0-10-50-250-1000-5000, at 1,000 Ohms/Volt
A.C. VOLTS: 0-10-50-250-1000-5000, at 1,000 Ohms/Volt
D.C. MILLIAMPERES: 0-10-100-500, at 250 Millivolts
OHMS: 0-2,000-400,000, (12-2400 at center scale)

MODEL 666-HH. . . . U.S.A. Dealer Net Price **$22.00**
Leather Carrying Case, $4.75.

MODEL 625-NA. This is the widest range laboratory-type instrument with long 5.6" mirrored scale to reduce parallax. Special film resistors provide greater stability on all ranges. Completely insulated molded case. Built by Triplett over a long period of time, it has thoroughly proved itself in laboratories all over the world.

TECH DATA

SIX D.C. VOLTS: 0-1.25-5-25-125-500-2500, at 20,000 Ohms/Volt
SIX D.C. VOLTS: 0-2.5-10-50-250-1000-5000, at 10,000 Ohms/Volt
SIX A.C. VOLTS: 0-2.5-10-50-250-1000-5000, at 10,000 Ohms/Volt
D.C. MICROAMPERES: 0-50, at 250 Millivolts
D.C. MILLIAMPERES: 0-1-10-100-1000, at 250 Millivolts
D.C. AMPERES: 0-10: at 250 Millivolts
OHMS: 0-2000-200,000, (12-1200 at center scale)
MEGOHMS: 0-40, (240,000 at center scale)
SIX DECIBELS RANGES: −30 +3.0, +15, +29, +43, +55, +69. (Reference level "O" DB at 1.73 V. on 500-Ohm line.)
Six Output on A.C. Volts ranges.

MODEL 625-NA. . . . . U.S.A. Dealer Net Price **$45.00**
Carrying Case, $5.50. Accessories available on special order for extending ranges.

MODEL 2405-A. This instrument combines ultra sensitivity with a large 5¾" scale meter and is housed in a rugged metal case. . . It is furnished with hinged cover so that it can be used for service bench work or for portable field service. Gives A.C. Amperes readings to 10 Amps.

TECH DATA

D.C. VOLTS: 0-10-50-250-500-1000, at 20,000 Ohms/Volt
D.C. AMPERES: 0-10, at 250 Millivolts
D.C. MILLIAMPERES: 0-1-10-50-250, at 250 Millivolts
D.C. MICROAMPERES: 0-50, at 250 Millivolts
A.C. VOLTS: 0-10-50-250-500-1000 at 1000 Ohms/Volt
A.C. AMPERES: 0-0.5-1-5-10, at 1 Volt-Ampere
OHM-MEGOHMS: 0-4000-40,000 ohms—0-4-40 megohms (self-contained batteries)
OUTPUT: Condenser in series with A.C. Volts ranges
DECIBELS: −10 to +15, +29, +43, +49, +55. (Reference level "0" DB at 1 73 V. on 500-ohm line.)
CONDENSER TEST: Capacity check of paper condensers is possible by following data in instruction book.

MODEL 2405-A. . . . . U.S.A. Dealer Net Price **$59.75**

MODEL 2451. Electronic Volt-Ohm-Mil-Ammeter . . . is easy to use in complicated testing . . . A must in F.M. and TV work in any sensitive circuit where low current drain is a factor . . .

TECH DATA

D.C.-A.C.-A.F. VOLTS: 0-2.5-10-50-250-500-1000
R.F. VOLTS: 0-2.5-10-50
D.C. MILLIAMPERES: 0-2.5-10-50-250-500-1000
OHMS: 0-1K-10K-100K
MEGOHMS: 0-1-10-100
INPUT IMPEDANCE: 11 Megohms on D.C. Volts.
4.8 Megohms on A.C.-R.F. Volts

MODEL 2451. . . . . . U.S.A. Dealer Net Price **$76.50**
External high-voltage probe available on special order. See the Triplett V.O.M. line at your local Radio Parts Distributor or write

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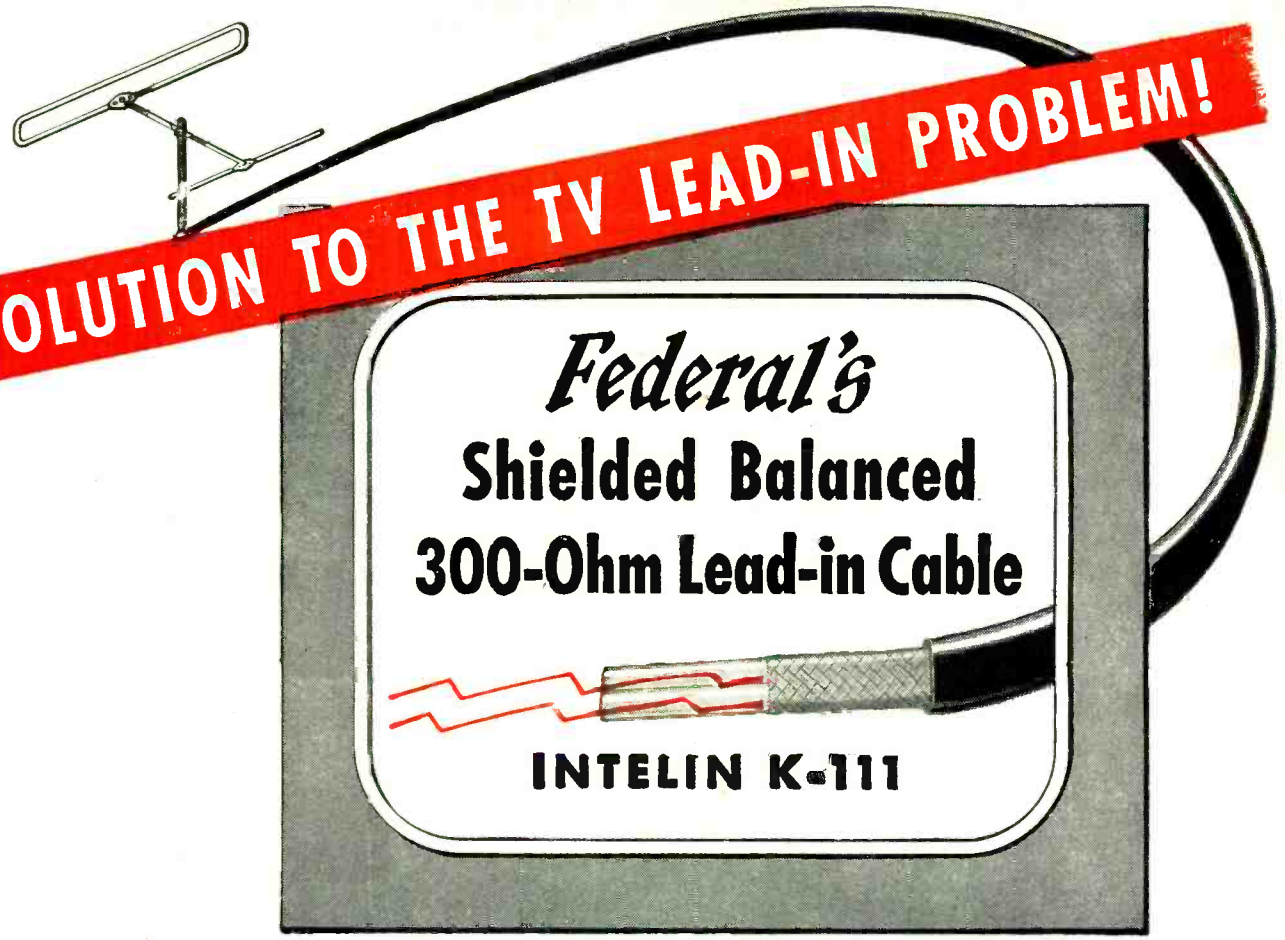

Minimizes Noise, "Snow" and "Ghosts" Due to Transmission Line Pick-Up!

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Here is the development for which the industry has been waiting.

It is a *shielded*, balanced 300-ohm line—Intelin K-111—developed and produced by Federal—and only by Federal.

Tests have given positive proof that Intelin K-111 goes far toward solving the lead-in problem that has been a major obstacle to television progress. K-111 protects against transmission line pick-up of ignition, streetcar, fluorescent light, diathermy and practically every other type of noise, "snow" and "ghosts" which interfere with picture clarity. This new lead-in won't pick up re-radiation from nearby lead-ins in urban areas. In rural areas, where signal strength is weak, Intelin K-111 provides greatly improved reception by reducing the noise level.

Now manufacturers can obtain a lead-in that *protects* the quality performance they build into receivers of 300-ohm input impedance. Antenna kit makers can greatly improve their products. And, by changing to Intelin K-111, servicemen can call a halt to many of the customer complaints that take the profit out of service policies.

Intelin K-111 is also recommended for a pick-up-free connection between antenna post and input stage of FM and TV receivers—and for test equipment and other HF applications. For information, write to Department D-159.

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For the RECORD

BY THE EDITOR

PUBLIC RELATIONS

WE WERE talking recently to some friends of ours who had acquired their first television set from a local service dealer. During the conversation, one of the women present complained about the carelessness in appearance of the serviceman who had installed her TV receiver. Another housewife present also had something to say on the subject which was not particularly complimentary to the profession.

The installation and maintenance of television, particularly in its infancy, requires a slightly different approach when working in and around a customer's apartment or residence. Invariably the first set is installed in the living room. This means that Mr. Serviceman works in and around that area. Most sets are installed during the daytime working hours, and very often Mrs. Smith will be entertaining friends at the very time the set is delivered and installed.

Why is it that so many servicemen are careless in their manner of dress and their presentation to their customers? We have attended, for example, many gatherings of radio servicemen, where a great number of those who came for an evening's get-together, arrived in soiled T-shirts, old sweaters, and other "get-up" that contrasted with the neat appearance of the majority. You wondered if these same fellows called on their customers in the same clothing.

One of the most intriguing facets of the business of serving the public needs for radio and electronic service has been the opportunities provided for men to branch out into their individual businesses. It has been constantly fascinating to observe the many different types of men who have turned to the radio service business in the hope of earning a living in this activity. Since radio is such an abstract science, work in connection with it is mental activity as well as a bit messy. It seems to us that men who become engrossed in the intricacies of radio, working with it day and night to solve the myriad problems it unfailingly presents, are prone to allow it to take almost complete possession of their consciousness. Perhaps this accounts for much of the carelessness in appearance and diplomacy that we often find in this business.

In many of our principal cities, officers and members of radio service associations conduct programs to keep their members conscious of the business and social importance of their personal appearance. A friend of ours recently met the newly-elected president of one of the radio service organizations—a neatly-dressed, personable chap, who by his appearance and manners impressed you as being a successful business man. Later, we learned that this gentleman's working clothes attire at service meetings, banquets, etc., had once been a very sore spot to his fellow radio servicemen. His transition had been effected by his fellow members kidding and joshing about his clothes and manners.

Another case was the fellow who had been notoriously careless in his personal appearance, so much so that he was finally told that he would be fined if he attended another meeting wearing greasy, unkempt clothing. At the next meeting this member showed up wearing full evening dress, including top hat, and carrying a cane. While this is an extreme case, it does prove a point. Many servicemen can't afford good clothes, but all of them can be neat.

It is a very touchy subject, of course, to discuss personal habits with other people. We're simply pointing to better customer-dealer relations. The radio technician must realize that his appearance is a very important part of the relations between his dealer and the customer. Perhaps many of these technicians are careless in this respect, but it isn't necessary to look like garage mechanics just because they repair radios or install television sets. We have heard where servicemen, lacking diplomacy, left very poor impressions with customers, after the dealer had closed a sale and the serviceman had been sent to do the installation.

As one of the chief engineers for N.B.C. so aptly stated: "It is impossible to find a radio technician who is a good serviceman, a diplomat, and a politician all in one. All of these qualities mean good business, and this is just what the radio and television dealer needs, wants, and expects to have."

The entire matter of public relations is of extreme importance in the radio servicing industry, particularly in view of the fact that so much unfavorable publicity has been leveled at the profession. A neat appearance and exemplary conduct, therefore, are vital stepping stones in the impression that technicians will leave with the public. We think it is worth considering. . O.R.

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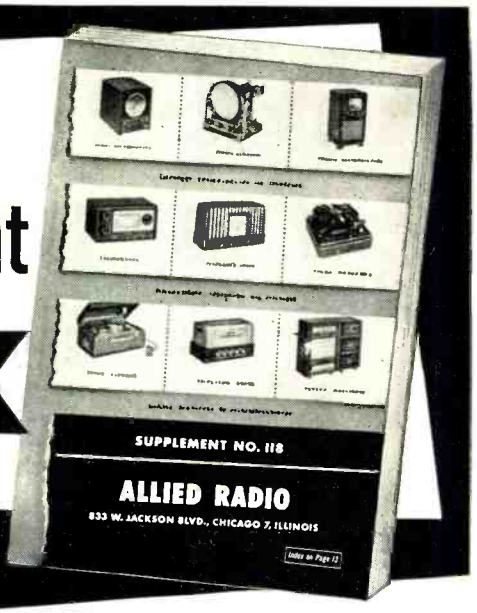

Typical ALLIED Values!

Knight TV Antenna

High-efficiency indoor type—with length and direction easily adjustable for maximum reception. Covers all TV channels. Compact; fits on TV cabinet or table, or mounts to wall. Ideal where roof antennas can't be installed.

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Hi-Fi Amplifier Kit

Superb quality at low cost. 10 watt output; 20-10,000 cps at ±1.5 db; practically distortionless. Takes 6-8 ohm PM speaker, any crystal pickup. With all parts, tubes, chassis 10x6½x3", instructions; less wire and solder. 110-120 v.,50-60 cy AC.

83-222. ONLY..... **$22.75**

HT-17 Transmitter

Save over $30 on this Hallicrafters all-band CW job. Ideal for beginners; perfect for Field Day tests, Net tie-in, vacation use, emergency. Covers 80, 40, 20, 15, 10 meter bands. Satin-black cabinet, 12⅞x6⅞x7⅞". For 105-125 v., 50-60 cy AC. Complete with tubes and all coils; less crystal.

97-580. ONLY..... **$39.50**

Knight Wire Recorder

Makes and plays wire-recordings; plays any 10 or 12" 78 rpm disc recording; serves as PA system or as wireless phono oscillator. Easy to operate. Complete in compact simulated leather case; with crystal hand-mike and pickup, all tubes, 2 half-hour spools of wire. For 105-125 v., 60 cy AC.

96-172. ONLY..... **$99.50**

Beginners—Get on the Air for Less Than $100!

Yes—you can get a complete station at ALLIED for less than $100! Includes HT-17 Transmitter complete with coils for all bands; Hallicrafters S-38 Receiver; a quality handkey; headset; Bliley 40 meter crystal; antenna wire and insulators; ARRL station logbook; Amateur Radio Callbook—everything you need to get on the air—at amazingly low cost!

97-636. Complete Low-Cost Ham Station, f.o.b. Chicago, ONLY .. **$97.50**

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- Gives ideal long-range reception with CONTINUOUS TUNING on ALL CHANNELS. Has DeLuxe TV-FM Inputuner.
- COMPLETE with Cabinet, Lens, Roto-Table, Antenna, Lead-in Wire.
- A BIG PROFIT-MAKER for service dealers. This kit is TOPS—ideal for homes, clubs, taverns, and other commercial installations.

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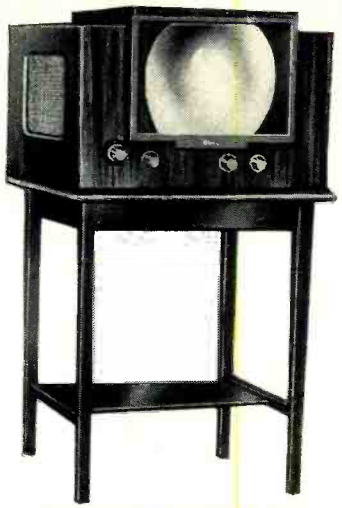

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$399.00 NET

Includes Cabinet, Lens, Table, Antenna

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VISIBLE from ALL ANGLES
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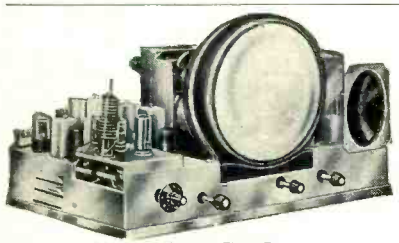

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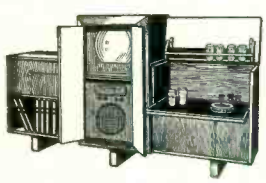

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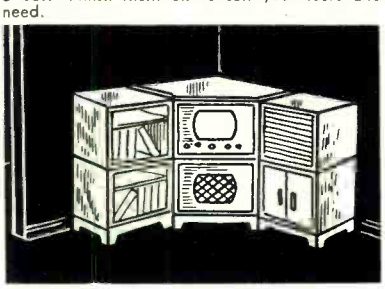

Corner piece, shown above, has room for TV, Phono, Record Storage, and open Book Case. COMPLETE..... Net $84.00

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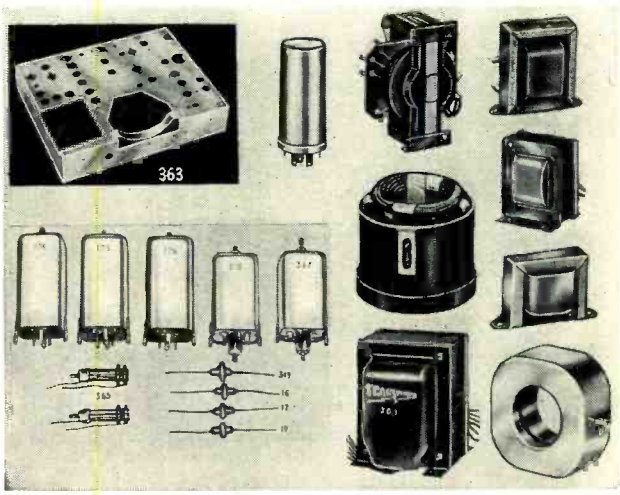

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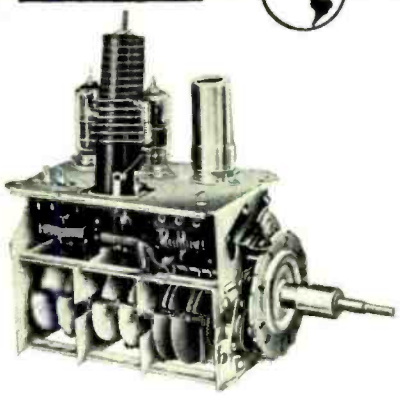

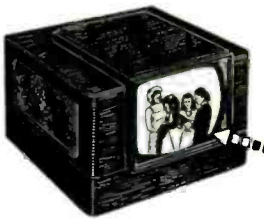

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OPERATES ANY TELEVISION SET from a DISTANCE up to 50 feet.

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

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CONTINUOUS TUNING

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

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

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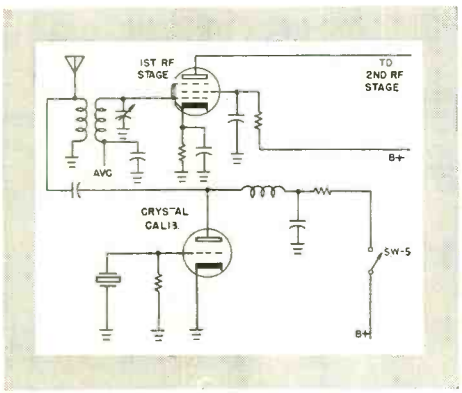

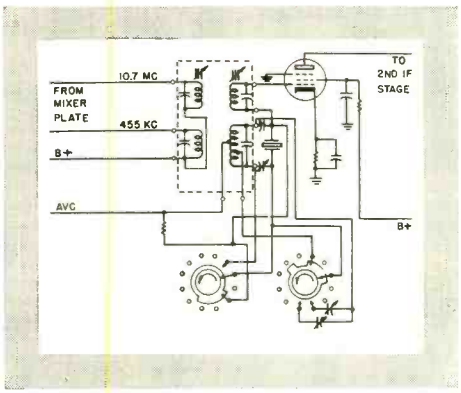

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0.1 ohm to 1000 megohms in 6 ranges
Center-Scale Indications: 10, 100, 1000, 10000 ohms; 0.1, 10 megohms

D-C Ammeter:
Six Ranges . . 0-3, 0-10, 0-30, 0-100, 0-300 milliamp. and 0-10 amps.

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Batteries . . . . . Four 1½ volt RCA-VS036
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Spot Radio News

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

By RADIO & TELEVISION NEWS' WASHINGTON EDITOR

TV STREAKED to new glory during the historic day in January when our President took his inaugural oath. For the first time in the history of our country millions were able to *see* and *hear* the complete impressive ceremonies at Capitol plaza, the striking parade, and the intriguing behind-the-scene moments.

Capturing the greatest inaugural events of the era were cameras with their telephoto lenses at five strategic points: the Treasury Building, south terrace, 15th and Pennsylvania Avenue; Old Post Office Building, 11th and Pennsylvania Avenue; Standard Oil Building, Constitution at 2d Street; the east portico of the Capitol; and Lafayette Park opposite the White House reviewing stands. Four networks, *NBC, Du Mont, ABC* and *CBS*, in a pooled effort, participated in the TV casting, with *NBC* producers (who were selected by lot) operating a battery of monitor sets in a telephone company building and selecting the best pictures from the five camera sites.

Many celebrities, including the FCC Chairman's wife, Mrs. Wayne Coy, chose TV viewing in the comfort of their homes to cover the sights of the day. In suites at the Willard and other hotels, many gathered to look in on the ride down Pennsylvania Avenue. *NBC* representatives, in their rooms, tuned in on 16-inch tube receivers.

Those who couldn't look in during the day were treated with TV film and still versions in the late afternoon and evening. TV helped set a new speed record in the servicing of still photos, when *AP* photographer Anthony Camerano took a still shot of the President taking oath of office off the face of a picture tube, and in ten minutes flashed the still, via a wirephoto service, to the newspapers. Film recordings were made available within twenty-four hours to every TV station in the country.

The radio audiences were not neglected in this inaugural event. In fact, the networks provided the greatest word-picture coverage in their history with over 500 engineers, announcers and technicians on the job. *NBC* assigned over 200 men and women to Washington, with twenty-three of their top commentators and news reporters stationed at fifteen vantage points. Nerve center for *NBC* was in a specially-constructed control room at the network's studios in the Translux Building. Two mobile units and a reconverted C-54 were also used to scan the scene and provide on-the-spot coverage.

Over 100 covered Washington for *CBS;* close to forty reported for *ABC* and *Mutual* had around forty at the scene, too. Some of the roving aircasters spotted themselves at some rather sky-sweeping points, which with binoculars, provided excellent viewing. There were, for instance, microphones atop the Washington Monument and Capitol Dome, as well as many of the taller Washington buildings.

January 20 was truly a memorable day in the history of aural and video broadcasting.

FUTURE TELECASTERS received some very hopeful news during the early months of the new year when FCC Chairman Wayne Coy revealed that the spring would see the end of the TV station-allocation freeze. Talking informally before a meeting of *CBS* executives at the Waldorf-Astoria in New York, at the opening of a three-day TV clinic, Coy said that not only did he expect that the freeze would be lifted, but that the ultra-highs would be used for channel allocations before the year is out. The higher bands would have to be used, Coy indicated, to assure a substantial competitive system of TVcasting. It will not be too difficult to pick up these higher-channel signals, he said, manufacturers having reported to the FCC that efficient two-band sets could be built and at attractive prices.

Elaborating on these predictions at another informal meeting in Boston, Coy said that from 50 to 75 more channels would be provided by the use of the ultrahigh channels, which would assure service to areas between metropolitan centers. Commenting on the extended service, Coy stated: "People do live in the areas between cities. They have the same right to be informed and entertained as those living within cities."

The FCC Headman also explained that TV is rapidly changing the management structure of broadcasters, with AM and FM operators beginning to ponder over their concentration on sight or sound activities. Coy felt

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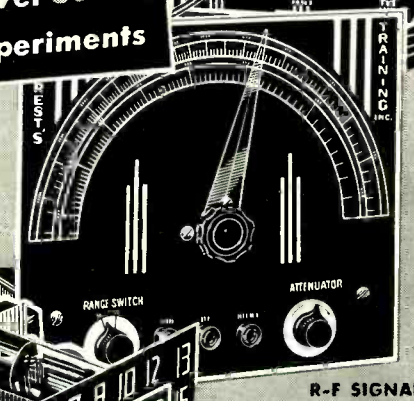
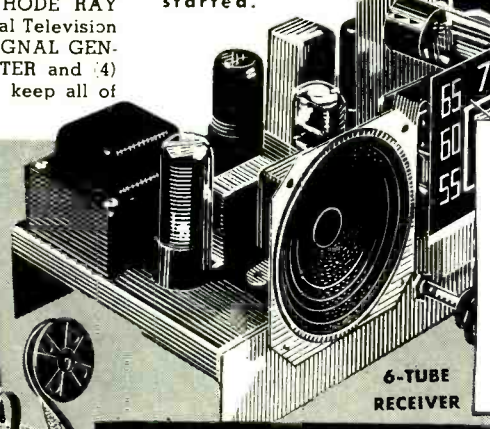


R-F SIGNAL GENERATOR



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that station men will have to think seriously about their future in TV and FM or AM, because he did not think that it is possible for TV and AM-FM stations to compete for the same audience under the same management.

In still another talk, this time at a banquet at Yale University, New Haven, Connecticut, Coy fired away at the censorship charges which were being hurled at the FCC. He said that the Commission has not handed down decisions which restrict a licensee's freedom. Enlarging on this point, Coy said: "If freedom of radio means a licensee is entitled to do as he pleases without regard to the interests of the general public, then it may reasonably be contended that restraints on that freedom constitute acts of censorship. If, however, the freedom of radio means that it should be available as a medium of freedom of expression for the general public, then it is obvious enough that restraints on the licensee which are designed to insure the preservation of that freedom are not acts of censorship."

Analyzing the problems broadcasters may face in allotting time to everyone, he said that the station operator must not use his own personal beliefs as a basis for approval or disapproval of a speaker. According to Coy: "The fact that all persons may not have an opportunity to speak over the air whenever they desire to do so does not of itself mean that they are deprived of freedom of speech. Nor does the fact that a licensee is not free to operate his station solely for his own interest on the basis of his own beliefs and prejudices mean that he is deprived of freedom of speech. But the maintenance of radio as a medium of free speech does preclude any absolute policy by a licensee or anyone else barring a subject within the scope of the guaranty of the freedom of speech on the ground that it is an unpopular subject. While the licensee must look to the interests and desires of the community he serves, he cannot bar views on particular subjects because the subjects are unpopular or the particular views are unpopular. For certainly the prevailing views and desires of the community cannot be made the measure of freedom of speech without destroying that freedom in the very situations where it has most significance."

THE 50 KW. OR HIGHER PUZZLE, which became a headline item with the 80th Congress, assumed a similar state of importance with some members of the new 81st Congress when it convened, with Senator Edwin Johnson again master-of-ceremoning the debate. Senator Johnson had introduced a bill in the last Congress to limit the power of stations to 50 kw. and in the new Congress, presented another limiting bill, which appeared to meet the approval of quite a few legislators and particularly the Senate Interstate Commerce subcommittee, composed of Senators Charles W. Tobey and Ernest W. McFarland,

(*Continued on page* 115)

NEVER BEFORE

Compare Centralab Ceramic BC "Hi-Kaps"				ADVANTAGES
"HI-KAP" FEATURES	DESCRIPTION			
1. Impervious to moisture	Ceramic-X is non-hygroscopic. Moisture absorption is .007% or less.			No deterioration, no shorting. Longer life even under the most adverse conditions.
2. Low mass weight	Av. Wt.	Dimensions	Values	For unit size and weight, Centralab BC "Hi-Kaps", made with Ceramic-X, are the only capacitors on the market which provide these voltage ratings.
3. Small size	.029 oz.	D—.315" L—.540"	.00005—.00025 mfd.	
4. High capacity	.044 oz.	D—.315" L—.830"	.0005 mfd.	
	.050 oz.	D—.340" L— 1"	.000750—.005 mfd.	
	.082 oz.	D—.400" L—1.305"	.01 mfd.	
	Rating: 600 WVDC — 1000 VDC flash test.			
5. Special insulation	Wax impregnated, lacquered, dipped in special phenolic resin, cured and wax impregnated.			Prevents any possibility of shorting to adjacent leads, chassis or components.
6. Convenient side leads	Heavy #22 gauge tinned copper.			Permit rapid, close-coupled connections. No tricky bending or fitting required.
7. Low power factor	Initial — .6%. After 100 hours, 95% humidity test — 3.0%.			More efficient circuit operation, fewer failures.
8. High leakage resistance	Initial — 5000 megohms. After humidity —500 megohms.			Long life, more efficient performance.
9. Maximum dependability	One-piece construction. Leads soldered directly to electrodes.			Will not short or become intermittent.
10. Factory tested	For your protection, all units 100% factory tested before packaging and shipping.			Your guarantee to your customers of reliable service and performance.

See for yourself—five "Hi-Kaps" neatly packaged in convenient envelope. Clean, easy to stock, easy to handle!

Here's modern merchandising at its best! Centralab now gives you ceramic capacitors at a new low price . . . sealed in handy envelopes that save you time and effort. Each package contains five *ceramic* capacitors of the same value, quickly identifiable by tab at top. All capacitors individually color coded, inspected and insulated!

has the dependability, permanence and convenience of *ceramic* by-pass and coupling capacitors been offered to radio service dealers at a favorable price!

See for yourself why Centralab Ceramic BC "Hi-Kap" Capacitors, feature for feature, are your best buy for QUALITY . . . your best buy for PRICE!

TODAY'S TREND is toward ceramic capacitors! Yes, more and more manufacturers are turning to them for longer life and better set performance. And now, Centralab offers you this opportunity to give yourself and your service customers the newest and finest in capacitor components.

Made with high dielectric constant Ceramic-X, BC "Hi-Kaps" are by-pass and coupling capacitors, rated at 600 WVDC—1000 V. flash tested. Values from .000050 to .010000 mfd, list priced from $1.25 to $1.50 *per envelope of five* (see opposite page). Now available at your Centralab Distributor! Look for large counter display, or individual display, shown at right.

FREE! Write today for this valuable addition to your technical library. "Why Ceramic Capacitors" is an important new booklet containing a complete history of the origin and development of ceramic capacitors.

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Division of GLOBE-UNION INC., Milwaukee

T.A.C. DOES IT *First* AGAIN!

"America's greatest Television Values per square inch of picture!"

All Major Components Already Mounted on Chassis!

including Pre-wired "VIVIDeo" I. F. Strip and Pre-wired front end

No technical knowledge required to build this outstanding, proven T.A.C. Custom-Built Television Receiver!

Now! BUILD THE FINEST PROVEN CUSTOM-BUILT TELEVISION RECEIVER IN MUCH LESS TIME . . . WITH LESS EFFORT . . . FOR LESS MONEY!

EXCLUSIVE T. A. C. "VIVIDeo" FEATURE

Pre-wired, pre-tuned and tubed I.F. sound and video strip (patents pending). An exclusive T.A.C. feature developed by our own research. All in one chassis.

FREE

Complete comprehensive Service Data on the T.A.C. exclusive "VIVIDeo" 13-tube Picture and Sound I.F. Strip (Pat. Pend.). Contains all information needed to thoroughly understand and service this unique high-gain I.F. Strip which features 5½ stages of Cathode-Coupled Grounded-Grid Video I.F. amplification. For high gain, sensitivity, stability, "VIVIDeo" can't be beat! Write for FREE booklet SB-1 or ask your local jobber far it. Booklet SB-1 also included with each T.A.C. Direct-View assembly.

NEW! SUPER-SIMPLIFIED INSTRUCTIONS!

AND COMPLETE SERVICE DATA

NEW LOW PRICES

The most explicit, easiest-to-follow, most elaborately detailed instructions in television—that even a layman can follow. ONLY 13 TUBES REMAIN TO BE WIRED! ABSOLUTELY NOTHING TO MOUNT!

T.A.C. STANDARD MODELS 29 RCA tubes, plus RCA or DuMont C. R. Tube. Pre-wired "VIVIDeo" 13-tube Picture and Sound I.F. Strip with 5½ stages of Picture Amplification. Pre-wired All-Channel Front End with Fine Tuning. RCA 5x7 Oval Heavy Duty PM Speaker. Delivered complete, with ALL MAJOR COMPONENTS MOUNTED, *PLUS* New Comprehensive SUPER-SIMPLIFIED DATA for Wiring and Servicing.

Model M101S—Complete (less C.R. Tube) ..... **$169.50** Dealer's Net*

Model F101S—Complete with 10" RCA C.R. Tube ..... **203.50** Dealer's Net*

Model F121S—Complete with 12" DuMont C.R. Tube ..... **231.25** Dealer's Net*

Model F151S—Complete with 15" Dumont C.R. Tube ..... **314.50** Dealer's Net*

T.A.C. CHAMPION MODELS Identical extra-value features as above except Standard Tuner replaced by DuMont Inputuner for *Continuous Tuning* of ALL FM RADIO AND TV CHANNELS.

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Model F121C—Complete with 12" DuMont C.R. Tube **271.40** Dealer's Net*

Model F151C—Complete with 15" DuMont C.R. Tube **357.35** Dealer's Net*

Model F201C—Complete with 20" DuMont C.R. Tube **566.75** Dealer's Net*

ALL T.A.C. 15" and 20" Assemblies contain 30 RCA tubes, plus DuMont C.R. tube, RCA 12" Heavy Duty PM Speaker, and all features mentioned above PLUS Pre-wired 14KV High Voltage Doubler Power Supply.

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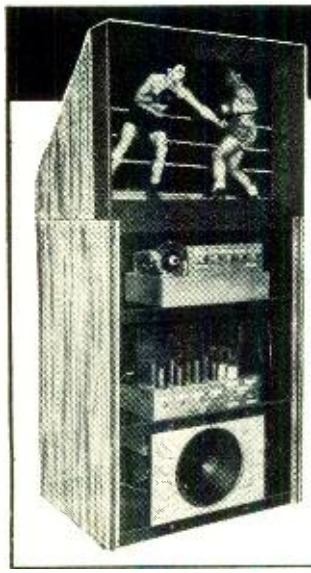
GUARANTEE

All components are of the finest quality and are fully guaranteed under the Standard RMA Guarantee. All TAC Assemblies are guaranteed to operate when assembled according to directions.



MODEL P-520 . . . 520 Sq. In. SCREEN PROJECTION TELEVISION ASSEMBLY

• Bausch & Lomb F: 1.9 Lens • Eastman Kodak Screen • DuMont Inputuner •37 R.C.A. Tubes • Pre-Wired & Pre-Tuned Picture I.F. & Sound I.F. • Pre-Wired 30 K.V. Tripler Fly Back Power Supply • Automatic Gain Control • Aluminum Coated Top Mirror • Metal Rack • Specially Designed Hood and Picture Frame Supplied • 5TP4 Projection Tube • 12" R.C.A. High Fidelty Speaker • Two Low Voltage Power Supplies.

MODEL P-520
Dealer's net **$769.50***

MODEL P-520W
Dealer's net **$895.00***

The above unit completely wired and ready to install.

Front and rear panels optional at additional cost.

Complete Instruction and Service Manual compiled by John F. Rider Laboratories in collaboration with T.A.C. engineers, included with each P-520. This manual also separately available at $2.50 each, dealer's net. Ask your local jobber for it.

TELEVISION ASSEMBLY CO.
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● Write for Catalog on our Complete Line of TV Replacement Components!

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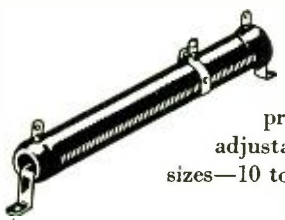
CLOSE CONTROL RHEOSTATS

Here is the most extensive line of rheostats offered today . . . 10 sizes, from 25 to 1000 watts, with many resistance values. All-ceramic construction. Windings are locked in vitreous enamel.

VITREOUS ENAMELED RESISTORS

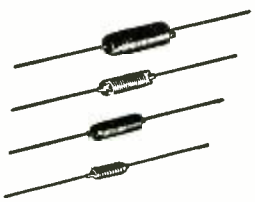
Resistors are wire wound on a ceramic core, rigidly held in place, insulated, and protected by vitreous enamel. Even winding dissipates heat rapidly —prevents hot spots. Many types, in ratings from 5 to 200 watts.

DIVIDOHM ADJUSTABLE RESISTORS



Used as multi-tap resistors or voltage dividers. Narrow strip of exposed winding provides contact surface for the adjustable lug. Available in seven sizes—10 to 200 watts.

RADIO FREQUENCY PLATE CHOKES

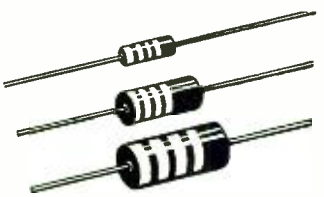


Single-layer wound on low power factor steatite or molded plastic cores. Seven stock sizes cover range 3 to 520 mc. Two units rated 600 ma; all others 1000 ma.

MOLDED COMPOSITION POTENTIOMETER

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

MOLDED COMPOSITION RESISTORS



Small and sturdy, these "Little Devil" units come in ½, 1, and 2-watt sizes. 10 Ohms to 22 megohms. Tol. ± 10% and ± 5%.

OHMITE MANUFACTURING CO.
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RHEOSTATS • RESISTORS • TAP SWITCHES • CHOKES • ATTENUATORS

Vibration Control

Columbian Humming Birds, one of the famous drawings from nature by John James Audubon.

Wing vibration, nimbly controlled, keeps the humming bird in flight, enables it to feed without alighting.

Electric vibration is the essence of telephone transmission. Voice, music, pictures, teletype—no matter what type of signal—the story is told by the frequency and strength of not one, but many vibrations.

Learning how to control electric vibrations to pin-point accuracy has been one of the basic jobs of Bell Laboratories scientists in their development of the "carrier" art which enables the sending of many more conversations over existing wires. Among their inventions have been oscillators, modulators, filters, coaxials, wave-guides, and radio lenses.

Constantly Bell Laboratories scientists discover new and better ways to control and adapt electric vibrations by wire or radio to the needs of the telephone user. Their pioneer work in this field is one important reason behind today's clear, dependable and economical telephone service.

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Learn RADIO TELEVISION, ELECTRONICS by SHOP METHOD HOME TRAINING

You receive all parts, including tubes, for building this fine, modern Superheterodyne Receiver. This and other valuable standard equipment becomes your property.

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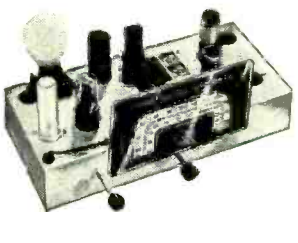
You are needed in the great, modern Radio, Television and Electronics industry! Trained Radio technicians are in constant and growing demand at excellent pay—in Broadcasting, Communications, Television, Radar, Research Laboratories, Home Radio Service, etc. National Schools Master Shop Method Home Study Course, with newly added lessons and equipment, can train you in your spare time, right in your own home, for these exciting opportunities. Our method has been proved by the remarkable success of National Schools-trained men all over the world.

You Learn by Building Equipment with Standard Radio Parts We Send You



Your National Schools Course includes not only basic theory, but practical training as well—you learn by doing. We send you complete standard equipment of professional quality for building various experimental and test units. You advance step by step until you are able to build the modern superheterodyne receiver shown above, which is yours to keep and enjoy. You perform more than 100 experiments—build many types of circuits, signal generator, low power radio transmitter, audio oscillator, and other units. The Free Books shown above tell you more about it—send for them today!

NOW! New Professional Multitester Included!

This versatile testing instrument is portable and complete with test leads and batteries. Simple to operate, accurate and dependable. You will be able to quickly locate trouble and adjust the most delicate circuits. You can use the Multitester at home or on service calls. It is designed to measure AC and DC volts, current, resistance and decibels. You will be proud to own and use this valuable professional instrument.

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1. Basic Receiver Circuits and How They Are Used.
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3. How Energy Is Picked Up by the Aerial.
4. How Signal Currents Are Converted into Sound.
5. How the Tuning Condenser Operates.
6. How the R-F Transformer Handles the Signal and other data, with diagrams and illustrations.

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Within the INDUSTRY

RENE M. JACOBS CO., INC., 40 East 32nd St., New York City, has been appointed sole distributor in the Metropolitan New York territory for the *Arvin* line of radios.

A complete dealer service will be established for the merchandising of *Arvin* radios. *Noblitt-Sparks Industries, Inc.,* manufacturer of the *Arvin* line, announced that it will shortly commence production of television receivers, and these will likewise be distributed by the *Jacobs* organization.

* * *

FRANCIS B. McQUILLEN is the new sales manager of the *Electro-Acoustic and Overseas Divisions* of *Telex, Inc.,* Minneapolis.

He will direct the distribution of two new products of the *Telex* laboratories: the "Twinset," new style headset, and the "Earset," miniature earphone that clips onto the ear. Overseas distribution of *Telex* hearing aids will also be under Mr. McQuillen's direction.

* * *

HENRY W. BURWELL, well-known manufacturer's representative for many of the southern states, has added the new line of "original equipment" television transformers made by *Chicago Transformer Division, Essex Wire Corporation.*

Mr. Burwell has been active in the radio field for over 28 years. Currently, he is national president of the Representatives of Radio Parts Manufacturers. As a lieutenant-colonel, Signal Corps, he carried out responsible technical and command duties in all three theaters of World War II.

As representative for upper New York State, Wally Swank will introduce the new line in that territory.

* * *

SIGHTMASTER CORPORATION, manufacturer of television receivers, has appointed four new distributors in line with their policy of simplifying, centralizing, and intensifying their distributing and merchandising program.

Century Motors, 45-57 W. Main Street, Sharpsburg, Pa., will handle the *Sightmaster Corporation* products for Western Pennsylvania, part of West Virginia, and Northern Ohio.

The *United Distributors of New Orleans, La.,* will handle the Louisiana trading area, while *Brady & Rosenberg, Inc.,* Philadelphia, Pa., have the Eastern Pennsylvania and Southern New Jersey distributing rights. *Parks-Grossman & Co.,* 1770 Broadway, San Francisco, Cal., have been appointed distributors for the San Francisco area.

* * *

ROBERT M. HANSON has recently been made chief engineer of the *Audio Development Company's* engineering department.

His appointment is the first step in the company's plan to develop a broader research program for the purpose of improving and increasing its technical transformer service.

Mr. Hanson was associated with *Thordarson Electric Company,* Chicago, for a period of twelve years, where he became well-known throughout the country.

* * *

ZENITH RADIO CORPORATION of Chicago has purchased *The Rauland Corporation* in a move to insure an adequate supply of the new, giant size picture tubes used in its "Giant Circle C" screen television receivers.

E. N. Rauland will remain as president and a director of the firm which will operate as a wholly-owned subsidiary of *Zenith.* No changes in personnel are anticipated at this time other than the addition of employees to take care of the increased tube production to be handled by *Rauland.*

Present plans call for a doubling of the tube building facilities of *The Rauland Corporation.*

* * *

WALTER A. BUCK is the newly elected operating vice-president of the *RCA Victor Division, Radio Corporation of America.*

Since March 15, 1948, Mr. Buck has served as president of *Radiomarine Corporation of America.* He was formerly a rear admiral in the U. S. Navy, and in retiring last March ended a distinguished career of thirty years in the naval service.

A native of Oskaloosa, Kansas, Mr. Buck was graduated from Kansas State College with a B.S. in Electrical Engineering in 1913 and received his Master of Science degree in 1916.

* * *

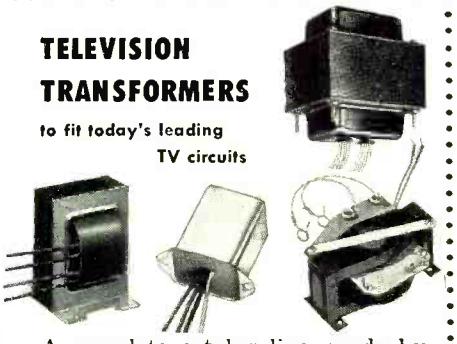
TELEVISION PRODUCTS INC., 469 Seventh Ave., New York City, N. Y., will be the sole distributor to dealers of the cathode-ray tubes, for kit sup-

CHICAGO

The Name that Makes NEWS in TRANSFORMERS

TELEVISION TRANSFORMERS

to fit today's leading TV circuits



A complete catalog line, made by CHICAGO—the largest single manufacturer of original equipment TV transformers. Included are power, vertical blocking oscillator, and both vertical and horizontal scanning output transformers in a range of designs that are exact duplicates of units used in the leading TV sets.

POWER TRANSFORMERS

A Complete Line in 2 alternate "Sealed in Steel" Mountings

Exclusive features like these make this the "Engineer's Line": Plate and filament voltages to fit today's most-used tubes; in two mountings —with solder lugs or 10" leads; one series for condenser input, another for reactor input use; exactly matching reactor for each power transformer. Get complete catalog now.

HIGH Q CHOKES

for Dynamic Noise Suppression Circuits

Two efficient filter reactors, inductance values .8 and 2.4 henrys respectively, are designed for noise suppression circuits, but can be used in any tuned circuit requiring the given inductances. Inductance values are accurate within ±5% with up to 15 ma. d-c. Minimum Q of 20. Mounted in identical drawn steel cases $1\frac{11}{16}$" x $2\frac{3}{8}$" x $1\frac{7}{16}$". Write for descriptive sheet including diagram of simplified dynamic circuit.

FULL FREQUENCY RANGE AUDIO TRANSFORMERS

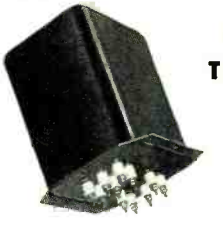
within ± ½ db. typical response 30 to 15,000 cycles

For uniformly low distortion, for response curves that are truly flat over the full frequency range, use these CHICAGO input and output units. Get the facts on the BO-6 (P-P 6L6's to 6/8 or 16/20-ohm speaker), the BO-7 (600/150-ohm line to 6/8 or 16/20-ohm speaker), and other CHICAGO full frequency units—they're tops in transformers.

ISOLATION TRANSFORMERS

for safer, more efficient servicing

For isolating chassis ground from line ground and eliminating the shock hazard (important on "hot" TV sets). Dual purpose: where line is under/over voltage, sec. supplies 115 v.; with 115-volt line, sec. supplies 125/115/105 volts (high/low volts help find doubtful tube, etc.). Three sizes: 50, 150, or 250-VA. to cover full range of servicing needs.



MODULATION TRANSFORMER

for Ham and Commercial Transmitters

A Modulation Transformer ideally suited for use in ham and commercial speech transmitters. Will deliver 250 watts of Class B audio power from P-P 203A's, 211's, 805's, 75TL's, etc. to a Class C load with response variations not exceeding ±1 db. over the speech range, 200-3,500 cycles. Primary impedances, 9000/6700 ohms; secondary impedances, 8000/6000/4000 ohms. A matching driver transformer is available.

REPLACEMENT TRANSFORMERS

Premium Quality Yet They Cost No More

The new CHICAGO Replacement Line provides servicemen with a wide range of standard ratings that fit the most frequent power and audio transformer requirements. These units, backed by CHICAGO'S 20 years of manufacturing experience represent the finest quality attainable through engineering ingenuity and precision manufacture—yet they *cost no more.*

Write for complete **CHICAGO** *Transformer Catalogs*

See the Complete CHICAGO Line at BOOTH **160** THE RADIO PARTS SHOW CHICAGO, MAY 18 to 20

in the meantime... SEE YOUR JOBBER

CHICAGO TRANSFORMER

DIVISION OF ESSEX WIRE CORPORATION

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CHICAGO TRANSFORMER — TRADE MARK REG.

pliers, conversions, replacements, etc., manufactured by *Tel-O-Tube Corporation of America.*

The increased volume of business was given as the reason for turning the dealer service over to *Television Products, Inc.,* but *Tel-O-Tube* will continue to supply television manufacturers.

* * *

SYLVANIA ELECTRIC PRODUCTS INC. has purchased the plant formerly occupied by the *Rumsey Pump Company* at Seneca Falls, N. Y.

Operations for television tube production will begin immediately, making this the third *Sylvania* television tube plant in operation. Others are located at Emporium, Pa. and Ottawa, Ohio.

* * *

LOUIS SILVER will be the new vice-president and sales manager of *Garod Electronics Corporation,* Brooklyn, N. Y.

For the past ten years, Mr. Silver has been with the *Garod* company and was responsible for the launching of the first complete post-war radio line which was introduced in retail outlets only several months after cessation of World War II hostilities.

Other appointments announced were Maurice Raphael, as assistant to the president, Mr. Paul Graf, as assistant vice-president in charge of production, and Robert Leykum as plant superintendent.

* * *

ISRAEL POLLACK has been appointed the head of the ballast manufacturing department of the *JFD Manufacturing Co., Inc.,* 4117 Ft. Hamilton Parkway, Brooklyn 19, N. Y.

Mr. Pollack, known as "Poly" to his friends in the industry, was formerly with the Signal Corps Radar Labs. Previously he was production engineer in the *Air King Radio Corp.* and chief engineer of *Paramount Industries.*

* * *

THE NOBLITT-SPARKS INDUSTRIES, INC., has just announced its recent opening of a Chicago branch sales operation at 150 N. Wacker Drive, Chicago. **VIDEO CORP. OF AMERICA** moves to larger quarters. The new address is 229 West 28th Street, New York City. **STANDARD LOCKNUT AND LOCKWASHER, INC.,** has moved into its new quarters at 118 West St. Clair Street, Indianapolis, Indiana. The former address was 311 North Capitol Avenue, Indianapolis. **THE WHEELER INSULATED WIRE COMPANY, INC.,** has moved from Bridgeport to Waterbury, Connecticut. The company is a division of the *Sperry Corporation.* **MR. J. C. VAN GROOS,** a member of "The Representatives," has opened a new sales office at 1436 North Serrano Avenue in Hollywood. He represents several manufacturers of radio and electronic equipment, in-

(*Continued on page* 93)

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SAVE WORK
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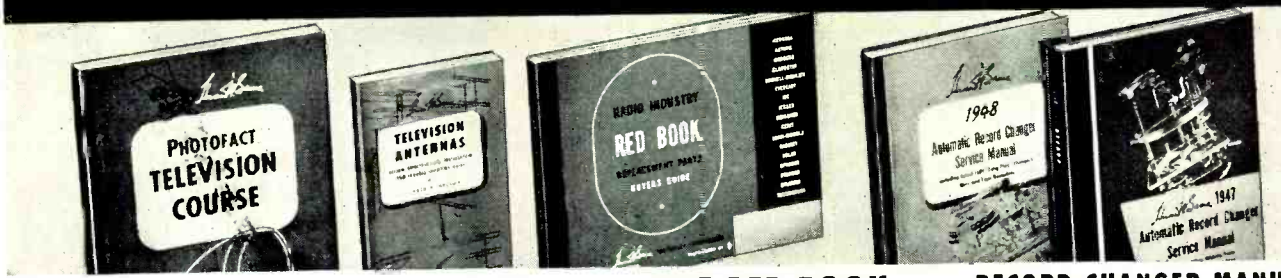

NEW TELEVISION BOOKS

TELEVISION COURSE

Gives you a clear, complete understanding of TV principles, operation and practice. Covers: Beam Formation and Control; Beam Deflection Systems; Beam Modulation and Synchronization. Full analysis of the Cathode Ray tube, voltage supplies, control functions, antenna circuits, RF and IF systems, AGC, video amplification, contrast, etc. 216 pages; 8½ x 11"; profusely illustrated; sturdily bound. *Only* **$3.00**

TELEVISION ANTENNAS

All you need to know about TV antennas. Written by Donald A. Nelson; based on actual field experience. Shows you how to select antenna, how to install it, how to solve troubles. Many short-cuts help you save time and earn more. Chapters cover: antenna principles; construction; analysis of all types of commercial units; installation data; problems and trouble-shooting. 192 pages; 124 illustrations. *Only* **$1.25**

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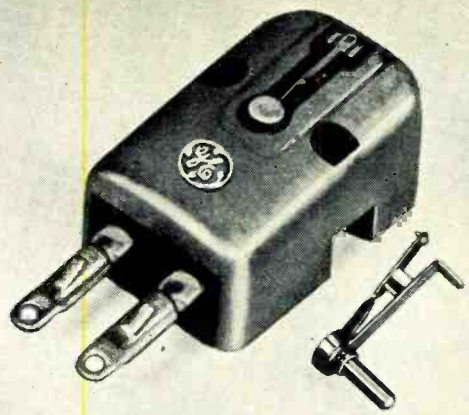

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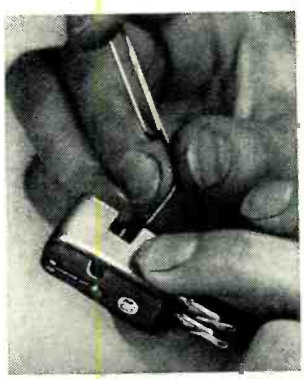
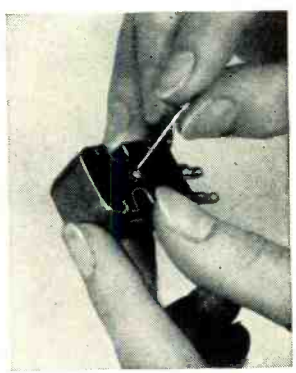
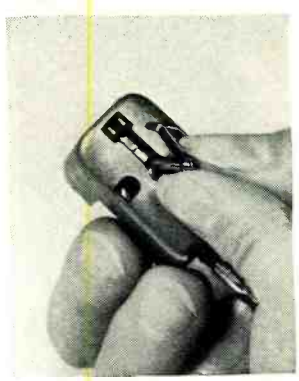


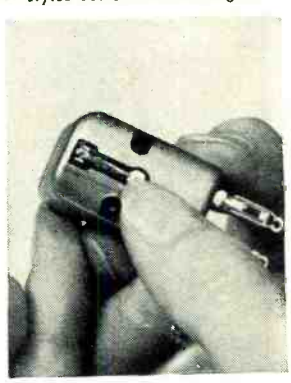
1 Simply remove cartridge from tone arm.



2 Use paper clip or wire to force stylus out of the cartridge.



3 Insert new stylus into cartridge with fingers.



4 Press firmly into position with thumb nail.

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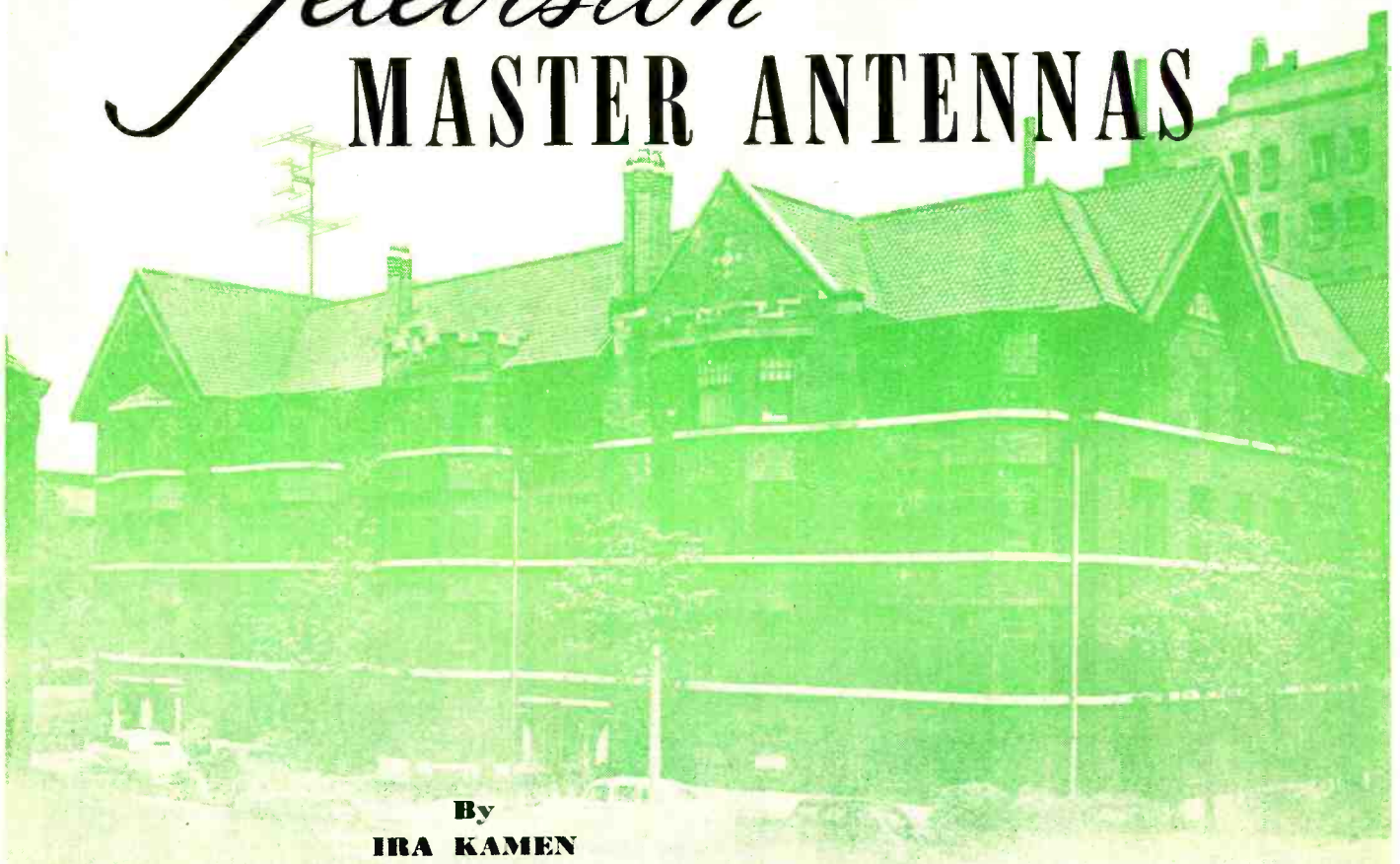
178-H1

Television MASTER ANTENNAS



By
IRA KAMEN

Television receivers with built-in antennas are not a reality as yet. A master antenna system for multiple dwellings is the only answer where individual installations are not permitted.

REALTY groups throughout the country have recommended to all landlords that installation of television antennas in multiple dwellings be prohibited for the following reasons:

1. To prevent the roofs of the buildings from being cluttered with a disfiguring maze of antennas.
2. To preclude damage to the parapet walls and other structures on the roofs of the buildings.
3. To avoid the financial liability involved in the event of accident from faulty antenna installations.

This restrictive action by the realtors has stirred industry-wide attention to the need for television master antenna systems. Pressure from the TBA and the RMA groups accelerated developments from *Amy, Aceves & King, Intra-Video Corporation of America, Radio Corporation of America,* and others.

All of these systems, however, are faced with considerable resistance from the realty field which expects the television industry to furnish television receivers with built-in aerials in the near future. Realtors constantly refer to the relatively limited use of radio master antenna systems today in multiple dwellings because radio receivers have built-in loop antennas. The realtors feel hesitant about spending money for television master antennas since they feel that perhaps these may be made obsolete by new indoor television antennas, developed on "super-duper" principles, solving all television reception problems. These people refer to the atomic bomb development and say that anything is possible.

No real comparison can be made with developments such as the atomic bomb. The bomb was a fundamental possibility ever since the discovery that all matter consists of atoms that are held together by tremendous molecular forces. Television waves are transmitted like light beams and, therefore, can be picked up only where there are no reflecting surfaces (steel structures, hills, etc.) between the television receiver and the television transmitter. This is a fundamental law, like the law of gravity, and is not subject to change. Indoor antennas work normally only in those apartment buildings where it is possible "to stick your head out the window" and see the television stations. There are some locations in urban areas where people have front apartments which more or less face some of the television transmitters and, therefore, they pick up satisfactory television pictures without a roof antenna. There are also many cases where indoor antennas can pick up two or three stations satisfactorily but cannot pick up any other television channels in the area because of their location with respect to these other television stations.

The reception, of course, on all television receivers connected to indoor antennas would be greatly improved if there were an external antenna. Probably the majority of the people in apartment dwellings will never be able to get satisfactory reception until master antenna systems are installed in those buildings.

An indoor television antenna has sev-

ILLUSTRATIONS OF AMY, ACEVES & KING'S ANTENNA SYSTEM

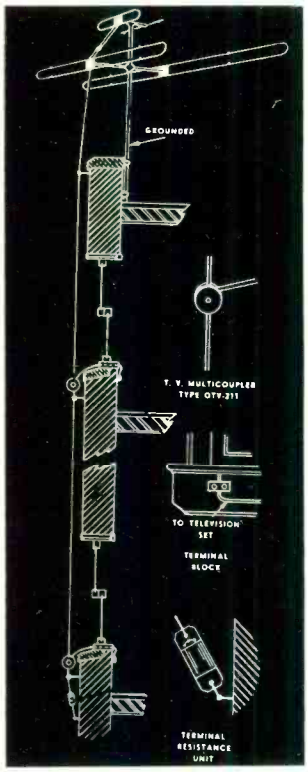


Fig. 1. A twelve-channel antenna connected to 150 ohm line distribution system for outside or exposed wiring installation in multiple dwellings.

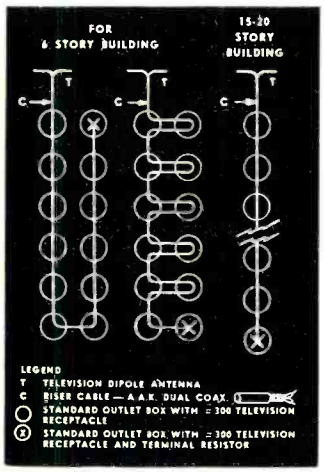


Fig. 2. A typical riser diagram for installation in multiple dwellings. Circuit shown is applicable where the coaxial cables are actually run in conduit.

eral defects as a practical permanent television installation unit in a multiple dwelling.

For one thing, most of the presently installed indoor antennas have a narrow bandwidth and relatively low gain on all television channels.

Then, human body capacity changes picture contrast when any person in the room gets close to the indoor antenna.

Another factor is the placement of screens in the windows. In summer these affect and sometimes mar the operation of an indoor antenna installed in the fall, winter, or spring.

Also, high noise-to-signal ratio is present in many indoor antenna installations due to the high attenuation which results from the dielectric losses of an inside television antenna installation and the inefficient type of antenna which must be installed in an apartment under a rug or in a closet. This inefficient indoor antenna installation makes it necessary to advance the contrast (gain) control to a point where the noise in the area may be amplified to a level where the picture shows background noise. Most customers, at this stage of television, cannot fully judge the quality of their reception and therefore accept a picture, distorted by background noise, without complaint.

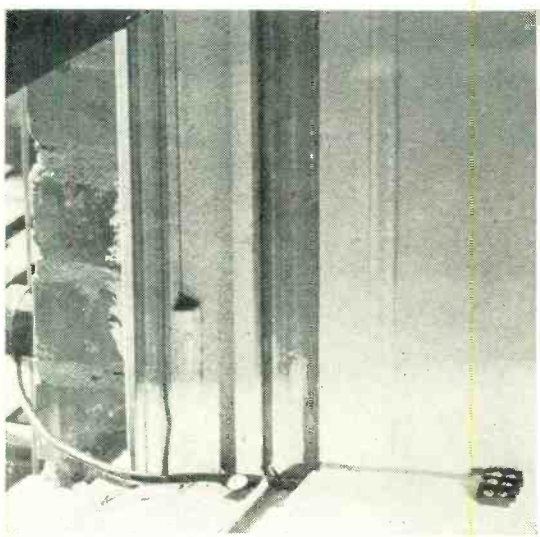


Fig. 3. Typical installation shows coupling unit and terminal block at service entrance of a multiple-family dwelling.

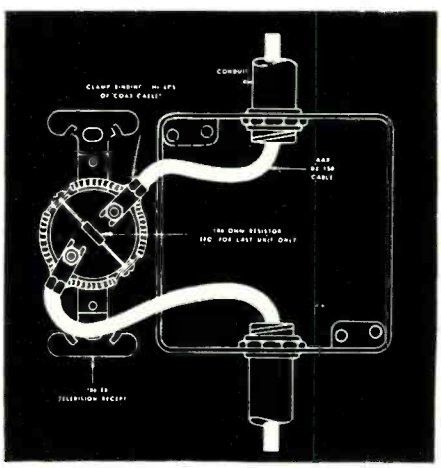
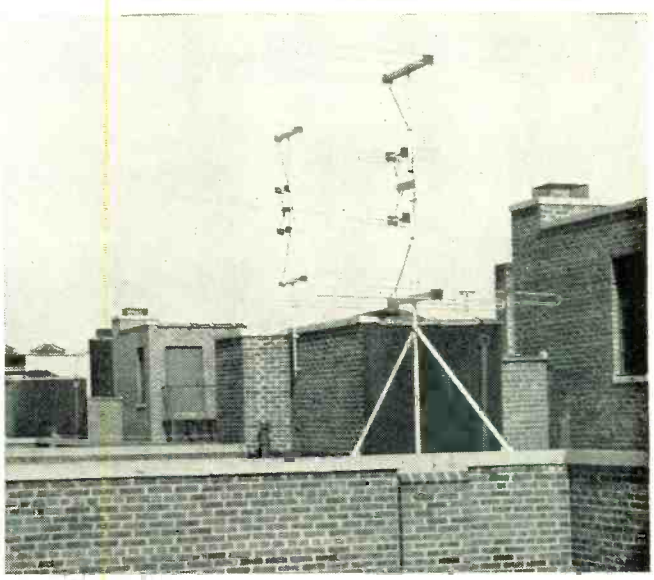


Fig. 4. A typical outlet assembly for installation in a 4 inch by 4 inch by 1½ inch box fitted to conduit riser system.

Fig. 5. Amy, Aceves & King antennas installed on a typical six-story building in Brooklyn, New York.

Fig. 6. A double-stacked array which is installed on the parapet wall of a Brookyln, N. Y., building.



ILLUSTRATIONS OF INTRA-VIDEO CORP.'S ANTENNA SYSTEM

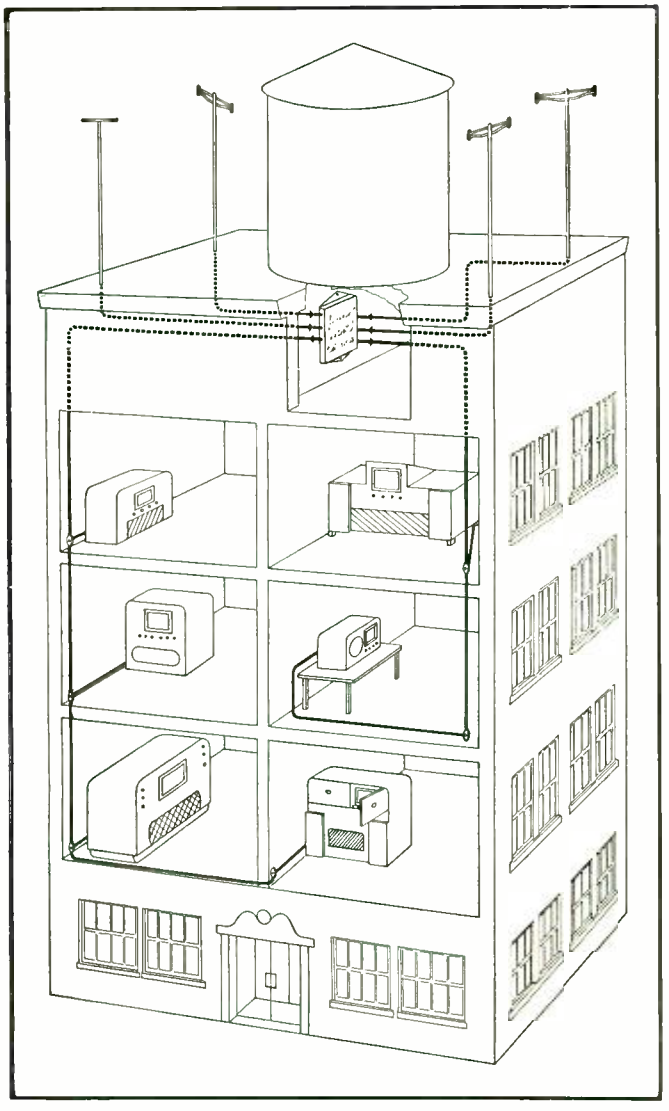


Fig. 7. Line drawing of a moderate-size apartment building showing a typical layout of antennas, amplifier, and outlets used by the Intra-Video Corp. in multiple dwellings.

Finally, each installation is a costly experiment and the best that can be hoped for, in most cases, is a compromise.

In the case of radio master antenna systems, these became limited in application because it was possible to increase the power of existing radio stations without interfering with neighboring stations in other cities, and reflections from steel structures were unimportant. Then, too, the human ear has a greater tolerance in comparison with the eye. All of these factors made the radio loop antenna practical.

It is not to be expected that television master antennas will become less important in the future as the present television stations cannot increase their power above the present level. This level has been set by the Federal Communications Commission, and any increase in power in New York, for example, would produce interference with the neighboring stations in the Pennsylvania and Connecticut areas. Also, the human eye is very sensitive, in comparison to the ear, and cannot view multiple images caused by reflections from steel structures or noisy, unsteady pictures due to weak signals, in an entertainment medium.

A master antenna system has to solve a five-fold reception problem:

1. Satisfactory pictures from all or a majority of the television stations transmitting in the area.
2. Strong, interference-free signals for all television receivers connected to the system.
3. Isolation between television receivers connected to the system to preclude the effect of re-radiation from the local oscillator of any television receiver (manufactured in accordance with RMA standards) marring reception on any other television receiver connected to the system.
4. Connection of television receivers to the system without altering the television outlet to compensate for the input characteristics of any television receiver.
5. Adjustment of a wide range of signal levels available from television stations in the area.

The following are descriptions of master antenna systems which are now being installed in multiple dwellings.

Amy, Aceves & King has patented a master antenna system which claims to serve twenty television and FM radio receivers from a single antenna array.

Fig. 8. Amplifier unit circuit for six-channel operation. Two unused channels are for connection of a seventh television channel, if such is desired, and for FM reception.

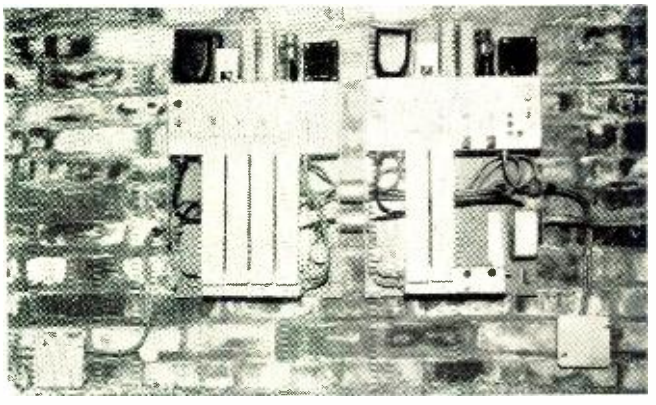


Fig. 9. A typical channel amplifier strip which plugs into the main amplifier unit located near the antenna units.

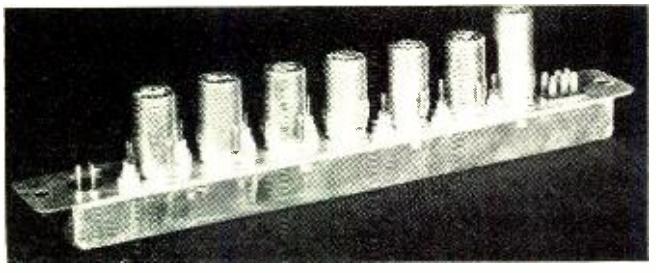
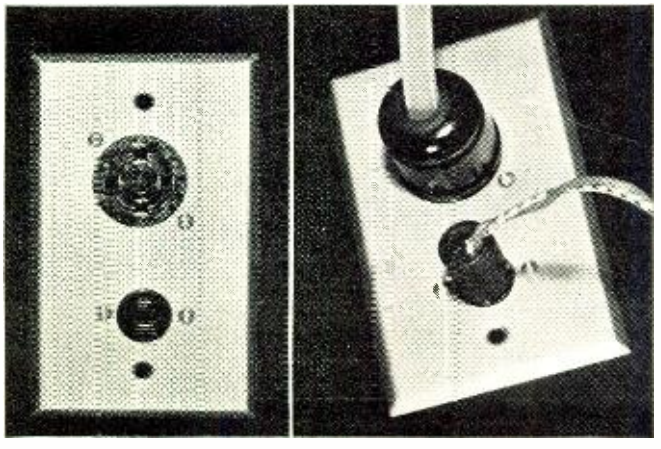


Fig. 10. (Left) Outlet with polarized four-prong receptacle for television (top) and two-prong receptacle for AM (bottom). (Right) Typical plug connection for 300 ohm line to TV outlet (top) and twisted pair to the AM outlet.



ILLUSTRATIONS OF R.C.A.'S MULTIPLE ANTENNA SYSTEM

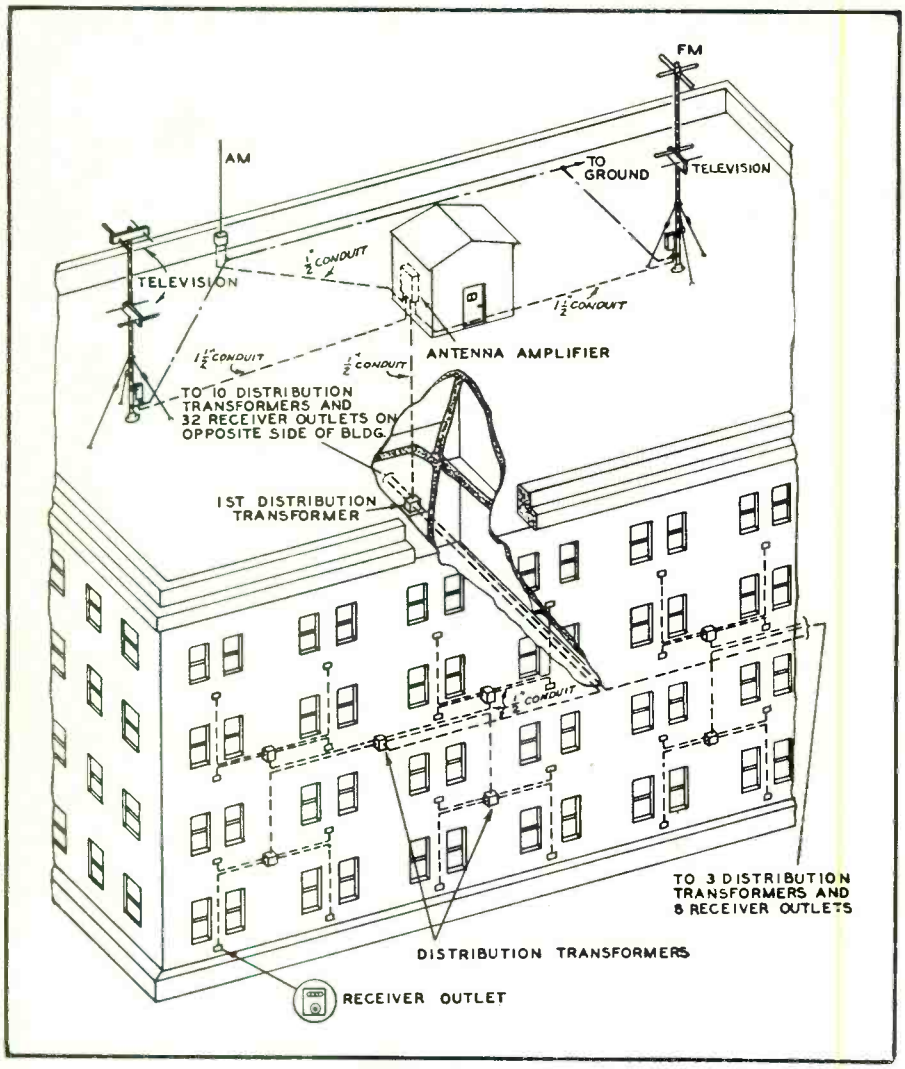


Fig. 11. Typical layout of the Antenaplex System showing antennas, amplifier, distribution transformers, and cable and outlet units.

The all-channel (2-13) antenna array shown in Fig. 1 has the unique feature of a divider network which is circuited between the low-channel (2-6) and the high-channel (7-13) antenna elements. This divider network prevents the low channel antenna elements from transferring any television signals they intercept on channels 7-13 into the transmission line cable. This feature enables the installer to adjust the smaller high frequency elements to a different angular position favoring television channels 7-13 with respect to the larger low frequency elements which may be independently adjusted for best reception on channels 2-6.

The signals induced into this an-

(*Continued on page* 136)

Fig. 12. An RCA amplifier unit equipped with seven channels of television boosters in addition to the standard AM and FM channels.

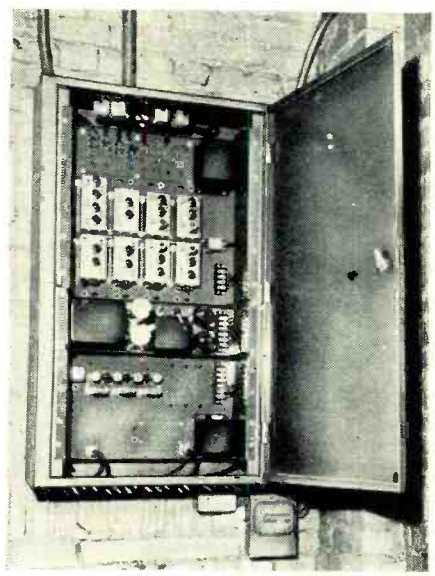


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Fig. 13. Coaxial fitting (right) used to connect TV receiver to RCA system. The bakelite fitting (left) is used to connect AM radio.

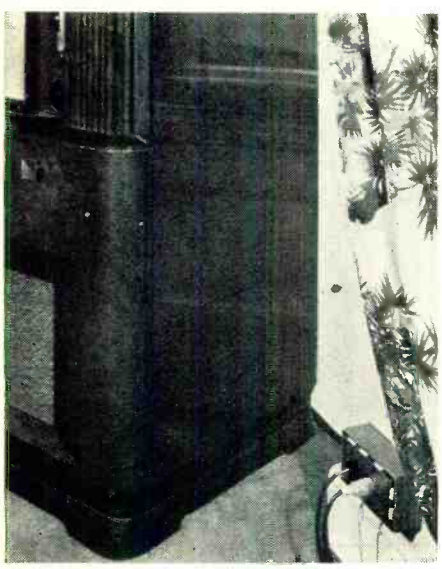


Fig. 14. TV-FM-AM antennas installed at Park Lane Hotel in New York for use with the RCA Antenaplex multiple installation system.

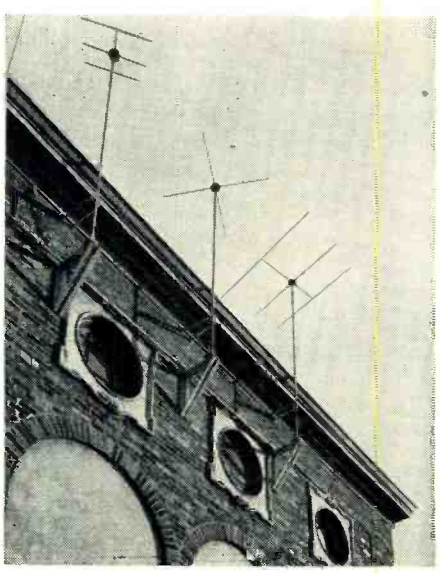
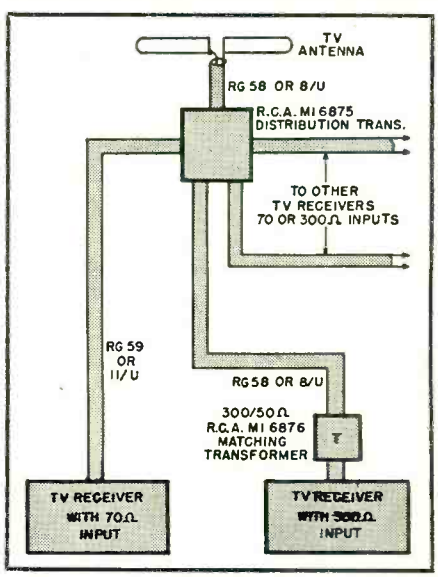
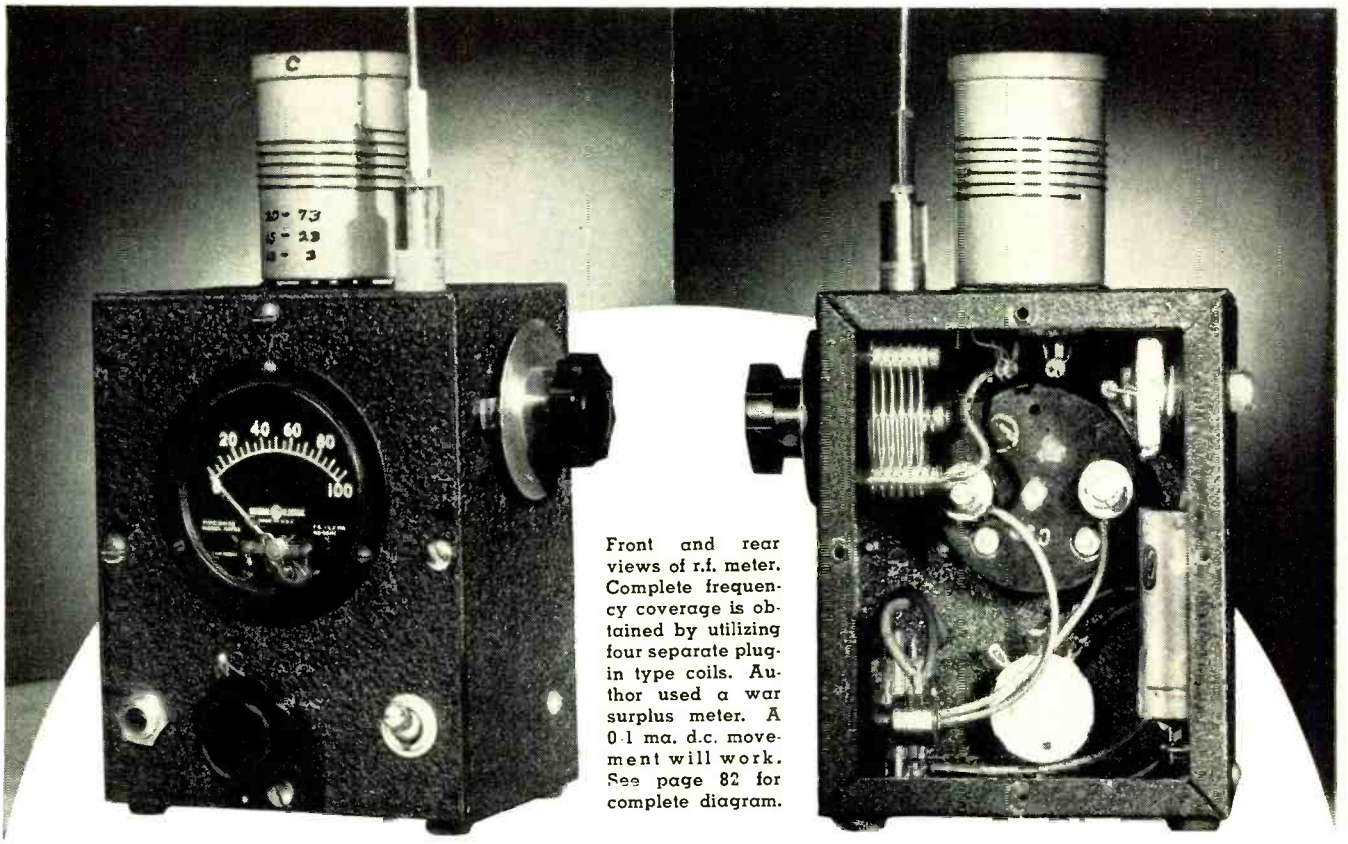


Fig. 15. A simplified TV-FM antenna system for the simultaneous operation of four television and/or frequency modulation receivers.





Front and rear views of r.f. meter. Complete frequency coverage is obtained by utilizing four separate plug-in type coils. Author used a war surplus meter. A 0-1 ma. d.c. movement will work. See page 82 for complete diagram.

Versatile R.F. METER for HAM STATIONS

By ROBERT LEWIS, W8MQU

This relatively low-cost, home-built test instrument covers a frequency range of from 2500 to 75,000 kc.

ALL hams are, or at least should be, familiar with FCC regulations regarding operation of amateur stations. Among these requirements are the ones specifying that means should be provided to insure operation within an amateur band; that phone transmitters are not overmodulated; that spurious emissions are not present.

It does not take much listening on the ham bands to discover how few hams are complying with these regulations. The most consistent departure from the book seems to be on the phone bands, where overmodulation and distortion are the rule rather than the exception. Not only do these conditions violate the FCC rules but they create a great deal of interference in the all-too-crowded ham frequencies.

Many hams feel that to own equipment capable of keeping a check on their operation would entail a prohibitive financial investment, in such units as oscilloscopes, expensive frequency meters, and so forth. However, such is not the case. The meter described herein is a virtual "Jack of all trades" in view of the many jobs it will do, and at a cost of only $10. What cheaper insurance could there be against receiving pink tickets? Consider, too, the value of a good reputation among fellow hams, as a result of having a clean signal and one which does not occupy 40 kc. of a 150 kc. phone band.

Offhand, the following uses for the r.f. meter can be listed: Wavemeter, field strength meter, modulation meter, carrier shift meter, phone monitor, neutralizing indicator. There are probably other jobs it can be put to, but the above are the ones that come to mind at the moment.

Inspection of the diagram will show that the meter consists simply of a tuned circuit coupled to a low-range milliammeter through a 1N34 crystal diode for indicating radio frequency current. By switching the meter over to a full-wave copper-oxide rectifier, modulation, hum, or any audio component of the r.f. wave will be indicated.

The entire instrument is built into a standard 3" x 4" x 5" metal utility box, with the meter, r.f.-a.f. switch, calibrating resistor (R_2) and phone jack being mounted on the 4" x 5". front panel. Any range of frequencies can be covered by means of coils which plug into a 4-prong socket in the top of the box. When the meter is being used as a field strength meter, a rod a foot or two long can be connected to the standoff insulator at the right of the coil. The tuning condenser and indicating dial are mounted on the right side of the box. Location of the parts inside the cabinet is shown in the photograph of the rear of the box.

All parts in the original job were standard, except for the meter, which is a surplus item having a 0-1.2 ma. movement and a full scale reading of 100. There are many excellent meters still available on the surplus market. About the only precaution necessary in the wiring is to avoid heating the rectifiers while soldering, and to be sure that the polarity of the two rectifiers is correct so that the meter will read in the same direction on both r.f. and audio.

The coils can be calibrated by using the instrument as a wavemeter, in conjunction with an oscillating regen-

(*Continued on page* 82)

A 35-Watt Hi-Fidelity AMPLIFIER

Fig. 1. Top-front view of completed amplifier. Cover has been removed to show components.

By RICHARD J. CLEARY

This home-built amplifier features two high-gain mike inputs, a phono input, and bass and treble tone controls. The d.c. operated filaments contribute to its hum-free performance.

THE unit to be discussed in this article was developed to achieve two important goals in amplifier design. The first very distinct advantage is fairly high power output, 30 watts undistorted, and 35 watts at less than 5% distortion. Although beam power output tubes are used, the quality equals that provided by such triodes as the 2A3, 6B4, 6A5, etc.

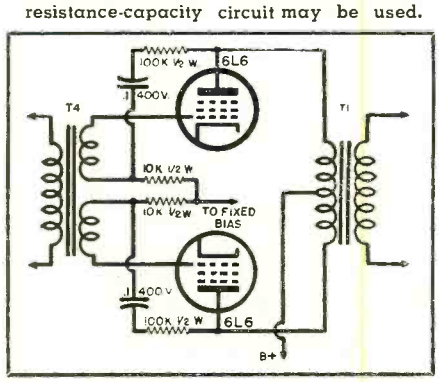
The second, but no less important accomplishment, was the construction of a very high gain amplifier, which had not the slightest trace of hum, despite the fact that both microphone gain controls were opened all the way.

The very high degree of quality is attained by the use of a special type of inverse feedback. Upon studying the circuit diagram of Fig. 3, it can be seen that when a signal is applied to the 6L6 grids, a change of current takes place in the primary of the output transformer (*Thordarson* T-17S13), inducing a voltage in the voice coil and the feedback winding. The voltage, or signal in the feedback (tertiary) winding is ten per-cent of the total output. This signal is fed back, out of phase with the incoming signal, into the 6L6 grids, by means of an input transformer with a split secondary (*Stancor* A-4206). This feedback virtually eliminates harmonics, and has a tremendous ability to stabilize the output tubes, thereby permitting them to be driven to higher volume levels than usual, without signs of overloading. Since this form of inverse feedback introduces very low d.c. resistance in the grid circuit, it may be used in cases where grid current is drawn. Bias is applied to the 6L6 grids through the center tap of the feedback winding.

Another great help to the over-all frequency response is the tone control circuit, which offers a large amount of treble and bass boost or attenuation.

An extra stage of amplification was necessary to overcome the large loss of gain caused by the tone circuit. To get bass boost, the signal from the 12SQ7 plate is worked through a load of 1.47 meghoms, into the grid of the 12SR7, where a portion of all frequencies above approximately 500 cycles is shunted to ground by the network of the 47,000 ohm resistor and the .005 μfd. condenser. Since a certain quantity of the higher frequencies is shunted, the "lows" enter the grid at a much stronger level, so it can be seen that bass boost is really obtained by merely attenuating all of the other frequencies.

Fig. 2. Schematic diagram of optional feedback circuit. If output transformer with separate feedback winding, as specified in the parts list, is not available, this resistance-capacity circuit may be used.

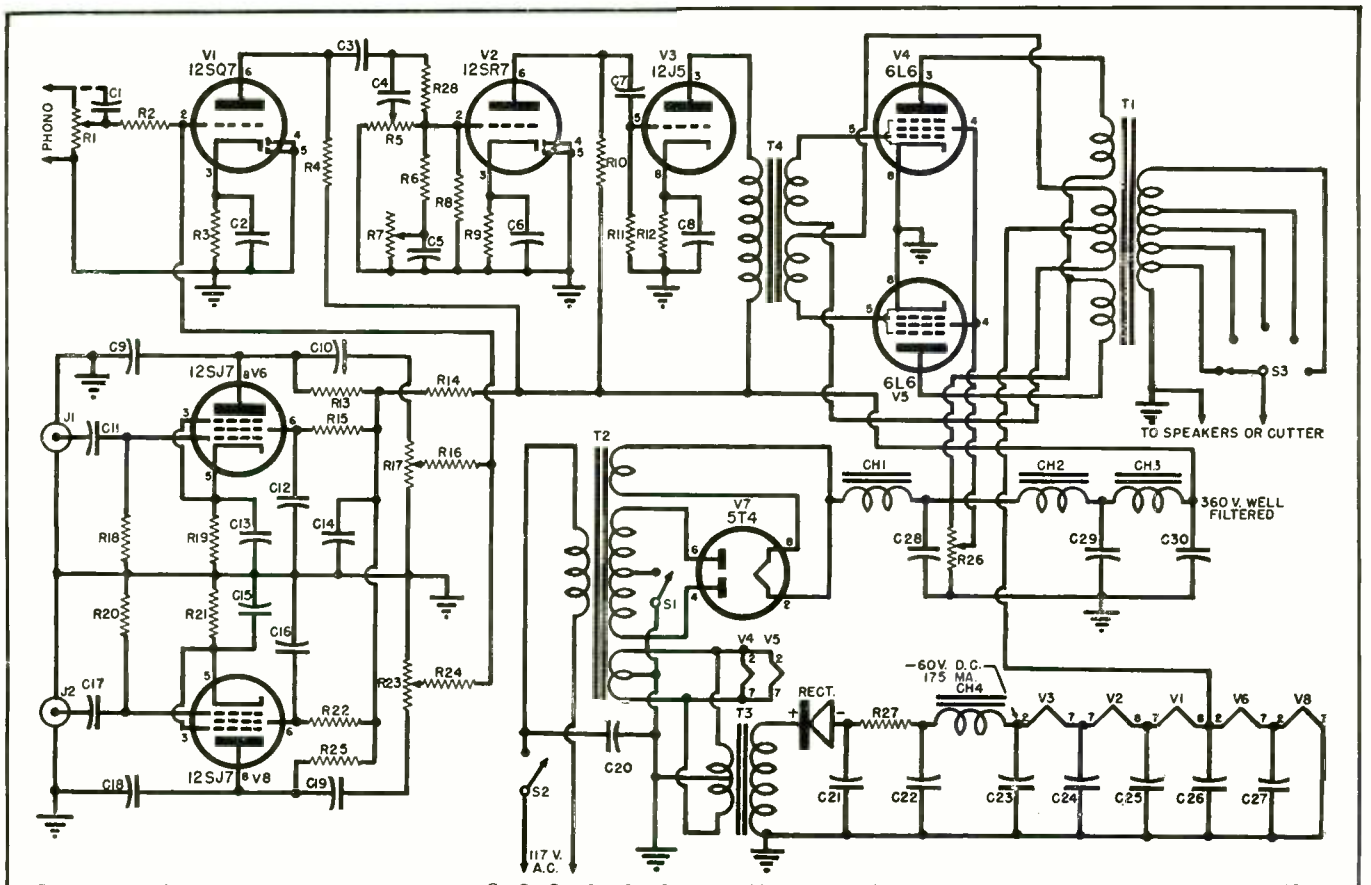


The amount of bass boost is controlled by placing a 1 megohm control across the .005 μfd. condenser. As this control is moved toward ground, the shunting network begins to lose its high impedance to bass frequencies, and the signal begins to work through the control, as well as the network. When the slider is grounded, the signal no longer works through the condenser, and all frequencies are shunted to an equal extent. When the slider is at the highest point from ground, the .005 μfd. condenser is placed in the circuit, preventing the shunting of low frequencies, and providing maximum bass boost.

High-frequency boost is obtained by passing all frequencies above approximately 4000 cycles directly into the 12SR7 grid, through a 250 μμfd. condenser. Since this signal does not work through the 1.47 megohm load, it will be much stronger than the other frequencies, except the lows, and will not be greatly affected by the shunting network. This 250 μμfd. condenser is wired to the slider of the treble control, one end of which feeds the 12SR7 grid, and the other end of which is grounded. Therefore by moving the slider, either boost or attenuation is available.

In effect, with treble and bass boosted to maximum, the tone circuit suppresses the strength of the middle frequencies, which are usually overabundant, and brings out the true beauty of the upper and lower ranges.

Additional treble boost for record playing can be obtained by placing a 250 μμfd. condenser from the high side of the phono control to the pointer. This simply allows the highs to pass into the input tube without being weakened by the load of the volume control. Therefore, at the grid of the tube, the highs are fed in at a greater signal strength than the other frequencies. Of course, when the control



R_1—500,000 ohm pot.
R_2, R_9, R_{11}, R_{16}, R_{24}—470,000 ohm, ½ w. res.
R_3—3300 ohm, 1 w. res.
R_4, R_{13}, R_{25}—270,000 ohm, ½ w. res.
R_5, R_7, R_{17}, R_{22}—1 megohm pot.
R_6—47,000 ohm, ½ w. res.
R_8, R_{12}—1200 ohm, 1 w. res.
R_{10}—100,000 ohm, ½ w. res.
R_{14}—47,000 ohm, 1 w. res.
R_{15}, R_{18}, R_{20}, R_{21}—1.2 megohm, ½ w. res.
R_{19}, R_{23}—560 ohm, ½ w. res.
R_{26}—25,000 ohm, 50 w. wirewound pot.
R_{27}—125 ohm, 25 w. wirewound res.
R_{28}—1.47 megohm, ½ w. res.
C_1—250 μμfd. mica cond. (optional)
C_2, C_6, C_8, C_{13}, C_{15}—50 μfd., 25 v. elec. cond.
C_3, C_7, C_{10}, C_{17}, C_{19}—.01 μfd., 400 v. cond.
C_4—250 μμfd. mica cond.
C_5—.005 μfd., 400 v. cond.
C_9, C_{18}—.002 μfd., 400 v. cond.
C_{12}, C_{16}—.1 μfd., 400 v. cond.
C_{14}—8 μfd., 450 v. elec. cond.
C_{20}—.05 μfd., 400 v. cond.
C_{21}, C_{22}—16 μfd., 150 v. elec. cond.
C_{23}—100 μfd., 150 v. elec. cond.
C_{24}, C_{25}—100 μfd., 50 v. elec. cond.
C_{26}, C_{27}—25 μfd., 25 v. elec. cond.
C_{28}, C_{29}, C_{30}—16 μfd., 450 v. elec. cond.
T_1—Universal output trans. 6600 ohms p.p. to 500, 250, 15, 8, and 4 ohm v.c. with 10% feedback winding (Thordarson T-17S13)
T_2—Power trans. 400-0-400 v. @ 175 ma.; 5 v. @ 2 amps.; 6.3 v. c.t. @ 5 amps. (Stancor P-6165 was used)
T_3—Fil. trans. 6.3 v. c.t., 4 amps. to 117 v. (Stancor P-4019)
T_4—Single plate to p.p. grids, 3.25: 1 ratio (Stancor A-4206)
S_1, S_2—S.p.s.t. toggle sw.
S_3—S.p.5-pos. rotary sw.
CH_1—5-25 hy., 175 ma., 90 ohm swinging choke (UTC S-30)
CH_2, CH_3—10 hy., 50 ma., 500 ohm filter choke
CH_4—10 hy., 175 ma., 90 ohm filter choke (UTC S-29)
J_1, J_2—Microphone chassis connector
Rect.—200 ma. selenium rectifier

Fig. 3. Complete schematic diagram of amplifier. The power supply is built on a separate chassis.

is at maximum volume position, the boost would lose effect, as there would be no load for the signal to work through, as far as the volume control is concerned.

The three 470,000 ohm resistors in the grid of the 12SQ7 permit the mixing of the three input channels, with no audible interaction.

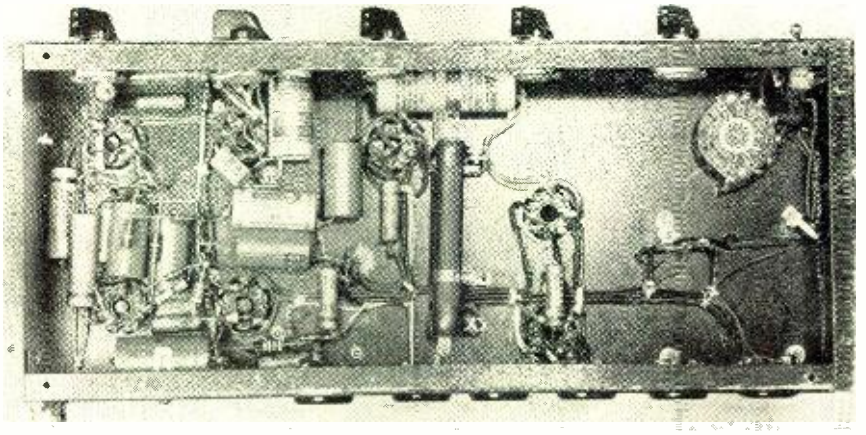
Standard resistance coupling was used throughout the circuit, except in the coupling of the last stage. The .01 μfd. coupling condensers were chosen after considerable difficulty was experienced with .1 μfd. condensers. It seemed that the larger condensers were passing various subsonic low frequencies, such as motor rumble, vibrations, etc., which consumed a large amount of power, and produced distortion due to overloading the power tubes and speakers at higher volume levels. With the present .01 μfd. coupling condensers, the frequency response is uniformly linear from 40 to 14,000 cycles.

It was necessary to place the filter unit consisting of a 47,000 ohm resistor, and an 8 μfd. 450 v. condenser, in the "B" supply of the 12SJ7's, in order to eliminate low frequency motorboating.

Although many designers are following the trend of coupling the driver tube to the interstage transformer by a resistance-capacity method, better low frequency response was secured in the present unit by coupling the

(*Continued on page* 114)

Fig. 4. Bottom view shows placement of underchassis components. Toggle switch shown on the right of operating controls is not incorporated in the schematic diagram and may be omitted. It was used to switch output of amplifier from speaker to recorder unit.



AUDIO TRANSIENT DISTORTION

Two-stage microphone preamplifier and pulse generator used in making studies of transient distortions due to speaker hang-over.

All audio equipment is plagued with this form of distortion. For good tonal response it must be minimized.

By
GLEN SOUTHWORTH

FOR practical purposes, all of the sounds encountered in audio reproduction are of a transient nature, with durations from milliseconds to a fraction of a minute. The behavior of an audio system is often far different under the steady state conditions used in conventional measurements of audio distortion. Due to the relatively small amount of published information in this field, the importance of transient distortion is seldom realized by radiomen.

Due to the fact that sounds commonly encountered are of a very complex nature, comprising amplitude modulated and frequency modulated tones of varying harmonic and transient content, it may readily be seen that transient distortion embraces a very broad field, overlapping the recognized steady state forms of distortion.

One common and important form of transient distortion is the alteration in the wave envelope of a transient tone. This form of distortion occurs naturally and can be the result of excessive reverberation, poor room acoustics, and various resonances occurring in the vicinity of the sound. The results of this form of distortion are mushiness, indistinctness, and alterations of tone color. Furthermore, listening experiments have strongly indicated that the basic character of musical instruments is strongly dependent on the transient characteristics of the wave envelopes produced. Even trained observers have difficulty in recognizing an instrument from a steady tone.

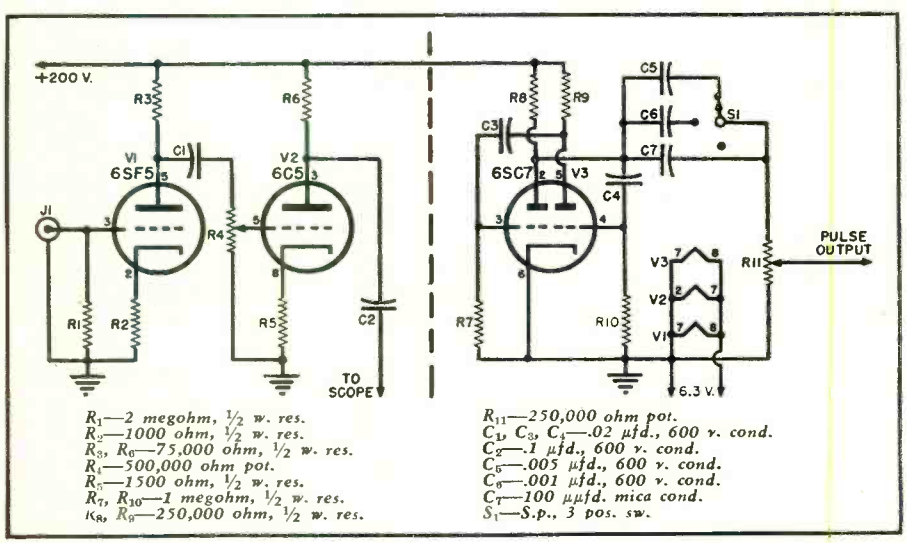
Distortion of this nature commonly occurs in recording and broadcasting due to the practice of placing microphones farthest away from instruments producing low tones of relatively high intensity. Severe envelope distortions may result due to reverberation, and the harmonic structures of these instruments may be almost lost. A further complication is added due to the poor low-frequency transient response of most loudspeakers.

A second disagreeable form of distortion results from the shock excitation of resonances removed from the fundamental tone and usually results in a rough, unpleasing tone and in the case of violins and other musical instruments may be an important factor in determining tone quality.

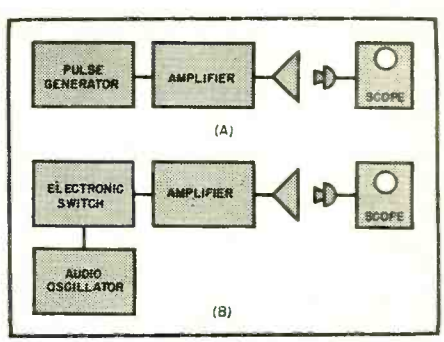
Both of these forms of distortion as well as several others are commonly found in audio systems. Wave envelope distortion may be introduced by phonograph pickups, by amplifiers using inductive-type compensation networks, or, more commonly, by the loudspeaker, due to the finite time required for it to build up to maximum value and the continuing vibrations after the original impulse has ceased.

The same factors generally hold in the second case, and usually the loudspeaker and its environment are the

Schematic diagram of simple microphone preamplifier and pulse generator shown in the photograph above. The variable pulse width is included due to the fact that resonant effects are best excited by a pulse of similar frequency.



R_1—2 megohm, ½ w. res.
R_2—1000 ohm, ½ w. res.
R_3, R_6—75,000 ohm, ½ w. res.
R_4—500,000 ohm pot.
R_5—1500 ohm, ½ w. res.
R_7, R_{10}—1 megohm, ½ w. res.
R_8, R_9—250,000 ohm, ½ w. res.
R_{11}—250,000 ohm pot.
C_1, C_3, C_5—.02 μfd., 600 v. cond.
C_2—.1 μfd., 600 v. cond.
C_6—.005 μfd., 600 v. cond.
C_6—.001 μfd., 600 v. cond.
C_7—100 μμfd. mica cond.
S_1—S.p., 3 pos. sw.



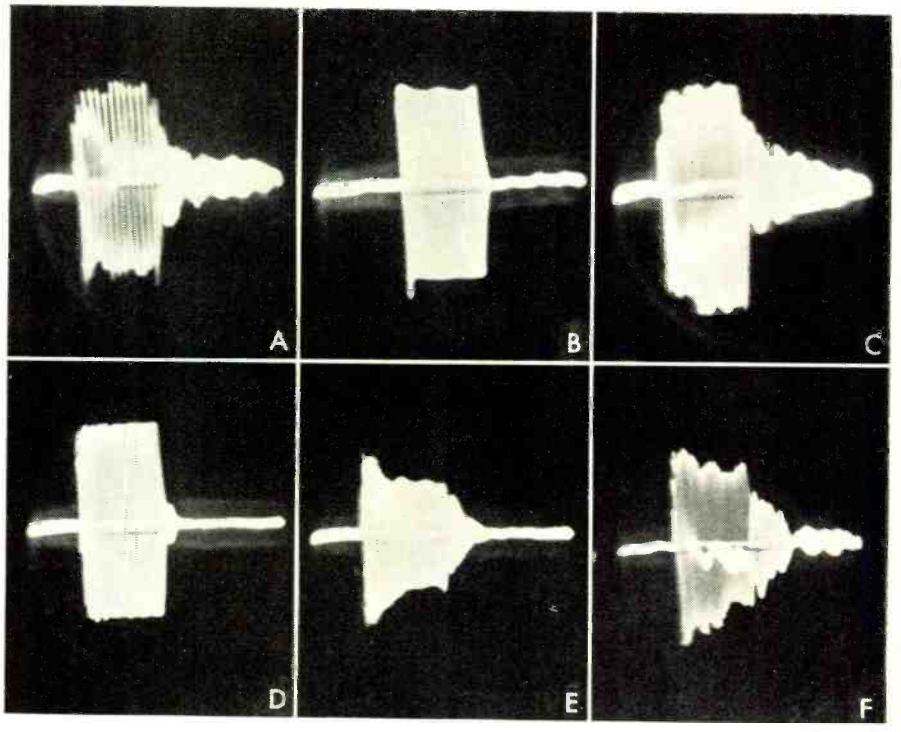
(A) Block diagram illustrates test set-up used in determining equipment response to pulse-type transients. (B) Block diagram of the test set-up that was used to determine wave envelope distortion, harmonic distortion, and speaker resonances.

worst in this respect. Two other factors relating to more commonly recognized forms of distortion are the wave envelope distortions that may result from frequency distortion or attenuation and a lesser recognized effect due to amplitude distortion. In the latter case, many important transients may be of a relatively low level compared to the average sound level. Hams and communications men familiar with the theory behind speech clipping will recognize the importance of these transients in relation to intelligibility. The most common distortions of these low-level transients occur due to masking effects from resonant "hangover" or masking due to hum or noise and, as mentioned before, the masking due to reverberation, etc., in the original pick-up. A second objectionable effect is the result of nonlinearity in equipment at very low levels. Class B amplifiers such as used in modulators, and mechanical devices such as pickups and loudspeakers may produce this effect. As a result, distortion in reproducing equipment may be very high at low output levels.

Although it is common to think of audio amplifiers as having relatively low transient distortion, this is not necessarily the case. Asymmetrical waveforms are commonly encountered in sound reproduction and may be greatly distorted even in voltage amplifier stages. In the illustration, the wave form of an asymmetrical pulse is shown at the input and at the output of a single stage of single ended voltage amplification. Not only is the asymmetry of the pulse distorted, but an objectionable low-frequency component is superimposed. This effect is especially noticeable in the case of sudden bursts of static where a low-frequency speaker "thump" may be observed.

Loudspeakers, due to the complex mechanical and electrical problems involved, are commonly considered one of the worst offenders where transient distortion is involved. "Hangover" due to poorly damped cone resonance is most often considered and may persist up to one second in extreme cases. An illustration of the damped wave train produced by an inexpensive five-inch speaker is shown in the photograph. Although the speaker was excited by a pulse of relatively short duration, oscillations at the fundamental resonant frequency persisted for one-tenth of a second and represented the major portion of the acoustic energy radiated. As noted before in the case of some audio amplifiers, the spurious low-frequency components produced by loudspeaker resonance can be very objectionable.

Several methods of reducing distortion of this nature are generally recognized. High-quality loudspeakers may have good internal mechanical damping, and electrical damping may be achieved to some degree by the use of inverse feedback or Class A triodes. Proper speaker enclosures provide acoustic damping with horn loading



(A) Oscillogram of 3000-cycle pulse at amplifier output. (B) Oscillogram of 3000-cycle pulse reproduced by 2-inch speaker. (C) Oscillogram of 3000-cycle pulse reproduced by extended range, 12-inch speaker. (D) Oscillogram of 2000-cycle pulse showing phase distortion in speaker. (E) 1500-cycle pulse showing phase, harmonic, and transient distortion produced by speaker at this frequency. (F) Acoustic output of highly damped, extended range, 12-inch speaker in response to a 600-cycle pulse.

becoming increasingly popular. Oscillograms of the five-inch speaker previously referred to are shown with strong mechanical and special electrical damping applied. In the case of amplifier distortion it is interesting to note that several manufacturers of high-quality amplifiers use inverse feedback over the voltage amplifier

(*Continued on page* 84)

(A) Wave form of the initial pulse obtained from the generator. (B) The pulse distortion produced by a single stage of voltage amplification. (C) Damped wave train of a 5-inch speaker, shock excited by a single pulse from generator. (D) The same 5-inch speaker as it appears with firm mechanical damping. (E) The same 5-inch speaker shown as it appears with special electrical damping. (F) Transient response of a high-quality, 12-inch speaker resulting from a pulse input.

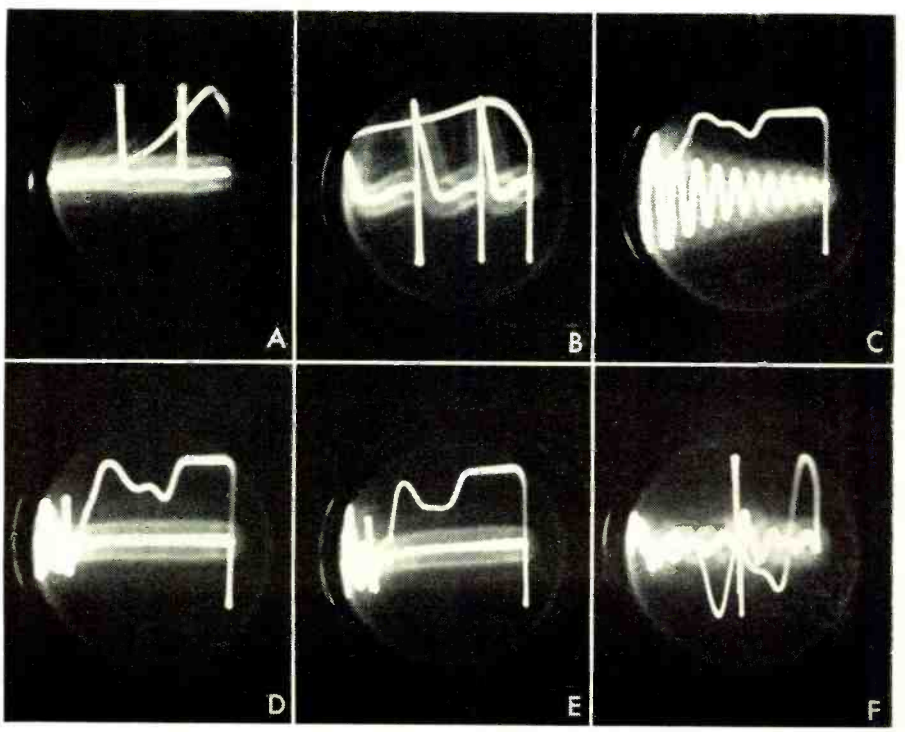
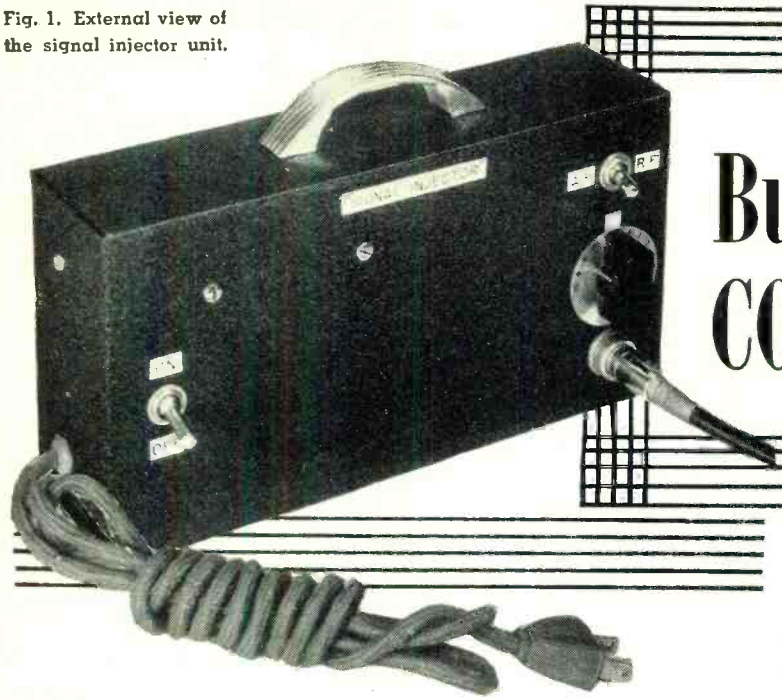


Fig. 1. External view of the signal injector unit.



Build This COMPACT SIGNAL INJECTOR

By RUFUS P. TURNER, K6AI

A simple unit for troubleshooting by the signal injection method. It supplies both a.f. and r.f. signals.

MANY radio servicemen know the merits of the signal injection method and use it, in one form or another, for localizing trouble in receivers. When using this method, a signal is injected into the circuit, first at the output, then at the input of each stage, starting at the loudspeaker voice coil and working back in steps to the antenna input terminals. An audio signal is employed at all points from the speaker to the output of the 2nd detector, an i.f. signal from the input of the 2nd detector to the output of the converter or 1st detector, and a suitable r.f. signal from the input of the 1st detector or converter, through the r.f. amplifiers, to the antenna terminals. When receiver output (as shown by the loudspeaker or output meter) is lost as the injected signal is transferred from the output of a particular stage to the input, the trouble has been localized in that stage.

Merely touching the finger successively to the various tube grids in a receiver or p.a. amplifier and listening for hum is a makeshift method of signal injection troubleshooting. But this is an unreliable adaptation of the system. The instrument method is avoided by some servicemen since this calls for both a radio-frequency and audio-frequency test oscillator. If the r.f. oscillator has provision for external use of its 400-cycle audio modulation, the audio oscillator can be eliminated. However, the great value of signal injection servicing is the ease with which it allows trouble to be located "on location" prior to making an estimate, and few servicemen care to lug their signal generators around on jobs.

A small, lightweight signal injector unit capable of supplying r.f., i.f., and audio signals without tuning is of advantage, since such an outfit is readily portable and may be subordinated to other test instruments in the shop. Properly constructed, it will take a lot of abuse in handling.

The instrument described in this article is a compact signal injector of this sort. Employing a simple circuit, it is useful for troubleshooting in both receivers and p.a. amplifiers. It has no critical adjustments to get out of order. Fig. 1 is the external view of the injector; while Fig. 3 shows the internal construction.

Circuit Description

In the injector circuit (See Fig. 2), one half of a 6SL7-GT tube is employed as a crystal oscillator. The crystal is a receiver i.f.-type component rated at 455 or 456 kc., the commonest receiver intermediate frequencies. The primary half of a midget 455-kc. i.f. transformer, T_2, is used as the oscillator plate tank. The secondary half of this transformer acts as a tuned r.f. output coil. The use of a crystal oscillator eliminates tuning (the trimmer condenser in the i.f. transformer can be set and forgotten) and insures highest electrical and mechanical stability. The i.f. crystals no longer are out of the reach of the builder of inexpensive test instruments. They may be found in the surplus ads priced at less than one dollar.

The second half of the 6SL7-GT is used as an audio oscillator, in conjunction with the iron-core transformer, T_1, to modulate the r.f. oscillator. The frequency of the audio tone is set by the capacitance of C_3 and the inductance of the primary winding of T_1.

Modulated r.f. signals delivered by the instrument start at the crystal frequency and occur at each harmonic of that frequency, being useful up to about the 50th. Thus, a 455-kc. crystal will furnish strong test signals every 455 kilocycles apart from 455 kc. to 22.75 megacycles. In the standard broadcast band, spot frequencies are available at 910 kc. and 1365 kc. A 456-kc. crystal will furnish broadcast spot frequencies at 912 kc. and 1368 kc. The two points in the broadcast band usually will be entirely adequate to shoot trouble in the r.f., 1st detector, or converter stages of a receiver.

The output jack, J_1, delivers either a.f. or r.f. signals, depending upon the position of the output switch, S_1. Signal intensity is adjusted by means of the output potentiometer, R_6. In order to maintain a constant load on the audio oscillator (thereby insuring its tone stability) and also to eliminate the multiple switching which would be necessary to couple the audio oscillator directly to the output jack, while devitalizing the r.f. oscillator, a novel system is employed. The modulated r.f. is rectified by the shunt-connected 1N34 crystal diode, and the audio component is delivered to jack J_1 when switch S_1 is thrown to its "AF" position.

The injector is powered by a single 100-milliampere selenium rectifier. The 6SL7-GT heater is operated from the power line through a 360-ohm line cord resistor, R_4. The filter consists of resistor R_5 (which requires less space than a choke), and condensers C_6 and C_7. While the power supply is of the a.c.-d.c. type, the instrument is entirely safe to handle with any sort of equipment, either straight a.c. or a.c.-d.c., since no portion of the power supply circuit is connected either to the chassis or to the output jack.

The circuit constants in the audio

oscillator portion of the injector give an audio frequency of approximately 400 cycles. This assumes that the transformer specified in Fig. 2 will be used by the reader. The capacitance of C_3 may be decreased to raise the frequency, or increased to lower the frequency.

The output coupling condenser, C_5, isolates the output jack from the internal circuit. This protects the internal components, especially R_6, the 1N34, and the secondary of T_2, when injecting a signal into a high-voltage d.c. point.

Construction Details

The injector is built into a standard radio chassis as a carrying case (See Figs. 1 and 3). This chassis is 9½ inches long, 5 inches wide, and 2½ inches deep. This is the smallest size which would accommodate all of the parts without unnecessary crowding. The carrying handle is a metal drawer pull from the dime-store hardware counter.

Fig. 1 shows the simple front-panel arrangement. The "On-Off" line switch, S_2, is mounted on the left-hand side. The line cord R_1 enters a grommet-lined hole in the left-hand end of the chassis. Output switch S_1 is mounted in the upper right-hand corner. Directly beneath it is the output potentiometer, R_6. Under the potentiometer is the coaxial output jack, J_1. The plug, shown inserted in Fig. 1, is the companion *Amphenol* 80-M connected to a 3-foot length of shielded microphone cable. The center conductor of the cable is connected to a shielded test prod used to inject the signal. The shield braid of the cable is connected, by means of a short length of flexible hookup wire, to an alligator clip which normally is fastened to the chassis or "B-minus" point of the radio or amplifier under test. The name plates were lettered with India ink and fastened to the panel with thickened rubber cement, after which they were coated with clear lacquer to prevent soiling.

Fig. 3 shows placement of parts inside the chassis. Note that the output potentiometer is a metal-cased type. This is for purposes of shielding. Leads to and from this potentiometer are enclosed in shield braid. The tube socket is mounted clear of the chassis on two short studs. The crystal socket, to the right of the tube, is similarly stud-mounted. The i.f. transformer, T_2, is mounted between the tube and potentiometer. The audio transformer is mounted above the tube and is held by screws to the back of the "front panel." The selenium rectifier may be seen in the upper right-hand corner above the electrolytic condensers. This is the best position for the rectifier, since any heat generated in this component does not reach the crystal readily. Shielding of the instrument is completed when the bottom plate of the chassis (back of the carrying case) is screwed into place.

Adjustment of the injector consists merely of tuning up the crystal oscillator by adjusting input trimmer, and setting the output trimmer for good output.

After the wiring has passed inspection, plug the injector into the power line, close switch S_2, allow about 3 minutes for the tube cathode to come up to normal operating temperature, and proceed with the adjustment in the following manner:

(1) Connect output jack J_1 to antenna terminals of broadcast receiver tuned to harmonic of injector crystal (Tune to 910 kc. if injector crystal is 455 kc., or to 912 kc. if injector crystal is on 456 kc.).

(2) Set receiver gain control to maximum.

(3) Set injector output control, R_6, to maximum.

(4) Set injector output switch, S_1 to "RF."

(5) Adjust the input trimmer condenser in injector i.f. transformer until modulated signal is heard in receiver. Tune receiver, if necessary.

(6) Adjust the output trimmer in injector i.f. transformer until signal in receiver is loudest without overloading.

(7) Run potentiometer R_6 back and forth over its range to check its operation in reducing and increasing injector signal.

(8) Throw switch S_2 to "Off." Switch on again in about 15 seconds. After tube re-heats, if no signal is heard, readjust the input trimmer to point slightly to one side of previous adjustment. When this trimmer is adjusted properly, oscillator will start up easily whenever tube reaches operating temperature.

(9) To check audio output, disconnect receiver, and connect high-resistance headphones to jack J_1.

(10) Throw switch S_1 to "AF," noting audio signal in headphones.

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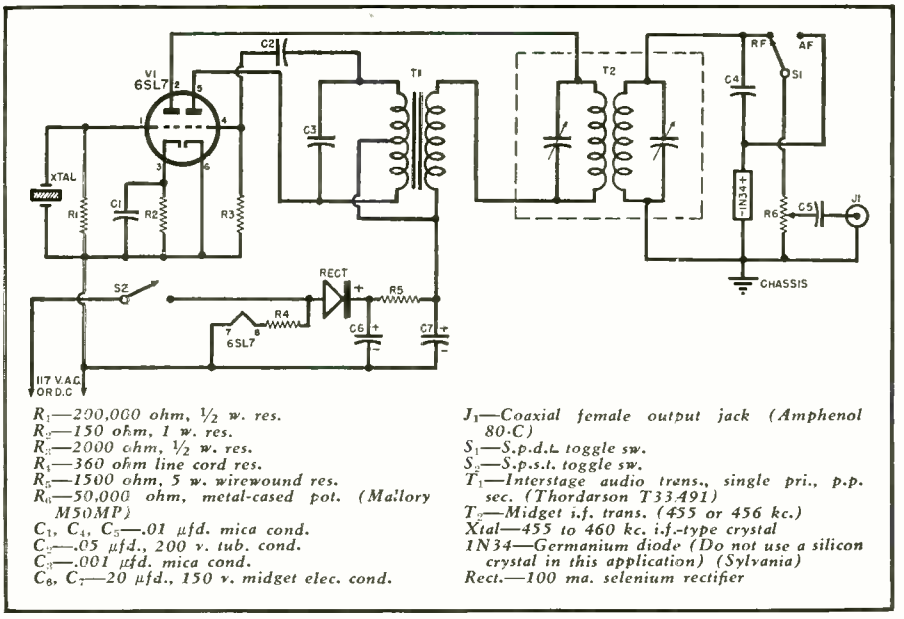
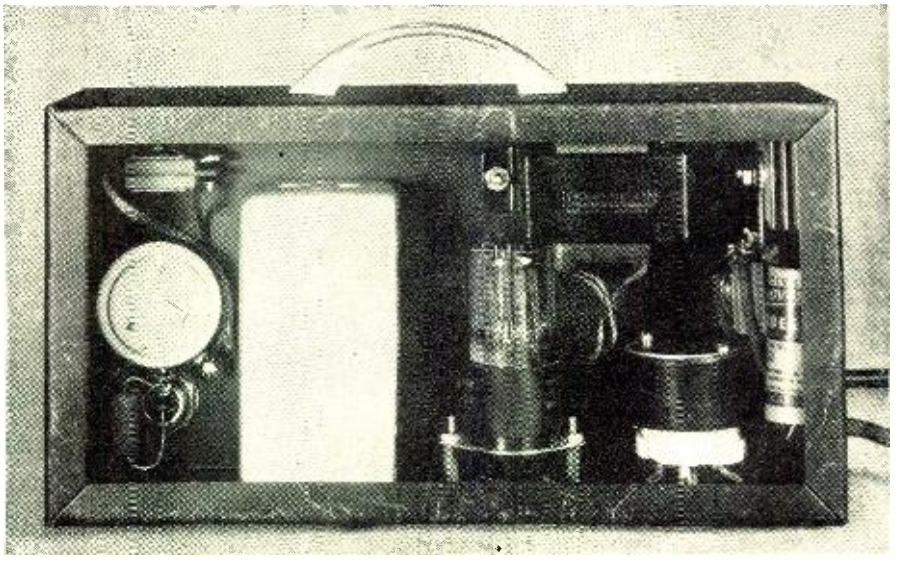


R_1—200,000 ohm, ½ w. res.
R_2—150 ohm, 1 w. res.
R_3—2000 ohm, ½ w. res.
R_4—360 ohm line cord res.
R_5—1500 ohm, 5 w. wirewound res.
R_6—50,000 ohm, metal-cased pot. (Mallory M50MP)
C_1, C_4, C_5—.01 μfd. mica cond.
C_2—.05 μfd., 200 v. tub. cond.
C_3—.001 μfd. mica cond.
C_6, C_7—20 μfd., 150 v. midget elec. cond.
J_1—Coaxial female output jack (Amphenol 80-C)
S_1—S.p.d.t. toggle sw.
S_2—S.p.s.t. toggle sw.
T_1—Interstage audio trans., single pri., p.p. sec. (Thordarson T33A91)
T_2—Midget i.f. trans. (455 or 456 kc.)
Xtal—455 to 460 kc. i.f.-type crystal
1N34—Germanium diode (Do not use a silicon crystal in this application) (Sylvania)
Rect.—100 ma. selenium rectifier

Fig. 2. Complete circuit diagram and parts list for constructing signal injector.

Fig. 3. Under chassis view. Although construction is compact there is no crowding of parts.



Mac's RADIO SERVICE SHOP

By JOHN T. FRYE

Barney Makes a Speech

ORDINARILY, only the night light should have been burning in Mac's empty radio service shop, but this early-April evening was obviously an exception, for every light in the place was blazing, and at least a dozen fellows were wandering about inside. Mac himself was comfortably established in an out-of-the-way corner watching the proceedings with a faint smile of amused anticipation on his face. This was not his show.

Barney, Mac's up-and-coming assistant, looked strangely out-of-place in a neat suit instead of a shop coat and with his mop of curly red hair all carefully combed. Suddenly he stood up behind Miss Perkins' desk and announced in a voice that was unnecessarily loud and a little hoarse from nervousness, "Well, fellows, I guess about everyone is here who is going to come; so we may as well get started."

There was a great scraping of chairs as the men and boys found places to sit down.

"First off," Barney said, "I want to thank Mr. McGregor, my boss, for letting us use the shop for our meetings."

As the heads turned toward his corner, Mac grinned his acknowledgment of their thanks and waved his clasped hands over his head like a prize-fight champion.

"You guys know why we are here," Barney continued. "Some of you asked me to help you get amateur radio licenses, and we decided the best way to do this was to work in a group. We intend to study the code, the radio laws, and the basic theory needed to get a ticket.

"I'd like to have as large a beginning group as we can; for, once we start rolling, it will be hard for a late-joiner to catch up. For that reason, I suggest we postpone actually starting work until our next meeting; and between now and then, let's all see if we can't scare up some more recruits.

"Tonight, if you will let me, I'd like to tell you why, after being a ham for five years, I think amateur radio is the best doggone hobby a fellow can have. Perhaps you will pick up an argument or two that you can use when you start twisting a guy's arm to join us.

"To begin with, a good hobby should be one that you won't outgrow. Playing with building blocks is hot stuff when we are very young; cross-country running is a fine thing for high school and college boys; but neither of these will have much appeal for the middle-aged man. He has lost his taste for the one and his wind for the other. Amateur radio is not like that. It is just as fascinating and just as available to the man in his seventies as it is to the boy in his teens. The great number of active 'old-timers' in the amateur ranks is proof of this. It is not at all unusual to run across a ham who has been pounding brass for a quarter of a century and is still going strong.

"The reason for this continuing fascination lies in the fact that amateur radio is too big and too varied a field for an individual to master. I remember reading in high school about the glamour girl of the Nile, Cleopatra. It was said that the secret of her way with the boys was that she was 'all things to all men.' Well, what Cleo had, amateur radio has, too; for it has something for every taste.

"If you pride yourself on your muscular coordination and like to engage in skill competitions, sending and receiving the code at high speeds is your dish. No matter how fast you get, you will always be able to find another operator who is every bit as fast, if not just a little bit faster.

"Maybe you are a craftsman and get a kick out of building beautiful things with your hands. You can get your enjoyment, then, in the painstaking construction of transmitters, receivers, beam antennas, etc. On the other hand, it could be that you like scientific experimenting. Well, your ham ticket will be the key that will let you into the biggest electronic laboratory in the world, for it actually does take in the whole globe.

"In this laboratory there are more than a hundred thousand amateurs who are constantly designing, building, testing, and experimenting with every kind of electronic equipment from radio-controlled model airplanes to mobile installations that permit them to reach locations thousands of miles from their moving cars.

"It is just possible, though, that you are not a great 'brain' and that you are not much interested in all of this technical side of radio. Perhaps you are an ordinary Joe who likes to meet new people and to talk with them. Again amateur radio is made for you. You can sit right there in your own home, with your sock feet up on the desk, and chew the fat with the whole world on any subject that strikes your fancy. There will not be a single hour of the day or night but that someone will be waiting to answer your 'CQ' on one band or another and to talk as long as you wish to carry on.

"No matter what your primary interest in radio is, this ability to talk with other amateurs is important, for one of the greatest pleasures of any hobby is 'talking shop' with other fellows who share your interest. This is not always so easy in other hobbies. For example, if you collect Ming vases, you may have to travel several hundred miles to meet another bird who appreciates and understands your hobby; but any time you turn on your receiver, you will hear dozens of fellows discussing every imaginable angle of your amateur radio hobby; and you will be as welcome as a muscle-man at a house-raising to join in the discussions.

"Another thing about amateur radio is that you never need to apologize for it as an avocation. It is the only hobby that is recognized by an international treaty. It receives every encouragement from the Army, the Navy, and from the Federal Communications Commission; because these agencies appreciate the fact that hams are ready-trained operators who make excellent instructors in time of war, and that they are always ready and eager to furnish emergency communication when there is a disaster. What is still more important, they know that amateur radio attracts thousands of young men each year into the field of electronics and so keeps our country away out in front in this branch of science. Whistle 'CQ' on the campus of M.I.T., Purdue, or Stanford, and you are al-

(*Continued on page* 92)

Modern TELEVISION RECEIVERS

By MILTON S. KIVER

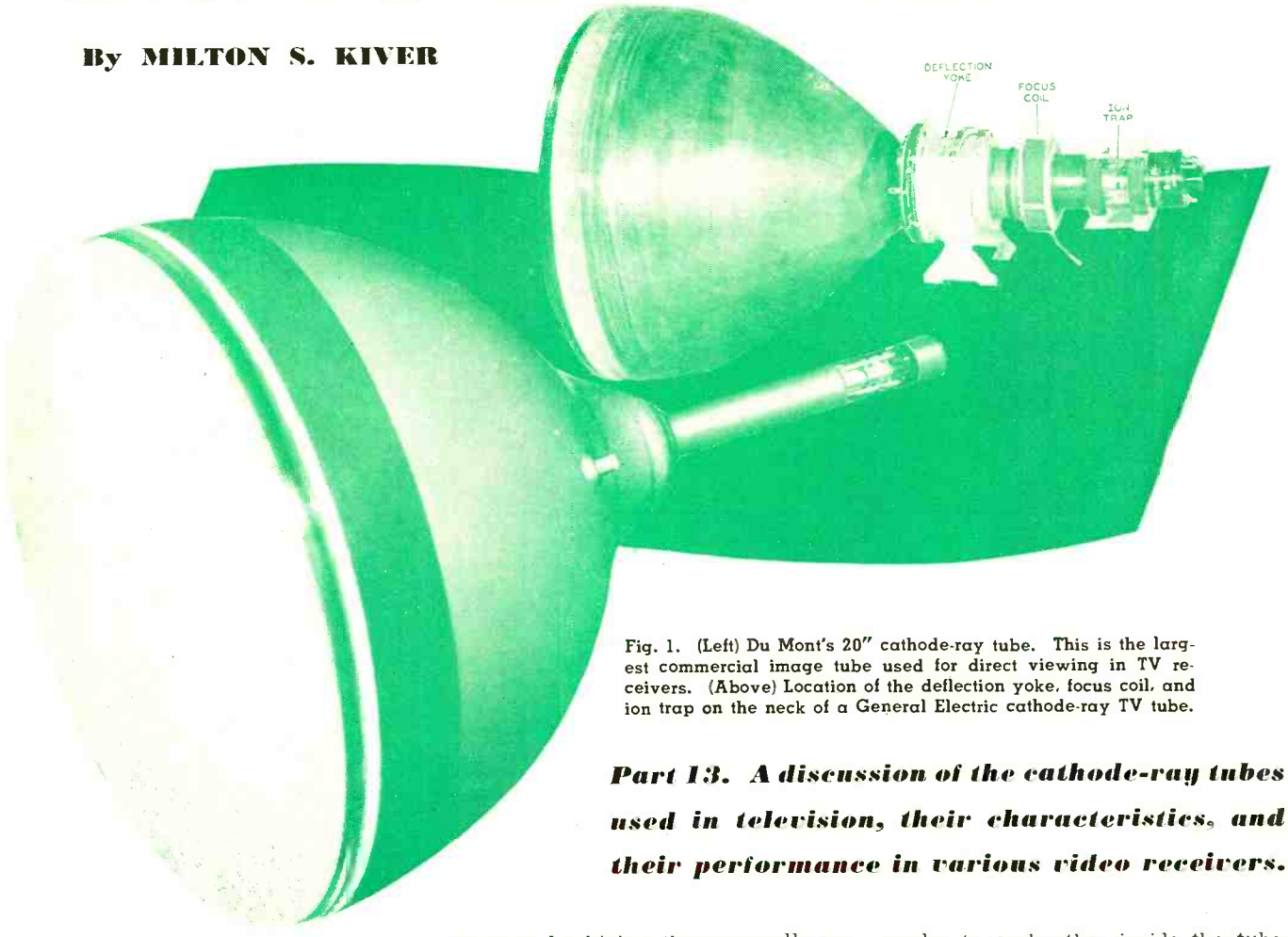


Fig. 1. (Left) Du Mont's 20" cathode-ray tube. This is the largest commercial image tube used for direct viewing in TV receivers. (Above) Location of the deflection yoke, focus coil, and ion trap on the neck of a General Electric cathode-ray TV tube.

Part 13. A discussion of the cathode-ray tubes used in television, their characteristics, and their performance in various video receivers.

THE cathode-ray tube is easily the most important and most expensive single component of the television receiver. It is what the customer sees on its screen that determines his entire attitude toward the rest of the set and, indeed, toward the television field as a whole.

There are eleven different types of television cathode-ray tubes in common use today. These are listed in Table 2, together with their most important characteristics. The 3NP4 and the 5TP4 are both projection tubes producing an extremely intense image on their screens and requiring accelerating voltages of about 27,000 volts. All the other tubes listed are of the direct-viewing type, so-called because the images produced on their screens are viewed directly by the set user. Under these circumstances the image need not be as intense as that required by projection tubes and the accelerating voltages used are correspondingly lower. Tubes with 7-inch screens require between 5000 and 6000 volts, while the 10", 12", 15" and 20" tubes operate satisfactorily with 9000 to 15,000 volts. It is to be noted that in all these tubes the accelerating voltages are far higher than normally encountered and extreme caution should be exercised when working with them. While 9000 volts may not necessarily be fatal, due to the extremely small current drain available, it will, at the very least, produce a severe jolt.

The essential components of a cathode-ray tube are: 1. Electron gun; 2. Focusing system; 3. Deflection system; and 4. Fluorescent screen.

The electron gun, where the scanning beam is formed and focused, consists of the cathode, control-grid, and preliminary accelerating electrodes called grids by some manufacturers and anodes by others. Focusing of the beam can be accomplished in one of two ways—by altering the potential difference between the first and second anodes or by using the magnetic field of an external coil. The 5TP4, the 7DP4, the 7GP4 and the 7JP4 employ the first method of focusing, known also as "electrostatic" focusing. In all of the remaining tubes, a special focusing coil is placed around the tube neck and the electrons are brought to a focus magnetically.

Deflection System. Deflection of the electron beam, to trace out the image, is accomplished by deflecting plates or coils. For electrostatic deflection, two sets of plates are mounted at right angles to each other inside the tube. See Fig. 2. One set of plates receives the horizontal deflection voltages; the other set receives the vertical deflection voltages. When both voltages are active, the electron beam is drawn horizontally across the screen and, at the same time, vertically downward. In this way the desired scanning pattern is traced out. To deflect the beam electromagnetically, two sets of mutually perpendicular coils are placed around the neck of the tube. Currents of saw-tooth shape pass through the coils and deflect the beam. A typical deflection yoke, containing both vertical and horizontal windings, is shown in Fig. 3.

Electrostatic deflection is commonly used in 7" (or smaller) screen tubes. In larger tubes, a considerable deflecting voltage is required if deflection plates are employed. Since it is cheaper to develop high currents than high voltages, the trend has been toward electromagnetic deflection. This trend has been further intensified by the shortening of the over-all length of the tube.

In electromagnetic deflection tubes used before the war, the deflecting angle of the electron beam was 40°. See Fig. 4A. In recent tubes, the deflecting angle has been increased to

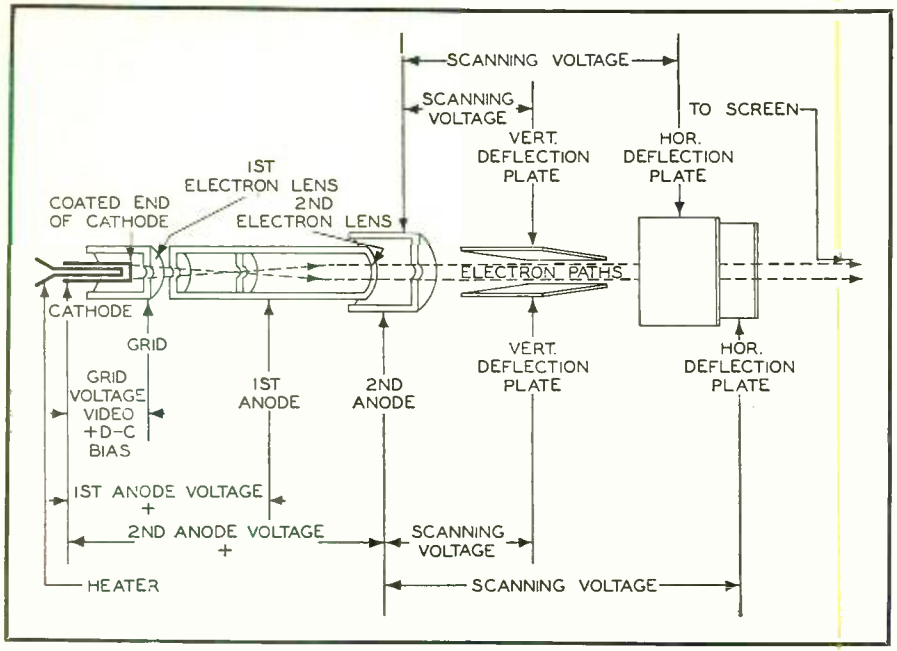


Fig. 2. The internal construction of an electrostatic deflection cathode-ray tube.

50°. See Fig. 4B. The increased deflecting angle results in a shorter over-all length (8 inches smaller for 12" tubes) and therefore permits the use of relatively large screen tubes in reasonably sized table model receivers. True, the increase in deflecting angle requires greater deflecting currents, but this is readily met with only slight increase in cost. Deflection by electrostatic means, on the other hand, would entail a significant rise in cost. Further, the use of electromagnetic deflection and focusing simplifies the internal construction of the cathode-ray tube. This may not lower the over-all cost of the set because deflection and focusing coils are needed, but it does lower the replacement cost of the cathode-ray tube.

In the small 3NP4 and 5TP4 tubes, the deflection is electromagnetic instead of electrostatic for several reasons.

(1). The accelerating voltage is 27,000 volts while the first anode voltage is 6000 volts. Since each tube is small, the separation between the deflection plates (with their average potential of 27,000 volts) and the first anode would be small, necessitating special precautions to prevent corona and arc discharges.

(2). The cost of developing the extremely large deflection voltages necessary with a 27,000 volt accelerating potential would be entirely out of proportion to the cost of the rest of the set. Special tubes, 27,000 volt isolating condensers, and additional amplifying stages are only some of the major items necessary.

(3). Electromagnetic deflection not only permits a simplification in tube design, but requires no more power than that available from a conventional 10" set.

Fluorescent Screens. The front end of the cathode-ray tube is internally coated with a fluorescent substance which emits light when hit by an electron beam. Many of the fluorescent screens contain zinc sulphide or combinations of zinc, and cadmium sulphides. For television receivers, the color of the light emitted is generally white, although sometimes it is tinged with blue or yellow to produce a softer looking image. Television screens are labeled P4, this designation denoting a screen emitting while light and exhibiting medium persistence. Other types of screens, employed for such purposes as oscilloscopes, radar, and photographic applications are listed in Table 1.

The fluorescent screen is probably the most delicate part of the cathode-ray tube and requires careful attention if it is not to be burned. If the deflection voltages should fail, the beam will remain stationary at one point. If allowed to remain stationary for more than several minutes, the beam will probably desensitize the screen at this point. Visually, this means that the image will have a dark spot, or blemish.

Many of the newer television receivers are designed so that the high accelerating voltage of the cathode-ray tube is removed when the horizontal deflection system fails. This insures that the beam is never stationary on the screen. However, in those sets which do not offer this protection, burning of the screen by a stationary beam is a real danger.

Raising the potential of the control grid by rotating the brightness control will, in time, reduce the useful life of the screen. Too high a setting of the contrast control may have the same effect. When a set is installed, the owner should be shown the proper procedure for setting these controls and cautioned against their misuse. The cathode-ray tube is expensive and should be treated carefully.

Cathode-Ray Tube Nomenclature. The following rules have been formulated to standardize and develop a uniform numbering system for cathode-ray tubes.

(1). The first number, whether one or two digits, will represent the diameter of the screen.

(2). The letter P with the number following it will indicate the type of fluorescent screen.

(3). Any additional letters found between the first number and P will distinguish between tubes that may have screens of equal size, but which possess other differing characteristics.

To illustrate the system, consider the 10BP4 tube. The 10 indicates that the screen diameter is 10 inches, the P4 tells us that the light trace is white, and the B distinguishes between this tube and other 10P4 tubes, such as the 10FP4. The latter tube has an aluminum backed screen.

Ion Traps. In cathode-ray tubes (and all other vacuum tubes for that matter) some gas atoms always exist after the supposed evacuation of all the air. When electrons in the beam strike these atoms, the atoms become ionized; some gain electrons, some lose electrons. Thus, there is present in the gas positively and negatively charged ions. The negatively charged ions are drawn forward by the positive accelerating voltage of the second anode and tend to fall in with and follow the electron beam. When the beam is electrostatically deflected, these ions are deflected with the electrons and hence are of no special importance. However, with electromagnetic deflection, the angle through which the electrons and ions are deflected is inversely proportional to their mass. Since ions are at least 1800 times heavier than electrons, they receive very little deflection. The continual bombardment of a small area at the center of the screen by these ions eventually produces a burned-out spot where all of the screen material is

Table 1. The most common phosphors used for oscilloscopes, TV tubes, and radar.

RMA Designation and Substance	Activator	Fluorescent Color
P 1—Zinc silicate	Manganese	Green
P 2—Zinc sulphide	Copper	Blue-green
P 3—Zinc beryllium silicate	Manganese	Yellow-Green
P 4—P3 and zinc sulphide	Silver	White
P 5—Calcium tungstate		Blue
P 6—Zinc sulphide	Silver	White
Zinc cadmium sulphide	Silver	
P 7—Zinc sulphide	Silver	Blue
Zinc cadmium sulphide	Copper	Yellow
P11—Zinc sulphide	Silver with a nickel quencher	Blue

Type	Heater		Nominal Dimensions		Base Socket	Image Size (Inches)	Defl. Method	Focus Method	Defl. Angle	Ion Trap	Typical Operating Conditions				Tube Symbol
	Volts	Amps	Diam.	Length							Grid 1	Anode 1	Grid 2	Anode 2	
											Cut-Off				
3NP4	6.3	1.2	2½	10½	Special 5 Prong	1.4 x 1.86	M	M	40°	No	−50	.....	250	25,000	Special socket
5TP4	6.3	0.6	5	11¾	Duodecal 7 Pin	3 x 4	M	E	50°	No	−98	5000	200	27,000	See Fig. B
7DP4	6.3	0.6	7 3/16	14 1/16	Duodecal 7 Pin	4 x 5½	M	E	50°	Yes	−45	1600	250	6,000	See Fig. B
7GP4	6.3	0.6	7	14½	Diheptal 12 Pin	4 x 5½	E	E	.....	No	−63	1000	.....	3,000	See Fig. A
7JP4	6.3	0.6	7	14½	Diheptal 12 Pin	4 x 5½	E	E	.....	.....	−168	2800	.....	6,000	See Fig. A
10BP4	6.3	0.6	10½	17⅝	Duodecal 7 Pin	6 x 8	M	M	50°	Yes	−63	.....	250	9,000	See Fig. C
10FP4	6.3	0.6	10½	17⅝	Duodecal 7 Pin	6 x 8	M	M	50°	No	−63	.....	250	9,000	See Fig. C
12JP4	6.3	0.6	12	17½	Duodecal 7 Pin	7¾x10¼	M	M	50°	No	−63	.....	250	10,000	See Fig. C
12LP4	6.3	0.6	12 1/16	18¾	Duodecal 7 Pin	7⅛x 9½	M	M	52°	Yes	−63	.....	250	11,000	See Fig. C
15AP4	6.3	0.6	15⅝	20 3/16	Duodecal 7 Pin	9½x12¾	M	M	50°	No	−63	.....	250	12,000	See Fig. C
20BP4	6.3	0.6	20	28¾	Duodecal 7 Pin	12⅞x17¼	M	M	50°	No	−63	.....	250	15,000	See Fig. C

Fig. A

Fig. B

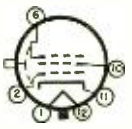


Fig. C

Table 2. The eleven most commonly used cathode-ray tubes, their characteristics, size, sockets, and their standard symbols.

inactive. This is known as an ion spot.

Since ion bombardment wears away the screen material, many devices are used to eliminate it. These devices are known as ion traps. Hence, whenever electromagnetic deflection is employed, some type of ion trap will be found. Exceptions to this exist when the newly developed aluminum-backed screen is employed (which is itself a form of ion trap) or when the tube diameter is large. In the latter case, the magnetic deflection fields are sufficiently strong to disperse the ions over a relatively wide area and no noticeable ion burn is developed during the normal life of the tube. Some 12-inch and all 15-inch tubes do not use ion traps. (The 12JP4 does not use an ion trap; the 12LP4, however, does.)

Diagonal-Cut Ion Trap. The most common type of ion trap in use today combines an external non-symmetrical magnetic field as shown in Fig. 5A with an internal accelerating anode that is constructed in two sections (*A* and *B*). Electrode *A* receives a low positive voltage; electrode *B* has a high positive voltage. The electrons, when they leave the control grid, are attracted forward by electrode *A*. However, due to the oblique gap between plates *A* and *B*, the electrons (and the ions) are bent in the manner indicated by the solid line in Fig. 5B. With no other forces applied, the electrons and ions would strike anode *B*. However, if a magnetic field is introduced in the tube at right angles to the electrode, the electrons receive a counter force deflecting them upward and permitting them to continue through the gun. The ions, because of their greater mass and the fact that the magnetic field scarcely deflects them, strike electrode *B* and are removed from the beam path.

The magnets are clamped on the tube stem in the manner illustrated in Fig. 5C. The magnet to the rear is stronger than the forward magnet.

The ion trap may operate electromagnetically, in which case current flowing through the front and rear ion trap coils provide the necessary magnetic field (Fig. 5C), or it may contain fixed magnets of Alnico (Fig. 3).

Adjustment of Ion Traps. When an ion trap is used, the following procedure indicates how to adjust the position of the unit properly:

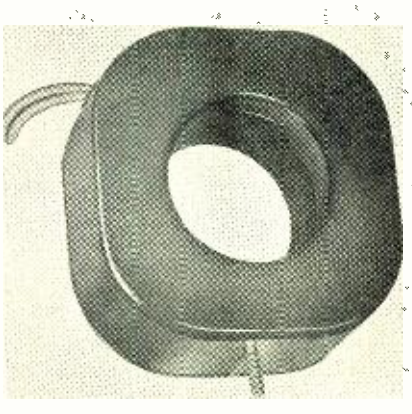
Step 1. Clamp ion trap on tube, the pole piece of the largest magnet (or coil) positioned over the rear electrode *A*. The focus and deflection coils should be in place, as shown in Fig. 1.

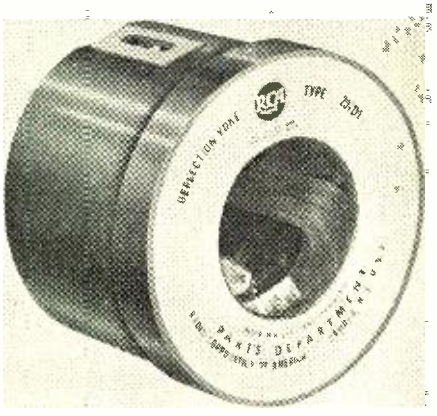
Step 2. Turn the television set power on and allow 5 minutes for warm-up. Turn brightness control clockwise until raster appears on screen. Move the ion trap back and forth and around the neck of the tube until maximum light output is produced on the screen.

Step 3. If no position can be found at which a raster appears on the screen, check to make certain that the strongest (and usually the largest) magnet is closest to the tube base.

In set repair, it has been found that fixed-magnet ion traps may become ineffective due to a reduced magnetic field. This can readily be determined by testing the unit on a set that is operating. Merely substitute the doubtful ion trap in place of the good unit and observe the screen raster. Fixed-magnet ion traps contain a small front bar and a larger back bar. The air gaps of both bars should be parallel to each other. Sometimes one or both bars can be rotated in their grooves with the result that their air gaps are

Fig. 3. (Left) A fixed magnet ion trap. (Center) A typical focusing coil. (Right) A typical deflection yoke.





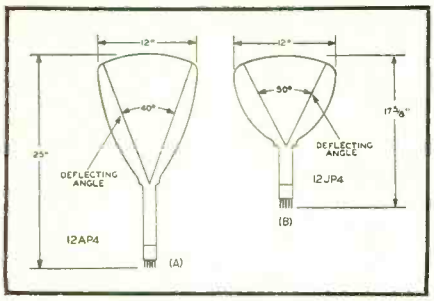


Fig. 4. (A) Prewar television tube, and (B) a typical present-day television tube.

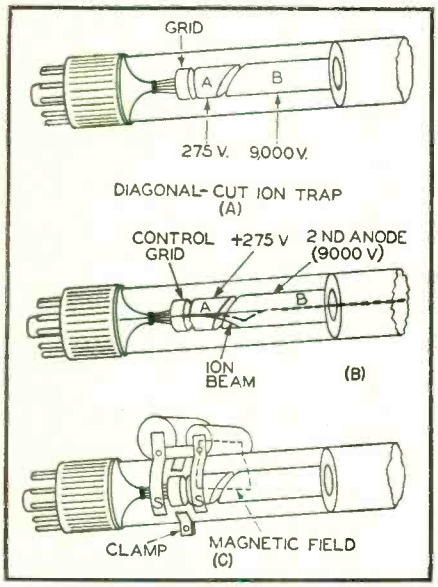


Fig. 5. The diagonal-cut ion trap.

no longer aligned. This, too, can prevent the beam from striking the screen. Electromagnetic ion traps, short of an open in their wiring or partial or total failure of the power supply providing the current, will operate satisfactorily if positioned as indicated above.

Metal-Backed Screens to Eliminate Ion Spot. Another device which eliminates the ion spot is the metal-backed screen. This screen consists of the usual fluorescent phosphor on the back of which is deposited a thin layer of aluminum. When the beam strikes the coating, the electrons, due to their small size, are able to penetrate between the molecules of the aluminum metal and reach the phosphor. The ions, however, are effectively stopped since they are too large to pass through. This sieve-like action of the aluminum serves as an effective ion trap. The metal-backed screen offers several other advantages. They are:

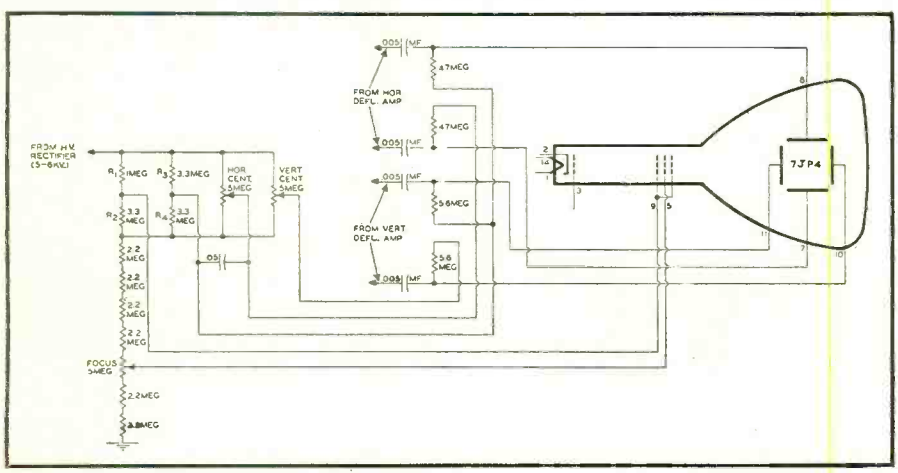
1. More light output due to the mirrorlike action of the metal backing.
2. Better contrast.
3. Reduction of the difficulties which are caused by the slow removal of electrons from the screen. (The conductive coating is a good path for electrons.)

The 10FP4, 5TP4, and 3NP4 cathode-ray tubes are the only tubes at present using an aluminum backing.

Focus Coils. Focusing, as previously noted, can be accomplished electrostatically by varying the voltage on the first anode of the electron gun or electromagnetically by using an external coil. For the first method, the voltage on the first anode is varied by means of a potentiometer. The control arm is simply rotated until the beam (or image) is sharp and clear.

A circuit which is typical of electrostatic deflection systems is shown in Fig. 6. The output of the high-voltage power supply is fed to a resistance voltage divider network where, at a suitable voltage point, a 5 megohm potentiometer is inserted and the necessary focusing voltage is obtained. Beam centering is accomplished with the same network. A high fixed voltage is placed on one vertical and one horizontal deflecting plate from taps between R_1, R_2 and R_3, R_4. In parallel with these resistors are two 5 megohm potentiometers, the center arm of each connecting to the other vertical and horizontal plates. When the arms of the potentiometers are in center position, there is no d.c. potential difference *between* the plates of the horizontal and vertical sets. A balance exists. Any change in these potentiometer arms, however, will make one plate more positive than the other of its set and bend the electron beam. If we rotate the vertical centering potentiometer, the beam (or image) will shift up or down. If we rotate the horizontal centering control, the image will shift right or left. The deflecting voltages for the image are applied separately as shown.

Fig. 6. A typical electrostatic deflection system as used in modern television receivers.



Focusing electromagnetically is accomplished by a coil slipped over the neck of the tube. See Figs. 1 and 3. A typical bracket to support the coil is shown in Fig. 7. The bracket consists of three parts: two vertical supports and a horizontal suspension section. Wing nuts hold the assembly in position. By adjusting the wing nuts, the focus coil can be moved up or down, from side to side, forward or backward, or twisted slightly at an angle.

Adjustment of the Focus Coil Position. A simple adjustment procedure is as follows:

Step 1. Produce a raster on the screen by following the preceding ion-trap adjustment.

Step 2. Rotate the brightness control until the screen brilliance is halfway between dark and maximum.

Step 3. Adjust the position of the focus coil until the most clearly defined raster is produced. That is, each line should be the same width all across the screen. There should be:

(a). No areas where the lines blend into each other.

(b). No shaded corners or rounded edges on the raster (beam striking neck of tube).

(c). A picture that is centered on the screen.

Step 4. After the focus coil is set, the ion trap should be rechecked because the fields of the two interact.

The adjustments on the focus coil position will indicate where the coil should be set. In addition, nearly all manufacturers provide a fine focus potentiometer which controls the current through the focus coil. See Fig. 8. Rotation of this control should produce a sharply-defined raster or image. On either side of this point, the beam will become defocused. In some sets, after several months of operation, the resistance values in the focus control circuit will change enough to reduce the ability of the focus control to provide sufficient resistance variation to produce a sharp focus. Best focus may be obtained when the potentiometer arm is completely to one side—in which case the serviceman is unable to determine whether the beam is properly focused. In the extreme case, no position of the control will be found where proper focusing appears. Check the resistance values in the focus control circuit against the manufacturer's stated values. If these are normal, within plus or minus 10%, measure the power supply voltage applied to the focus coil. It is entirely possible that the voltage has decreased enough to affect the focusing action and yet not enough to affect the rest of the set appreciably.

Deflection Coil Adjustment. Deflection coils are mounted on brackets

(*Continued on page* 148)

The Beginning AMATEUR

A neat addition to a boy's den, affording him many interesting hours of listening.

By

ROBERT HERTZBERG, W2DJJ

Part 3. Complete details on a simple, reliable receiver for the three main amateur bands.

Front panel view of completed receiver. The white paper cemented to the panel serves as the "dial" for the band-setting condenser. The positions of the pointer knob are simply marked in pencil.

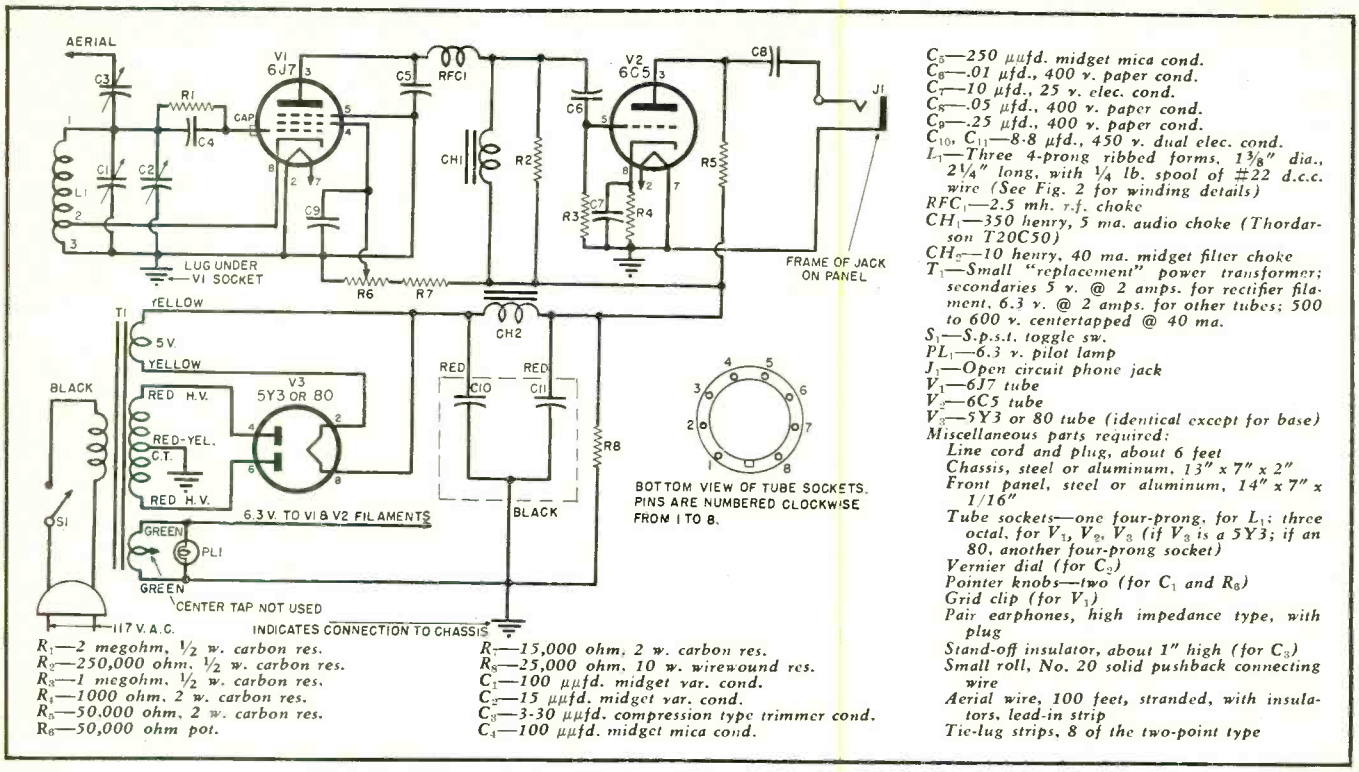
IF YOU are making fair progress with the code and want to start getting a station together, there is no better introduction to the technical side of the game than the construction of your own short-wave receiver. Just buying the parts immediately makes you familiar with coils and condensers, tubes and transformers, switches and sockets, etc. Assembling them on a small metal chassis gives you valuable experience in the handling of steel and aluminum and the mounting of molded ceramic and plastic components. Connecting up all the pieces develops your skill with the soldering iron. All of this is necessary background for your later work on more complicated receivers and on an endless chain of transmitters. The actual receiver, small and simple as it is, will surprise you with its fine results.

Most young beginners have to depend on Dad's generosity or on meager after-school earnings. The first question they ask about a construction project is, naturally, "How much will it cost?" If you don't have a single socket or resistor on hand, and have to go out and buy everything shown in the accompanying photographs, you can just about get by for $20, and perhaps a shade less if you shop around carefully. You'll obtain many times twenty dollars' worth of enjoyment out of the set, and when you are ready to graduate to something better you'll be able to use 99% of the parts over again. I predict that you'll probably leave the receiver intact, as a sort of standby unit, instead of tearing it down; as your "first" set, it will develop a sentimental value far in excess of its original cost.

In undertaking your first receiver, you will also learn how to read radio diagrams. The type of drawing included with this article is known as a "schematic," because it shows the "scheme" of the connections. For convenience of identification, the various parts bear symbols, which appear also in the parts lists and on the photographic illustrations. At first a schematic is just a collection of pen scratches, but after a little study it becomes very easy to read. The pictures show where the parts are placed, while the diagram shows how they are connected together.

Examine the diagram, the parts list, and the photos very carefully, checking each part by its symbol. This step alone will acquaint you with the appearance of the parts. It is common practice in the radio art to use the letter V for vacuum tubes, C for condensers, R for resistors, T for transformers, S for switches, J for jacks, etc. Coils of various kinds are marked L, since C is already assigned. The first tube in this receiver is V_1, of the 6J7 type. The circle represents the outer shell (or "envelope," as it is known to engineers), and the lines inside various grids, the plate, the cathode, and the heater. In conjunction with the coil L_1 and the two variable condensers C_1 and C_2 (the arrow head through the condenser symbol means variable), this tube operates as a regenerative detector. It works into V_2, which is an amplifier. The signals are heard in a pair of earphones connected to jack J_1.

Transformer T_1, rectifier tube V_3 and



R_1—2 megohm, ½ w. carbon res.
R_2—250,000 ohm, ½ w. carbon res.
R_3—1 megohm, ½ w. carbon res.
R_4—1000 ohm, 2 w. carbon res.
R_5—50,000 ohm, 2 w. carbon res.
R_6—50,000 ohm pot.
R_7—15,000 ohm, 2 w. carbon res.
R_8—25,000 ohm, 10 w. wirewound res.
C_1—100 μμfd. midget var. cond.
C_2—15 μμfd. midget var. cond.
C_3—3-30 μμfd. compression type trimmer cond.
C_4—100 μμfd. midget mica cond.
C_5—250 μμfd. midget mica cond.
C_6—.01 μfd., 400 v. paper cond.
C_7—10 μfd., 25 v. elec. cond.
C_8—.05 μfd., 400 v. paper cond.
C_9—.25 μfd., 400 v. paper cond.
C_{10}, C_{11}—8-8 μfd., 450 v. dual elec. cond.
L_1—Three 4-prong ribbed forms, 1⅜" dia., 2¼" long, with ¼ lb. spool of #22 d.c.c. wire (See Fig. 2 for winding details)
RFC_1—2.5 mh. r.f. choke
CH_1—350 henry, 5 ma. audio choke (Thordarson T20C50)
CH_2—10 henry, 40 ma. midget filter choke
T_1—Small "replacement" power transformer; secondaries 5 v. @ 2 amps. for rectifier filament, 6.3 v. @ 2 amps. for other tubes; 500 to 600 v. centertapped @ 40 ma.
S_1—S.p.s.t. toggle sw.
PL_1—6.3 v. pilot lamp
J_1—Open circuit phone jack
V_1—6J7 tube
V_2—6C5 tube
V_3—5Y3 or 80 tube (identical except for base)
Miscellaneous parts required:
Line cord and plug, about 6 feet
Chassis, steel or aluminum, 13" x 7" x 2"
Front panel, steel or aluminum, 14" x 7" x 1/16"
Tube sockets—one four-prong, for L_1; three octal, for V_1, V_2, V_3 (if V_3 is a 5Y3; if an 80, another four-prong socket)
Vernier dial (for C_2)
Pointer knobs—two (for C_1 and R_6)
Grid clip (for V_1)
Pair earphones, high impedance type, with plug
Stand-off insulator, about 1" high (for C_3)
Small roll, No. 20 solid pushback connecting wire
Aerial wire, 100 feet, stranded, with insulators, lead-in strip
Tie-lug strips, 8 of the two-point type

Fig. 1. Schematic diagram shows how the various components are connected.

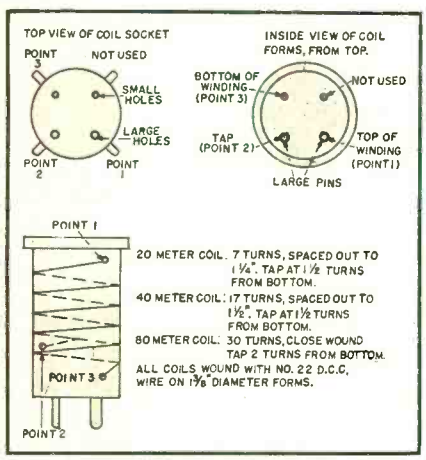


Fig. 2. Complete mechanical and electrical details of coil assembly. Three separate coils are required to cover the 20, 40, and 80 meter bands.

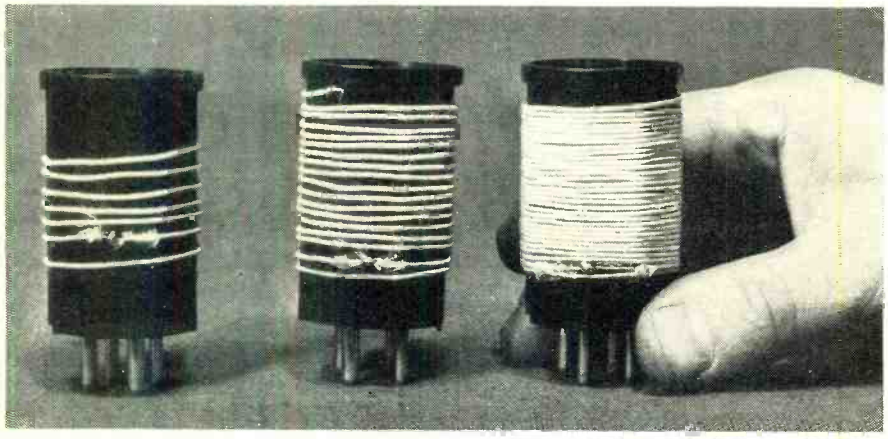
filter circuit CH_2, C_{10}, C_{11} comprise the "power supply." T_1 is connected to the a.c. power line. It has three secondary windings. One, developing 6.3 volts, lights the heaters of V_1 and also the red ruby panel light PL_1, which is a reminder that the power has been turned on by switch S_1. Another secondary gives about 600 volts. This high voltage, still a.c., is changed or "rectified" into a pulsating direct current by V_3. These pulsations are smoothed out, or "filtered," by the combination of choke coil CH_2 and filter condensers C_{10}, C_{11}. Without this filtering, the rough voltage would produce a terrific growl or hum in the phones. The voltage that appears across the output of the filter, at resistor R_8, is about 250 volts.

The diagram shows one coil L_1, but actually there are three separate coils, of different sizes, which are plugged into this position to give the receiver a tuning range of from 2.9 to 22.4 megacycles (or 2900 to 22,400 kilocycles). The first coil covers 2.9 to 6 megacycles, which takes in the amateur "75-meter" band (more accurately stated, the 3.5 to 4 megacycle band); the second runs from 5.1 to 10.9 mc. ("mc." for megacycles), and includes the busy 7 to 7.3 mc. c.w. band; the third goes from 10.5 to 22.4 mc. and includes the long distance 14 to 14.4 mc. band.

The coils themselves consist of single layers of No. 22 d.c.c. (double cotton covered) copper wire on ribbed four-prong forms; the latter fit into a four-prong tube socket on the chassis, and changing them is the work of a few seconds. The spacing of the turns on the two smaller coils is not critical and need not be uniform, although the completed coils look neater if the turns are nice and even. Winding each coil shouldn't take more than five minutes. First drill the forms with two small holes: one near the bottom and one near the top. Push the end of the wire through the bottom hole, pull it up through the form with a pair of long nose pliers, and then carefully thread it down through No. 3 pin. Solder it fast, pull out the slack loop inside the form, and wind on the specified number of turns. Start with the 7-turn coil, as it's the easiest. At the end of the last turn, cut the wire about six inches long, push the end through the top hole, then down through the No. 1 pin and solder it.

To make the tap, scrape the cotton off the wire about 1½ turns up from the bottom and drill a hole next to this point, being careful not to cut adjacent turns. Cut a separate piece of wire

The three home-made plug-in coils are wound on small four-prong forms. The "20 meter" coil is on the left, the "40" in the center, and the "80" on the right. Note that the soldered tap is on the second turn from the bottom on each coil.



about six inches long. Bend one end to form a small hook. Push the other end through the third hole and up through the coil form, and pull it until the hook fits over the scraped turn. Solder the joint and then thread the free end down into the No. 2 pin of the form and solder it. It will take you less time to perform these operations than to read the instructions!

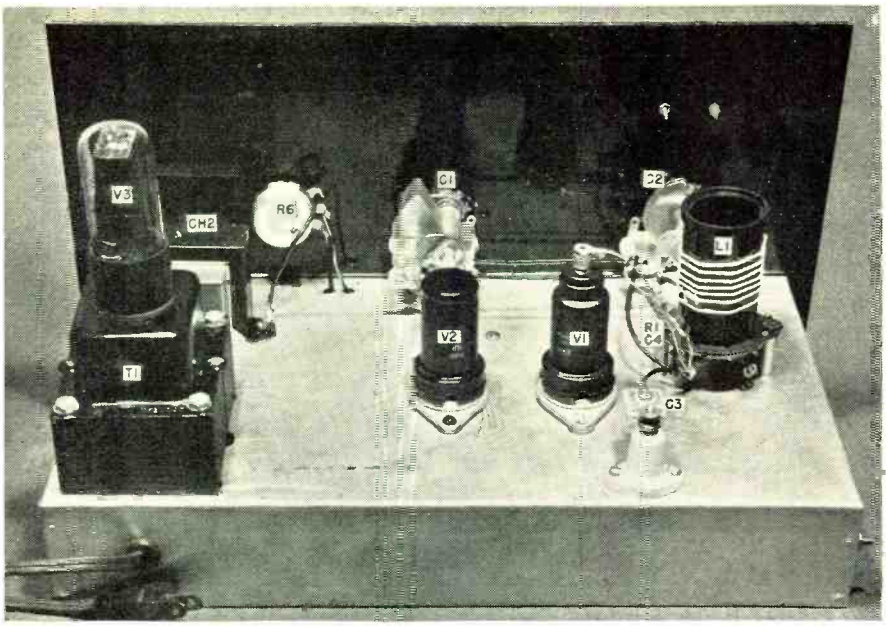
Since the largest coil has its turns closewound, you will have to separate the second and third turns temporarily while you drill the hole for the tap wire. Pull all the windings as taut as possible; if they are a bit loose when you've finished them, anchor the wire with a couple of vertical strips of Scotch tape.

The placement of the various parts is made very clear in the pictures. The front panel holds the two variable condensers C_1 and C_2, the earphone jack J_1, the regeneration control R_6, the line switch S_1 and the panel light PL_1. C_1 is fitted with a pointer knob, while C_2 has a vernier dial on it for close adjustment. On the chassis, regarded from the rear, the power supply units are on the left, the coil socket on the extreme right, and the tubes in the center. The coil socket is supported about an inch above the surface of the chassis by means of washers or short pieces of tubing. This makes the soldering lugs accessible for short connections to C_1 and C_2. The grid condenser C_3 and the grid leak R_3 are soldered together to point 1 of the coil socket, and their other ends go to a clip which fits over the end cap of V_1. The little antenna adjusting condenser C_4 is mounted on a porcelain stand-off insulator.

All necessary holes should be laid out carefully, using a scriber, compass, and straightedge. No detailed drilling layout is given because the positions are not critical, and hole spacing will vary with makes of sockets, transformers, etc. To make the socket holes and the transformer opening, first drill a circle or rectangle of holes, cut out the inner section with a chisel and file the edges smooth. You can do a perfectly good job with a small hand drill, although, of course, a power drill will save time. Ask the manual training teacher in your school for help; he'll probably be glad to let you use a power drill press, under his supervision.

The small parts on the underside of the chassis are mounted by their own connecting wires, or with the assistance of "tie-lug strips." These are little pieces of insulating material with mounting feet and soldering lugs. It will be convenient to mount one each under the screws that hold down the filter choke CH_2 and the tube sockets for V_1 and V_2. For wiring, use No. 20 solid push-back, a clean hot iron, and rosin core solder. The entire wiring job shouldn't take more than about an hour and a half.

A small three-tube receiver of this kind needs the help of a good outside aerial. A single wire, having a total length from the aerial binding post to the far end of about 100 feet, is recommended. It should be as high and as clear as possible, well insulated, and pulled fairly tight to minimize swinging. A ground connection to a water pipe is also helpful, although in some locations the set will work satisfactorily without one.

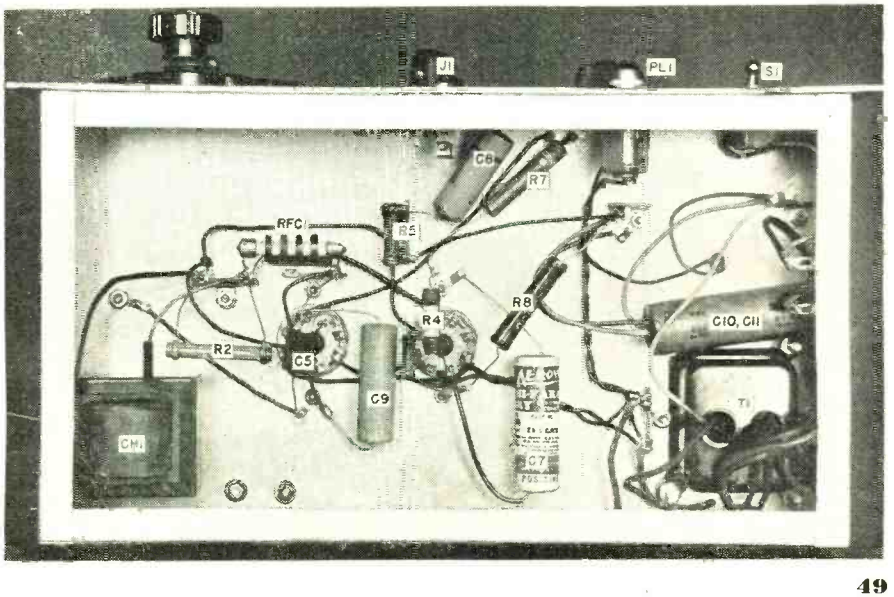


Top view of the completed receiver. Tubes and a plug-in coil are in place and very little wiring is in sight. (Note: The particular power transformer used in this set has the rectifier socket built into the top. If a conventional transformer is used instead, socket for V_3 can easily be put between T_1 and V_2.)

To place the set into operation, put the tubes in their sockets and plug in the 40 meter coil. Connect the aerial and ground, and the 117-volt plug. Connect the earphones, which, by the way, should be of the high impedance type, by means of a plug that will fit the jack J_1. Turn the switch S_1 to the "on" position. The panel light will go on and the filament of V_3 will start to glow dull red. The tubes will take about ten seconds to come up to operating temperature. Start with the potentiometer knob R_6 backed all the way counterclockwise (rotating arm nearest to ground connection). With C_1 and C_2 in any position, *slowly* advance R_6. Condenser C_3, by the way, should be about in its mid-position. As you crank up R_6, you will hear a soft rushing noise, and then a noticeable *plop*. This indicates that the detector tube V_1 has gone into oscillation. Turn C_1 carefully by means of its knob, and if you have wired the set correctly you will hear numerous c.w. stations. With your left hand on C_1 and your right on R_6, you will be able to strike combinations of adjustments that will bring in stations by the score, some with enough volume to make you take off the phones. The setting of R_6 is critical and important, as it deter-

(*Continued on page* 141)

Bottom view of the completely wired receiver. The parts are well separated and can be soldered with ease. The small fixed resistors and condensers are mounted directly by means of their connecting leads. The exact placement of parts is not critical; just follow the layout and no trouble will be encountered.



An All-Band MOBILE TRANSMITTER

Front view of mobile transmitter. Push-to-talk operation is obtained with T17B mike.

By JOHN F. CLEMENS, W9ERN

This sturdily-constructed unit provides both c.w. and phone operation at the home shack or on the go.

THE new regulations of the FCC permitting mobile operation on the low-frequency amateur bands present opportunities for a new and interesting phase of amateur activity. Many ham stations are being moved *in toto* to the automobile and almost all of the amateur fraternity are engaged in or contemplate engaging in some sort of portable work. The transmitter described here is the result of an attempt to condense in as small a space as possible a number of refinements usually reserved for the more pretentious home station. The foremost of these refinements is variable frequency operation which has been found to be not only satisfactory but as valuable in the mobile rig as in the home station. The percentage of contacts is greatly increased if the low-powered mobile station can move to the called station's frequency and the ability to elude QRM is always useful.

While phone operation is the rule for mobile work, provision is made for c.w. and a keying jack is provided on the front panel next to the mike jack. A standard phone jack is used for the key while a smaller jack, type PL68, is used for the mike so that the two cannot be confused. The ubiquitous T17B mike is recommended and a connection is made to the mike thumb button so that push-to-talk control is obtained. In addition to the e.c.o. tuning dial, a knob on the front panel peaks the final amplifier for maximum antenna current and another screwdriver adjustment allows tuning the antenna network. The pilot light is in series with the antenna lead and serves as a tuning and modulation indicator. In actual operation, once the antenna coupling condenser is adjusted, only the e.c.o. dial and the output peaking control need be tuned to change frequency.

Originally the transmitter was intended to operate from a PE103 dynamotor at 500 volts but after considering the 21 ampere dynamotor drain it seemed advisable to reduce the power requirements somewhat. A compromise was finally made: the 500 volt design was retained but three jumpers (shown dotted in the circuit diagram) were added in the transmitter so that a 250 to 300 volt supply could be used. A PE103 with 6 volts applied to the 12 volt winding draws only about 9 amps. and will deliver about 250 volts at 130 ma. Under these conditions the transmitter will run about 12 watts input to the final amplifier. If an increase in power is desired it is only necessary to clip out the three jumper wires and excite the 6 volt winding of the PE103.

Frequency stability of the transmitter is enhanced by rigid mechanical construction and the use of small components in the compact e.c.o. assembly. The oscillator coil is wound on a small ceramic form and enclosed in a separate shield which partially covers the oscillator tube socket so that the grid and cathode terminals of the tube socket are inside the shield. The e.c.o. tuning condenser and ceramic padding condensers occupy a small area of their own, clear of all other components and wiring. A small variable condenser of the air trimmer type is to be preferred to allow maximum clearance between it and all parts of the shield and chassis. The oscillator tube is a 6AK6. This tube is ideally suited to e.c.o. use as it has a low drain heater for minimum thermal effects and a separate connection is made to the suppressor grid so that it may be tied to the screen to decrease capacity coupling inside the tube and maintain true electron coupling. In addition, the tube has a more generous plate dissipation rating than the voltage amplifier pentodes and heavy element construction typical of the audio power output pentodes.

The perforated metal cover is an effective r.f. shield and keeps the "B plus" inaccessible to the operator, while the ventilation is unimpaired. Good ventilation is especially important when the transmitter is of compact design since no amount of voltage regulation or cathode tap adjustment will correct frequency drift which is a result of thermal changes.

The keying stability is limited solely by the regulation of the power supply. Dynamotors have excellent load regulation and c.w. operation is quite satisfactory with dynamotor power, provided the dynamotor is supplied with constant input voltage. This means that instability resulting from changing generator output during normal driving would be objectionable for c.w. operation but using a bug while driving a car is a little hard to imagine, anyway.

The e.c.o. grid circuit tunes from 1740 to 2000 kc. The oscillator plate circuit is tuned to 80 meters by means of a powdered iron slug in the plate coil. Following the oscillator is a 12AU7 twin triode with both sections

operating as slug-tuned doublers so that 40 and 20 meter output is obtained. The "hot" end of each tank coil is connected to a small standoff insulator made up of a number 4 machine screw through a fibre grommet. A few inches of hookup wire and a soldering lug are connected to the 807 grid and by moving the soldering lug to the proper machine screw and fastening it down with a nut, either 80, 40, or 20 meter excitation may be supplied to the 807. For ten meter output, the 807 doubles. With a 250 volt supply the 807 grid current runs between 3 and 4 ma. on all bands, quite enough for efficient doubling and linear modulation. The final amplifier is shunt-fed and a pi network couples the plate to almost any type of antenna. A 100" bumper mounting vertical antenna may be loaded on any band in this way and will give surprising results even on 75 meters.

In the audio section, the carbon mike is transformer-coupled to a 12AT7 phase inverter of the self-balancing type. This tube drives a pair of 6K6GT modulators. 6V6GT's could be used with no change in the circuit but they draw slightly more filament and plate current. For the lower plate voltages, i.e., up to 300 volts, 6K6GT's are preferable.

It will be noticed that microphone voltage is obtained from the modulator cathode resistor. This has been done so that a 6 volt a.c. supply may be used on the filament circuit. In a push-pull audio stage no audio voltage appears across the cathode resistor (except distortion components) so that a simple *RC* filter is adequate for decoupling the mike voltage. If this filter proves insufficient and audio oscillation occurs, it will be necessary to reverse the connections of either the primary or the secondary of the mike transformer.

The transmitter is assembled on two aluminum chassis trays to which the front panel is affixed by means of self-tapping screws. The smaller chassis is 6½" long by 2⅝" wide with ½" aprons on each side. As can be seen in the photographs, this chassis supports all components of the 6AK6 and 12AU7 stages. The tubes are mounted upside down below this horizontal chassis. This construction makes all components easily accessible and short leads are almost automatic. The larger chassis mounts vertically behind the front panel and measures 6½" long by

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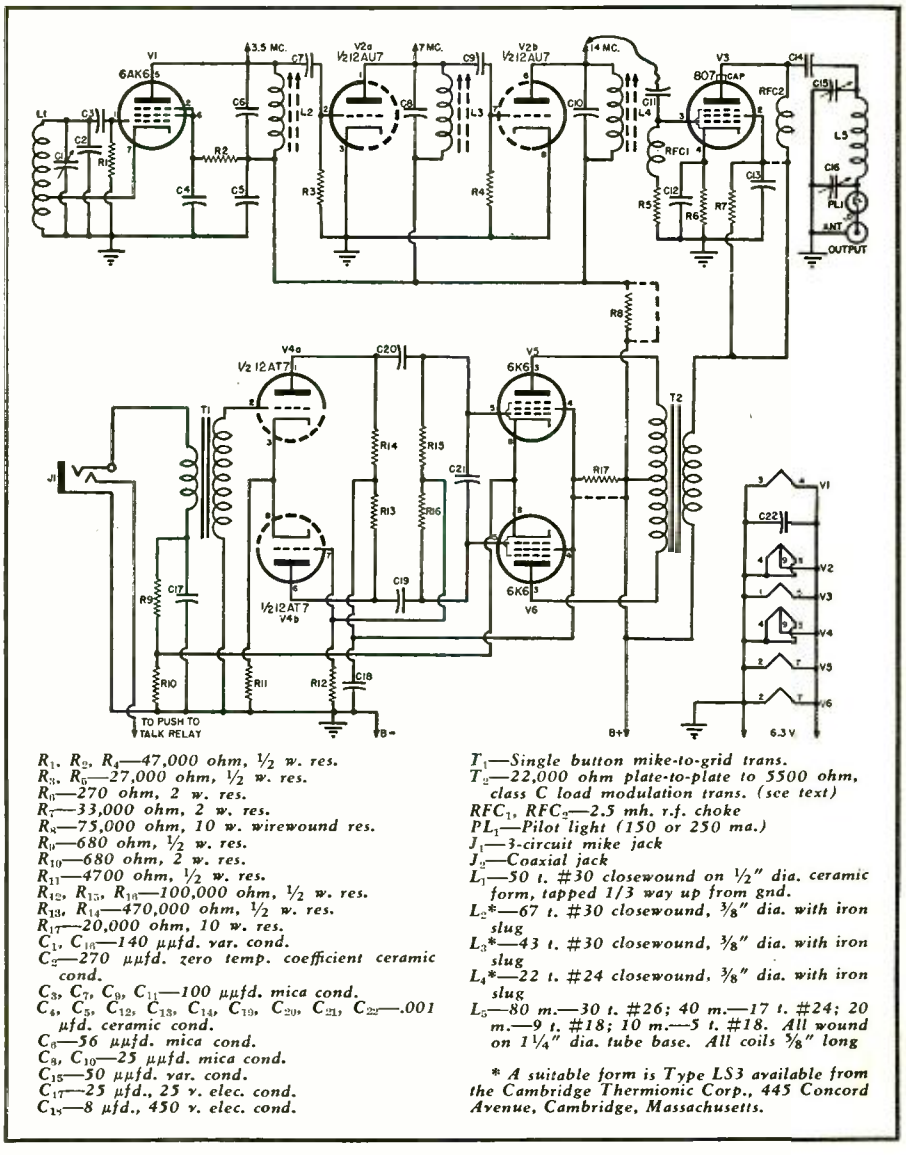


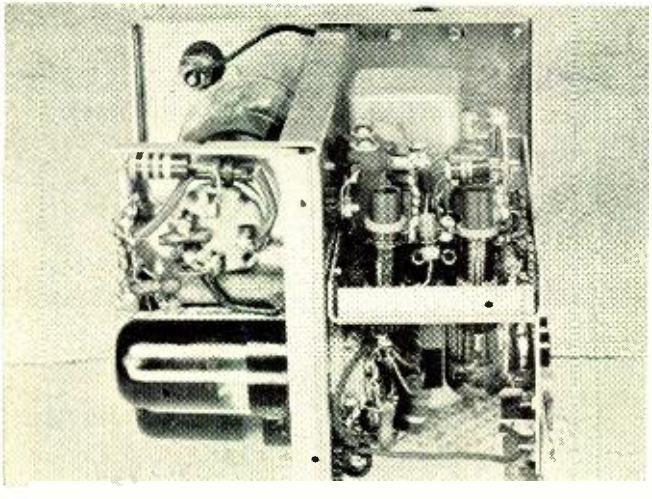
R_1, R_2, R_4—47,000 ohm, ½ w. res.
R_3, R_5—27,000 ohm, ½ w. res.
R_6—270 ohm, 2 w. res.
R_7—33,000 ohm, 2 w. res.
R_8—75,000 ohm, 10 w. wirewound res.
R_9—680 ohm, ½ w. res.
R_{10}—680 ohm, 2 w. res.
R_{11}—4700 ohm, ½ w. res.
R_{12}, R_{15}, R_{16}—100,000 ohm, ½ w. res.
R_{13}, R_{14}—470,000 ohm, ½ w. res.
R_{17}—20,000 ohm, 10 w. res.
C_1, C_{16}—140 μμfd. var. cond.
C_2—270 μμfd. zero temp. coefficient ceramic cond.
C_3, C_7, C_9, C_{11}—100 μμfd. mica cond.
C_4, C_5, C_{12}, C_{13}, C_{14}, C_{19}, C_{20}, C_{21}, C_{22}—.001 μfd. ceramic cond.
C_6—56 μμfd. mica cond.
C_8, C_{10}—25 μμfd. mica cond.
C_{15}—50 μμfd. var. cond.
C_{17}—25 μfd., 25 v. elec. cond.
C_{18}—8 μfd., 450 v. elec. cond.

T_1—Single button mike-to-grid trans.
T_2—22,000 ohm plate-to-plate to 5500 ohm, class C load modulation trans. (see text)
RFC_1, RFC_2—2.5 mh. r.f. choke
PL_1—Pilot light (150 or 250 ma.)
J_1—3-circuit mike jack
J_2—Coaxial jack
L_1—50 t. #30 closewound on ½" dia. ceramic form, tapped 1/3 way up from gnd.
L_2*—67 t. #30 closewound, ⅜" dia. with iron slug
L_3*—43 t. #30 closewound, ⅜" dia. with iron slug
L_4*—22 t. #24 closewound, ⅜" dia. with iron slug
L_5—80 m.—30 t. #26; 40 m.—17 t. #24; 20 m.—9 t. #18; 10 m.—5 t. #18. All wound on 1¼" dia. tube base. All coils ⅜" long

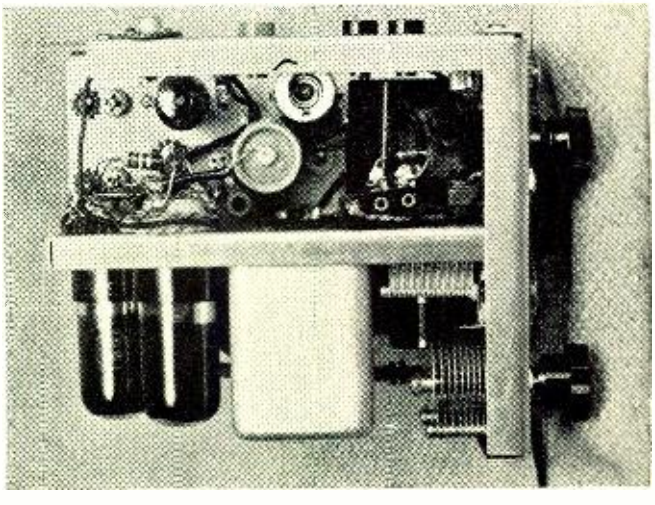
* A suitable form is Type LS3 available from the Cambridge Thermionic Corp., 445 Concord Avenue, Cambridge, Massachusetts.

Circuit diagram of the compact, mobile c.w.-phone transmitter unit.

Rear view shows the two trays which form the chassis at right angles to each other. The 40 and 20 meter doubler tank coils can be seen.



Bottom view. Tops of e.c.o. and dual-triode doubler tubes can be seen. Power and antenna terminals are supported by aluminum angle.



PROJECTION TV FOR LARGE AUDIENCES

By

GERARD FRANCEOUR
Chief Eng. Television Assembly Co.

A commercially available kit that can be used as a basic unit for custom-built installations.

THE P-520 projection television receiver has a 520 sq. in. (20" x 26") projection screen, brighter than the average 16 mm. movies, which can be viewed comfortably from distances up to 120 feet.

The P-520 is supplied in kit form, with the critical assemblies prefabricated and checked at the factory. This enables the dealer to complete the assembly in his own shop with his own tools and instruments, and keep the entire profit on this stage of set manufacture.

The standard kit is supplied complete with mounting rack, metal sides, and the screen hood, but *without* the front panel. This enables the dealer to custom-tailor the installation by designing and supplying a special front panel, in any material or color or degree of ornamentation, to suit exactly the customer's decorating scheme.

The standard mounting rack provides room to spare for all the units of the television instrument. The dealer can install, in addition, an automatic record player, or a p.a. system, or both, mounting the additional units in the P-520 rack and utilizing its loudspeaker. This is another important source of additional revenue.

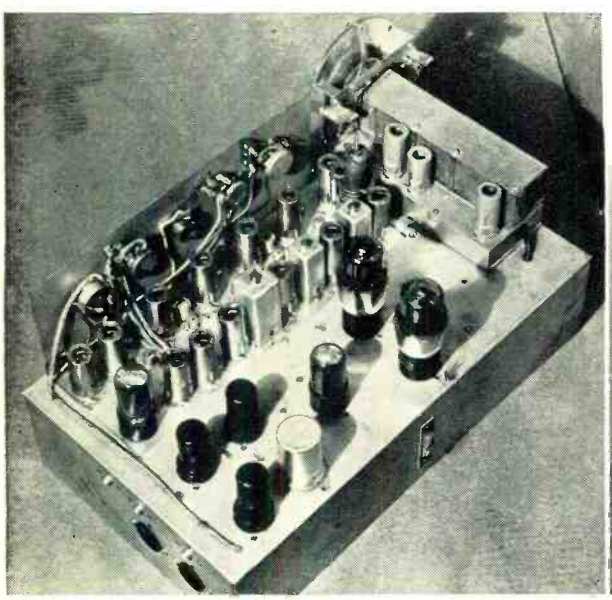
An exhaustive 80-page instruction and service manual, illustrated with photographs, diagrams and charts is supplied with each unit. The manual contains step-by-step instructions for the assembly and adjustment of the instrument, together with service notes on installation and troubleshooting. Complete electrical parts lists, hardware parts lists, and a composite schematic diagram of the instrument are also included.

To follow the technical description, refer to the block diagram (Fig. 1). The blocks are numbered consecutively, from 1 to 12, and we shall proceed in that order: from front end to the low-voltage power supply.

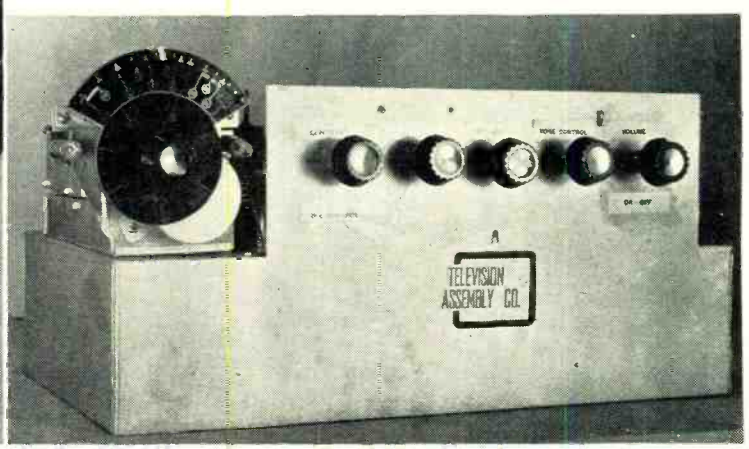
1. *Front End.* This consists of the *Du Mont "Inputuner"* employing a 6J6 as the r.f. amplifier, another 6J6 as the local oscillator, and a 6AK5 as the mixer. This standard unit is already familiar to the readers of RADIO & TELEVISION NEWS, and need not be described in detail, beyond stating that the r.f. amplifier has an input impedance of 73 ohms, and the coupling network to the mixer tube has a bandpass 6 mc. wide. The unit is pre-set at the factory, and no repairs or adjustments should be attempted in the field, but the entire unit returned for replacement, if needed.

2. *Video Section.* The video i.f. section employs six 6J6 duo-triodes in a unique circuit arrangement. One section of each tube is cathode-coupled, while the other section operates as a grounded-grid amplifier. The signal is coupled from the first section to the second by means of a common cathode circuit, by grounding the grids of the second triode sections. The output of each grounded-grid amplifier is fed to the next stage through a bridged-T coupling network, providing a wide bandpass (4.25 mc.). Five and one-half of these stages are used in cascade. This circuit is shown in Fig. 2.

The output from the fifth video i.f. stage is fed to one triode section of the sixth 6J6, which functions as the detector-driver stage. The second triode section of this tube has its grid and plate connected, and this triode section functions as a diode detector. The signal from the detector-driver stage is coupled to the detector stage by a common-cathode circuit. The output from the plate circuit of the detector stage is then fed to the video amplifier section, with peaking circuits incorporated in the outputs of the detector and the video amplifier stages. Two stages of video amplification are employed, utilizing a 6AG5 and a 6V6 tube. The output from the



Top view of r.f. chassis. All critical assemblies are prefabricated and, when possible, aligned at the factory.



Panel view of the r.f.-i.f. chassis. The front end is a Du Mont "Inputuner" employing a 6J6 as an r.f. amplifier, with another 6J6 as local oscillator, and a 6AK5 as mixer.

Final installation of any television receiver is an important factor for best performance. Availability to antenna lead-in and proper viewing position must be considered.

mixer tube is directly coupled to a converter transformer, the primary of which is tuned to 26.4 mc. (the intermediate frequency of the video section), and the secondary tuned to 21.9 mc. (the intermediate frequency of the audio section).

Only two traps are used: 27.9 mc. and 21.9 mc. These traps are pretuned at the factory but may require an adjustment to meet local reception needs.

3. *Automatic Gain Control.* The system consists of a 6AT6 tube which serves as an a.g.c. noise clipper and a d.c. amplifier. A portion of the output signal from the cathode of the detector-driver tube is fed to the a.g.c. detector section of a 6AL5 tube, and the voltage across a resistor in the cathode circuit of this section is then fed to the diode of the 6AT6; this section of the 6AT6 thus functions as a noise limiter. The output from the 6AT6 diode section is now fed through an integrated network, and the signal applied to the grid of the triode section of the 6AT6, where the signal is amplified and inverted. A portion of this amplified a.g.c. signal now is fed to the control grid of the mixer tube, while the other portion of the signal is fed to the first four video i.f. stages. A feature of this circuit is that overloading of the i.f. amplifiers on strong signals is prevented, yet maximum r.f. gain is obtained on weak signals in the mixer stage.

4. *D.C. Restorer.* The d.c. component of the video signal is here fed through a 1N34 crystal to the sync amplification and separation circuits.

5. *Sync Amplifier and Separator.* The signal is first fed to the control grid of a 6SK7 tube which serves as the first sync amplifier where the sync signal-to-noise ratio is improved. The output of this tube is then fed to the control grid of a 6SH7, which serves as the second sync amplifier. The values of the operating potentials of the 6SH7 are such that the video and blanking pulses are removed and only the sync pulses pass through. Next, a 6J5 triode serving as the third sync amplifier inverts the signal to the required polarity and removes amplitude variations between the sync pulses. The vertical and horizontal sync pulses are separated in an integrating network, and the two groups of sync signals are coupled to the corresponding vertical and horizontal sweep circuits.

6. *Vertical Deflection.* A 6J5 triode and its associated circuit form a blocking oscillator and discharge network, producing a saw-tooth waveform of the correct polarity and frequency in the vertical deflection coils to which the signal is fed through a 6K6 power output tube. The impedance match between the 6K6 and the vertical deflection coils is provided through an output transformer.

7. *Horizontal Deflection.* In the horizontal deflection circuit, one triode section of a 6SN7 tube serves as the horizontal blocking oscillator, while the second section of this tube with its associated circuit forms the horizontal discharge network. The output from the second triode section of the 6SN7 is fed through two 6BG6 power tubes connected in parallel, to raise the signal level to the value required for the operation of the high-voltage power supply as well as of the horizontal deflection coils.

8. *Kinescope and Optical System.* A five-inch magnetic-deflection, electrostatic-focusing 5TP4 projection kinescope tube is employed, projecting the image through an F/1.9 *Bausch & Lomb* focusing projection lens, the image being reflected by the silver top-coated mirror onto the 20" x 26" projection screen.

9. *Sound Section.* The FM sound section is comprised of the sound i.f. section, the limiter-discriminator section, and the audio section.

The 21.9 mc. sound i.f. signal is taken from the secondary of the converter transformer in the front end, and directly coupled to the control grid of the first sound i.f. amplifier, a 6BA6. The sound i.f. signal is then fed to the second i.f. amplification stage (another

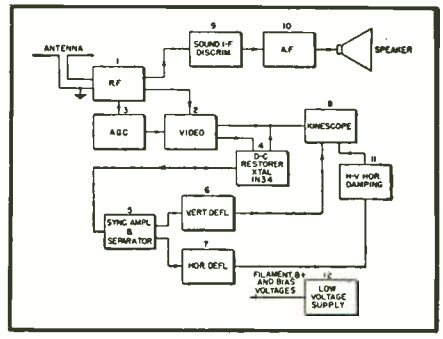
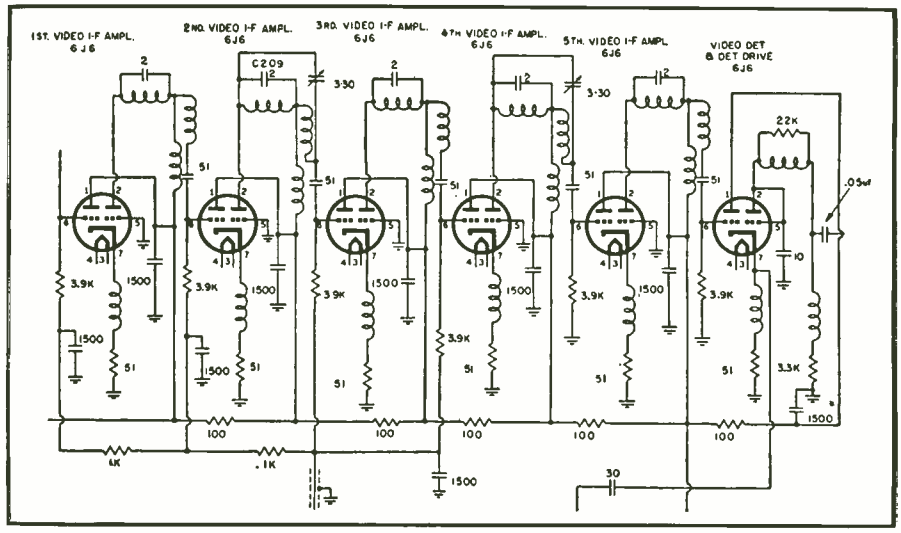
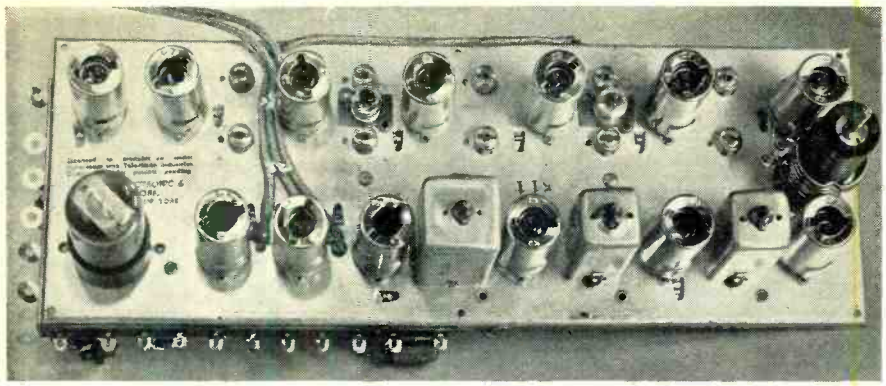


Fig. 1. Block diagram of Model P-520 TV projection unit manufactured by Television Assembly Company. Blocks are numbered to show sequence of operation.

Fig. 2. The video i.f. section of the Model P-520 receiver employs six 6J6 duo-triodes to provide five and one-half stages of amplification in cascade.





Top view of i.f. chassis. This 14-tube i.f. picture and sound strip is shipped pre-wired and pre-tested. Automatic gain control is included.

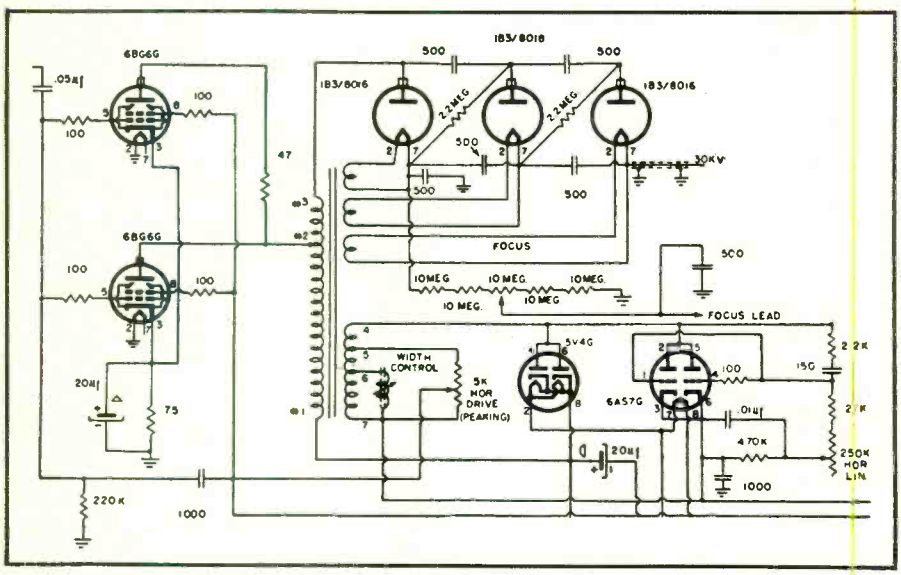


Fig. 3. The high voltage tripler flyback power supply unit. The three rectifiers are arranged in a voltage-tripler circuit. A high frequency (15,750 c.p.s.) is employed, necessitating only a small filter capacity.

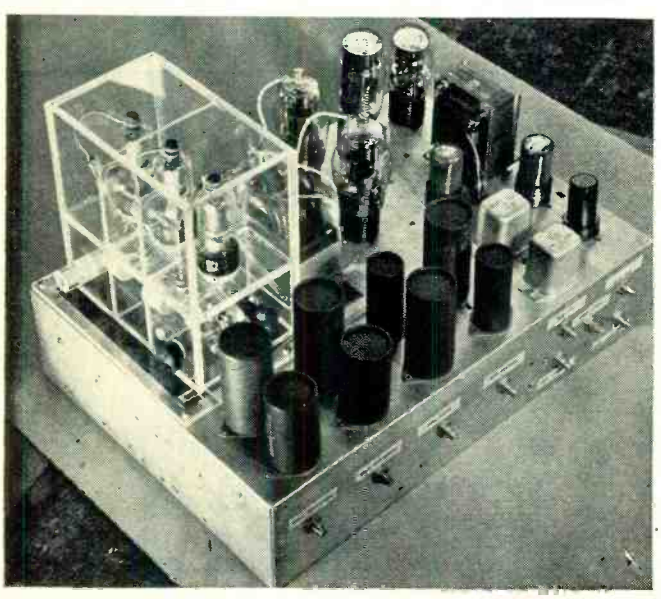
6BA6), and then to the control grid of the 6AU6 limiter tube, whence it is transformer-coupled to the 6AL5 duo-diode serving as the discriminator. The audio component in the output of the discriminator tube is then applied across the volume control.

10. *Audio Section.* The audio output from the volume control is fed to the first triode section of a 6SN7, where it is amplified. The second section of this tube functions as a phase inverter and provides the required signal for the grids of two 6F6 power amplifier tubes working in push-pull. The power stage output is coupled to the loudspeaker through an output transformer.

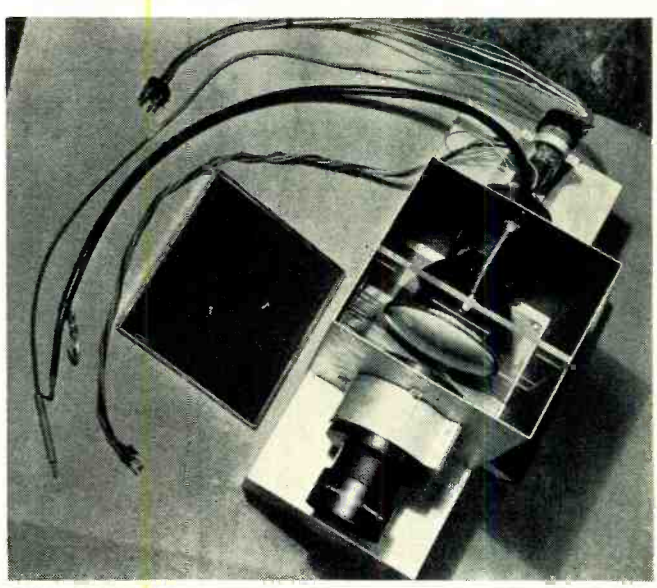
11. *High-Voltage Power Supply.* The high-voltage power supply unit is shown in Fig. 3. The power supply is obtained from the energy stored in the inductances of the deflection coils during each horizontal sweep. A collapsing field in the deflection coils is produced when the incoming signal cuts off the plate currents of the two 6BG6 tubes, causing a positive pulse to appear in the step-up transformer. These stepped up pulses are then applied to the plates of three 1B3/8016 rectifiers, and at the same time a negative pulse is applied to the rectifier filaments. The three rectifiers are arranged in a voltage-tripler circuit, producing about 27-30 kv., direct current. The horizontal sweep frequency, 15,750 c.p.s., is employed.

12. *Low-Voltage Power Supply.* Two separate low-voltage supply sources, each of 6.3 volts, are provided: one for the heaters of the r.f., video, sync amplifier, and sound sections, the other for the tube heaters of the deflection circuits and the 6AS7 damping tube. The transformer in the first section, in conjunction with a 5U4 rectifier, also supplies "B-plus" and bias voltages for its associated circuits, as well as the negative potentials for the deflection circuits. The transformer in the second section, in conjunction with two 5U4 rectifiers connected in a single full-wave rectification system, furnishes "B-plus" potentials for the deflection circuits. The operation of these two power supplies is controlled by the "FM-Television" switch, with the a.c. power supplied to both transformers when in the "Television" position, and only to the first transformer when in "FM" position. —30—

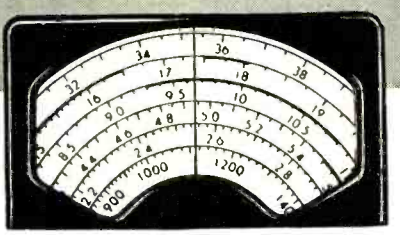
Top view of deflection chassis. High-voltage power supply producing nearly 30,000 volts is shown within plastic housing.



The kinescope and projection unit. A 5TP4 kinescope tube projects image through an F/1.9 lens onto a 20" x 26" screen.



International SHORT-WAVE



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

THIS month we are pleased to dedicate the *ISW Department* to The Blue Danube Network, Austria.

Through the courtesy of our *ISW* monitor in Newfoundland, Roland C. Peddle, we present the following data which Mr. Peddle received from Robert Graff, former station manager of KZCA.

The Salzburg station KZCA is one of three stations comprising The Blue Danube Network: WOFA, the key station, is located in Vienna and feeds KOFA, Linz, and KZCA, Salzburg. (A few local programs are produced at the repeaters, these being news of local interest and special programs of requests.)

The transmitter site of KZCA, operating on 1,104 kc., using a *Western Electric* 443A, 1 kw., is located about two miles out of town; the 41.55 m. spectrum is supplied by a BC-610 pushing 350 watts into a quarter-wave grounded vertical antenna. Both units are mounted in Army trailer vans on the property of the Italian Embassy mission to Austria which used to be the studios. The Linz station KOFA has a 443A transmitter also, while WOFA uses an *RCA*, 1 kw.

Equipment employed at KZCA is *RCA* 76-B2, used in conjunction with three *Presto* type 6N recording turntables. The board in Linz is a *Western Electric* 22-D remote amplifier; tables also of *Presto* manufacture are used.

The Vienna station has the latest in modern studio equipment, using *RCA* type 76-C turntables while, I believe, a new *Western Electric* 25-C control board is now installed. The 22-D remote amplifiers are used on all "NEMO" pick-ups, the network having a total of about 10 of these units. A diversity receiver rack houses two *Hammarlund* super pros in Vienna master control to bring in statewide broadcasts and a *Gates* 4-channel amplifier feeds the net lines.

An interesting note, however, may be found in that the call letters of O.F.A. stand for "Occupation Forces, Austria," while Z.C.A. stand for "Zone Command, Austria." KZCA at one time had the same call letters as the Linz station, that is KOFA. It was changed August 1, 1947. Linz, operating on 629 kc., could be heard throughout most of the day, both in Salzburg and Vienna, as it was driving close to 1,400 watts. Vienna operates on 1,068 kc., and all stations use *Truseen* steel beam antenna towers raging up to 260 feet.

Mr. Graff explained that in February, 1948, preparations were made to change the short-wave frequency of KZCA from 7.220 to 5.660 but this idea had to be abandoned. He further stated that many reports come in to KZCA from New Zealand, Australia, Sweden, and a few from the East Coast of North America. KZCA issues an attractive QSL card.

Latest available schedule of KZCA on 7.220 is 2300-1700 (Sundays 0000-1700).

Our best wishes go to The Blue Danube Network in Austria!

* * *

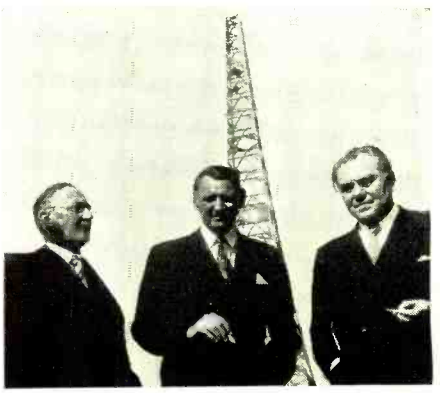
DX Broadcasts

Complimentary to the International Short Wave Club, London, observing its 20th anniversary this year, a 30-minute DX program is to be radiated on Saturday, April 23, from *Radio Sweden*, Stockholm, under the direction of Arne Skoog, who compiles "Swedish DX-ers Calling."

The program will feature messages from DX-ers in various parts of the world, including Arthur E. Bear, London, secretary of ISWC; Graham Hutchins, DX Editor of *Radio Australia;* Ken Boord, and others.

The broadcast will be heard at 0230 on 6.065, 9.535; 1630, 10.780, 15.155; and 2030, 6.065, 9.535.

At the opening of the new 50 kw. SW transmitter in Denmark were (l. to r.) Engineer Warming, King Frederik IX, and the Danish Prime Minister. Broadcasting on 9.520 daily to N. America at 1900-2030, 2130-2300, 2300-0030, and on 15.165 to eastern countries Tuesdays, Thursdays, Fridays, at 0500-0600, EST. area service will expand as facilities permit.



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New Call Letters

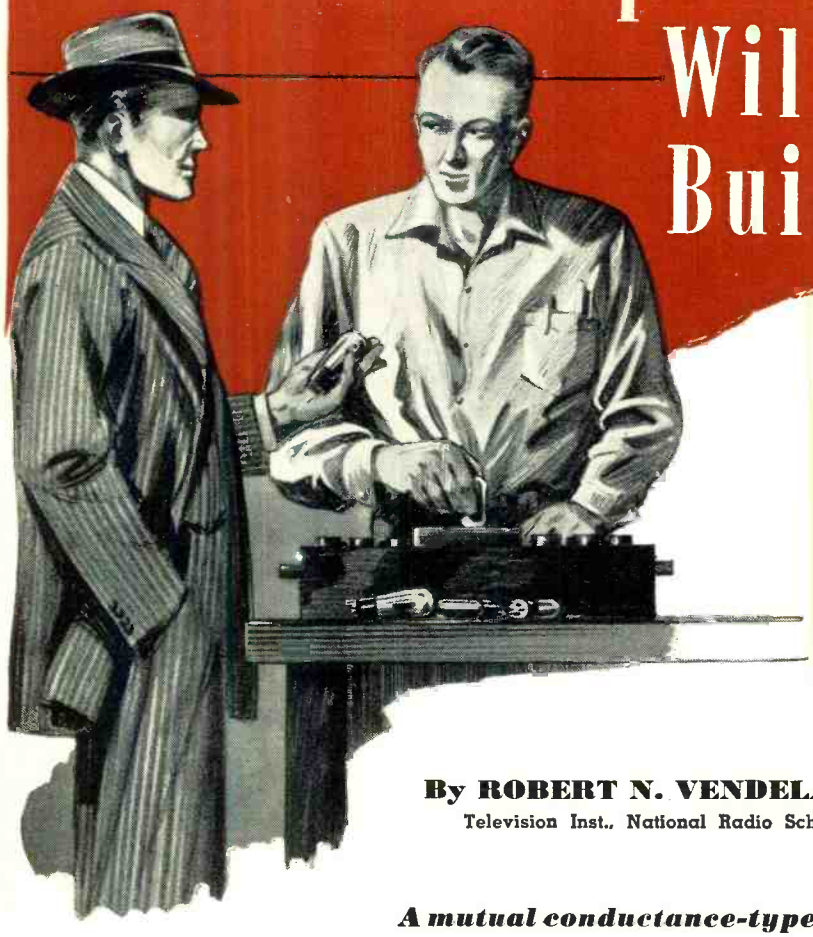
As of January 15, 1949, a number of changes were made in station call letters throughout the world. Current allocations as listed by the Newark News Radio Club are as follows:

AAA-ALZ — United States; AMA-AOZ—not allocated; APA-ASZ—Pakistan; ATA-AWZ—India; AXA-AXZ — Australia; AYA-AZZ — Argentina; BAA-BZZ—China; CAA-CEZ—Chile; CFA-CKZ — Canada; CLA-CMZ — Cuba; CNA-CNZ—Morocco; COA-COZ —Cuba; CPA-CPZ—Bolivia; CQA-CRZ—Portuguese Colonies; CSA-CUZ — Portugal; CVA-CXZ — Uruguay; CYA-CZZ—Canada; DAA-DMZ—Germany; DNZ-DQZ—Belgian Congo; DRA-DTZ—Bielo Russian S.S.R.; DUA-DZZ—Philippine Republic; EAA-EHZ—Spain; EIA-EJZ—Eire; EKA-EKZ — U.S.S.R.; ELA-ELZ — Liberia; EMA-EOZ — U.S.S.R.; EPA-EQZ — Iran; ERA-ERZ—U.S.S.R.; ESA-ESZ—Estonia; ETA-ETZ — Ethiopia; EUA-EZZ—U.S.S.R.; FAA-FZZ—France and Colonies; GAA-GZZ — Great Britain; HAA-HAZ — Hungary; HBA-HBZ —Switzerland; HCA-HDZ — Ecuador; HEA-HEZ—Switzerland; HFA-HFZ—Poland; HGA-HGZ—Hungary; HHA-HHZ—Haiti; HIA-HIZ — Dominican Republic; HJA-HKZ—Columbia; HLA-HMZ—Korea; HNA-HNZ—Iraq; HOA-HPZ — Panama; HQA-HRZ — Honduras; HSA-HSZ—Siam; HTA-HTZ—Nicaragua; HUA-HUZ—El Salvador; HVA-HVZ—Vatican City; HWA-HYZ —France and Colonies; HZA-HZZ—Saudi Arabia; IAA-IZZ—Italy and Colonies; JAA-JSZ—Japan; JTA-JVZ — Mongolia; JWA-JXZ — Norway; JYA-JZZ—not allocated; KAA-KZZ—United States; LAA-LNZ — Norway; LOA-LWZ — Argentina; LXA-LXZ — Luxembourg; LYA-LYZ — Lithuania; LZA-LZZ—Bulgaria; MAA-MZZ—Great Britain; NAA-NZZ — United States; OAA-OCZ—Peru; ODA-ODZ—Lebanon; OEA-OEZ—Austria; OFA-OJZ — Finland; OKA-OMZ — Czechoslovakia; ONA-OTZ — Belgium and Colonies; OUA-OZZ—Denmark; PAA-PIZ — Netherlands; PJA-PJZ — Curacao; PKA-POZ—Netherlands Indies; PPA-PYZ—Brazil; PZA-PZZ—Surinam; RAA-RZZ—U.S.S.R.; SAA-SMZ—Sweden; SNA-SRZ — Poland; SSA-SUZ — Egypt; SVA-SZZ—Greece; TAA-TCZ—

(*Continued on page* 98)

(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.)

Your Shop TUBE TESTER Will Help Build Prestige



By ROBERT N. VENDELAND
Television Inst., National Radio School

A mutual conductance-type tube tester gives a true picture of a tube's condition. Let your customer watch it operate.

WITH the crusade of the "clipped wire" putting the public on guard against the radio serviceman, you have probably found that what has been at times a trying business is now getting just a little nerve grating.

The high parts prices, the suspicion engendered by repeated investigations, and the general economic condition of the country have all combined to make it necessary for the radio serviceman to redevelop his own "good will."

Probably the best way to retain the customer's confidence is to earn his respect for your ability and business-like approach to the servicing of his set. It goes without saying that a neat, well laid out shop is half the battle, but it really is only half.

The other half is an intangible something that makes him see that you are interested in his radio, that you know your business, and above all, that you are honest.

In most shops the one piece of equipment that the customer sees you operate—and the one he looks for—is your tube tester. In his eyes the tube tester is the most complicated cure-all of the radio game. Have you ever watched the face of the man who has carefully delivered all of his five tubes for testing when you tell him that they're all good? Worse yet, have you ever found one tube a little flat and replaced it for him only to have him storm in with the set a half hour later calling you a crook because it still doesn't work?

Assuming that the tube tester is the gadget that the customer respects, you have, probably unconsciously, selected the most impressive looking tester. Manufacturers of tube testers hear all kinds of complaints about the complexity of the controls of a tester, but they also find that the tester with the most controls on the front is the one that sells to the radio serviceman. The goal, then, seems to be an impressive piece of equipment that has a lot of necessary controls, but is still easy and rapid to use.

When you start flipping switches, pushing buttons, tapping tubes, and flashing neon lights, the customer usually hovers about waiting for that all-important time when you push the button so that he can see the needle climb up into the "good" section. Sometimes you may find it difficult to explain a "doubtful" reading on a tube checker, but most of the time the customer accepts your professional opinion that the tube is ready for replacement.

Rather than just let it go at that, you can probably make a rather favorable impression on the customer by telling him just what is wrong with the tube and just how "doubtful" it is. If you possess a good, direct reading, mutual conductance tube tester, there is no guesswork as to how good or how bad a tube really is.

As you well know, mutual conductance tells exactly what the tube will amplify into a given load. For example, since mutual conductance is the change in plate current for a given change in grid voltage, you can multiply that term by the load impedance and get the gain of the stage. When you have a fixed load, as you do in a radio, a drop in the mutual conductance means a proportionate drop in the gain of the stage. An example that you might use would be to take a required mutual conductance of 2000 micromhos. When you test the tube and get a reading of only 1500 micromhos, you know that the amplifier is only three-fourths as good as it could be with a new tube.

This brings up another point that you probably haven't given much thought. You may have checked a tube that shows 1500 instead of 2000, but when you put it in the radio there was no apparent difference in the operation of the set. It's entirely possible that a strong station will bias your amplifier way down so that you never use the full gain of the tube. Then—how could you tell the difference? Try the set on a weak station so that the a.v.c. bias is reduced and more is demanded of the amplifiers.

Fortunately, or unfortunately, this problem of having a weak tube carried by the stronger tubes in the set does not come up in many television receivers using staggered i.f. amplifiers. Since each amplifier stage must carry

the brunt of a certain range of frequencies, the end effect of a loss in mutual conductance is not necessarily a loss in picture contrast. It usually shows as a loss in picture detail represented by the range of the weak tube. As a result, the mutual conductance test of a tube in a television receiver is extremely important.

This discussion should give you some idea of the possibilities for making your customer understand your decision as to the worth of his tubes. There is no need for any technical lecture on the relative merits of tube checkers or how a bridge circuit works. The average radio owner just wants to have his radio working.

You can have a large block diagram of a simple radio on the wall (similar to the one shown in Fig. 1). Even if the owner doesn't know what's going on from a technical standpoint he does want to know where his money is going.

As an example we'll assume that the radio you have just repaired needed a new filter and the tubes were in sad shape. The 12SA7 was low on mutual conductance, the 12SK7 was noisy, and the 50L6 was a little gassy. With a set-up like that you probably have a bill for this customer that comes to a considerable portion of the cost of the radio. We'll both be willing to bet that he won't be happy.

When he arrives for his set, have his old tubes in a bag stapled to his bill. Tell him that the filter was bad. Pointing to the filter on the block diagram you can tell him that the filter smooths out the ripples in the voltage as it is changed to d.c. from a.c. by the rectifier. Since that was bad, his set made the buzzing noise that it did.

Next, tell him that in your usual servicing a thorough check of all of the tubes is included. During this routine check you discovered that three of his tubes were bad. Take him over to the tester and show him that the 12SA7 converter is only ¾ as good as it should be. Show him what number the checker says is "good" and show him the actual reading in micromhos. An explanation telling that the job of the tube is to change the high radio frequency to a lower frequency so that it is easier to amplify, will help. This tube is then most important in the operation of his set and will affect all of the other tubes after it. If it is weak, all of the other tubes have to work just that much harder. Show him the block that it represents on the diagram, and also point out that in his particular radio, no radio frequency amplifier is employed, so his converter is even more important.

As far as his noisy 12SK7 is concerned, put it in the tester and connect the noise test jacks to the antenna of a radio. Tap the tube and let him hear the noise. There will be no argument about that tube. Show him where that tube is located on the block diagram.

The gassy 50L6—you'll have to explain that a tube that is gassy will draw more current than it's supposed to draw and that it might overload his rectifier circuit doing more damage. Show him the gas test on your tube tester so that he can see for himself that the tube needs replacement.

So much for the customer and his part in the need for a good tube tester. From your own service standpoint, you've probably spent a lot of time fiddling with stages in a radio that checked out good when the tube was tested in an emission tester. Had you employed a mutual conductance tester, a lot of valuable time would have been spared.

If you do try the method of talking to your customer and telling him what is wrong with his tubes, it will pay you to have a more thorough understanding of just what a tube does and how it is tested. A few minutes with a tube manual that discusses the characteristics of tubes and what they mean will refresh your memory on some of that important theory. If you're deep into television you have had to do it long ago or many of the troubles in high frequency circuits

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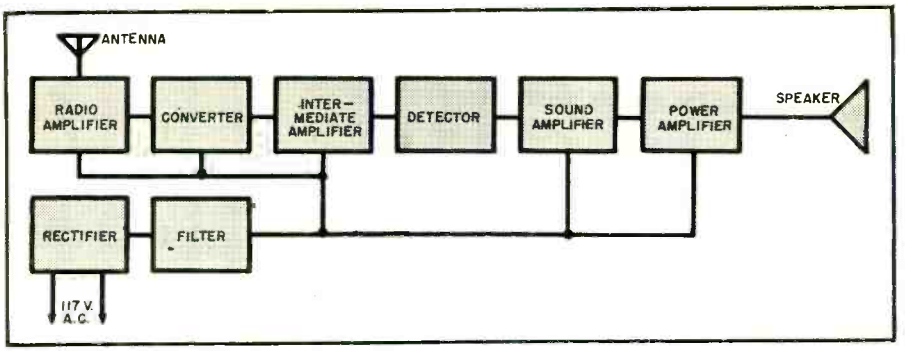


Fig. 1. Use a simple block diagram like this to "educate" your radio customers.

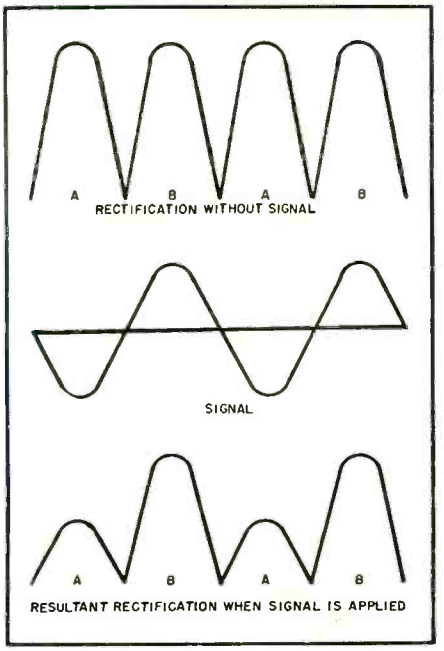
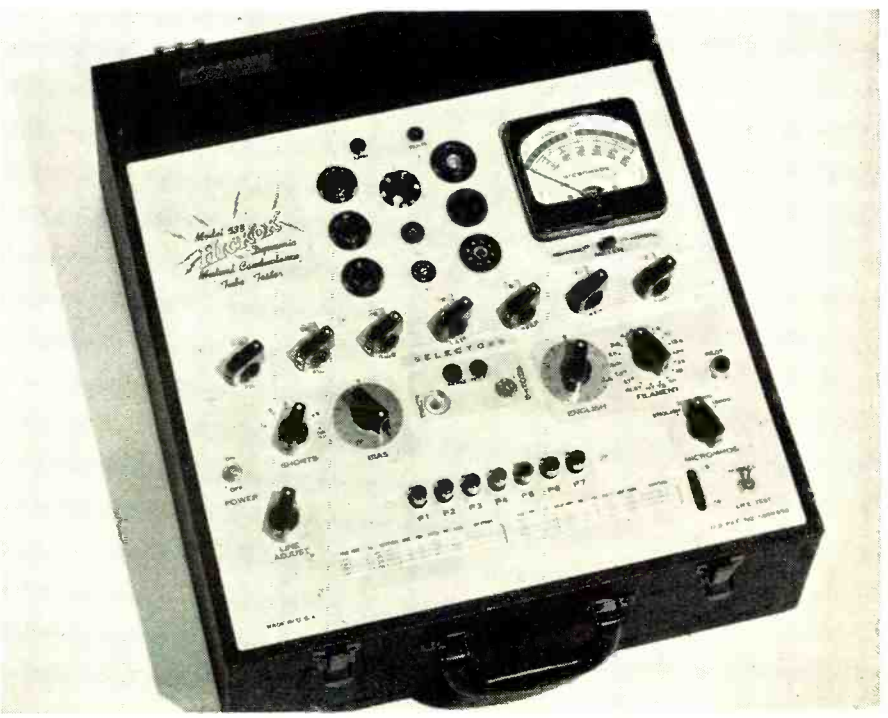


Fig. 2. The resultant curve shows the actual plate current of the tube under test with a signal applied to the grid.

A typical dynamic mutual conductance tube tester, the Hickok Model 533.



A Stable High-Voltage R.F. Power Supply

By LOUIS E. GARNER, JR.

Minor changes in a standard r.f. power supply, for oscilloscopes and TV sets, will yield a unit of greater stability and higher output voltage.

RECENTLY r.f., high-voltage power supplies have gained popularity for use in television sets, cathode-ray oscilloscopes, and in similar applications requiring a high-voltage, low-current, d.c. supply. The kick-back type of supply is also popular, but is used primarily in equipment employing electromagnetic deflection cathode-ray tubes. The r.f. type supplies usually are the choice for electrostatic tubes.

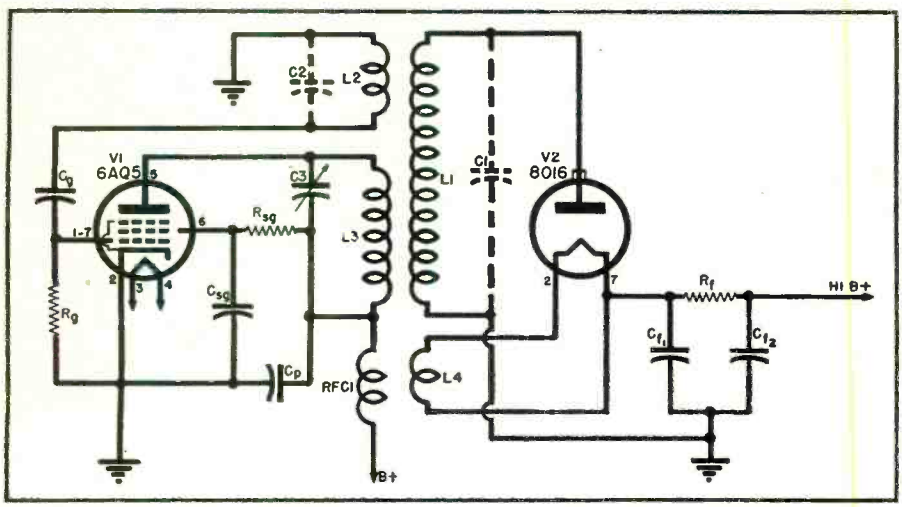
Most r.f. supplies assume the general form shown schematically in Fig. 1. Essentially it consists of a moderate power r.f. oscillator with a high-voltage, low-current, and a low-voltage, moderately high-current winding coupled to the primary coil. A "tickler" winding is provided for feedback to sustain oscillation.

The high r.f. voltage across the secondary winding is rectified by a specially designed tube and a conventional resistance-capacity filter is used. Filament voltage is supplied to the rectifier tube by means of the low voltage winding.

A power supply of this sort suffers from one disadvantage—which is quite serious in actual practice—the output voltage is not constant, but may vary over wide ranges.

This results, of course, in varying picture brightness on a television screen, or varying line brightness on a scope. There may also be a tendency for the focus to change.

Fig. 1. Typical r.f. power supply which uses a "tickler" winding to sustain oscillation.



There are several reasons for this, and a brief analysis of the circuit action will clarify these reasons.

First, of course, it is easy to understand the operation of the oscillator—it is a conventional tickler feedback arrangement, with L_2-C_2 furnishing the drive to the grid of V_1. Primary coil L_3, in the plate circuit, is tuned by variable condenser C_3.

For the circuit to operate efficiently, the frequency of the oscillator should be equal to the resonant frequency of the high voltage secondary L_1, tuned by distributed capacities C_1—a combination of coil distributed capacity, plate-cathode capacity of the rectifier tube, and wiring capacities. Thus, not only is a step-up in voltage achieved due to direct step-up in turns ratio, but also due to the effect of resonance. The rectified output voltage (Hi "B+") can be seen to go through a definite peak as C_3 is tuned.

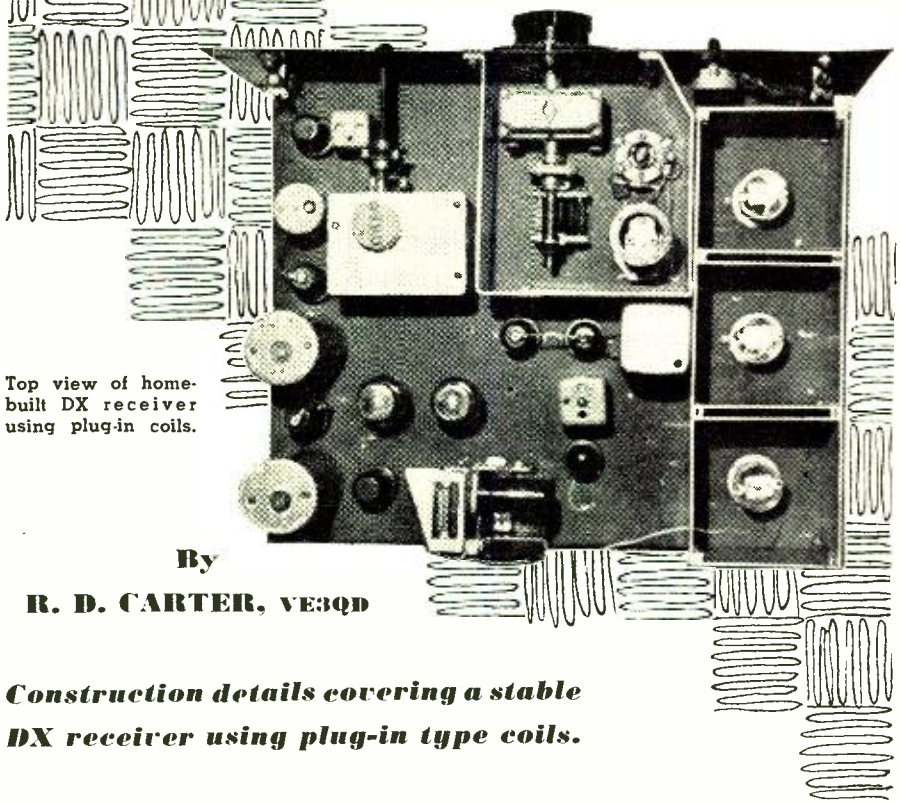
From this we can see that anything which will affect the operating frequency of the oscillator, or which will change the resonant frequency of L_1-C_1, will cause a large change in output voltage. Changes in "B+" supply voltage, changes in parameters due to temperature, changes in loading, all tend to affect the output voltage adversely.

As an example, in one television set power supply built using a circuit of this type, the output was found to vary between 1500 and 5000 volts, the change occurring due to shock of turning the unit on and off, shorting the output temporarily with a screwdriver (since filter resistor r.f. has a high value and the supply has inherently poor regulation, such momentary shorting does no injury) changes in supply voltage would sometimes occur due to line voltage surges and this, in turn, would cause Hi "B+" to vary.

In addition, the adjustment of trimmer condenser C_3 was found to be quite critical; the adjustment for maximum output voltage was not, of course, the

(*Continued on page* 126)

A MODERN DX RECEIVER



Top view of home-built DX receiver using plug-in coils.

By
R. D. CARTER, VE3QD

Construction details covering a stable DX receiver using plug-in type coils.

LIVING in a country where the price of a good commercial receiver is in the neighborhood of $400/500 most of us are forced to build our own. However this is no real hardship as it usually means that we are more likely to weigh carefully the merits of the different features offered in various circuits and the benefits of different tubes, and with the knowledge of what we are striving to achieve we can usually finish with a job that will outperform the best commercial receivers available as, of necessity, these are at best only a compromise. This may seem a tall statement but have you ever examined the front end of even the best bandswitching commercial receivers? If so you will agree that there is considerable room for improvement. This is no reflection on the manufacturers and is entirely the fault of the amateurs themselves as they invariably insist on high fidelity, several watts output, full frequency coverage including the broadcast band in addition to bandspread tuning on the amateur bands. It is not the purpose of this article to explain why all these things are not possible if maximum efficiency is to be obtained. Enough to say that it can not be done. After building several different forms of receivers and being dissatisfied with one feature or another we finally built the one presently in use and it has performed for over two years now with the utmost satisfaction. It was used in the last two DX contests and if we had been able to work everything we heard our scores would leave us quite content.

First we decided that it was imperative that two stages of r.f. be incorporated and a careful survey of the tubes available showed that the 956 acorn was still the best tube for this application. This despite the apparently higher gain of some of the newer tubes because the extra gain involves added loading which makes tapping of the coils essential in addition to reducing the selectivity. The selectivity of the acorns is high, the noise level low and they are not at all fussy to use. While we have not used the 9003's they should perform equally well as they are the miniature counterpart of the 956. However, they do not lend themselves as well as the 956 to layouts in which the r.f. leads are to be kept to a minimum nor is it as easy to isolate the grid and plate circuits.

The first tube is run wide open at all times with maximum plate and screen voltages. The second stage has the r.f. gain control in the cathode circuit. The gain is such that only when conditions are extremely poor is it necessary to run this control past the half-way mark. This should prove that it is unnecessary to use higher gain tubes in the front end. A further necessity is that the coils in the r.f. mixer stages have the highest possible "*Q*" while the oscillator be designed for stability. This means separate controls but, as pointed out later in the article, this actually has some advantages.

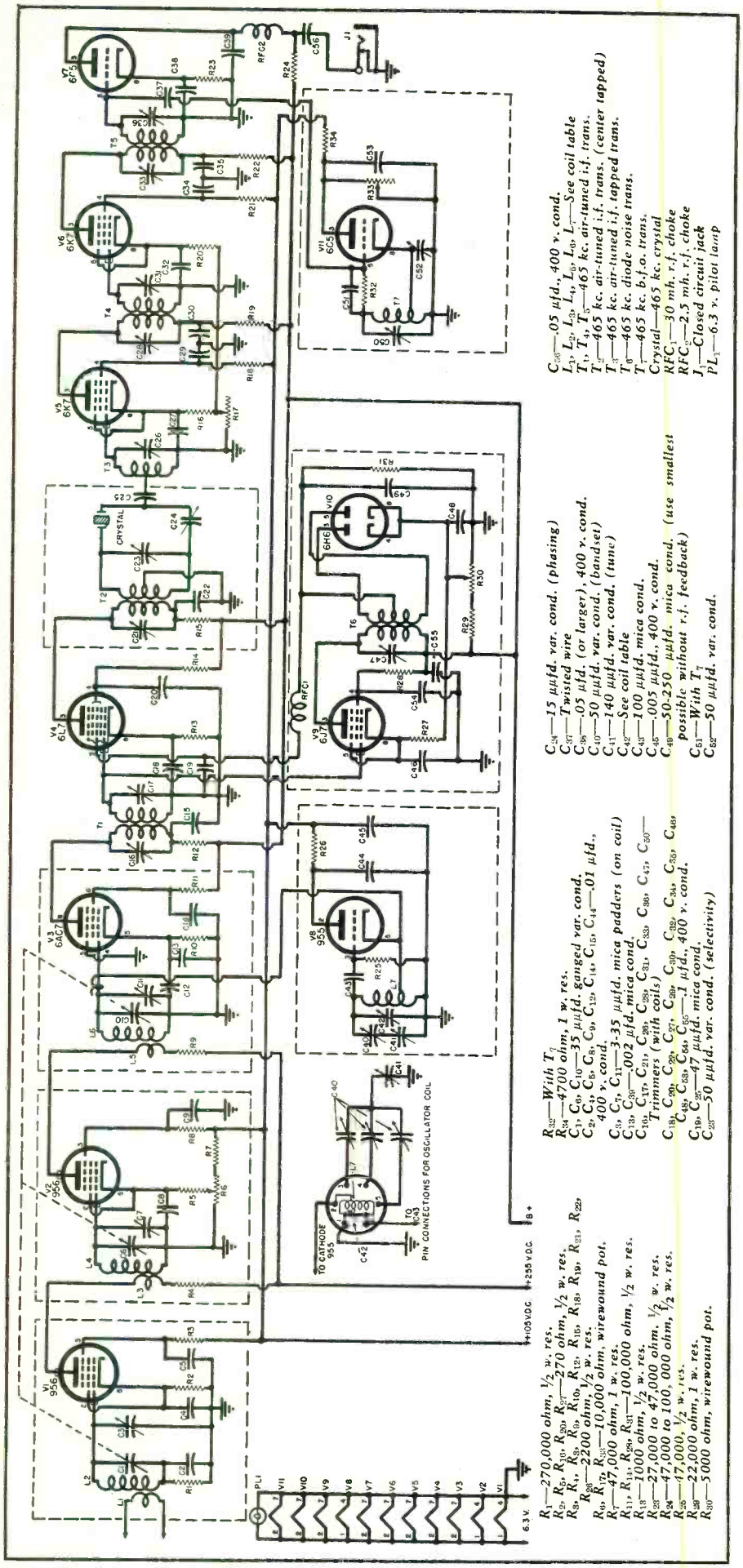
The mixer stage was next given our attention and all the various mixer tubes and circuits were tried experimentally with results that were far from satisfactory. Our troubles were solved when we remembered the article in the June 1939 "*QST*" on the use of the 1852 as a mixer. We incorporated this into the set using the single-ended counterpart 6AC7. Never have we used anything in this position that performed as well. There is considerable gain from this stage now, it is very quiet and, when properly adjusted, displays absolutely no pulling effect whatsoever. All in all this is an ideal tube for the job.

Next came the question of the type of noise silencer and here again after much experimenting the original *Lamb* noise silencer was included. We have never regretted this as it performs very well and you can actually work DX with the neighbor's electric razor in action. In using a crystal filter it is

Complete specifications for the 80, 40, 20, and 10-meter plug-in type coils.

	L_1	L_2, L_4, L_6	L_3, L_5	L_7
80	18 t. #32 en. close-wound ⅛" below L_2.	50 t. #24 en. close-wound. Winding 1⅛".	30 t. #32 en. ⅛" below L_4, L_6.	32 t. #24 en. spaced 1⅛". Tap 8 t. from bottom. C_{42}—140 $\mu\mu$fd. air padder. Jumper 3 to 6.
40	8 t. #32 en. ⅛" below L_2.	23 t. #18 en. spaced 2½".	13 t. #32 en. interwound.	16 t. #18 en. spaced 1½". Tap 6 t. from bottom. C_{42}—100 $\mu\mu$fd. air padder. Jumper 3 to 6.
20	4 t. #32 en. ⅛" below L_2.	12 t. #14 en. spaced 2½".	7 t. #32 en. interwound.	8 t. #14 en. spaced 2¾". Tap 2¾ t. from bottom. C_{42}—100 $\mu\mu$fd. air padder. Jumper 4 to 6.
10	5 t. #32 en. ⅛" below L_2.	5½ t. #14 en. spaced 2".	4 t. #32 en. interwound.	3 t. #14 en. spaced 1½". Tap 1½ t. from bottom. C_{42}—100 $\mu\mu$fd. air padder. Jumper 5 to 6.

Coils for 80 meters wound on 1¼" forms, all others on 1½" forms including all oscillator coils. For 11 meters a duplicate oscillator coil, properly tuned, is suggested in order to avoid retuning when switching bands.



R_1—270,000 ohm, ½ w. res.
R_2, R_6, R_{10}, R_{30}, R_{37}—270 ohm, ½ w. res.
R_3, R_4, R_8, R_9, R_{12}, R_{15}, R_{18}, R_{19}, R_{21}, R_{28}—2200 ohm, ½ w. res.
R_5, R_{17}, R_{33}—10,000 ohm, wirewound pot.
R_7—47,000 ohm, 1 w. res.
R_{11}, R_{14}, R_{29}, R_{31}—100,000 ohm, ½ w. res.
R_{16}—1000 ohm, ½ w. res.
R_{22}—27,000 to 47,000 ohm, ½ w. res.
R_{24}—47,000 to 100,000 ohm, ½ w. res.
R_{25}—47,000, ½ w. res.
R_{26}—22,000 ohm, 1 w. res.
R_{30}—5000 ohm, wirewound pot.
R_{32}—With T_7
R_{34}—4700 ohm, 1 w. res.
C_1, C_8, C_{10}—35 $\mu\mu$fd. ganged var. cond.
C_2, C_4, C_5, C_6, C_9, C_{12}, C_{14}, C_{15}, C_{44}—.01 μfd., 400 v. cond.
C_3, C_7, C_{11}—3-35 $\mu\mu$fd. mica padders (on coil)
C_{13}, C_{38}—.002 μfd. mica cond.
C_{16}, C_{17}, C_{21}, C_{28}, C_{29}, C_{31}, C_{33}, C_{36}, C_{47}, C_{50}—Trimmers (with coils)
C_{18}, C_{20}, C_{26}, C_{27}, C_{30}, C_{32}, C_{34}, C_{35}, C_{46}, C_{48}, C_{52}, C_{53}, C_{54}, C_{55}—.1 μfd., 400 v. cond.
C_{19}, C_{39}—47 $\mu\mu$fd. mica cond.
C_{23}—50 $\mu\mu$fd. var. cond. (selectivity)
C_{24}—15 $\mu\mu$fd. var. cond. (phasing)
C_{37}—Twisted wire
C_{40}—.05 μfd. (or larger), 400 v. cond.
C_{42}—50 $\mu\mu$fd. var. cond. (bandset)
C_{41}—140 $\mu\mu$fd. var. cond. (tune)
C_{42}—See coil table
C_{43}—100 $\mu\mu$fd. mica cond.
C_{45}—.005 $\mu\mu$fd., 400 v. cond.
C_{49}—50-250 $\mu\mu$fd. mica cond. (use smallest possible without r.f. feedback)
C_{51}—With T_7
C_{52}—50 $\mu\mu$fd. var. cond.
C_{56}—.05 μfd., 400 v. cond.
L_1, L_2, L_3, L_4, L_5, L_6, L_7—See coil table
T_1, T_4, T_5—465 kc. air-tuned i.f. trans.
T_2—465 kc. air-tuned i.f. trans. (center tapped)
T_3—465 kc. air-tuned i.f. tapped trans.
T_6—465 kc. diode noise trans.
T_7—465 kc. b.f.o. trans.
Crystal—465 kc. crystal
RFC_1—30 mh. r.f. choke
RFC_2—2.5 mh. r.f. choke
J_1—Closed circuit jack
PL_1—6.3 v. pilot lamp

Complete circuit diagram of DX receiver.

essential that the silencer be ahead of the crystal or it is useless.

The crystal and i.f. stages are quite conventional and as this was built primarily for DX no a.v.c. was deemed necessary. However it can easily be incorporated by changing over from plate detection and using a 6SQ7 in the second detector. While plate detection can be easily overloaded it does help some on weak signals and was therefore used.

The crystal is effectively shorted out when not used, by bending one of the rotor plates of C_{21} so that it shorts at maximum capacity. The same method is used on C_{52} to disable the b.f.o.

When these details had been settled we were ready to begin the actual construction and selected a 17" x 14" chassis to avoid crowding in the front end. A sheet of thin copper was bolted to the bottom of the chassis before any holes were cut and this makes a perfect ground and all bypass condensers may be soldered directly to the nearest point possible to the element bypassed. While it is always advisable to return all grounds to one central point in each stage this has not been necessary with this plate and the set has been very stable and free from parasitics or spurious oscillations of any kind. The photos clearly show the placement of the various parts and the only thing not too clear is the driving mechanism of the two r.f. and mixer tuning units. This mechanism was taken from an old *National Velvet Vernier* dial and is mounted behind the panel. As the shaft is less than ¼" we drove a piece of ¼" brass tube over this to extend through the panel. The condensers are 35 $\mu\mu$fd. units with one stator and rotor plate removed. This is not necessary but we had them on hand from another job and it does reduce the minimum capacity somewhat. If frequent 80 meter operation is contemplated leave these two plates in place. It will be noticed that no r.f. lead is over 1½" long. This contributes to the ease of operation on 10 meters. You will note that the oscillator is in a separate shield box and that it is the main tuning control. There are a number of you who will immediately say "What, two tuning controls?" Don't let it throw you as the r.f./mixer control is not critical and 50 kc. can be covered without touching this control except to peak up a weak signal. The set is, in effect, single control tuning. If you haven't tried it don't judge it until you have done so. There is another big benefit to be derived from its use. When local signals are booming in and the DX is coming through. this control may be backed off. Strangely enough the loud signals drop much faster than the weak ones. Don't ask me why but it does. Time and again it has worked here for some nice DX under adverse conditions. Turning down the r.f. gain control in such cases reduces the weak signal much faster than the strong local. So the separate control is

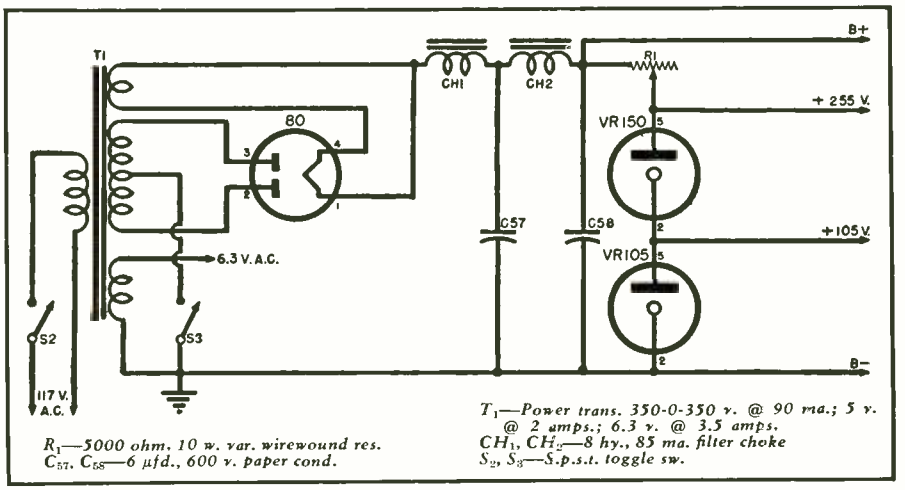
definitely of advantage. You will see that we have used a six-prong socket for the oscillator coil and this is done so that full advantage may be taken of the series condenser system of bandspread. By connecting the three bandspread condensers to three of the pins and jumpering from the grid prong, the different condensers are automatically switched into use as the proper coil is inserted. In this way you set up the bandspread you desire for each band and no change is necessary when changing bands. One pin is used for 10 and 11 meters, one for 20 meters and the last for 40 and 80 meters. With a spread of 40 for 400 divisions on the *National* dial 80 is a bit shy of complete coverage but the whole c.w. portion is available on 480 divisions. When 15 is available, the 10 meter pin can be used. All in all this scheme results in a front end that really performs. While we used a 955 in the oscillator a 6C4 is equally as good.

As a further contribution to stability the plates and screens of all the front end tubes are voltage regulated by VR tubes except the screen of the 6AC7 and this was fed through a dropping resistor in order to limit the dissipation in case of oscillator failure. We have added a form of a.v.c. to the first r.f. tube to protect it against r.f. surges from the transmitter. It works quite satisfactorily as we have yet to replace a tube even though the transmitter is right alongside of the receiver. The i.f. transformers are all air-tuned and are from different manufacturers. In each case we spread the windings some (by heating the coils with an infra red bulb then gently sliding them along the support) to improve the selectivity. Don't carry this spreading too far or the gain will drop too much. This has helped considerably and some idea of the over-all selectivity with the crystal at the full selectivity position and properly phased may be gathered from the fact that a BC453A added to the tail end in "a Lazy Man's Q5'r" adds very little to performance. The difference was so slight that it was not deemed worthwhile to use this in the DX contest, this despite the difference such a set makes to a really good commercial receiver.

The photos will tell more about the assembly than hundreds of words and when built you will find that getting the set in alignment and operation is simplicity itself. Not having a signal generator we used the crystal for preliminary adjustment then transferred this to the set and used a 100 kc. bar to feed a signal into the front end for final alignment. In adjusting the bandspread the padder and the bandspread condensers each affect the other and it is necessary to juggle both until the desired spread is obtained. We purposely have not gone into detail as to building or alignment of the set as we assume that anyone duplicating this set already has knowledge of these requirements. The only critical adjustment is the coupling of the oscillator to the grid of the 6AC7. This adjustment consisted of a single turn of insulated wire wrapped around the grid wire. We suggest you wrap 1½ turns to start with and then prune a little at a time until there is no sign of pulling between the oscillator and the mixer. This is easily observed and the right point is where the r.f. mixer tuning does not affect the signal

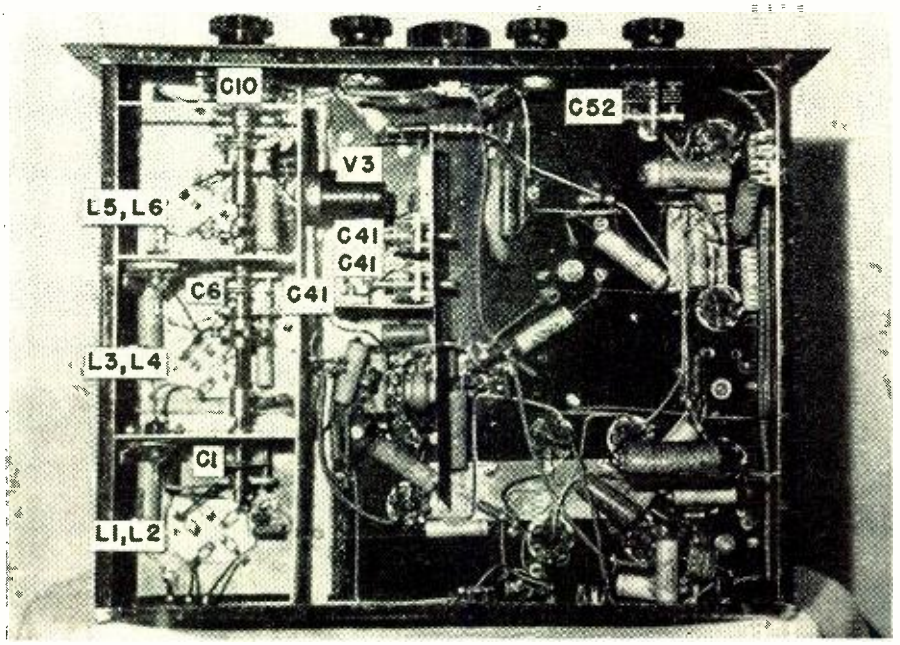
(*Continued on page* 149)

Front view of the completed receiver showing suggested panel layout.



Circuit diagram of power supply which may be used with this receiver.

Underchassis view of DX receiver. A copper plate is used as a common ground.



CIRCUIT ISOLATION by means of SIGNAL TRACING

By
J. T. CATALDO
General Research Laboratories
and
S. J. RICHARD
Delehanty Institute

Servicing—by isolating the trouble as quickly as possible will reduce over-all repair costs.

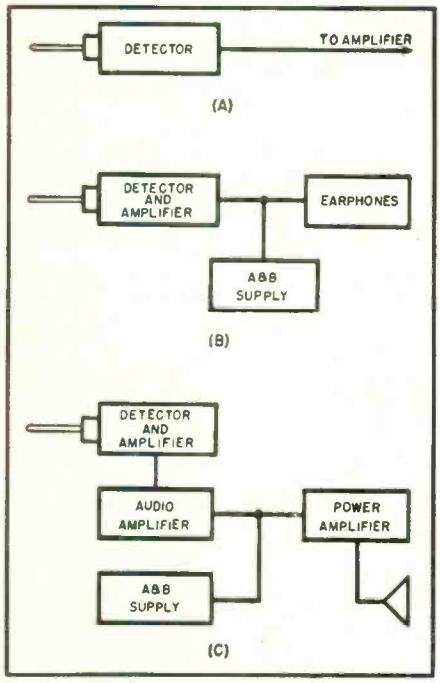


Fig. 1. Block diagram of three basic types of signal tracers. (A) Untuned r.f. detector probe which is connected to an available audio amplifier. (B) Untuned r.f. detector and audio amplifier connected to a set of earphones. (C) Conventional speaker output signal tracer.

THE authors, in a previous article,[1] discussed a method of troubleshooting in which the serviceman started his probing at the speaker end of the radio, working his way toward the antenna. Although it is possible and practical for the radio serviceman to isolate the trouble with the method discussed, the authors feel that a serviceman should be acquainted with the many methods employed in the field. Accordingly, a method whereby the serviceman starts probing at the antenna end and works toward the output or speaker, will be discussed. This method may be performed by signal tracing.

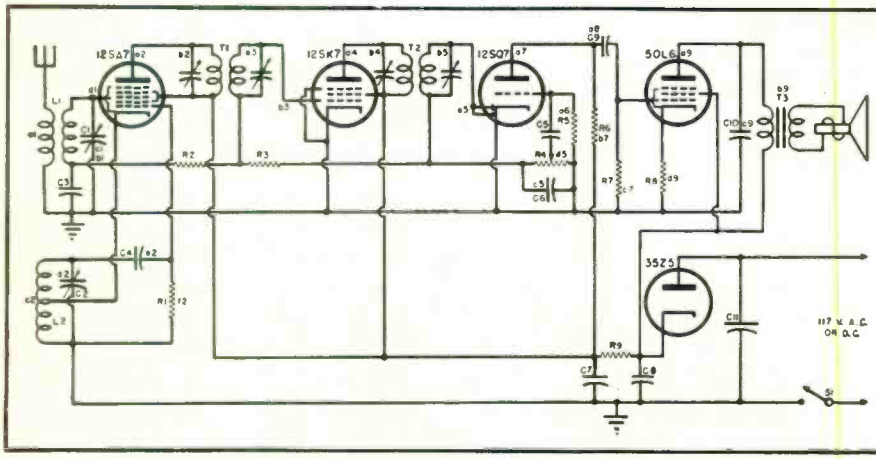
Since signal tracing is relatively new, the definition of signal tracing and a brief historical background seems desirable. Signal tracing is usually defined as a means of following the signal from a radio station through the various stages of a radio receiver. The means of following the signal is accomplished with a signal tracer which was developed sometime in 1939. However, this versatile instrument did not become as popular as was expected due to its undesirable characteristic of loading or detuning the radio circuit, among other reasons. These signal tracers employed tuned amplifiers which necessitated tuning when they were used. Since early in 1945, various manufacturers have designed and produced signal tracers which eliminate the many disadvantages of the earlier types.

It is beyond the scope of this article to discuss the theory and operation of the many signal tracers on the market. However, it must be pointed out that there are three basic types of signal tracers as shown in the block diagram of Fig. 1. The probes are usually untuned r.f. detectors employing a germanium crystal, a miniature radio tube, or a network of resistance and capacitance. When a radio tube is used, it is usually wired as a detector and an audio amplifier which amplifies the detected signal. In the case of the crystal or resistance-capacitance network detection, there is no amplification of the signal in the probe. The "A" and "B" voltages required for the signal tracers are obtained either from batteries or rectified a.c. Some signal tracers have visual as well as audible output. Visual indication is accomplished by means of an electrical in-

(*Continued on page* 106)

[1] Cataldo & Richard; "Circuit Isolation by Means of Circuit Disturbance Tests," RADIO & TELEVISION NEWS.

Fig. 2. Schematic diagram of General Research Laboratories' Model EX-52 superheterodyne receiver. This circuit is typical of most 5-tube a.c.-d.c. type receivers.



R_1—20,000 ohm, ½ w. res.
R_2—82,000 ohm, ½ w. res.
R_3—2 megohm, ½ w. res.
R_4—500,000 ohm pot.
R_5—5 megohm, ½ w. res.
R_6, R_7—470,000 ohm, ½ w. res.
R_8—140 ohm. ½ w. res.
R_9—1200 ohm, 2 w. res.
C_1, C_2—420/165 μμfd. cut-plate gang cond.
C_3, C_9—.05 μfd., 200 v. cond.
C_4—100 μμfd. mica cond.
C_5—.005 μfd., 200 v. cond.
C_6—250 μμfd. mica cond.
C_7, C_8—50/30 μfd., 150 v. dual elec. cond.
C_{10}—.002 μfd., 400 v. cond.
C_{11}—.05 μfd., 400 v. cond.
L_1—Ant. coil
L_2—Osc. coil
T_1, T_2—455 kc. i.f. trans.
T_3—Output trans.
S_1—S.p.s.t. sw. (on R_4)

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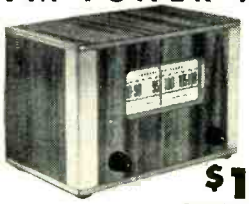

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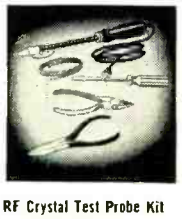

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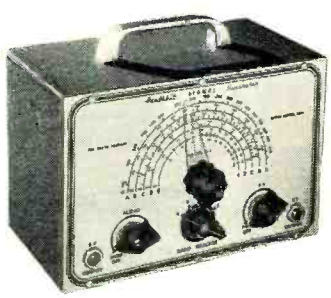

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$8.75

Heathkit 3-TUBE ALL WAVE RADIO KIT

An ideal way to learn radio. This kit is complete ready to assemble, with tubes and all other parts. Operates from 110 V. AC. Simple, clear detailed instructions make this a good radio training course. Covers regular broadcasts and short wave bands. Plug-in coils. Regenerative circuit. Operates loud speaker. Shipping Wt., 3 lbs.

HS30 Headphones per set	$1.00
2½" Permanent Magnet Loudspeaker	1.95
Mahogany Cabinet	2.95

The HEATH COMPANY

★ ★ ★ . . . BENTON HARBOR 15, MICHIGAN

EQUIPMENT must be good!

Heathkit engineer calibrating Heathkit VTVM using Weston and General Electric laboratory standards.

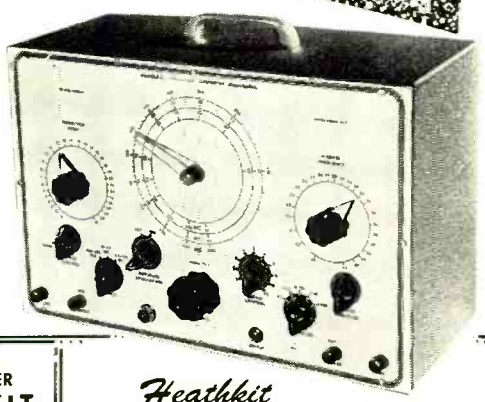
MATCHED TO THE HIGHEST PRECISION STANDARDS . . .

Heathkit technician calibrating condensers for Heathkit Condenser Checker using General Radio capacity bridge of 1% accuracy.

New Heathkit
TELEVISION ALIGNMENT GENERATOR KIT

Everything you want in a television alignment generator. A wide band sweep generator covering all FM and TV frequencies — a marker indicator — AM modulation for RF alignment — variable calibrated sweep width 0-30 Mc. — mechanical driven inductive sweep. Husky 110 V. 60 cycle power transformer operated — step type output attenuator with 10,000 to 1 range — high output on all ranges — band switching for each range — vernier driven main calibrated dial with over 45 inches of calibrations — vernier driven calibrated indicator marker tuning. Large grey crackle cabinet 16-1/8" x 10-5/8" x 7-3/16". Phase control for single trace adjustment. Uses four high frequency triodes plus 5Y3 rectifier — split stator tuning condensers for greater efficiency and accuracy at high frequencies — this Heathkit is complete and adequate for every alignment need and is supplied with every part — cabinet — calibrated panel — all coils and condensers wound, calibrated and adjusted. Tubes, transformer, test leads — every part with nstruction manual for assembly and use. Actually three instruments in one — TV sweep generator — TV AM generator and TV marker indicator. Also covers FM band. Deliveries start early in March. Order early.

$39.50



Heathkit
SINE AND SQUARE WAVE AUDIO GENERATOR KIT

$34.50
Nothing
ELSE TO BUY

Experimenters and servicemen working with a square wave for the first time invariably wonder why it was not introduced before. The characteristics of an amplifier can be determined in seconds compared to several hours of tedious plotting using older methods. Stage by stage, amplifier testing is as easy as signal tracing. The low distortion (less than 1%) and linear output (± one db.) make this Heathkit equal or superior to factory built equipment selling for three or four times its price. The circuit is the popular RC tuning circuit using a four gang variable condenser. Three ranges 20-200, 200-2,000, 2,000-20,000 cycles are provided by selector switch. Either sine or square waves instantly available at slide switch. All components are of highest quality, cased 110 V. 60 cycle power transformer, Mallory F.P. filter condensers, 5 tubes, calibrated 2 color panel, grey crackle aluminum cabinet. The detailed instructions make assembly an interesting and instructive few hours. Shipping Wt., 13 lbs.

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

$5.95

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

110 V. A.C. TRANSMITTER POWER SUPPLY KIT

$14.50

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

Heathkit
CONDENSER CHECKER KIT

$19.50
Nothing
ELSE TO BUY

Features

- Bridge type circuit
- Magic eye indicator
- 110 V transformer operated
- All scales on panel
- Power factor scale
- Measures resistance
- Measures leakage
- Checks paper-mica-electrolytics

Checks all types of condensers, paper-mica-electrolytic-ceramic over a range of .00001 MFD to 1000 MFD. All on readable scales that are read direct from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarizing voltage for 20 to 500 volts provided. Measures power factor of electrolytics between 0% and 50%. 110 V. 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instructions for assembly and use. Why guess at the quality and capacity of a condenser when you can know for less than a twenty dollar bill. Shipping Wt., 7 lbs.

The HEATH COMPANY
. . . BENTON HARBOR 15, MICHIGAN

ELECTRONIC BARGAINS *for* EXPERIMENTERS *and* HOBBYISTS

ORDER NOW . . . ALL QUANTITIES LIMITED

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

DM 35 12 VOLT DYNAMOTOR
NO. 274. New input 12 Volt at 18.7 Amperes. Supplies 675V at 275 MA or ½ above voltage from 6 volts. Excellent for auto use. Shipping Wgt. 11 lbs. Each **$7.50**

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

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

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

1N90 FEED THROUGH INSULATOR
NO. 276. Heavy duty feed through, 2" diameter 4" long, complete with brass hardware and gasket. Shipping Wgt. 2 lbs. 2 FOR **$1.00**

1N86 STRAIN INSULATOR
NO. 277. Husky army type 1¼" diameter, 5¼" long. Brown porcelain. Shipping Wgt. 4 lbs. 4 FOR **$1.00**

G.E. BC 306 ANTENNA
TUNING UNIT
NO. 231. Matches any aerial to 150 Watt transmitter, used on BC 375. Brand new. Add postage for 20 lbs. **$2.95**

G. E. 1,000 VOLT 350 MA
DYNAMOTOR

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

$5.95

POWER TRANSFORMER *Specials*

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

T32 TABLE MICROPHONE

NO. 210. One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons. Add postage for 5 lbs. **$2.95**

MINIATURE ELECTRIC MOTOR

NO. 211. Tiny Delco motor only 1" x 1¼"x2" 10,000 RPM. Operates from 6 to 24 V. Excellent for models. Add postage for 1 lb. **$2.95**

OUTPUT TRANSFORMER

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

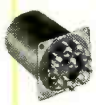
RCA SATURABLE REACTOR TRANSFORMER

NO. 246. New RCA No. CKV30531 AC current 750 MA DC current 2 Amperes. Rated 1.75 henries. Shipping wgt. 4 lbs. Each **$1.00**

12.6V POWER TRANSFORMER

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

RCA INPUT TRANSFORMER



NO. 248. Heavy duty RCA No CKV-30529. Input has primaries 600 to 200 and 25 ohms secondary 250,000 ohms C.T. Shipping Wgt. 2 lbs. Each **$1.00**

FEDERAL POWER TRANSFORMER

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

MILITARY POWER TRANSFORMERS

NO. 229. Convert your military receivers without rewiring the filament. "A" type supplies 500 VCT at 50 MA, 5V. at 2A. and 24V. at ½ A. "B" type supplies 500 VCT at 50 MA, 5V. at 2A. and 12V. at 1 Amp. State whether A or B type desired. Shipping Weight 4 lbs. **$2.95**

WALKIE TALKIE TRANSFORMER
No. 744. Carbon microphone input transformer and output to headphone transformer, all in one case, excellent for building your own. Shipping Wt. 1 lb. **4 for $1.00**

LOW PASS FILTER UNIT

No. 637. 3000 cycle cutoff consists of 3 inductances and 4 capacitors in network, 500 ohms in and out. Excellent for clipping all frequencies above 3000 cycles. Drawn steel case, shipping Wt. 5 lbs. **$2.50**

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

BC 746 TUNING UNIT

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

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

BC731 CONTROL BOX
with Weston Model 476 AC Voltmeter

NO. 208. Excellent buy in motor control box. Size 8"x10"x5½". Contains Weston 0-150V. AC 3½" voltmeter, motor starting switch, 28 fuses all 30 Amp 110V. and 8 fuse holders. Fuses and holders alone worth the price. Shipping Weight 18 lbs. **$7.95**

METER SPECIAL

NO. 237. Brand new DeJur Model 312 0-800 M.A. D.C. Square 3" 0-10 M.A. basic meter with built in shunt. Probably the best buy ever offered in a surplus meter. Shipping Weight 1 lb. **$2.95**

HEARING AID HEADPHONES

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

BC 451 CONTROL BOX

NO. 236. Control box for 274N transmitters. Contains proper cw-voice switch, 4 channel switch, power switch, mike jack and telegraph key.
Add postage for 2 lbs. $1.95

100 MA FILTER CHOKE
No. 641. Heavy 1.5 henry choke in drawn steel case, 50 ohm resistance, conservatively rated at 100 MA. Shipping Wt. 1 lb. **50c**

FILAMENT TRANSFORMER

No. 922. 220V. 60 cy. primary supplies 12.6V. at 3.5 Amps, 15.6V at 1 Amp. Supplies 6.3 at 3.5 Amps and 7.8V. at 1. Amp from 110V. Shipping Wt. 8 lbs. $1.50

PANEL METER
Burlington O-300 VAC Meter

No. 290. Model 32XA 3½" round AC Voltmeter 0-300 VAC full scale. Scale also calibrated 0-600V. Bakelite case. A beautiful meter in original carton. Shipping Wt. **$3.95**

DRIVER TRANSFORMER

No. 651. Couples 3000 ohm plate to push pull parallel grids hermetically sealed. Ship. Wt. 1 lb. $1.00

OUTPUT and MODULATION TRANSFORMER

No. 745. Companion transformer to above driver. A push pull output, 3000 ohms to 3.2 ohm voice coil, or to 1250 ohms at 80 MA. A high quality cased unit. Shipping Wt. 2 pounds. **$1.00**

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

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

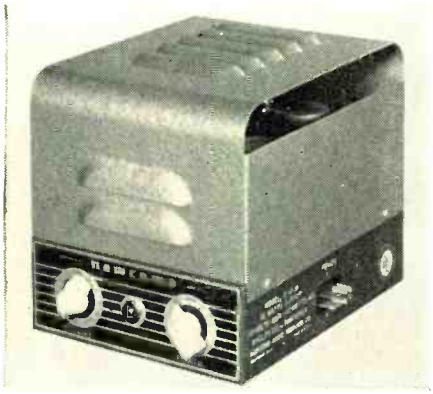
What's New in Radio

For complete 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.

MOBILE AMPLIFIER

The new model, E-10-M, manufactured by *Newcomb Audio Products Co.*, 6282 Lexington Ave., Hollywood 38, Calif., is a low-cost, 10 watt mobile amplifier designed for use on 6 v.d.c., or 117 volts, 60 cycles a.c. power.

Features of this design include push-



pull beam power output tubes with inverse feedback for low distortion, and a special mounting to simplify removal of chassis for servicing. It is provided with sturdy Jones connectors for battery and a.c. cables.

TV "CHANNEL-CHIEF"

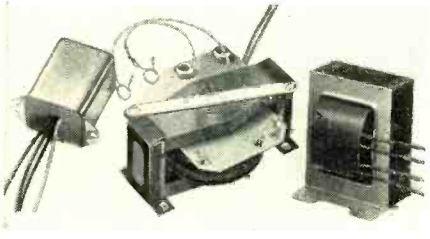
A square-corner type TV antenna has been developed by the *Channel-Chief Company*, 37 Mali Drive, North Plainfield, N. J., for long-distance pictures from any high-band television station.

It is an inexpensive unit that can be added to existing television installations by non-technical owners for the purpose of improving picture quality on any channel 7 through 13. Its 15 degree directivity in conjunction with an extremely high front-to-back rejection factor provides high signal-to-noise ratios resulting in steady pictures.

The kit supplied is complete including 60 feet of low-loss 300-ohm twin-lead and all necessary hardware. The instructions are easy to follow, and no special tools are required.

TELEVISION TRANSFORMERS

Designed to fit the circuits of leading TV receiver manufacturers, the new line of television transformers made by *Chicago Transformer Division, Essex Wire Corporation*, 3501 W. Addison Street, Chicago 18, can provide servicemen with the convenience of exactly matched replacements.



The company provides, through local jobbers, a complete line of these units, including television power transformers, vertical blocking oscillator transformers, vertical scanning output transformers, and a horizontal scanning output transformer.

MULTI-COLORED RECORDS

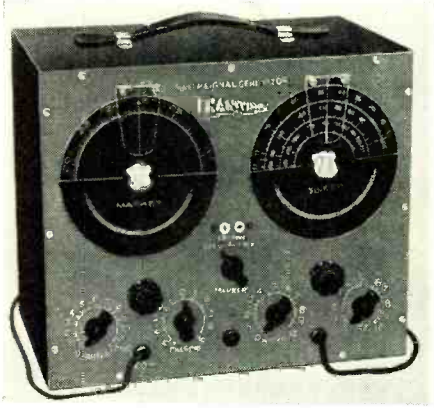
Translucent plastic phonograph records in a variety of eye-catching colors are being made available by *RCA Victor* as a feature of its new 45 r.p.m. music reproduction system.

The color index was revealed as ruby red for classical records, midnight blue for semi-classical, jet-black for popular, lemon-drop yellow for children's, sky-blue for International, grass-green for Western, and cerise for folk music. All single records will be packaged in transparent cellophane envelopes.

The color selections resulted from a study headed by John Vassos, nationally known industrial designer. The basic objective was to make available records as pleasing to the eye as the ear, and the colors represent, in each classification, the psychological and aesthetic connotation of the type of music represented.

SWEEP SIGNAL GENERATOR

Transvision, Inc., 385 North Ave., New Rochelle, N. Y., is offering a new



sweep signal generator, Model No. SG, for television and FM.

Among the features of this model are complete frequency coverage from 0 to 227 mc. with no band switching, a sweep width from 0 to 12 mc., continuously variable, and it has an accurately calibrated built-in marker generator. The power consumption is 35 watts at 115 volts, and the power supply required is 105 to 125 volts, 60 cycles.

The generator is contained in a hammertex finished cabinet, with an overall size of 8 by 10 by 12 inches, weighing 20 lbs. It is available for immediate delivery.

IMAGE DEFINER

Recently introduced on the market is a pigmented plastic filter designed to help provide a clearer television picture, thus reducing eyestrain caused by flickering and other flaws on tele-

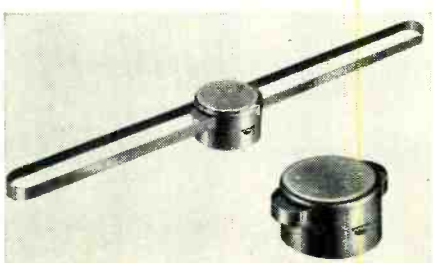
vision picture screens. The filter is designed for all of the standard tube sets, and is also available for projection screens.

The manufacturer of the image definer is the *Transmirra Products Corporation,* 1650 Broadway, New York 19, N. Y.

SLIDE RULE ANTENNA

A portable TV-FM antenna, less than 4½ inches in diameter and only 2½ inches high, is being introduced by *The Radio Craftsmen, Inc.,* 1341 S. Michigan, Chicago, Ill. By means of a simple push-button control, its two antenna arms may be retracted within a small housing when not in use.

The "slide rule" antenna derives its name from the feature by which one arm of the folded dipole is calibrated



in TV channel numbers as well as the entire FM band. It is designed also to operate on proposed ultra-high-frequency TV bands.

TELEVISION CONDENSERS

Intended specifically for television receivers and cathode-ray equipment, a new series of high-voltage paper dielectric condensers, oil-impregnated and encased in molded phenolic housings is now available from *Sprague Products Co.,* North Adams, Mass.

They are known as the *Sprague* Type TVM Telecaps and are rated at 6000 and 10,000 d.c. working volts. The small size of the 500 μμfd., 10,000 volt rating also permits its use as an alternate for "doorknob" type ceramic condensers in some television sets.

ADAPTER KIT

In an announcement to distributors and dealers, the *Webster-Chicago Corporation,* 5610 W. Bloomingdale Ave., Chicago 39, Ill., introduced an adapter kit that will quickly convert its dual speed (33⅓ and 78 r.p.m.) record changers to include playing of the new 45 r.p.m. disc.

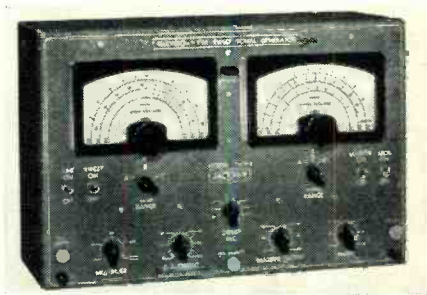
The kit, No. RM-45, consists of a small drive bushing which can be fitted on the 33⅓ r.p.m. drive sleeve of any *Webster-Chicago* dual-speed record changer, and a spindle spacer which takes up the center 1½ inch holes.

SELF-CONTAINED TEST UNIT

The *Jackson* Model TVG-1 television generator is a self-contained test instrument, requiring only the addition of a cathode-ray oscilloscope for visual alignment of television or FM radios.

This signal generator provides a complete range of frequencies for the alignment of r.f., oscillator, i.f., and trap circuits. Any cathode-ray oscilloscope capable of showing a 60-cycle sine wave may be used.

Complete instructions on this model



are provided by the manufacturer. *The Jackson Electrical Instrument Co.,* 18 South Patterson Boulevard, Dayton 1, Ohio.

PLAYER ATTACHMENT

American Microphone Company has developed a new LP record player attachment which fits all types of existing record players, manual or automatic, without requiring installation. This conversion unit will make it possible for millions of record player owners to use their present record players for the new LP records.

The unit consists of a microweight crystal pickup attached to a double disc turntable which is placed on the record player turntable spindle. A ball-bearing, noiseless friction-drive between the two discs reduces the speed of the converter turntable to the slow 33⅓ r.p.m. speed required for the LP records. The pickup tone arm is adjustable to any turntable height and contains a switch which automatically

(*Continued on page* 90)

6-TUBE AC TYPE 2-BAND DELUXE RADIO KIT $16.95

McGee's Theatre Quality AMPLIFIER KIT $24.95

Our sales and engineering department, realizing that not everyone can afford a $100.00 audio amplifier, has designed a Theatre quality, 15 watt True-Fidelity Amplifier kit. Response essentially flat, from 20 to 17,000 cycles. It contains every part, tubes and ready punched chassis. Has input for a crystal or dynamic microphone and gain and tone compensation for the new G.E. Variable Reluctance pickup, as well as the conventional crystal pickups. A 4 step tone switch for tone equalization. This kit has a 34 watt Merit high fidelity, wax impregnated output transformer, with 4, 8, 16 and 500 ohm taps. The chassis is of heavy treated metal, ready punched; approximately 5x11 inches. The quality of all parts is second to none. Priced complete with tubes as follows: 12AX7, 3—6C4, 2—6AQ5, and 5Y3. This is the best amplifier kit we know how to produce and we have made thousands. Kit Model ME-15R. Weight 16 lbs. Net price **$24.95.** Kit model ME-15R Laboratory wired and tested **$10.00** extra. Kit model ME-15R with our regular **$12.95** coaxial PM speaker both for only **$34.95.** Altec Model 602B 15 inch super heavy duty coaxial PM theatre type speaker as pictured with the ME-15R **$63.00.**

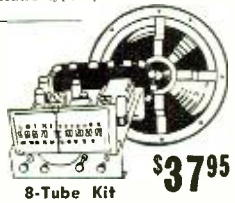
BUILD A RADIO WITH MATCHED "DETROLA" PARTS
DELUXE 6-TUBE 2 BAND KIT $16.95

A complete kit of parts, tubes and ready punched chassis to build a fine 6 tube power transformer type radio chassis. (No cabinet.) We furnish every piece as well as a pictured diagram and photograph. Chassis size 14x7½x7. Receives standard broadcast and 6 to 18 MC foreign short wave. 3 gang tuning condenser used on both bands. 90 mil power transformer. 6v6 output tube. Heavy duty 8 inch speaker. This kit is made up of parts intended for use in a high quality Detrola radio. Has full lighted slide rule dial. Everything goes together just like a factory built radio. Priced complete with 6 tubes. Kit model AC-AK6. Weight 16 lbs. net $16.95.

Kit model ABK-7 Same basic design as the above model AC-AK6 except it is an 8 tube AC DC circuit with push pull 25L6 tubes in the audio. Weight 15 lbs. Priced complete with tubes net $16.95.

Basic parts kit for the 6 tube AC kit model AC-AK6. You get the chassis pan slide rule dial 3 gang cond. IF coils RF and ANT coils, and band switch. Diagram of a 6 tube AC radio or you may design your own rec. Complete coil data furnished. Weight 7 lbs. Kit model DBK-8. Net $6.95.

BUILD THIS 8-TUBE HI FIDELITY RADIO AND AMPLIFIER



8-Tube Kit $37.95

- 8-INCH SLIDE RULE DIAL
- RECEIVES BROADCAST and 19 to 49 METERS
- PUSH PULL OUTPUT TUBES
- BASS BOOST TONE CONTROL
- EVERYTHING FURNISHED
- CHASSIS SIZE 9½ x 11 x 8" HIGH
- BEST RADIO KIT VALUE IN THE WORLD

Here is something new in radio. A real 15 watt power amplifier with bass and treble controls. Has extra gain stage for crystal or dynamic mikes. And on the same chassis, a standard superhet radio receiver. We furnish all parts, knobs, escutcheon plate and tubes: 6SA7, 6SK7, 6SR7, 6SN7, 6SJ7, two 6V6 and 5Y3. No cabinet. Extra care in designing the power supply section assures low hum level, making this unit ideal for recording as well as P.A. use. We furnish everything as well as schematic diagram and photos of the completed chassis. Weight 26 lbs.

PRK-24. Radio-Amp. Kit with 12" P.M. speaker. With tubes....Net **$29.95**

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

GAROD PERSONAL RADIO KIT, $14.95

Size 6½ x 3¼ x 4⅛—Weight 3½ Lbs.
Simple Assembly and Wiring Instructions

This kit is ready for immediate delivery. The same nationally known factory that manufactures tens of thousands of this radio, is line producing this radio kit for us. Every part, from the cabinet down to the last resistor, is matched. The chassis is ready punched, all you do is mount the parts and wires. This radio kit will assemble into a beautiful personal radio for you, just the same as it does for the factory. We furnish you a diagram, photograph of the completed chassis and full assembly instructions so that those with a minimum knowledge of radio may wire this kit. The beautiful case is made of metal with plastic hinged lid and snap-on back. The lucite face of the receiver has an inlaid gold design. The circuit is the conventional two gang superhet type, with A.V.C. Receives the broadcast band 540 to 1650 KC. Uses miniature tubes: 1R5 converter, 1S5 detector A.V.C., 1T4 amplifier and 3S4 power amplifier. Alnico V PM speaker. The loop antenna is built in the lid. Radio comes on automatically when lid opens. Operates on self-contained batteries. Priced complete with tubes and 67½ volt "B" battery and flash cell (Not AC-DC). Nothing else to buy.

Model X45. Price $14.95 Include Postage for 6 lbs.
Scoop Model X-45 Personal Portable Kit Wired and Tested With Batteries. Net $17.95.

20-WATT AMP. KIT, $17.95

Build this 20 watt utility 110 volt AC 20 Watt power amplifier.

Ready punched chassis, size 12 x 6 x 2½ inches. Has two input circuits, one mike and one phono. Mike stage has 135 DB gain for crystal or dynamic mike. Has bass and treble control. Designed for use with PM speakers: has 8-16 ohm output transformer. All parts and easy-to-follow diagram furnished, including tubes: 2—7N7, 6SJ7, 2—6L6GA, 5Z3. Kit Model 20LX. **Net $17.95.**

DELUXE 5-TUBE AC-DC KIT

OUR LEADER $9.95

Made from Detrola Components

A full size 5 tube superhet radio kit housed in a 13 inch wood cabinet with full plastic front. Lighted slide rule dial. Standard 2 gang superhet circuit. Loop antenna, punched chassis, etc. This is another one of our line production radio kits. Every part is furnished including tubes, 12BE6, 12BA6, 12AT6, 50B5, 35SW4. Diagrams, photos and instructions are included. 5" dynamic speaker. Receives broadcast 550 to 1650 kc. Weight 9 lbs. **Kit model TF-6C. Net $9.95.**

WALNUT ARM CHAIR CABINET, $29.95

WILL HOUSE CRP-15 KIT. Beautifully made walnut armchair cabinet. Outside dimensions 24" high, 16½" deep and 27" wide. Ample room for radio receiver 14" long, 9" high, and 10" deep. Will hold a changer up to 14" square. Will accommodate speaker up to 12". Has record album storage compartment. Hinged lid covers changer compartment. Cabinet AR-15. Net price **$29.95.** Crescent DeLuxe changer **$14.95** extra. Armchair cabinet in blonde finish. Net price **$34.95.**

12-WATT AMP. KIT, $10.95

KIT MODEL AC-12. 12 watt amplifier kit. Ideal for high quality record player as well as public address or recording amplifier. Matched component parts, ready punched chassis pan. One control fades from phono to microphone. Gain enough for crystal or dynamic microphone. 100 mil power transformer, for 110 volt AC 60 cycle operation. Priced complete with tubes: 2—6V6, 6SN7, 6SH7 and rectifier. Diagrams and photos furnished. Kit AC-12. Net **$10.95.** AC-12 Laboratory wired and tested **$4.00** extra.

NATIONAL UNION SAVE A SHAFT 49c

Genuine National Union Sav-A-Shaft Volume Controls. Replaces 90% of your volume control needs. Only 1 1/16 inch in diameter. All controls have switches. Unique design allows use of old shaft on new N.V. control. Offered at less than half regular list of $1.25. Net each **49c.** 10 for **$4.50.**

NV 10 M-B 10,000 Ohm with Switch **.49**
NV 25 M-A 25,000 Ohm with Switch **.49**
NV 50 M-B 50,000 Ohm with Switch **.49**
NV 100 M-B 100,000 Ohm with Switch **.49**
NV 250 M-TX 250,000 Ohm Tapped with Switch **.49**
NV 500 M-TX 500,000 Ohm Tapped with Switch **.49**
NV 1 Meg TX 1 Meg. Ohm Tapped with Switch **.49**
NV 2 Meg TX 2 Meg. Ohm Tapped with Switch **.49**

WORLD'S BEST MIKE VALUES

33X Crystal Mike with 20 Ft. Cable, worth 1½ more..... **$10.95**
33D Dynamic Mike with 20 Ft. Cable, Scoop Price..... **12.95**
Top quality Xtal mike & stand—recording type..... **4.95**
Small Plastic Low Loss Mike Cable. **4c** Per Foot
Beldon Heavy Duty Mike Cable. **6c Per Ft.; 100 Ft. for $4.95**

BELDON SOLDERING IRON $1.95

Beldon—100 Watt Soldering Iron for radio set use. Worth $3.95. Sale Price **$1.95.**

BUY VIBRATORS FROM McGEE FOR LESS

Standard size 4 prong, 6 volt vibrator. Made and branded by the Number One builder of auto set vibrators. Regular non-sync type, but has 8 points for heavy duty use. Buy these vibrators with confidence. The se Vibrators are tops. Scoop price **$1.29** each; 10 for **$11.95.**

Every Vibrator Guaranteed Best Values in U. S.

Replacement sync vibrator unit..... **$0.99**
Standard 5 prong sync vibrator..... **1.49**
6 prong, reversible sync vibrator..... **1.99**
7 prong reversible sync vibrator..... **1.99**
7 prong, 2 volt G.E. vibrator..... **1.99**
4 prong, off-set Delco vibrator..... **1.49**
5 prong sync vibrator..... **1.49**
4 prong vibrator for Ford..... **1.49**

SAVE OVER HALF on VOLUME CONTROLS

Regular manufacturers' type with 2½" shaft that is split and knurled. These controls fit 90% of all radio sets.
500,000 ohm with SPST switch. **39c**; 10 for **$3.50**
500,000 ohm with DPST switch. **39c**; 10 for **3.50**
1 megohm midget with SPST switch. **39c**; 10 for **3.50**
500,000 ohm less switch. **29c**; 10 for **2.50**
1 megohm midget, less switch. **29c**; 10 for **2.50**
Regular 3" shaft jobbers' stock controls at scoop prices.
5,000 ohm with DPST switch for battery radio sets and portable. **49c** ea.; 10 for **4.50**
1 megohm tapper, with SPST switch. **49c** ea.; 10 for **4.50**

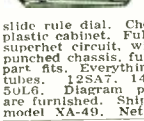
SCOOP SALE ON RADIO CHASSIS; 6 TUBES, 3-WAY $14.95

Chassis Model 819-A. A deluxe broadcast 3-way; 110 volt, AC or DC or battery pack radio chassis, complete with 6 tubes, 6" slide rule dial and 6" PM speaker. Size 12x6x7 inches. Made by a No. 1 manufacturer for a top mail order house. Has tuned RF stage; giving high sensitivity and selectivity. A $25.00 value for only **$14.95.** 5-Tube AC-DC Chassis similar in appearance to above 819-A. Built-in Loop and 4½ inch lighted slide rule dial. A 2-gang condenser. Priced with tubes and 5½" speaker while they last. Stock No. 652. **Net $9.95.**

$59.50 VALUE MUSICAL AMP. $24.95

8 watt Musical Amplifier. 4 tube AC transformer type. Proper gain for all instrument pickups. Housed in leatherette case with built-in 8" speaker. Gain and tone controls. Made by a large manufacturer, to sell for $59.50. Stock No. XR-3. Weight 25 lbs. Net Price **$24.95.**

GAROD DELUXE 5-Tube Kit $12.95



This is our latest and finest AC-DC radio kit. Receives Broadcast, 540 to 1650 KC. Has full length illuminated slide rule dial. Choice of ivory or Walnut plastic cabinet. Full high efficiency 2 gang superhet circuit, with loop antenna. Ready punched chassis, full 5" PM speaker. Every part fits. Everything furnished, including tubes, 12SA7, 14A7, 12SQ7, 35Z3 and 50L6. Diagram photos and instructions are furnished. Shipping weight 9 lbs. Kit model XA-49. **Net $12.95.**

6-110 VOLT POWER SUPPLY KIT, $14.95

New utility power supply kit, works on either a 6 volt storage battery or 110 volts AC. Furnishes power for a 25 watt amplifier and will run a turntable from a storage battery. Kit 6-110 KR complete with diagram **$14.95.** 6-110 volt 60 cycle vibrator only **$1.98.** Thermador 6-110 power transformer **$5.95.**

CROW UNDER DASH CONTROL $3.98

Universal under dash automobile radio remote control. Made up for Crow dial parts of older model cars. Choice of drive ratios 8, 18, 12, 16 or 20 to 1. To find ratio, count turns of gang for left to right and double. Under dash control. Net **$3.98.** If off-on switch is desired, add **$1.00.** Genuine Crow custom controls for all cars 1941 through 1949, with drive and V.C. adapter, **$7.57.** If off-on switch is desired, add **$1.00.** Bulk dial drive, casing and shafting with choice of end fittings. 48 in. length of each (non-ravel), **$1.15.**

G.E. AUDIO OSC. $29.95

General Electric YGA-4 Audio Oscillator. Brand new in factory cartons. Variable from 25 to 16000 CPS. A regular $50.00 item offered by us while they last for only **$29.95.** Weight 31 lbs.

4-TUBE T.R.F. KIT

BARGAIN SPECIAL $6.95

4 tube AC-DC, TRF radio kit. Ideal for students and beginners. Every part furnished to build this kit, including tubes, diagrams and photos. Has Alnico V PM speaker and tubes 12SK7, 12SN7, 50B5 and 35W4. Plastic cabinet with airplane dial. Receives broadcast 550 to 1600 KC. This is the easiest type of radio to build. Kit Model TF-4. Weight 6 lbs. **Net $6.95.**

100 assorted, insulated ¼, ½ and 1 Watt resistors low ohms to 10 meg..... **$1.49**
40 ft. No. 16 Leadin, rubber covered and stranded. Special..... **19c**
I.C.A. Universal AC-DC line cords. $1.00 value. Special..... **49c**
8 ft. G.E. AC line cord and plastic coated plug..... **24c**
10 for..... **$2.00**
6½ ft. G.E. AC line cord and plastic bakelite plug..... **16c**
10 for..... **$1.50**
2 gang condenser, 2 I.F.'s, loop, and oscillator coil, matched. Special. **$1.29**
Finest 456 I.F. transformers, matched. You can't beat this. Each..... **49c**
Pee Wee Iron Core 456 I.F.'s. A hot value. Each..... **39c**
10 watt wire wound resistors, all sizes..... **19c**
25 watt wire wound resistors, all sizes..... **25c**
67½ volt "B" wafer cell, best quality..... **$1.39**
5 for..... **6.50**
High grade Grill Cloth, brown or grey, 48" wide, 1 yd. **$1.49**
Spaghetti tubing, ½" bundle ass'td 9" long. Special..... **19c**
3 or 4 wire oscillator coils, 456. Special..... **15c**
Bronze dial cable, as used on old sets. Spec. 100 ft..... **99c**
2 watt Neon lamp. Standard base. 35c value. Special..... **19c**
10 for..... **$1.50**
Hi-impedance Army head phones. Civilian type band and cord. Special. **$1.49**
Loop antennas. Small, medium and large. All late production. Special..... **29c**
50 MA. AC-DC chokes, 39c; 75 MA. **59c**
501.6 output transformers, 3Q5 outputs, 39c; 10 for..... **$3.50**
4 watt universal output transformers, **75c**
8 watt universal output transformers, **95c**
12 watt universal output transformers..... **$1.25**

SALE! RECORD PLAYERS—AUTOMATICS—LONG PLAYING AND STANDARD ECONOMY PORTABLE PLAYER KIT $9.95

Children's Player Kit $7.95

New, children's electronic player. Offered in kit form. Includes all material necessary. Attractive red plywood cabinet, self-starting phono motor and crystal pick-up, 4x6" PM speaker and parts to build 701.7 amplifier. Diagram included. Weight 8 lbs. Stock No. LJ-1. Net Price **$7.95.**

LJ-1 $7.95

Portable Player Kit Scoop $9.95

Deluxe portable electronic player kit in deluxe capitol case. Includes all parts and easy to wire diagram. Comes complete with grey leatherette portable carrying case self-starting phono motor, pickup, 5" PM speaker and all necessary parts to build 70L7 amplifier. Weight 14 lbs. Stock No. CK-1. Net Price **$9.95.**

Super Portable Player With A.C. Amp. $19.95

Super deluxe record player with push-pull 7C5 AC type amplifier and 6 inch speaker. All you do is mount amp. in the case. Case is of the accepted type. This player should sell for $35.00. Stock No. DL-3. Net **$19.95.** Offered with Stewart-Warner automatic changer. Stock No. ARO-4. Net **$27.95.**

Portable Record Player $14.95

Complete record player. Component parts shipped separately. Amplifier is ready wired and tested. Amplifier has four tubes, 12SQ7, 2—117Z3, 50L6. All parts are included, self-starting phono motor, crystal pickup, 5" heavy duty PM speaker and amplifier, with tone and volume control. Deluxe capitol heavy wooden case is covered with brown leatherette and has chrome fittings and speaker grill. Stock No. CC-8. Net price **$14.95.** Model LP-CC8—Same as above only Dual speed with 2 pickups. **$19.95.**

McGEE RADIO COMPANY

Order from This Ad. Prices F.O.B. K.C.
25% Deposit with C.O.D. Orders. Include Postage with full remittance.

SEND 25% DEPOSIT—BALANCE C.O.D.
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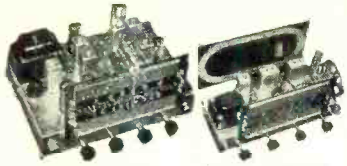
WHO BUT McGEE COULD DO THIS!

HALLICRAFTERS S-56 FM/AM CHASSIS ONLY $59.50

REGULAR $110.00 VALUE • 11-TUBES HIGH FIDELITY AUTOMATIC FREQENCY CONTROL • PUSH PULL AUDIO • PHONO INPUT • TONE SELECTOR • WE HAVE 'EM



11-TUBE FM/AM Model S-56—$59.50 | 8-TUBE FM/AM Model S-59—$39.95 • ORDER NOW

MODEL S-56 HALLICRAFTERS, high fidelity, 11 tube AM-FM radio receiver chassis for custom installations. Receives standard broadcast 540 to 1700 kc and FM 88 to 108 mc. Automatic frequency control on FM, holds the receiver in perfect tune. Phono connection on rear of chassis. Full range tone control with base boost. Push-pull 6K6 tubes in audio system. Frequency response essentially flat, from 50 to 14,000 CPS. Wide vision accurately calibrated slide rule dial, with pre-selection on broadcast band. Output transformer matches 500 ohm line. 4 antenna terminals: two for AM and two for FM. This is the finest type home radio that we know of today. Better get your order in early. Designed to be used in commercial radios selling in the $400.00 to $600.00 class. The regular dealers net on this chassis is $110.00. However, a lucky purchase enables us to offer these brand new, factory cartoned S-56 Hallicrafter chassis; complete with tubes and operation instructions, at only $59.50, less speaker. Speaker matching trans. 500 ohm to voice coil $2.50 extra. Weight 25 lbs. Buy your S-56's with a coaxial PM speaker. Pick your combination from the prices listed below.

S-56 Hallicrafter AM-FM Chassis, with tubes, 500 ohm line to speakers; matching transformer. High fidelity 12" Coaxial PM Speaker; Model CR-13X. All for only $71.95

S-56 Hallicrafter AM-FM Chassis, with tubes, 500 ohm to line matching transformer and 15" King Co-ax PM Speaker; model S-15X. This is an ideal combination for the recreation room, having both heavy bass and excellent high frequency response. All for the price of only $81.95

S-56 Hallicrafter AM-FM Chassis, with tubes, 500 ohm to line matching transformer and our 12", 12 Oz. Alnico V PM Speaker, equipped with University Lab. high frequency Coaxial adapter. This combination gives augmented and an extended high frequency response. All for only $83.50

S-56 Hallicrafters AM-FM Chassis with tubes and line matching transformer and 15" Jensen. $55.00 list PM speaker. All for $84.95

1948 MODEL—MIKE-BROADCASTER ONLY $7.95

4-TUBES

Broadcasts 800 to 1500 KC from either a phonograph pick-up or a crystal or dynamic mike. Makes any radio receiver a P.A. system, record player or recording amplifier. Broadcast quality. Has fader control from mike to record, simulating a regular broadcast station. This is a powerful model: using 2—35B5, 12SJ7 and 35W4. Priced with tubes and connecting instructions. Work on 110 volts AC-DC Crystal mike and desk stand $4.95 extra. Model DE-5 truly a de-luxe mike-phono oscillator. Weight 4 lbs.

DE-2X Phonograph Oscillator. Broadcasts from 800 to 1500 KC gain for any crystal pick-ups. A new, powerful circuit has variable gain control. Priced complete with 2 tubes and connecting instructions. Weight 2 lbs. Net $3.95

SUPERHET BROADCAST TUNER $7.95

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

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

4 tube, plus rectifier, AC-DC amplifier. Push-pull 50B5 output tubes, with 12SJ7 (Gain for mike or G.E. variable reluctance pick-up), 12SL7 (Gain for conventional crystal pick-up) and phase inverter. This is a nice small audio amplifier, with tone and fader control, plus inverse feedback. Furnished wired and tested, complete with tubes, 8 watts output. Ready to play. Weight 6 lbs. Model TM-5. Net price $9.95
Crystal mike and desk stand $4.95 extra
8" PM speaker $2.95 extra. G.E. variable reluctance pick-up cartridge $5.85 extra.

SAVE ½ CARTRIDGES—ARMS

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

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

Standard L-40, L-26, cartridges, old standbys, thousands in use. Complete with rest clip. Each, $1.79; 10 for $15.00.

Astatic L-70, L-75, cartridges or equal. Each, $1.79; 10 for $15.00.

Astatic L-72A or equal 3½ volt output, used in one lung record players, etc. Also where tone networks are used, $1.79; 10 for $15.00.

Shure 1-volt cart. Light weight, $1.79; 10 for $15.00.

NJ-Nylon cartridge with permanent, but changeable needle. $3.29.

RCA magic-tone cell, with permanent sapphire needle. Modernization kit replaces 95% of old cartridges in RCA radio phonographs, built during 1938 and later. 4 page instruction book included. A scoop at only $1.95.

Astatic QT 3-M cartridge with silent needle response to 10,000 CPS. Reg. $8.40 List. Scoop price, $3.29.

Complete arm with 3½ V. cartridge, $2.29.

Complete arm with 1 V. cartridge. $2.29.

L.P. micro-groove arm with needle, $3.95.

Shure TN305 or TO305 Cartridges with needle $2.49

Astatic LTM Cartridge with needle. Scoop price $2.49

Standard Plastic Arm with 3½ Volt Cartridge and mounting hardware $1.95

NATIONALLY ADVERTISED 15-INCH P.M. SPEAKER 6 LB. MAGNET

REGULAR $55.00 LIST.

SALE PRICE $26.95

A 15 P.M. A fine 15 Inch Permanent Magnet Speaker. Heralded by some connoisseurs of fine musical reproduction as the world's finest speaker. Brand new original cartons. 6 Pound Alnico 5 Magnet. 1½ Inch 8 Ohm Voice Coil. One Piece molded cone made by Jensen. A regular $55.00 list price for only $26.95. Two for $50.00. Weight 22 lbs.

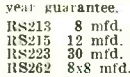
NATIONALLY ADVERTISED COND. SAVE ½

DEALERS! STOCK UP NOW ON THESE FRESH COND.
BUY 100 ASSORTED ELECTROLYTICS AND TAKE 10% OFF.

ELECTROLYTICS UPRIGHT ALUMINUM CANS

Save half on these genuine aluminum can upright screw mounting. Fresh Stock. One year guarantee.

RS213	8 mfd. 450V. 1 x2¾"	$0.49
RS215	12 mfd. 450V. 1 x2¾"	.54
RS223	30 mfd. 450V. 1⅜x3"	.59
RS262	8x8 mfd. 450V. 1⅜x3¾"	.59



NATIONALLY FAMOUS 600 VOLT TUBULARS

All latest production 600 volt tubulars Branded by their makers as type T.P. Buy 100 assorted for only $6.95—8 cents each in smaller quantities. .04, .06. .02, .004, .006, .008.

1600 volt rated for the tough job or auto buffers. .002, .02, .04, .05, 15c each; 10 for $1.29.

NATIONALLY ADV. TUBULAR ELEC.

Every day tubulars with long leads. Only name brands shipped. Every cond. guaranteed one year. Order 100 assorted and take 10% off.

40x20 150 Volt		$0.29
40x40 150 Volt		.39
50x30 150 Volt		.39
30x30 150 Volt 20x25		.49
50x30x20 150 Volt		.59
10 mfd. 150 Volt		.19
20 mfd. 150 Volt		.24
40 mfd. 150 Volt		.29
8 mfd. 450 Volt		.24
16 mfd. 450 Volt		.39
30 mfd. 450 Volt		.49
10 mfd. 250 Volt		.19
20 mfd. 250 Volt		.29
20x20 250 Volt		.39
40 mfd. 250 Volt		.39
8x8 525 Volt		.49
16 mfd. 525 Volt		.49
8x8 450 Volt		.39
20x20 450 Volt		.49
8x8x8 450 Volt		.49
20x20 350 Volt		.39
10x10x10 400 Volt		.39

SOLAR WET ELECTROLYTICS

Genuine Solar Screw Mounting Wet Electrolytics. Latest 1948 production. Use Solar wets when you want a filter for those tough jobs.

8 mfd. 500 Volt wet.	Solar	$0.87
16 mfd. 500 Volt wet.	Solar	1.23
20 mfd. 500 Volt wet.	Solar	1.32
8 mfd. 600 Volt wet.	Solar	1.32
16 mfd. 600 Volt wet.	Solar	1.80

ELECTROLYTICS EVERY DAY REPLACEMENTS

Type TCS Aluminum tubes with paper insulating tubes. Separate sections with lugs. Buy a good supply of these at over half off. Fresh stock. One year guarantee.

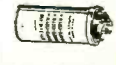
TCS45	20x20 mfd. 150V. 1x2⅜"	$0.39
TCS47	30x30 mfd. 150V. 1x2⅜"	.44
TCS48	40x40 mfd. 150V. 1x2⅜"	.49
TCS52	10x10 mfd. 250V. 1x2⅜"	.29
TCS55	20x20 mfd. 250V. 1x2⅜"	.34
TCS75	8x8 mfd. 450V. 1x2⅜"	.49
TCS74	15x15 mfd. 450V. 1x2⅜"	.59
TCS75	20x20 mfd. 450V. 1x3½"	.65

Type TCD Dual with Common Neg. and 3" Leads.

TCD55	20x20 mfd. 250V. 1x2"	$0.34
TCD52	10x10 mfd. 250V. 1x2"	.29
TCD65	20x20 mfd. 350V. 1x3"	.34

ST, 2N, 3S, 4S. Cardboard Tubes, Mallory Built, with metal tabs for vertically or under chassis mounting. Fresh Stock. One year guarantee.

ST595	8 mfd. 450V. ¾x2½"	$0.29
ST597	16 mfd. 450V. 1x2¾"	.39
ST598	20 mfd. 450V. 1x2¾"	.44
ST599	30 mfd. 450V. 1x3½"	.49
2N509	20x20 mfd. 150V. ⅞x2⅜"	
2N518	8x8 mfd. 450V. 1x2¾"	.49
2S556	30x30 mfd. 150V. 1x2⅜"	.44
3N533	30x30 mfd. 150V. 20x25V.	.54
3S579	8x8 mfd. 450V. 20x25V. 1⅜x2⅞"	.54
3S584	8x8x8 mfd. 450V. 1⅜x2⅞"	.69
4S718	8x8 mfd. 450V. 10x10" 25V. 1⅜x2⅝"	.59



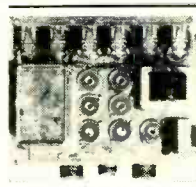
POPULAR F.P. FOR EXACT REPLACEMENT SAVE OVER ½

Popular FP electrolytics twist mounting in aluminum cans. All guaranteed one year. Only name brands shipped. Order 100 assorted and take 10% off.

40 mfd. 25 Volt		$0.19
25x25 mfd. 50 Volt		.19
40 mfd. 1500—25x50 Volt		.24
40x20 150 Volt		.29
40x40 150V. 25x50 Volt		.39
80x40 150 Volt		.49
40x40x20 150 Volt		.49
10 mfd. 450 Volt		.29
20x350V. 10x300V. 25x25V.		.49
30 mfd. 450V. 20x25V.		.39
24x16 mfd. 350V.		.39
16x16 mfd. 350V.		.39
20 mfd. 450 Volt		.39
30 mfd. 450 Volt		.49
10x10 450 Volt		.44
20x20 450 Volt		.49
40x40 450 Volt		.59
15x15 450 Volt—20/25		.54
30 mfd. 450 Volt—20/25		.49
20x10 350 Volt—20/25		.39
30x15 350 Volt—20/25		.49

TELEVISION SALVAGE SCOOP! $2.95

Television Receiver Salvage Scoop. A large manufacturer's made engineering change which caused throwout of the T.V. partially built-up Chassis. We do not recommend completing this but for salvage it's a dream. Size 12x17". It has 17 Octal Sockets, 2 F.P. Filter Condensers, and over 150 small ceramic condensers, resistors, and molded condensers. It certainly is a terrific buy at only $2.95. Include postage for 12 lbs. St. No. 17FX.



AUTO PILOT, $1.00

CIT—Auto pilot amplifier salvage scoop. Has 6 high resistance relays. Weight 13 lbs. Scoop price $1.00 each.

USED BC-458 WITH TUBES $2.95

Brand new BC-458 5.3 to 7.1 mc Transmitter, with tubes $5.95
Used modulator BC-456, with tubes & dynamotor. Weight 18 lbs. $2.95
Antenna current meter for BC 458 command transmitter, each $1.99
ARC-4 Transmitter-receiver, used, good condition, with tubes. Wt. 30 lbs. $12.95
APN-1 Transreceiver only, with tubes, good condition. Weight 25 lbs. $9.95
HS-30 Army "plugin your ears" headphones with 800 ohm trans., very tiny. Scoop price $1.79
SCR-518 Radio Altimeter. New Factory Cartoned Weight 140 lbs. $24.95
BC-733-D Localizer receiver, with 10 tubes, good condition. Wt. 20 lbs. $6.95
APS-15 Radar Range Scope with 45 tubes 7-6L6, etc. 5" Scope Tube with electromagnetic deflection. Weight 65 lbs. Scoop price $29.95

CRESCENT DELUXE CHANGER ONLY $14.95

Model 350A Crescent Deluxe 78 RPM Automatic Changer with shure cartridge. Base size 11½x13½". Deep maroon finish. Weight 11 lbs. Scoop price $14.95
Aero 78 RPM Automatic Changer with Q. T. Cartridge and permanent needle. Base size 12x13". Scoop price $12.95. Two for $24.95
VM-800 78 RPM Automatic Changer. Base size 13¼x14". A wonderful buy at $12.95. Two for $24.95
Farnsworth 78 RPM 2-Post Automatic Changer with new variable reluctance cartridge. Net $19.95
VM-400 78 RPM Automatic Changer. Intermixes 10" and 12" records. Space required 12¼x13". A Scoop at only $19.95
Triple Post 78 RPM Seeburg Automatic Changer. Super construction. Intermixes 10" and 12" records. Base size 14½x14". Price $29.95
General Instrument 78 RPM Automatic Changer. A fine small changer. Base size 10½x12". Net $14.95
Leatherette made to fit bases for any of the above changers $1.95 each.

WEBSTER CHICAGO DUAL SPEED CHANGERS MODEL 256 $31.53

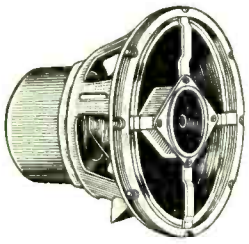
World famous Webster Chicago model 256 dual speed automatic record changer for the regular 78RPM records or the new 33⅓ microgroove records. New Pick-up with needles mounted in tandam for flip of the wrist change. Base size 14x14". This is the famous tilt-o-matic model. Weight 18 lbs. Net $31.53
Webster model 246 dual speed automatic changer is a fine changer at a lower price and also requires less space. Weight 15 lbs. Net $28.36

McGEE RADIO COMPANY

Order from This Ad. Prices F.O.B. K.C. 25% Deposit with C.O.D. Orders include Postage with full remittance.

SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

BUY A 12 INCH "COAXIAL" P.M. SPEAKER AT McGEE FOR $10.95



12 INCH COAXIAL MODEL CN-12X $10.95

Designed by one of America's finest speaker builders. Made for FM high fidelity radios, record players and P. A. systems. This speaker is incorporated in radios selling in the $500.00 bracket. It has an especially designed 12" 4.64 oz. Alnico V magnet PM for the low range and a coaxially built-in 3" Alnico V tweeter. The high pass filter is concealed under the pot cover. Just hook to any 8 ohm output transformer (will hook in place of any home radio speaker, as most speakers have an 8 ohm voice coil). Only 2 wires to connect, will handle 18 watts peak. Frequency response, 50 to 17,000 CPS. This coaxial PM speaker should sell for $35.00. Why buy an ordinary speaker, when we offer you the speaker of the future, for only **$10.95?**
Stock No. CN-12X. Weight 8 lbs. ..... **$10.95, 2 for $20.95**

DELUXE 12 INCH COAXIAL MODEL CR-13X $12.95

A regular $37.50 list speaker. The same basic design as the model CN-12X, described above, but furnished with 6.8 oz. magnet in the 12" woofer. Frequency response, 40 to 17,000 CPS. Has more mellow tone than CN-12X. Weight 9 lbs.
Model CR-13X ..... **$12.95, 2 for $24.95**

15 INCH SUPER HEAVY DUTY COAXIAL P. M. SPEAKER $24.95

"IT WOOFS AS IT TWEETS"

The King Coax. A 21.5 oz. 15 inch Alnico V PM speaker with a built-in high frequency tweeter. Will respond to from 50 to 12,000 cycles. This is a ruggedly built speaker with a curvelenier one piece molded cone. Built-in high pass filter. Just hook to any 8 ohm output. Built by the maker of our ever popular 12 inch coax model 4-12X. This speaker has a retail list of over $60.00. We offer you our 5-15X 15 inch coax for only **$24.95.** Weight 22 lbs.

5 NATIONALLY KNOWN 12" P.M. SPEAKERS ONLY $22.50

Nationally known 12" 6.8 oz. Alnico V PM with 1" 8 ohm voice coil. Will take 15 watts. Grey finish. Our leading 12" speaker.
Stock No. CH-12. Net **$4.95.**
5 for **$22.50**
12" 12 Oz. Mag. Will Take 20 Watts **$8.95**

Super heavy duty 12" 12½ oz. Alnico V magnet PM with 1¼" with 8 ohm voice coil. This speaker is equal to 60 oz. of old type magnet. Will take 25 watt peak. Stock No. CH-13—**$8.95;** two for **$17.00**

McGEE HAS THE SPEAKERS

Following speakers listed are latest production No-Factory throwouts made by the largest factory who furnish the original equipment to America's biggest Radio Factory. Every speaker guaranteed.

3" PM 1 Oz. Alnico 5 Magnet	$0.99
4" PM 1 Oz. Alnico 5 Magnet	.99
4" PM 1½ Oz. Alnico 5 Magnet	1.19
5" PM 1 Oz. Alnico 5 Magnet	.99
5" PM 1½ Oz. Alnico 5 Magnet	1.19
6" PM 1½ Oz. Aln. 5 Mag.. Square	1.49
6" PM 2.15 Oz. Aln. 5 Mag.. Square	1.98
6" PM 3.16 Oz. Aln. 5 Mag.. Square	2.49
6½" PM 1.5 Oz. Aln. 5 Mag.. Round	1.69
4x6" PM 1.5 Oz. Alnico 5 Magnet	1.49
6x9" PM 3.16 Oz. Alnico 5 Magnet	2.98
6x9" 7 Oz. Alnico V PM	3.49
7" PM 3.16 Oz. Alnico 5 Magnet	2.98
8" PM 3.16 Oz. Alnico 5 Magnet	2.98
10" PM 4.64 Oz. Alnico 5 Magnet	3.98

Hot Buys In PM's—With Trans.

4" PM 1 Oz. Aln. 5 2500 Ohm Trans.	$1.49
4" PM 1 Oz. Aln. 5 10M Ohm Trans.	1.49
5" PM 1 Oz. Aln. 5 2500 Ohm Trans.	1.69
5" PM 1 Oz. Aln. 5 10M Ohm Trans.	1.69
5½" PM 1 Oz. Aln. 5 2500 Ohm Trans.	1.89
6" PM 1.5 Oz. Aln. 5 2500 Ohm Trans.	1.99
6" PM 1.5 Oz. Aln. 5 7000 Ohm Trans.	1.99
6" PM 2.15 Oz. Aln. 5 7000 Ohm Trans.	2.49
6" PM 3.16 Oz. Aln. 5 10M Ohm Trans.	2.98

Hot Buys In Field Spkrs. With Trans.

5" 450 Ohm with 2500 Ohm Trans.	$1.98
5" 450 Ohm with 7000 Ohm Trans.	1.98
6" 1500 Ohm with 7000 Ohm Trans.	2.29
8" 450 Ohm with 7000 Ohm Trans.	2.98
8" 1000 Ohm, Less Trans.	2.49
10" 1000 Ohm, Less Trans.	3.98
12" 450 Ohm RCA, Less Trans.	4.98
12" 1000 Ohm Magnavox, Less Trans.	4.98

Famous Magnavox Speakers

6" Auto Speaker—4 Ohm	$2.49
7" Auto Speaker—4 Ohm	2.98
8" Auto Speaker—4 Ohm	2.98
5" 8 Oz. Alnico 3 PM	1.79
8" 12 Oz. Alnico 3 PM	2.98
10" 21 Oz. Alnico 3 PM	4.98
12" 21 Oz. Alnico 3 PM	5.98

Save Up To 50% On Cinaudagraph Field Coil Speakers

Regular Dealers Stock of field type Cinaudagraph Replacement speakers. Brand new, individually cartoned. Don't pass up this value.

3" 450 Ohm Field Cinaudagraph	$1.79
4" 4 Ohm Field (Auto) Cinaudagraph	1.79
4" 450 Ohm Field Cinaudagraph	1.79
5" 4 Ohm Field (Auto) Cinaudagraph	1.79
6" 450 Ohm Field Cinaudagraph	1.99
6" 1000 Ohm Field Cinaudagraph	1.99
8" 1000 Ohm Field Cinaudagraph	2.49

HOT ITEM—AUTO SPEAKERS

MAGNAVOX	UTAH
6" Square 4 OHM	$1.49
6½" Round 4 OHM	1.49
6x9" Auto Speaker 4 OHM	1.98
7" Motorola-Philco	2.49
8" Motorola-Philco	2.49

15" Theatre Twin Speaker $26.95

Our sound laboratory has assembled this fine speaker combination. A super heavy duty 15" Cinaudagraph Alnico V PM and a University Laboratories trumpet type high frequency tweeter. Ready cut plywood baffle and cut to fit grill cloth are furnished. All you do is bolt the speaker to the baffle and connect in the 4 Mfd. high pass filter. This combination will take 35 Watts of audio and frequency response 40 to 10,000 cps. A speaker combination of theatre quality. Stock No. BW-3L. Net Price **$26.95**

BASS REFLEX SPEAKER BAFFLE $24.95

6 Cubic Foot Utility Bass Reflex Speaker Baffle. Size 32x22x16. Heavy construction with curved pleasing lines. Celotex lining assures non-rattle reproduction. Finish is an attractive brown wrinkle paint. Chrome front trim. Specify when ordering whether for use with a 12" or 15" Speaker. Weight 40 lbs. This is an ideal baffle for our deluxe Coaxial model CN-13X. Baffle Stock No. NA-12. Net **$24.95.** CN-13X 12" Coaxial PM Speaker and NA-12 Baffle both for **$34.95.** You will be pleased with the fine tone of this combination.

BRAND NEW 1949 PRODUCTION

15 INCH PERMANENT MAGNET SCOOP OF ALL TIMES NEW MOLDED CONE

Pre-War or Post-War, you never bought a speaker like this for such a scoop price. Made by a nationally known builder of fine speakers. A full 15" 12½ oz. Alnico V magnet speaker of juke box quality. Has standard 8 ohm voice coil. Will take up to 18 watts average or 25 watts peak. Here is a speaker that will bring out those low notes. Latest 1948 production; not a line cheater. Every speaker is guaranteed new and perfect. We may not be able to continue this offer for long, so place your order now. Stock No. 15-KR. INCLUDE POSTAGE. Wt. 11 lbs. A $35.00 value for only **$9.95**

15" DELUXE 50 WATT P.M. SPEAKER $16.95

Model 15-LS. 15" 21½ oz. Alnico V Magnet PM Speaker. Will take 35 watts with ease. Thousands of dollars were spent in building the fine tools to produce this speaker. The 8 ohm voice coil is 1½" in diameter and has been heat treated and plastic coated. Constructed to eliminate loose voice coils, wires and warping. Made by a renowned builder of fine speakers. Truly the King of juke box speakers. Weight 18 lbs. Net Price **$16.95,** 2 for **$32.95**

50 WATT 12 INCH SUPER HEAVY DUTY P.M. $14.95

Model A-50—12", 50 watt super heavy duty permanent magnet speaker. Has 1½" 8 ohm treated voice coil and one piece molded cone. Heavy half inch machined pot, with bolt secured 21 oz. Alnico V magnet. Frame is of heavy construction with metal pot cover. Finished in silver-grey enamel. This speaker is the best value possible today. Efficiency is two to three times that of ordinary speakers. Especially recommended for all public address systems and high quality home audio systems. Will handle 35 watts with ease and 50 watts peak or short lengths of time. Its retail value is $50.00. But, by our large purchase, we are able to offer it to you for only **$14.95.** Do not confuse this speaker with surplus merchandise. This is the latest production, Model A-50. Weight 15 lbs. Net **$14.95,** 2 for **$29.00**

OUTPUT TRANSFORMER HIGH FIDELITY 20—20,000 C.P.S. SCOOP PRICE $6.95 EACH

Why pay $20.00 or $30.00 for an output. Supreme quality and high fidelity output transformer. Designed to match push-pull plates (2—6L6, 2—6V6, or 2—6AQ5) class AB, to 4-8-15-250 and 500 ohm; with 10% feedback winding. Housed in a compound filled case; 3⅞x4½x3". Actual net weight, 6 lbs. If you want the best quality from your audio system, order this transformer. Response essentially flat from 20 to 20,000 cycles. We have tried several high fidelity outputs in our lab and find this to be the best value. Even though your amplifier only puts out 10 or 15 watts, this 34 watt job is what you should have. Connecting instructions are furnished. Stock No. A-403, shipping weight 8 lbs. Net price **$6.95**

$100 Value Wire Recorder Complete Only $69.50

Makes and plays back through its own amplifier and speaker a 1 hour, 30 minute, or 15 minute Wire Recording. Made to retail for $100.00 by Air King. Portable with blue leatherette carrying case, weight of 24 lbs. 1 hour spools of wire $3.25. 30 minute spools for **$1.95.** 15 minute spools **$1.30.** Complete ready to operate. Stock No. A-725 ..... **$69.50**
Deluxe Model Air King Model A-750—Similar to above. Only heavier construction and records directly from 78 RPM phono records or mike to wire, weight 35 lbs. Net **$92.50**

Our Leader Magnetic Tape Recorder $250 List—Net $149.50

Magnetic tape recorder of nationally known manufacturer, complete ready to operate. Has AC transformer type amplifier for recording and playback. Housed in an attractive leatherette case, with microphone. Makes a 30 minute recording from standard magnetic tape. Made to sell for $250.00 list. McGee's scoop price **$149.50.** Circular sent on request.

100 RADIO TUBES $29.95

250,000 Tubes for fast sale. Tremendous value. Tubes up to $3.00 list. 100 Cartoned and branded Hyvac Miniature Tubes for $29.95. Over a million sold. Guaranteed full replacement. 34c Each in smaller quantities.

1R5	12BA6	12AX7	6AU6	6BF6
1T4	12BE6	19T8	6BJ6	6AU7
1U5	35W4	12AU6	6BA6	6AJ5
3A4	50B5	12BF6	6BE6	6SU7
1S5	35B5	117Z3	6AT6	6AQ6
3V4	12AT7	6A6G	6C4	
3Q4	12AU7	6BH6	6AL5	
3S4	12BA7	6X4	6AQ5	

34c each
100 for $29.95

Popular GT Tubes, individually cartoned and branded Hyvacs. $35.00 per hundred. 39c Each in smaller quantities.

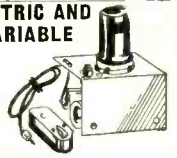
6V6	6X5	6SK7	12SF7	12SN7
6SN7	6SD7	6SQ7	6J5	12BF7
6C5	5Y3	25L6	6SJ7	6SL7
6P5	6K7	70L7	12SJ7	35Z5
12A8	5Y3	1B4	6SF5	
6S8	6K6	12K8	80	
12S8	6SA7	12A6		

39c each
100 for $35.00

STANDARD BRAND TUBES CARTONED and UNCARTONED 49c

12AH7	6J5	6SJ7	12BE6	1S5	7N7	6A3	6E5	1G6
27	6K7	6SK7	12H6	7B6	35Z5 GT	483	38	1B5
26	9001	6SL7	12J5 GT	7A7	35W4	2051	39	1E5
78	9002	6SG7	7H7	6R7	50B5	25Z5	89	1F5
76	9003	6SN7	7C7	6L7	2525	6B4	6SS7	1B4
3S4	1625	7E5	12SG7	7Z4	2526	6C4	7A5	1H6
5U4G	6SA7	7E7	12SH7	12SQ7	6D6	78	12FS7	12C8
5Y3G	14Q7	6S R7	12SJ7	12S R7	6C6	7Y4	7V7	5V4
6AC7	14B6	6V6 GT	12SA7	50L6	6J7	14C7	6Y6	
35Y4	6SC7	6X5 GT	12SL7	12SK7	77	14R7	30	
14A7	6SF7	6AB7	12SC7	25L6 GT	7C5	35B5	32	
6C5	6SQ7	12AT6	1T4	35L6 GT	7Z4	12BD6	33	
6H6	6SH7	12BA6	1R5	7F7	6K5 GT	6F5 GT	1J6	

GENERAL ELECTRIC AND WEBSTER VARIABLE RELUCTANCE



New Webster cartridge with removable permanent needle. Response is second to none. Offered with preamplifier (6sc7) ready wired and tested.
A scoop at **$5.95** complete.
Webster M1-VR cartridge only, net..**$4.41**
New General Electric V. R. cartridge No. RPX-040, with removable needle. Net **$5.85**
General Electric V. R. cartridge (RPX-041) for micro-groove records. Net **$5.85**
Our 6sc7 type pre-amplifier with either PRX-040 or PRX-041 cartridge. Net..**$7.95**

G.I. RM-4 $5.95

General Industries RM-4 heavy duty phono motor with T.T. 78 RPM. Scoop price **$5.95**
Deluxe quality 78 RPM phono motor with T.T. **$2.95**
Dual speed phono motor 33⅓ or 78. Reg. $11.00 list, scoop price **$4.95**

REPLACEMENT MOTOR $1.29

Scoop-Replacement phono motor fits 90% of all changers. A scoop at only **$1.29** ea.

NAME BRAND 1½ VOLT LOCTALS, ETC.

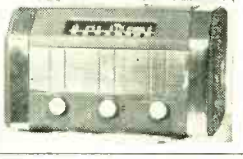
1LN5	1LD5	1LH4	1LC6	1LA6	1LB4	69c	10 for $6.50
1LC5	1LG5	3LF4	1LE3	1LA4	—		
1A7	1H5	1A5	1N5	3Q5	1T5	69c	10 for $6.50
1Q5	1P5	1C5	1G4	1G6	117Z6		

0Z4 **69c Each, 100 for $59.50.**
35A5 50A5 **69c Each.**

McGRADE $11.95

McGrade Intercom. Master and sub-station, housed in small matching walnut plastic cabinets, 5½x7x3½ inches. Sloping front for desk or wall installations. Furnished with 50 feet of inter-connecting wire. Sub-station may be used up to 1000 feet from master station. These units are new and factory cartoned. Complete with tubes. Made to retail at $29.95. A lucky purchase enables us to offer these to you for only **$11.95.** Include postage for 8 lbs. Stock No. MG-2S.

RCA COIN RADIO $39.95



Brand New RCA 6-Tube Coin Operated Radio. The popular model of which thousands are now in use. 25c Coin Slot set for 1 Hour play. Sample order $39.95. Phone Victor 9045 for quantity prices.

PORTABLE WIRE RECORDER AND 12-WATT P.A. SYSTEM $69.95

RECORD ON WIRE FROM MIKE OR RECORDS

Has a ready wired and tested 5-Tube, 12 Watt AC-Type Wire Recording and play back amplifier. Push-Pull 6V6 Output Tubes. Built in eraser circuit. Input for crystal mike or phono pick-up. Diagrams show how you can record from any radio receiver. 3 position switch enables you to quickly change from record to play-back or use as a conventional Public Address System. Here is what you get: Wired and tested 5 Tube recording Amp., attractive portable case, 6" PM Speaker, and Air-King type Wire Recording Mechanism (also plays records). Instructions for mounting amplifier and mechanism in ready cut case. Priced complete with 15 Minute Spool of Wire. 30 Minute Wire, $1.95. 1 Hr. Wire, $3.25. Model GN-11X Wire Recorder, $69.95. Crystal Mike and Desk Stand, $4.95 extra.

Deluxe Model Wire Recorder GN-12X, same as Model GN-11, but has large case with removable lid, and 10" PM Speaker. Model GN-12X, Net $79.95.

McGEE RADIO COMPANY

Order from This Ad. Prices F.O.B. K.C.
25% Deposit with C.O.D. Orders. Include Postage with full remittance.

SEND 25% DEPOSIT — BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

MARS Station of the Month

The first MARS member in the U. S.—Amateur radio station W4NGX, licensed to Maj. Griffin L. Davis, Arlington, Virginia.

FIRST to join the new Military Amateur Radio System was a Signal Corps officer, but—of all things—he is in charge of motion picture activities for the Army Pictorial Service. He is Major Griffin L. Davis of Arlington, Virginia.

As proprietor of W4NGX (which will become A4NGX when operating on MARS frequencies), Major Davis was notified just before Christmas that his was the first application for MARS membership to be approved. He had a slight advantage over the field, of course, since his desk and those of the two chiefs of MARS all are in the Pentagon, merely two floors and a couple of blocks apart.

Under various calls, beginning with W5FJM in 1935, Major Davis holds these four certificates: Worked All Continents, Worked All States, Amateur Emergency Corps, and Rag Chewers Club.

In 1942, this first of the Martians received a new call, W200X, and later, in 1946 and 1947, he was licensed and active as J2AAQ in Tokyo. Last year his license was modified, and he obtained his present call, W4NGX.

Major Davis started his Army career as a private in the Field Artillery in 1932, stationed with the Second Division at Fort Sam Houston, Texas. He served with the division as radio operator, radio chief, communications chief and first sergeant. Then, in 1941, he was appointed a second lieutenant in the Signal Corps and became an instructor at the Signal School, Fort Monmouth, New Jersey. He remained at Fort Monmouth until 1944, when he went overseas.

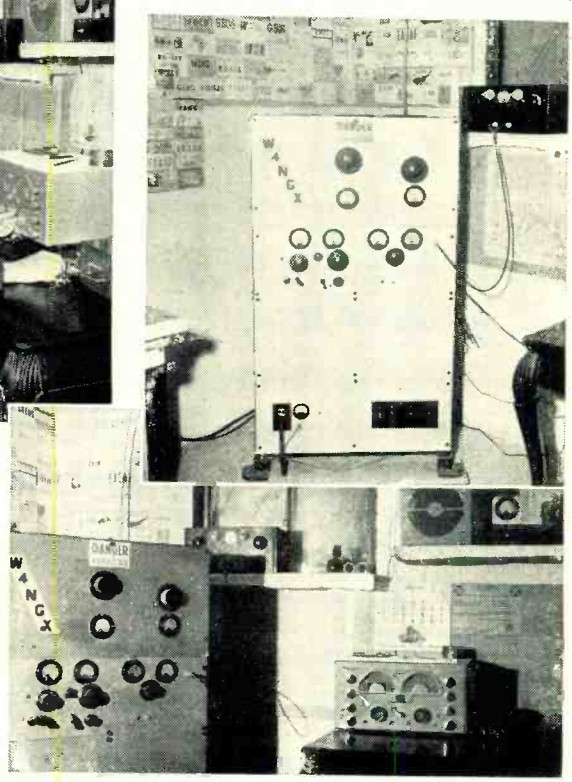
Going to the Pacific Theater of Operations, Major Davis served with the Signal Section of General MacArthur's GHQ until 1948, when he was assigned to the Office of the Chief Signal Officer. His decorations include the Legion of Merit.

How does he feel about MARS? Says Major Davis: "I deem it a pleasure and a privilege to be the first MARS member." —30—

Major G. L. Davis in QSO. The receiver is a National NC-173.

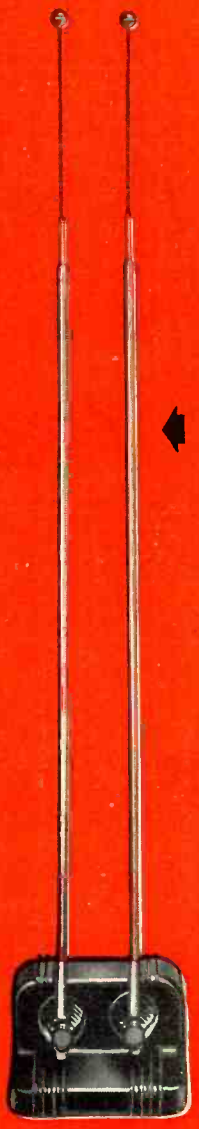
Top panel of transmitter contains a new (uncompleted) final amplifier using a 250TH. The second panel contains 6AG7 oscillator, 6L6 buffer-doubler, 807 final, and their power supplies. The two lower panels contain a.c. filler, transmitter control, and input power supply for new final. A Universal antenna coupler (on shelf to right of transmitter) connects to Zepp antenna.

Panel view of transmitter which uses a 6AG7 oscillator, 6L6 buffer-doubler, and an 807 final with a 60-watt input. An end-fed Zepp antenna on 45-foot mast is used.



Announcing

2 SENSATIONAL NEW INDOOR ANTENNAS *by* WARD



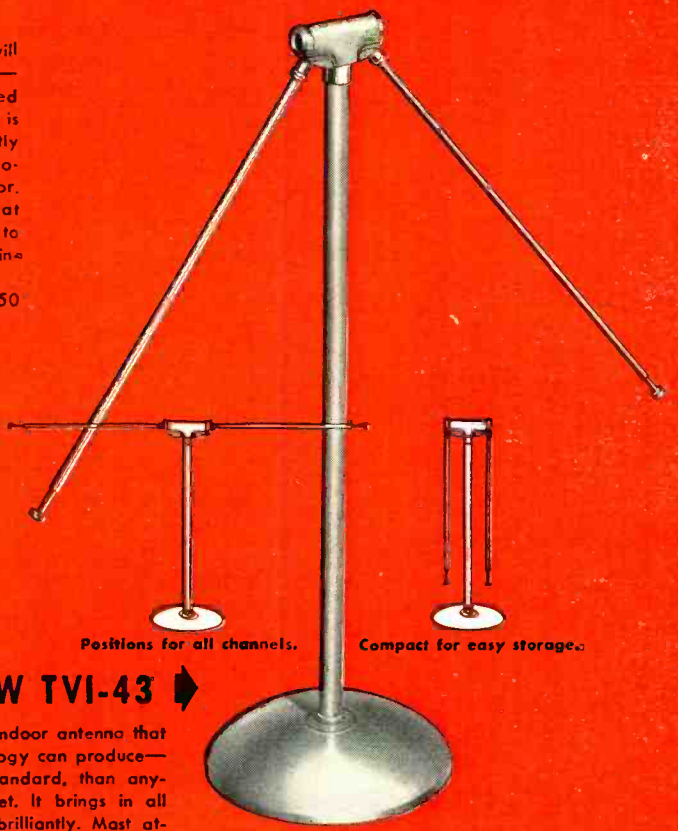
Only the very best indoor antenna is sufficient for excellent reception. Ward's new TVI-43 and TVI-49 are the finest indoor antennas available today for metropolitan multi-station areas.

Ward is the largest exclusive manufacturer of the finest and fastest selling antennas in the world. Behind the Ward name and symbol stands a company, known and respected for a quarter of a century for exceptional quality. These antennas are creative masterpieces, superb in their performance, into which Ward has poured a host of new design and construction features.

WARD'S NEW TVI-49

And here is Ward's portable TVI-49. It will give excellent reception on all channels—orients easily in all directions. Chrome-plated brass telescopic dipoles. The TVI-49 is sturdily constructed and weighted perfectly—*it will not tip over*—designed to harmonize beautifully with living room decor. Manufactured by Ward, a company that stresses utmost perfection. You owe it to yourself and your customers to see and inspect Ward's unique indoor antennas.

List $7.50



Positions for all channels. Compact for easy storage.

WARD'S NEW TVI-43

The TVI-43 is the finest indoor antenna that modern skill and technology can produce—far superior, by any standard, than anything else on the market. It brings in all channels precisely and brilliantly. Most attractive—chrome-plated brass telescopic dipoles, satin beige brown finish—blends perfectly with the most exacting interior.

List $17.95

1949 IS TV YEAR

See any leading parts distributors or write for catalog today.

WARD PRODUCTS CORPORATION

1523 E. 45TH ST., CLEVELAND 3, OHIO

DIVISION OF THE GABRIEL CO.

WARD *Magic Wand* ANTENNAS

TUBE PRICES SLASHED!

ALL BRAND NEW
STANDARD BRAND

MINIMUM ORDER $5.00
QUANTITY PRICES ON REQUEST

Type	Price
1B23	$ 9.50
1B24	4.95
1B26	4.95
1B29	.89
1P24	.89
1C21	1.29
1S21	1.96
2AP1	3.95
2C21	.98
2C22	.39
2C26A	.28
2C34	.59
2C40	1.96
2C43	7.50
2C44	1.75
2C46	3.69
2D21	1.18
2E22	1.50
2E24	4.95
2E25	4.25
2E26	3.95
2E30	2.49
2J21A	12.39
2J26	8.95
2J31	10.95
2J32	13.95
2J33	24.95
2J34	24.95
2J36	22.95
2J37	17.95
2J38	13.95
2J49	24.95
2JB51	4.95
2J54B	17.95
2K25	24.95
2K28	24.95
3AP1	4.95
3B22	4.95
3B23	4.95
3B24	.65
3B26	.89
3B28	2.95
3BP1	3.95
3C21	5.95
3C22	18.95
3C23	4.95
3C24	.69
3C30	1.50
3CP1	3.00
3D21A	1.50
3DP1	3.95
3EP1	3.95
3E29	4.95
3FP7	3.95
3J31	49.50
4-65A	14.50
4-125A	27.50
4-250A	37.50
4A1	1.98
4AP10	6.95
4B24	4.95
4C35	19.95
4E27	12.95
4J26	110.00
5AP1	4.95
5AP4	5.95
5BP1	2.95
5BP4	4.95
5CP1	3.95
5CP7	13.95
5D21	29.95
5FP7	3.95
5GP1	9.95
5HP4	9.95
5J29	17.50
5JP2	11.95
5LP1	11.95
6AF6G	.88
6C21	24.95
6D4	1.29
7BP7	4.95
7EP4	17.95
9AP4	24.95
9GP7	15.00
9JP1	7.95
10Y	.69
10SPEC	.69
12DP7	14.95
12DP8	14.95
12FP7	14.95
12GP7	14.95
12HP7	14.95
15E	1.50
15R	1.50
23D4	.49
24G	.98
45SPEC	.49
75TL	3.95
100TH	12.95
100TS	3.00
114A	.69
114B	1.25
120	5.95
121G	2.65
205B	4.50

Type	Price
211	$ 0.98
215A	3.00
217C	7.30
218	49.50
221A	2.95
231D	1.49
249C	3.49
250R	7.95
250TH	19.50
250TL	19.50
252A	4.95
254	19.95
259A	4.95
274A/B	1.25
282A/B	9.95
304TH	6.95
304TL	1.49
307A	4.95
316A	.69
322A	8.95
327A	4.95
331A	5.95
338A	4.93
350A/B	2.95
354C/D	19.95
368AS	4.93
371A/B	.89
393A	7.95
394A	4.50
417A	24.95
434A	7.95
446A/B	1.95
450TH	24.95
464A	7.50
527	12.95
531	24.50
575A	14.95
701A	4.95
703A	4.95
705A	2.95
706CY	18.95
707A/B	24.95
708A	7.95
710A	2.95
713A	1.65
714AY	6.95
715A/B	9.95
715C	24.95
717A	.99
720DY	34.95
721A/B	4.35
723AB	7.95
724A/B	4.95
725A	9.95
726A	23.50
750TL	49.50
800	2.25
801A	.98
802	3.75
803	8.95
804	12.95
805	5.95
807	1.25
808	1.89
809	2.93
810	7.95
811	2.45
812	2.95
812H	6.90
813	8.95
814	3.95
815	2.95
816	1.19
826	.69
828	6.95
829A/B	7.95
829B/3E29	4.95
830	2.95
830B	5.25
832/A	4.95
833A	34.50
834	5.95
836	1.15
837	2.50
838	3.95
841	.69
843	.69
845	4.95
845W	5.95
849A	60.00
849H	60.00
851	75.00
860	3.00
861	49.95
864	.69
865	2.98
866A	.99
868	1.95
869B	75.00
872A	2.95
874	2.49
876	.39
878	2.49
884	1.49
885	.98

Type	Price
891	$110.00
902P1	7.95
904	9.95
905	11.95
913	7.95
920	2.95
923	.98
925	1.40
929	1.25
930	1.10
931A	4.95
954	.75
955	.75
956	.75
957	.75
1608	4.95
1611	.98
1613	.75
1614	1.75
1616	1.39
1619	.75
1621	1.98
1622	1.75
1624	1.75
1625	.49
1626	.49
1628	4.95
1629	.69
1631	1.50
1633	1.65
1634	.79
1635	1.10
1636	5.95
1638	.98
1641	.79
1642	.98
1644	1.49
1654	1.98
1851	1.25
1852	1.06
1853	1.06
1960	.95
2050	1.19
2051	.98
5514	4.95
5516	5.95
5562	10.00
7193	.39
8003	5.95
8005	4.95
8011	2.95
8012	4.95
8013A	2.95
8014A	24.95
8016	1.49
8020	3.95
8025	7.95
C5B	12.95
C6J	12.95
CEQ72	1.95
CK1005	.39
CK1006	.69
CK1090	4.95
EF50	.79
EL1C	4.95
EL3C	4.95
EL225	1.95
F123A	12.95
F660	150.00
FG17	3.25
FG27A	9.95
FG33	8.95
FG67	12.95
FG81A	6.95
FG105	19.95
FG172A	32.50
FG235	59.50
FG238B	160.00
GL146	11.00
GL530	49.50
GL559	5.35
GL697	150.00
HF100	3.95
HF210	17.95
HY65	2.49
HY69	2.49
HY75	1.25
HY615	1.25
HYE1148	.48
KU610	9.95
ML101	150.00
RK21	3.95
RK22	4.95
RK25	2.95
RK33	.98
RK34	.59
RK59	3.95
RK60	.79
RK65	24.95
RK72	1.95
RK73	3.95
RX120	10.00
SD809	4.95
TZ40	2.95

Type	Price
UH50	$ 5.95
V70D	6.95
VR75	.98
VR78	.75
VR90	.75
VR91	1.49
VR105	.98
VR150	.75
VT127A	3.00
VU111	1.19
WL460	14.95
WL468	14.95
WL532A	4.95
WL562	150.00
WL616	105.00
Z225	1.95
ZB120	6.95
ZP477/12DP8	14.95
0A2	1.65
0A3/VR75	.98
0A4G	1.06
0B2	2.05
0B3/VR90	.75
0C3/VR105	.98
0D3/VR150	.75
CY4	.88
0Z4	.88
OZ4G	.88
01A	.50
1A3	.72
1A4	1.28
1A4P	1.56
1A5GT	.72
1A6	1.28
1A7GT	.80
1B3GT	1.49
1B4	1.56
1B5/25S	1.28
1B7GT	1.06
1C5GT	.88
1C6	1.28
1C7G	1.28
1D5GP	1.55
1D7G	1.28
1D8GT	1.56
1E5GT	1.38
1E7G	1.56
1F4	1.06
1F5G	1.06
1F6	1.56
1F7G	1.56
1G4GT	1.06
1G6GT	1.06
1F4G	.88
1H5GT	.66
1H6G	1.28
1H6GT	1.28
1J6GT	1.28
1L4	.80
1LA4	1.06
1LA6	1.06
1LB4	1.06
1LC5	1.06
1LC6	1.06
1LD5	1.06
1LE3	1.06
1LG5	1.06
1LH4	1.06
1LN5	1.06
1N5GT	.80
1P5GT	1.06
1Q5GT	1.06
1R4	1.06
1R5	.80
1S4	.96
1S5	.72
1T4	.80
1T5GT	1.06
1U4	.80
1U5	.72
1V	.88
2A3	1.28
2A4G	1.28
2A5	.88
2A6	1.06
2A7	1.06
2B7	.88
2F5	.88
2V3G	1.98
2X2A	1.25
3A4	.39
3A5	1.49
3A8GT	1.98
3B7	.36
3D6	.36
3Q4	.88
3Q5GT	.96
3S4	.80
3V4	.80
5AZ4	.50
5R4GY	1.15
5T4	1.28
5U4G	.60
5V4G	.96
5W4	1.06

Type	Price
5W4GT	$ 0.66
5X4G	.72
5Y3GT	.42
5Y4G	.60
5Z3	.72
5Z4	1.06
6A3	1.28
6A6	1.06
6A7	.80
6A8	.80
6A8GT	.80
6AB5/6N5	.88
6AB7/1853	1.06
6AC5GT	1.16
6AC7/1852	1.16
6AD6	.88
6AD7G	1.28
6AF6	1.25
6AG5	1.06
6AG7	1.28
6AH6	1.56
6AJ5	.99
6AK5	1.56
6AK6	.96
6AL5	.80
6AL7GT	1.06
6AQ5	.80
6AQ6	.72
6AQ7GT	.88
6AR5	.66
6AS7G	4.95
6AT6	.60
6AU6	.80
6AV6	.60
6B4G	1.28
6B5	1.56
6B6G	.88
6B7	1.28
6B8	1.28
6B8G	1.28
6BA6	.80
6BE6	.72
6BG6G	1.92
6BH6	.80
6BJ6	.80
6C4	.39
6C5	.66
6C5GT	.66
6C6	.80
6C7	1.28
6C8G	1.28
6D6	.66
6D8G	1.28
6E5	.85
6E6	1.06
6F5	.66
6F5GT	.66
6F6	.80
6F6GT	.66
6F7	1.06
6F8G	1.28
6G6G	1.06
6H6	.60
6H6GT	.60
6J5	.54
6J5GT	.54
6J6	1.16
6J7	.80
6J7GT	.80
6J8G	1.28
6K5GT	.96
6K6GT	.60
6K7	.66
6K7GT	.66
6K8	.96
6K8GT	.96
6L5G	1.06
6L6	1.42
6L6G	1.16
6L6GA	1.16
6L7	.96
6L7G	1.16
6N6G	1.56
6N7	.96
6N7GT	.96
6P5GT	.66
6Q6G	1.06
6Q7	.80
6Q7GT	.72
6R7	1.06
6R7GT	1.06
6S7	1.28
6S7G	1.28
6S8GT	1.06
6SA7	.66
6SA7GT	.66
6SB7Y	.88
6SC7	.72
6SD7GT	.49
6SF5	.66
6SF5GT	.72
6SF7	.80
6SG7	.80
6SH7	.39
6SJ7	.66

Type	Price
6SJ7GT	$ 0.66
6SK7	.66
6SK7GT	.66
6SL7GT	.96
6SN7GT	.88
6SO7	.60
6SO7GT	.60
6SR7	.72
6SR7GT	.72
6SS7	.66
6ST7	.88
6SV7	.88
6T7G	1.24
6U5/6G5	.72
6U6GT	.72
6U7G	.72
6V6	1.28
6V6GT	.80
6W7G	.88
6X4	.60
6X5GT	.60
6Y6G	.96
6Y7G	.88
6Z7G	1.28
6ZY5G	.88
7A4/XXL	.72
7A5	.72
7A6	.72
7A7	.72
7A8	.72
7AD7	1.06
7AF7	.72
7AG7	.88
7AH7	.88
7B4	.72
7B5	.72
7B6	.72
7B7	.72
7B8	.72
7C4/1203A	.39
7C5	.72
7C6	.72
7C7	.72
7E5/1201	1.66
7E6	.72
7E7	.88
7F7	.88
7F8	1.06
7G7/1232	1.06
7H7	.80
7J7	1.06
7K7	1.06
7L7	.88
7N7	.88
7Q7	.72
7R7	.88
7S7	1.06
7V7	1.06
7W7	1.06
7X7/XXFM	1.06
7Y4	.72
7Z4	.72
10	.69
12A	.60
12A6	.39
12A6GT	.39
12A7	1.28
12A8GT	.80
12AH7GT	.88
12AL5	.80
12AT6	.60
12AT7	1.16
12AU6	.80
12AU7	.96
12BA6	.72
12BE6	.72
12C8	.69
12F5GT	.72
12H6	.39
12J5GT	.39
12J7G	.80
12J7GT	.80
12K7GT	.66
12K8	.88
12K8GT	.96
12Q7GT	.72
12SA7	.66
12SA7GT	.66
12SC7	.72
12SF5	.80
12SF5GT	.80
12SF7	.80
12SF7GT	.80
12SG7	.72
12SH7	.39
12SJ7	.66
12SJ7GT	.66
12SK7	.66
12SK7GT	.66
12SL7GT	.88
12SN7GT	.80
12SQ7	.60
12SQ7GT	.60
12SR7	.39
12SR7GT	.39

Type	Price
12X3	$ 0.98
12Z3	.88
14A7/12B7	.88
14AF7/XXD	.88
14B6	.88
14B8	.88
14C5	.88
14C7	.88
14E6	.72
14E7	.88
14F7	.88
14F8	1.06
14H7	.88
14J7	1.06
14N7	1.06
14O7	.88
14R7	.88
14S7	1.06
14W7	1.06
14X7	1.06
14X4	.88
19	1.28
19T8	1.56
22	1.28
24A	.88
25A6	1.06
25A6G	1.06
25AC5GT	1.16
25L6GT	.66
25Y5	1.16
25Z5	.60
25Z6GT	.60
26	.72
27	.60
28D7	.39
30	.39
31	.39
32	1.28
32L7GT	1.28
33	.39
34	.38
35/51	.80
35A5	.72
35B5	.80
35L6GT	.66
35W4	.46
35Y4	.72
35Z3	.72
35Z4GT	.60
35Z5GT	.50
36	.39
37	.39
38	.39
39/44	.39
41	.66
42	.66
43	.66
45	.66
45Z3	.60
45Z5GT	.72
46	1.06
47	.96
49	.88
50	1.56
50A5	.88
50B5	.66
50L6GT	.66
50Y6GT	.72
53	1.06
56	.72
57	.80
58	.80
59	1.06
70L7GT	1.56
71A	.80
75	.66
76	.66
77	.66
78	.66
79	.88
80	.46
81	1.56
82	1.06
83	1.06
83V	1.28
84/6Z4	.72
85	.88
89	.72
89Y	.39
117L7GT	1.56
117M7GT	1.56
117N7GT	1.56
117P7GT	1.56
117Z3	.60
117Z4GT	1.16
117Z6GT	.96
FM-1000	1.28
UX120	1.38
UX200	1.28
9001	.89
9002	.39
9003	.69
9004	.49
9005	.98
9006	.49

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TUBE SOCKETS

JOHNSON SOCKET—for 304TL, 304TH, 213..$1.00
Ceramic miniature tube sockets..... .25
Ceramic octal sockets for all currently popular tubes..... .12
Shielded aluminum socket with built-in by-pass condensers. Designed for 829, 832, 826..... 1.75
Ceramic Socket for 829, 832, 826..... .39
Acorn Ceramic Sockets for 955, etc..... .49
Mykroy Socket for 813, 4E27, 4-65, etc..... 1.25
4, 5, 6, 7 Pin Ceramic Sockets..... .12

11-Pin Ceramic Scope Sockets for 5BP1, 5AP1, PE74, etc..... .69

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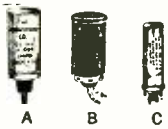
Ceramic socket for 803, complete with shock mount (Johnson No. 216)..... 1.25

Mykroy Socket for VT127A. 1.25

CONDENSERS



A. 1mfd-3000V DC upright .. .. Round Can.....$1.25
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C. 20mfd-450V—10mfd-25V.... .98

Dual .05 @ 9000vDC working PC-2151-1.....$14.50
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Coaxial—RG8U, 50 ohms imp.....$ .10 per foot
RG58U, perfect for television 50 ohms impedance..... .06½ per ft.
RG59U, 72 ohms impedance..... .06½ per ft.
RG11U, 72 ohms impedance..... .12 per foot
RG13U, 72 ohms impedance Double shielding..... .15 per foot
RG22U, 92 ohms impedance (twin lead in shield)..... .15 per foot
RG34U, 71 ohms impedance (will handle 200 watts of RF.. .35 per foot
Federal—K200, 200 ohms impedance (twin lead, perfect for handling RF power) Less than 1 DB loss at 100 mc..... .08 per foot
Hard drawn copper wire, No. 12 enamel..... .01½ per ft.

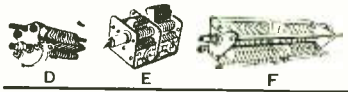
HANDY UTILITY SPOOLS

Plain Enamel	Double Cotton	Double Silk
12	12	12
14	14	14
16	16	16
18	18	18
20	20	20
22	22	22
24	24	24
26	26	26
28	28	28
30	30	30
32	32	32
34	34	34
36	36	36
38	38	38
40	40	40

ALL ONE PRICE
38c
PER SPOOL

VARIABLE CONDENSERS

A B C



D E F

B. C3002—Butterfly condenser—built in tank circuit 200 to 1000 mcs.....$1.98
E. C4115—2 gang superhet for broadcast band..... .98
C. C4419—Dual 200mmf per section, ceramic insulation will handle 100 watts..... 1.19
F. C200D—Johnson 200mmfd per section 2000 volts spacing—9" long..... 3.95
Johnson 150 dd 70-150mmfd per section used in BC610..... 7.95
A. C4646—Bud 250mmfd, air gap .100 will handle 2000v—8" long..... 3.95
D. 100mmfd screw driver adjustment..... .39

R. F. CHOKES

A B

A. 2½ milihenry, mounted on mycalex.....$ .40
B. Same as above with pigtails..... .15

R. F. UNIT

Designed for the BC312. Contains six coils which cover from 1500kc to 18mc. Has a ceramic band switch to change from any coil, each coil is tuned with an air padder. Build your own receiver or signal generator with this assembly. A marvelous Buy at $1.98

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A. Speaker Cabinet—size 12/12/7½ black crackle with highly polished chromium plated decorative strips. Metal grill. $2.95
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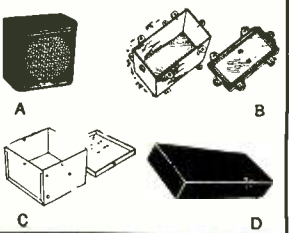
D. Blank Chassis—All sizes in stock—black crackle 13/17/3 $1.98



A B C D

KITS

522 Power Supply Kit—contains all necessary voltages to operate SCR-522 includes all components and chassis. $14.95
Eico VTVM kit—Reads up to 1000V. also up to 1000 megohms. Easy to read diagram.....$23.95
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High Frequency Probe—will fit most VTVMs. Will measure RF voltages to over 200mcs with a minimum of circuit loading. In kit form.....$3.75

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H466 Threadswell—Here is a complete radio man's tool kit. All popular sizes of taps and dies for radio use. Mounted in a metal tool kit includes the tap handle and die handle—no radio man can afford to be without this kit. List, $16.00. Your Cost $12.00

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Single heat.....$12.95
(Most popular model) Dual heat..... 14.95
Extra tips fo rabove.....package of 4 .25

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Dual Grinder 1/3 horse power motor.
THIS IS A WONDERFUL BUY—$36.50

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For removing miniature tubes.....$ .88

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F604—Lo. imp. phones 600 ohms complete w/5 ft. of rubber cord. Adj. chin band. TH37—Navy..$1.75

HF100—The ever popular H16U complete with output transformer and ear pads. high impedance $1.89

MICROPHONES

M4107—Crystal handmike complete with 100 feet of shielded cable high impedance—perfect for P.A. or speech amplifier or transmitter. High sensitivity. 2⅛ dia. $5.95

Dynamic mike used with famous Mark II transmitter. Can be used anywhere.

a wonderful value—black bakelite frame, complete with 3 feet rubber cord and PL55 plug.....$1.75
CM305—Carbon throat mike—a good buy..... .49

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Made to mount in a tube socket D.P.D.T. relay—sealed in vacuum 300 ohm coil will follow 100 words a minute..$2.00

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Red stop button, black start button. Ideal for controlling xmitter break-in relay.....$1.25

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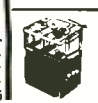

B4011—2V plastic case, 30A capacity — size 5¾ inches $3.49

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110v 60 cycle input
For indicating direction of your beam or actually driving it..$12.95 per pair
Type 1—light duty—for use as indicators.....$9.95 per pair

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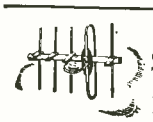
S4118—Triple pole double throw.....$1.25
Ten pole double throw..... 2.10
SWITCH—Very heavy duty D.P.S.T. 40 amp. 12 volts.....$1.25

BEAM ANTENNAS



Five element 2 meter beam with folded dipole. Guaranted 60DB gain. Feeds with 50 ohm cable. Thousands already in use.....$8.50
10 meter wide spaced 3 element beam with T match. Very heavy elements. Manufactured by Hy-lite. Very, very popular.....$45.00
For Television all channel folded dipole and reflector, upper and lower channels.....$13.20
Same as above—a real competitive item..... 8.40
All wave window antenna..... 9.00

HEAVY DUTY PM SPEAKER

8" speaker, seven ounce alnico 5 magnet. Ripple edged cone.....$3.89
12" speaker, same as above..... 6.75

DYNAMOTOR

D 4064—Designed for the BC-312 receiver, 12 volts input—235 volts @ 90ma output. Complete with filter.....$2.49

PE 94—Designed for the SCR-522. 28 volts input—output 300 volts @ 250ma DC. 150 volts @ 50ma bias. 12 volts @ 10A for filaments.....$8.75

HEAVY DUTY DYNAMOTOR
28 volts input @ 18A. Output 1000 volts DC @ 150ma. 380V @ 40ma. Complete with filter. $19.95

RECEIVER
Here is the answer to the lazy man's Q5er. A 200 to 400 KC receiver using standard tubes—Mfg. by the Detrola Co. to rigid Air Corps specs. Designed for 28 volts but can easily be converted to 115V AC or DC. Tube complement 2—25L6, 1—6SA7 1—6K7 1—6SK7 1—6SQ7. This receiver contains a stage of T.R.F.....$4.95

VIBRATOR POWER SUPPLY

N268—12V input. 200V @ 85 ma. output...$3.50

Ant. Mounting Base

H487—Here is a mounting base to mount your mobile antenna. Flexible and sturdy.....$ .49

COLLAPSIBLE ANT.

Made of dural. Opens up to 3 ft. 3 in. Collapses to 1 ft. Has ¼-20 mounting stud. AN30—WHILE THEY LAST../.$1.49

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H404—1½" sq. Mounted in metal flange, 4 of these mounts will eliminate vibration and will handle 50 lbs. Use them in receivers and Xmitters for mobile applications.....$ .10

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H4226 — A popular item. Makes disconnecting of the A.C. line a cinch.....$ .18

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TELEVISION and the Radio Technician

By MAX F. BALCOM
Pres., Radio Manufacturers Association

Text of an address presented before the recent Town Meeting of Radio Technicians held in Atlanta.

THIS is the fourth Town Meeting in a series of six authorized by the RMA board of directors in an effort to lend a hand to the radio servicemen who, like the rest of us in the radio industry, are making a rapid transition from radio to television.

Atlanta is going through its first phase of television development, and it is interesting to note that the pattern is about the same in all cities where television stations have gone on the air, thus opening a new market for distributors, dealers, and servicemen and a new medium of entertainment for the public. The first reaction of both the public and the trade is one of wonder and excitement. Often this enthusiasm leads a few tradesmen and TV receiver buyers to expect a brand of magic heretofore not available this side of heaven. The result, therefore, at times is disappointment over the failure of this new toy to measure up to all of these day-dreams. This is particularly true where only one TV station is available in a community. That, as I have said, is the first phase. The second is much more stable and rewarding. It usually begins with the entry of a second TV station into a city or the linking of a station with a TV network, thus providing a greater variety of television programs.

Enthusiasm for television and TV set purchases grows steadily with the broadening of available programs, and the owner of a television receiver often becomes an unpaid salesman of TV sets among his friends. And, as sales of television receivers mount, the business of installing and servicing them expands proportionally. The radio-television industry produced more than 975,000 TV sets in 1948, bringing the postwar total output to well over one million. It expects to manufacture and sell more than 2,000,000 television receivers in 1949. Future years will see the annual production rate continue to rise until television becomes as standard in the American home as radio is today.

All of us in the radio industry—and that includes you who are providing the highly essential servicing of the sets we manufacturers make—are on the threshold of one of the greatest and most rapid industrial developments in American history. The total income from television within a few years probably will dwarf that from radio in its most prosperous years. Already it is accounting for at least half of many set manufacturers' revenues. The 2,000,000 television sets we expect to produce in 1949 may not seem much in comparison with about 16,000,000 radios manufactured in 1948. In units, that is true; but in dollars it presents an entirely different picture.

Television receivers sell today from $100 to more than $4000. The average retail price is between $350 and $400—a price equal to the more expensive radio phonograph consoles. As a matter of interest, manufacturers' sales of television receivers in November, 1948, represented only 10.4 per-cent of the total set production for that month, but 45.9 per-cent of the set manufacturers' dollar volume.

What does this mean to the radio technician? It means that he will be working on a much more costly product than he has been in the radio field where the average service job probably was done on a table model which sold anywhere from $10 to $35. It's like turning from repairing bicycles to servicing automobiles. Another thing for the serviceman to bear in mind is that with the 2,000,000 TV sets that the industry plans to produce in 1949 will go one hundred million dollars or more in installation and the first year's servicing charges. Moreover, this figure will grow yearly with the increasing tempo of TV set production. I do not need to tell you that a tinkerer with a pair of pliers and a screw driver can no longer pose as a radio repairman unless he confines his work to the prewar AM radio. Actually, this development should prove beneficial to every radio technician who takes pride in his ability to take a set apart and put it together again as good as new.

No competent radio technician today need have any fear that television or any other new broadcasting service will put him out of business. On the contrary, his chances for increasing his profits and making his economic position more secure were never so good as they are today. But he will have to do what every other professional man has to do—learn everything he can about new equipment and techniques as they appear in his field.

MONEY BACK GUARANTEE — We believe units offered for sale by mail order should be sold only on a "Money-Back-If-Not-Satisfied" basis. We carefully check the design, calibration and value of all items advertised by us and unhesitatingly offer all merchandise subject to a return for credit or refund. You, the customer, are the sole judge as to value of the item or items you have purchased.

FOR FM-AM-TELEVISION
BUILD YOUR OWN SIGNAL TRACER and SAVE!!

(We can supply the Model CA-12 completely wired, ready to operate—**$29.95**)

Increasing production of F.M. and Television Receivers means more complex Receivers. Now more than ever this time-saving method of quickly and easily *localizing* the exact cause of trouble becomes the "must" method. Since 1939 when we first introduced our CHANNEL ANALYZER we have worked continuously developing and improving the "short-cut" method of Receiver servicing.

The Only Signal Tracer in the Low Price Range Including BOTH METER AND SPEAKER!!

FEATURES: ★ Comparative intensity of the signal is read directly on the meter—quality of the signal is heard in the speaker. ★ Simple to operate—only one connecting cable—no tuning controls. ★ Highly sensitive—uses an improved vacuum-tube voltmeter circuit. ★ Tube and resistor capacity network are built into the detector probe. ★ Built-in high gain amplifier—Alnico V speaker. ★ Completely portable—weighs 8 pounds—measures 5½" x 6½" x 9".

MODEL CA-12 Kit includes ALL PARTS assembled and ready for wiring, circuit diagram and detailed operating data for the completed instrument.

$21.95

THE NEW MODEL 670
SUPER METER

SUPER METER. A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS.

D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500. **A.C. VOLTS:** 0 to 15/30/150/300/1500/3000 Volts. **OUTPUT VOLTS:** 0 to 15/30/150/300/1500/3000. **D.C. CURRENT:** 0 to 1.5/15/150 ma.; 0 to 1.5 Amps. **RESISTANCE:** 0 to 500/100,000 ohms, 0 to 10 Megohms. **CAPACITY:** .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for electrolytics.) **REACTANCE:** 700 to 27,000 Ohms; 13,000 Ohms to 3 Megohms.

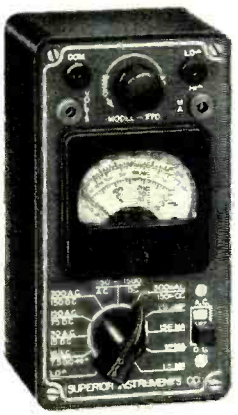
INDUCTANCE: 1.75 to 70 Henries; 35 to 8,000 Henries.

DECIBELS: —10 to +18, +10 to +38, +30 to +58.

The model 670 comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 5½" x 7½" x 3".

$28.40 NET

The New Model 770—An Accurate Pocket-Size
VOLT-OHM MILLIAMMETER



(Sensitivity: 1000 ohms per volt)

Features:
Compact-measures 3⅛" x 5⅞" x 2¼". Uses latest design 2% accurate 1 Mil. D'Arsonval type meter. Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. Housed in round-cornered, molded case. Beautiful black etched panel. Depressed letters filled with permanent white, insures long life even with constant use.

Specifications: 6 **A.C. VOLTAGE RANGES:** 0-15/30/150/300/1500/3000 volts. 6 **D.C. VOLTAGE RANGES:** 0-7½/15/75/150/750/1500 volts. 4 **D.C. CURRENT RANGES:** 0-1½/15/150 Ma., 0-1½ Amps. 2 **RESISTANCE RANGES:** 0-500 ohms, 0-1 Megohm.

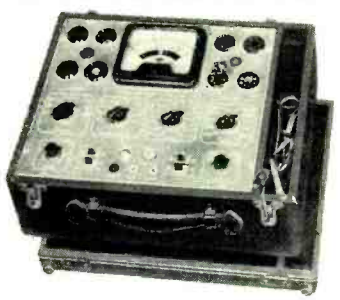
The Model 770 comes complete with self-contained batteries, test leads and all operating instructions.

$13.90 NET

THE NEW MODEL 777
20,000 OHMS PER VOLT!!
TUBE & SET TESTER

Tube Tester Specifications:

★ Tests all tubes including New Miniatures, etc. Also Pilot Lights. ★ Tests by the well-established emission method for tube quality, directly read on the scale of the meter. ★ New type line voltage.



V.O.M. Specifications:

D.C. VOLTS: (at 20,000 Ohms Per Volt), 0 to 7.5/15/75/150/750/1,500 Volts.

A.C. VOLTS: (At 10,000 Ohms Per Volt), 0 to 15/30/150/300/1,500/3,000 Volts.

D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5 Amperes.

RESISTANCE: 0 to 5,000/50,000/500,000 Ohms, 0 to 50 Megohms.

Model 777 operates on 90-120 volts 60 cycles AC. Housed in beautiful hand-rubbed cabinet. Complete with test leads, tubes, charts and detailed operating instructions. Size 13" x 12½" x 6".

$59.95 NET

The Model 88—A COMBINATION
SIGNAL GENERATOR AND SIGNAL TRACER

Signal Generator Specifications:

*Frequency Range: 150 Kilocycles to 50 Megacycles. *The R.F. Signal Frequency is kept completely constant at all output levels. *Modulation is accomplished by Grid-blocking action which is equally effective for alignment of amplitude and frequency modulation as well as for television receivers. *R.F. obtainable separately or modulated by the Audio Frequency.

Signal Tracer Specifications:

*Uses the new Sylvania 1N34 Germanium crystal Diode which combined with a resistance-capacity network provides a frequency range of 300 cycles to 50 Megacycles.

The Model 88 comes complete with all test leads and operating instructions. ONLY.....

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All of us in the radio industry have had to "go back to school" to keep abreast of the rapid developments in television. While closely akin to radio, television is different in so many respects that everyone—from the design engineer to the dealer-salesman—has had to start from scratch to produce and market this new product. Television requires new production techniques and know-how. It requires new marketing and selling methods. Also, TV sets require new servicing knowledge and practices. The servicing of home receivers, particularly of the new TV sets, is rapidly becoming a big business, and it will require well trained technicians who are familiar with the instrument they are servicing and with the most modern techniques for detecting and correcting any trouble that may develop.

We hope that this Town Meeting has given you some realization of the opportunities awaiting you and has shown you how to prepare yourself to take advantage of them.

There are many reasons why television and, to a lesser degree, FM broadcasting, have made all of our jobs more difficult and more painstaking. There is one obvious reason why neither an incompetent set manufacturer nor an untrained serviceman can hope to stay in the television business very long. That is because, in broadcasting at least, the ear is much easier to fool than the eye. No doubt all of you have met the radio listener who is so used to listening to the distorted tone of his old radio that he thinks there's something wrong when he hears the clear tones of a modern set. Many listeners are tone deaf or have tin ears and, consequently, fail to appreciate the high-quality reception and amplification found in today's better radios. The ability of an FM receiver to reproduce music with much higher tonal ranges than is possible in an AM set, for instance, means little to such listeners.

Almost anyone, however, whether or not he wears glasses, can immediately detect a faulty television picture. He doesn't need a musical education to note that reception is distorted or unclear. And he's even more at a loss than he was with his radio as to what he can do about it. So he just picks up the phone and calls a serviceman or the dealer from whom he bought it. Similarly, this televiewer may not have the slightest idea what you're doing when you repair the TV set, but you'll hear from him mighty quick if the results aren't satisfactory.

The radio technician today is one of the most important factors in this rapidly expanding television field. Unless a television set owner can get proper servicing, he may soon lose his initial enthusiasm for this new medium for home entertainment or even turn sour against it. A shortage of qualified television servicemen may prove a deterrent to television set buying and thus actually reduce receiver production and sales. The radio technician who calls at a home to install or service a TV or radio set is the

liaison man between the set manufacturer and the buyer. He is in a position to do an excellent public relations job for the industry because of his personal contact with the set owner—a contact the manufacturer seldom, if ever, makes.

Perhaps I have placed too much emphasis on television. I have done so because television is the newest and the most exciting addition to the receiver line. I do not mean to imply, however, that radio receivers are passing out of the picture. On the contrary, radio set production undoubtedly will continue well ahead of television for several years to come, and I do not believe that television will ever supplant radio. There is room for both services. For one thing, don't forget there are approximately 75,000,000 radio receivers in this country, some 2000 AM stations, and more than 700 FM stations. Neither the public nor the station owners are going to scrap such investments in a hurry, regardless of the attraction of television. Sales of automobile radios and portables, moreover, are the greatest in the industry's history and are likely to remain at a high level for some time.

FM broadcasting and the proportion of radios with FM reception facilities are growing steadily. An FM-AM set, while not as complex as a TV receiver, is a much more complicated instrument than the AM radio and requires greater skill to service. In addition, privately-owned radio communications systems are becoming more and more numerous. The number of "land transportation" radio transmitting stations, according to the FCC, has almost doubled in the past year and numbered over 3500 on January 1 of this year. This station count does not represent the number of communications receivers used in conjunction with these transmitters. For instance, 65 taxis equipped with communication receivers may operate under one station authorization.

The long-heralded Citizens' Radio Service—the adaptation of wartime walkie-talkie to civilian use—is practically here. The FCC has announced its proposed operating rules, and the opening date of this new radio service is only a few weeks away. While it is too early to predict how widespread this Citizens' Radio Service will be, its potentialities are tremendous. As it grows, the radio servicing business will expand proportionally. Industrial uses of radio and electronic devices provide an expanding and profitable field for the radio technician who takes the time to master these intricate instruments. Most industrial plants will be happy to turn over the servicing job to an independent technician if they are confident he is qualified to keep these devices in good working order. What is needed here are technicians who can detect potential trouble before it occurs and stops production lines.

I could cite many other new fields in which radio is being put to new

uses, and all of them are in the market for technical servicing. These opportunities will increase as we move further into the Electronic Era. What you see now is just the beginning.

This Town Meeting has had, I hope, a beneficial aspect beyond that of offering technical and business information. It was designed to bring the interests of manufacturers, broadcasters, distributors, dealers, and technicians closer together and to produce mutual benefits. I know that we manufacturers often have failed to recognize the importance of the radio technician who services the sets we make. I suspect that many of you have not always understood the problems we manufacturers have been up against when you struggled to repair a receiver of unusual or intricate design.

One of the most beneficial results of these meetings, I believe, has been the frankness with which technicians attending the conferences have expressed their "gripes" against manufacturers or their products. These "gripes" are carefully analyzed by the men who direct these Town Meetings, and along with other suggestions are passed on to all set manufacturers within RMA. While you can hardly expect manufacturers and their engineers to agree with every complaint registered and to modify or rebuild their equipment accordingly, I assure you that all complaints are carefully considered, and I am confident that many of them will lead to improvements in the manufactured product.

Perhaps more so than in other industries, the various segments of the radio trade are inter-dependent. One cannot prosper without the success of the other. If the manufacturer's product is bad, your job becomes more difficult. If your servicing is bad, the reputation of the manufacturer and his product is damaged.

Certainly, all radio-television manufacturers are vitally interested in this undertaking and will do everything possible, as members of RMA, as well as individual manufacturers, to assist you and other radio technicians throughout the United States who wish to better equip themselves professionally and to increase their earning capacity. —30—

KNICKERBOCKER HAMS REORGANIZE

THE Knickerbocker Amateur Radio Club, founded back in 1937, is reorganizing after the war time inactivity. Some of the former members held a reunion recently and had such a swell time discussing ham radio and the old club, they decided to try and get together again for good. All lower east side Manhattan hams are asked to write temporary recording secretary Mack Santer, W2ZPW, 544 East 6th Street, New York 9, N. Y., for full details. Things are going to start right in where they left off before the war, and all the old Knickerbocker hams are hoping the group will grow to regain its old pep and vitality. —30—

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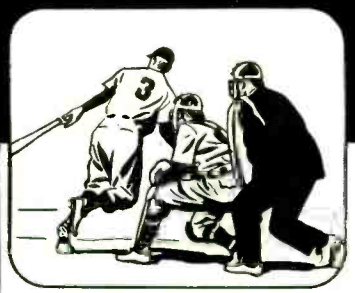
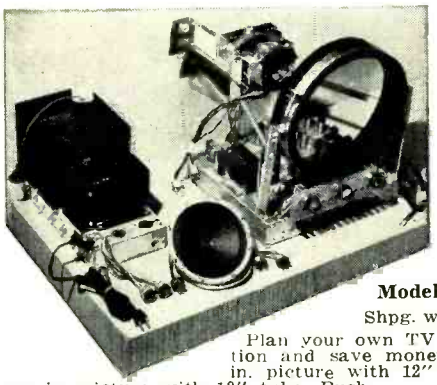


"Batter up" for these never-to-be-forgotten bargains made possible by "Surprise" Trade-In Allowances on your used, factory-built Communication equipment! Right on the eve of an exciting new baseball season Walter Ashe knocks the bugaboo of price "out of the box" by making it possible for you to own Hallicrafters TV and Communication equipment at tremendous savings! So don't delay! Get your trade-in deal working today. Phone, wire, write or use the handy coupon.



Model T-64

Shpg. wt. 60 lbs.

Plan your own TV installation and save money! 95 sq. in. picture with 12" tube; 64 sq. in. picture with 10" tube. Push button tuning on all 12 TV Channels. New DUAL FOCUS Switch for larger, round picture. Factory-wired and tested. Complete with 19 tubes plus 3 rectifiers, less picture tube. Only **$169.95**

Bracket for 12" tube installation....$ 8.50 extra
10" picture tube—type 10BP4 .....$34.00
12" picture tube—type 12LP4 .....$60.00

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Model 509

The latest addition to the Hallicrafter TV line. Push button tuning on all 12 channels. **Dual Focus** for larger round pictures 56 sq. in. rectangular picture or 64 sq. in. full circle picture for dramatic close ups at a flick of a front panel switch. Mahogany veneer cabinet. Transparent safety shield. 19 tubes plus 3 rectifiers.

Complete with all tubes. Shpg. wt. 105 lbs.

$269.50

Model SX-62 Receiver

SWL version of the SX-42. Continuous coverage 540 Kc. to 110 Mc. Each band separately illuminated. 15 tubes plus rectifier. Shpg. Wt. 68 lbs. **$269.50**

Model S-38 Communication Receiver

Hallicrafters most versatile receiver. For Ham or SWL. Covers 540 Kc. to 32 Mc. 5 tubes plus rectifier. Internal speaker. Shpg. Wt. 13½ lbs. **$49.95**

Special Double-Value Trade-In Offer

Buy and operate an S-38. Then, if you aspire to ownership of even finer Hallicrafters Communication equipment (or TV) we'll apply the full purchase price of your S-38, bought from us, as a trade-in allowance on new equipt. Offer good only within a period of 90 days following date of purchase.

Model S40A Communication Receiver

Hallicrafters popular priced communication receiver. 540 Kc. to 43 Mc. 8 tubes plus rectifier. Internal speaker. Shpg. Wt. 33 lbs. **$99.50**

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ADDRESS _____

CITY _____ ZONE _____ STATE _____

R.F. Meter

(*Continued from page* 35)

erative detector or the local oscillator of a superhet. Keep in mind that in a superhet the local oscillator will be different from the receiver dial reading by the intermediate frequency, usually 455 kc. higher. The meter is sensitive enough to indicate current flow when the coil is held near the oscillator stator section of the tuning condenser in a superhet. By making a measurement of frequency at each five or ten divisions on the wavemeter dial, a frequency curve can be plotted for each coil.

To use the instrument as a wavemeter, it is only necessary to plug in the desired coil, throw the selector switch to the r.f. position, hold the meter near the circuit being checked, and tune the meter to resonance. Due to the high sensitivity of the meter, a full scale reading can be obtained several feet from a low-power oscillator or amplifier. It is advisable, therefore, to approach the rig with caution, lest the meter or rectifier be damaged. The sensitivity may be reduced by turning R_2 to the high resistance end. In its function as a wavemeter, this unit can be used to indicate resonant frequency in various stages of the transmitter, to differentiate between harmonics in doubler stages, to detect harmonic content or parasitic oscillations, and as a neutralizing indicator. Phone signals can be monitored by plugging in a pair of phones. Incidentally, if the wave meter is calibrated without a pickup antenna, then it should be used without one if accuracy of calibration is to be maintained. Use of a pickup antenna will change the readings on the tuning dial slightly.

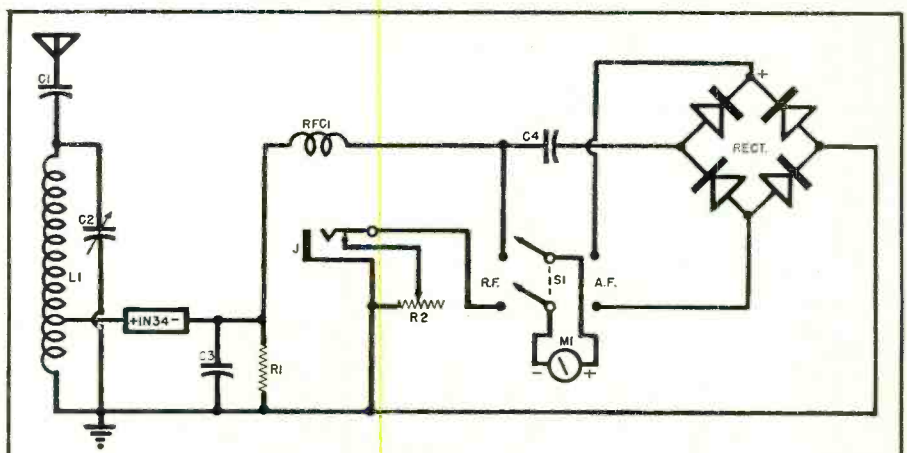
Calibration of the unit for use as a modulation meter should be made in conjunction with a scope or another modulation meter of known accuracy. Modulate the transmitter with a stable sine wave 100 per-cent, as indicated on the known standard. Tune the wavemeter to resonance. Then with the selector switch in the a.f. position, vary the r.f. coupling until the meter reads full scale on the 100 per-cent sine wave modulated signal. The next step is to throw the selector switch to the r.f. position and adjust R_2 until a full-scale reading is indicated on the meter. The setting of R_2 should then be marked on the panel so that it can be reset at any time. The meter should now indicate the modulation percentage of any transmitter when R_2 is set at the reference point and the r.f. coupling is adjusted to give a full-scale reading. An added feature which came to mind after the writer's meter was in use was the incorporation of a double-pole, double-throw switch to reverse the input connections to the copper-oxide rectifier so that both positive and negative peaks can be indicated. As presently set up, however, the meter reads negative peaks, which contribute the greater part of distortion due to overmodulation.

This meter has been used for field measurements while adjusting a 10-meter beam antenna, and it gives good readings at a distance of 50 feet, using a 1-foot pickup antenna.

To use as a neutralizing indicator, the coil of the instrument should be held near the plate tank of the stage to be neutralized, with plate voltage off, and the neutralizing condenser adjusted for minimum indication.

—30—

Schematic diagram of r.f. meter. Actual wiring is relatively simple.



R_1—25,000 ohm, ½ w. res.
R_2—25,000 ohm pot.
C_1, C_3—100 μμfd. mica cond.
C_2—100 μμfd. variable midget cond.
C_4—.5 μfd. 200 v. cond.
L_1—Wound on standard 1½", 4 prong forms
2500 to 6500 kc.—31 t. #20 en., tapped 8 t. from bottom
5500 to 12,500 kc.—15 t. #22 en., ¾" long, tapped 5 t. from bottom
12,000 to 32,000 kc.—5½ t. #20 en., ⅜" long, tapped 2 t. from bottom
25,000 to 75,000 kc.—6 t. #14 en., ⅜" long, ½" in diam., wound self-supporting and mounted inside standard 4 prong form., tap 2 t. from bottom
1—1N34 selenium rectifier
J—Closed circuit jack
RFC$_1$—2.5 mh. r.f. choke
S$_1$—D.p.d.t. toggle sw.
M$_1$—0-1 ma. d.c. meter
Rect—Full-wave bridge copper oxide meter rectifier

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CARBON TET—One Gal. fire Ext type 99.9% pure $2.89

CABLE CLAMP ¾" diam. 100 for ..... .79

Hi Gain Dynamic Mike Xfmr UTC/Super Elec 3 wdg. 600CT & 4000 ohms tapped 250 & 150 ohms. Fully shielded Herm Sld 2 for ..... 98c, 10 for $4.50 ..... 59c

RCA UNIVERSAL OUTPUT 10 W. Xformers 100 to 10000 cycles, 10 Watts Potted. Fully Cased. Matches any spkr w/voice coils of 3 to 4 or 15 ohms to any line between 50 and 10240 ohms $1.89

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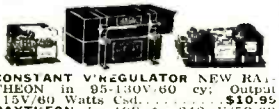

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1B21/471A	2.95	6BK6	1.05	10	.67	807	1.15	6633UX	.69
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1C6	1.26	6LE6	.59	10Y	.60	814	2.98	8013A	3.95
1D5GP	1.25	6C4	.27	12A6	.23	816	1.10	8020	3.49
1LN5	.75	6C6	.71	12AH7GT	.87	826	.69	9001	.39
1N5GT	.69	6CG7	1.05	12C8	.39	832	2.45	9003	.49
1P5GT	.69	6D4	1.25	12SA7GT	.64	836	1.12	9006	.29
2B22/GL559	.73	6E5	.71	12SG7	.69	860	1.97	C6J	4.95
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2X2	.49	6L7	.75	250-TH2	1.77	1619	.39	VR105	.74
3B7/1291	.95	6N7/6535	.85	211	.89	1625	.39	VR150	.90
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5U4G	.87	6U7G	.58	450TH	18.98				
5Y3GT	.38	6V6GT	.69	701A	3.95				
5Z3	.81	6X5GT	.58	703A/8021	2.25				
6AH7/1853	.84	6Y6GT	.87	707B	8.95				
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SEALED, 12Meg/10KV/9W ..... $1.35 @ 10 for $10.00

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D168391 Therm Compensator. $2.00; 3 for $5.00

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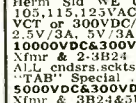

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DEPT. 4RN, SIX CHURCH ST. NEW YORK 6, N.Y., U.S.A. – CORNER CHURCH & LIBERTY STS. ROOM 200

Transient Distortion

(*Continued from page 39*)

stages instead of only around the power output stage as is common practice at present.

Although it is common to think of a speaker as having only one resonant point, this is usually far from the case. Various resonances of portions of the speaker diaphragm may appear throughout the audible range. Anyone who has listened to a speaker with a torn cone or loose suspension will realize the disagreeable effects produced. Cone "breakup" in large radiators due to steep wave fronts has long been recognized, and in most high-quality systems, large radiators with heavy, rigid diaphragms are employed, coupled to the power amplifier through a low-pass filter to eliminate the effect of steep wave fronts. Experiments have shown that cone breakup may occur as low as six hundred cycles, and for this reason some systems employ crossovers of four hundred cycles or lower. Additional speakers with smaller, lighter diaphragms are used to cover the higher frequency ranges.

A second factor of importance is the fact that when a single radiator is designed to cover a wide frequency range, the high-frequency response may depend largely on various resonances occurring in this range. This is especially true in conventional speakers for frequencies above one thousand cycles where the dimensions of the speaker become comparable to the wavelength of the sound generated. In this case, portions of the cone tend to become virtual diaphragms vibrating with different rates and amplitudes, and, of course, different resonant periods. Several factors result. Sudden peaks and dips in the response curve may result due to the different modes of vibration of the various portions of the cone, and may be the result of cancellation, reinforcement, or standing waves, depending on the phase shifts involved. Likewise these high-frequency resonances may be shock excited by steep wave fronts such as found in wide-range reproduction, or stimulated by wave trains of similar frequency. In practice, screechiness, and distortion of some tones or combination tones result.

Another related effect is partly physiological in nature and is due to the fact that the ear apparently acts as a form of integrating mechanism for sounds of short duration and various repetition rates. In the case of static or noise consisting of short pulses, speaker resonance and hangover may greatly increase the audibility of these sounds.

A very important and neglected form of distortion is a product of poor transient response. As mentioned before, poor speakers may take several cycles to build up to maximum value when a steady tone is applied. This factor may result in excessive discrim-

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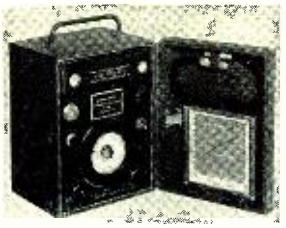
- APS-15 (Near Comp)
- QBG-I (New)
- SO-I (Used)
- SO-13 (Used)
- SQ (Used)
- CPN-6 (Unused)
- TBM (Used)
- TDE (Used)
- RAK-7 (New)
- TBK-19 (New)
- SE-SF
- SG-SN (New)

MICROWAVE TEST EQUIPMENT



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Bell Labs. Dual Mount mixer-beacon assemblies. 2 complete mixer-beacon mounts on gold-plated wave-guide section $50.00

Slotted Line. Bell Labs. 1⅜"x⅝" guide, gold plated $150.00

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3 cm. Wavemeter: 9200 to 11,000 mc transmission type with square flanges.....$15.00

3 cm. stabilizer cavity, transmission type.....$20.00

3 cm. Wavemeter, Micrometer head mounted on X-Band guide. Freq. range approx. 7900 to 10,000 Mc..$75.00

A Complete Line of Microwave Plumbing . . . Send for List

NBFM-465 KC DISCRIM XFMRS. FOSTER-SEELEY WITH CIRCUIT DIAGRAM. $2.50 EA.

VARISTORS

D-171631	$0.95
D-167176	.95
D-168687	.95
D-171812	.95
D-171528	.95
D-163298	.95
D-168549	.95
D-162482	3.00
D-166271	2.50
D-162356	1.50
D-161871A	2.85

THERMISTORS

D-167332 (tube)	$0.95
D-170396 (bead)	.95
D-167613 (button)	.95
D-166228 (button)	.95
D-164699 for MTG, in "X" band Guide	2.50
D-167018 (tube)	.95

COAX PLUGS

831SP	$0.35
831AP	.35
831HP	.15
UG 21/U	.85
UG 86/U	.95
UG 254/U	.75
UG 255/U	1.25
UG 146/U	1.00
UG 85/U	1.25
UG 25/U	1.25
CSJ 49137	1.25

MAGNETRONS

Tube	Freq. Range	Pk. Pwr.Out.	Price
2J31	2820-2860 mc.	265 K.W.	$25.00
2J21-A	9345-9405 mc.	50 KW.	$25.00
2J22	3267-3333 mc.	265 KW.	$25.00
2J26	2992-3019 mc.	275 KW.	$25.00
2J27	2965-2992 mc.	275 KW.	$25.00
2J32	2780-2820 mc.	285 KW.	$25.00
2J37			$45.00
2J38 Pkg.	3249-3263 mc.	5 KW.	$35.00
2J39 Pkg.	3267-3333 mc.	87 KW.	$35.00
2J40	9305-9325 mc.	10 KW.	$65.00
2J49	9000-9160 mc.	58 KW.	$85.00
2J55 Pkg.	9345-9405 mc.	50 KW.	$35.00
2J61	3000-3100 mc.	35 KW.	$65.00
2J62	2914-3010 mc.	35 KW.	$65.00
3J31	24.000 mc.	50 KW.	$55.00
5J30			$39.50
714AY			$25.00
715DY			$25.00
720BY	2800 mc.	1000 KW.	$50.00
720CY			$50.00
725-A	9345-9405 mc.	50 KW.	$25.00
730-A	9345-9405 mc.	50 KW.	$25.00

Klystrons: 723A/B $12.50; 707B W/Cavity 417A $25.00; 2K41 $65.00

MAGNETRON MAGNETS

GAUSS	POLE DIAM.	SPACING	PRICE
5200	21/32 in.	¾ in.	$17.50
4850	¾ in.	⅞ in.	$15.00
1500	1⅝ in.	1½ in.	$12.50
1300	1⅝ in.	1 5/16 in.	$12.50

* Mfr's Number.

TUNABLE PKGD. "CW" MAGNETRONS

QK 61 2975-3200 mc. QK 62 3150-3375 mc.
QK 60 2800-3025 mc. QK 59 2675-2900 mc.
New, Guaranteed .....Each $65.00

BC929 SCOPE

Excellent foundation for Hi-Gain Oscilloscope. Complete with 8 tubes including 3BP1, and conversion data. For 110V, 60 cy. oper. New $24.95

DYNAMOTORS

Type	Input Volts	Input Amps	Output Volts	Output Amps	Radio Set	Prices*
DM 416	14	6.2	330	.170	RU 19	$15.95N
DY-2/ARR-2	28	1.1	250	.060	ARC-5	
DM 36	28	1.4	220	.080	SCR 508	8.75N
DM 53AZ	14	2.8	220	.080	BC 733	7.00N
DM 21	14	3.3	235	.090	BC 312	3.45N
DM 21CX	28	1.6	235	.090	BC 312	3.45N
DM 25	12	2.3	250	.050	BC 367	2.49LN
DM 28R	28	1.25	275	.070	BC 348	8.95N
DM 33A	28	7	540	.250	BC 456	5.50N
DM 42	14	46	515	.110	SCR 506	6.50LN
			1030	.050		
			2/8			
SP 175	18	3.2	450	.060		4.75N
DAG 33A	18	3.2	450	.060		4.50N
PE 86	28	1.25	250	.060	RC 36	3.95
PE 101C	13/26	12/6/	400	.135	SCR 515	5.25N
		6.3	800	.020		
BD AR 93	28	3.25	375	.150		4.95
23350	27	1 75	285	.075	APN-1	3.50N
35X045B	28	1.2	250	.060		3.50N
ZA .0515	12/24	4/2	500	.050		3.95N
ZA .0516	12/24	8/4	12/275	3/.110		5.50N
B-19 pack	12	9.4	275	.110	Mark II	9.95N
			500	.050		
D-104	12		225	.100		14.95N
			440	.200		
DA-3A*	28	10	300	.260	SCR 522	8.95
			150	.010		
			14.5	.5		
#5053	28	1.4	250	.060	APN-1	3.95N
DA-7A	26.5		1100	.400	TA-2J	25.00N
CW 21AAX	13	12.6	400	.135		17.50N
	26	6.3	800	.020		
			9	1.12		
BD 77KM	14	40	1000	.350	BC 191	
PE 94	28	10	300	.260	SCR	15.00N
			150	.010	522	
			14.5	.5		

N—New. LN—Like New. * Less Filter Box & Relays
Replacement dynamotor for PE 73. less filter box.....$12.00

HAND GENERATORS

GN 35: 350 v. 60 ma; 8v 2.5 A. New, with hand cranks..$12.50
GN 45: 500 v. 100 ma; 6v. 3 amps. Slight use, exc. cond. with crank* $12.50

INVERTERS

PE 218-E: Input: 25-28 vdc, 92 amp. Output: 115 v, 350-500 cy 1500 volt-amperes. Dim: 17" x 6½" x 10". New (as shown).$49.95

PE 218-H: Same as above except size: 16½"x6"x10".

New $49.95

PE 218H, used, good cond.....$25.00

PE 206: Input: 28 vdc. 38 amps. Output: 80 v, 800 cy, 500 volt-amps. Dim: 13" x 5½" x 10½". New $12.50

GE 5D21NJ3A: Input: 28 vdc. 35 amp. Output: 115 v, 400 cy, 485 volt-amps. Dim: 9" x 4½" diam. New $49.95

MICROWAVE GENERATORS

AN/APS-15A "X" Band compl. RF head and modulator, incl. 725-A magnetron and magnet, two 723A/B klystrons (local osc. & beacon), 1-B24 TR, revr-ampl. duplexer, HV supply, blower, pulse xmtr. Peak Pwr Out: 45 KW apx. Input: 115, 400 cy. Modulator pulse duration .5 to 2 micro-sec, apx. 18 KV PL Pulse. Compl with all tubes incl. 715-B, 829B RKR 73, two 72's. Compl. pkg. new.....$210.00

APS-15B. Complete pkg. as above, less modulator $150.00

"S" BAND AN/APS-2. Complete RF head and modulator, including magnetron and magnet, 417-A mixer, Tlt. receiver, duplexer, blower, etc., and complete pulser. With tubes, used, fair condition.....$75.00

10 CM. RF Package. Consists of: SO Xmtr.-receiver using 2J27 magnetron oscillator, 250 KW peak input. 707-B receiver-mixer $150.00

Modulator-motor-alternator unit for above.....$ 75.00
Receiver-rectifier power unit for above.....$ 25.00
Rotating antenna with parabolic reflector for above. New .....$ 75.00

POWER EQUIPMENT

STEP DOWN TRANSFORMER: Pri. 440/220/110 volts a.c. 60 cycles. 3 KVA. Sec. 115 v. 2500 volt insulation. Size 12" x 12" x 7"...$40.00

PLATE TRANSFORMER: Pri: 117 v, 60 cy. Sec. 17,600 @ 144 ma, with choke. Oil immersed. Size: 26" x 29" x 13" American.....$120.00

FIL. TRANS. UX6899. Pri: 115 v, 60 cyc. Sec: Two 5 v, 5.5 amp wdgs. 29 KV test...$24.50

VOLTAGE REG. Transtat. Amertran type RH 2 KVA load, input: 90/130 v. 50-60 cy. output 115 v $40.00

ITE CIRCUIT BREAKER, 115 A, 600 v. Mod KJ $15.00

UX 6801 (Raytheon): Pri: 110 v, 60 cy. 1 ph. Sec: 22,000 v, 234 ma, 5.35 KVA. Dim: 23"x 24"x10¾".

31911 (Amertran): Pri: 115v, 60 cy, 3 ph, 4 KVA. Sec: 105/125 v. Dim. 20"x14½"x12½".

PLATE XFMR: Pri: 198, 22, 240 v, 60 cy. 1 ph, 16.7 KVA. Sec: 3650 v, 30 KV test.

FIL. XFMR: Kenyon: Pri: 210/215/220/225/230/235/240 vac, 60 cy. Sec: 11v, 35 amp; 10 v. 35 amp ct; 7.5 v, 35 amp ct; 5 v, 35 amp (ct #3-10768 .....$37.50

FIL TRANS: KS8767: Pri: 115 v, 60 cy. Sec: 2 wdgs: 5 v @ 5 amps. 15 KV Test.....$15.00

COMBINATION TRANSFORMERS

#5102: Pri: 117V, 60 cy. Sec: 1080 V.C.T. @ 55 Ma. 6.3V @ 1.2A., 6.3V @ 1.2A.....$5.95

#5104, 800 vct, 150 ma: 5 v. 3 amp; 6.3 v, 6.25 amp $6.95

KS 8931, 585 vct, 86 ma: 5 v. 3 amp; 6.3 v, 6 amp $4.25

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1.5 MFD., 6000 vdc.....$12.50
1 MFD., 25,000 volts.....$99.50
.25 MFD., 20,000 vdc.....$17.50
10 MFD., 1000 vdc.....$ 1.79
3x10 MFD., delta connected synchro-capacitor, 90v, 60 cycles $4.95
.1 MFD., 5000 vdc, 25F-509G2.....$6.50

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'01-A	$0.45	10Y	$0.60	837	$1.95
1B24	4.85	12A6	.35	843	.59
2C21	.69	12K8Y	.65	860	15.00
2C22	.69	12SF7	.49	861	40.00
2J21-A	25.00	12SR7	.72	874	1.95
2J22	25.00	15R	1.40	876	4.95
2J26	25.00	28D7	.75	1005	.35
2J27	25.00	30 (Spec.)	.70	1619	.21
2J31	25.00	45 (Spec.)	.59	1B24	.85
2J32	25.00	39/44	.49	1629	.35
2J38	35.00	35/51	.72	1961	5.00
2J39	35.00	227A	3.85	9002	.65
2J40	60.00	225	8.80	9004	.47
2J49	85.00	268-A	20.00	CEQ72	1.95
2J55	35.00	355A	19.50	EF 50	.79
3J31	55.00	417A	25.00	E-1148	.75
2x2/879		530	90.00	F-127	20.00
3BP1	2.25	531	45.00	FG258A	165.00
3C24	.60	532	3.95	FC 271	40.00
3C30	.70	559	4.00	GL 562	75.00
3D6	.79	562	90.00	GL 623	75.00
3CP1	3.50	615	.89	GL 697	75.00
3D21-A	1.50	703-A	7.00	ML 100	60.00
3DP1	2.25	704-A	.75	OK59	65.00
3EP1	2.95	705-A	2.85	OK60	65.00
3FP7	3.85	707-B	†20.00	OK61	65.00
3Q5	.79	714AY	25.00	OK62	65.00
5BP1	1.95	715-B	12.00	RCA 932*	.65
5BP4	4.95	720BY	50.00	VR 91	1.00
5CP1	3.75	721-A	3.80	VR 130	1.25
5FP7	3.50	723-A/B	12.50	VR 135	1.25
5JP2	8.00	724B	1.75	VR 137	1.25
5J30	39.50	725-A	25.00	VU 120	1.00
6G	2.00	726-A	15.00	VU 134	1.00
6L6GA	1.00	800	2.25	WL 532	4.75
6SC7	.70	801-A	1.10	WN 150	3.00
7C4	1.00	804	9.95	WT 260	5.00
7E5	1.15	815	2.50	† With Cavity.	
7E6	.72	836	1.15	* Photocell.	

POWER CHOKES

SWING CHOKE:		6 hy. 150 ma.	$ 1.50
4.5 to .8 hy: .2 to 1 amp		Dual, 120 hy, 17 ma.	2.45
12 OHMS	$10.95	.01 hy. 2.5A	1.50
.03 hy. 2 A	1.45	.35 hy, .35 A	7.50
8.5 hy. 125 ma.	1.50	Dual 2.5 hy, 130 ma.	1.25
25 hy, 65 ma.	1.10	.1 hy, 12 A, 46 ohms	16.00
Dual 7 hy, 75 ma. 11 hy, 65 ma.	1.65	Dual .5 hy, 380 ma, 5 hy, 40 ma, 312 ohms	.95
Dual 2 hy. 100 ma.	.75		.65
.116 hy. 150 ma.	4.50	2 hy, 200 ma.	.75

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COAX CABLE

RG 9/U. 52 ohms .....$.24/Ft.
RG 17/U. 52 ohms imp. .....$.48/Ft.
RG 57/U. Twin Cond. 95 ohms.....$.55/Ft.
RG 18/U. 52 ohm imp. armored.....$.51/Ft.
RG 23/U. twin coax, 125 ohm imp. armored..$.50/Ft.
RG 28/U. 50 ohm imp. pulse cable. Corona min. starting voltage 17 KV.....$.50/Ft.
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CARBON PILE VOLTAGE REGULATORS

Type "A" Coil current .105 to .115 amp. 80 volts, Leland Electric $3.00

Type "C" Input: 22-30 v. coil, 30 amps. Output: 19 v, 5.7 amps Spec #VR9000-2c. Leland Electric.....$3.00

#35X045B; 22v. .1 to 3 amps. for K-14B Gunsight, Webster $3.00

TEST SET 159 TPX

Measures frequency between 150 & 200 mc. by heterodyne method. Power of Xmtr can be directly measured. Measures DC voltages up to 500 Volts. Original operation on 110 V. 400 cy. but conversion kit makes it operable on 110 V. 60 cy. new, and complete with tubes, crystal, cal. chart, antenna, meter....$29.95

ARC—3 AUDIO TRANSFORMERS

T-102. #55545 T-104. #55547
T-103. #55546 T-105. #55554
T-206. #55530

Price, each .....$.95

MOD. XMFR: PP 807's to PR. 807's CL. "C".....$1.65

DRIVER XMFR: 6V6 Driver to PP 811 Grids.....$1.45

UNIVERSAL OUTPUT: Amertran Silcor. PRI: 20,000/16,000/5000/4000 ohms. Sec: 500/15/7.5/3.85 ohms. 30db. content Flat to 17,000 CY.....$4.75

CONVERSION COILS FOR ARC-5 TRANSMITTERS

M.O. Coils	P.A.Coils	Antenna Loading Coils	Freq. Range
$1.00 ea.	$1.00 ea.	$ .85 ea.	
6029	7247	6033	3-4 Mc.
6030	9293	6034	4-5.3 Mc.

CONVERSION KIT, consisting of 1-M 0 coil, PA coil, 1-ANTENNA COIL, in any one particular frequency range $2.00

ARC No. 4990, variable xmtg capacitor, 22-4—145 mmf, .05" spacing, 11 rotors. Each.....$1.00

ARC 5632 Var. Xmtg. capacitor, 29.2—117 mmf, .06" spacing, 16 rotors, worm drive: 9:1.....$1.00

80 METER VFO KIT. Kit consists of the following: 1-6029 M.O. coil; 1-5632 tuning condenser; 1-4990 padding cap; 1-ARC-5 Xmtr. schematic. Complete kit..$2.95

INSTRUCTION MANUALS

BC 312, BC 342 .....$1.25
SCR 281.....$1.25 Mark II..... 1.00
ZA Eqpt..... 1.00 SCR-508..... 1.50

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TR 1210, 12 vdc, 5 pin.....$1.00
OAK V-6675, 24-32 vdc, 7 pin..... 1.00
Mal. Type G534C, 12 vdc, 5 pin..... 1.00
Mal. Type G629-C, 12 vdc, 4 pin..... 1.00
Radiart VR2, 6v, DC. 6-pin special..... 1.00
Mfrs. quantities available.

MICROPHONE ELEMENTS

Carbon transmitter element for TS11-J. TS11-L, TS13-E, TS15-A .....$ .75 ea.
Element for microphone T-24. 30 ohm resistance. .95 ea.
T-17 elements ..... .85 ea.

HEADSETS

Dynamic Mike and Headset Combination. A high quality, efficient, unit, used in B-19 tank Xmtrs. Mike and phones complete. new.....$2.75

HEADSET, WE #716A, with dual plug patch cord..$9.95

CROSS POINTER INDICATOR

ID 24-ARN-9 Dual 0-200 microamp. movement in 3" case. Each movement brought out to 6-term receptacle at rear. Originally used in ILS equipment.

New $5.50
ZA Type $10.00

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COMMUNICATIONS EQUIPMENT CO.

MANUFACTURERS QUANTITIES AVAILABLE

PHONE DIGBY 9-4124

ination against complex waveforms due to the fact that it is easier for the cone to vibrate in the form of a sine wave or near sine wave than in other methods. As a result, a system with over-all static frequency response flat from fifty to ten thousand cycles may exhibit very low fidelity and a noticeable lack of middle register. This form of distortion is very common and is sometimes offset to a degree by deliberately introducing distortion in the amplifier or speaker to "brighten" the tone. More desirable methods of overcoming this form of distortion are the use of multiple speaker systems and the use of high-quality speakers with powerful magnetic structures. Phase shift in audio amplifiers may produce considerable alteration of complex wave structures and, of course, pick-ups and microphones may do the same. Instruments with high harmonic output suffer excessively from this form of distortion and may be almost indistinguishable in musical selections.

Many radiomen will have the equipment necessary to make simple tests regarding transient distortion. A simple pulse generator and an oscilloscope are the basic elements. Pulses from the generator are applied to the equipment under test and checked stage by stage with the oscilloscope to determine distortion that may arise in the amplifier. In most cases when the scope is hooked across the voice coil of the loudspeaker, transient distortion due to low-frequency speaker resonance is clearly visible. In the case of an amplifier with a low effective output impedance, it is advisable to use a crystal microphone and preamplifier in connection with the oscilloscope to determine the acoustic output of the system. Effects of wall reflections should be reduced by placing the microphone close to the speaker, although if a fixed system is being examined, it may be desirable to investigate the acoustic conditions of the room. Several oscillograms of the waveforms obtained by this pulse method are shown.

Much more interesting information may be obtained by using a variable-frequency audio oscillator in connection with an electronic switch. Simple transient wave trains of various envelope widths and frequencies may be obtained in this manner. When applied to a reproducing system, this test method provides a simple means of detecting envelope distortion, various speaker resonances, and harmonic distortion in the initial cycles of a pulsed wave train. Examples of these distortions are illustrated in the oscilloscope patterns shown. As mentioned earlier, the larger speakers, especially those with corrugated cones, may tend to produce complex standing waves which make close-up measurements difficult. This effect is immediately noticeable by moving the microphone back and forth in front of the speaker. It is suggested that an approximation to actual listening conditions may be obtained by using two identical micro-

IT'S SATISFACTION— or YOUR MONEY BACK at— R&M RADIO

Cost Gov't over $600

Famous SCR 274-N
A Complete Radio Station

TRANSMITTERS & RECEIVERS FOR 10-20-40-80 METERS **$39.50**

This sensation of all surplus is a complete amateur radio station! Other ways to use it: Xmtr. VFO driver stage gives your BC-375-E RF output up to 150 watts. Make swell standby receivers with the BC-348 on round-table "rag chews." You get all this: 3 receivers—190-550 kc. "Lazy Q Fiver," 3-6 and 6-9.1 mc; 2 xmtrs., 4-5.3 mc, 5.3-7 mc; 4 dynamotors—28 v. DC input; 1 modulator with carbon mike input; 2 control boxes; 1 coupling box with r-f ammeter, ant. relay and 5000 v. 50 mmfd. WE vacuum condenser (ant. relays can be used with most rigs); and a complete set of 29 popular tubes. CAN BE SHIPPED F.O.B. ARIZONA, OKLA., OR VIRGINIA.

We still have a few BC-375 transmitters available at $20 each FOB Arizona complete with 5 tuning units. Transmitter and 1 tuning unit, dynamotor, antenna loading unit—FOB Oklahoma, only $15.00.

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Factory Close-Out!

Brand New and Priced for Quick Clearance!

Limited Quantity **$14.95**

(List price $34.95)

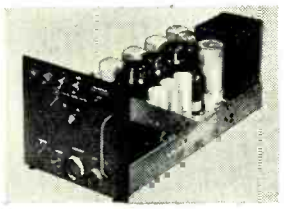
Price includes master station, one remote, and 50′ of wire. Rig it up as a "baby-sitter" with pick-up at baby's crib. Useful in office, or for instant contact with basement, garage, attic, kitchen. Simple to install—just plug it in to 110 v. AC or DC socket.

BC 1206

LAZY Q FIVER
SINGLE SIGNAL RECEPTION

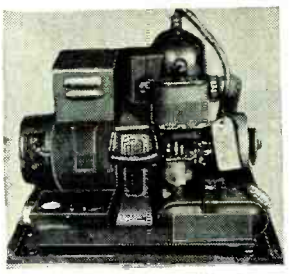
$9.95

The littlest BIG BUY ever offered! A BC-1206 Setchell Carlson receiver will take the place of BC-453 (Lazy Q Fiver). We think it's even better. Here's why: **Smaller** — 4″ x 4″ x 6¾″; weighs only 3 lb. 14 oz. **Less current drain,** .75 amps at 24 v. DC. IF freq. 135 kc. A conventional superhet circuit is employed and is arranged so that AVC will prevent overloading on strong signals.



APN-4 RCVR—'SCOPE POWER SUPPLY

4 switch-selected screw-driver tuned RF channels; IF freq. 1050 kc, band-width 45-60 kc; RF freq. 16 2000 kc. Tubes: (2) 2Y2, (3) 6B4, (4) 6SK7, (1) ea. 5U4, 6SU7, 6SA7, 6H6, VR150. Makes fixed tuner for med. freq. police calls or PA system. Has power supply for 5″ scope, with 400 cycle trans. Electronic-controlled low v. supply; delivers 260 vdc. 150 mils reg. to .01%. Power supply alone worth more than price..... **$8.95**



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Gasoline Generator (HRU-28)

28 - 32 Volts D.C. ONLY **$74.50**

Single cylinder, 2-cycle gasoline engine with generator that is rated at 2,000 watts direct current, 70 amps. Has unlimited use around a farm; useful as field day power supply. More literature upon request.

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For converting SCR-274-N to 115 Volts AC.

No. 1 Power Transformer. Pri—115v 60 cycle; sec—500 CT .06 Amp. 24v —½ amp.
Price only $3.90

No. 2 Filament Transformer. Pri—115v 60 cycle; Sec. 1—14v 7½ amp.; sec. 2 14v 7½ amp. Series 28v 7½ amp. Parallel 14v 15 amp.
Price only $4.50

No. 3 Filament XMFR. Pri—115v 60 cycle; Sec. 24v 2 amps.
Price only $2.25

• Speakers—Brand New
Permanent Magnet

4″	$ 1.60
5″	1.85
12″ Jensen in Metal Case	14.50

10% discount, purchase of 2 or more

• Heavy Duty Transmitting Chokes
8 HY—500 MA—5000 V INS.
Price each $8.95

• Condensers—Fixed

.05	Mfd.	600 Volts	$0.15
10	Mfd.	350 Volts	.69
15	Mfd.	150 Volts	.60
16 x 16		450 Volts	1.20
20		250 Volts	.69
40		150 Volts	.75
50		150 Volts	.69
150		25 Volts	.54
200		10 Volts	.45
8 x 8	Can.	Electrolytic	1.50

Tubes (New, in Original Cartons).
For the SCR-274-N Command Set & Others.

12A6	69c	OD8- VF150	75c
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12K8	69c	77	59c
12SK7	69c	78	59c
12SF7	69c	89	59c
1625	89c	38322	$1.19
1626	79c	12J5-GT	69c
1629	89c		

DUAL POWER SUPPLY

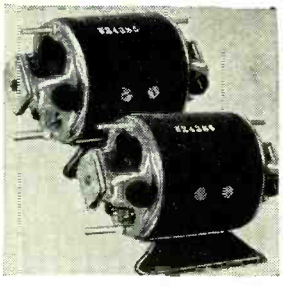
LOW DRAIN 6 VOLT TRANSMITTER AND RECEIVER POWER SUPPLY

Use our dual dynamotors by wiring them in series and use one on receivers and both in transmitter. High voltage output 600 volts at 48 watts. Low voltage 300 volts at 24 watts.

SAVE YOUR BATTERY!

$4.95 each

Both for $8.95



• SAVE C.O.D. CHARGES and speed your order by remitting in full or 25% deposit. Please don't send money for postage, we ship "transportation charges collect". These prices supersede all previous prices. Write every month for BARGAIN BULLETIN.

R&M RADIO COMPANY

1426 N. QUINCY ST. DEPT. RN-49 ARLINGTON, VIRGINIA

ALL EQUIPMENT F.O.B.

BE SURE TO WRITE FOR BARGAIN BULLETIN

Name.....

Address.....

City.....

Zone..... State.....

phones separated by approximately six inches to give the effect of an artificial head. It is of further interest to note that definite alterations of tone color may result from the production of standing waves, especially when one ear is at a node and the other at an antinode.

In conclusion, it seems reasonable to assume that the problems facing the audio constructor are intimately associated with transient distortion in its various forms. Almost all of the steps taken by amplifier and speaker manufacturers in recent years to reduce intermodulation effects have meant a corresponding reduction in transient distortion. Triode output stages, heavy inverse feedback, and multiple speaker systems all having a very definite effect on transient response.

A brief summary of transient distortions include: booms and thumps, ringing sensations following some tones or combination tones, change of tone color, lifelessness, synthetic reverberation effects, discrimination against complex tones, dynamic distortion of high-level sounds of short duration, screechiness resulting from excessive distortion of the beginning cycles of a pulse or excitation of various speaker resonances, mushiness or indistinctness, and a virtual amplification of static or needle noise.

In fairness it should be pointed out that the average radio is not so much a reproducing instrument as it is a musical instrument producing simple tones over a limited frequency range and often in a very pleasing manner. Where accurate, wide-range reproduction is desired, however, the elimination of transient distortion is of paramount importance. —30—

Contest Instructors Wanted

Ham clubs or individuals who are planning on entering Radio & Television News' $10,000 Ham Contest, and are looking for trainees, should contact the following individuals. The men listed below have shown their desire to become amateurs. Only those in your immediate vicinity should be contacted. See last month's issue of RADIO & TELEVISION NEWS for complete details on contest.

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Sam Goodheart & Co.
48 West 37th Street, New York 18, N. Y.

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5536 West Jackson Blvd., Chicago, Illinois

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Municipal Metallic Bed Mfg. Corp.
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FREE! $20.00 worth of condensers (list value), 10 Cornell-Dubilier 15-15 at 150V or standard brand 20-30 Filters at 150V. FREE with each 100 tubes.

Popular GT Miniature and Loctal Tubes. All individually cartoned and guaranteed best quality. Available at this low price and may be assorted. THE FIRST REAL SCOOP FOR THE SERVICE DEALER.

7Y4	3Q4	6H6GT	10	24A	46
7Z4	3S4	6J5GT	12A8GT	25L6GT	47
7B6	5U4G	6J7GT	12A6	25Z5	50
7E6	5V4	6K6GT	12A7	25Z6GT	50B5
7E5	5X4G	6K7GT	12AT6	26	50L6GT
7C4	5Y3GT	6P5GT	12AU6	27	56
14X7	5Y4G	6Q7	12C8	30	57
1A5GT	5Z3	6Q6GT	12BA6	31	58
1A7GT	6A7	6R7	12BE6	32L7GT	70L7GT
1B4	6AC5GT	6SA7GT	12F5	35	71A
1C4	6A3	6SC7GT	12H6	35/51	75
1H5GT	6A8GT	6SD7GT	12J5	35B5	76
1L4	6AJ5	6SF5GT	12J7GT	35C5	78
1N5GT	6AQ6	6SF7	12K7GT	35L6GT	80
1P5	6AT6	6SG7GT	12K8G	35W4	81
1Q5	6B6	6SH7	12Q7GT	35Z4GT	83
1R4	6B7	6SJ7GT	12SA7GT	35Z5GT	84/6Z4
1R5	6BA6	6SK7GT	12SH7GT	37	85
1S4	6BE6	6SL7GT	12SG7	37A	112A
1S5	6C4	6SQ7GT	12SJ7GT	38	89
1T4	6C5GT	6SR7GT	12SK7GT	39	117L7GT
1U4	6C6	6TB	12SN7GT	39/44	117P7GT
1V	6C8G	6U7GT	12SQ7GT	40	117Z3
2A3	6D6	6V6GT	12SR7	41	182B
2A5	6F5G	6X4	12SR7GT	42	183
2A7	6F6GT	6X5GT	20	43	482B
2B7	6F8G	6Y6G	2050	44	483
3A4	6G6	9T8	2051	45	

TELEVISION TUBES

Special!

54¢ each in 100 lots, assorted

59c each in smaller quantities.

1B3	6AU6	6T8
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6AG5	6BH6	12AT7
6AK5	6BJ6	12AX7
6BG6G	6S8GT	12S8
6AL5	6SN7GT	12BA7
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100 lot prices also apply to mixed assortments of 32½c and 54c tubes. IF YOU WISH, tear out this page and send it in. Just write in quantities desired. Please print name and address plainly.

5 TUBE Super AC-DC KIT

Packed complete including tubes, plastic cabinet, all parts and the easiest, best instructions ever printed. Students, hobbyists, experimenters, hams—build your own radio, each..... **$11.95**
Quantity prices upon request.

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Nationally advertised brands—GUARANTEED—best quality

5" Alnico 5 Magnet. Lots of 10,	ea.	95c
4" " " "	ea.	95c
3" " " "	ea.	95c
2" " " "	ea.	95c
Individual price	ea.	99c
6" Lots of 10,	ea.	$1.49
Individual price	ea.	1.59
8"	ea.	3.65
10"	ea.	4.25
12"	ea.	4.95

BY-PASS CONDENSERS

6c each—Lots of 100 (assorted)..... **$4.95**

.001 mfd, 600V.—	
	ea. 6c
.002	ea. 6c
.005	ea. 6c
.01	ea. 6c
.02	ea. 6c
.05	ea. 7c
.1	ea. 8c

FILTER CONDENSERS

Highest Quality Standard Brands, All Fresh Stock Electrolytic.
60-60 mfd, 150V.....ea. 39c
(Small size, low price, use in place of 60-40, 50-30, 50-50, 40-40, 30-30, etc.).

STOCK UP AT THESE PRICES

20-20 mfd, 150V	ea. 39c	40 mfd, 150V	ea. 29c
30-30 mfd, 150V	ea. 47c	8 mfd, 450V	ea. 21c
40-40 mfd, 150V	ea. 49c	8-8 mfd, 450V	ea. 43c
50-50 mfd, 150V	ea. 49c	10-10 mfd, 450V	ea. 43c
20 mfd, 150V	ea. 25c	20-20 mfd, 450V	ea. 39c
		25 mfd, 25V	ea. 17c

OUTPUT TRANSFORMERS

For: 50L6, 50B5, 50A5, 50C6, 32L7, 70L7, 26A7, 6W6, 28D7, 70A7, 1276, 6A5, 6B4, 25C6, 7C5, 2A3, 6A3, 6Y6, 25B6, 25L6, 6L6.....each **39¢**

For: 6V6, 6F6, 3Q5, 42, 41, 43, 45, 50, 71A 12A5, 25A6, 25A7, 6N7, 6A6, 25N6, 25B5, 117L7, 117M7, 117N7, 117P7, 35A5, 6AH5, 6AL6..ea. **49¢**

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Standard replacement Each..... **45¢**
Standard replacement Midget..... **45¢**

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500,000 ohms with switch and long shaft—best brands .....ea. **35¢**

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Crystal Cartridge
L-72A.....ea. $1.49
1 to 1.5 V Cartridge.....ea. 1.39
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Good rubber with plug....10 for 1.25
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Standard 100 mil.....ea. 69c

UNIVERSAL OUTPUT TRANSFORMER SPECIAL—Up to 12 watts to almost any speaker . . 99c ea.

All Merchandise is Brand New and nationally advertised brands.—Minimum order $5.00: all shipments F.O.B. Chicago . . ORDER TODAY! 20% additional on small orders outside continental United States. *Low Price Catalog sent with first order.*

CLEAR-VAC CO.

5036 RAVENSWOOD AVE.
CHICAGO, ILLINOIS

"Clear heads order from CLEAR-VAC"

What's New In Radio

(*Continued from page 68*)

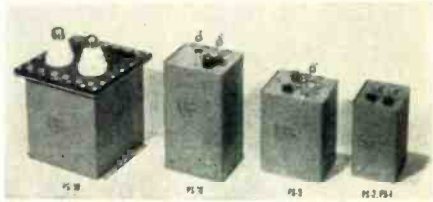
starts the record when the pickup is placed in playing position.

Full information and detailed literature may be obtained by writing to

American Microphone Company, 370 South Fair Oaks Avenue, Pasadena 2, California.

HI VOLT POWER SUPPLY

Condenser Products Company, 1375 North Branch Street, Chicago 22, Illinois, announces the addition to its line of Hi Volt power supplies, Numbers PS-5. PS-10. and PS-30, which



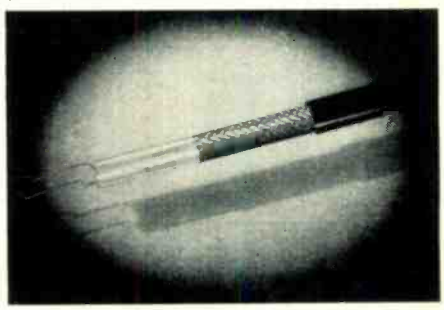
have respective outputs of 5000, 10,000, and 30,000 volts.

These power supplies are used for oscilloscopes, radiation counters, insulation testers, electrostatic precipitators, etc. The containers are gray lacquer coated terne or tin plate and are hermetically sealed and oil filled.

300-OHM SHIELDED LEAD-IN

To solve the problem of noise introduced into lead-in lines from outside sources, the *Federal Telephone and Radio Corporation,* East Newark, New Jersey, developed the K-111 shielded, balanced line, which assures a perfect match between antenna and receiver.

A feature of this line is its constant characteristic impedance, independent of the proximity of any metallic objects, enabling it to shield out all in-



terfering signals normally induced in the transmission line. The cable may eliminate, in many cases, the necessity for expensive and elaborate antennas. —30—

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Greater Values Than Ever Before in Our New Larger Store At 189 Greenwich St., N. Y. 7. (Come in and Browse Around)
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SPECIALS OF THE MONTH

TWO-SPEED PLANETARY DRIVE

Auxiliary Speed Reducer fits on Condenser Shaft back of panel or on dial knob shafts. Ratios 5 to 1 and 1 to 1. Fits any ¼ inch round shaft.

57c Each—Two for 97c

PERMALLOY SHIELDS
for CATHODE RAY TUBES

3" Shield	$1.47
5" Shield	1.97

TRANSMITTING KEY

General purpose transmitting key on a heavy die cast base, all mounted on a swinging bracket thigh clamp. ⅛" pure silver contacts. Key can be easily removed from clamp. Adjustable bearings. Supplied with 5-foot cable and PL-55 phone plug.

Brand new—Each 57c

SELENIUM RECTIFIERS
Full Wave Bridge Type

INPUT	OUTPUT		
up to 18v AC	up to 12v DC	½ Amp.	$1.47
up to 18v AC	up to 12v DC	1 Amp.	1.97
up to 18v AC	up to 12v DC	5 Amp.	5.27
up to 18v AC	up to 12v DC	10 Amp.	8.97
up to 18v AC	up to 12v DC	15 Amp.	11.57
up to 18v AC	up to 12v DC	30 Amp.	22.57
up to 36v AC	up to 28v DC	1 Amp.	3.47
up to 36v AC	up to 28v DC	5 Amp.	8.57
up to 36v AC	up to 28v DC	10 Amp.	14.57
up to 36v AC	up to 28v DC	15 Amp.	22.27
up to 115v AC	up to 100v DC	.25 Amp.	2.57
up to 115v AC	up to 100v DC	.6 Amp.	5.27
up to 115v AC	up to 100v DC	5 Amp.	22.57
up to 115v AC	up to 100v DC	3 Amp.	17.97

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NATIONALLY ADVERTISED BRANDS
All Ratings D. C.

2x.1mfd.	600v	$0.37	1mfd.	2000v	$0.97
.25mfd.	600v	.37	2mfd.	2000v	1.77
.5mfd.	600v	.37	4mfd.	2000v	3.77
1mfd.	600v	.37	15mfd.	2000v	4.97
2mfd.	600v	.37	4mfd.	2500v	3.97
4mfd.	600v	.57	2mfd.	2500v	2.47
8mfd.	600v	1.07	.1mfd.	2500v	1.27
10mfd.	600v	1.17	25mfd.	2500v	1.47
3x.1mfd.	1000v	.47	.5mfd.	2500v	1.77
.25mfd.	1000v	.47	.05mfd.	3000v	1.97
1mfd.	1000v	.57	.1mfd.	3000v	2.27
2mfd.	1000v	.67	.25mfd.	3000v	2.67
4mfd.	1000v	.87	1mfd.	3000v	3.47
8mfd.	1000v	1.97	12mfd.	3000v	6.97
10mfd.	1000v	2.07	2mfd.	4000v	5.97
15mfd.	1000v	2.27	1mfd.	5000v	4.97
20mfd.	1000v	2.97	.1mfd.	7000v	2.97
24mfd.	1500v	6.97	3mfd.	4000v	6.97
.1mfd.	1750v	.87	2mfd.	3000v	3.47
.1mfd.	2000v	.97	2x.1mfd.	7000v	3.27
.25mfd.	2000v	1.07	.02mfd.	12000v	9.97
.5mfd	2000v	1.17	.02mfd.	20000v	11.97

HIGH CAPACITY CONDENSERS

10,000 mfd.—25 WVDC	$6.97
2x3500 mfd.—25 WVDC	3.47
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4000 mfd.—18 WVDC	1.97
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PHONE DIGBY 9-0347

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1B24	$4.87	725A	$7.97	1LC6	$0.87
1B26	3.97	726A	4.57	1LD5	.87
1B29	3.47	800	1.87	1LE3	.97
1N21	.67	801A	.47	1LH4	.77
1N23	.77	802	2.97	1LN5	.67
1N34	1.37	803	4.87	1Q5GT	.97
1P24	.87	805	3.97	1R5	.67
1S21	1.97	807	1.07	1S4	.67
2AP1	2.87	808	1.57	1S5	.57
2C21	.27	809	1.67	1T4	.57
2C22	.17	810	4.97	3Q4	.57
2C26	.27	811	1.97	3Q5	.67
2C34	.27	812	2.37	5U4	.47
2C40	.97	813	5.87	5Y3	.37
2C44	.67	814	2.67	6A7	.57
2C46	2.87	815	2.47	6A8GT	.57
2D21	1.27	816	1.07	6AG5	.87
2J21	9.87	826	.47	6AG7	.97
2J22	9.87	829B	3.47	6B4G	.97
2J26	9.87	832A	2.97	6B6G	1.47
2J31	12.87	833A	28.97	6C6	.47
2J32	14.87	836	.97	6D6	.47
2J36	24.87	837	1.57	6F5GT	.47
2J38	14.57	838	2.67	6F6GT	.47
2J39	18.47	841	.47	6F6	.57
2J40	18.47	843	.37	6H6	.37
2J48	14.97	845W	3.87	6J5GT	.47
2J49	26.97	851	14.97	6J7GT	.67
2J54B	18.97	860	2.27	6K6GT	.47
2J55	18.97	861	9.97	6L6G	.97
2K25	23.97	864	.47	6L6	1.17
2K28	8.97	865	.67	6L7	.77
2V3G	.87	866A	.97	6Q7GT	.57
2X2	.37	866JR	1.07	6SA7GT	.47
3AP1	2.97	869B	18.97	6SC7	.57
3BP1	1.37	872A	1.47	6SF5GT	.57
3B22	.57	874	.67	6SH7	.47
3B24	1.27	876	.37	6SJ7GT	.47
3B26	.87	878	1.17	6SK7GT	.47
3CP1	2.67	884	.97	6SL7GT	.57
3C21	3.97	885	.87	6SN7GT	.57
3C22	7.97	902P1	4.97	6SQ7GT	.47
3C23	2.47	905	1.87	6V6GT	.67
3C30	.47	923	.87	6X5GT	.57
3C31	1.47	954	.17	7A8	.67
3DP1	1.47	955	.37	7B7	.57
3D21A	1.47	956	.37	7C5	.57
3E29	3.37	957	.27	7C6	.67
4B24	2.27	958	.27	7F6	.67
4E27	12.97	1611	.97	7Y4	.67
5AP4	3.97	1613	.57	12A8GT	.57
5BP1	1.27	1616	1.37	12AT6	.47
5BP4	2.47	1619	.27	12AU6	.67
5CP1	1.97	1624	.77	12AB6	.67
5D21	18.97	1625	.27	12BE6	.47
5FP7	1.37	1626	.27	12J5GT	.47
5JP1	9.97	1629	.27	12J7GT	.47
5JP2	9.97	1630	1.87	12Q7GT	.57
5J29	14.97	1636	3.97	12SA7GT	.57
5J30	18.97	1638	.47	12SF7GT	.57
5LP1	11.97	1641	.37	12SJ7GT	.47
5NP1	11.97	1654	1.97	12SK7GT	.57
5R4GY	1.07	1851	.87	12SQ7GT	.57
5T4	.97	2050	.67	12SR7GT	.57
5Z3	.47	2051	.47	14A7	.57
5Z4	.77	8005	2.47	14B6	.67
6AB7	.77	8011	.87	14Q7	.57
6AC7	.67	8012	1.47	24A	.67
6AK5	.87	8013	1.27	25L6GT	.57
6AL5	.67	8016	1.37	25Z5	.47
6C4	.27	8020	1.47	25Z6GT	.47
6J6	.87	8025	3.57	26	.47
6Q5G	1.97	9001	.37	27	.47
7EP4	17.97	9002	.37	30 Spec.	.27
10Y	.27	9003	.47	32L7GT	.97
12A6	.17	9004	.27	35/51	.57
12DP7	12.87	9005	.57	35A5	.67
12GP7	12.87	9006	.27	35L6GT	.57
15E	2.47	CK1005	.27	35W4	.47
15R	.97	CK1090	1.27	35Y4	.57
24G	.37	EF50	.47	35Z3	.67
45 Spec.	.37	F123A	9.97	35Z5GT	.37
75TL	2.47	F127A	17.97	36	.77
100TH	9.97	F128A	39.47	41	.47
211	.47	F660	39.47	42	.47
227A	2.97	FG81A	3.97	43	.57
249C	.77	FG105	7.47	45	.57
250R	7.97	FG238B	29.47	47	.77
250TH	19.47	GL146	7.97	50A5	.87
250TL	19.47	GL697	29.47	50B5	.57
304TL	.97	HY615	.37	50L6GT	.57
304TH	3.47	ML100	19.97	50Y6GT	.57
316A	.47	ML101	39.47	56	.47
327A	2.97	ML502	39.47	59	.97
350B	1.47	RK72	1.37	70L7GT	1.07
368AS	1.97	RK73	1.67	71A	.57
371B	.97	VR75	.97	75	.57
450TH	29.87	VR78	.37	76	.47
530	4.97	VR90	.67	77	.47
531	2.97	VR105	.67	78	.47
559	.97	VR150	.67	80	.47
575A	12.97	VR127A	2.37	81	1.57
703A	1.97	VU111	.37	82	.87
705A	1.67	OZ4	.67	83	.87
706CY	18.97	1A5GT	.47	83V	.87
715B	7.97	1A7GT	.57	84/6Z4	.67
715C	18.97	1H5GT	.57	89	.67
717A	.97	1N5GT	.57	117L7GT	1.17
721A	1.57	1LA4	.97	117P7GT	1.17
723A/B	12.87	1LA6	.87	117Z3	.57
724A/B	1.77	1LB4	.97	117Z6GT	.87

NOW AVAILABLE

1000 KC Crystal	$2.97
Socket	.07

RF VACUUM SWITCH
GE-1S21

9200 volts peak. 8 amps. Used as antenna switch in Collins Art 13.

Brand New $2.47

TRANSFORMER—115 V. 60 Cy.
HI-VOLTAGE INSULATION

2500v @ 15 ma.	$4.97
2150v @ 15 ma.	3.97
1750v @ 4 ma.; 6.3 v @ 3A	4.27
1600v @ 4 ma.; 700v CT @ 150 ma.; 6.3v @ 9A	6.47
525-0-525v @ 60 ma.; 925v @ 10 ma.; 2x5v @ 3A; 6.3v @ 3.6A; 6.3v @ 2A; 6.3v @ 1A	6.97
515-0-515v @ 175ma.; 5v @ 3A; 2.5v @ 5A	4.97
500-0-500v @ 25 ma.; 262-0-262v @ 55 ma.; 6.3v @ 1A; 2x5v @ 2A	4.47
500-0-500v @ 100 ma.; 5v CT @ 3A	3.97
450-0-450 @ 300 ma.; 140-0-140 @ 100 ma. 36v @ 1A, 6.3v @ 5A, 5v @ 3A, 110/220 Dual Pri.	7.97
400-315-0-100-315v @ 200 ma.; 2.5v @ 2A; 5v @ 3A; 6.3v @ 9A; 6.3v; 9A	5.97
400-0-400v @ 200 ma.; 5v @ 3A	3.97
350-0-350v @ 150 ma.; 5v @ 3A; 6.3v @ 6A; 78v @ 1A	3.97
385-0-385-550v @ 200 ma.; 2½v @ 2A; 5v @ 3A; 3x6.3v @ 6A—PRI. 110/220	6.27
350-0-350v @ 35 ma.	1.27
340-0-340v @ 300 ma.; 1540v @ 5 ma.	4.97
335-0-335v @ 60 ma.; 5v @ 3A; 6.3v @ 2A; 0-13-17-21-23v @ 70 ma.—PRI. 110/220	3.97
325-0-325v @ 120 ma.; 10v @ 5A; 5v @ 7A	2.27
300-0-300v @ 65 ma.; 2x5v @ 2A; 6.3v @ 2½A; 6.3v @ 1A	3.47
150-0-150 @ 80 ma.; 150 @ 40 ma; 6.3v @ 3.5A; 6.3v @ 1A	1.97
150v @ 55A; 150v @ 2.13A; 5v @ 5A	3.97
120-0-120v @ 50 ma.	.97
80-0-80v @ 225 ma.; 5v @ 2A; 5v @ 4A	3.97
24v @ 6A	3.47
3x10.3v @ 7A; CT	7.97
12.6v CT @ 10A; 11v CT @ 6.5A	6.97
6.3v @ 12A; 6.3v @ 2A; 115v @ 1A	3.47
6.3v @ 10A; 6.3v @ 1A	2.97
6.3v @ 1A; 2½v @ 2A	2.47
6.3v @ 21½A; 6.3v @ 2A; 2½v @ 2A	4.97
6.3v @ 1A ..... $0.97 8v CT 1A	.97
6v @ 15 amps RMS	1.97
6.3v CT @ 3A; 5v CT @ 4A	3.97

FILTER CHOKES
HI-VOLTAGE INSULATION

8 hy @ 300 ma.	$3.97	1 hy @ 800 ma.	$14.97
25 hy @ 160 ma.	3.47	10 hy @ 250 ma.	2.47
12 hy @ 150 ma.	3.27	10 hy @ 200 ma.	1.97
25 hy @ 65 ma.	1.37	10/20 @ 85 ma.	1.57
.05 hy @ 15 amps.	7.97	15 hy @ 125 ma.	1.47
1 hy @ 5 amps.	6.97	15 hy @ 100 ma.	1.37
4 hy @ 600 ma.	5.97	3 hy @ 50 ma.	.27
200 hy @ 10 ma.	3.47	30 hy Dual @ 20 ma.	1.47
600 hy @ 3 ma.	3.47	8/30 hy @ 250 ma	3.47
325 hy @ 3 ma.	3.47		

All Tubes guaranteed, except for open filaments, shorts and broken glass, for which we check before shipment.
Please specify how to ship.

All Prices Subject to Change Without Notice

All merchandise guaranteed. Mail orders promptly filled. All prices F.O.B. New York City. Send money order or check. Shipping charges sent C.O.D. Minimum order $5.00. 20% Deposit required with all orders.

RADIO HAM SHACK Inc.
189 GREENWICH STREET . NEW YORK, N. Y.

Mac's Service Shop

(*Continued from page 42*)

most certain to get an answer. Scratch many a big name in electronic engineering, and you will find a ham underneath.

"Some of you have asked what 'practical' benefits you can expect from being an amateur. While practical considerations are not usually considered a fair means of measuring a hobby, I know from experience that hamming does have some dollars-and-cents advantages, especially if your work has any connection with radio.

"Being a ham is just about the most painless way to acquire a knowledge of radio theory and practice. Because you are interested, you seem to absorb a knowledge of radio as casually and as effortlessly as a sponge takes up water. The strong currents of r.f. you work with in a transmitter are of sufficient strength to be observed and easily measured with ordinary instruments. You can *see* how r.f. behaves; you do not have to imagine, as is the case when you are studying books.

"The arrival of television has suddenly placed a spotlight on the work that hams have been doing with high-frequency beam antennas for many years. Yagi beams, corner reflectors, stacked arrays, terminated rhombics—these and all of the other terms that are popping up like dandelions in the service literature these days are old stuff to the radio amateurs. In fact, Mr. McGregor says that installing a TV antenna is the one job in which he is inclined to pay some attention to my opinion!"

Mac nodded his head in vigorous agreement.

"I do not want you to think," Barney continued, "that being a ham will make you a radio serviceman or a radio engineer, for that certainly is not so; but it will give you an excellent foundation for any kind of work in the field of electronics.

"Finally, I want to point out that ham radio is a democratic hobby. When a radio amateur travels, he keeps one eye cocked on the rooftops; and when he sees a transmitting antenna, he knows that his knock at the door will be welcome. The house may be a mansion; the antenna may be a multi-element rotary beam; and the ham himself may only have a single 6L6 on eighty meters; but he will still be welcome. That's the way hams are. The nice part of it is, too, that the fellow with the single 6L6 will be having just as much fun hamming as will the man with the custom-built kilowatt. Amateur radio is a hobby that can be entered at almost any financial level with a guaranteed maximum return in enjoyment. I know that as far as I am concerned it will be my Number One Hobby for the rest of my life."

That terminated Barney's speech, and the rest of the meeting was given over to arranging details of future meetings. At last, when they were all gone and Barney and Mac were locking up, Mac suddenly said, "Red, I hope you never take up selling gold bricks."

"Why not?" Barney asked.

"Because I'd probably buy one. I had intended to be just a spectator at these meetings, but after that high-pressure sales talk you gave tonight—and I may as well admit right now that I never thought you had it in you to give a speech like that—you can reserve a seat for me right up next to teacher's desk; and if I flunk my code exam, I'll fire you!"

"Hey! That's swell!" Barney gasped. "I kind of hoped you would join us, but —well golly, that *is* swell!" —30—

The Coast Guard was never like this! Commander Chet Gibson of Seattle, commander of the Coast Guard Auxiliary Flotilla 21, has installed a Hallicrafters Model T-54 television receiver aboard his 40 foot cabin cruiser "Hilma III." According to Mr. Gibson, the installation is a complete success even when the antenna is disconnected. Satisfactory pictures are obtained up to 8 miles out without any antenna. Other instances have been noted in which TV reception over water has been possible over long distances, far in excess of the theoretical "line-of-sight" television radius.

Within the Industry

(*Continued from page 26*)

cluding *Insl-X Co., Lear, Inc., Measurements Corp., Shallcross Mfg. Co.,* and *Superior Electric Co.* **THE CORNELL-DUBILIER ELECTRIC CORPORATION,** South Plainfield, New Jersey, has announced the opening of a midwest direct factory sales office at 605 W. Washington Blvd., Chicago, Ill. The office will be supervised by Charles H. Caine, Chicago. **THE FAIRCHILD RECORDING EQUIPMENT CORPORATION** has a new address: 154th St. and 7th Ave., Whitestone, New York. **FREED TRANSFORMER COMPANY, INC.,** has moved to its new location, 1718-36 Weirfield St., Brooklyn 27, N. Y.

* * *

G. W. DeSOUSA has been appointed staff assistant to the divisions manager of *General Electric Company's* Tube Division at Schenectady, N. Y.

A native of New York City, Mr. DeSousa was graduated from Princeton University and has spent nine years with the *Farnsworth Television and Radio Corp.* of Fort Wayne. He joined *General Electric Company* in 1948 in the Marketing Division.

* * *

KIMBLE GLASS will expand its television bulb manufacturing operations and other glass production into the *Owens-Illinois* plant in Columbus, Ohio. A definite date for reopening of the Columbus plant has not been set, as it must be made ready in gradual stages.

The new plant should be in full operation by May 1 and will virtually duplicate the Westwood production set-up in Toledo. Demands for *Kimble Glass* television bulbs have taxed the production capacity of the Westwood plant, making it necessary to supplement that operation by the addition of the Columbus facilities.

* * *

JOHN S. GARCEAU, formerly of *Farnsworth Television and Radio Corporation,* has been appointed to head the advertising and sales promotion program of the *York Corporation.*

Until recently, Mr. Garceau acted as chairman of the Radio Manufacturers Association Advertising Committee, a post held for seven years. His experience during the past 15 years in the appliance, radio, and television industry includes positions held with *Crosley Corporation* and *Fairbanks Morse.*

* * *

DR. HENRY A. STRAUS has received the appointment of principal research engineer at *Bendix* Radio Division in Baltimore, and will be active with research and development on ultra-high frequency circuits, special antenna design, and in radio and radar developments.

He was a key figure in the development of gun laying radar and in the Navy's MARK-56 radar. Both developments have been cited as being among the most advanced radar devices to come out of World War II.

Dr. Straus was formerly a scientist with the Atomic Energy Commission, having done development work at Oak Ridge.

* * *

FRANCES E. SOLOW has been appointed to the newly-created position of director of public relations and research at *Emerson Radio & Phonograph Corporation.*

Miss Solow joined *Emerson Radio* in 1924 and served as advertising manager until her recent appointment.

* * *

GAROD ELECTRONICS CORPORATION has formed a new branch in Long Beach, Ontario, a suburb of Toronto, to be known as *Garod Electronics, Ltd.,* of Canada. The new company will manufacture and distribute the company's line of radio and television receivers in the Dominion of Canada.

Although Canada, at least for the time being, does not have any television facilities or stations, the *Garod* receivers have been engineered so that Buffalo and Cleveland can be picked up throughout the Toronto area. Apparently a substantial market exists in Canada for the reception of television broadcasts from the United States.

* * *

CORNELL-DUBILIER ELECTRIC CORPORATION, South Plainfield, New Jersey, has purchased from *Maguire Industries, Incorporated,* all of the stock of *Radiart Corporation,* manufacturers of auto radio vibrators and television and auto antennas.

The three *Radiart* plants will be operated in Cleveland as a separate division of the *Cornell-Dubilier Electric Corporation,* one of the largest manufacturers of condensers. The company maintains other plants in New Jersey, Massachusetts, Rhode Island, and Indiana.

* * *

RICHARD E. HALL will cover the New England states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut for the *American Phenolic Corporation.*

Since his release from the Air Force, Mr. Hall has been in the sales department of *Amphenol* at Chicago. He will maintain his office in the United Building, Boston 15, Mass. He succeeds the late Morrill P. Mims, who represented *Amphenol* in New England until his death in December, 1948.

After his war duties, Mr. Hall entered the Engineering Department at *Amphenol* in the antenna development laboratory. After an intensive training course on AN connectors in the general engineering department, he

was transferred to sales, where he did intensive field work out of the Chicago office.

* * *

THE SAMPSON COMPANY, a Chicago wholesaler, has been designated exclusive distributor of *Capehart* television, television-phonograph and radio instruments. The *Capehart* line is manufactured by the *Farnsworth Television and Radio Corporation.* **A. R. THIBAU,** 402 Manufacturers Exchange Building, Kansas City, Mo., has been chosen as sales representative of *Clarostat's* line of resistors, controls, and resistance devices. Mr. Thibau will cover Kansas, Nebraska, Western Missouri, with the exception of Jefferson City, and Iowa, with the exception of Waterloo, Cedar Rapids, Sioux City, and Fort Dodge. **THE EARL S. DIETRICH COMPANY** of Cleveland has been selected by the *Hallicrafters Company* to handle its regular communications line and television receivers. **FRANK M. BROWN COMPANY,** 12-16 Free Street, Portland, Maine, has been appointed distributor for *Arvin* radios and electrical appliances in the State of Maine and in Coas, Carroll, Belknap, and Grafton Counties, New Hampshire. The firm of **MERRITT AND ANDREE,** Room 1174, Merchandise Mart, Chicago, has been appointed district merchandiser for *Bendix Radio and Television* in the Northern Illinois and Lake County, and Indiana territories. **GRICE RADIO AND ELECTRONIC SUPPLIES** of 358-60 East Wright Street, Pensacola, Florida, has been appointed distributor for products of the Radio Tube Division of *Sylvania Electric Products, Inc.* **LEONARD ELECTRONIC SUPPLY COMPANY,** 106 W.S. Second Street, Roanoke, Va., has been appointed distributor of the *Sylvania Electric Products, Inc.* It will handle the *Sylvania* line of radio and television tubes, test equipment, and electronic products. —30—

Engineer Bob McCreadie compares the new 8½-inch General Electric picture tube developed for low-priced sets with the old 7-inch type (bottom). This larger TV picture tube, say G-E engineers, will probably cost no more than the 7-inch sizes now used in inexpensive models but will offer 50 per-cent more viewing area. It is a metal type, employing magnetic focusing and deflection, and picture quality seems as good as other tubes.

Mobile Transmitter

(*Continued from page* 51)

4½" high. It also has ½" aprons on four sides to stiffen it. On this chassis are assembled all the audio components and the 807 stage. The 807 itself is mounted on a separate bracket. The three audio tubes are grouped close together in a triangle; the 12AT7 is hidden by the modulator tubes in the photographs. Next to the audio tubes is the modulation transformer and "underneath" this chassis is the mike transformer, which can be seen directly behind the panel in the bottom view.

One corner of the case is made by an angle bent from 1/16" aluminum. This angle carries the power and antenna jacks. The perforated cover has a slot for this angle so that the cover may be slid off without disconnecting the transmitter leads. The jack strip itself is easily removed by unscrewing a self-tapping screw at each end. It can then be moved out of the way and when the r.f. tubes are removed the audio section is quite accessible for servicing.

The modulation transformer is a surplus item designed for the SCR-522. It is well suited to this application and was obtained at the surprisingly low price of nineteen cents. Of course, any modulation transformer having similar characteristics will work as well. The use of class A modulation allows considerable latitude in the modulation transformer since class A pentodes such as the 6K6GT will develop practically the same power in a wide range of load impedances. Therefore, any modulation transformer should prove suitable if designed to work between a five to ten thousand ohm class C load and a plate-to-plate impedance of ten to twenty thousand ohms.

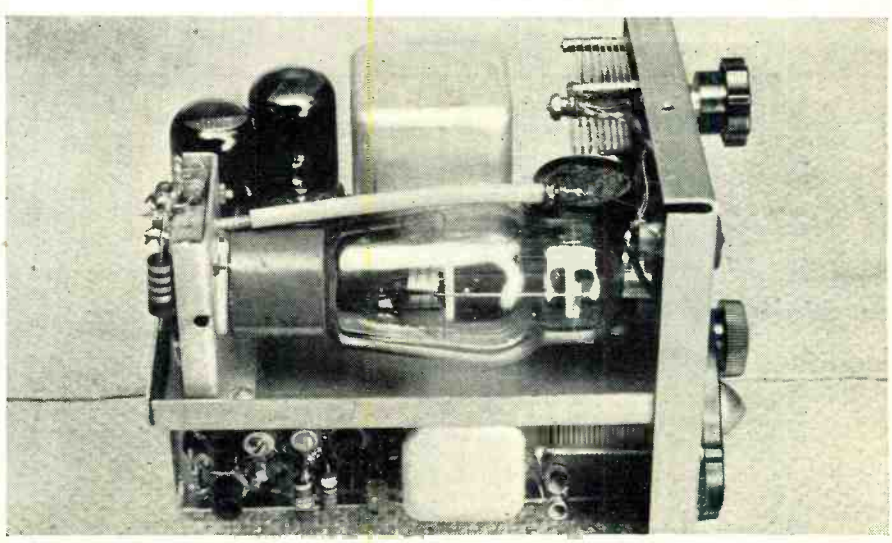
The oscillator and doubler tank circuits are tuned by rather low capacities. A low C tank is advantageous in a frequency doubler, especially when driving a beam tube such as the 807. The low operating "*Q*" obtained results in a broadly resonant tank so that the entire ten meter phone band may be covered without retuning the oscillator or doubler plate tanks, with proportionate coverage of the other bands. Grid leak bias on the 807 accounts for some of this broadness since the bias rises when the grid current is increased. Although all of the 75 meter phone band may be covered, if a change is made across the entire 80 meter band it will be necessary to retune the oscillator plate coil. Adjustment of the slug-tuned coils is easily accomplished by means of a screwdriver inserted through the top of the perforated shield if the slugs are slotted with a hacksaw. The slugs are adjusted for maximum output indicated by the antenna current bulb.

If the rig is to be used on c.w. a closed circuit jack should be connected in series with R6. This jack may be used for metering or to disable the final by means of a dummy plug when the e.c.o. is tuned.

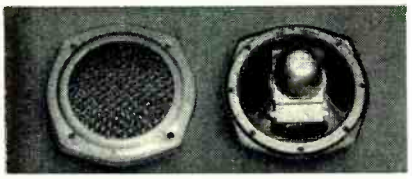
The oscillator and doubler stages draw a total current of about 40 ma. at 250 volts. The modulators account for about 50 ma. and the 807 can be loaded to between 40 and 80 ma. The speech amplifier consumes approximately 1 ma. and the total filament drain is 2.45 amps. The glove compartments of some cars will accommodate the transmitter as its dimensions are only 6⅝" x 5¾" x 4⅝". In actual operation the transmitter has proved itself quite adequate for local work on phone and capable of excellent distant work on the regular station antenna on 75 and 40 meter phone and c.w.

When coupling to a balanced antenna, a separate antenna tuner should be used with link coupling to the transmitter. The link terminals can be connected to the antenna terminal and the chassis and the pi network used to adjust the loading. An

Top view of transmitter. Between the base of the 807 and the modulator tubes, can be seen the 12AT7 speech amplifier-phase inverter. The r.f. circuit is laid out for maximum isolation between the 807 plate tank and the driver tanks.



Remote - Rear Seat
AUTO SPEAKER KIT



Complete Kit includes: • 5-inch PM Speaker with heavy pot • Grille Cloth and Wire Mesh Support • Attractive Metal Escutcheon with Gray Hammertone finish • Instructions for Installation. Small size permits installation in practically any make of car. Kit No. D-62H
Sensationally low priced at only _____ **$2.97** net

#2204 3-Way switch for selecting front speaker, remote speaker or both. _____ **30¢**

Light Collapsible ALUMINUM MAST

5 ft. 6 inches extended, 13" collapsed. Sections lock up positively in the extended position. May be used as mast for light arrays, camera unipod, canoe sail-mast, or pup tent pole. Other uses will suggest themselves. Large section 1¼" dia. small section 5/8" dia. with 1-5/8" dia. mounting plate. Net weight 14 ounces.
STOCK NO. CB-9H _____ **98¢**

G.E. Radio Noise Filter

Type No. 1C200 for aircraft and car installations. Maximum ratings 50 VDC, 25 amps. Shiping wt. 3 lb.
Stock No. B-458-4H **69¢**

Stock No. B-592H - 1/2 lb. Roll of Waxed #12 Cord Linen Lacing Twine.
Per roll, _____ **59¢**

SCR-274N Transmitter and Receiver COMPONENTS

BC-458	5.3 to 7 mc. Transmitter, Brand new	$5.95
BC-458	5.3 to 7 mc. Transmitter, Used	4.95
BC-457	4 to 5.3 mc. Transmitter, Used	4.95
BC-454	3 to 6 mc. Receiver, Used	5.95
BC-456	Modulator with plugs & dynamotor, Used	2.95
BC-456	Modulator less plugs & dynamotor, New	2.95
BC-450 *	3-section Receiver Control Box, Used	.98
BC-451 *	Transmitter Control Box, Used	.49
FT-220 *	3-section Receiver Rack, Used	.98
FT-226 *	2-section Transmitter Rack, Used	.98
B-785B	Brass Spline for tuning receivers	.09
C-822B	6 to 9.1 mc. RF Coil Set #6234	.98
C-252B	2830 KC First I.F. #7277	.29
B-693B	50 ma. 3 hy. Filter Choke #5634	.19

All used components are in good condition. complete with tubes, and guaranteed to be satisfactory to you.

* Complete with plugs.

Conversion Kit for BC-454 and BC-455 Recievers.
Stock No. CK-45H, Shpg wt. 4lb. Only **$6.95**
Contains AC Power Supply parts, gain control, BFO switch, tuning knob and spline, and instructions. Power supply uses all standard parts (Thordarson T-22R01 Transformer, 6X5GT, etc.) and mounts on dynamotor mounting base.

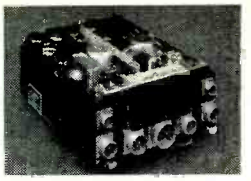
SCR - 274N Receiver Diagram _____ **10¢**
(One furnished with each BC - 454)

Schematic Diagram of Complete SCR - 274N Transmitting System with Receiver Practical Wiring Diagram on reverse side. _____ **25¢**
(one furnished with each BC-456 Modulator)

Write for our bulletin "Conversion of the SCR - 274N Transmitters" giving power supply suggestions, circuit diagram and other hints. Send 10¢ for mailing.

1020 Cycle Audio Filters

C-760H FL-8A High Impedance _____ **$1.49**
C-760L FL-30 Low Impedance _____ **.98**



BC-645 Transmitter – Receiver

Stock No. D-61H
$14.95

Makes an excellent transceiver for amateur, citizens band and other services in the 420 to 500 Mc range. Brand new, complete with 15 tubes, less power supply. Conversion references: Feb. 1947 QST, August 1948 Electronics. Shipping wt. 25 lb.

Stock No. C-54H - PE-101C Dynamotor for BC-645
Shipping wt. 12 lb. _____ **$3.95**

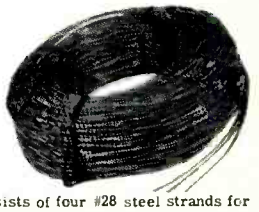
Installation Parts Kit consisting of two antennas and complete set of 13 plugs for BC-645 and PE-101C. Shipping wt. 5 lb.
Stock No. D-86H **$9.95**

Outdoor Telephone-Intercom
3-CONDUCTOR CABLE

at less than 1¢ per foot

525 FOOT ROLLS
Stock No. C-561H

Only $4.95 per roll



Each conductor consists of four #28 steel strands for added strength and three #28 copper strands for extra conductivity and flexibility. Rubber insulation with two-ply waterproofed braid covering around each conductor. Net wt. 20 lbs. A wonderful buy for any telephone or inter-communication use requiring 2 or 3 - conductor cable.

Anticipate your needs on this wire!
Lay in a stock now. You will never again be able to duplicate this value.

TERMS - cash with order or 20% deposit, balance C.O.D. Minimum order $2.00.

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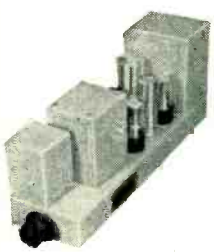
Include sufficient postage · excess promptly refunded.

THE FINEST PRODUCTS OF *Audio Engineering*

AMPLIFIERS

ADC AMPLIFIER—TYPE 71



1. 8 Watt (69.3V rms across 600 Ohms).
2. ± ½db 40-15,000 cps.
3. Measured response (1 KC = 0).

8 Watts	½ db	40 cps. Flat @ 20 KC.
20db Down	¼ db	18 cps. Flat @ 20 KC.
40db Down	½ db	20 cps. Flat @ 20 KC.

4. Input for full power output-Zero VU.
5. Max. Noise Level—77db below full output.
6. Gain Control Range—35 db.
7. Distortion measurement at 8 Watts: Av. tubes, 1%; picked tubes, .76%.
8. Apparent source impedance (looking back into amplifier) 500 Ohms for 600 Ohm load.

JACKS

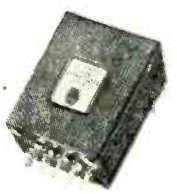
PLUGS

PATCH CORDS

AUDIO TRANSFORMERS

QUALITY PLUS SERIES

1. ±½db 30-15,000 cps, all types.
2. Low transmission loss.
3. Excellent longitudinal balance.
4. Top or bottom mounting.
5. Silver plated terminals.
6. High permeability mu-metal shielding.
7. Highest grade insulation materials.



INDUSTRIAL SERIES

1. Dependable at lower cost.
2. ±1½db from 50 to 10,000 cps.
3. Minimum insertion loss.
4. Same construction, insulation and impregnation as Quality Plus series.

FOR DEPENDABLE Amplifiers, Transformers or components of all descriptions used in radio or television look to **ADC.**

Our catalog carries complete details on all available products. If you don't have your **ADC** catalog, *Write TODAY!*

SPECIFICATIONS engineered and quotations made for research laboratory and product design to fit your needs.

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alternate method would be to wind a turn or two around the plate coil in the transmitter and couple it into the antenna feed line if a low impedance (70 or 300 ohm) line is used. The screwdriver tuning adjustment would not be used, this condenser being set to maximum capacity or shorted. If the regular home station antenna is a quarter wavelength or more at 160 meters it is unwise to connect it directly to the pi network terminals since the pi network has poor discrimination against frequencies below resonance and the e.c.o. has, of course, a fundamental frequency (160 meter) component of plate current which drives the 807 and may result in a radiated signal on 160. This trouble is likely to occur only when the antenna has a definite resonance at 160 meters and will cause no difficulty with the short mobile antenna.

—30—

International Short-Wave

(*Continued from page 55*)

Turkey; TDA-TDZ—Guatemala; TEA-TEZ—Costa Rica; TFA-TFZ—Iceland; TGA-TGZ — Guatemala; THA-THZ — France and Colonies; TIA-TIZ—Costa Rica; TJA-TZZ—France and Colonies; UAA-UQZ — U.S.S.R.; URA-UTZ — Ukrainian S.S.R.; UUA-UZZ—U.S.S.R.; VAA-VGZ—Canada; VHA-VNZ—Australia; VOA-VOZ — Newfoundland; VPA-VSZ—British Colonies; VTA-VWZ — India; VXA-VYZ — Canada; VZA-VZZ — Australia; WAA-WZZ — United States; XAA-XIZ — Mexico; XJA-XOZ—Canada; XPA-XPZ—Denmark; XQA-XRZ—Chile; XSA-XSZ—China; XTA-XWZ—France and Colonies; XXA-XXZ—Portuguese Colonies; XYA-XZZ — Burma; YAA-YAZ — Afghanistan; YBA-YHZ — Netherlands Indies; YIA-YIZ — Iraq; YJA-YJZ — New Hebrides; YKA-YKZ — Syria; YLA-YLZ — Latvia; YMA-YMZ — Turkey; YNA-YNZ — Nicaragua; YOA-YRZ—Romania; YSA-YSZ—El Salvador; YTA-YUZ—Yugoslavia; YVA-YYZ — Venezuela; YZA-YZZ — Yogoslavia; ZAA-ZAZ—Albania; ZBA-ZJZ—British Colonies; ZKA-ZMZ — New Zealand; ZNA-ZQZ—British Colonies; ZPA-ZPZ —Paraguay; ZQA-ZQZ—British Colonies; ZRA-ZUZ—Union of South Africa; ZVA-ZZZ—Brazil; 2AA-2ZZ—Great Britain; 3AA-3AZ—Monaco; 3BA-3FZ —Canada; 3GA-3GZ—Chile; 3HA-3UZ —China; 3VA-3VZ—France and Colonies; 3WA-3XZ—not allocated; 3YA-3YZ—Norway; 3ZA-3ZZ—Poland; 4AA-4CZ—Mexico; 4DA-4IZ—Philippines; 4JA-4LZ—U.S.S.R.; 4MA-4MZ—Venezuela; 4NA-4OZ — Yugoslavia; 4PA-4SZ — British Colonies; 4TA-4TZ — Peru; 4UA-4UZ—United Nations; 4VA-4VZ—Haiti; 4WA-4WZ—Yemen; 4XA-4ZZ—Israel; 5AA-5ZZ, 6AA-6ZZ; 7AA-7ZZ, 8AA-8ZZ, 9AA-9ZZ—not allocated.

Director Fung Chien of former XGOY (now using BEF calls), Chungking, informs me that this station still announces as "The Voice of China in Chungking, for our listeners' identifi-

cation." Director Chung furnished me this list of new call signs for Chinese MW and SW outlets:

Central Broadcasting Station, *Nanking*, 660 kc., BEA2; 15.105, BEA3; 15.250, BEA4; 11.880; BEA5; 17.765, BEA6; 11.830, BEA7; 9.730, BEA8; 5.985, BEA9. Shanghai Broadcasting Station, *Shanghai*, 900 kc., BEB2; 800 kc., BEB3; 1,390 kc., BEB4; 11.780, BEB5. Chekiang Broadcasting Station, *Hangchow, Chekiang*, 1,280 kc., BEC3; 1,440 kc., BEC5. Taiwan Broadcasting Station, *Taiwan*, 750 kc., BED2; 1,020 kc., BED3; 7.215, BED9; 1,190 kc., BED22; 1,340 kc., BED29; 960 kc., BED23; 1,040 kc., BED24; 840 kc., BED25; 1,070 kc., BED26; 1,060 kc., BED27; 890 kc., BED28. Fukien Broadcasting Station, *Foochow, Fukien*, 1,140 kc., BED4; 720 kc., BED7. Kiangsi Broadcasting Station, *Nanchang, Kiangsi*, 1,080 kc., BED5. Amoy Broadcasting Station, *Amoy, Fukien*, 1,310 kc., BED6; 9.552, BED8. Canton Broadcasting Station, *Canton, Kwangtung*, 1,160, BEE2; 800 kc., BEE3; 9.700, BEE4. Kunming Broadcasting Station, *Kunming, Yunnan*, 700 kc., BEF2. Chungking Broadcasting Station, *Chungking*, 1,200 kc., BEF3. Kweichow Broadcasting Station, *Kweiyang, Kweichow*, 1,000 kc., BEF4; 6.065, BEF9. The Chinese International Broadcasting Station, *Chungking*, 7.153, BEF6 (this one lately has actually been heard on 7.100—K.R.B.); 11.913, BEF7; 15.170, BEF8; 6.140, no call letters listed. Peiping Broadcasting Station, *Peiping*, 1,350 kc., BEK8; 770 kc., BEK25; 11.700, BEK9; 850 kc., BEK2. Tientsin Broadcasting Station, *Tientsin*, 620 kc., BEK3; 810 kc., BEK22; 1,110 kc., BEK25; 1,290 kc., BEK27. Tsingtau Broadcasting Station, *Tsingtau*, 1,150 kc., BEK4; 710 kc., BEK23. Hankow Broadcasting Station, *Hankow, Hupeh*, 600 kc., BEL2; 830 kc., BEL5; 7.245, BEL7. Hunan Broadcasting Station, *Changsha, Hunan*, 950 kc., BEL4. Lanchow Broadcasting Station, *Lanchow, Kansu*, 820 kc., BEM2; 1,400 kc., BEM4; 9.750, BEM6. Shansi Broadcasting Station, *Sian, Shansi*, 1,300 kc., BEM3. Kweisui Broadcasting Station, *Kweisui, Suiyuan*, 970 kc., BEN2. *Shansi* Broadcasting Station, *Taiyuan, Shansi*, 790 kc., BEN3; 1,220 kc., BEN5; 9.520, BEN6.

Yvan Michel of ex-HHYM, *Port-au-Prince, Haiti*, sent Kary this official list of *new* Haitian calls—HH2S, 5.951, is now 4V2S; HHYM, 6.000, is 4VM; HH3W, 10.076, is 4VRW; HHCN, 6.407, is 4VCN; HHCP, 6.200, Cap-Haitien, is 4VA; HHBM, 9.660 (inactive), is 4VBM; HHCM, 6.166, is 4VCM; HHCA, 4.665, is 4VCN; 4V2S was bought by the political group now in power and thus can be considered the "official" Haitian government station, it was explained.

According to reports reaching *Radio Australia*, here is information on *new* calls of Philippine Republic outlets—KZFM, *"The People's Station,"* has become DZFM, 710 kc.; DUH2, 6.170; DUH4, 9.615; DUH5, 11.840. KZMB,

"The Voice of Manila," has become DZMB, 760 kc.; DZH4, 6.000. KZPI, *"Radio Philippines,"* has become DZP1, 800 kc., DZH3, 9.500. KZRH, *"The Voice of the Philippines,"* has become DZRH, 650 kc., DZH2, 9.640. KZRC, *"The Voice of Cebu,"* has become DYRC, 600 kc.; DYH2, 6.140. KZBU has become DYBU, 1,250 kc.; DYH3, 6.100. KZRM is assumed to be DZRM on 620 kc., and possibly DUH3 or DZH5 on 9.570 (?).

* * *

Verification Data

Although XGOY (now using BEF calls), Chungking, still lists its 41-m. outlet as 7.153, station officials verified my report on 7.100 and stated "your estimated frequency was very accurate."

Radio Athens is again verifying promptly and states it is "catching up" on answers to reports received over the past several months; delay was caused by "voluminous correspondence," it is stated by D. K. Svolopoulos, Director General of the National Broadcasting Institute. He says further, "We are always at your disposal for anything you would like to know about radio in Greece. It is a great pleasure for us to know that *Radio Athens* has many listener-friends around the world, who like to hear directly from Greece about the actual situation prevailing in this country."

Australian Broadcasting Commission, 264 Pitt St., Sydney, N.S.W., Australia, verifies VLI reports. (Cushen, N. Z.) Other QRA is G.P.O., Box 487, Sydney, N.S.W., Australia. (Rosenauer, Calif.)

HI2T-HI4T sent card giving new (announced) slogan of *"La Voz de Dominicana."* (Pearce, England)

Address of the *new* station in Portuguese India is Emissora de Goa, Goa, Portuguese India. (Gillett, Australia)

HOQQ, 6.140, Aptdo, de Correos 552, Panama, Republic of Panama, sent a long letter in Spanish; said is "backed" by the newspaper *Diario Vanguardia;* transmits three times a day—0800, 1300, 2200. Said using *Hallicrafters* BC-610-E which has been adapted to operate in the 49-m. band with a 250-watt output; antenna is doublet type "Y" with a 600-ohm transmission line. Sent along a clipping from the daily *La Hora* for which one of their staff writes a column; in part, it was stated in the column, "We should endeavor to improve our programs as listeners outside of the country hear them also"; then they printed report in full from McPheeters, La., who relayed this data to *ISW.*

Recently, *Radio Moscow* has been verifying again widely; QSL cards are signed by Petrov of the "Moscow Mailbag" Section; seems to take about three months for reply.

* * *

Club Notes

England—The International Short Wave Club, 100, Adams Gardens Estate, London, S.E. 16, England, is observing its 20th anniversary during 1949. Among founders were George F. Brooks, Joseph Sessions, Jacob Kleimens, Charles Schroeder, and Arthur J. Green. This club was started in America. ISWC is conducting a membership-getting contest running January-July 1949; a Silver Trophy and other awards are to be given. Also it has contests for SWL's on reception reports of the several special programs being dedicated to ISWC during that period; another contest is for amateur listeners.

QRA of headquarters, British Short Wave League, is 145, Uxendon Hill, Wembley Park, Middlesex, England. (Driver, Ohio)

United States—Miss Belle Aaron, Baltimore, Md., informs me that due to poor health she has given up the presidency of *Silent QRM-ers,* and that all information or inquiries concerning that club should be sent to Walter J. Hastrich, 19 Holland Ave., Lancaster, New York.

* * *

This Month's Schedules

Albania—Nattugglan, Sweden, reports Scutari on 8.220 at 1300.

Algeria—Pearce, England, has heard what may be a "spurious" signal of *Radio Algiers* at 1725 on 9.49 in parallel with the 9.57 regular channel; news in French 1745 with both channels becoming unintelligible shortly afterwards. Heard later with strong signal from 1330 (Arabic) on both channels, French program from 1500. Schild says the 9.57 outlet is best in New York around 1500.

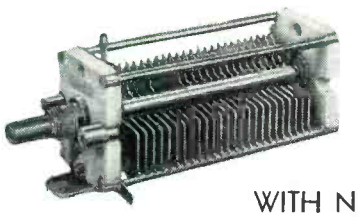
Andorra — Radio Andorra, 5.985, heard signing off "morning" session, with French and Spanish identification, 0900. (Pearce, England)

Anglo-Egyptian Sudan—The Public Relations Office, Broadcasting Service, P.O. Box 522, Khartoum, has informed a URDXC member that frequencies are 13.320 and 9.650 on SW and 572 kc. on MW; scheduled daily 2315-2345; daily *except* Fridays 1130-1300 and 1400-1430; Fridays 1130-1230, 1400-1430, 0300-0400, 0900-1000; all these in Arabic. Only *English* broadcast is Fridays 1230-1300. It was further stated that a *new* 6.5 kw. transmitter is being tested in the 31-m. band on 9.474. It was explained that this *new* transmitter would be operating also on other frequencies between 19- and 40-m. The 9.747 outlet is heard well in East daily in Arabic at 2315-2345; at 2330 announces *"Huna Omdurman."* (I would like to know actual location of Anglo-Egyptian Sudan transmitters, as some say at Khartoum while others say location is Omdurman; appears to verify from Khartoum.—K.R.B.)

Angola — CR6RN, 9.475, Luanda, leaves the air 1600, as does CR7RL, 8.090. (Peddle, Newfoundland)

Swedes report *Radio Diamond,* CR6RG, Dundo, on 8.242 at 1400. (Nattugglan)

Radio Clube de Angola, Luanda, heard daily with "Radio Journal" at 1430 on 7.135 (news read by man and woman, alternating); heard to close-down 1800 with Port. National An-



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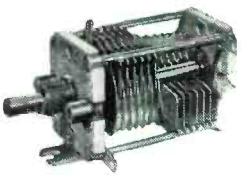

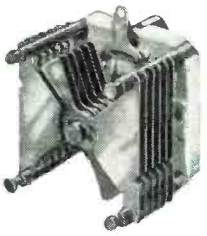

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DIFFERENTIAL TYPE — Available in three models: 2.8 to 11 mmf, 3.5 to 27 mmf, 4.6 to 51 mmf.

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- **Ready punched chassis**
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- **2 mike inputs, 1 phono input**
- **Push pull phase inverter driver for low hum and distortion**
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- **110-120 volt AC operation, on fuse UL approved line cord**
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- **Attractive, well-constructed steel chassis and cover. Baked hammerloid finish**
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Under 1940 — Universal Underdash Mounting Dials. Dealers' Price..... **$4.41**

Tuning Units 706-T1 up thru 720-T1. Dealers' Price..... **2.03**

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Volume control units 700-V1. Dealers' Price..... **.88**

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Cable kits to fit Delco-Arvin-Philco. Dealers' Price..... **2.09**

Motorola Cables. Dealers' Price..... **2.80**

When ordering, specify Make, and Model of car and make and model of radio.

Complete dial kit consists of "Head, Tuning Unit, and Volume Control Unit."

We carry a complete line of all auto radio equipment and accessories.

6" Square type Auto Speaker. 4 ohm field. Replacement for all auto radios.

Each..... **$1.95**

Lots of 10..... **16.50**

Radio Parts Company, 614 RANDOLPH ST., CHICAGO 6, ILL.

them; bad QRM from local hams; program checks with CR6RN, 8.090. *Radio Clube de Benguela* sent schedule of 1230-1400 on CR6RB, 9.165, CR6RF, 7.041. (Pearce, England)

Argentina — LRS-1, 9.315 *Radio Splendid,* Buenos Aires, after giving usual network calls, announces "transmitting with *Radio La Americana,* Santiago de Chile" (this is CE960, 9.593V). (McPheeters, La.)

Novomstky, Puerto Rico, reports a *new* outlet of *Radio Splendid,* LR-4, 17.94; suffers from slight CWQRM and is heard from 1930; states it is operating in network with *Radio La Americana,* Chile.

Australia — "Autumn" schedules of *Radio Australia (English),* recently effected, are—Forces Service to Japan, weekdays 2158-2315, VLB5, 21.540; VLC9, 17.840; VLG11, 15.210; Sats. and Suns. commences 2100, and VLA6, 15.200, is brought into service also. Sporting news on holidays and Saturdays is at 2215-0230 on VLB5, 21.540, VLG11, 15.210. To West Coast of North America, 2330-0045, VLA8, 11,760; VLC4, 15.320; in parallel for Africa, VLB5, 21.540; to ships at sea in Indian Ocean, VLG11, 15.210. To Britain and Europe, 0200-0245, VLC10, 21.680; 0200-0315, VLA8, 11.760, VLB9, 9.580. Forces Service to Japan, 0330-0630, VLA6, 15.200, VLB3, 11.760. To Asia, 0355-0630, VLC4, 15.320, VLG3, 11.710; 0630-0900, VLA6, 15.200, VLG3, 11.710; 0630-0645, VLB3, 11.760, VLC4, 15.320. To East Coast of North America, 0700-0845, VLB, 9.54, VLC7, 11.810. To Britain and Europe, 0900-0945, VLC11, 15.210, VLB3, 11.760; 0900-1000, VLA6, 15.200, VLC3, 11.710. To West Coast of North America, 1000-1115, VLC3, 11.760, VLB9, 9.615; to Asia, VLG3, 11.710; and at 1015-1115 to Africa, VLA6, 15.200. To Britain and Europe, 1500-1630, LVA8, 11.760, LVB2, 9.650; at 1500-1655, VLC9, 17.840. To Forces in Japan, 1643-1815, VLB6, 15.200. To East Coast of North America, 1643-1815, VLA5, 15.230. To South America, 1655-1815, VLC9, 17.840. To Britain and Europe, 1710-1815, VLG3, 11.710. Language broadcasts are to Europe (French), 0100-0145, VLA8, 11.760, and to Tahiti on VLG6, 15.240 (*except* Sats., when is replaced by VLC, 15.200); to New Caledonia, (French), 0245-0345, VLG3, 11.710; 0300-0345. VLC4, 15.320; to Europe (German), 1200-1315, VLA8, 11.760, VLB2, 9.650, and at 1230-1315, VLC11, 15.210.

Transmitter of VLI, Sydney, N.S.W., is designed primarily to serve the outback of New South Wales, but reports from overseas indicate that it has a much wider service area than this. Power listed 2 kw., schedule as 1500-1745, 6.090, 1800-0315, 9.500, and 0330-0830, 6.090. (Rosenauer, Calif.) Transmitter is located at Liverpool, N.S.W.; began service December 22, 1948. (Cushen, N.Z.)

Azores—Ponta Delgada, 11.090, is good signal 1500-1600. (Harris, Mass.) The 4.845 channel is heard in Newfoundland 1715-1900. (Peddle)

Belgian Congo—Radio Congolia, 9.210, Leopoldville, previously heard 1300-1330, more recently has been heard at 1230 giving call in French, off 1330. (Pearce, England)

Elizabethville, 7.200, operates daily 1130-1215. (BSWL)

OTM2, *Radio Conge Belge,* is scheduled 0000-0200, 0515-0700, 1100-1500 on 9.380, 6.295; *no English listed*; news bulletins are in French, Dutch, Flemish, Portuguese; OTC, 9.767, is scheduled 1300-1845, 1900-2300; *English* language programs at 1430-1530, 2100-2300; news 1432, 1527, 2102, 2355. (Rosenauer, Calif.) Weekly DX period is Wednesdays around 2110.

Brazil—ZYK-3, 9.565, heard ending *English* session 2045; woman announcer stated "Tune to this station at the same time tomorrow night"; she said other *English* programs are transmitted on Monday at 1800 ("Sugar Plantation Program") and Sundays at 1700 (*"Brazil Calling"*), then added, *"We will be very pleased to hear your impressions of this program, and all letters are gratefully received. All reception reports will be promptly verified." English* announcement at 2039 was, *"This program came to you from Radio Jornal de Cormercio, Recife, Pernambuco, Brazil."*

ZYN-7, 15.165, Fortaleza, has International Programs on Mondays, Fridays 1300-1500, with announcements in Port., Sp., and *English.* (Boice, Conn.)

Radio Nacional, Rio de Janeiro, informs Worris, N. Y., "We regret to state that at present we have at our disposal no program in the *English* language; within a short time, we hope to be able to satisfy your wishes which are the same as those of many other listeners of *Radio Nacional* in foreign countries." Gave schedule of Sun., Mon., Wed., Fri., 1130-2240; Tue., Thur., 1200-2240; and Sats. 1500-2240, all on PRL-7, 9.72.

Becker, Michigan, says PRF-5, Manaos, is now operating on 4.950, instead of former 4.895. Is reported to have news 1845 and to announce in *English* after 1900.

British Gold Coast—Has anyone in U. S. heard Accra testing on 15.435 around 0400-0430 as reported by Swedish DX-ers?—K.R.B.

The 4.915 outlet has *English* 1245-1300. (BSWL)

British Honduras—ZIK-2, 10.598, Belize, heard on a recent Monday closing 1317, but most weekdays closes around 1320. (Ferguson, N.C.)

Stark, Texas, informs me that opens daily 1305 with news; on Sundays runs longer than weekdays and at 1320 has "Caribbean Review," program sponsored by Caribbean Commission; Sunday sign-off is 1433, announcing "until 1230 tomorrow" (local time).

Bulgaria—Sofia's 7.671 has been heard from 2250 sign-on to after 2330; sometimes is badly mauled by Aø carrier. (Kary) Has been heard in North Carolina late as 0035 when was covered by QRM. (Ferguson) Bellington, N. Y., says at times has been badly jammed.

The 7.671 channel is heard in England with news 1530-1540 and again 1650-1700. (Pearce)

Burma—Rangoon's 6.035 outlet is good now on West Coast to 1015 closedown. (Dilg, Calif.) Has news 1000.

Canada—CBC International Service is scheduled — To Europe, 0915-1128, CKNC, CKCX; 1130-1500, CKNC, CKCS; 1500-1515, CKCS; 1515-1715, CKCS, CHOL; 1715-1730, CHOL; 1730-1830, CHOL, CKLO. To Australia and New Zealand, 2300-2340 (commentaries from the U.N.; *except* Sun., Mon.), CHOL, CKCS; 0345-0530, Sundays *only* (*English* program for listeners in Southwest Pacific area), CHOL, CHLS. To Latin America and the Caribbean, 1845-1925, *English* to Caribbean, CKCX; 1845-1925, Spanish, CKRA; 1930-2025, Portuguese, CKRA, CKCX; 2030-2130, Spanish, CKRA, CKLO; 2130-2145, French, CKRA, CKLO; and 2145-2235, *English*, CKRA, CKLO. To Northwest Territories, Sundays *only*, 2310-2400 (winter service to Arctic settlements), CKLO, CKOB. Frequencies are CKNC, 17.82; CKCS, 15.32; CKCX, 15.19; CKOB, 6.09; CKRA, 11.76; CKLO, 9.63; CHOL, 11.72; CHLS, 9.61.

Stein, Calif., says VE9AI, 9.540, Edmonton, Alberta, peaks around 2100-2200.

CHNX, 6.130, Halifax, Nova Scotia, has mailbag feature Saturdays 1830. (Weisberg, N.Y.)

Cape Verde Island—CR4AA, *Radio Clube de Cabo Verde*, Praia, sent QSL card giving frequency as 6.024 and daily schedule as 1330-1500, but when heard was on approximately 5.910 and heard to 1700 closedown. More recently has been heard near 5.895 with severe CWQRM. (Pearce, England)

Ceylon—Colombo, 4.900, has *English-French* Lessons by Radio on Fridays 1115. (Cushen, N.Z.)

China — Former XURA (now BED9), listed 7.215 by Chinese, Taipei, Formosa, heard at 0615 with Western music, then Chinese news. (Sanderson, Australia)

XNCR, 9.39, heard in Australia 0725 with Chinese news and Western music. XAET, 9.50, heard 0600 when woman reads Chinese news. (Sanderson)

XLRA, 168 Victory St., Hankow, verified via airmail; gave frequency 11.500 and schedule as 1800-1915, 0500-1000; signed by L. C. Cheng, Director. (Cushen, N.Z.) Heard in Ohio at 1800 to 1820 fade-out. (Sutton) Also heard in Massachusetts at 1800. (Harris)

Former XGOA (now using BEA calls), Nanking, airmails these schedules—To North America, 15.105, 2100-2340, news 2115, 2230. To Australasia, 9.730, 0500-0550, news 0520-0530 and *English* commentary 0540-0550. To Mongolia, Tibet, Japan, and Pacific Islands, 9.730, 0550-0730, *no English listed*. To India, South Africa, and Europe, 9.730, 0800-1000, news 0900, and *English* commentary 0840-0850. Lists 5.985 and 660 kcs. in parallel at 0800-0830, 0900-0915; however, it is believed 9.73 and 5.985 parallel most of the morning sessions. The 15.105 transmission has not been reported to me as heard in America recently.

ZBW-3, 9.525, Hong Kong, has improved signal around 0445 to after 0715. (Gaynor, Calif.) Carries BBC news relay 0600.

XGYA, 7.990, China, heard daily around 0500 to sign-off 0830; relays XNCR (Communist-controlled) from 0500 to 0730; programs are in Chinese and identification is given at 30-minute intervals. (Desouza, Singapore, via *Radio Australia*) Has been heard in California by Dilg around 0750 with news in Chinese at dictation speed, with repeated sentences, badly CWQRM'd.

Colombia — Radiodifusora Nacional de Colombia informs Eyles, Md., that "the weekly newscast in *English*, following a program of Colombian folk music, is heard over our 11.68 transmitter, every Thursday 2100; *daily* newscasts in *English* will be on the air in the near future."

HJCQ, 11.680, heard evenings to 2230 or later. (Ferguson, N.C.)

Costa Rica — TIPG, approx. 9.615, San Jose, good signal signing on 0700; Spanish news was followed by musical program. (Boice, Conn.)

Cuba—COBC, 9.363, signs off 0015 after news in Spanish; network is *Radio Progreso* and slogan frequently used is *"La Onda de Alegria."* COCY, 11.74, is scheduled 0630-0100. (Mueller, Ohio)

Curacao—Hankins, Pa., reports Wellemstad heard recently on approximately 5.010 at 1835 to after 2000; *no English noted.*

Cyprus—Sharq-al-Adna verified with mimeographed form letter, saying it transmits 12 hours daily on 6.135, 6.170, 6.790, 9.650, 11.720, but gave no definite schedules. (McPheeters, La.)

Czechoslovakia—Prague's 9.55 outlet heard in England signing on 1000. (Pearce) This channel is now used to North America daily 1900-2000, news at start; has bad QRM. (Bishop, Ohio) Is poorly modulated.

Denmark—Copenhagen now broadcasts to Eastern countries on 15.165 on Tuesday, Thursdays, Fridays, 0500-0600, partly in Danish and partly in *English*. Uses the new 50-kw. transmitter.

Dominican Republic — HI2T, 9.735, signs off 0030. (Mueller, Ohio)

HI2A, formerly 7.217, has been wandering around the 31-m. band, reported on 9.490, 9.407, 9.417, 9.665. (Stark, Texas, Hankins, Pa., Sutton, Ohio, others.)

Ecuador—HCJB, Quito, now has six transmitters and will obtain five additional ones of 20 kw. each when finances permit. Aims at a total of 100 kw. eventually. (Swedish DX session)

"La Voz de Riobamba," heard on measured 7.472, to sign-off 2250. (Ferguson, N.C.)

El Salvador—YSR, 6.260, *"La Voz de el Salvador,"* good signal, signed off 0000 announcing sign-on time as 1200. (McPheeters, La.)

England—Cushen, N. Z., lists as *new* BBC outlets GSY, 6.040; GSX, 6.060; GSZ, 6.170; GWZ, 7.200; GWX, 9.570; GWY, 9.700; GWV, 11.790; GWW, 11.890; GWD, 15.200; GWU, 15.210; says BBC now has 86 frequencies assigned.

Finland—The Finnish Broadcasting Company is sending out a *new* verification card for the 15.190 (100 kw.) channel, bears picture of the *new* transmitter, and lists OIX1, 6.120, 15 kw., Helsinki; OIX2, 9555 (presumably moved from 9.500?), 15 kw., Lahti; OIX4, 15.19, 100 kw., Pori; and OIX5, 17.800, 1 kw., Helsinki. On reverse stated "our daily program times are 2200-0000, 0700-0800, 1145-1245, 1600-1700" (presumably for 15.19).

France—RDF, Paris, was heard on 7.280 signing off 1600. (Ferguson, N. C.)

French Cameroons—Alfred, Canada, reports *Radio Douala* on 9.160, signing off 1515. (URDXC) Heard in England with recordings 1315. (Pearce)

French Indo-China—Sanderson, Australia, reports Pnompenh on 12.36 at 0530 with Chinese news at dictation speed, then music. I wonder if this is the listed *"La Voix de Sud Vietnam"* at N. Annam given officially as on 12.384?

The station on 11.78 with news 1830 is definitely *Radio Saigon;* some days is quite readable, but usually suffers bad CWQRM; signs on 1800 with *"La Marseillaise."*

French West Africa—Radio Dakar, 11.898, heard early as 1325; is scheduled weekdays 1330-1700, to 1800 Saturdays, and Sundays 1300-1800. (Pearce, England)

Germany—Leipzig, 9.728, heard signing on 0000. (Bellington, N. Y.) Heard with excellent signal (German) at 0215; 6-tone interval. (Ormond, N. C.)

Greece—Radio Athens is scheduled on 9.607 at 0015-0235, relaying a medium-wave outlet, also 0500-0800. Is on 7.300 at 1100 news in Greek; 1130 *English:* 1145 French; 1200 Turkish; 1250 Russian; 1300 Rumanian; 1310 Yugoslav; 1320 Bulgarian; 1330 Albanian; 1340 warnings to shipping; 1400-1600, relay of medium-wave program. On 15.345 at 1730-1830 still has special transmission for the United States, news at start; latter is received poorly in East most days.

(*Continued on page* 127)

Circuit Isolation

(*Continued from page 62*)

strument (milliammeter), a neon lamp, or an "eye" tube. Each of the various combinations of audible, visual, and type of voltage supply has its advantages which is usually reflected in the price of the unit.

In addition to isolating the faults normally encountered in servicing a "dead" radio, the signal tracer is an invaluable instrument in the determination of the origin and cause of distortion, fading, and hum. Prior to signal tracing, there was no reliable or fast method of localizing the sources of distortion, fading, and hum other than the old standby system of replacing suspected components. Often on fading and intermittent distortion faults, considerable time was wasted by the serviceman in listening to the radio after the suspected part or parts were replaced to determine whether his reasoning was correct. Needless to say, his first replacement often did not correct the fault and he would have to try again.

As may have been gathered from the above discussion, testing a defective radio by signal tracing is one of the fastest methods developed to date. To illustrate the procedure, it is thought best to start by troubleshooting a "dead" set. All references hereafter are to Fig. 2 which is a typical a.c.-d.c., five-tube radio receiver.

Dead Set

To start troubleshooting, invert the set in the conventional position (to a serviceman), turn on the power, and set the dial at a convenient station. Before starting to probe the radio set with the signal tracer, it is advantageous to check the "B+" voltage at the cathode of the 35Z5 and at the output filter condenser. This voltage should be approximately 85 to 135 volts d.c. Since filter condensers break down frequently, the fault may be found at this stage. However, if the voltage at these two points is present, the faulty component is at some other part of the radio circuit and the use of the signal tracer will facilitate localizing the defect. Connect the ground clip from the signal tracer to the chassis (radio), turn on the signal tracer to full gain, and touch the probe to the signal grid of the 12SA7. A radio signal (program) should be heard if this stage is functioning properly. If no signal is heard, one of the following is the cause:

a1. Open or shorted antenna loop or coil
b1. Shorted plates on variable (r. f. section) condenser
c1. Shorted trimmer condenser on r. f. variable condenser
d1. Grid-to-cathode short

These defects can easily be ascertained in a few minutes by the use of an ohmmeter and the repair or replacement of the defective component may be effected.

Next, we touch the probe of the signal tracer on the mixer plate of the 12SA7 converter tube (i.f. input primary). If no signal (radio program) is heard, check the following:

a2. Inoperative converter (mixer or oscillator section)

b2. Open or shorted i. f. transformer (primary)

c2. Open or shorted oscillator coil (primary or secondary)

d2. Shorted oscillator variable or trimmer condenser

e2. Open or shorted oscillator grid coupling condenser or coupling winding. (Some manufacturers obtain grid coupling by means of a capacity winding on the oscillator coil

f2. Open or shorted grid leak resistor

Defect *a2* may be checked by substituting a new tube and the remaining defects by means of an ohmmeter.

Assuming that this stage is operative, touch the control grid of the 12SK7 with the probe of the signal tracer. Should no signal be heard, the possible defects are:

a3. Open or shorted i. f. transformer (secondary)

b3. Grid-to-cathode short in 12SK7

If a signal is heard, then touch the plate terminal of the 12SK7 with the probe. A signal of higher level should be heard because the signal has been amplified by the 12SA7 and the 12SK7. It may be necessary to turn down the gain on the signal tracer. If no signal is heard, then we may look for trouble at the following points:

a4. Inoperative tube (12SK7)

b4. Open or shorted i. f. transformer (primary)

Should the signal be heard, we can reasonably assume that our electrical circuits are intact and functioning properly from the antenna to the plate of the 12SK7. Our problem is to probe further. Apply the probe to the diodes of the 12SQ7 tube. If no audible signal is emitted by the signal tracer, check the following:

a5. Inoperative diodes

b5. Open or shorted i. f. transformer (secondary)

c5. Open or shorted r. f. filter (bypass condenser)

d5. Shorted diode load (volume control)

e5. Shorted a.v.c. filter

Since the diodes are part of the 12SQ7, defect *a5* can only be corrected by inserting a new 12SQ7. This is one disadvantage of using multi-purpose tubes.

If the signal is heard, we proceed with our probing by applying the probe to the grid of the first audio tube which is the triode section of the 12SQ7. If a signal is not heard, the defective component is:

a6. Shorted contact bias resistor

At this stage, all r. f. has been demodulated (detected) and we will be concerned only with audio frequencies. When a signal is heard on the grid of the first audio tube, it indicates that the whole r. f. section (converter, i. f.'s,

and second detector) of the radio is operative. The probe is now applied on the plate of the 12SQ7. If a signal is not heard, we have localized the trouble to:

a7. Inoperative triode (12SQ7)
b7. Open plate load resistor
c7. Shorted output stage grid resistor

The above failures may be determined as noted previously with a volt-ohmmeter or inserting a new tube. Since we have not located our evasive defect, we will continue working toward the speaker end and probe further into the intricacies of the remaining circuits. Our next step is to apply the signal tracer probe to the grid of the 50L6. At this point, you will find that the gain of the signal tracer should be reduced since we now have three complete stages of amplification in the radio before making contact with the probe of the signal tracer, which is essentially an amplifier. If no signal is heard, the following failure may be the troublesome element:

a8. Open coupling condenser

Our failure has not been located if the signal is heard. Apply the probe on the plate of the 50L6. Now, if a signal is not heard ,the fault may be:

a9. Inoperative 50L6
b9. Open or shorted output transformer
c9. Shorted plate-to-ground condenser
d9. Open cathode resistor

If, however, a signal is heard, then our evasive fault is either an open or shorted secondary on the output transformer or an open voice coil on the speaker. The defective component may be found with the aid of an ohmmeter. Replacing the part will naturally correct the trouble.

Distortion

The above discussion is typical procedure followed in localizing trouble in a dead set. The signal tracer, as previously mentioned, is very helpful in locating distortion since the distortion is made audible on the signal tracer whether it is in the r. f. or audio stages. The source or cause of distortion can be localized by following the procedure outlined above. Starting on the first tube and following the signal from the grid to plate on each tube, the stage in which the distortion originates can be easily determined. For example, when the probe is placed on the grid of the 50L6, no distortion is heard. But when the probe is applied on the plate of the 50L6, a distorted signal is heard. The distortion has been localized and the defective component is a defective 50L6 having a leaky or shorted cathode.

Some distortion results from leaky coupling and bypass condensers which may be detected readily with a signal tracer. In locating distortion, it is preferable to work with the volume of the radio under test turned down so that the output of the signal tracer is higher than that of the receiver. Occasionally, it is convenient to disconnect the voice coil of the radio being tested.

Fading

Fading sets have long been the main source of headaches for the serviceman. Often, radio servicemen will refuse a fading job since if the trouble is not located quickly, the labor involved to localize the trouble is high. Some servicemen have "lost their shirts," so to speak, on fading jobs. Although fading is still one of the toughest problems in the radio servicing shop, the signal tracer is a very valuable instrument or service tool. In servicing a fading job, get the relative gain at the plate terminal of each stage when the radio is playing normally. The relative gain, depending on the type of instrument you own, may be in terms of scale deflection, "eye" closing, or volume output of the

OBTAINING FINE ADJUSTMENTS WITH RHEOSTATS

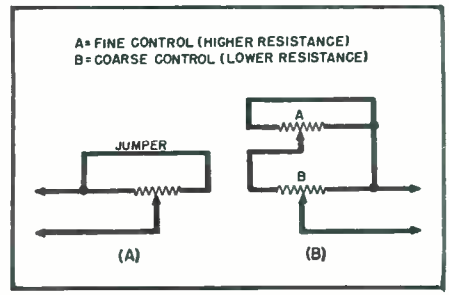
By HUGH LINEBACK

WHEN a variable resistor does not provide adjustments which are delicate enough, a handy trick is to make the connections shown in Fig. 1A. Tying a jumper between the two ends of a rheostat reduces the maximum resistance obtainable to one-fourth the previous value, but at the same time the usable movement of the sliding arm is reduced only one-half. Thus a finer adjustment is obtained, and it will be found that the rate of variation is most gradual when the arm is near the center. Also in this region the current carrying capacity will be nearly doubled.

This scheme is useful in the construction of instruments and with experimental setups where the wirewound variable resistors give too coarse a variation. For example, in plotting characteristic curves of tubes, students will find this arrangement valuable for setting filament current exactly on specified values.

If a wide range of control is necessary, the circuit of Fig. 1B may be used. Here the element with lower resistance provides coarse settings while the higher resistance rheostat shunted across it gives fine variations. In use, this fine control should be set initially at the center position until coarse adjustment is made as closely as possible. When used permanently in a piece of equipment, a stop may be added to restrict the slider to the desired limits of rotation. —30—

Fig. 1.



signal tracer. As soon as the radio fades, read the gain at each stage again. A decrease from the normal gain at any one particular stage indicates that this stage is the faulty section in the radio. For example, if you find that the signal strength (level) remains the same on the plate of the 12SQ7 and the signal level has decreased on the plate of the 50L6, you have localized the defect between the outputs of these two stages. To isolate the trouble to a fewer number of components, you should apply the probe to the grid of the 50L6. If you find that the signal level has decreased at this point, then the trouble has been isolated to a faulty coupling condenser or a partially shorted grid resistor.

As another example, assume that the signal fades on the plate of all the tubes in the set. This fault is usually in the "B+" supply. The trouble is probably a bad filter condenser or a leaky 35Z5 cathode. Of course there are many other causes of fading. These are too numerous to mention or discuss and naturally are beyond the scope of this article.

Hum Disturbances

Another troublesome fault which may be easily localized by the use of a signal tracer is hum. Probably the best procedure to follow, in this case, is working from grid to plate of each stage. It is surprising how many times a radio tube will test good in a tube tester and yet cause hum when used in a radio. The serviceman usually loses time because he doesn't suspect the tube, having just tested it or having replaced it with a new tube which causes hum. When you are acquainted and familiar with the use of a signal tracer, you will agree that hum in a radio set is no longer a serious or troublesome problem.

Miscellaneous Tests

It is only fair to state that a signal tracer is a versatile instrument and may be used to make other tests besides those noted above. As you become acquainted with it, you will find more and more tricks and ways of using it to test radios or components. Some of the other uses are the testing of paper condensers, resistors, record player crystal pick-ups, microphones, and speakers. Some of the units currently being sold on the market have provisions such as a jack or a set of terminals so that they can be used as audio amplifiers. If this provision is not on your unit, it can be added.

In conclusion, the author wants to indicate that it is not the intent of this article to sell you signal tracers, or imply that the signal tracer method of isolating circuit defects is the only good method of troubleshooting. This article has been written with the idea of familiarizing the serviceman with another of the numerous methods employed in servicing the many defective radios. The above is but one of the many techniques employed. —30—

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.

ANTENNA ACCESSORIES

The complete line of radio antennas and accessories put out by *L. S. Brach Manufacturing Corp.* is described in detail in a new catalogue, No. 1304.

Of particular interest to servicemen is the new "HI-LO" Rotatable Antenna which has been designed to cover all television channels. A new high-frequency antenna, covering 152 mc. to 162 mc., is also described in detail. This unit has been designed for automobile communications systems for mobile telephone applications.

Antenna accessories described include all the elements required for efficient installation, operation, and convertibility.

This loose-leaf catalogue may be obtained by addressing *L. S. Brach Manufacturing Corp.*, 200 Central Ave., Newark 4, New Jersey.

MERCHANDISING KIT

The complete merchandising kit which *Belden Manufacturing Company* is currently including with its new "Polypoint" FM antenna has been designed to assist dealers and servicemen in promoting better FM reception in their areas.

This new kit includes posters, promotion pieces, and newspaper advertising mats. This material has been developed to assist dealers and servicemen in their task of creating greater satisfaction with new FM receivers.

This kit is available only with *Belden's* new "Polypoint" FM antenna.

MINIATURE TUBE CHART

The latest four-page tube reference folder published by *Raytheon Manufacturing Co.* includes all pertinent characteristics, applications, terminal connection diagrams, and outline drawings for every miniature receiving type tube now announced and produced by all tube manufacturers.

To obtain a copy of this chart, address *Raytheon Manufacturing Co.*, 60 East 42nd Street, New York 17, N. Y.

CONDENSER CATALOGUE

The *Cornell-Dubilier Electric Corporation* has compiled a complete bulletin on its line of condensers used in capacitor-type motors.

This 56-page catalogue, No. 163, contains eight distinct sections, covering Motor Part Numbers (alphabetical listing; Motor Part Numbers (numerical listing); Cross Index of *C-D* Replacements (numerical listing); Replacements; Technical Information; *C-D* Catalogue Listing; Interference Filters; and Service Mikes.

The replacement section includes tables listing the proper *Cornell-Dubilier* type for replacing units made by other manufacturers. This information should be helpful when there is only a condenser number to work with and when the characteristics are unknown.

Catalogue No. 163 is available free of charge, and may be had by addressing the Jobber Division, *Cornell-Dubilier Electric Corporation*, South Plainfield, New Jersey.

HYTRON REFERENCE GUIDE

Hytron Radio & Electronics Corporation announces the latest edition of its reference guide for miniature electron tubes, prepared primarily for servicemen, technicians and engineers.

This six-page booklet contains 91 types, 19 of them new, and includes pertinent characteristics, data and basing diagrams for all miniatures announced to date, regardless of make. Besides the miniatures, the listing includes similar larger prototypes.

This Hytron Reference Guide, third edition, is available free of charge at all company jobbers, or write direct to *Hytron Radio & Electronics Corporation*, 76 Lafayette Street, Salem, Mass.

DYNAMOMETERS

W. C. Dillon & Company, Inc., has issued a new bulletin on its line of dynamometers. The uses to which these instruments may be put are reported, and clear and informative photographs are used to show the dynamometer at work in the rubber, aircraft, communications, steel, automotive, and railroad industries, etc.

Dynamometers such as those described in this bulletin may be used for measuring traction, tension, or weight from 0-500 pounds to 0-20,000 pounds with close accuracy. It differs from spring measuring devices in that it operates through deflection of an alloy steel beam, and requires only .040" movement to indicate a full scale reading.

Manufacturers interested in obtaining this illustrated pamphlet may write *W. C. Dillon & Company, Inc.*, 5410 West Harrison St., Chicago 44, Illinois.

TV SUPPLY BOOKLET

The House of Television, New York manufacturer of the Tele Filter, Multivision Screen and Signal Kleer line of television accessories, has completed a new catalogue which may be obtained free of charge by dealers and distributors.

A 12-page, 8½" by 11¼" booklet, which was designed to fit standard binders, the new catalogue contains illustrations, descriptions and specifica-

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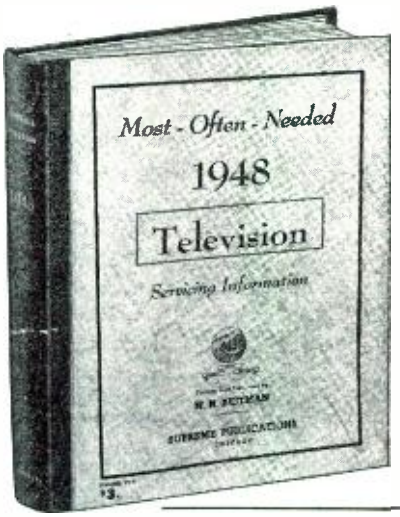

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Compiled by M. N. Beitman, radio engineer, teacher, author & serviceman.

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tions of the *House of Television* line of television products. Included also are selling hints together with numerous servicing and installation suggestions. Among the items listed are the Signal Kleer accessories such as antennas, indoor antennas, mounting hardware, wave traps, attenuator and matching pads, and matching transformers.

Dealers and distributors desiring a copy of the catalogue are asked to write the *House of Television*, Starrett-Lehigh Building, New York 1, N. Y.

REPLACEMENT TRANSFORMER CATALOGUE

The *Crest Transformer Corporation*, which produces transformers and component parts for the radio and television industry, has completed a new catalogue on its line which is designed to meet the requirements of manufacturers, jobbers and amateurs.

Forty major types of replacement transformers, comprising 186 specific units, are listed and described, and in an effort to present the products clearly and concisely, the items are in alphabetical and numerical order where possible.

Requests for this *Crestran* catalogue should be addressed on business stationery to *Crest Transformer Corporation*, Department T, 1834 West North Avenue, Chicago 22, Illinois.

TYPE "K" SUPPLEMENT

A 12-page supplement to its Type "K" Bulletin has been issued by the Catalogue Department of *Cannon Electric*, 3209 Humboldt Street, Los Angeles 31, California.

The booklet contains new information on the "K" and "RK" types of Aircraft Firewall connectors, as well as 16 new insert arrangements in various shell sizes for radio, sound, electronic, and electrical equipment.

Included in the new insert arrangements are various layouts having one to eight coaxial contacts, including the LK-R24C insert used on television cameras.

Twenty-five pressurized receptacles are listed as available in the "K" series. These are generally limited to inserts having 10-amp., 15-amp., or 30-amp. pin contacts only.

Address the Catalogue Department, *Cannon Electric*, 3209 Humboldt Street, Los Angeles 31, California.

1949 TV CATALOGUE

On February 15, *The Workshop Associates* released a new eight-page television catalogue listing its new line of antennas and accessories. The compilers of this booklet have written in a clear and concise style, illustrating it with diagrams, charts, and sketches of typical installations.

This 1949 television catalogue will probably be helpful to servicemen and dealers, as *The Workshop Associates* engineering staff, in their announcement, stated that besides the listings usually found, they have attempted also to make it a comprehensive review of the problems of TV reception,

giving the solutions to these problems in methods utilizing advanced equipment and techniques developed by leading engineers.

Those wishing to obtain a copy may write to *The Workshop Associates,* Newton Highlands, Massachusetts.

PERMANENT MAGNET CATALOGUE

Cast and sintered Alnico magnets are described in the *General Electric Company's* 28-page illustrated catalogue which lists its permanent magnet line, as well as special magnetic alloys.

Photographs and pull curves have been incorporated in this booklet to illustrate the *General Electric* stocked magnets, and drawings of all *G.E.* stocked patterns are also included. Procedures are outlined for requesting quotations and obtaining magnet design assistance from the engineering department.

Copies of this new catalogue may be obtained by addressing the *General Electric Company,* Chemical Department, Pittsfield, Massachusetts.

ADJUSTABLE TRANSFORMERS

General Radio Company's transformer catalogue contains complete descriptions and general specifications of its line of adjustable auto-transformers. These transformers are used in voltage control for a.c. power.

The catalogue lists the various types available, and a chart is also supplied showing how to select the proper unit for each voltage and power. In the production line, in research and development, and in other laboratories and branches of the electrical industry, these auto-transformers can be applied where an a.c. control is desired.

Address *General Radio Company,* Cambridge 39, Massachusetts, for copies of this catalogue, specifying the New Variac Continuously Adjustable Transformer booklet. —30—

SOUTHWEST HAMFEST

THE hamfest in Lubbock, Texas, April 23 and 24, sponsored by the South Plains Amateur Radio Club is timed to coincide with the annual Electrical Engineering Show held at Texas Technological College, owing to the extensive phases of electronics and radio on the agenda of the college show.

It is believed this will be an outstanding event in the southwest for amateurs of West Texas, New Mexico, and Oklahoma. According to club president U. V. Blake, W5EWB, a great many reservations have been received.

The Tech Radio Club at Texas Technological College is assisting in the promotion of this hamfest, and the Lubbock XYL Club will help in the entertainment of the XYL's so the OM's can plan to bring her along. Registration on opening day begins at one o'clock, and hams are urged to plan to show up on time for a full program.

Reservations or information requests should be addressed to Rogers Orr, W5NIC, club secretary, who is assisting General Convention Chairman T. Bruce Craig, W5JQD. Mr. Orr's address is 2501 23rd St., Lubbock, Texas. —30—

Hi-Fidelity Amplifier

(*Continued from page 37*)

driver plate directly to the transformer.

The completely hum-free operation of this unit is due to the fact that a highly filtered d.c. heater supply was used for all tubes, except the 6L6's. It was found that the filter choke (*UTC* S-29) and all the high capacity condensers placed after each tube filament were absolutely necessary if complete freedom from hum was desired.

The d.c. voltage for the heaters was supplied by placing the 6.3 v., 4 amp. winding of a filament transformer, (*Stancor* P-4019) across the 6.3 winding of the power transformer (*Stancor* P-6165) and rectifying the voltage induced in the 117 v. primary, by using a 200 ma. selenium rectifier in a half-wave circuit in such a way that negative voltage is supplied, thereby providing a convenient bias supply for the 6L6 tubes, as well as lighting the other tubes. The 24 volts of negative bias was tapped off the heater line, between the 12SQ7 and the 12SJ7.

The "B" supply for the stages ahead of the 6L6's is very well filtered, using two 10 henry, 50 mil. chokes, and two 16 μfd. condensers. These chokes are made by several manufacturers and may be purchased at any radio equipment store. On the oscilloscope, with the gain running wide open, no ripple voltage could be detected. It is not necessary to use well filtered "B" voltage in the last stage, as all hum introduced there is cancelled out by virtue of push-pull. The only filtering for this stage is the swinging choke (*UTC* S-30) and a 16 μfd. condenser.

The power supply was mounted on a separate chassis, to keep any a.c. away from the high gain channels, and to avoid mechanical hum, caused when chokes and transformers vibrate the chassis and high gain tubes amplify this vibration. The only a.c. in the amplifier chassis is the 6L6 heater supply line. This is well twisted, and kept as far as possible from the other tubes, to eliminate any possible hum radiation into the other stages. The power supply may also be used to provide heater and plate voltages to operate additional equipment such as AM and FM tuners. This type of arrangement makes for an efficient and very compact over-all unit.

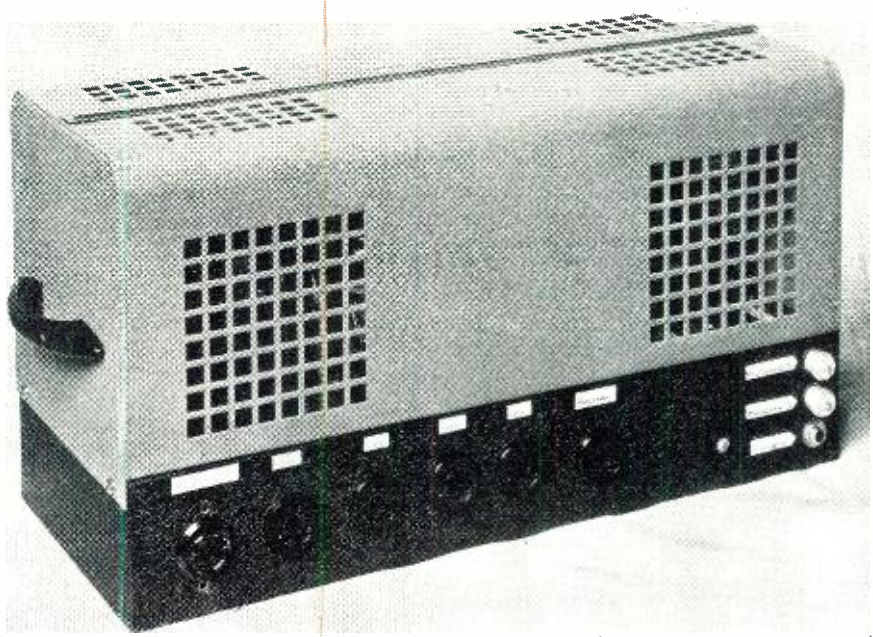
The over-all frequency response of 40 to 14,000 cycles can be made to have rising characteristics at the upper and lower ranges, by use of the boost controls.

Several very excellent recordings have been cut with this unit, which can match any cutter from 4 to 500 ohms impedance. As a public address amplifier, the unit far exceeded my fondest hopes. The quality of speech is superb. When treble and bass are fully boosted, every tone of the voice is brought out to its true richness of quality and clarity.

For highest quality, one must stand ready to expend much time and effort, as well as to suffer the high cost of quality components and accessories. There is little need to impress upon the reader that the results obtained from any amplifier can be no better than the supplementary equipment used with it. Good speakers—well baffled, high quality microphones, record players, and recording equipment, all these things go a long way toward enhancing the over-all performance of any high-fidelity sound equipment, and these facts should never be overlooked.

—30—

Fig. 5. Rear view of home-built amplifier. Six sockets are shown on rear flange. Only two of them (for power supply and speaker) are actually required—the others were incorporated to supply additional speakers and a recorder unit if they should be needed.



Spot Radio News

(*Continued from page 16*)

Republican and Democrat, respectively.

Commenting on his new bill, Senator Johnson said that the power decision should be made by Congress and cited a subcommittee report, which supported these views. According to the Senator and the report, there is the legal question as to whether this fundamental policy matter which affects all of the people should be decided by an ". . . administrative, regulatory agency created by Congress for that function or whether such a paramount question of important national policy should be determined by Congress itself." The Senator felt that basic, fundamental policy questions must be determined by the lawmaking body, the Congress.

The presentation of the new bill and action of the subcommittee placed the FCC in the same puzzling position they were in last fall, when probe of the power question was halted by Congressional intervention. And FCC is again faced with the problem of preparing an allocation program for the North American Regional Broadcasting Agreement, postponed from last summer and scheduled for September, with the power question still unanswered. Since the official position of this country at the September meeting is scheduled to be set by members of the State Department, the FCC and industry, and not the Senate group, there is the baffling question as to the position which will prevail at the conference, and which camp, the FCC-State Department or Congressional committee, will dictate policy.

There'll be many a roaring debate on the subject during the next few months.

FM TV may be a new factor in telecasting according to John R. Willoughby, FCC acting Chief Engineer and Hart Cowperthwait, acting chief of the FCC TV Broadcasting Section. Appearing during an informal Washington luncheon of broadcast engineers, who are members of the engineering committee of the National Association of Broadcasters, the FCC experts described their tests at the FCC lab just beyond Laurel, Maryland, which indicated that FM showed great promise of minimizing interference on TV, and was particularly suitable for the higher bands.

To support their statements, demonstrations were conducted several weeks later at the labs, with Edward W. Chaplin, chief of the FCC Laboratories Division, conducting the tests before members of the Commission, NAB and industry. Three receivers were used during the tests: one a 12" TV model converted for FM, with a limiter and discriminator for video only; another a standard TV model; and a third serving as a driver for the

two sets, picking up signals from Baltimore and Washington. The tests revealed that the FM method was slightly better in a 10:1 and 20:1 co-channel interference pickup, but in ghost tests did not show up too well.

According to engineers of *RCA* at the demonstration, FM TV tests had been conducted from the Empire State Building in New York City ten years ago and the results were unsatisfactory. It was because of these trials that FM was discarded when the National Television System Committee and RTPB set up the TV standards which are now the bases of operations.

While the Laurel and the Empire State Building tests did not provide completely satisfactory results, it did appear as if the newer approach had possibilities and that perhaps with concentrated developmental effort, FM might provide an avenue of use for TV.

THE THREE-YEAR-OLD GCA *(ground controlled approach)* and ILS *(instrument landing system)* argument came to an end a few weeks ago at the CAA offices, when D. W. Rentzel, administrator of civil aeronautics, announced that both systems had been approved.

The GCA system, which provides plane control by radar observations from the ground with oral radiotelephone instructions to the pilot, has been a standard with the Navy and Air Force as a bad-weather landing aid. For years, the CAA permitted the use of the ILS method only, in which the plane is guided by a two-frequency unit, signalling the plane down on a 3-degree equi-signal path.

The combined systems are expected to be placed in operation soon at Chicago, and other major airports. The systems are already in operation at New York and Washington and in use by many airlines, including *Trans Canada, Peruvian International, Scandinavian Airlines* and *TransWorld Airline.* Rentzel revealed that last summer *TWA* received approval to use GCA at its Wilmington, Delaware, overhaul and training base. Two years ago, *Pan American* set up a GCA system at their Gander, Newfoundland airport.

THE UNIQUE METHOD used to assign call sign blocks to stations was disclosed a short while ago by FCC. In a report, based on the agreements made at International Telecommunication and Radio Conferences at Atlantic City in 1947, a new system of call blocks was described; this country was allotted four initial or key letters, *N, K* and *W,* exclusively, and partial use of *A.* Calls beginning with *N* are now reserved for the Navy and Coast Guard; while *A, K* and *W* are shared by Government and private stations.

The *K* and *W* characters are used for broadcasting, coastal stations, aeronautical, fixed, mobile telegraph and telephone, radar, etc. Broadcast stations are assigned letters only, while non-broadcast systems use numerals. The composition of the call sign, according to the report, ranges from three letters alone, as for coastal stations, to three letters and three digits for land (other than aeronautical and coastal stations), five letters for aircraft telegraph and telephone, six letters for TVcasters, and complex letter-digit-letter combinations for amateur and experimental applications.

TUBE SALES SOARED to a new high in '48, with nearly 205,000,000 tubes being sold, over five million more than in 1947. Close to 147,000,000 tubes were for new sets, over 47,000,000 for replacements, nearly 11,000,000 for export, and over 800,000 for government.

THE COMPLEX STUDIES AND planning involved in the radio industry become more and more apparent

Shown at right is "Emmy," Television's version of the movie "Oscar," awarded to Don Lee Television Engineer Charles Mesak at the first annual awards dinner held recently in Hollywood. Below, Mesak, shown holding "Emmy," was thus honored for his work in developing the face-fader, for changing black images to white ones on a video screen. Walter O'Keefe, Master of Ceremonies, left, stands by after presentation.

every year when the RMA releases its annual review of the work of its engineering department. In 1948, nearly 2000 engineers, belonging to 173 committees, served to set up standards for not only the basic systems of broadcasters, but for practically every component used in the transmitter and receiver, the year's report of RMA showed.

In TV were committees on color, sound modulation, flicker, resolution, interference and propagation. Component committees were concerned with hookup wire, condensers (ceramic, mica, fixed paper), sockets, variable air condensers, fixed composition resistors, variable control resistors, h.f. switches, wire-wound resistors, r.f. and i.f. transformers, vibrating interrupters and rectifiers, dry-disc rectifiers, high-frequency cores, dry batteries, etc. There were even special committees on cabinets and finishes, packaging, wiring color codes, citizens' radio, sampling procedures, phono records, disc home recording, magnetic wire recording, pickups and needles, flame hazards, speakers, amplifiers, intercoms, safety, microwaves, etc.

And 1949 will see an even more intensive series of studies by these engineers who merit the resounding thanks of everyone for their outstanding voluntary help to give Mr. and Mrs. Public the best in sight and sound transmission and reception.

FM HAS BECOME a major factor in broadcasting in many countries throughout the world, according to the International Broadcasting Union, Geneva. In Italy for instance, four FM transmitters have been installed in Milan, Rome, Turin, and Naples. If the results are successful, twenty more stations will be added. A network of FM stations is being completed in Holland to supplant the wired service between amplifiers on the *wired-wireless* lines.

An experimental 3 kw. FM station will soon be opened on 5000-foot-high Mount Chasseral, in Switzerland. Low-power tests will also be conducted soon with 10 to 15-watt transmitters in local areas, reradiating AM programs aired by high-powered stations and thus serving as booster stations.

FM is being used to link studios and transmitters in Argentina, with the low-powered FM setups also being used for local broadcast work. In Australia, the government has approved the progressive introduction of FM in a *National Broadcasting Service*, which will provide FM for the large cities first, and then the rural centers.

FM activity in Great Britain is still in the experimental stages. High-power transmission will be studied when a 25 kw. station at Wrotham (Kent) goes on the air soon.

There is intense activity in TV, too, overseas, with France and Great Britain providing most of the interest. There are about 80,000 who have receivers in Great Britain, with about twenty-five per-cent of the owners living in London and the suburbs. L.W.

AFCA NEWS

This Association is a patriotic non-profit organization, with chapters in most of the larger cities, dedicated to developing and maintaining efficient personnel, commissioned, enlisted, civilian, for the supply (including design and development), installation, maintenance and operation of communications and electronic equipment for Army, Navy and Air Force and their supporting civilian activities. It publishes a magazine "SIGNALS" at its national headquarters in Washington. Every American interested in any way in communications is eligible and invited to join. Further details may be obtained by addressing the secretary at 1624 Eye St. N.W., Washington 6, D. C.

AFCA News

AFCA National Convention

The vital importance of communications in modern warfare, with special reference this year to the Navy—afloat, ashore, and in the air—will be the theme of the third annual meeting of the AFCA, March 28 and 29, with representatives of science, industry, the Navy, Army, Air Forces, and other governmental agencies reviewing the Navy's readiness in the fields of communications and photography.

The Washington Chapter was chosen official host to the convention, with Captain Robert J. Foley, USN, Office of the Chief of Naval Communications, directing the program for the Navy, and Colonel E. Goring Bliss, Washington telephone company official, in charge of the chapter's committee on arrangements.

The Shoreham Hotel was selected as AFCA headquarters and the site for the first day's meetings and banquet. Plans for the convention included visiting Navy installations and exhibitions, with a carry-over into a third day for those wishing to revisit any of the facilities. The Navy demonstrations and exhibitions were to include communications, radar, and photographic equipment as operated on board ship, in aircraft, and ashore.

Chapter Notes

Boston

The third annual Industry-Army Day meeting was held in Boston on February 4th. Early in the day, nearly 3,000 gathered in the First Cadet Corps Armory to hear addresses by: Mr. Gordon Gray, Assistant Secretary of the Army; Maj. Gen. A. C. McAuliffe, Deputy Chairman of the Research and Development Board; and General J. Lawton, Collins, Vice Chief of Staff.

At 11:00 A.M., AFCA members and guests met at the Copley Plaza to hear a presentation of the industrial mobilization planning situation in the Signal Corps. Col. Paul Hannah of the Boston Chapter presided. The speakers were: Mr. Fred R. Lack, AFCA National Director, and Vice President of *Western Electric Company;* Col. Fred W. Kunesh, in charge of industrial mobilization planning for the Signal Corps; Col. A. M. Shearer, Deputy head of the Procurement and Distribution Service, OCSigO; Col. E. F. Hammond, Chief of the Personnel and Training Service, OCSigO; and Col. Kirke B. Lawton, Deputy Chief Signal Officer, who represented General Akin at the meeting.

At the close of the forum, the gathering attended a luncheon given by the Boston Chapter of AFCA. Walter F. Schuchard, President of the Chapter, presided. Among those present were: Maj. Gen. J. O. Mauborgne, former Chief Signal Officer; Rear Admiral Joseph R. Redman, wartime Chief of Naval Communications and now Vice President of *Western Union Company* and AFCA's New York Chapter; Col. F. W. Wozencraft, AFCA legal counsel; Col. George P. Dixon, President of the New York Chapter; Col. Van Ness Philip, AFCA charter life member; and Brig. Gen. S. H. Sherrill, AFCA Executive Director.

The annual banquet was held in the main ballroom of the Hotel Statler. Mr. Joseph P. Spang, President of the *Gillette Razor Company,* acted as master of ceremonies. The speaker for industry was Mr. Benjamin F. Fairless, President of *U. S. Steel.* The speaker for the Army was General Omar Bradley, Chief of Staff.

Baltimore

The January 11th meeting of the chapter took place at the *Locke, Inc.,* plant, which specializes in insulators for power and radio installations. Over one hundred members of the Baltimore Chapter and guests were present. After dinner in the company cafeteria, President F. E. Moran introduced Capts. Paul Dugan and Richard E. Elliot of the Naval Communications Station in Annapolis, and Col. Arthur Pulsifer, Second Army Signal Officer, who was the first secretary of the Baltimore Chapter. Brig. Gen., S. H. Sherrill, Executive Director, came over from Washington and spoke on developments in other AFCA chapters throughout the country.

Lt. Col. C. A. Brown, Assistant to the Chief of the Engineering and Technical Service, OCSigO, described in detail recent accomplishments in the development of communications

equipment and projects now under way.

Mr. Howard Frey, Chief Development Engineer of *Locke, Inc.*, outlined the various operations of the *Locke* plant, after which the audience was taken on a tour of the plant.

Cleveland

The Cleveland Chapter meetings are featuring inspection tours of various local facilities. The February 10th meeting consisted of a most interesting tour through the Air Craft Engine Laboratories of the National Advisory Committee for Aeronautics at the Cleveland Municipal Airport.

European

Because of its scope, the European Chapter is unable to arrange many general meetings of the chapter membership. However, its sub-chapters are holding independent meetings rather frequently, some of which have been reported as follows:

The Frankfurt and Wiesbaden Sub-Chapters held a joint meeting to view a demonstration of the teleconference equipment using teleoptican projection. In addition, members saw a film covering long lines communications in Newfoundland.

The Hanau Sub-Chapter reports that Amateur Radio Station, sign D4AHE, has been established for the convenience of members and all those who are interested in radio operations. A twenty-position code practice table has been set up for training purposes.

Kentucky

A dinner meeting was held on January 28th at the Jefferson Davis Inn in Lexington. Officers for 1949 were elected as follows: Murray P. McQuown, President; Harry Bradshaw, Bernard Haefling and Eli Hall, Vice Presidents; Clyde T. Burke, Secretary; Robert Miller, Treasurer; and Merrell Whitmer, Assistant Treasurer.

The speaker of the evening was Major L. C. Taynton of the Armored School at Fort Knox. He described the Army Field Forces Cold Weather Test Program during 1946 and 1947 in Alaska, which he had attended as an observer for the Armored School.

New York

On January 6th, the New York Chapter held a joint meeting with the Atlantic Coast Section of the Society of Motion Picture Engineers. The meeting took place at the Signal Corps Photographic Center in Long Island City and included an inspection trip through the new laboratory and a demonstration of the Sound Recording facilities and Process Screen Photography in use at the Center.

The February meeting, held jointly with the New York Naval Volunteer Reserve Electronic Warfare Company, had a record turnout. The guest speakers were the Communications Chiefs of the three Services: Maj. Gen. Spencer B. Akin, USA, Chief Signal Officer; Rear Admiral Earl E. Stone, USN, Chief of Naval Communications;

and Maj. Gen. Francis L. Ankenbrandt, USAF, Director of Air Communications.

Pittsburgh

The Pittsburgh Chapter attended the January 10th meeting of the Pittsburgh Section of the Institute of Radio Engineers, which was devoted to the subject of Television. The speaker was Mr. Luther R. Huggler, Assistant Engineer of Transmission, *The Bell Telephone Company of Pa.*

The February meeting of the chapter was devoted to problems submitted by the National Advisory Committee. Subjects and discussion leaders were: "Protection of Records of American Communications Systems in the Event of Major Disaster"—John J. McGovern of the *Bell Telephone Company of Pa.;* and "Procurement—Negotiated Contracts vs. Competitive Bidding"—Sumner W. Dana of the *G. C. Murphy Company.* A final report on the subject discussed at the November meeting, "Conversion of Industry from Peacetime Operation to Wartime Controls," was presented by E. J. Staubitz of the *Blaw Knox Company.*

Sacramento

The January dinner-meeting was held jointly with the Sacramento Section of the American Society of Civil Engineers at the Sacramento Signal Depot. Among the guests was Brig. Gen. C. H. Arnold, Chief of the Procurement and Distribution Division, OCSigO, who had made the trip west to inspect the Depot. The featured speaker was Dr. Luis W. Alvarez, University of California's radar expert who was recently presented with the Medal of Merit, the nation's highest civilian award, for his development of radar devices used during the war. Dr. Alvarez delivered an interesting talk on the future industrial development of atomic energy.

St. Louis

The Mark Twain Hotel was the scene of the St. Louis Chapter gathering on January 24th. Officers for 1949 are: C. P. Bobe, President; O. A. Eilers, Vice President; A. R. Chappell, Secretary-Treasurer. After the dinner-meeting, Mr. E. J. Ulm of the *American Air Lines* presented a color sound movie entitled "Wings to Vikingland," a film of northern Europe.

Seattle

Members of the Seattle Chapter met on January 25th at the American Legion Club. The new officers for 1949 were installed as follows: President—Maurice F. Kerr; 1st Vice President—Ed Mickelson; 2nd Vice President—Ezra T. Pope; Secretary—Clarence C. Bodine; Treasurer—John F. Rozanski.

Major Joyce B. James, Alaska Communication System, described the organization and function of the ACS as a military and commercial communication system; and Major G. E. Vitt discussed the formation of an ACS reserve unit.

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Tube Tester

(*Continued from page 57*)

would, obviously, be too much of a mystery to you.

A brief discussion of a dynamic mutual conductance tube tester will give you some ideas as to how a tube is tested for the various troubles mentioned previously in this article. We'll go over the checks made on the customer's tubes and show how the tube tester works.

If you'll recall, the 12SA7 converter was low on mutual conductance. As a typical instrument we'll use the *Hickok* tube tester, a direct reading, dynamic mutual conductance tester. Again, the mutual conductance of a tube, or G_m, is a measure of the tube's change in plate current for a change in its grid voltage. After all, that is what interests us in an amplifier. If we take the changing grid voltage and can get a large change in plate current through a load resistor, we have a good amplifier.

Then, to test a tube for G_m we have to first have some means of varying the grid voltage by a fixed amount and then measuring the *plate current change* caused by that changing grid voltage. This is a true test of the tube's operating worth.

The circuit used in the *Hickok* tester is an ingenious bridge that makes use of the full-wave rectification principle. Fig. 3 shows the basic schematic diagram of the tester. Notice that the transformer windings have a common core. This fact is extremely important since the relative polarity of the a.c. plate voltage at any instant with respect to the a.c. signal grid voltage at the same instant determines the mutual conductance.

As mentioned before, the purpose of the whole tester is to measure the changing plate current for a given change in grid voltage. Therefore, as you'd expect, the meter is in the plate circuit of the tube under test. Notice that it is situated right in the center tap of the "B plus" transformer winding. If we track electrons through the circuit we find that as the top of winding number 1 goes positive, the bottom of winding number 2 goes negative. As a result the electrons would leave the cathode of the tube under test and be attracted toward the top diode "*A*" of the 83 gas tube. The complete path for the electron stream at that instant would have to be through winding number 1, through R_1, and back to the cathode. This would develop a voltage across R_1 (the plate load) and tend to swing the meter needle. The inertia of the meter, however, doesn't allow it to move before the 60 cycle a.c. reverses, making the top of winding number 1 negative and the bottom of number 2 positive. This reversal drags the electron stream through winding number 2 and develops the voltage across R_2 at this instant. Since R_1 and R_2 are equal, the voltage is the

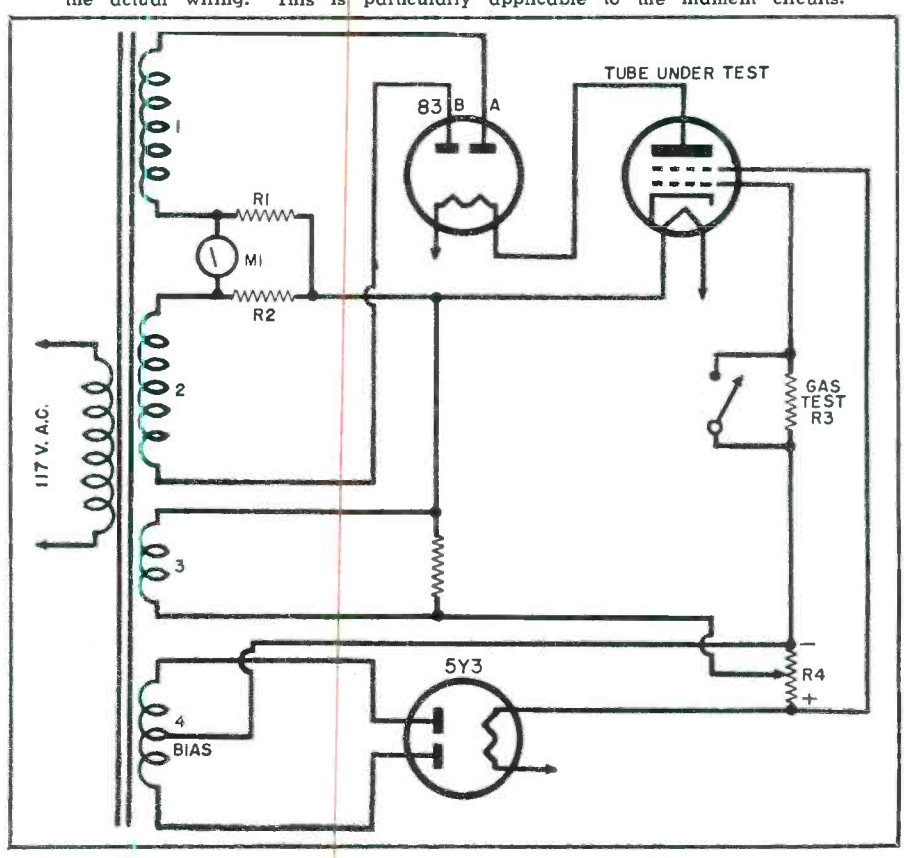
same as it was in the first instance, only in the opposite direction across the meter. This tends to swing the needle in the opposite direction. Since the reversals were too fast for the meter movement, the total average deflection is zero. This then, is the case with no signal applied to the grid.

Let's turn our attention to winding number 3 at this time. This winding is also on the same core as 1 and 2, so that when the top of winding 1 is positive, the top of winding 3 must also be positive and the bottom negative. This signal is applied to the grid of the tube under test. If we backtrack a little we can see that when the *"A"* diode of the 83 tube is conducting, a negative voltage appears on the grid which will reduce the current drawn by coil 1, dropping the voltage across R_1. On the reversal, however, when winding 2 is positive, the signal to the grid will also be positive and increase the electron flow on that half cycle. This develops a larger voltage across R_2. The unbalance in voltages across R_1 and R_2 will cause a current to flow through the meter and deflect the movement according to the average change in plate current drawn by the tube. Perhaps this will be clearer if reference is made to Fig. 2. Here we see the characteristic full-wave rectifier waveform, showing the current flow through the two diodes, *A* and *B*. Next, the signal is applied and the resultant diode currents (plate current of the tube under test) show that the meter will respond to the change in current from *A* to *B* since this *change* in current is developed across each resistor and then impressed across the meter movement. This discussion then shows how the *Hickok* dynamic mutual conductance tube tester can show a change in plate current for a change in grid voltage, a true dynamic tester.

The 5Y3 in the circuit is used as a bias supply to place screen and grid bias voltages for different tubes that must be tested. There are a great many more refinements to the circuit showing how an "English" reading is obtained on the tester instead of a direct reading in micromhos. For the true serviceman, a "good" "?" "bad" scale is just a side convenience since the actual test is to find what percentage of the amplification is really available. Only a direct reading in micromhos, the unit of mutual conductance, will tell you that.

Note the resistor in the grid circuit of the tube under test. For a mutual conductance reading, that resistor is shorted out, but for a gas test the bias is made very negative and the short is removed from the large resistor. This does several things. It gives an extremely low reading on the meter, and gas in the tube will draw electrons from the grid causing the grid to develop a current through the resistor, making the grid positive. This causes an increase in plate current. Therefore, the gas test is to first decrease the plate current to a low value, and then to insert the large grid resistor into the circuit. Any gas in the tube causes the meter to read up-

Fig. 3. Diagram of the Hickock dynamic mutual conductance tube tester, showing basic operation of the circuit as explained in the text. Schematic does not show the actual wiring. This is particularly applicable to the filament circuits.



scale and the tube may be rejected.

As far as the noise test is concerned, it's simply a pair of jacks across the neon short indicator. As the elements are tested for shorts one at a time, the neon light shows shorts. Slight shorts that are not of long enough duration to light the neon bulb will cause the voltage to appear across the jacks. Connecting these jacks to the input of a radio will then make static heard in the speaker.

In closing this discussion of tube testers and tube sales; it is safe to say that too many radio servicemen find weak tubes and put them back into the set because they are afraid that the total service bill will be too high for the customer to absorb. By taking a little time for explanation, he'd find that the customer will be more than happy to take the new tubes, pay a little more, and ultimately appreciate his suggestion. —30—

NO MORE STATIC

By EARL C. WINKEL

THE British have found an answer to the static problem—elaborate though it might be. A bill was introduced recently in Parliament that would require every owner of an electrical machine or automobile to install a suppressor for static or interference.

The Automobile Association said that it would cost British motorists $4,000,000 just to stop interference from automobile generators.

For people who do not put a suppressor on their electrical equipment there will be a fine of up to $400, and three months in jail. —30—

IRON TEMPERATURE

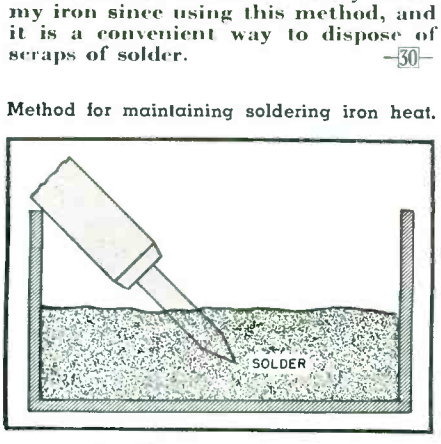
By G. B. HERZOG, WØIUD

THERE are many methods of keeping a soldering iron at nearly the proper temperature, but I think the method described here is the easiest and keeps the iron at just the right temperature without burning the tip.

As shown in the illustration, the tip of the iron is placed in a container which holds scraps of solder. The iron is placed at an angle so that the handle will not become hot. When the iron is placed in the container, the tip melts its way into the solder and thus is not exposed to the air and cannot burn (turn to oxide). As the iron tends to overheat, the heat is dissipated in melting more of the solder.

I have not found it necessary to tin my iron since using this method, and it is a convenient way to dispose of scraps of solder. —30—

Method for maintaining soldering iron heat.



Technical BOOKS

"THE ADVERTISING AND BUSINESS SIDE OF RADIO" by Ned Midgley. Published by *Prentice-Hall, Inc.*, New York. 353 pages. Price $5.25.

Written by the sales service manager of *CBS*, this authoritative book should find wide acceptance on the part of station management.

Although the book places major emphasis on network operation, several worthwhile chapters have been devoted to such subjects as spot broadcasting, planning a spot campaign, and local station operation and management.

An analysis of the American system of broadcasting, the size and makeup of the radio audience, elementary engineering facts, FM, television, and the future of broadcast radio are treated in separate chapters. A glossary of terms has been appended to assist the reader and provide a ready reference to broadcasting terminology.

All business and advertising phases of the broadcast industry have been covered, including billing, discounts, network affiliations, FCC rules and regulations, various types of network coverage, plus an analysis of the operation of each of the four big networks as well as the smaller regional nets and the *Canadian Broadcasting Corporation*.

As a guide book to the profitable management of any radio station, big or small. this book should prove helpful.

* * *

"RADIO STATION MANAGEMENT" by J. Leonard Reinsch. Published by *Harper & Brothers*, New York. 173 pages. Price $3.50.

All too often persons contemplating the establishment or purchase of a radio station experience difficulty in securing authoritative data on the necessary procedures and the problems likely to be encountered.

The author of this manual is actively engaged in the management of three radio stations. His experience in the broadcasting industry includes practically all phases of station operation and management. From his broad experience Mr. Reinsch has supplied the answers to the questions most likely to stump the tyro.

The book is divided into fifteen chapters and two appendices. Such subjects as how to get a radio station, how to judge network affiliation, how to set up the organization, how to use surveys, how to handle union relations, program department, the news department, sales department, engineering department, the accounting and traffic departments, how to train the staff, how to promote circulation, how to fulfill community responsibility, how to prepare renewal and annual reports are all subjects which come under the

author's scrutiny. The appendices cover a typical "handbook" for announcers covering policy-mechanics-procedure and a sample "statement of policies in effect at radio station WSB."

As Justin Miller, president of the National Association of Broadcasters, says in his foreword to this book, "For the novice operator, it is a cache of immediately available information. For those recently established broadcasters, who aspire to increasing effectiveness, it is a thesaurus of fundamentals."

* * *

"PHOTOFACT TELEVISION COURSE," published by *Howard W. Sams & Co., Inc.,* Indianapolis 7, Ind. 216 pages. Price $3.00.

There has long been a need for a clear and detailed explanation of television. This book, compiled from a series of lectures by Albert C. W. Saunders, presents the entire operation of television receivers in simple, easily understandable form, in a style that makes for easy and interesting reading.

The book is divided into three sections covering cathode-ray beam formation and control, beam deflection systems, and beam modulation and synchronization. A total of eighteen chapters covers such subjects as the camera tube, sawtooth generators, antenna systems, input systems, and intercarrier sound systems.

The entire receiver system is completely covered in a logical and thorough manner, with many diagrams and illustrations. The various circuits shown are typical of those actually used in many of the leading makes of receivers.

The book is well indexed, and contains a complete glossary of the various terms used in television. A bibliography refers the reader to many books and publications on the subject of television. —30—

Amateur radio operators have again come to the rescue during a Missouri sleet storm. Jack A. Horn, taking 8 doses daily of streptomycin, began to have dizzy spells while at his parents' Missouri home. His Chicago physician, unable to reach him because of the storm, called on amateur radio to communicate his amended medication orders, thus saving Jack from possible deafness.

R.F. Power Supply

(*Continued from page 58*)

same as for most stable operation. When adjusted for reasonably stable operation, the output voltage was much lower than desired.

In order to get high output voltage, and still have the circuit stable, it became obvious that the oscillator *must* operate at the resonant frequency of the high-voltage secondary. To achieve this end, the circuit shown in Fig. 2 was tried. Note that now no tickler winding is used, but that the output of the high-voltage secondary is capacitively coupled back to the grid circuit of the oscillator tube. This is easily accomplished by placing a shield around the rectifier tube V_2 which couples (capacitively) to the plate of the tube. In the first model tried, the shield consisted of a piece of foil from a cigarette package wrapped tightly around the tube and held in place with bare wire.

To obtain efficient operation, the primary winding L_3 is still tuned, but the tuning is no longer critical. In place of a variable condenser, such as was used in the first circuit, a fixed condenser with normal tolerance (10%) was found to work perfectly satisfactory.

Not only did the second circuit operate with more stability (the output could be shorted momentarily, and the voltage would still rise to its original value when the short was removed, or the power to the oscillator could be turned on and off, with the output still returning to its original value) but a much higher output voltage could be obtained due to more efficient operation. Whereas, in the first model, the maximum obtained was around 5000 volts, more than 8000 volts could be obtained in the second model, using the same coil.

The output voltage can be easily changed by adjusting the size of screen grid resistor R_{sg} or grid condenser C_g. Varying R_{sg} is more desirable, since varying C_g introduces two simultaneous effects.

First, the drive on the grid of the tube varies as the ratio of C_g to shield-plate capacity of the rectifier tube is changed. In addition, however, the total capacity across L_1 is changed, with resulting changes in operating frequency and in circuit efficiency.

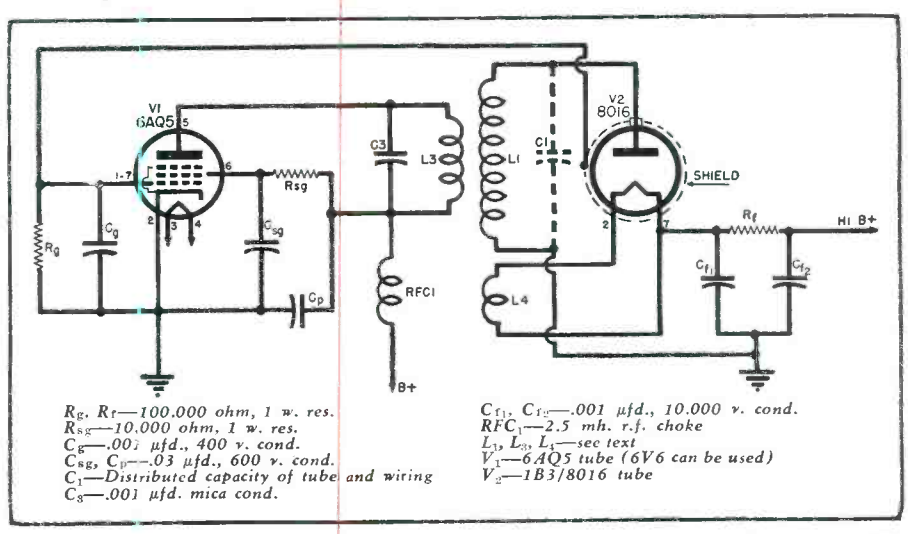
In the final design, the shield is an ordinary GT type tube shield with an open top, and with a small piece of wire soldered to it, passing through a rubber grommet in the chassis and returning to the grid of V_1. The composite coil, L_1, L_2, L_4 was obtained from *Stanwyck,* and also had the original tickler winding which was not used.

Grid condenser C_g was varied over the range from 10 $\mu\mu$fd. to .001 μfd., with the latter value finally being chosen. Good output voltage could be obtained over the entire range, however, with stable operation. If the output voltage is to be changed, R_{sg} rather than C_g should be varied. In the final model, a value of 10,000 ohms (1 watt carbon) for R_{sg} gave an output, under load, of 6200 volts with "B+" at about 350 volts. The output voltage could be easily dropped to 4500 by raising the value of R_{sg} to 18,000 ohms.

Layout does not appear especially critical, but conventional r.f. wiring techniques should be followed when wiring the oscillator section and high-voltage techniques should be observed when wiring the rectifier and filter portion.

The entire high-voltage supply should be well shielded, with a perforated metal or copper screen shield over the entire unit. If the power supply is to be used on a television chassis, build it on a small sub-chassis and cut holes in the main chassis so that only the filament, "B+," Hi "B+," and ground leads connect to the set proper. Further, when making a box shield for the entire unit, it is advisable to leave adequate spacing between the top of the coil and the shield as well as on the sides, at least ¾" and preferably more. —30—

Fig. 2. Schematic diagram of the stable, high voltage r.f. power supply unit.



Rg, Rf—100,000 ohm, 1 w. res.
Rsg—10,000 ohm, 1 w. res.
Cg—.002 µfd., 400 v. cond.
Csg, Cp—.03 µfd., 600 v. cond.
C1—Distributed capacity of tube and wiring
C3—.001 µfd. mica cond.
Cf1, Cf2—.001 µfd., 10,000 v. cond.
RFC1—2.5 mh. r.f. choke
L1, L2, L4—see text
V1—6AQ5 tube (6V6 can be used)
V2—1B3/8016 tube

International Short-Wave

(*Continued from page* 105)

The 9.607 channel has recently been heard with excellent signals from around 0030. (Fargo, Ga.)

Ward, England, reports the Greek Democratic Army Radio heard at 1335 on 6.720 (news in French); asked for reports to Greek Democratic Army, Larissa, Dep. Thessaly, Greece; stated that transmission was being made simultaneously on 8.105, but observation on that channel at the time produced nil results, Ward states.

Peddle, Newfoundland, says SVM, 9.935, Athens, is again heard often to RCA, New York.

Guatemala — TGWA, 9.76, heard 1800-0000. (Mueller, Ohio)

Hungary—L. Barta, Jr., head of the International Relations Department of Magyar Kozpenti Hirado Rt. (*Radio Budapest*), wrote Worris, N. Y.:

"We regret to inform you that the station which was destroyed by the Nazis just before the close of the war, has as yet not been completely rebuilt. The building operations of the new station at Diesd, near Budapest, are already under way. Once completed, our short-wave station will emit with a power of 50 kw., but resumption of the service with a low power of 15 kw. is contemplated already during the *summer* of 1949. Neither the frequencies nor the callsigns have as yet been determined, and discussions to this effect are now under way in New York. We are planning to have transmissions to other countries—both in Europe and in North and South America, and there will, of course, also be broadcasts in the *English* language." Further details promised.

India — Overseas Service of AIR, Delhi, heard 1400-1500 on 7.290 in parallel with 11.76, 9.565. (Pearce, England)

This winter here in East I have had good signal at 0730 from Madras, 4.920, when relays news from Delhi; then man identifies as *"This is All India Radio, Madras,"* and continues with "local" (Madras) news (*English*).

Ward, England, has heard AIR, 6.010, closing news around 1640, asked for reports on strength and quality, to Broadcasting House, Parliament Street, New Delhi, India.

Indonesia—Radio Indonesia, Macassar Studios, Strandweg 22, Macassar, verified via airmail; gave latest schedules on 9.550, 5.050, as weekdays 2200-0130, 0400-1000, 1700-1900; Sundays 1900 (Sats. EST)-0130, 0400-1000. (Cushen, N.Z.)

Pontianak, 8.090, more recently has had improved signal, some days is in clear; seems like strength is more than 200 watts; at 0830 sign-off does *not* use *"Resmi"* call; it is likely the Indonesians now announce simply, for example, as *"Radio Pontianak."* (Stark, Texas)

Simpson, Australia, says PLB-7, Ba-

Tavia, listed 11.080, is actually operating on 11.000. (*Radio Australia*)

PLB-4, 10.365, Batavia, heard with good signal in Idaho around 0830; announces "*Radio Indonesia, studio in Batavia.*" (Brain)

Iran—A recent DX broadcast from Leopoldville, Belgian Congo, listed an Iranian station on 7.857 with *English* 1515-1540. (Mueller, Ohio) (This item may have referred to GMT, in which case time would be 1015-1040 EST.—K.R.B.)

Iraq—Baghdad, 7.092, has been heard from 2335 to 0010 fade-out; amateur CW heavy but signals strong enough to read. (Kary) The 7.095 outlet until a short time ago usually signed off around 1510 after news in Arabic; occasionally plays a Western recording; recently was heard with extended program around 1430, all Western recordings until sign-off 1800 after a short newscast in Arabic; still more recently, however, has been heard regularly signing off with National Anthem around 1410, after the 1400 Arabic newscast. (Pearce, England)

Ireland—I have a vague report that *Radio Eireann* is again heard 1710-1730 on 9.595 with newscast.

Japan—WLKS, 6.105, Kure, heard closing 0800 when announced "WLKS, Voice of the British Commonwealth in Japan, time 11 o'clock, operating on 1,470 kcs. in the broadcast band and 6.105 in 49-meter band; this is Tom—saying goodbye and wishing a very pleasant good night to you all." A few bars of "*God Save the King*" were played (Stein, Calif.)

Kenya Colony—VQ7LO, 4.885, Nairobi, relays BBC news 1300. (URDXC) Has BBC recordings 1245; at 1315 has local news from the EAST AFRICAN STANDARD, then weather forecast. (ISWC)

Forces Broadcasting Station, Mombassa, has returned to the air on 7.200 at 2259-0000, 0400-1400; has some QRM from Elizabethville, Belgian Congo. (Bluman, Eritrea, via ISWC)

Lebanon—Does anyone in U. S. hear Beirut, 8.020, around scheduled 2335 sign-on?

Madagascar—Tananarive's 49-m. channel appears to be closer 6.070 than listed 6.064. (Rosenauer, Calif.)

Malaya—*Radio Malaya*, Singapore, heard Sunday at 1000 with "*Sunday Serenade*" on 4.825; on 4.780 at same time had Chinese program with woman announcer; Blue Network, 4.825, signed off 1031 (no late news); also Red Network, 4.780, signed off 1032 with "*God Save the King.*" Some days is heard signing off 4.825 at 1100. (Pearce, England)

Radio Malaya, 6.015, at Kuala Lumpur, has news and lottery results 0815. (Sandersor., Australia) Gillett, Australia, confirms that has been off frequency lately, about 6.015 where sometimes interferes with JKE, 6.015, Tokyo; is heard in West Virginia some days 0630 when woman reads news and gives market reports.

BEFBS, Singapore, tested in Feb-

ruary at 0330 on 15.300, 11.880, and at 1230 on 6.770 in preparation for relaying cricket commentaries from BBC in June. Daily schedule is now 0415-1030 on 15.300, 11.880, 6.770, and 0600-1030 on 9.690. (Cushen, N.Z.) Others report sign-off still 1130.

Manchuria—XNNR, 7.100, Harbin, is heard in an additional transmission from around 1700 to 1830 when signals are stronger in Singapore than during the 0800-0920 broadcast; call given 1800 and before closedown. (Desouza, via *Radio Australia*) Has been fair signal on West Coast mornings and has no jamming from Chungking, so must be slightly lower than 7.100 which is used by Chungking. (Dilg, Calif.)

Martinique — Fort-de-France, 9.700 heard 1820-1830 in French, fair signal. (Ferguson, N.C.)

Mexico—XEWW, 9.500, Mexico City, signs off 0115; XEQQ, 9.68, signs off 0045. (Mueller, Ohio)

While tuning for Sofia's 7.671 channel recently at 0005, Stark, Texas, found the spot occupied by X9BGC, American-Mexican Hoof and Mouth Disease Commission; said next test on 8.258, 5.869 at 0030.

Monaco—Cushen, N. Z., reports *Radio Monte Carlo* on 9.500 at 0100; heard *under* VL13, Sydney, N.S.W., Australia, and also heard 1500; heard testing on 11.800 from 0100 on Sundays, mixed with GWH to 0245, then at 0300 has "Bringing Christ to the Nations" (*English*). The N.Z. DX Times reports Monte Carlo testing 0800 on 17.780.

Pearce, England, confirms that Monte Carlo has been testing on 9.495, 9.465, 11.800, and 17.780; heard 0300 on 9.495 (occasionally on 9.465) in parallel with 6.035; other days on or near 11.800 in parallel with 6.035. Heard later on 9.495 but in parallel with 17.780 to 1100; 16-m. channel has bad QRM from sign-on of WNBI at 1045. The 9.495 outlet at times has QRM from OIX2, Lahti, 9.500, heard sometimes at 1645. Has been heard at 0300 on 9.495 and again from 0310; also heard from 0830 on 9.495 and 11.800, some days as late as 1100; sometimes 9.495 heard signing on again 1105, and is joined 1115 by 6.035, still on after 1300; for a few days used 9.520 but later was back on 9.495; news in French 0700. The 31-m. outlet is reported heard irregularly in New York.

Mozambique—Cushen, N.Z., reports CR7BI, 17.915, Lourenco Marques, testing weekdays 0000-0200, 1000-1100, asking for reports to Box 594, Lourenco Marques, Mozambique. (Is officially listed on this frequency with 10 kw. power.—K.R.B.)

New Zealand—*Radio New Zealand* is now operating 1500-0130 on 11.780, 15.280, relaying 2YA on weekdays and 2YA-2ZB on Sundays; broadcast is for remote parts of the Dominion with poor reception locations. (Cushen, N.Z.) However, is not reported as heard in U.S. prior to 2330.

Nicaragua—YNDG, 7.660, Leon, now

announces *"Radio Colonial,"* heard once leaving the air 2030, but later was heard signing off 2200, so 2030 may be Sunday *only* sign-off time. (Stark, Texas) May run later than 2200 on Saturdays.

Northern Rhodesia — Verification card received airmail from ZQP listed schedule daily to Africans 1000-1200 (1030-1130 Suns.) on 9.71, 7.22, 3.914; and to Europeans Sundays 0400-0530; QRA is Northern Rhodesia Broadcasting Station, Broadcast House, P.O. Box 209, Lusaka, Northern Rhodesia. (URDXC)

Norway — Oslo's LLN, 17.825, is heard well in New Zealand to 0235 daily. (Cushen) Gray, N.Z., reports LLK, 11.850 opening 0130 at good strength, news in Norwegian 0200. Gillett, Australia, reports the 17.825 channel heard 0800-0830 in Norwegian, but that two *English* announcements are usually made, announces as *Radio Norway* and asks for reception reports, stating transmitters in 19-, 31-, and 41-m. bands are also in use.

LLG, 9.610, has fair signal around 1615 in Norwegian. (Lambach, Ill.)

Panama — HP5B, 6.030, Panama City, heard opening 0700, announcing in Spanish as *"Radio Miramar."* (Ferguson, N.C.)

Paraguay—ZPA-5, 11.950, Encarnacion, heard from 1845 to sign-off 2048; when tuned had *"Radio Belgrano"* (Argentine) relay, but latter period was own program. (Ferguson, N.C.)

Philippines — Cushen, N.Z., says KZOK is still heard with *old* call on 9.690 at 0530 but is "blotted out" by BFEBS, Singapore, at 0600. Desouza, Singapore, has notified *Radio Australia* that the 9.690 outlet has call of DZH5, and that DZAB is call on 860 kcs., further that announces as *"The Station of the Skies."* (Is this separate from *old* KZOK?) Cushen reports

NEXT "TOWN MEETING" TO BE HELD IN CHICAGO

THE fifth and final Town Meeting of Radio Technicians will be held April 11, 12, and 13 in the Ashland Boulevard Auditorium, Chicago. Officers presiding include Roy Laird, vice-president of *Ohmite Manufacturing Company*, acting as chairman; Charles A. Hansen, *Jensen Manufacturing Company*, vice-chairman; and A. T. Alexander, *Motorola, Inc.*, program chairman. Mr. Hansen is also chairman of Electronics Parts and Equipment Manufacturers, while Mr. Alexander is chairman of the Radio Manufacturers Association's service committee.

The revised program worked out for the three-day Atlanta sessions, held January 31 through February 2, was adopted for the Chicago format, but the Chicago meeting will be staffed almost entirely with Chicago area personnel. The Atlanta program had drawn largely upon northern and midwestern manufacturers.

Only two business management papers are planned: one on shop control systems and one on merchandising of sets and services. These were quite popular in Philadelphia, New York, and Boston presentations.

Other papers include one on the Composite Television Signal, one on Interference—AM, FM, and TV, and an RMA movie-and-slide presentation on proper handling of cathode-ray tubes in installation and service operations. In addition, the antenna discussion and the one on service in the shop and necessary test equipment each have been turned into two-hour presentations.

—30—

Certificate presented to servicemen and technicians at the Southern California meeting. Similar ones will be given out to those attending the Chicago Town Meetings.

DUH5, 11.840, Manila, with news 0500, announcing "This is DZFM, The People's Station, 710 kcs. long-wave and SW on DUH2, 6.170, DUH4, 9.620, and DUH5, 11.840."

Worris, N.Y., says *"Voice of America in Manila,"* 11.89, carries a locally-recorded Chinese transmission 0915-1015 after the Far Eastern Program (relayed from U.S.) closes down.

Poland—Warsaw, 6.215, heard from tuning 1620 to fade-out 1830 (when Latins buried it); at 1800 has news in Polish at dictation speed. (Ormond, N.C.)

Portugal — Lisbon's 15.100 outlet heard afternoons to sign-off 1800, closing with Portuguese National Anthem. (Ferguson, N.C.)

Portuguese China — British Short Wave League reports CR8AA, *Macau Radio Clube,* will re-open soon with a *new* transmitter; frequencies most likely to be used are listed by BSWL as 7.530, 9.230.

Portuguese Guinea—Despite the fact that the station recently wrote it had dropped 7.943 and was using 6.298, Bissau has been heard more recently over CQM-4, 7.943, signing off 1800 with *"A Portugesa."* (Driver, Ohio)

Portuguese India—Cushen, N.Z., airmails that Goa verified by registered airmail in 18 days, from President of *"Emissora Goa,"* was using 500 watts on 7.230 with NE-SW-directed dipole antenna, but lately moved to 9.610; *new* schedule is 0730-1040; Portuguese sessions are 0730-0830 Mondays, 0830-0930 Tuesdays, 0730-0830 Wednesdays, 0830-0930 Thusrdays, 0730-0830 Fridays, 0830-0930 Saturdays, and 0830-0930 Sundays; other periods are in Marathi, Urdu, Concamin. Station informed Gillett, Australia, is using an American Federal Telephone and Radio Corporation transmitter.

Roumania—Bucharest, 11.900, heard 1345 in parallel 9.250; usually has news 1500, also heard over *Romana Libera,* 6.210. (Pearce, England)

Siam — Gillett, Australia, confirms that HS8PD, Bangkok, has made a slight frequency adjustment and now seems near 6.010; news is still heard at 0615; leaves air at 0630 but later returns (probably 0700) in native language broadcast.

South Africa—Pietermaritzburg, 4.878, heard recently 1300 with organ music, few *English* announcements, but mostly in Afrikaans; spoiled by severe CWQRM after 1330. (Pearce, England)

Spain—Radio Seu, 7.140, heard with recordings 1430; frequency varies from 7.120. FET-22, 7.130, Oviedo, often heard with recordings 1700-1815 or 1830. *Radio Falange,* Alicante, 7.947, strong signals afternoons, takes relay from *Radio Nacional de Espana,* Madrid, 1545; heard Sundays from around 1230. (Pearce, England)

Surinam—PZC, 15.405, Paramaribo, heard with musical programs 1700-2300 sign-off. (Sutton, Ohio)

Sweden—A *new* list covering all transmissions from Stockholm is now available free of charge from Swedish

Broadcasting Corporation, Short-wave Section, Stockholm, Sweden. (Swedish DX session)

Ormond, N.C., reports good signal from the 6.065 outlet, coming on 0015 with Home Service.

Switzerland — Berne has recently been heard in United Kingdom at 1415-1515 over *new* (announced) 9.665. (Pearce, England) This is good level here in East and recently was heard closing down 1530.

Syria—A British DX-er has informed the Swedish DX broadcast that Damascus has been heard on 7.090 at 1300-1400, often to 1420. May be confused with Baghdad, 7.092.

Tahiti—Stark, Texas, still hears a station on Tuesdays and Fridays on 6.980 around 2300-2345 that he believes is Papeete, but he has not positively identified it as such.

Tangier Zone—*Radio International* sent usual verification card for report on broadcast heard on 6.115, but still said 6.200. (Pearce, England)

Tibet—I have heard a vague rumor that a station is now transmitting from Lhassa. *Does anyone have details?*

Trinidad — Trinidad Broadcasting Co., Ltd., Bradcasting House, Port-of-Spain, Trinidad, B.W.I., in verifying for Novomestky, Puerto Rico, listed channels of 9.625 and 1.295 kcs., and gave schedules as Sundays 0600-1400, 1600-2200; Mondays through Saturdays, 0600-0900, 1100-1400, 1600-2200.

Turkey—Nezih Manyas, who was in charge of *Radio Ankara's* Foreign Language broadcasts 1939-1947, and who is now with the Turkish Information Office, 444 East 52nd St., New York 22, New York, is anxious to receive reports on reception of Ankara's *English*-language programs as heard in the U.S.

Vatican — URDXC reports HVJ, 9.660, 5.970, heard in England 1315 with news. Recently, HVJ has been heard with news 1315 on 5.970 and 9.645 (low side of Cyprus, 9.650); at 1330 announced broadcast in French would be heard in 15 minutes on 5.970 and 6.190, reports Pearce, England.

Ormond, N.C., reports HVJ on 11.680 (listed 11.685) closing news in Italian 1547 (was on Thurs. when station closes down later than usual, he said); good level.

Venezuela — This country has recently made many changes in calls.

YVKC, 3.550 (announced frequency and callsign), *Radio Libertador,* Caracas, signs off 2230; YV3RN, 4.940, Baraquisimeto, heard 2200-2230 but latter is apparently *not* sign-off time; YVKB, 5.057, *Radio Cultura,* Caracas, heard 2000-2030. (McPheeters, La.)

Yugoslavia — URDXC reports Belgrade, 6.100, with news 1215, 1700.

United Nations—Schedules of *United Nations Radio,* Lake Success, New York, as furnished by Worris, N.Y., are—1000-1025 to Russia, CKNC, 17.82, CKCX, 15.19; 1030-1815 to Europe and Middle East, WNRA, 21.61 (1030-1430), WNRI, 18.16 (1030-1415), WOOC, 15.13 (1030-1815), WNRA, 11.77 (1500-1815).

(Times given are outside limits—schedules vary according to length of meetings.) At 1330-1410 to Europe and Middle East, WNRA, 21.61, WNRI, 18.16, WOOC, 15.13 (*English* at 1350-1355, 1400-1410). At 1800-1900 to Latin America, WRCA, 15.21, WNRX, 9.67, WLWR1, 11.71, WLWR2, 15.33, WCBX, 17.83. At 2100-2200 to Latin America, WRUL, 11.79, WRUW, 9.57. At 2310-2335 to Australasia, CHOL, 11.72, CKCS, 15.32; *English* throughout and runs to 2350 on Fridays; foregoing to Australasia is presumably *except* Sun., Mon. At 0215-0345 to Transpacific, KNBA, 6.06, KNBI, 9.65, KRHO, 15.13, Manila, 15.33; *English*, 0215-0220, 0230-0235, 0300-0315; this is presumably *except* Mondays.

United States—G. F. Meyer, Jr., operator in charge, Radio Station WFN, 439 N. Preston St., Louisville, Kentucky, USA, writes—"I would like signal reports on this station and will answer and verify all reports received, regardless of origin." Gave station data as WFN, 100 watts, transmitter WE 23B Mod., type sta. Marine Radiophone working boats on Ohio and Mississippi Rivers; operates weekdays 0200-1700 and Sundays 0900-1300; frequencies are 8.840 (Channel 6) and 6.455 (Channel 2).

USSR—URDXC lists call of Russian on 5.979 as RTH; location is believed Yakutsk A.S.S.R.

Balbi, Calif., reports the Petropavlosk station on 6.075 has not been heard recently; may be off the air or moved.

Moscow has dropped morning beam to North America; has evening sessions 1820-1930, 15.23, 11.72, 7.36, 7.29, 11.88; 2030-2215, 15.23, 11.72, 7.36, 7.29, 11.88, 9.6. (Ormond, N.C.) The 11.72 channel seems best.

Leningrad, 11.63, has news 0230. (Bellington, N.Y.)

* * *

Last Minute Tips

Howard R. Boyle, Chief Engineer, Armed Forces Radio Service, "Far East Network," Radio Tokyo Building, Tokyo, Japan (letter came from A.P.O. No. 500, c/o P.M., San Francisco, California, USA), informs me that present set-up is WVTR, 870 kcs., Tokyo; JKE, 6.015, Yamata; JKL-2, 9.605, Nazaki; and JKL-1, 4.860. He added: "I would also like to inform you that we are only able to verify DX listeners' reports originating in the United States. International Reply Coupons from other countries are invalid at this time in Japan." Sent along a sample of verification card, quite attractive.

A station heard by Hankins, Pa., on approximately 9.650, signing off recently 2200 may be *new* HOJA, Chitre, Panama, "*Radio Provincias*," on 9.642; power is probably only 300 watts.

An AP dispatch from Leopoldville, Belgian Congo, recently stated that "tom-tom beaters in the Belgian Congo are sadly packing away their instruments. Their domain was invaded by the white man's tom-tom—radio. The Belgian Congo Radio started a new

service to the natives in six local dialects. The service is staffed almost exclusively by the Negroes." *I wonder if this refers to Radio Congo Belge or Radio Congolia?*

Dilg, Calif. flashes that an "unknown" around 6.230 is definitely *not* Pakistan as formerly thought, but is a Chinese station; is badly CWQRM'd, but there is no mistaking Chinese dialects; may be Communist-controlled since does *not* carry National Programs of either Nanking or Chungking key stations; heard *before* 0730 and to *after* 0900.

Gillett, Australia, confirms to me that *Radio Sario*, Menado, Celebes, is currently on 9.720. Stark, Texas, flashed at press time that this station is heard at 0530 in clear, good signal; still announces "Menado, Radio Sario."

Radio National Belge gives schedule on 17.840 as 1100-1200, 1600-1700. (Martin, Ohic) Is located near Brussels.

Elizabethville, Belgian Congo, 7.200, has been blotted out recently by the Forces Broadcasting Station, Mombasa, Kenya Colony, moved to this spot. (Bluman, Eritrea, via ISWC)

Dilg, Calif., says the French-speaking station on about 7.210, believed Saigon, seems to relay Paris, signs off about 1030; same program noted on approx. 6.090, 6.195, 11.780; key Paris station is on 17.850 and is audible on West Coast also; all have fair signals.

ZBW-3, 9.525, Hong Kong, heard in England to closedown 1000. (Ward)

The Asiatic station in vicinity of 6.229 mornings may be at or near Rawalpindi, seat of the Azad Kashmir Government.

The N.Z. DX-TRA reports that Tebrau, 26 miles from Johore, Behru, in Malaya, is the site where four 100 kw. BBC transmitters are to be erected to relay BBC's Far Eastern Service. BBC engineers are ready to begin construction on the site although transmitters are still in England.

Latest available schedules of Rangoon, Burma, are 2000-2130 (except Sun.) on 6.035 in Burmese; 2015-2030 (except Sun.) on 9.540 in *English;* 0030-0115 (except Mon.) on 6.035, 9.540 in Burmese; 0115-0145 (except Mon.) on 6.035, 9.540 in *English;* 0145-0230 (except Mon.) on 6.035, 9.540 in Burmese; 0645-0700 (except Mon.) on 6.035 in Hindustani; 0700-0915 (except Mon.) on 6.025 in Burmese; 0645-0915 (Mon. *only*) on 6.035 in Burmese; 0915-1015 daily on 6.035 in *English.* (Worris, N.Y.)

While Canada has 13-m. channels assigned, it has no facilities at present for utilizing the 21-mc. band. (Worris, N.Y.)

A Greek friend has advised Foerster, Ill., that the Greek Army Radio operates from Athens on 6.415 at 0130-0900, 1145-1500, and 1700-2200; and from Larissa 0130-0900, 1300-1400, 1830-2200 on 6.745.

OTC now has an "International Goodwill Station Club," P.O. Box 505, Leopoldville, Belgian Congo; dues for

U.S. are $1.00 by International Postal Money Order. (Gaynor, Calif.)

Winter Edition of WORLD RADIO HANDBOOK is still available for $1.25, postpaid, direct from Ben E. Wilbur, 32 Whittlesey Ave., East Orange, New Jersey.

HJKJ, 6.160, Colombia, verified for Hankins, Pa., listing frequencies of 970 kcs. and 6.160, both with 10 kw. Stated "our equipment is entirely constructed here by us." QRA appears *Emissora Nueva Granada*, LTDA, Bogota, Colombia (Apartado Nacional 509).

Russell Henderson, Swiss Short-wave Service, Berne, informs me that Berne's two new 100 kw. transmitters now make it possible to broadcast around 170 hours per week instead of former 135 hours. Schedules will be changed this month, watch for announcements.

* * *

Acknowledgement

Please keep the FB reports coming in, fellows . . . especially about stations going on Summer Time schedules. Thanks! —K.R.B.

"TV SERVICING IS EASY"

ACCORDING to a report made public recently by Frank W. Mansfield, director of sales research for Sylvania Electric Products Inc., servicemen are experiencing little difficulty in handling television servicing.

The statement, according to Mr. Mansfield, is based on the findings of a recent survey in which several hundred television dealers, representing a good cross-section by size, type of establishment, and geographic areas, were interviewed.

According to the report, dealers feel that the sets are performing well. 57 per-cent said that sets were performing extremely well and 27 per-cent admitted that they required only occasional service. Only 7 per-cent reported continual trouble. The remaining 8 per-cent said they lacked first-hand experience to qualify an intelligent opinion.

Of the dealers interviewed, 21 per-cent do all of their repair work in their own shops; 59 per-cent farm all of it out; and 20 per-cent divide service work between their own and other shops.

Dealers reported that 10" screen receivers were the best sellers in 84 per-cent of the cases, 6 per-cent said the 12" receivers went over best, 9 per-cent had the largest turnover on the 7" sets, and 1 per-cent said their customers favored the large direct-view and projection types.

That they feel that this situation will change in 1949 was indicated by their answers to the question "What type of television set will be the best seller in 1949?" About 42 per-cent said 10" models, 44 per-cent said 12" units, 2 per-cent thought the 7" sets would go over best, while 12 per-cent backed the larger screen sizes and projection models.

Among the larger outlets 44 per-cent say they can't get enough sets. Only 6 per-cent feel that supply exceeds demand. Among the smaller outlets 19 per-cent report they can't get enough sets although 12 per-cent say they feel supply exceeds demand. —30—

TV Master Antennas

(*Continued from page* 34)

tenna array are fed to television outlets which are tapped in parallel on the transmission line. 150 ohm isolating resistors are used. The last outlet on the transmission line has a terminal resistor which terminates the transmission line in its own impedance. This matching of impedance is the most important factor in installing the system, for when the transmission line is properly terminated, the signals from the antenna are completely absorbed by the terminal resistor, and as a result there are no reflections or standing waves on the transmission line. The antenna's impedance is important only from the standpoint of power transfer. At those frequencies where the antenna impedance matches the transmision line, maximum power is transferred.

This system is furnished for external installations where the transmission line is run outside the building adjacent to each living room window as shown in Fig. 1 and for internal conduit installations as shown in Fig. 2.

For external installations, a 150-ohm twin lead is guided down the side of the building on screw-eye insulated supports which should be securely fastened to the brick wall (into the brick and not in the cement) on each floor.

A television outlet coupling unit is connected to the transmission line outside each living-room window and is suspended from same. The coupling unit has a lead-in piece of 150-ohm transmission line, which must be carefully passed through a hole in the window sill as shown in Fig. 3 (note protective sleeve over twin lead) and connected to a terminal block installed on the inside apron of the window sill. The television receivers are connected to the terminal block with 150-ohm transmission line.

When this system is installed in conduit, each riser has two RG-62/U coaxial cables or a special dual cable (DK 200) furnished by *A. A. K.* which is effectively two RG-62/U cables in one plastic sheath. This latter cable is simpler to install as its rigidity makes it easier to pass it through the installed conduit.

The riser cables are fed through the conduit systems and looped between outlets as shown in Figs. 2 and 4. Fig. 4 details the outlet and shows the means by which the shields of the cables are fastened together and the inner conductors of the coaxial cables connected to the receptacle. The position of the terminal resistor in the last outlet is shown in Fig. 4. This ¼ or ½ watt resistor must be of the non-inductive type if it is to afford proper termination.

Fig. 5 shows a typical installation of an *A. A. K.* system in a six-story building. A double-stacked antenna array, Fig. 6, was installed on this

building due to the lack of signal strength in the location.

The television AM-FM master antenna system designed by the *Intra-Video Corporation of America,* Patent #2,394,917, see Fig. 7, provides for simultaneous operation of many television receivers from a single antenna system. Television outlets are connected in a series-system string on this system from any of four possible outputs from the *Intra-Video* amplifier. The *Intra-Video* television master antenna system attempts to solve the five-fold multiple dwelling reception problem in the following manner:

1. High-quality pictures are realized by the use of an individual directional antenna array for each television channel that can be adjusted to discriminate against transmission ghosts and cancel out reflection from structures behind the antenna.

2. Strong, interference-free signals for all television receivers are realized by the application of pretuned r. f. booster amplifiers, Figs. 8 and 9, which reject i. f. interference on the antennas and amplify the signal on each antenna to a level where there is sufficient energy to operate the least sensitive television receiver through the 30 db. attenuation in each outlet.

3. The effect of television receiver oscillator re-radiation is minimized by the 30 db. attenuation in each television receiver outlet. This arrangement provides a minimum of 60 db. isolation between any two television receivers connected to the series outlets of the *Intra-Video* system.

4. The connection of all television receivers to the system without altering the television outlet is accomplished by the resistive network in each four prong outlet (see Fig. 10) which permits matching of 300-ohm balanced and 70-ohm unbalanced television receiver inputs to the system. The simplicity of connecting a television receiver to the *Intra-Video* master antenna system outlet is also shown in Fig. 10.

5. Adjustment of wide-range signal levels from television stations is made possible by a screwdriver gain control shown over each booster amplifier strip, see Figs. 8 and 9, so that the signal level for all stations can be adjusted approximately equal. Booster amplifiers are removable with connectors as shown in Figs. 8 and 9. This permits quick service of amplifiers which are out of adjustment.

The *RCA* TV-FM-AM Antenaplex master antenna system, Fig. 11, meets the five-fold installation problem in the following manner:

1. By installing a television antenna for each channel, it is possible with the *RCA* system to provide the highest quality pictures receivable in the location on each individual television channel.

2. Strong interference-free signals are realized at each outlet as they are fed from a group of pretuned booster amplifiers, see Fig. 12, which have an output capacity of between ½ and 1

volt of r. f. signal for each television channel.

3. The effect of one television receiver upon another is minimized by the isolation provided in the distribution transformers and outlets shown in Fig. 11. The isolation provided by these components is approximately 100,000:1 or 50 db. Further isolation is provided for television receivers with 300-ohm inputs by the *RCA* MI-6876 matching transformer which is used to connect any 300-ohm input television receiver to the system. This impedance matching transformer cancels out most of the television receiver's local oscillator generation which is in "push-push."

4. The *RCA* MI-6877 outlet shown in Fig. 13 has a coaxial fitting to which a television receiver with a 70-ohm input can be directly connected by RG-59/U. A 300-ohm balanced input type receiver connects to the system by mounting an *RCA* MI-6876 300/50-ohm matching transformer at the television receiver input, and running RG-58/U coaxial cable between the transformer and the outlet.

5. The level of the input signals to each television channel amplifier is controlled by the installation and adjustment of individual resistance pads for each channel which enables the installer to compensate for varying signal levels in any area.

Both the *Intra-Video* and the *RCA* systems require the installation of individual antennas (see Fig. 14) for each television channel. These antennas are installed with the consideration that the most important requirement for an antenna is that it must furnish a clear picture, as completely free from ghosts as possible. All other requirements are secondary to this, except for noise considerations.

The proper antenna orientation of each individual channel antenna requires the work of two men with a high definition calibrated television receiver. The antenna is connected to the receiver by an RG-58/U coaxial cable which has been calibrated as to its attenuation characteristics. This cable should have sufficient slack on the roof to allow the antenna to be moved over the entire roof area. The test receiver should be located where the picture is shielded from glaring lights and sound powered telephone communication established between the man at the antenna and the man at the receiver.

Tests should begin with the antenna in the location most convenient for a practical installation with the director element of the antenna aimed toward the transmitter. The test receiver is carefully adjusted to the transmitter's channel and the test pattern observed for reflections. The transmitted image must be a standard pattern which clearly shows the interfering reflected images. The man at the test receiver always directs the man rotating the antenna on the method of making a careful adjustment. When a perfect

picture is not found after a full 360 degree rotation at the preferred location the antenna must be moved to another position and the adjustment repeated. In complex signal areas, the entire roof may be covered without locating a perfect picture. Under these conditions a drawing of the roof, with a careful report of the quality and level of the signals found, assists in determining a final compromise position where the reflections least mar the picture.

After the antenna location for one channel has been found, the test procedure must be repeated for each of the other channels to be received. Care must be taken to avoid the possibility of antenna interaction where the antennas must operate in close proximity. Tests must be made with all the antennas erected to make sure that no one antenna impairs another signal.

In mounting the antennas, precautions should be taken to comply with all existing building ordinances and electrical codes.

All other installation details on the *Intra-Video* and *RCA* systems are furnished to the installing groups by a manufacturers' engineering representative at the time of installation.

Both of these electronic systems have been submitted, tested, and approved by the Engineering Committee of the Television Broadcasters Association (TBA) which has been furnishing technical guidance to the realty associations on all matters pertaining to television master antenna systems for multiple dwellings.

All three master antenna maufacturers are now installing their systems on a nation-wide basis. Each organization is able to estimate the cost of his equipment when it knows the location of the building with respect to the television transmitting stations; height of the building and data on any higher structures located between the building and the television transmitting stations; typical floor plans, including roof layout; total number of apartments; and layout and size of any existing conduit system which may be used for the distribution cables.

It should be understood however that a master antenna system is not a "cure-all." The following interferences cannot be fully compensated for by any type of master antenna system:

A. Sweep circuit radiation from the horizontal sweep circuit wiring and deflection yokes from large tube and projection television receivers. This radiation may blanket the broadcast band of any AM set with interfering "beeps." Using the high-level shielded AM signals available from the master antenna system raises the "signal to beep" ratio but in many cases (especially loop receivers) the beep level still makes a nearby AM receiver difficult to use.

B. High level local oscillator radiation from television receivers which do not have adequate preselection on

their r.f. head amplifiers. Some poorly designed television receivers have been known to re-radiate between 1 and 2 volts of interfering signal on television channels. A master antenna system cannot normally stop this interference, as much of it is direct chassis radiation and couples into a neighboring set in another apartment which may be only a few feet away.

In some buildings, there is only a thin common bulkhead which separates two living-rooms of adjacent apartments.

The success of master antenna systems in multiple dwellings is directly dependent on the television industry's designing their receivers in accordance with RMA standards, so that every apartment can be equipped with a television receiver that will pick up the high quality pictures available from the master antenna systems and not generate interference back into the transmission line or through the other to a neighboring television FM or AM receiver.

Fig. 15 shows a simplified antenna system which may be used to operate four television or FM receivers (which have low level oscillator re-radiation) simultaneously from a single antenna array which is designed to match coaxial cables. The signal from the antenna is fed into an *RCA* MI-6875 4:1 distribution transformer having a relatively flat (± 3 db.) broadband characteristic from .5 megacycles to 220 megacycles. This transformer has four 50/70-ohm outputs which may be fed to separate television receivers. Should any of the television receivers have a 300-ohm balanced input they may be connected to the coaxial line through an *RCA* MI-6876 50/300-ohm matching transformer.

—30—

MASS PRODUCTION OF TAPE RECORDINGS

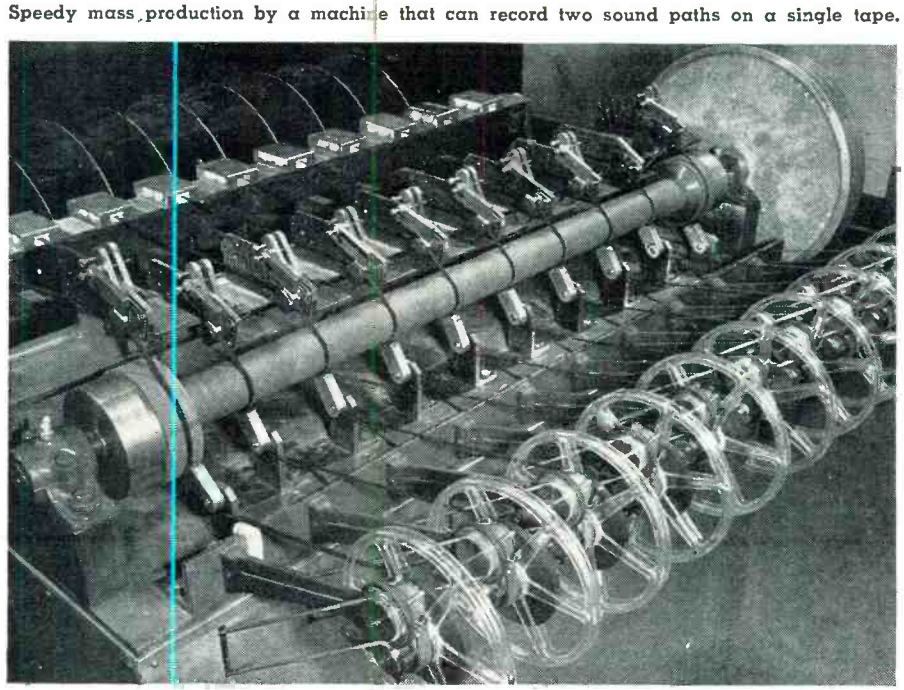
THE Minnesota Mining and Manufacturing Company, St. Paul, maker of "Scotch" sound recording tape announces the development of a machine for mass production of recorded music on reels of tape, to be offered in competition with phonograph discs for use in homes, radio stations, schools, and theaters.

From a master tape transcription, the machine can reproduce 48 hours of recorded music on tape in one hour with a single magnetic pattern in the center, or with a double pattern of two magnetic paths side by side. One path plays as the reel unwinds forward; the other functions when the tape reverses, which is accomplished automatically in a fraction of a second. The double pattern affords twice the playing time with the same amount of tape.

The machine is designed so that it can record either the single or double pattern type tape and can record both paths on the double-pattern tape simultaneously. In addition, it can be adjusted by switch control for recording different length reels and for different speeds.

At the rate of 48 per hour, 600-foot reels of tape, double pattern, can be turned out, with a playing speed of 3¾ inches-per-second. At the rate of 32 per-hour, 1200-foot reels of tape, double pattern, can be recorded, with a playing speed of 7½ inches-per-second. In addition, 1200-foot tape reels designed for playing speeds of 15 and 30 inches-per-second can be produced. Master transcriptions from which the tape records are made may be played at varying speeds, to fit the requirements of the job. The multiple recorder employs an electrical duplicating process whereby the signal from a master copy is picked up by a playback head, amplified, and fed electrically into a number of re-record heads. —30—

Speedy mass production by a machine that can record two sound paths on a single tape.



Beginning Amateur

(*Continued from page 49*)

mines the entire operating condition of the circuit.

C_1 has been designated as the *"band-set"* condenser and C_2 is the *"band-spread"* condenser. C_2 acts as a vernier or fine adjustment on C_1. After C_1 has been set, C_2 in effect spreads out a small band of frequencies so that stations can be separated. Spotting the location of the ham bands on the coils is a matter of patient listening and identifying stations by their call letters. If you hear a station signing as WSL, you can be sure it's a commercial station and out of the amateur frequencies! Mark the settings of C_1 on the paper dial cemented to the front panel.

The bandspread afforded by C_2 is excellent. On 14 and 7 mc., the respective ham bands are covered by about 75 degrees rotation of the dial, starting at the high frequency end (minimum capacity, plates all out). On 3.5 mc., the spread is the full dial.

Experiment with the setting of C_3. It won't be critical. Regenerative receivers like this one are simple and cheap, so you must expect some shortcomings. The only important one is relatively poor selectivity on phone reception. For phone, you must back down R_6 very very carefully so that the circuit just fails to oscillate. Or, to put it the other way, you must advance R_6 very slowly up to but not quite onto the point of oscillation. With a few hours of practice, you'll be able to coax signals out of stations in the far corners of the world.

For c.w., this set is really hot. With skillful handling, it produces amazingly strong signals. In fact, it operates a five-inch PM type speaker quite well, although phones are better for real DX, and I don't want to give the impression that two tubes really can push a speaker. Provide yourself with lots of ruled paper and a fountain pen, adjust the headband of the phones for comfort, and get yourself "live" code practice. Then you'll be set for your license examination. More on this subject next month.

(*To be continued*)

"Moscow? But how can the radio signal get through that iron curtain?"

LETTERS *from our readers*

10 W.P.M.?

"I AM an old timer in radio and have seen the spark coil, crystal, WD11, and 199 all laid to rest. Now I see RADIO & TELEVISION NEWS is out for new blood. I am in favor 100 per-cent. The best way to bring it about is to bring the code speed back to where it was years ago (10 words-per-minute). The amateur lost the 160-meter band after the war, and this was a loss to the newcomer as those who gave us code lessons on that band were a nice bunch of amateurs.

"Now there are some amateur clubs who would like the return of the old 160-meter band, and I think a few kc. should be allowed if they will give us code lessons again. Let a certain frequency be set aside for code lessons and nothing else.

"America must depend on radio and electronics to win the wars and keep the peace. There is no better way to acquire new blood and make and keep America strong and free than by making it easy for one to get a ticket.

"Good luck to the contest and contestants!"

Marvin Gurlin
111 White Horse Pike
Audubon 6, New Jersey

We'd like more opinions on code speed requirements, fellows. What do you think?

* * *

PUBLIC RELATIONS?

"READING in RADIO & TELEVISION NEWS that you would like to see more of the younger generation become radio hams, I feel that the following idea may help. All ham clubs should take in members of both sexes who are now short-wave listeners or interested in radio. In that way they would get to know the ham better.

"They would not be allowed to take part in the election of officers, etc., but would be able to hear the discussion which takes place. After the meeting is over they could take part in a question-and-answer period. Each ham could take one of these members under his wing and invite him or her over to his station to see how he works, and I feel that before long many new hams will be on the air calling *CQ*.

"I know a few hams will say that the bands are now overcrowded, but I think there is room for more. The man on the street does not know what the hams are doing or what they have done in the past, for very little has been said about them in the papers. I feel that each club should let the public know through their local papers just what is doing.

"Take my case, for instance. I am getting on toward seventy years of age and have been interested in radio since the beginning. It was only last year that I met my first ham face-to-face and saw him operate his rig. You can see that if there had been a club I could have joined in my younger days, I would have been calling *CQ* many years ago. To me, the ham fraternity is one of the finest organizations in this world today and one that can help toward peace more than any other agency. It is they that we can thank for the type of receivers that we have today.

"I monitored the 10-meter band for nearly two years for the Propagation Bureau, Washington, D. C., putting in six hours every day, so I feel I know just what the hams are doing and their line of thought. I know a few hams have no time for the short-wave listeners, for I have heard them say so, but I feel that the majority of them are only too glad to give a hand to anyone who wants to get his license.

"I would like to see a story written about the work done by hams during some of the disasters which we have had during the past years. It really would make a good motion picture so that the rest of the world would know that they do more than sit in their shacks and call *CQ*.

"I do hope that this will help to create more hams, and so will close with best wishes to you and your staff."

Fred Wolfe
3266 Fairview Avenue
Alameda, California

An excellent idea, Fred, and worthy of consideration. For a starter—you fellows who have participated in emergencies—let's hear your experiences. If you have snapshots, send them along. And you photo bugs—let us know if you have movie film that could be borrowed for duplicating.

* * *

ATTENTION—DETROIT HAMS

"MR. HERTZBERG'S article interested me a great deal. In fact, I would say that it was the clincher that decided me on getting my ham ticket and a rig of my own. All that is holding me back right now is my being unfamiliar with the process of going at it.

"I can say that I am on nodding terms with radio theory, having had three years of it in the service, and back in 1945 my code speed bumped 30 words-per-minute, so there is some hope.

"I am depending on the future issues of RADIO & TELEVISION NEWS to light the way. Is there any way that I can contact a local club around Wayne or Detroit, Michigan, and get some first-

hand advice? Thanks loads from a steady reader."

Joseph A. Butkiewicz
4487 Mildred
Wayne, Michigan

Come on, Detroit and Wayne. Here is a recruit just waiting to be gathered into the fold.

* * *

ATTENTION: LONG BEACH, LONG ISLAND HAMS

"I HAVE been reading your magazine for over a year now, and find it very intriguing. The reason I say intriguing is simply this: I have just finished reading the first part of Mr. Hertzberg's series, "The Beginning Amateur," published in the recent February issue.

"It was quite some time ago when the symptoms explained by Mr. H. became apparent to me. I then realized I had the 'Radio Bug.' Mr. Hertzberg mentions the need of young blood to fill the veins of ham radio. Well, what could be better material than fellows like me? Twenty-two years old and really anxious to get that ham ticket.

"In my area (Long Island), there are many hams I tune in from neighboring towns. I wrote one of them once asking a chance to visit and see his equipment and get his advice. Unfortunately, I received no answer. There are probably many of these hams who would be glad to help us green 'bug bitten' victims get started, if they knew we existed. So, Mr. Editor . . . what to do?

"My profession is photography. I would be glad to trade knowledge with a ham who would care to set up a darkroom, etc. All we beginning amateurs want is to know how to go about it, and from neighboring fellows who already have their tickets, a little HELP!!"

Jerome R. Weiss
50 West Walnut Street
Long Beach, Long Island

From some of the letters received from hams and ham clubs, they are waking up to the value of your "new blood" and you will probably have more sponsors than you'll know what to do with. Good luck.

* * *

PROS AND CONS

"AS AN old-timer, 39 years in the ham game, I wish to express to you and the magazine my most hearty congratulations in your effort to stimulate interest in amateur radio as a hobby and electronic advancement.

"There is one thing which would be a great help to our group, if you would just run a small insert in your magazine under the amateur section which you will be using in your contest with the following heading: *If I become an amateur radio operator and own my station 'can I take it?'* Let's be realistic about this matter and not point out all the good things there are in it for the gang without the bitter end showing also.

"Having grown up with the game and watched it advance from spark

coils, coherer and de-coherer to our present dual-conversion receivers and single side-band suppressed carrier transmitters, I find there has sprung up along with this, the broadcasting business in all its ramifications.

"Here let me point out some of the very bitter pills an amateur has to swallow. Business has to make money, and in so doing cheapens and engineers everything out of a radio that makes it a good radio so as to sell it at a low price. Thus designed, the inadequate receivers are sold as radios to the unsuspecting public as good (squawk box) receivers (a.c.-d.c.). Television receivers of present manufacture fall in this same category.

"Now when a receiver is moved in the close proximity of an amateur's station, and he is picked up on the set, the ham is immediately put in the dog house, there to remain the rest of his life. It's funny that when these same radios are used near a broadcasting station, and they come in all over the dial, nothing much is said to that station about it, but a ham . . . well that's different! The new amateur has three strikes against him before he gets his operator's license.

"It is a very hard problem to avoid causing interference with TV sets, due to the complexity of the receiver, and the very broad tuned front end with no rejection of any frequencies that might be a harmonic radiation or interlocked frequency to enter the i.f. channels.

"The a.c.-d.c. table models and consoles with no front end, no shielded circuits, and no bypass condensers on audio tube cathodes cause our BCI, making the ham the recipient of telephone calls of a very degrading nature by persons who will not leave names or addresses, so that you could advise them what to do. Even if you do succeed in getting in a few words asking them to write to the FCC, they won't do it. Again, they will call and tell you to get off the air in no uncertain abusive language, because they have a good, inexpensive radio.

"As a suggestion to the ARRL and NARC organizations, why not place before the FCC a recommendation that all types of receivers (AM-FM and Television) be placed on trial for various types of interference from the amateur transmitters before they are sold to the public and the necessary parts put in the receivers to overcome this difficulty. This would eventually improve the receivers and give the public a great deal more satisfaction even at the cost of two or three dollars more per set.

"The amateur at present is under a very great pressure from the manufacturers to have an FCC ruling placed on him to restrict his operating during certain broadcast times. This in itself shows the manufacturers' weaknesses, and the great need for more amateurs to combat this present pressure from the set manufacturers.

"There has been for some time an underground rumor to the effect that there is a concerted movement to get the amateur off the air.

"So, fellows, come and make our ranks swell and become recognized as a large organization, active, and no weakling to be pushed around.

"This is my story to anyone thinking of taking up radio as a hobby. 'Can You Take It?'"

Chris E. Hobson
W3AER, ex W2ALX, W2AER, W8BWP, W3PWP.

Well, Chris, OM, you gave with both barrels. We see no threat to amateur radio, however, as long as we have the support of such men as Admiral Stone, General Ankenbrandt, and General Akin, of our Navy, Air Force, and Signal Corps behind us. And, they are!

* * *

CODE MYSTERIOUS? TRY THIS

"I HAVE been reading some of the letters on learning the code. First, no one can teach you; you have to get in there and keep knocking off the word speed one at a time.

"I started back in high school without the help of a school or club. My sending might not be as good as a tape-taught operator, but I have been able to earn a living at it and hold a First Telegraph and First Telephone with a Class 'A' ham ticket; I started out with W8DER, W8EIL, and now W2QCS. I have an ARRL 30 w.p.m. ticket.

"The way I learned the code was just to tune the ham bands until a *CQ* was heard. I hung onto that fellow and got first one letter (in most cases they start *'CQ DE W'*) then the number, the first or second time he goes around; then the first letter following the number, then the second, etc. Then when he comes back, the routine is generally the call of the fellow he wants to work repeated two or three times, then *'DE'* and then his call, and then the report of the city.

"The greatest pitfall I have found with persons I know is they seem to get so far, say 8-10 w.p.m., then for a week or so they just cannot get up over that hump; but if they just keep at it, all of a sudden—'the light,' and over the top they go, continuing right up to the speed they want.

"You fellows who seem to get just so far—don't stop there. You will remain there for a week or so, of course, but you have to continue your study, then when you get over that hump you're in.

"I've been in this business eighteen years and find you need a real interest, not just a passing fancy. That is why I say no one can teach you. You have to want to use the code, not as a means of getting a ticket (you'll forget it), but with real interest right from the start."

E. F. Dietz
WKBW, Rand Building
Buffalo 3, N. Y.

Here's food for thought and worth a try.

* * *

FANTASTIC?

"I AM writing you not only as the editor of RADIO & TELEVISION NEWS, but also as a fellow amateur. I will appreciate any information you can give me on the following subject.

"Perhaps you have received additional queries concerning the Taylor super-modulation system as given in the September and October 1948 issues of your magazine? After re-reading the article a goodly number of times and waiting several months hoping to hear more about it, I scaled down his rig to a pair of 807's and have made a few test transmissions with very interesting results. At least to me. And judging from the other fellows on ten who have heard it, considerable interest has been aroused.

"On writing *"QST"* asking for further information, and why we hadn't been seeing articles on it, it really bowled me over to find that "Q Street" had originally turned down the article and considered the claims to be fantastic.

"Well, I'm in business on ten with it, and I like it. Perhaps it is not so sharp that you may miss it in tuning, but it is much sharper than conventional AM with a tendency towards full 100 per-cent modulation. I am especially enthusiastic about the two primary claims. One, that the audio sideband power is extended right up to CW level, and two, that the audio power required to obtain this efficiency is exceptionally small. Let alone the ability to reduce the carrier.

"Would it be possible to get Mr. Taylor's address from your organization? Would he welcome inquiries? Incidentally, the receiving advantage provided by his system (he mentions it as an elevation of the base line in the detected signal) really works. I had definite and interesting corroboration during one contact."

John K. McCord, W1BIJ
48 Franklin Street
Medford, Massachusetts

Thanks, OM, for your report of results on Bob Taylor's super-modulation system. It checks with results of many others who have used it. Chances are you'll soon be hearing transmissions from one of several MARS stations who are testing the system!! We'll be glad to forward correspondence for you.

* * *

MORE MATHEMATICAL ACROBATICS?

"While reading the November 1948 issue of your good publication, I came across an article by G. A. Burns showing a method for calculating ohmmeter scales. The article appeared on page 162 and even though it was quite interesting, it seems to me that Mr. Burns subjects the builder of 'custom tailored' ohmmeters to a great deal of tedious mathematical acrobatics by the formula he proposes.

"Permit me to suggest a formula which I have used for quite some time and have found to be the simplest of them all:

$$\text{Scale division} = \left(\frac{\text{int. res.}}{\text{int. res.} + O}\right) D$$

where:

D = total number of divisions
O = value of ohms mark.

"To use the values Mr. Burns suggested, this would give:

Scale division $= \frac{2345}{10345}$ times 100 equals 22.7.

"As you can very readily see, this formula will, with (or without) the use of a slide rule, permit the calculation of a complete ohmmeter scale in a very short time.

"Since the numerator always stays the same, it is a simple matter to set the hairline of a slide rule to that value on the D scale, and by moving the C scale, the answer can be read directly on the D scale.

"I have taken the liberty of submitting this formula for your consideration, and also I thought that perhaps it might be of some interest to your many readers."

Rudolph Graf
12 Harrison Avenue
Brooklyn 11, N. Y.

Thanks for the suggested simplified method. It certainly does seem to work, and those readers interested will be happy to use it.

* * *

MORE RECRUITING UNDER WAY

"I HAVE followed with interest your recent editorials referring to the need for 'new blood' in our amateur fraternity. There is no doubt in my mind but what this topic is indeed timely, for there is no time like the present, when amateur radio is approaching its most active season, to induce the enthusiasms necessary into club membership to do something to alleviate the condition.

"I am happy to report that following your editorial in the September, 1948, RADIO & TELEVISION NEWS and that in 'Zero Bias' in the October *CQ*, a correlation of these two reports was printed in the November issue of the 'Ground Wave,' the St. Paul Radio Club newspaper.

"Following the printing of this correlation, a committee to decide what our club might do to induce activity was appointed at the November meeting. From this, you may deduce that as one of the major projects of the season, the St. Paul Radio Club is attempting to 'spread the gospel of amateur radio' and 'induce new ham blood into our ranks.'

"As president of the St. Paul Radio Club, I wish you the best of success in this project."

James L. Whittaker
1812 East Maryland Avenue
St. Paul 6, Minnesota

The above letter is typical of many received since the September editorial. Many clubs and individual amateurs are taking steps to train new amateurs.

You, as an individual or club member may aid in the program, and in addition help yourself and your club by entering the RADIO & TELEVISION NEWS *$10,000 Contest for new amateurs.*

Contestants, have you sent in your entry blank?

-30-

(*Continued from page 46*)

similar to the type shown in Fig 1. This one is partially adjustable (the coil can be moved forward and it can be rotated a few degrees about the tube axis). The deflection coil is adjusted in the following manner:

Step 1. Obtain a raster on the screen by the preceding ion trap and focus coil adjustments.

Step 2. Rotate deflection coil until the lines in the raster are horizontal.

Step 3. Move deflection coil as close as possible to bulge in the tube.

Step 4. Tighten screws.

In Fig. 1, the deflection, focus, and ion trap coils are shown mounted cor-

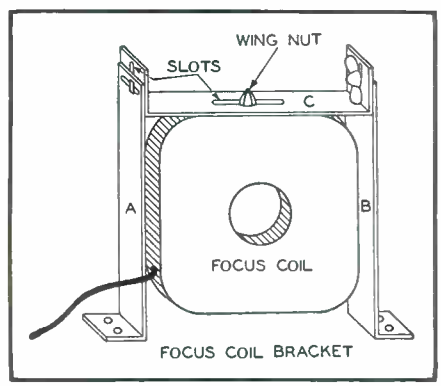


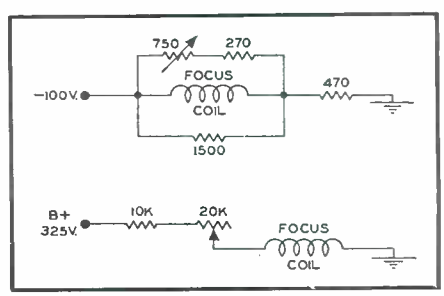
Fig. 7. Supporting bracket for focus coil.

rectly on the neck of a 10BP4 cathode-ray tube.

If it is found that pictures appearing on the screen are too wide and too high, use the horizontal and vertical size controls to reduce the image to fit the screen mask. It is not good practice to move the deflection yoke back in order to achieve the same result.

The foregoing adjustments concern tubes which employ electromagnetic deflection. With electrostatic tubes, the adjustments are considerably simplified because there are no ion traps or movable coils to adjust. The tube is placed in its socket, the power turned on, and the brightness control turned clockwise until a raster is visible on the screen. The contrast control is turned completely to the left to prevent signals or noise voltages from reaching the cathode-ray

Fig. 8. Two widely used methods of varying the current through the focus coil.



tube. The focus control is now adjusted until the lines of the raster stand out sharp and clear. Rotate the contrast control until an image appears on the screen. The image should be square with the mask if the tube has been set properly in place. If the image is not square, then the entire tube, with its socket, will have to be rotated until the image is correctly positioned. Most sets make provisions for partial rotation of the tube by providing adjustable tube base screws. Once the image is properly oriented, the screws are tightened.

(To be continued)

DX Receiver

(Continued from page 61)

except to drop the volume. If there is any pulling the signal may be tuned in with either control. The one adjustment made on ten meters is satisfactory for all bands.

The usual precautions of keeping all r.f. leads short, direct, and well away from other wires and the bypass condenser leads as short as possible will repay the builder. Should the noise silencer not be wanted it can be omitted by connecting the plate lead of the 6AC7 directly into T_2 and ignoring the circuits and tubes between. If it isn't incorporated when built we suggest you leave room for later inclusion as it is a big help in pulling in the stuff through QRM of all kinds.

Two final tips, use a Faraday shield at the receiver and a pi-network to tune the antenna line. The Faraday shield here is external and connects to the set with a piece of coax cable to the receiver input. Both our 3 element beams perform far better when these two are in use than straightthrough even though the lines are quite flat for both bands.

As to results, we have worked 159 countries with this set and heard regularly about 15 more Asians that the local boys with their expensive commercial jobs don't hear. Also we can work through the strong evening QRM at will.

—30—

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BC348, 110V. USED under ten hours. $85.00. Woodrich, R. F. D. 4, Wellsville, N. Y.

BC348-Q RECEIVER complete with headphones and speaker, converted for 110V A.C. Excellent condition. Sidney Rotz, 269A Stevens Ave., Jersey City, N. J.

HALLICRAFTER, S-40-A. Slightly used. $65.00. Chas. Cerami, 146 Congress St., Newark, N. J.

RCA 500 WATT Public Address Amplifier, new, $250.00. Al Williams, 31-D Victory Heights, Spokane, Wash.

MILLIAMMETERS. Weston 2" dia. Sensitive 0-1 mil movement $2.95. Neon Glow Lamps, ¼ watt GE-NE-48. List 40c, 10 for $1.50. Rectifiers, 115 AC to 110 DC, center-tap, 6 amps. $4.95. 2-jaw Mechanical Retriever, pick up screws, etc. $1.00. Send check or money-order. All items postpaid. Anchor Surplus, Dept. R, 6987 W. Fort St., Detroit 9, Mich.

HALLICRAFTERS SX43, excellent condition, $135.00, delivered. Navy ARB, converted 110V, good condition, $32.50, delivered. Box 8, Calhoun, S. C.

SELENIUM Cells, 200 milliampere, 1¾" diameter with pressure plates 15c set. Hornbeck, 514 Sanders Ave., Scotia, N. Y.

SYLVANIA 7" scope, in original carton, never used, $100. H. L. Phillips, 151 Trenton, Findlay, Ohio.

16" REK-O-KUT standard Recording Turntable, Masterpro M-5 cutting mechanism, Presto 1-C Cutter, good condition, extra motor, recording meter, Shure 556 Microphone, $325. C. Foster, 726 Milwaukee Rd., Beloit, Wis.

NC200 COMMUNICATIONS receiver, less speaker, in good condition, $90. Reply to Herbert Gordon, 12 Sunnyside Ave., Wellesley 81, Mass.

SURPLUS BC-45", $5.95; BC-458, $6.95; BC-1206C, $5.95; BC-433G, $12.95; FT-226 Racks, $1.19; P-1 Generators, $7.95; PE-94C Dynamotors, $4.95; T-17B Mikes, $1.19; HS-38 Headsets, 49c; MC-254 Mikes, 29c; TU-26B Tuning Units, $2.95; VHF-152, $75.00; S-20R, $49.95; DM-36, $29.95; 905 Trans-Meter, $29.95; XE-10 NBFM Exciter, $29.95; Meissner Analyst, $69.95; Adj-A-Volt Xfmr. $19.95; 3E29, $2.95; 829B, $3.45; 832A, $2.95; 1625, 39c; 1626, 39c; 809, $1.25; TZ-40, $2.95; TUF-20, $3.45; 6AG7, 95c. Many other items and types of tubes. Write, complete list. Albert J. Arnold, W5WX, Box 706, Amarillo, Tex.

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WIRE Recorder Webster 78 with G.E. Amplifier and Speaker, new, $100. Sweger, 111 N. Day Ave., Rockford, Ill.

SURPLUS B-29 Gunsights, Servos, Computers, Turret Motors, Automatic Pilots. Get list. Smead, % High School, Everett, Wash.

12B8 & 25B8 TUBES. Adapter unit using 2 miniature tubes (6AT6 & 6BA6 for 12B8, and 12AT6 & 12BA6 for 25B8). Takes less space than original tube, nothing else to buy, just plug in and it works. Money-back guarantee. 12B8 or 25B8 unit complete: $2.49 each, 10 units for $22.50. Send 25% deposit, balance C.O.D. Write for free parts catalog. Commercial Radio, 36 Brattle St., Boston, Mass.

COAXIAL Cable. Identical characteristics as RG-58/U. Send dime for 3 foot sample: 300 ohm Twin-Lead $1.75 per 100 feet. Harry H. Van Dick, Box 236, Little Falls, N. J.

TELEVISION, radio, tubes, parts. Send for free bargain list. Hallmark, 592 Communipaw Ave., Jersey City, N. J.

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RADIO Diagrams Broadcast 30c; SW, FM or combined, 60c; Television $1.00; Service information $1.00 add'l. State manufacturer and model number. Kramer's Radio Service, 36 Columbus Ave., New York 23, N. Y.

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WRITE Dept. RN18 for our free wholesale list of Radio parts & accessories. R. C. Radio Parts & Distributing Co., 731 Central Ave., Kansas City 6, Kan.

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AN/ART-13, BC-348, RTA-1B, AN/APN-9, R5A/ARN-7, AN/ARC-1, AN/ARC-3, BC-788-C, I-152, MN-26. Test sets with TS- or I-prefix, Dynamotors, Control Boxes, Transmitters, Receivers, Power Supplies, etc. State quantity, condition and best price first letter. HI-MU Electronics, Box 105, New Haven, Conn.

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MISCELLANEOUS

TECHNICAL Report No. 101. Practical Transformer design, construction and repairing. $2.00 Postpaid. Conrad Roeschke, Buckhorn, New Mexico.

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INDEX OF Advertisers

APRIL 1949

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.

RMA-IRE SPRING MEETING

AT THE annual spring meeting of the RMA and the IRE, to be held April 25 through 27 in Philadelphia, some of the newest technical developments in the radio-television industry will be discussed during morning sessions of the three-day conference.

The first day will be devoted to four talks by executives and technicians of leading corporations. L. F. Deise and L. W. Gregory of *Westinghouse Electric Corporation* will discuss "A Three-Kilowatt Medium Frequency Transmitter, Utilizing Iron Core Interstage and Output Circuits." Henry Magnuski of *Motorola, Inc.* will give a talk on the "Use of the Cavity Resonator in the Mobile Communications Field." "The Symmetron 50-Kilowatt FM Broadcast Amplifier" is the subject of a talk by L. D. Balthis of *Westinghouse*, while Marion Winkler of *Motorola* will speak on "An Instantaneous Deviation Control for Phase Modulation Transmitters."

Tuesday's session will be devoted to four more discussions relating primarily to Television. The *Radio Corporation of America* representative, R. V. Little, Jr., will speak on "Television Recording Technique." "The Utiliscope, Pioneer of Industrial Television Systems," will be the subject of a discussion by M. Cawein and J. A. Good, of *Farnsworth Television and Radio Corp. General Electric Company's* A. J. W. Rhodehamel will present "A New Television Visual Modulator," and E. Finley Carter's talk on "The Reality of Invisible Forces" will close the sessions. Mr. Carter represents *Sylvania Electric Products, Inc.*

The final morning session, to be held Wednesday, April 27, will present the following panel of speakers: M. G. Lemeshka and A. G. Nekut, of *Radio Corporation of America*, on "High-Efficiency Coolers for Forced-Air-Cooled Power Tubes"; John M. Miller, Jr., *Bendix Radio*, speaking on "Audio Power Amplifier with Positive and Negative Feedback"; H. W. Augustadt, *Bell Telephone Laboratories*, presenting "Longitudinal Interference in Audio Circuits"; and N. J. Gottfried, *Federal Telecommunication Laboratories*, and W. J. Logan, *Maritime Telephone & Telegraph Company*, discussing "Commercial PTM Telephone Microwave Link."

Afternoon and evening sessions will be occupied by committee meetings and inspection trips. Mr. Stuart L. Bailey, president of the IRE, will speak at the Tuesday dinner with Mr. T. A. Smith, chairman of RMA Transmitter Division, acting as toastmaster. —30—

ERRATUM

On the diagram appearing on page 65, February issue, a 10 $\mu\mu$fd. mica cond. should be connected in the grid lead to V_{1b}. This condenser should be placed between L_4C_9 and R_9.

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RK-34	.45
36	.55
37	.55
38	.55
39/44	.34
41	.55
45 Spec. VT-52	.55
46	.85
49	.75
EF50/VT-250	.65
RK60/1641	.65
72	1.10
CEQ-72	1.55
76	.55
77	.55
VR-78	.68
80	.41
83	.85
83V	.95
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829	3.25
829B	3.95
830B	3.75
832A	3.50
837	1.25
838	3.25
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869B	28.95
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874	2.15
884	1.50
954	.55
955	.55
956	.55
957	.55
1005	.45
1148	.40
1201	.95
1616	1.25
1619	.55
1624	1.25
1625	.45
1626	.45
1629	.45
1636	4.75
2050	.78
2051	.95
7193	.35
8011	2.55
8012	4.35
8020	3.25
9001	.70
9002	.65
9003	.55
9004	.55
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350-31	57	12-16	1.5 CP	G-4½	Min. Bay	.08
350-42	Spec.	12	6 Watts	S-6	Cand. Scr.	.13
350-20	1446	12	.2 amps.	G-3½	Min. Scr.	.07
350-14	49	2	.06	T-3¼	Min. Bay	.06
350-15	3S6	120	3 Watts	S-6	Can. Bay	.11
348-22	PR-10	6	.5 amps.	B-3½	Min. Flang	.05
350-18	1477	24	.17 amp.	T-3	Min. Scr.	.16
350-55	323	3	(AIRCRAFT)	T-1½	953	.22
350-19	Proj. Bulb	120	500 W	T-20	Med. Pf.	1.45
LB-103	44 (Ruby)	6-8	.25 amp.	T-3½	Min. Bay	.04
LB-102	1195	12-16	50 CP	RP-11	DC Bay	.14
LB-104	313	28	.17 amp.	T-3½	Min. Bay	.11
350-24	12A	12	.09 amp. 11	T-2	Tel Base	.18
LB-107	24-A	W E	24	.75 amp. 105	T-2	Tel Base
350-63	S-14	ARGON	105	2½ Watt	Med.	Screw
LB-109	TELEPHONE TYPE NEON				T-2	.17
350-41	943	6-8	100 CP	G-16½	S. C. Pref.	.85
350-43	11A/T4C	18	.11 amp.	T-4	Cand. Scr.	.14

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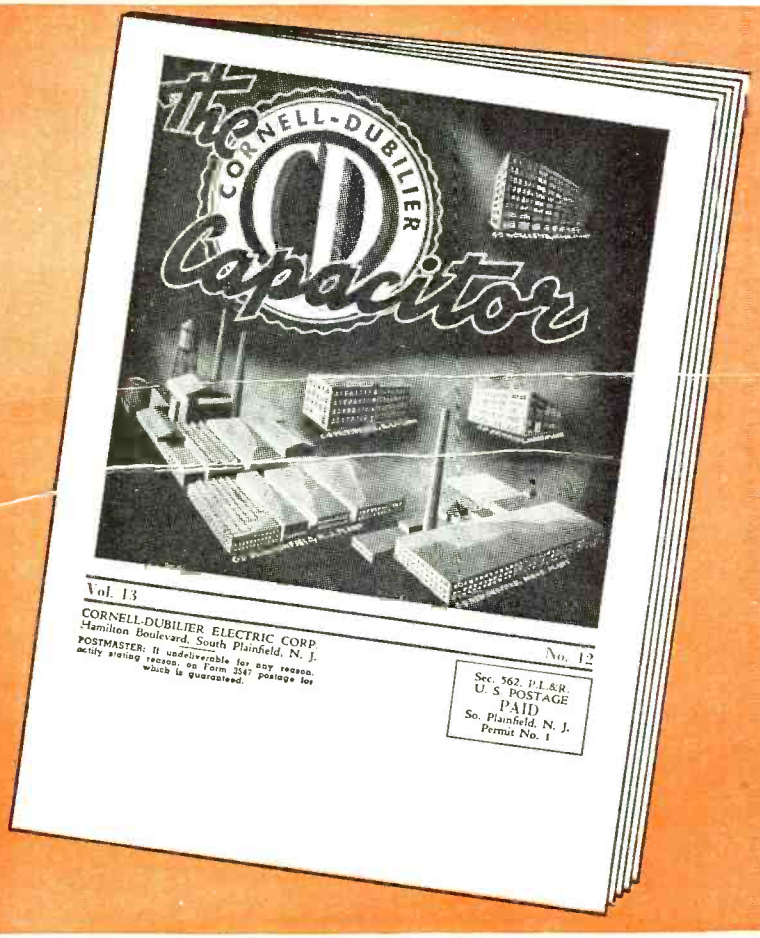

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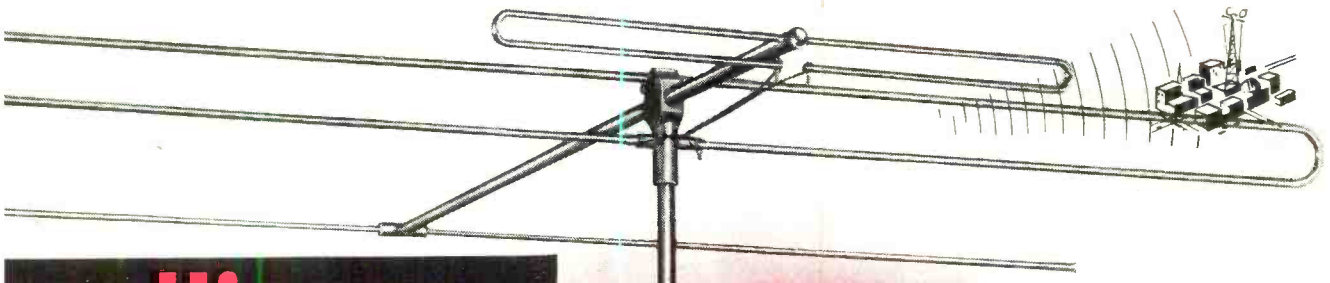
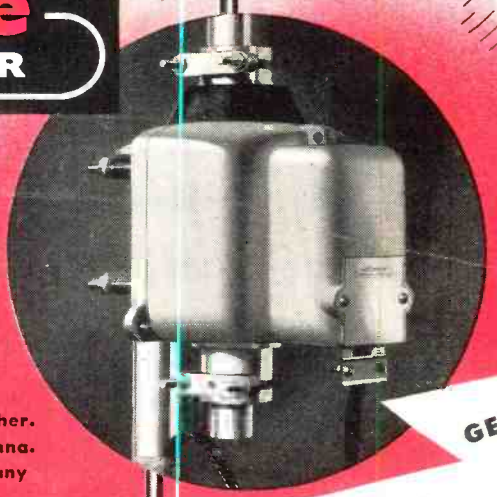
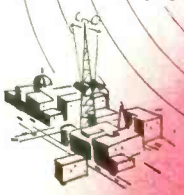
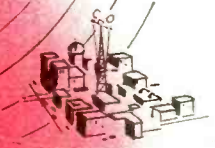


alliance
TENNA · ROTOR

For "Top"
TELEVISION
Performance!





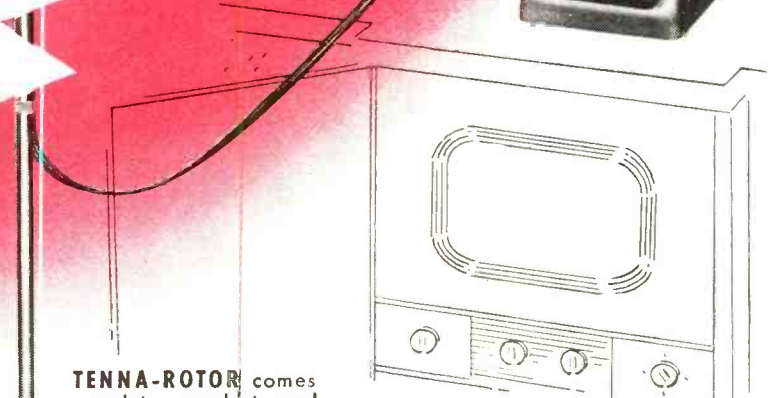


Operates in any weather.
Fits all types of antenna.
Motor will not cause any receiver distortion.

GETS **STRONGER SIGNALS!**

GIVES **MULTI-STATION DIRECTIVITY**

ROTATES TV OR FM ANTENNA



GREATEST DIRECTIONAL AID
For Maximum Signal Intensity!

THE ALLIANCE TENNA-ROTOR gives instantaneous "arm chair control" to rotate all types of TV and FM antenna. Operating a simple two-way selector switch at the set swings the antenna clockwise, or counter-clockwise, over a complete circle of 360 degrees! You can stop it at any point. This positive control of rotation selects the exact *position for "peaked" reception!*

An automatic signal light tells when the limit of travel is reached.

Tenna-Rotor is easy and inexpensive to install— any antenna mast is quickly clamped into a rotating hollow shaft powered by a fully enclosed, weather-proof, electric unit.

TENNA-ROTOR comes complete—ready to use!
The Rotor is sturdy, water-tight, metal housed —a plastic control box five inches square plugs into any 60 cycle 110 volt circuit.

FACTORY LUBRICATED FOR LIFE . . . DESIGNED FOR RUGGED SERVICE

TV and FM dealers, service men and users find that the **Alliance Tenna-Rotor** simplifies and improves both new and existing installations—most important, it assures correct antenna and "beaming" for strong, brilliant signals! Approx. shipping weight 10 lbs. Retails at **$39.95**

Overall dimensions of Rotor Unit 7¾" x 5¼" x 8"
Control Box 5" x 5"
Takes Max. Antenna Center Post O.D. 1⅜"

***AMATEURS** can use TENNA-ROTOR for both transmitting and receiving!*

ALLIANCE MANUFACTURING COMPANY · ALLIANCE, OHIO
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