Radio Call Book Magazine and Technical Review

Established 1921

25¢

CONTENTS

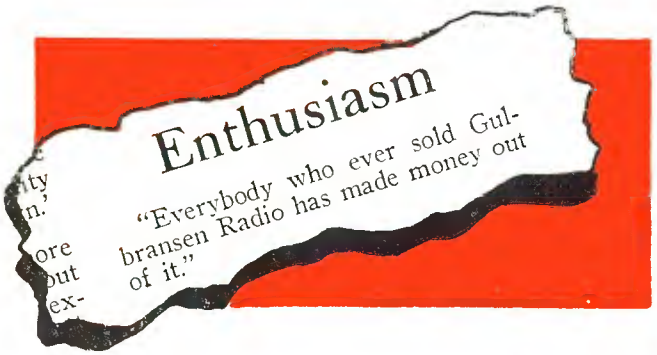
for December, 1931

Performance curves and schematics of following receivers:

All-American	Model B-7
Brunswick	Model 17-24
Colonial	Model 47-48
Crosley	Model 124
Fada	Model KW28-29
Howard	Model "O"
RCA-Victor	Model R50-55
Scott All-Wave	Model 31
Silver	Model F
Sparton	Model 25-26

Frequency assignments of all broadcast, short wave relay, police and visual stations. Other informative features in every issue

SERVICE - ENGINEERING - SALES



They say we're *enthusiastic*

...and we *are*...we caught it from GULBRANSEN Dealers and Jobbers

AN unbroken record of "no distress merchandise" . . . a service history, certified by scores of jobbers and dealers, to the effect that Gulbransen Radio very rarely requires a service call after installation . . . these are the reasons why we are "enthusiastic", as a trade magazine commented recently in quoting from a Gulbransen advertisement.

The Gulbransen line, with its background of nation-wide goodwill, is today one of the surest profit producers in the industry. These modern Superheterodynes have *everything* that is new and wanted . . . EVERYTHING

There is no *cheap* Superheterodyne, because you know and we know that a *good* Superheterodyne cannot be built and sold cheaply. The low-priced Gulbransen receiver is a time-tried TRF set of splendid performance—better than a cheap "Super" could possibly deliver.

Another fact which you know and we know, is that "most service calls start in the factory production line". Gulbransen stops 99% of them there, by the simple means of employing two inspectors for every three producing workers.

That's why Gulbransen dealers are "sitting pretty" . . . and we'd appreciate an opportunity of proving this to you. Wire or write—

GULBRANSEN COMPANY
Factory and General Offices: 816 N. Kedzie Ave.
CHICAGO, ILLINOIS

GULBRANSEN
SUPERHETERODYNE
Radio
TUNED RADIO FREQUENCY

Console De Luxe Model 235. 10-tube Superheterodyne (four '35 Vari-mu, two '47 Pentode in push-pull, three '27 and one '80). Compensating Dynamic Speaker, Visual Tuning meter (simplified distance tuning), Automatic and Manual Volume Controls, Tone Control, Full-floating Tuning Condenser, Power Switch. No "blasting," no fading, no "tube" noises, no cross-talk. Price, complete with R. C. A. tubes, $113.50.

Console Receiver Model 135. Seven-tube Superheterodyne, same chassis as Model 130, in beautifully designed cabinet, 40 inches high. 2 to 5 micro-volt sensitivity (per meter). Tone Control. No tube noises or cross-talk. Price, complete with R.C.A. tubes, $79.50.

Mantel Receiver Model 130. Seven-tube Superheterodyne (two '35 Vari-mus, one '47 Pentode, two '24 screen grid, one '27 and one '80). 10-kilocycle separation. Full-floating Tuning Condenser. Completely selective, beautiful in tone. Finest cabinet work. Price, complete with R. C. A. tubes, $69.50.

Mantel Receiver Model 330. Six-tube, tuned radio frequency, including four '24 screen grids, one '45 power tube. Powerful Dynamic Speaker. Selective, sensitive, ample volume and pleasing tone. Price, complete with R. C. A. tubes, $48.00.

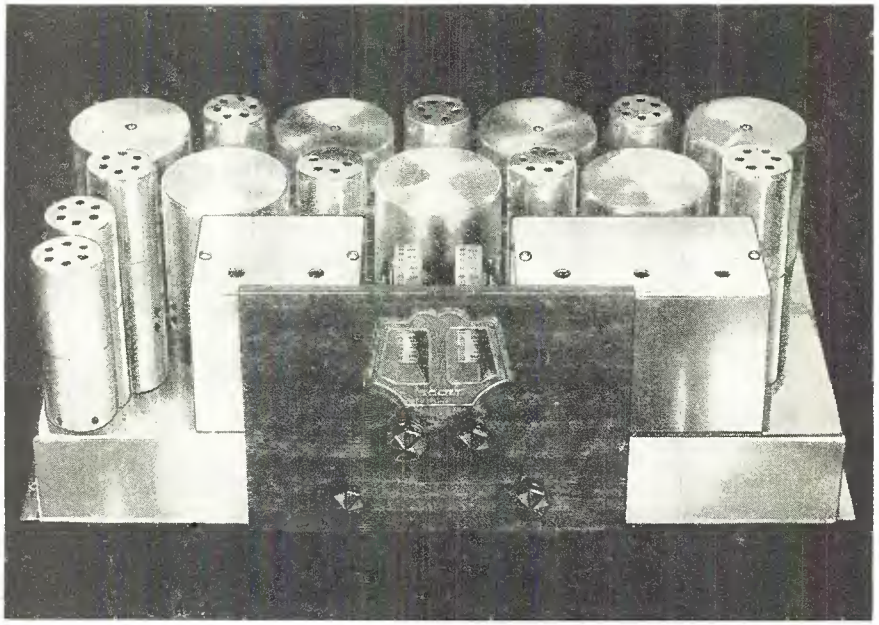
"For 16 Weeks

I enjoyed every broadcast from

VK3ME

MELBOURNE, AUSTRALIA"

This is not a "freak" record. Hundreds of other Scott All-Wave Receivers—all summer long—have brought their owners loud, clear, perfect music and song from the other side of the world.



EVERY now and then, the story of some phenomenal instance of extremely long distance radio reception breaks into the press. DX fans usually find little interest in such stories because they know the performance which they relate is invariably due to "freak" conditions.

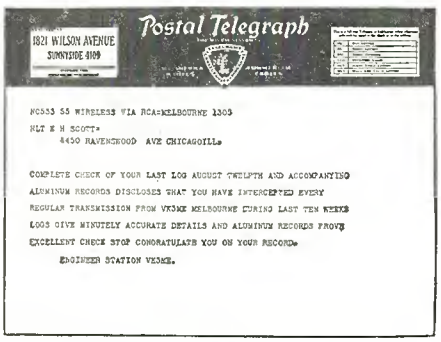
But DX fans KNOW, when *my* receiver brings in every broadcast from VK3ME for 16 consecutive weeks, that full credit must go to the receiver that did the work. And when they learn that hundreds of other receivers exactly like mine, and located in all parts of the world, are piling up equally sensational records, they are well satisfied that the Scott All-Wave is not only the most powerful, most sensitive receiver possible to obtain, but the one receiver that fulfills their lifelong hopes.

Undeniable Proof

Away last spring I made up my mind to eclipse all standards of radio reception—distance—power—selectivity and tone. I believed the Scott All-Wave would do it, so I set out to make a day-to-day log of VK3ME, Melbourne, 9560 miles away from my receiver. I tuned in *every* broadcast, on the loud speaker, and to prove to the entire world that I heard *every* VK3ME program with full volume, and with perfect tone and clarity, *I made a disc recording of every broadcast!* Half of these records I sent to VK3ME. The others are at my laboratory and will be played for anybody who asks to hear them.

Not a Special Set

The Scott All-Wave Receiver that you may buy, will *in no way*, differ from the one I used in my 16-week test. It will be identical to the hundreds of other Scott All-Wave Receivers that tune in voice from England, France, Germany, Italy, Japan, Indo-China, and South America every day in the week—summer and winter. The set that I will send to you will actually be tested on reception from G5SW, Chelmsford, England, or 12RO, Rome, Italy, before shipping!



Postal Telegraph

1821 WILSON AVENUE
SUNNYSIDE 9109

NC553 55 WIRELESS VIA RCA-MELBOURNE 1305
HLT E H SCOTT=
4450 RAVENSWOOD AVE CHICAGOILL=

COMPLETE CHECK OF YOUR LAST LOG AUGUST TWELFTH AND ACCOMPANYING
ALUMINUM RECORDS DISCLOSES THAT YOU HAVE INTERCEPTED EVERY
REGULAR TRANSMISSION FROM VK3ME MELBOURNE DURING LAST TEN WEEKS
LOGS GIVE MINUTELY ACCURATE DETAILS AND ALUMINUM RECORDS PROVE
EXCELLENT CHECK STOP CONGRATULATE YOU ON YOUR RECORD=
ENGINEER STATION VK3ME.

This cablegram verifies the first 10 weeks' reception. To date there has not been time for my log of the last 6 weeks to reach Melbourne.

Another Challenge

Again, I challenge the whole world of radio to any kind of competitive test, between 15 and 550 meters. I guarantee that the Scott All-Wave will bring in the most stations between 15 and 550 meters—that the Scott All-Wave will leave no doubt as to superior tone quality—and that it will give actual 10 kilocycle selectivity over the Broadcast Band.

Clip the coupon—mail it today for full particulars. You'll be amazed when you see how little it costs to own a Scott All-Wave Superheterodyne.

E. H. Scott

E. H. SCOTT RADIO LABORATORIES, Inc. (*Formerly Scott Transformer Co.*)
4450 Ravenswood Avenue - Dept. CB12 - Chicago, Illinois

The SCOTT ALL-WAVE

15-550 METER SUPERHETERODYNE

CLIP

E. H. SCOTT RADIO LABORATORIES, Inc.
(*Formerly Scott Transformer Co.*)
4450 Ravenswood Ave., Dept. CB12, Chicago, Ill.

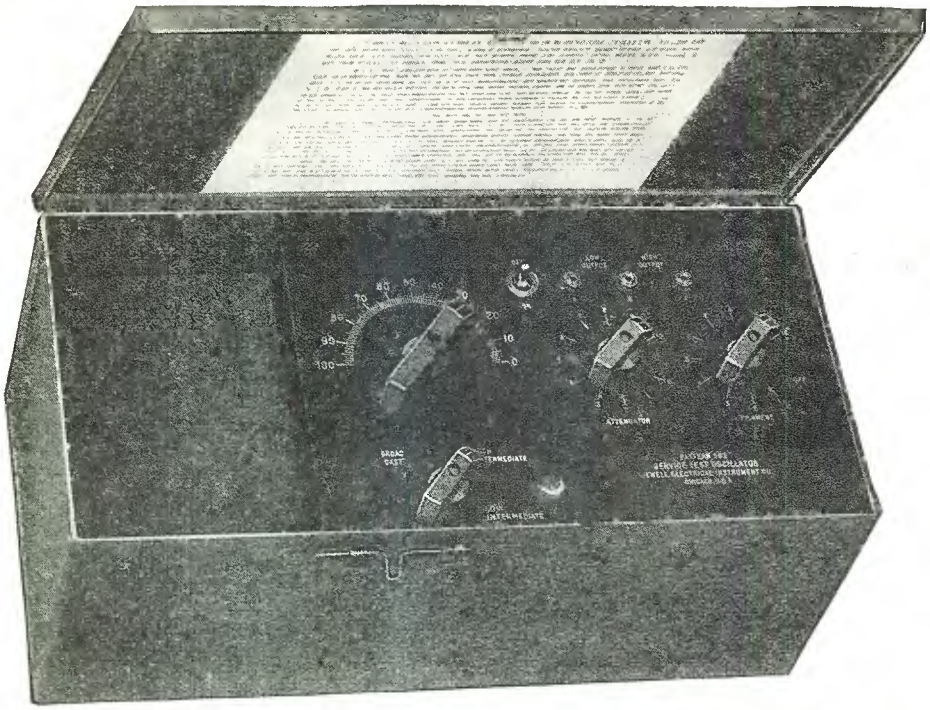
Send me full particulars of the Scott All-Wave Receiver.

Name.....

Street.....

Town.....*State*.....

A new Jewe Test Osc llator

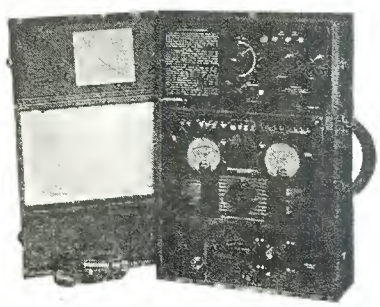


—with every necessary test feature

—plus Jewell quality construction and dependable operation

JEWELL

—at an astonishing low price



The Jewell Professional Service Combination

Here is combined in a single unit all the testing equipment the radio serviceman needs for quickly and accurately performing every service task.

The Jewell Pattern 531 Professional Service Combination includes a Jewell Pattern 444 Set Analyzer, a special model of the oscillator described to the right, and a power unit that supplies all necessary power for testing tubes in the analyzer. No separate output meter is needed as receiver output measuring ranges are available in the set analyzer.

Write for complete details.

In the Pattern 563 Test Oscillator, Jewell has again set new standards in value.

Now no serviceman need go without an adequate oscillator or be handicapped by an inaccurate or undependable instrument.

This remarkable instrument combines every oscillator feature necessary for servicing modern radio receivers, and Jewell dependability of operation.

Features of the Pattern 563

Output frequency continuously variable from 550 to 1,500 K. C. in the broadcast.

Two intermediate bands, 125 to 185 K. C. and 175 to 450 K. C., allow servicing of all modern supers.

Metal carrying case and panel form effective shield.

Operates from batteries carried within shielded case.

Single control adjusts output frequency.

Three-position switch allows instant change to any of the three frequency bands.

Calibration curves and operating instructions carried in cover.

Trimmer adjustment permits spotting any much used intermediate frequency at a convenient point on the dial.

Space provided in case for carrying Jewell Pattern 559 Output Meter, which may be purchased separately.

Completely equipped with shielded output lead, calibration curves, instruction chart, one '30 type tube, and all necessary batteries.

Handsomely finished metal carrying case protects the instrument from damage and provides an effective shield for the oscillator.

Write for prices and complete description.

31 YEARS MAKING GOOD INSTRUMENTS

JEWELL

Jewell Electrical Instrument Company,
1642-G Walnut Street, Chicago, Ill.

Please send me literature describing the new Jewell instruments, Patterns 563 and 531.

Name .....

Address .....

City ..... State .....

RADIO CALL BOOK MAGAZINE AND TECHNICAL REVIEW, December, 1931. VOL. XII, No. 5. Published monthly at Chicago, Ill. Subscription price, $2.00 per year. 25 cents per copy. Entered as second-class matter September 3, 1931, at the Post Office of Chicago, Ill., under the Act of March 3, 1879. Citizens Radio Service Bureau, Inc., Publishers, 508 S. Dearborn St., Chicago.

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Table of Contents

Editorial

Engineers and technicians who have been accustomed to working with performance curves will undoubtedly be interested to know that for the first time in the history of the Federal Radio Commission a mass of sensitivity, selectivity, electrical fidelity and power overload or automatic volume control curves became a portion of the record in case on October 1 of KMA, modification of license. Mr. Scheer, our technical editor, was called to appear before the examiners' hearing on October 1 as an expert witness. He carried with him performance curves on all of the receivers that have appeared in the October, November and present issues, the original blue print forms being included in the testimony, which, according to one of the observers, is quite comprehensive. In this case KMA wished to use a frequency 10 k-c separated from WGN who is assigned at 720, and WGN demurred. The purpose of the curves was to indicate what could be expected from the average modern receiver in the way of performance. Taking of testimony in this case required several days. It is not expected that a decision will be handed down by the Commission under several weeks, possibly even longer.

Work of classifying our subscribers according to vocations is going ahead rapidly. The editorial department has been interested in seeing how the eight vocational classifications of our mail subscribers develop. Readers may also be interested in some of the figures, which are not complete but which represent the reclassification work up to the present writing. More than 16% of our readers classify themselves as dealers, 28% as service men, 6% as engineers, manufacturers 1%, distributors 1%, salesmen 1½%, technicians 3%, experimenters 23% and unclassified as to vocation but interested in the radio business 18%. Having each subscriber classify himself vocationally enables the editorial department to allocate the editorial content in accordance with the various proportions of the vocations represented. Consequently any subscriber having a request from the circulation department for his vocational classification will help the editorial department considerably by forwarding such information so that this work can be completed at an early date.—Editor.

Will Show You Too

How to Start a Spare Time or Full Time

Radio Business of Your Own

Without Capital

J. E. SMITH, *President*
National Radio Institute

The man who has directed the Home-Study Training of more men for the Radio industry than any other man in America.

Here are a few examples of the kind of money I train "*my boys*" to make

Started with $5 Now has Own Business

"I started in Radio with $5, purchased a few necessary tools, circulated the business cards you gave me and business picked up to the point where my spare time earnings were my largest income. Now I am in business for myself. I have made a very profitable living in work that is play."—Howard Houston, 512 So. Sixth Street, Laramie, Wyo.

$700 in 5 Months Spare Time

"Although I have had little time to devote to Radio my spare time earnings for five months after graduation were approximately $700 on Radio, sales, service and repairs. I owe this extra money to your help during the time I studied and since graduation."—Charles W. Linsey, 537 Elati St., Denver, Colo.

$7396 Business in 2½ Months

"I have opened an exclusive Radio sales and repair shop. My receipts for September were $2,332.16, for October $2,887.77 and for the first half of November, $2,176.32. My gross receipts for the two and one-half months I have been in business have been $7,396.25. If I can net about 20% this will mean a profit of about $1,500 to me."—John F. Kirk, Kirk Sales and Service, Union Block, Spencer, Iowa.

My Free book gives you many more letters of N. R. I. men who are making good in spare time or full time businesses of their own

THE world-wide use of receiving sets for home entertainment, and the lack of well-trained men to sell, install and service them have opened many splendid chances for spare time and full time businesses. You have already seen how the men and young men who got into the automobile, motion picture and other industries when they were young had the first chance at the key jobs—and are now the $5,000, $10,000 and $15,000 a year men. Radio offers you the same chance that made men rich in those businesses. Its growth is opening hundreds of fine jobs every year, also opportunities almost everywhere for a profitable spare time or full time Radio business. "Rich Rewards in Radio" gives detailed information on these opportunities. It's FREE.

So many opportunities many make $10 to $25 a week extra while learning

Many of the ten million sets now in use are only 25% to 40% efficient. The day you enroll I will show you how to do 28 jobs common in most every neighborhood for extra money in your spare time. I will show you the plans and ideas that are making as high as $200 to $1,000 for others while taking my course. G. W. Page, 133 Pine St., McKenzie, Tenn., writes: "I made $935 in my spare time while taking your course."

Many $50, $60 and $75 a week jobs opening in Radio every year

Broadcasting stations use engineers, operators, station managers, and pay $1,200 to $5,000 a year. Radio manufacturers use testers, inspectors, foremen, engineers, service men and buyers for jobs paying up to $7,500 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. Radio dealers and jobbers are continually on the lookout for good service men, salesmen, buyers, managers, and pay $30 to $100 a week. Talking Movies pay as much as $75 to $200 a week to the right men with Radio training. My book tells you of other opportunities in Television, Aircraft Radio and other fields.

I will train you at home in your spare time

Hold your job until you are ready for another. Give me only part of your spare time. You don't have to be a high school or college graduate. Hundreds have won bigger success. J. A. Vaughn jumped from $35 to $100 a week. E. E. Winborne seldom makes under $100 a week now. The National Radio Institute is the Pioneer and World's Largest organization devoted exclusively to training men and young men, by correspondence for good jobs in the Radio industry.

You Must Be Satisfied

I will give you an agreement to refund every penny of your money if you are not satisfied with my Lessons and Instruction Service when you complete my course. And I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also Advanced Training in any one of five leading branches of Radio opportunities.

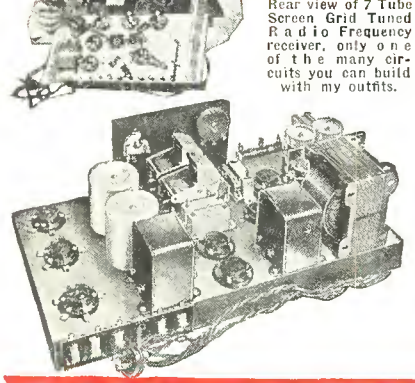
My 64-Page Book Gives the Facts

Clip and mail the coupon now for "Rich Rewards in Radio." It points out the money-making opportunities the growth of Radio has made for you. It tells of the opportunities for a spare time or full time Radio business of your own, the special training I give you that has made hundreds of other men successful; and also explains the many fine jobs for which my course trains you. Send the coupon to me today. You won't be obligated in the least.

Get my new book It points out what Radio Offers You

You will get Extensive Practical Radio Experience with my Home Experimental Outfits

Rear view of 7 Tube Screen Grid Tuned Radio Frequency receiver, only one of the many circuits you can build with my outfits.



My course is not all theory. You use the 8 Outfits I'll give you, in working out the principles, diagrams and circuits used in modern sets and taught in my lesson books. This 50-50 method of home training makes learning easy, fascinating, interesting. You get as much practical set servicing experience in a few months as the average fellow who hasn't had this training gets in two to four years in the field. You can build over 100 circuits with these outfits. You experiment with and build the fundamental circuits used in such sets as Crosley, Atwater-Kent, Eveready, Majestic, Zenith, and many others sold today. You learn how these circuits work, why they work, how they should work, how to make them work when they are out of order.

J. E. SMITH, President
Dept. INE
National Radio Institute
Washington, D. C.

THIS COUPON IS GOOD FOR ONE *FREE* COPY OF MY NEW BOOK — mail it TODAY

J. E. SMITH, *President*,
National Radio Institute, Dept. INE
Washington, D. C.

DEAR MR. SMITH:—Send me your book. I want to see what Radio offers. I understand this request does not obligate me and that no agent will call.

Name.....

Address.....

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

Get the facts on my Lifetime Employment Service to all Graduates

American Broadcasting Stations

Station assignments shown in the following pages were made by the Federal Radio Commission. This list is revised from issue to issue and is therefore up-to-the-minute. Initials such as E, C, M, and P denote Eastern, Central, Mountain and Pacific time.

KABC—1420 kc, San Antonio, Texas, Alamo Broadcasting Co., 100 w, C.
KBPS—1420 kc, Portland, Ore., Benson Polytechnic School, 100 w, P.
KBTM—1200 kc, Paragould, Ark., Beard's Temple of Music, 100 w, C.
KCRC—1370 kc, Enid, Okla., Champlin Refining Co., 100 w, C.
KCRJ—1310 kc, Jerome, Ariz., C. C. Robinson, 100 w.
KDB—1500 kc, Santa Barbara, Calif., D. Faulding, 100 w, P.
KDFN—1210 kc, Casper, Wyo., D. L. Hathaway, 100 w, P.
KDKA—980 kc, Pittsburgh, Pa., Westinghouse E. & M. Co., 50,000 w, E.
KDLR—1210 kc, Devils Lake, N. D., KDLR, Inc., 100 w.
KDYL—1290 kc, Salt Lake City, Utah, Intermountain Broadcasting Corp., 1000 w, M.
KECA—1430 kc, Los Angeles, Calif., Pacific Development Radio Co., 1000 w, P.
KELW—780 kc, Burbank, Calif., Magnolia Park, Ltd., 500 w, P.
KEX—1180 kc, Portland, Ore., Western Broadcasting Co., 5000 w, P.
KFAB—770 kc, Lincoln, Nebr., KFAB Broadcasting Co., 5000 w, C.
KFAC—1300 kc, Los Angeles, Calif., L. A. Bdcstg. Co., 1000 w, P.
KFBB—1280 kc, Great Falls, Mont., Buttrey Broadcast, Inc., 1000 w, M.
KFBK—1310 kc, Sacramento, Calif., James McClatchy Co., 100 w, P.
KFBL—1370 kc, Everett, Wash., Leese Bros., 50 w, P.
KFDM—560 kc, Beaumont, Tex., Magnolia Petroleum Co., 500 w, C.
KFDY—550 kc, Brookings, S. D., State College, 500 w, C.
KFEL—920 kc, Denver, Colo., Eugene P. O'Fallon, Inc., 500 w, M.
KFEQ—680 kc, St. Joseph, Mo., Scroggin & Co., 2500 w, C.
GFGQ—1310 kc, Boone, Iowa, Boone Biblical College, 100 w, C.
KFH—1300 kc, Wichita, Kan., Radio Station KFH Co., 1000 w, C.
KFI—640 kc, Los Angeles, Calif., Earl C. Anthony, Inc., 50,000 w, P.
KFIO—1120 kc, Spokane, Wash., Spokane Broadcasting Corp., 100 w, P.
KFIU—1310 kc, Juneau, Alaska, Alaska Elec. Light & Power Co., 10 w.
KFIZ—1420 kc, Fond du Lac, Wis., Reporter Printing Co., 100 w, C.
KFJB—1200 kc, Marshalltown, Iowa, Marshall Electric Co., 100 w, C.
KFJF—1480 kc, Oklahoma City, Okla., National Radio Mfg. Co., 5000 w, C.
KFJI—1370 kc, Astoria, Ore., KFJI Broadcasters, Inc., 100 w, P.
KFJM—1370 kc, Grand Forks, N. D., University of North Dakota, 100 w, C.
KFJR—1300 kc, Portland, Ore., Ashley C. Dixon & Son, 500 w, P.
KFJY—1310 kc, Ft. Dodge, Iowa, C. S. Tunwal, 100 w, C.
KFJZ—1370 kc, Ft. Worth, Texas, Henry Clay Meacham, 100 w, C.
KFKA—880 kc, Greeley, Colo., Mid-Western Radio Corp., 500 w, M.
KFKB—1050 kc, Milford, Kan., KFKB Brdcstg. Assn., 5000 w, C.
KFKU—1220 kc, Lawrence, Kan., University of Kansas, 500 w, C.
KFKX—See under KYW.
KFLV—1410 kc, Rockford, Ill., Rockford Broadcasters, Inc., 500 w, C.
KFLX—1370 kc, Galveston, Texas, Geo. Roy Clough, 100 w, C.
KFMX—1250 kc, Northfield, Minn., Carleton College, 1000 w, C.
KFNF—890 kc, Shenandoah, Iowa, Henry Field Seed Co., 500 w, C.
KFOR—1210 kc, Lincoln, Neb., Howard A. Shuman, 100 w, C.
KFOX—1250 kc, Long Beach, Calif., Nichols & Warriner, Inc., 1000 w, P.
KFPL—1310 kc, Dublin, Texas, C. C. Baxter, 100 w, C.
KFPM—1310 kc, Greenville, Texas, The New Furniture Co., 15 w, C.
KFPW—1340 kc, Ft. Smith, Ark., John Brown Schools, 50 w, C.
KFPY—1340 kc, Spokane, Wash., Symons Broadcasting Co., 1000 w, P.
KFQD—1230 kc, Anchorage, Alaska, Anchorage Radio Club, 100 w.
KFQU—1420 kc, Holy City, Calif., W. E. Riker, 100 w, P.
KFQW—1420 kc, Seattle, Wash., KFQW, Inc., 100 w, P.
KFRC—610 kc, San Francisco, Calif., Don Lee, Inc., 1000 w, P.
KFRU—630 kc, Columbia, Mo., Stephens College, 500 w, C.
KFSD—600 kc, San Diego, Calif., Airfan Radio Corp., 500 w, P.
KFSG—1120 kc, Los Angeles, Calif., Echo Park Evan. Assn., 500 w, P.
KFUL—1290 kc, Galveston, Texas, W. H. Ford, 500 w, C.
KFUO—550 kc, St. Louis, Mo., Concordia Theological Seminary, 500 w, C.
KFUP—1310 kc, Denver, Colo., Fitzsimmons General Hospital, 100 w, M.
KFVD—1000 kc, Culver City, Calif., Los Angeles Broadcasting Co., 250 w, P.
KFVS—1210 kc, Cape Girardeau, Mo., Hirsch Battery & Radio Co., 100 w, C.
KFWB—950 kc, Hollywood, Calif., Warner Bros. Broadcasting Corp., 1000 w, P.
KFWF—1200 kc, St. Louis, Mo., St. Louis Truth Center, Inc., 100 w.
KFWI—930 kc, San Francisco, Calif., Radio Entertainments, Inc., 500 w, P.
KFXD—1420 kc, Nampa, Idaho, Service Radio Co., 50 w, M.
KFXF—920 kc, Denver, Colo., Colorado Radio Co., 500 w, M.
KFXJ—1310 kc, Edgewater, Colo., Western Slope Broadcasting Co., 50 w, M.
KFXM—1210 kc, San Bernardino, Calif., Lee Bros. Broadcasting Co., 100 w, P.
KFXR—1310 kc, Oklahoma City, Okla., Exchange Avenue Baptist Church, 100 w, C.
KFXY—1420 kc, Flagstaff, Ariz., Mary M. Costigan, 100 w, M.
KFYO—1420 kc, Abilene, Texas, Kirksey Bros., 100 w, C.
KFYR—550 kc, Bismarck, N. D., Meyer Broadcasting Co., 1000 w, C.
KGA—1470 kc, Spokane, Wash, Northwest Broadcasting System, Inc., 5000 w, P.
KGAR—1370 kc, Tucson, Ariz., Tucson Motor Service Co., 100 w, M.
KGB—1330 kc, San Diego, Calif., Don Lee, Inc., 500 w, P.
KGBU—900 kc, Ketchikan, Alaska, Alaska Radio & Service Co., 500 w.
KGBX—1310 kc, St. Joseph, Mo., KGBX, Inc., 100 w.
KGBZ—930 kc, York, Nebr., Geo. R. Miller, 500 w, C.
KGCA—1270 kc, Decorah, Iowa, Chas. W. Greenley, 50 w, C.
KGCR—1210 kc, Watertown, S. D., Greater Kampeska Radio Corp., 100 w.
KGCU—1200 kc, Mandan, N. D., Mandan Radio Association, 100 w, M.
KGCX—1310 kc, Wolf Point, Mont., First State Bank of Vida, 100 w, M.
KGDA—1370 kc, Mitchell, S. D., Mitchell Broadcasting Corp., 100 w, M.
KGDE—1200 kc, Fergus Falls, Minn., Jaren Drug Co., 100 w, C.
KGDM—1100 kc, Stockton, Calif., E. F. Peffer, 250 w.
KGDY—1200 kc, Huron, S. D., J. A. Loesch, 15 w, C.
KGEF—1300 kc, Los Angeles, Calif., Trinity Methodist Church, 1000 w, P.
KGEK—1200 kc, Yuma, Colo., Beehler Elec. Equip. Co., 50 w, M.
KGER—1360 kc, Long Beach, Calif., Consolidated Bdcstg. Corp., 1000 w, P.
KGEW—1200 kc, Ft. Morgan, Colo., City of Ft. Morgan, 100 w, P.
KGEZ—1310 kc, Kalispell, Mont., Chamber of Commerce, 100 w, M.
KGFF—1420 kc, Alva, Okla., KGFF Bdcstg. Corp., 100 w, C.
KGFG—1370 kc, Oklahoma City, Okla., Oklahoma Broadcasting Co., Inc., 100 w, C.
KGFI—1500 kc, Corpus Christi, Texas, Eagle Broadcasting Co., 100 w, C.
KGFJ—1200 kc, Los Angeles, Calif., Ben S. McGlashan, 100 w, P.
KGFK—1500 kc, Moorhead, Minn., Red River Broadcasting Co., Inc., 50 w, C.
KGFL—1370 kc, Raton, N. Mex., KGFL, Inc., 50 w, M.
KGFW—1310 kc, Ravenna, Neb., Sothman & McConnell, 50 w.
KGFX—580 kc, Pierre, S. D., Dana McNeil, 200 w, C.
KGGC—1420 kc, San Francisco, Calif., Golden Gate Broadcasting Co., 100 w, P.
KGGF—1010 kc, South Coffeyville, Okla., Powell & Platz, 500 w.
KGGM—1230 kc, Albuquerque, N. Mex., New Mexico Broadcasting Co., 250 w.
KGHF—1320 kc, Pueblo, Colo, Ritchie & Finch, 250 w, M.
KGHI—1200 kc, Little Rock, Ark., Berean Bible Class, 100 w.
KGHL—950 kc, Billings, Mont., Northwestern Auto Supply Co., 1000 w, M.
KGIQ—1320 kc, Twin Falls, Idaho, Radio Broadcasting Corp.
KGIR—1360 kc, Butte, Mont., KGIR, Inc., 500 w, M.
KGIW—1420 kc, Trinidad, Colo., Leonard E. Wilson, 100 w, M.
KGIX—1420 kc, Las Vegas, Nev., J. M. Heaton, 100 w.
KGIZ—1500 kc, Grant City, Mo., Grant City Park Corp., 100 w, C.
KGJF—890 kc, Little Rock, Ark., First Church of the Nazarene, 250 w.
KGKB—1500 kc, Tyler, Tex., Tyler Commercial College, 100 w, C.
KGKL—1370 kc, San Angelo, Tex., KGKL, Inc., 100 w, C.
KGKO—570 kc, Wichita Falls, Tex., Wichita Falls Broadcasting Co., 250 w, C.
KGKX—1420 kc, Sandpoint, Idaho, C. E. Twiss and F. H. McCann, 100 w, P.
KGKY—1500 kc, Scottsbluff, Nebr., Hilliard Co., Inc., 100 w, C.
KGMB—1320 kc, Honolulu, Hawaii, Honolulu Broadcasting Co., 250 w, P.
KGMP—1210 kc, Elk City, Okla., Bryant Radio & Elec. Co., 100 w, C.
KGNF—1430 kc, North Platte, Nebr., H. L. Spencer, 500 w, M.
KGNO—1210 kc, Dodge City, Kans., Dodge City Broadcasting Co., Inc., M.
KGO—790 kc, San Francisco, Calif., National Broadcasting Co., Inc., 7500 w, P.
KGRS—1410 kc, Amarillo, Texas, Gish Radio Service, 1000 w, C.
KGU—940 kc, Honolulu, Hawaii, Marion Mulrony, Advertising Publ. Co., 1000 w.
KGVO—1420 kc, Missoula, Mont., Mosby's, Inc.
KGW—620 kc, Portland, Ore., Oregonian Pub. Co., 1000 w, P.
KGY—1200 kc, Lacey, Wash., St. Martins College, 10 w, P.
KHJ—900 kc, Los Angeles, Calif., Don Lee, Inc., 1000 w, P.
KHQ—590 kc, Spokane, Wash., Louis Wasmer, Inc., 1000 w, P.
KICK—1420 kc, Red Oak, Iowa, Red Oak Radio Corp., 100 w.
KID—1320 kc, Idaho Falls, Ida., KID Broadcasting Co., 250 w, M.
KIDO—1250 kc, Boise, Idaho, Boise Broadcasting Station, 1000 w, P.
KIT—1310 kc, Yakima, Wash., C. E. Haymond, 50 w, P.
KJBS—1070 kc, San Francisco, Calif., Julius Brunton & Sons Co., 100 w, P.
KJR—970 kc, Seattle, Wash., Northwest Broadcasting System, Inc., 500 w, P.
KLCN—1290 kc, Blytheville, Ark., C. L. Lintzenich, 50 w, C.
KLO—1400 kc, Ogden, Utah, Peery Building Co., 500 w, M.
KLPM—1420 kc, Minot, N. D., John B. Cooley, 100 w, C.
KLRA—1390 kc, Little Rock, Ark., Arkansas Broadcasting Co., 1000 w.
KLS—1440 kc, Oakland, Calif., Warner Bros., 250 w, P.
KLX—880 kc, Oakland, Calif., Tribune Pub. Co., 500 w, P.
KLZ—560 kc, Denver, Colo., Reynolds Radio Co., Inc., 1000 w, M.
KMA—930 kc, Shenandoah, Iowa, May Seed & Nursery Co., 500 w, C.
KMAC—1370 kc, San Antonio, Texas, W. W. McAllister, 100 w, C.
KMBC—950 kc, Kansas City, Mo., Midland Broadcasting Co., 1000 w, C.
KMED—1310 kc, Medford, Ore., Mrs. W. J. Virgin, 100 w, P.
KMJ—1210 kc, Fresno, Calif., J. McClatchy Co., 100 w, P.
KMLB—1200 kc, Monroe, La., J. C. Liner, 100 w, C.

KMMJ—740 kc, Clay Center, Neb., The M. M. Johnson Co., 1000 w, C.
KMO—860 kc, Tacoma, Wash., KMO, Inc., 500 w, P.
KMOX—1090 kc, St. Louis, Mo., Voice of St. Louis, Inc., 50,000 w, C.
KMPC—710 kc, Beverly Hills, Calif., R. S. Macmillan, 500 w, P.
KMTR—570 kc, Los Angeles, Calif., KMTR Radio Corp., 500 w, P.
KNX—1050 kc, Hollywood, Calif., Western Broadcast Co., 5000 w, P.
KOA—830 kc, Denver, Colo., National Broadcasting Co., Inc., 12,500 w, M.
KOAC—550 kc, Corvallis, Ore., Oregon State Agricultural College, 1000 w, P.
KOB—1180 kc, State College, N. M., N. M. College of Agri. & Mech. Arts, 20,000 w, M.
KOCW—1400 kc, Chickasha, Okla., Oklahoma College for Women, 250 w, C.
KOH—1370 kc, Reno, Nevada, Jay Peters, Inc., 500 w.
KOIL—1260 kc, Council Bluffs, Iowa, Mona Motor Oil Co., 1000 w, C.
KOIN—940 kc, Portland, Ore., KOIN, Inc., 100 w, P.
KOL—1270 kc, Seattle, Wash., Seattle Broadcasting Co., 1000 w, P.
KOMO—920 kc, Seattle, Wash., Fisher's Blend Station, Inc., 1000 w, P.
KONO—1370 kc, San Antonio, Tex., Mission Broadcasting Co., 100 w, C.
KOOS—1370 kc, Marshfield, Ore., H. H. Hanseth, Inc., 100 w, P.
KORE—1420 kc, Eugene, Ore., Eugene Broadcast Station, 100 w, P.
KOY—1390 kc, Phoenix, Ariz., Nielsen Radio & Sporting Goods Co., 500 w, M.
KPCB—650 kc, Seattle, Wash., Queen City Broadcasting Co., 100 w, P.
KPJM—1500 kc, Prescott, Ariz., A. P. Miller, 100 w, M.
KPO—680 kc, San Francisco, Calif., Hale Bros. & The Chronicle, 5000 w, P.
KPOF—880 kc, Denver, Colo., Pillar of Fire, Inc., 500 w, M.
KPPC—1210 kc, Pasadena, Calif., Pasadena, Presbyterian Church, 50 w, P.
KPQ—1500 kc, Wenatchee, Wash., Wescoast Broadcasting Co., 50 w, P.
KPRC—920 kc, Houston, Texas, Houston Printing Co., 1000 w, C.
KQV—1380 kc, Pittsburgh, Pa., KQV Bdcstg. Co., 500 w, E.
KQW—1010 kc, San Jose, Calif., Pacific Agric. Foundation, 500 w, P.
KRE—1370 kc, Berkeley, Calif., First Congregational Church, 100 w, P.
KREG—1500 kc, Santa Ana, Calif., Pacific-Western Broadcasting Federation, 100 w, P.
KRGV—1260 kc, Harlingen, Texas, KRGV, Inc., 500 w.
KRLD—1040 kc, Dallas, Texas, KRLD, Inc., 10,000 w, C.
KRMD—1310 kc, Shreveport, La., Robert M. Dean, 50 w, C.
KROW—930 kc, Oakland Calif., Educational Broadcasting Corp., 500 w, M.
KRSC—1120 kc, Seattle, Wash., Radio Sales Corp., 50 w, P.
KSAC—580 kc, Manhattan, Kan., Kansas State Agricultural College, 500 w, C.
KSCJ—1330 kc, Sioux City, Iowa, Perkins Bros. Co., 1000 w, C.
KSD—550 kc, St. Louis, Mo., Pulitzer Pub. Co., 500 w, C.
KSEI—900 kc, Pocatello, Idaho, Radio Service Corp., 250 w, M.
KSL—1130 kc, Salt Lake City, Utah, Radio Service Corp., 5000 w, M.
KSMR—1200 kc, Santa Maria, Calif., Santa Maria Radio Co., 100 w, P.
KSO—1380 kc, Clarinda, Iowa, Iowa Bdcstg. Co., 500 w, C.
KSOO—1110 kc, Sioux Falls, S. D., Sioux Falls Broadcasting Assn., 2000 w, C.
KSTP—1460 kc, St. Paul, Minn., National Battery Broadcasting Co., 10,000 w, C.
KTAB—560 kc, San Francisco, Calif., Associated Broadcasters, 1000 w, P.
KTAR—620 kc, Phoenix, Ariz., KTAR Broadcasting Co., 500 w, M.
KTAT—1240 kc, Ft. Worth, Tex., S. A. T. Broadcasting Co., 1000 w, C.
KTBR—1300 kc, Portland, Ore., M. E. Brown, 500 w, P.
KTBS—1450 kc, Shreveport, La., Tri-State Broadcasting Co., 1000 w, E.
KTFI—1320 kc, Twin Falls, Idaho, Radio Broadcasting Corp., 250 w, M.
KTHS—1040 kc, Hot Springs, Ark., Chamber of Commerce, 10,000 w, C.
KTLC—1310 kc, Houston, Tex., Houston Broadcasting Co., 100 w, C.
KTM—780 kc, Los Angeles, Calif., Pickwick Broadcasting Corp., 500 w, P.
KTRH—1120 kc, Houston, Tex., Rice Hotel, 500 w, C.
KTSA—1290 kc, San Antonio, Texas, Lone Star Broadcast Co., 1000 w, C.
KTSL—1310 kc, Shreveport, La., Houseman Sheet Metal Works, Inc., 100 w, C.
KTSM—1310 kc, El Paso, Tex., W. S. Bledsoe and W. T. Blackwell, 100 w, C.
KTW—1220 kc, Seattle, Wash., First Presbyterian Church, 1000 w, P.
KUJ—1370 kc, Walla Walla, Wash., Paul R. Heitmeyer, Inc., 100 w, P.
KUOA—1390 kc, Fayetteville, Ark., University of Arkansas, 1000 w, C.
KUSD—890 kc, Vermilion, S. Dak., University of South Dakota, 500 w, C.
KUT—1500 kc, Austin, Tex., Rice Hotel, 100 w, C.
KVI—760 kc, Tacoma, Wash., Puget Sound Radio Broadcasting Co., 1000 w, P.
KVL—1370 kc, Seattle, Wash., KVL, Inc., 100 w, P.
KVOA—1260 kc, Tucson, Ariz., R. M. Riculfi, 500 w.
KVOO—1140 kc, Tulsa, Okla., Southwestern Sales Corp., 5000 w, C.
KVOR—1270 kc, Colorado Springs, Colo, W. D. Corley, 1000 w, M.
KVOS—1200 kc, Bellingham, Wash., KVOS, Inc., 100 w, M.
KWCR—1310 kc, Cedar Rapids, Iowa, Harry F. Paar, 100 w, C.
KWEA—1210 kc, Shreveport, La., Hello World Broadcasting Corp., 100 w, C.
KWG—1200 kc, Stockton, Calif., Portable Wireless Tel. Co., 100 w, P.
KWJJ—1060 kc, Portland, Ore., KWJJ Broadcasting Co., Inc., 500 w, P.
KWK—1350 kc, St. Louis, Mo., Greater St. Louis Broadcasting Corp., 1000 w, C.
KWKC—1370 kc, Kansas City, Mo., Wilson Duncan Broadcasting Co., 100 w.
KWKH—850 kc, Shreveport, La., Hello World Broadcasting Corp., 10,000 w, C.
KWLC—1270 kc, Decorah, Iowa, Luther College, 100 w, C.
KWSC—1220 kc, Pullman, Wash., State College of Washington, 1000 w, P.
KWWG—1260 kc, Brownsville, Texas, Brownsville Herald Publishing Co., 500 w, C.
KXA—570 kc, Seattle, Wash., American Radio Tel. Co., 500 w, P.
KXL—1420 kc, Portland, Ore., KXL Broadcasters, Inc., 100 w, P.
KXO—1500 kc, El Centro, Calif., Irey & Bowles, 100 w, P.
KXRO—1310 kc, Aberdeen, Wash., KXRO, Inc., 75 w, P.
KXYZ—1420 kc, Houston, Texas, Harris County Broadcasting Co., 100 w, C.
KYA—1230 kc, San Francisco, Calif., Pacific Broadcasting Corp., 1000 w, P.
KYW—1020 kc, Chicago, Ill., Westinghouse E. & M. Co., 10,000 w, C.
NAA—690 kc, United States Navy Department, Washington, D. C., 1000 w, E.
WAAB—1410 kc, Quincy, Mass., Bay State Bdcstg. Corp.
WAAF—920 kc, Chicago, Ill., Drovers Journal Pub. Co., 500 w daytime, C.
WAAM—1250 kc, Newark, N. J., WAAM, Inc., 1000 w, E.
WAAT—940 kc, Jersey City, N. J., Bremer Broadcasting Corp., 300 w, E.
WAAW—660 kc, Omaha, Neb., Omaha Grain Exchange, 500 w daytime, C.
WABC—860 kc, New York City, N. Y., Atlantic Broadcasting Corp., 50,000 w, E.
WABI—1200 kc, Bangor, Maine, Pine Tree Broadcasting Co., 100 w, E.
WABO—See under WHEC.
WABZ—1200 kc, New Orleans, La., Coliseum Place Baptist Church, 100 w, C.
WACO—1240 kc, Waco, Tex., Central Texas Broadcasting Co., Inc., 1000 w, C.
WADC—1320 kc, Tallmadge, Ohio, Allen T. Simmons, 1000 w, E.
WAGM—1420 kc, Mars Hill, Me., Aroostook Bdcstg. Corp., 100 w.
WAIU—640 kc, Columbus, Ohio, Associated Radiocasting Corp., 500 w, E.
WALR—1210 kc, Zanesville, O., Roy W. Waller, 100 w, E.
WAPI—1140 kc, Birmingham, Ala., Alabama Polytechnic Institute, 5000 w, C.
WASH—1270 kc, Grand Rapids, Mich., WASH Broadcasting Corp., 500 w, C.
WAWZ—1350 kc, Zarepath, N. J., Pillar of Fire, 250 w, E.
WBAA—1400 kc, Lafayette, Ind., Purdue University, 500 w, C.
WBAK—1430 kc, Harrisburg, Pa., Pennsylvania State Police, 500 w, E.
WBAL—1060 kc, Baltimore, Md., Consolidated Gas, Elec. Co., 10,000 w, E.
WBAP—800 kc, Ft. Worth, Tex., Carter Publications, Inc., 10,000 w, C.
WBAX—1210 kc, Wilkes-Barre, Pa., John H. Stenger, Jr., 100 w, E.
WBBC—1400 kc, Brooklyn, N. Y., Brooklyn Broadcasting Corp., 500 w.
WBBL—1210 kc, Richmond, Va., Grace Covenant Presbyterian Church, 100 w, E.
WBBM—770 kc, Chicago, Ill., WBBM Bdcstg. Corp., 25,000 w, C.
WBBR—1300 kc, Brooklyn, N. Y., People's Pulpit Association, 1000 w, E.
WBBZ—1200 kc, Ponca City, Okla., C. L. Carrell, 100 w, C.
WBCM—1410 kc, Bay City, Mich., James E. Davidson, 500 w, E.
WBCN—See under WENR.
WBEN—900 kc, Buffalo, N. Y., Buffalo Evening News, 1000 w, E.
WBEO—1310 kc, Marquette, Mich., Lake Superior Bdcstg. Co.
WBGF—1370 kc, Glens Falls, N. Y., W. Parker & N. Metcalf, 50 w, E.
WBHS—1200 kc, Huntsville, Ala., Hutchens Co., 50 w.
WBIG—1440 kc, Greensboro, N. C., North Carolina Broadcasting Co., 500 w, E.
WBIS—See under WNAC.
WBMS—1450 kc, Hackensack, N. J., WBMS Broadcasting Corp., 250 w.
WBNX—1350 kc, New York, N. Y., Standard Cahill Co., Inc., 250 w, E.
WBOQ—See under WABC.
WBOW—1310 kc, Terre Haute, Ind., Banks of Wabash Broadcasting Assn., 100 w, C.
WBRC—930 kc, Birmingham, Ala., Birmingham Broadcasting Co., 500 w, C.
WBRE—1310 kc, Wilkes-Barre, Pa., Louis G. Baltimore, 100 w, E.
WBSO—920 kc, Needham, Mass., Babson's Statistical Org., Inc., 250 w, E.
WBT—1080 kc, Charlotte, N. C., Station WBT, Inc., 5000 w, E, shared.
WBTM—1370 kc, Danville, Va., Clarke Elec. Co., 100 w, E.
WBZ—990 kc, Boston, Mass., Westinghouse E. & M. Co., 15,000 w, E.
WBZA—990 kc, Springfield, Mass., Westinghouse E. & M. Co., 1000 w, E.
WCAC—600 kc, Storrs, Conn., Connecticut Agricultural College, 250 w, E.
WCAD—1220 kc, Canton, N. Y., St. Lawrence University, 500 w, E.
WCAE—1220 kc, Pittsburgh, Pa., WCAE, Inc., 1000 w, E.
WCAH—1430 kc, Columbus, Ohio, Commercial Radio Service Co., 500 w, E.
WCAJ—590 kc, Lincoln, Neb., Nebraska Wesleyan University, 500 w, C.
WCAL—1250 kc, Northfield, Minn., St. Olaf College, 1000 w, C.
WCAM—1280 kc, Camden, N. J., City of Camden, 500 w, E.
WCAO—600 kc, Baltimore, Md., Monumental Radio, Inc., 250 w, E.
WCAP—1280 kc, Asbury Park, N. J., Radio Industries Broadcast Co., 500 w, E.
WCAT—1200 kc, Rapid City, S. D., South Dakota State School of Mines, 100 w, M.
WCAU—1170 kc, Philadelphia, Pa., Universal Broadcasting Co., 10,000 w, E.
WCAX—1200 kc, Burlington, Vt., Burlington Daily News, 100 w, E.
WCAZ—1070 kc, Carthage, Ill., Superior Broadcasting Co., 50 w.
WCBA—1440 kc, Allentown, Pa., B. B. Musselman, 250 w, E.
WCBD—1080 kc, Zion, Ill., Wilbur Glen Voliva, 5000 w, C.
WCBM—1370 kc, Baltimore, Md., Baltimore Broadcasting Corp., 100 w, E.
WCBS—1210 kc, Springfield, Ill., Dewing & Meester, 100 w, C.
WCCO—810 kc, Minneapolis, Minn., Northwestern Broadcasting Inc., 5000 w, C.
WCDA—1350 kc, New York, N. Y., Italian Educational Broadcasting Co., 250 w, E.
WCFL—970 kc, Chicago, Ill., Chicago Federation of Labor, 150 w, C.
WCGU—1400 kc, Brooklyn, N. Y., U. S. Broadcasting Corp., 500 w, E.
WCHI—1490 kc, Chicago, Ill., People's Pulpit Association, 5000 w, C.
WCKY—1490 kc, Covington, Ky., L. B. Wilson, 500 w, E.
WCLB—1500 kc, Long Beach, N. Y., Arthur Faske, 100 w, E.
WCLO—1200 kc, Janesville, Wis., WCLO Radio Corp., 100 w, C.
WCLS—1310 kc, Joliet, Ill., WCLS, Inc., 100 w, C.
WCMA—1400 kc, Culver, Ind., General Broadcasting Co., 500 w, C.
WCOA—1340 kc, Pensacola, Fla., City of Pensacola, 500 w, E.
WCOC—880 kc, Meridian, Miss., Mississippi Broadcasting Co., 500 w, C.
WCOD—1200 kc, Harrisburg, Pa., Keystone Broadcasting Corp., 100 w, E.
WCOH—1210 kc, Yonkers, N. Y., Westchester Broadcasting Corp., 100 w, E.

WCRW—1210 kc, Chicago, Ill., Clinton R. White, 100 w, C.
WCSC—1360 kc, Charleston, S. C., Lewis Burk, 500 w, E.
WCSH—940 kc, Portland, Me., Congress Square Hotel Co., 1000 w, E.
WDAE—1220 kc, Tampa, Fla., Tampa Publishing Co., 1000 w, E.
WDAF—610 kc, Kansas City, Mo., Kansas City Star Co., 1000 w, C.
WDAG—1410 kc, Amarillo, Texas, National Radio & Broadcasting Corp., 250 w, C.
WDAH—1310 kc, El Paso, Texas, W. S. Bledsoe, 100 w, M.
WDAY—940 kc, Fargo, N. D., WDAY, Inc., 1000 w, C.
WDBJ—930 kc, Roanoke, Va., Times-World Corp., 250 w, E.
WDBO—1120 kc, Orlando, Fla., Orlando Broadcasting Co., 1000 w, E.
WDEL—1120 kc, Wilmington, Del., WDEL, Inc., 250 w, E.
WDEV—1420 kc, Waterbury, Vt., H. C. Whitehill, 50 w.
WDGY—1180 kc, Minneapolis, Minn., Dr. Geo. W. Young, 1000 w, C.
WDIX—1500 kc, Tupelo, Miss., North Mississippi Broadcasting Corp., 100 w, C.
WDOD—1280 kc, Chattanooga, Tenn., WDOD Broadcasting Co., Inc., 1000 w, C.
WDRC—1330 kc, Hartford, Conn., Doolittle Radio Corp., 500 w, E.
WDSU—1250 kc, New Orleans, La., Jos. H. Uhalt, 1000 w, C.
WDZ—1070 kc, Tuscola, Ill., James L. Bush, 100 w.
WEAF—660 kc, New York, N. Y., National Broadcasting Co., Inc., 50,000 w, E.
WEAI—1270 kc, Ithaca, N. Y., Cornell Univ., 1000 w, E.
WEAN—780 kc, Providence, R. I., Shepard Broadcasting Service, 250 w, E.
WEAO—570 kc, Columbus, Ohio, Ohio State University, 750 w, E.
WEBC—1290 kc, Superior, Wis., Head of The Lakes Broadcasting Co., 1000 w, C.
WEBQ—1210 kc, Harrisburg, Ill., First Trust & Savings Bank, 100 w, C.
WEBR—1310 kc, Buffalo, N. Y., Howell Broadcasting Co., 100 w, E.
WEDC—1210 kc, Chicago, Ill., Emil Denemark, Inc., 100 w.
WEDH—1420 kc, Erie, Pa., Erie Dispatch-Herald, 30 w, E.
WEEI—590 kc, Boston, Mass., Edison Elec. Illum. Co., 1000 w, E.
WEEU—830 kc, Reading, Pa., Berks Bdcstg. Co., 1000 w.
WEHC—1350 kc, Emory, Va., Emory and Henry College, 500 w, E.
WEHS—1420 kc, Evanston, Ill., WEHS, Inc., 100 w, C.
WELK—1370 kc, Philadelphia, Pa., WELK Broadcasting Station, Inc., 100 w, E.
WELL—1420 kc, Battle Creek, Mich., Enquirer-News Co., 50 w, E.
WENR—870 kc, Chicago, Ill., Great Lakes Radio Broadcasting Co., 50,000 w, C.
WEPS—See under WORC.
WEVD—1300 kc, New York, N. Y., Debs Memorial Radio Fund, 500 w, E.
WEW—760 kc, St. Louis, Mo., St. Louis University, 1000 w, C.
WEXL—1310 kc, Royal Oak, Mich., Royal Oak Broadcasting Co., 50 w, E.
WFAA—800 kc, Dallas, Texas, Dallas News and Journal, 50,000 w, C.
WFAM—1200 kc, La Porte, Ind., South Bend Tribune, 100 w, C.
WFAN—610 kc, Philadelphia, Pa., Keystone Broadcasting Co., Inc., 500 w, E.
WFBC—1200 kc, Knoxville, Tenn., First Baptist Church, 50 w, E.
WFBE—1200 kc, Cincinnati, Ohio, Post Publ. Co., 100 w, E.
WFBG—1310 kc, Altoona, Pa., William F. Gable Co., 100 w, E.
WFBL—1360 kc, Syracuse, N. Y., The Onondaga Co., Inc., 1000 w, E.
WFBM—1230 kc, Indianapolis, Ind., Indianapolis, Power & Light Co., 1000 w, C.
WFBR—1270 kc, Baltimore, Md., Baltimore Radio Show, Inc., 250 w, E.
WFDF—1310 kc, Flint, Mich., Frank D. Fallain, 100 w, E.
WFDV—1310 kc, Rome, Ga., Dolies Goings, 100 w, E.
WFDW—1420 kc, Talladega, Ala., R. C. Hammett, 100 w, C.
WFEA—1430 kc, Manchester, N. H., Rines Hotel Co., 500 w.
WFI—560 kc, Philadelphia, Pa., Strawbridge & Clothier, 500 w, E.
WFIW—940 kc, Hopkinsville, Ky., WFIW, Inc., 1000 w, C.
WFLA—620 kc, Clearwater, Fla., Clearwater Chamber of Commerce and St. Petersburg Chamber of Commerce, 1000 w, E.
WFOX—1400 kc, Brooklyn, N. Y., Paramount Broadcasting Corp., 500 w.
WGAL—1310 kc, Lancaster, Pa., WGAL, Inc., 100 w, E.
WGAR—1450 kc, Cleveland, Ohio, WGAR Broadcasting Co., 500 w, E.
WGBB—1210 kc, Freeport, N. Y., Harry H. Carman, 100 w, E.
WGBC—See under WNBR.
WGBF—630 kc, Evansville, Ind., Evansville on the Air, Inc., 500 w, E.
WGBI—880 kc, Scranton, Pa., Scranton Broadcasters, Inc., 250 w, E.
WGBS—1180 kc, New York, N. Y., General Broadcasting System, Inc., 500 w, E.
WGCM—1210 kc, Gulfport, Miss., Great Southern Land Co., Inc., 100 w, C.
WGCP—1250 kc, Newark, N. J., May Radio Broadcast Corp., 250 w.
WGES—1360 kc, Chicago, Ill., Oak Leaves Broadcasting Corp., 500 w, C.
WGH—1310 kc, Newport News, Va., Hampton Roads Broadcasting Corp., Inc., 100 w, E.
WGL—1370 kc, Ft. Wayne, Ind., Allen-Wayne Co., 100 w, C.
WGMS—See under WLB.
WGN—720 kc, Chicago, Ill., Tribune Co., 25,000 w, C.
WGR—550 kc, Buffalo, N. Y., Buffalo Broadcasting Corp., 1000 w, E.
WGST—890 kc, Atlanta, Ga., Georgia School of Technology, 250 w, E.
WGY—790 kc, Schenectady, N. Y., General Electric Co., 50,000 w, E.
WHA—940 kc, Madison, Wis., University of Wisconsin, 750 w, C.
WHAD—1120 kc, Milwaukee, Wis. Marquette University, 250 w, C.
WHAM—1150 kc, Rochester, N. Y., Stromberg-Carlson Tel. Mfg. Co., 5000 w, E.
WHAP—1300 kc, New York, N. Y., Defenders of Truth Society, Inc., 1000 w, E.
WHAS—820 kc, Louisville, Ky., The Courier Journal Co. & Louisville Times Co., 10,000 w, C.
WHAT—1310 kc, Philadelphia, Pa., Independence Broadcasting Co., 100 w, E.
WHAZ—1300 kc, Troy, N. Y., Rensselaer Polytechnic Institute, 500 w, E.
WHB—860 kc, Kansas City, Mo., WHB Broadcasting Co., 500 w, C.
WHBC—1200 kc, Canton, Ohio, St. John's Catholic Church, 10 w, E.
WHBD—1370 kc, Mt. Orab, Ohio, F. P. Moler, 100 w, E.
WHBF—1210 kc, Rock Island, Ill., Beardsley Specialty Co., 100 w, C.
WHBL—1410 kc, Sheboygan, Wis., Press Pub. Co., 500 w, C.
WHBQ—1370 kc, Memphis, Tenn., Station WHBQ, Inc., 100 w, C.
WHBU—1210 kc, Anderson, Ind., Citizens Bank, 100 w, C.
WHBY—1200 kc, Green Bay, Wis., St. Norbert's College, 100 w, C.
WHDF—1370 kc, Calumet, Mich., Upper Michigan Brdcstg. Co., 100 w, C.
WHDH—830 kc, Boston, Mass., Matheson Radio Co., Inc., 1000 w, E.
WHDI—1180 kc, Minneapolis, Minn., Dr. G. W. Young, 500 w, C.
WHDL—1420 kc, Tupper Lake, N. Y., Tupper Lake Broadcasting Corp., 100 w, E.
WHEC—1440 kc, Rochester, N. Y., Hickson Electric Co., Inc., 500 w, E.
WHFC—1420 kc, Cicero, Ill., WHFC, Inc., 100 w, C.
WHIS—1410 kc, Bluefield, W. Va., Daily Telegraph Printing Co., 250 w, E.
WHK—1390 kc, Cleveland, Ohio, Radio Air Service Corp., 1000 w, E.
WHN—1010 kc, New York, N. Y., Marcus Loew Booking Review, 250 w, E.
WHO—1000 kc, Des Moines, Iowa, Central Broadcasting Co., 5000 w, C.
WHOM—1450 kc, Jersey City, N. J., New Jersey Broadcasting Corp., 250 w, E.
WHP—1430 kc, Harrisburg, Pa., WHP, Inc., 500 w, E.
WIAS—1420 kc, Ottumwa, Iowa, Poling Electric Co., 100 w, C.
WIBA—1280 kc, Madison, Wis., Capital Times Co., 500 w, C.
WIBG—930 kc, Elkins Park, Pa., St. Paul's Church, 25 w, E.
WIBM—1370 kc, Jackson, Mich., WIBM, Inc., 100 w.
WIBO—560 kc, Chicago, Ill., Nelson Bros. Bond and Mortgage Co., 1000 w, C.
WIBR—1420 kc, Steubenville, Ohio, G. W. Robinson, 50 w, E.
WIBU—1210 kc, Poynette, Wis., W. C. Forrest, 100 w, C.
WIBW—580 kc, Topeka, Kan., Topeka Broadcasting Assn., Inc., 1000 w, C.
WIBX—1200 kc, Utica, N. Y., WIBX, Inc., 100 w, E.
WICC—1190 kc, Bridgeport, Conn., Bridgeport Broadcasting Station, Inc., 500 w, E.
WIL—1200 kc, St. Louis, Mo., Missouri Broadcasting Co., 100 w, C.
WILL—890 kc, Urbana, Ill., University of Illinois, 250 w, C.
WILM—1420 kc, Wilmington, Del., Delaware Broadcasting Co., Inc., 100 w, E.
WIOD—1300 kc, Miami, Fla., Isle of Dreams Broadcasting Co., 1000 w, E.
WIP—610 kc, Philadelphia, Pa., Gimbel Bros., Inc., 500 w, E.
WIS—1010 kc, Columbia, S. C., South Carolina Broadcasting Co., Inc., 500 w, E.
WISJ—See under WIBA.
WISN—1120 kc, Milwaukee, Wis., Evening Wisconsin Co., 250 w, C.
WJAC—1310 kc, Johnstown, Pa., Johnstown Automobile Co., 100 w, E.
WJAG—1060 kc, Norfolk, Neb., Norfolk Daily News, 1000 w, C.
WJAK—1310 kc, Marion, Ind., Marion Brdcst. Co., 50 w.
WJAR—890 kc, Providence, R. I., The Outlet Co., 250 w, E.
WJAS—1290 kc, Pittsburgh, Pa., Pittsburgh Radio Supply House, 1000 w, E.
WJAX—900 kc, Jacksonville, Fla., City of Jacksonville, 1000 w, E.
WJAY—610 kc, Cleveland, Ohio, Cleveland Radio Broadcasting Corp., 500 w, E.
WJAZ—1490 kc, Chicago, Ill., Zenith Radio Corp., 5000 w, C.
WJBC—1200 kc, LaSalle, Ill., Kaskaskia Broadcasting Co., 100 w, C.
WJBI—1210 kc, Red Bank, N. J., Monmouth Broadcasting Co., 100 w, E.
WJBK—1370 kc, Highland Park, Mich., J. F. Hopkins, 50 w, C.
WJBL—1200 kc, Decatur, Ill., Commodore Broadcasting Co., 100 w, C.
WJBO—1420 kc, New Orleans, La., Valdemar Jensen, 100 w, C.
WJBT—See under WBBM.
WJBU—1210 kc, Lewisburg, Pa., Bucknell University, 100 w, E.
WJBW—1200 kc, New Orleans, La., C. Carlsen, Jr., 30 w, C.
WJBY—1210 kc, Gadsden, Ala., Gadsden Broadcasting Co., 50 w, C.
WJDX—1270 kc, Jackson, Miss., Lamar Life Ins. Co., 1000 w, C.
WJJD—1130 kc, Chicago, Ill., Loyal Order of Moose, 20,000 w, C.
WJKS—1360 kc, Gary, Ind., Johnson-Kennedy Radio Corp., 1000 w, C.
WJMS—1420 kc, Ironwood, Mich., Johnson Music Store, 100 w.
WJR—750 kc, Detroit, Mich., The Goodwill Station, Inc., 5000 w, E.
WJSV—1460 kc, Alexandria, Va., Independent Publishing Co., 10,000 w.
WJTL—1370 kc, Oglethorpe University, Ga., 100 w, E.
WJW—1210 kc, Mansfield, Ohio, Mansfield Broadcasting Association, 100 w, E.
WJZ—760 kc, New York City, N. Y., National Broadcasting Co., 30,000 w, E.
WKAQ—890 kc, San Juan, Porto Rico, Radio Corp. of Porto Rico, 250 w, E.
WKAR—1040 kc, East Lansing, Mich., Michigan State College, 1000 w, E.
WKAV—1310 kc, Laconia, N. H., Laconia Radio Club, 100 w, E.
WKBB—1310 kc, Joliet, Ill., Sanders Bros., 100 w, C.
WKBC—1310 kc, Birmingham, Ala., R. B. Broyles Furniture Co., 100 w, C.
WKBF—1400 kc, Indianapolis, Ind., Indianapolis Broadcasting Corp., 500 w, C.
WKBH—1380 kc, LaCrosse, Wis., WKBH, Inc., 1000 w, C.
WKBI—1420 kc, Chicago, Ill., WKBI, Inc., 100 w, C.
WKBN—570 kc, Youngstown, Ohio, WKBN Bdcstg. Corp., 500 w, E.
WKBO—1450 kc, Jersey City, N. J., Camith Corp., 250 w, E.
WKBS—1310 kc, Galesburg, Ill., Permil N. Nelson, 100 w, C.
WKBV—1500 kc, Connersville, Ind., Knox Battery & Electric Co., 100 w, C.
WKBW—1480 kc, Buffalo, N. Y., WKBW, Inc., 5000 w, E.
WKBZ—1500 kc, Ludington, Mich., K. L. Ashbacker, 50 w.
WKJC—1200 kc, Lancaster, Pa., Kirk Johnson & Co., 100 w, E.
WKRC—550 kc, Cincinnati, Ohio, WKRC, Inc., 1000 w, E.
WKY—900 kc, Oklahoma City, Okla., WKY Radiophone Co., 1000 w, C.
WKZO—590 kc, Kalamazoo, Mich., WKZO, Inc., 1000 w, C.
WLAC—1470 kc, Nashville, Tenn., Life & Casualty Ins. Co., 5000 w, C.

WLAP—1010 kc, Louisville, Ky., American Broadcasting Corp. of Kentucky, 1259 w, C.
WLB—1250 kc, Minneapolis, Minn., University of Minnesota, 1000 w, C.
WLBC—1310 kc, Muncie, Ind., Donald A. Burton, 50 w.
WLBF—1420 kc, Kansas City, Kan., WLBF Broadcasting Co., 100 w, C.
WLBG—1200 kc, Petersburg, Va., WLBG, Inc., 100 w, E.
WLBL—900 kc, Stevens Point, Wis., Wisconsin Department of Markets, 2000 w, daytime, C.
WLBW—1260 kc, Oil City, Pa., Radio-Wire Program Corp., 500 w, E.
WLBX—1500 kc, Long Island City, N. Y., John N. Brahy, 100 w.
WLBZ—620 kc, Bangor, Me., Maine Broadcasting Co., 500 w, E.
WLCI—1210 kc, Ithaca, N. Y., Lutheran Assn. of Ithaca, 50 w, E.
WLEY—1370 kc, Lexington, Mass., Lexington Air Station, 100 w, E.
WLIB—See under WGN.
WLIT—560 kc, Philadelphia, Pa., Lit Brothers, 500 w, E.
WLOE—1500 kc, Boston, Mass., Boston Broadcasting Co., 100 w.
WLS—870 kc, Chicago, Ill., Agricultural Broadcasting Co., 5000 w, C.
WLSI—See under WPRO.
WLTH—1400 kc, Brooklyn, N. Y., Voice of Brooklyn, Inc., 500 w, E.
WLVA—1370 kc, Lynchburg, Va., Lynchburg Broadcasting Corp., 100 w, E.
WLW—700 kc, Cincinnati, Ohio, Crosley Radio Corp., 50,000 w, E.
WLWL—1100 kc, New York, N. Y., Missionary Society of St. Paul, 5000 w, E.
WMAC—See under WSYR.
WMAK—1040 kc, Buffalo, N. Y., WMAK Broadcasting System, 1000 w, E.
WMAL—630 kc, Washington, D. C., M. A. Leese Co., 250 w, E.
WMAQ—670 kc, Chicago, Ill., WMAQ Inc., 5000 w, C.
WMAZ—1180 kc, Macon, Ga., Southeastern Broadcasting Co., 500 w, E.
WMBA—1500 kc, Newport, R. I., LeRoy Joseph Beebe, 100 w, E.
WMBC—1420 kc, Detroit, Mich., Michigan Broadcasting Co., Inc., 100 w, E.
WMBD—1440 kc, Peoria Heights, Ill., Peoria Bdcstg. Co., 500 w.
WMBF—See under WIOD.
WMBG—1210 kc, Richmond, Va., Havens & Martin, Inc., 100 w, E.
WMBH—1420 kc, Joplin, Mo., Edwin Dudley Aber, 100 w, C.
WMBI—1080 kc, Chicago, Ill., Moody Bible Institute Radio Station, 5000 w, C, shared.
WMBJ—1500 kc, Wilkinsburg, Pa., Rev. John W. Sproul, 100 w, E.
WMBO—1310 kc, Auburn, N. Y., Radio Service Laboratories, 100 w, E.
WMBQ—1500 kc, Brooklyn, N. Y., Paul J. Gollhofer, 100 w.
WMBR—1370 kc, Tampa, Fla., F. J. Reynolds, 100 w, E.
WMC—780 kc, Memphis, Tenn., Memphis Commercial Appeal, Inc., 500 w, C.
WMCA—570 kc, New York, N. Y., Knickerbocker Broadcasting Co., Inc., 500 w, E.
WMIL—1500 kc, Brooklyn, N. Y., Arthur Faske, 100 w, E.
WMMN—890 kc, Fairmont, W. Va., Holt Rowe Novelty Co., 250 w, E.
WMPC—1500 kc, Lapeer, Mich., First Methodist Protestant Church, 100 w, E.
WMRJ—1210 kc, Jamaica, N. Y., Peter J. Prinz, 10 w, E.
WMSG—1350 kc, New York, N. Y., Madison Square Garden Broadcast Co., 250 w, E.
WMT—600 kc, Waterloo, Iowa, Waterloo Broadcasting Co., 500 w, C.
WNAC—1230 kc, Boston, Mass., The Shepard Broadcasting Service, 1000 w, E.
WNAD—1010 kc, Norman, Okla., University of Oklahoma, 500 w, C.
WNAX—570 kc, Yankton, S. Dak., Gurney Seed & Nursery Co., 1000 w, C.
WNBF—1500 kc, Binghamton, N. Y., Howitt-Wood Radio Co., 100 w, E.
WNBH—1310 kc, New Bedford, Mass., New Bedford Broadcasting Co., 100 w, E. shared.
WNBO—1200 kc, Silver Haven, Pa., J. B. Spriggs, 100 w, E.
WNBR—1430 kc, Memphis, Tenn., Memphis Broadcasting Co., 500 w, C.
WNBW—1200 kc, Carbondale, Pa., Home Cut Glass & China Co., 10 w, E.
WNBX—1200 kc, Springfield, Vt., First Congregational Church Corp., 10 w, E.
WNBZ—1290 kc, Saranac Lake, N. Y., Smith & Mace, 50 w, E.
WNJ—1450 kc, Newark, N. J., Radio Investment Co., 250 w, E.
WNOX—560 kc, Knoxville, Tenn., WNOX, Inc., 1000 w, C.
WNYC—570 kc, New York, N. Y. Department of Plant & Structures, 500 w. E.
WOAI—1190 kc, San Antonio, Texas, Southern Equipment Co., 50,000 w, C.
WOAN—See WREC.
WOAX—1280 kc, Trenton, N. J., WOAX, Inc., 500 w, E.
WOBU—580 kc, Charleston, W. Va., WOBU, Inc., 250 w, E.
WOC—1000 kc, Davenport, Iowa, Central Broadcasting Co., 5000 w, C.
WOCL—1210 kc, Jamestown, N. Y., A. E. Newton, 50 w, E.
WODA—1250 kc, Paterson, N. J., Richard E. O'Dea, 1000 w, E.
WODX—1410 kc, Mobile, Ala., Mobile Brdcstg. Corp., 500 w, C.
WOI—640 kc, Ames, Iowa, Iowa State College, 5000 w, C.
WOKO—1440 kc, Albany, N. Y., WOKO, Inc., 500 w, E.
WOL—1310 kc, Washington, D. C., American Broadcasting Co., 100 w, E.
WOMT—1210 kc, Manitowoc, Wis., Francis M. Kadow, 100 w.
WOOD—1270 kc, Grand Rapids, Mich., Walter B. Stiles, Inc., 500 w, C.
WOPI—1500 kc, Bristol, Tenn., Radiophone Broadcasting Co., 100 w, E.
WOQ—1300 kc, Kansas City, Mo., Unity School of Christianity, 1000 w, C.
WOR—710 kc, Newark, N. J., J. Bamberger Broadcasting Service, Inc., 5000 w, E.
WORC—1200 kc, Worcester, Mass., A. F. Kleindienst, 100 w, E.
WOS—630 kc, Jefferson City, Mo., State Marketing Bureau, 500 w, C.
WOV—1130 kc, New York, N. Y., International Broadcasting Corp., 1000 w, E.
WOW—590 kc, Omaha, Neb., Woodmen of the World, 1000 w, C.
WOWO—1160 kc, Ft. Wayne, Ind., Main Auto Supply Co., 10,000 w, C.
WPAD—1420 kc, Paducah, Ky., Paducah Broadcasting Co., 100 w, C.
WPAP—See under WQAO.
WPAW—1210 kc, Pawtucket, R. I., Shartenberg & Robinson, 100 w, E.
WPCC—560 kc, Chicago, Ill., North Shore Congregational Church, 500 w. C.
WPCH—810 kc, New York, N. Y., Eastern Broadcasters, Inc., 500 w, E.
WPEN—1500 kc, Philadelphia, Pa., Wm. Penn Broadcasting Co., 100 w, E.
WPG—1100 kc, Atlantic City, N. J., WPG Broadcasting Corp., 5000 w, E.
WPOE—1370 kc, Patchogue, N. Y., Nassau Broadcasting Corp., 100 w, E.
WPOR—See under WTAR.
WPRO—1210 kc, Providence, R. I., Cherry & Webb Bdcstg. Co., 100 w, E.
WPSC—1230 kc, State College, Pa., Pennsylvania State College, 500 w, day, E.
WPTF—680 kc, Raleigh, N. C., Durham Life Insurance Co., 1000 w, E.
WQAM—560 kc, Miami, Fla., Miami Broadcasting Co., 1000 w, E.
WQAN—880 kc, Scranton, Pa., Scranton Times, 250 w, E.
WQAO—1010 kc, New York, N. Y., Calvary Baptist Church, 250 w, E.
WQBC—1360 kc, Vicksburg, Miss., Delta Broadcasting Co., 300 w, C.
WQDM—1370 kc, St. Albans, Vt., A. J. St. Antoine, 100 w, E.
WQDX—1210 kc, Thomasville, Ga., Stevens Luke, 100 w, E.
WRAK—1370 kc, Williamsport, Pa., C. R. Cummins, 50 w, E.
WRAM—1370 kc, Wilmington, N. C., Wilmington Radio Association, 100 w, E.
WRAW—1310 kc, Reading, Pa., Reading Broadcasting Co., 50 w, E.
WRAX—1020 kc, Philadelphia, Pa., WRAX Broadcasting Co., 250 w, E.
WRBJ—1370 kc, Hattiesburg, Miss., Hattiesburg Bdcstg. Co., 10 w, C.
WRBL—1200 kc, Columbus, Ga., WRBL Radio Station, Inc., 50 w, E.
WRBQ—1210 kc, Greenville, Miss., J. Pat Scully, 250 w, C.
WRBX—1410 kc, Roanoke, Va., Richmond Development Corp., 250 w, E.
WRC—950 kc, Washington, D. C., National Broadcasting Co., 500 w, E.
WRDO—1370 kc, Augusta, Me., Albert S. Woodman, 100 w, E.
WRDW—1500 kc, Augusta, Ga., Davenport's Musicove, Inc., 100 w, E.
WREC—600 kc, Memphis, Tenn., WREC, Inc., 500 w.
WREN—1220 kc, Lawrence, Kan., Jenny Wren Co., 1000 w, C.
WRHM—1250 kc, Minneapolis, Minn., Minnesota Broadcasting Corp., 1000 w, C.
WRJN—1370 kc, Racine, Wis., Racine Broadcasting Corp., 100 w, C.
WRNY—1010 kc, New York, N. Y., Aviation Radio Station, 250 w, E.
WROL—1310 kc, Knoxville, Tenn., Stuart Broadcasting Corp., 100 w, C.
WRR—1280 kc, Dallas, Texas, City of Dallas, 500 w, C.
WRUF—830 kc, Gainesville, Fla., University of Florida, 5000 w, E.
WRVA—1110 kc, Richmond, Va., Larus Bros. & Co., Inc., 5000 w, E.
WSAI—1330 kc, Cincinnati, Ohio, Crosley Radio Corp., 500 w, E.
WSAJ—1310 kc, Grove City, Pa., Grove City College, 100 w, E.
WSAN—1440 kc, Allentown, Pa., Allentown Call Pub. Co., 250 w, E.
WSAR—1450 kc, Fall River, Mass., Doughty & Welch Electrical Co., Inc., 250 w, E.
WSAZ—580 kc, Huntington, W. Va., WSAZ, Inc., 250 w, E.
WSB—740 kc, Atlanta, Ga., Atlanta Journal Co., 5000 w, E.
WSBC—1210 kc, Chicago, Ill., World Battery Co., 100 w, C.
WSBT—1230 kc, South Bend, Ind., South Bend Tribune, 500 w, C.
WSEN—1210 kc, Columbus, Ohio, Columbus Broadcasting Corp., 100 w, E.
WSFA—1410 kc, Montgomery, Ala., Montgomery Brdcstg. Co., 500 w, C.
WSIX—1210 kc, Springfield, Tenn., 638 Tire & Vulcanizing Co., 100 w, C.
WSJS—1310 kc, Winston-Salem, N. C., The Journal Co., 100 w, E.
WSM—650 kc, Nashville, Tenn., National Life & Accident Ins. Co., 5000 w, C.
WSMB—1320 kc, New Orleans, La., Saenger Theaters, Inc., & Maison Blanche Co., 500 w, C.
WSMK—1380 kc, Dayton, Ohio, Stanley M. Krohn, Jr., 200 w, C.
WSOC—1210 kc, Gastonia, N. C., A. J. Kirby Music Co., 100 w, E.
WSPA—1420 kc, Spartanburg, S. C., 100 w, E.
WSPD—1340 kc, Toledo, Ohio, Toledo Broadcasting Co., 1000 w, E.
WSUI—880 kc, Iowa City, Iowa, State Univ. of Iowa, 500 w, C.
WSUN—See under WFLA.
WSVS—1370 kc, Buffalo, N. Y., Seneca Vocational High School, 50 w, E.
WSYB—1500 kc, Rutland, Vt., Seward & Weiss Music Store, E.
WSYR—570 kc, Syracuse, N. Y., Clive B. Meredith, 250 w, E.
WTAD—1440 kc, Quincy, Ill., Illinois Stock Medicine Broadcasting Corp., 500 w.
WTAG—580 kc, Worcester, Mass., Worcester Telegram Pub. Co., Inc., 250 w, E.
WTAM—1070 kc, Cleveland, Ohio, National Broadcasting Co., 50,000 w, E.
WTAQ—1330 kc, Eau Claire, Wis., Gillette Rubber Co., 1000 w, C.
WTAR—780 kc, Norfolk, Va., WTAR Radio Corp., 500 w, E.
WTAW—1120 kc, College Station, Texas, Agri. & Mech. College of Texas, 500 w, C.
WTAX—1210 kc, Springfield, Ill., WTAX, Inc., 100 w.
WTBO—1420 kc, Cumberland, Md., Associated Brdcstg. Corp., 100 w, E.
WTEL—1310 kc, Philadelphia, Pa., Foulkrod Radio Eng. Co., 50 w, E.
WTFI—1450 kc, Toccoa, Ga., Toccoa Falls Bdcstg. Co., 500 w, E.
WTIC—1060 kc, Hartford, Conn., Travelers Broadcasting Service Corp., 50,000 w, E.
WTJS—1310 kc, Union City, Tenn., Sun Publishing Co., 100 w, C.
WTMJ—620 kc, Milwaukee, Wis., Milwaukee Journal, 1000 w, C.
WTNT—1470 kc, Nashville, Tenn., Life and Casualty Ins. Co. of Tenn., 5000 w, C.
WTOC—1260 kc, Savannah, Ga., Savannah Broadcasting Corp., 500 w, E.
WWAE—1200 kc, Hammond, Ind., Hammond-Calumet Broadcasting Corp., 100 w, C.
WWJ—920 kc, Detroit, Mich., Evening News Assn., 1000 w, E.
WWL—850 kc, New Orleans, La., Loyola University, 5000 w, C.
WWNC—1260 kc, Asheville, N. C., Citizens Broadcasting Co., 1000 w, E.
WWRL—1500 kc, Woodside, N. Y., Long Island Broadcasting Corp., 100 w.
WWSV—1500 kc, Pittsburgh, Pa., W. S. Walker.
WWVA—1160 kc, Wheeling, W. Va., West Virginia Broadcasting Corp., 5000 w, E.
WXYZ—1240 kc, Detroit, Mich., Kunsky Trendle Broadcasting Co., 1000 w, E.

U. S. Broadcasting Stations by Frequencies

550 Kilocycles, 545.1 Meters:
KOAC, WGR, WKRC, KFUO, KSD, KFDY, KFYR

560 Kilocycles, 535.4 Meters.
WLIT, WFI, KFDM, WNOX KTAB, KLZ, WIBO, WPCC, WQAM

570 Kilocycles, 526.0 Meters:
WNYC, WMCA, WSYR, WMAC, WKBN, WWNC, KGKO, WNAX, KXA, KMTR, WEAO

580 Kilocycles, 516.9 Meters—Canadian Shared:
WTAG, WOBU, WSAZ, KGFX, KSAC, WIBW

590 Kilocycles, 508.2 Meters:
WEEI, WCAJ, WOW, KHQ, WKZO

600 Kilocycles, 499.7 Meters—Canadian Shared:
WCAO, WREC, WOAN, KFSD, WCAC, WMT

610 Kilocycles, 491.5 Meters:
WFAN, WIP, WDAF, KFRC, WJAY

620 Kilocycles, 483.6 Meters:
WLBZ, WTMJ, KGW, WFLA, WSUN, KTAR

630 Kilocycles, 475.9 Meters—Canadian Shared:
WMAL, WOS, KFRU, WGBF

640 Kilocycles, 468.5 Meters:
WAIU, KFI, WOI

650 Kilocycles, 461.3 Meters:
WSM, KPCB

660 Kilocycles, 454.3 Meters:
WEAF, WAAW

670 Kilocycles, 447.5 Meters:
WMAQ

680 Kilocycles, 440.9 Meters:
WPTF, KPO, KFEQ

690 Kilocycles, 434.5 Meters—Canadian Wave:

700 Kilocycles, 428.3 Meters:
WLW

710 Kilocycles, 422.3 Meters:
WOR, KMPC

720 Kilocycles, 416.4 Meters:
WGN, WLIB

730 Kilocycles, 410.7 Meters—Canadian Wave:

740 Kilocycles, 405.2 Meters:
WSB, KMMJ

750 Kilocycles, 399.8 Meters:
WJR

760 Kilocycles, 394.5 Meters:
WJZ, WEW, KVI

770 Kilocycles, 389.4 Meters:
KFAB, WBBM, WJBT

780 Kilocycles, 384.4 Meters—Canadian Shared:
WTAR, WPOR, KELW, KTM, WMC, WEAN

790 Kilocycles, 379.5 Meters:
WGY, KGO

800 Kilocycles, 374.8 Meters:
WBAP, WFAA

810 Kilocycles, 370.2 Meters:
WPCH, WCCO

820 Kilocycles, 365.6 Meters:
WHAS

830 Kilocycles, 361.2 Meters:
KOA, WHDH, WRUF, WEEU

840 Kilocycles, 356.9 Meters—Canadian Wave:

850 Kilocycles, 352.7 Meters:
KWKH, WWL

860 Kilocycles, 348.6 Meters:
WBOQ, WABC, KMO, WHB

870 Kilocycles, 344.6 Meters:
WLS, WENR, WBCN

880 Kilocycles, 340.7 Meters—Canadian Shared:
WQAN, WGBI, WCOC, KLX, KPOF, KFKA, WSUI

890 Kilocycles, 336.9 Meters—Canadian Shared:
WIAR, WMMN, WGST, KGJF, WILL, KUSD, KFNF, WKAQ

900 Kilocycles, 331.1 Meters:
WKY, WLBL, KHJ, KSEI, KGBU, WJAX, WBEN

910 Kilocycles, 329.5 Meters—Canadian Wave:

920 Kilocycles, 325.9 Meters:
WWJ, KPRC, WAAF, WBSO, KOMO, KFXF, KFEL

930 Kilocycles, 322.4 Meters—Canadian Shared:
WIBG, WDBJ, WBRC, KGBZ, KMA, KFWI, KROW

940 Kilocycles, 319 Meters:
WCSH, WFIW, KOIN, KGU, WHA, WDAY, WAAT

950 Kilocycles, 315.6 Meters:
WRC, KMBC, KFWB, KGHL

960 Kilocycles, 312.3 Meters—Canadian Wave:

970 Kilocycles, 309.1 Meters:
KJR, WCFL

980 Kilocycles, 305.9 Meters:
KDKA

990 Kilocycles, 302.8 Meters:
WBZ, WBZA

1000 Kilocycles, 299.8 Meters:
WHO, WOC, KFVD

1010 Kilocycles, 296.9 Meters—Canadian Shared:
WQAO, WPAP, WHN, WRNY, KGGF, WNAD, KQW, WIS, WLAP

1020 Kilocycles, 293.9 Meters:
KYW, KFKX, WRAX

1030 Kilocycles, 291.1 Meters—Canadian Wave:

1040 Kilocycles, 288.3 Meters:
WKAR, KTHS, KRLD, WMAK

1050 Kilocycles, 285.5 Meters:
KNX, KFKB

1060 Kilocycles, 282.8 Meters:
WBAL, WJAG, KWJJ, WTIC

1070 Kilocycles, 280.2 Meters:
WTAM, WCAZ, WDZ, KJBS

1080 Kilocycles, 277.6 Meters:
WBT, WCBD, WMBI

1090 Kilocycles, 275.1 Meters:
KMOX

1100 Kilocycles, 272.6 Meters:
WPG, WLWL, KGDM

1110 Kilocycles, 270.1 Meters:
WRVA, KSOO

1120 Kilocycles, 267.7 Meters—Canadian Shared:
WTAW, WISN, WHAD, KFSG, KRSC, WDEL, WDBO, KFIO, KTRH, KMSC, KMBC

1130 Kilocycles, 265.3 Meters:
WOV, KSL, WJJD

1140 Kilocycles, 263.0 Meters:
WAPI, KVOO

1150 Kilocycles, 260.7 Meters:
WHAM

1160 Kilocycles, 258.5 Meters:
WWVA, WOWO

1170 Kilocycles, 256.3 Meters:
WCAU

1180 Kilocycles, 254.1 Meters:
KEX, KOB, WHDI, WDGY, WMAZ, WGBS

1190 Kilocycles, 252.0 Meters:
WICC, WOAI

1200 Kilocycles, 249.9 Meters: Canadian Shared:
WABI, WNBX, WORC, WIBX, WHBC, WBHS, WLBG, WNBO, WKJC, WNBW, WABZ, WJBW, WBBZ, WFBC, WRBL, KGCU, WJBC, WJBL, WWAE, WFAM, KFJB, WCAT, KGDY, KFWF, KGDE, WCLO, WHBY, KSMR, WIL, KVOS, KGY, KGEK, KGEW, KGHI, WCAX, WCOD, WFBE, KBTM, WEPS, KMLB, KGFJ, KWG

1210 Kilocycles, 247.8 Meters—Canadian Shared:
WJBI, WGBB, WCOH, WOCL, WLCI, WPAW, WPRO, WLSI, WJW, WBAX, WJBU, WMBG, WSIX, WJBY, WRBQ, WGCM, KWEA, KDLR, KGCR, KFOR, WHBU, KFVS, WEBQ, WODX, WCRW, WEDC, WCBS, WTAX, WHBF, WOMT, WSBC, KDFN, KMJ, KFXM, KPPC, WALR, WBBL, WMRJ, KGMP, KGNO, WSEN, WSOC, WIBU

1220 Kilocycles, 245.6 Meters:
WCAD, WCAE, WREN, KFKU, WDAE, KWSC, KTW

1230 Kilocycles, 243.8 Meters:
WNAC, WBIS, WPSC, WSBT, WFBM, KFQD, KYA, KGGM

1240 Kilocycles, 241.8 Meters:
WACO, KTAT, WNYZ

1250 Kilocycles, 239.9 Meters:
WGCP, WODA, WAAM, WLB, WGMS, WRHM, KFMX, WCAL, KIDO, KFOX, WDSU

1260 Kilocycles, 238.0 Meters:
WLBW, KWWG, KRGV, KOIL, KVOA, WTOC

1270 Kilocycles, 236.1 Meters:
WEAI, WASH, WOOD, KWLC, KGCA, KOL, KVOR, WFBR, WJDX

1280 Kilocycles, 234.2 Meters:
WCAM, WCAP, WOAX, WDOD, WRR, KFBB, WIBA, WISJ

1290 Kilocycles, 232.4 Meters:
WNBZ, WJAS, KTSA, KFUL, KLCN, KDYL, WEBC

1300 Kilocycles, 230.6 Meters:
WBBR, WHAP, WEVD, WHAZ, KFH, KGEF, KFAC, KFJR, KTBR, WIOD, WMBF, WOQ

1310 Kilocycles, 228.9 Meters:
WKAV, WEBR, WNBH, WOL, WGH, WHAT, WFBG, WRAW, WCAL, WSAJ, WBRE, WKBC, WTJS, KRMD, KFPM, WDAH, KFPL, KFXR, WKBS, WCLS, WKBB, KWCR, KFJY, KFGQ, WBOW, WJAK, WLBC, KTSL, KFUP, KFXJ, KFBK, KGEZ, KMED, KTSM, KGCX, WJAC, WSJS, KXRO, KGFW, KFIU, KGBX, KIT, WMBO, KCRJ, KTLC, WEXL, WROL, WTEL, WBEO, WFDV

1320 Kilocycles, 227.1 Meters:
WADC, WSMB, KID, KTFI, KGHF, KGMB, KGIQ

1330 Kilocycles, 225.4 Meters:
WDRC, WTAQ, KSCJ, WSAI, KGB

1340 Kilocycles, 223.7 Meters:
KFPW, WCOA, KFPY, WSPD

1350 Kilocycles, 222.1 Meters:
WMSG, WCDA, WBNX, KWK, WAWZ, WEHC

1360 Kilocycles, 220.4 Meters:
WQBC, WJKS, WGES, KGIR, KGER, WFBL, WCSC

1370 Kilocycles, 218.8 Meters:
WSVS, WCBM, WHBD, WJBK, WIBM, WRAK, WELK, WHBQ, WRAM, KGFG, KFJZ, KGKL, KFLX, KGDA, KRE, WPOE, KFBL, KWKC, WRJN, KGAR, KVL, KFJI, KGFL, WHDF, KOOS, WGL, KFJM, KCRC, WMBR, WRBJ, WLEY, WBGF, WBTM, WLVA, WQDM, WRDO, KONO, KMAC, KUJ, WJTL, KOH

1380 Kilocycles, 217.3 Meters:
KQV, KSO, WKBH, WSMK

1390 Kilocycles, 215.7 Meters:
WHK, KLRA, KUOA, KOY

1400 Kilocycles, 214.2 Meters:
WCGU, WFOX, WLTH, WBBC, WCMA, WKBF, KOCW, WBAA, KLO

1410 Kilocycles, 212.6 Meters:
KGRS, WDAG, KFLV, WHBL, WBCM, WODX, WSFA, WAAB, WRBX, WHIS

1420 Kilocycles, 211.1 Meters:
WTBO, WKBI, WIBR, WEDH, WMBC, KGFF, KABC, KFYO, KICK, WIAS, KGGC WLBF, WMBH, KFIZ, KORE, WILM, KGIW, KGKX, KFQW, KLPM, KXL, WHDL, WHFC, WEHS, KFQU, KFXD, KGIX, WJBO, WELL, WFDW, WPAD, WSPA, KBPS, KFNY, KXYZ, WAGM, WDEV, KGVO, WJMS

1430 Kilocycles, 209.7 Meters:
WHP, WCAH, WGBC, WNBR, WBAK, KECA, KGNF, WFEA

1440 Kilocycles, 208.2 Meters:
WHEC, WABO, WOKO, WCBA
WTAD, WMBD, KLS, WSAN, WBIG

1450 Kilocycles, 206.8 Meters:
WBMS, WNJ, WKBO, WSAR, WGAR, WTFI, KTBS, WHOM

1460 Kilocycles, 205.4 Meters:
WJSV, KSTP

1470 Kilocycles, 204.0 Meters:
KGA, WTNT, WLAC

1480 Kilocycles, 202.6 Meters:
KFJF, WKBW

1490 Kilocycles, 201.6 Meters:
WCKY, WJAZ, WCHI

1500 Kilocycles, 199.9 Meters:
WMBA, WLOE, WNBF, WMBQ, WLBX, WWRL, WKBZ, WMPC, WOPI, WPEN, KGKB, WKBV, KPJM, KDB, KGFI, WMBJ, KREG, WCLB, WRDW, KGIZ, KGKY, KPQ, KUT, WDIX, KXO, KGFK, WSYB, WWSV, WWSW, WMIL

LIST OF POLICE BROADCASTING STATIONS

Call	Kilocycles	Meters	Location	Call	Kilocycles	Meters	Location
WPDO	2,458	122.05	Akron, Ohio	WPDT	2,470	121.50	Kokomo, Ind.
WPDY	2,452	122.34	Atlanta, Ga.	WPDL	2,410	123.00	Lansing, Mich.
KGUJ	1,712	175.23	Beaumont, Tex.	KGPL	1,712	175.23	Los Angeles, Calif.
KSW	2,410	124.50	Berkeley, Calif.	WPDE	2,440	123.00	Louisville, Ky.
WEY	1,596	187.97	Boston, Mass.	WPEG	2,470	121.50	Memphis, Tenn.
WRDU	1,596	187.97	Brooklyn, N. Y.	WPDK	2,452	122.34	Milwaukee, Wis.
WMJ	2,422	123.86	Buffalo, N. Y.	KGPB	2,416	124.17	Minneapolis, Minn.
WBR	257	1,165.00	Butler, Pa.	WPY	438	685.00	New York, N. Y.
KGOZ	2,470	121.50	Cedar Rapids, Iowa	WPY	500	600.00	New York, N. Y.
WPDV	2,458	122.05	Charlotte, N. C.	WCP	1,596	187.97	New York, N. Y.
WPDB	1,712	175.23	Chicago, Ill.	KGPH	2,452	122.34	Oklahoma City, Okla.
WPDC	1,712	175.23	Chicago, Ill.	KGPI	2,470	121.50	Omaha, Neb.
WPDD	1,712	175.23	Chicago, Ill.	KGJX	1,712	175.23	Pasadena, Calif.
WKDU	1,712	175.23	Cincinnati, Ohio	WPDP	2,440	123.00	Philadelphia, Pa.
WRBH	2,452	122.34	Cleveland, Ohio	WPDU	1,712	175.23	Pittsburgh, Pa.
WPDI	2,416	124.17	Columbus, Ohio	KGPP	2,416	124.17	Portland, Ore.
KVP	1,712	175.23	Dallas, Tex.	WPDH	2,416	124.17	Richmond, Ind.
KGPN	2,470	121.50	Davenport, Iowa	WPDR	1,712	175.23	Rochester, N. Y.
WKDT	1,596	187.97	Detroit, Mich.	KGPC	1,712	175.23	St. Louis, Mo.
WCK	2,410	124.50	Detroit, Mich.	WPDS	2,416	124.17	St. Paul, Minn.
WPDX	2,410	124.50	Detroit, Mich.	KGPD	1,596	187.97	San Francisco, Calif.
WPDF	2,440	123.00	Flint, Mich.	KGPD	2,410	124.50	San Francisco, Calif.
WMP	1,662	180.51	Framingham, Mass.	KGPA	2,416	124.17	Seattle, Wash.
WPEB	2,440	123.00	Grand Rapids, Mich.	KGPK	2,470	121.50	Sioux City, Iowa
WJL	257	1,165.00	Greensburg, Pa.	WRDQ	2,470	121.50	Toledo, Ohio
WRDR	2,410	124.50	Grosse Point Village, Mich.	WPDA	2,416	124.17	Tulare, Calif.
WBA	257	1,165.00	Harrisburg, Pa.	KGPG	2,410	124.50	Vallejo, Calif.
WMO	2,410	124.50	Highland Park, Mich.	WPDW	2,410	124.50	Washington, D. C.
WMDZ	2,440	123.00	Indianapolis, Ind.	WMB	257	1,165.00	West Reading, Pa.
WRDS	1,662	180.51	Ingham, Mich.	WDX	257	1,165.00	Wyoming, Pa.
KGPE	2,422	123.86	Kansas City, Mo.	WPDG	2,458	122.05	Youngstown, Ohio

U. S. VISUAL BROADCASTING STATIONS

Call	Kilocycles	Meters	Owner	Call	Kilocycles	Meters	Owner
1XAV	2,850	105.30	Short Wave & Television, Boston, Mass.	W3XAD	60,000	5.00	RCA-Victor, Camden, N. J.
W2XAB	2,750	109.10	Atlantic Broadcasting, New York, N. Y.	W3XAD	2,100	142.90	RCA-Victor, Camden, N. J.
W2XBC	2,750	109.10	United Research Corp., Long Island City, N. Y.	W3XK	2,000	150.00	Jenkins Laboratories, Wheaton, Md.
W2XBU	2,000	150.00	Harold E. Smith, Beacon, N. Y.	W6XS	2,100	142.90	Don Lee, Inc., Los Angeles, Calif.
W2XCD	2,000	150.00	DeForest Radio Co., Passaic, N. J.	W8XAV	2,100	142.90	Westinghouse, East Pittsburgh, Pa.
W2XCR	2,100	142.90	Jenkins Television, Jersey City, N. J.	W9XAA	2,750	109.10	Federation of Labor, Chicago, Ill.
W2XCR	2,000	150.00	Jenkins Television, Jersey City, N. J.	W9XAB	1,564	191.82	Federation of Labor, Chicago, Ill.
W2XCW	2,100	142.90	General Electric, Schenectady, N. Y.	W9XAO	2,000	150.00	Western Television Corp., Chicago, Ill.
W2XDA	1,544	194.30	Atlantic Broadcasting, New York, N. Y.	W9XAP	2,100	142.90	Daily News, Chicago, Ill.
W2XF	43,000	6.97	National Broadcasting, New York, N. Y.	W9XD	43,000	6.97	Journal Company, Milwaukee, Wis.
W2XF	48,500	6.18	National Broadcasting, New York, N. Y.	W9XD	48,500	6.18	Journal Co., Milwaukee, Wis.
W2XF	60,000	5.00	National Broadcasting, New York, N. Y.	W9XD	60,000	6.00	Journal Co., Milwaukee, Wis.
W2XR	2,850	105.30	Radio Pictures, Inc., Long Island City, N. Y.	W9XG	2,750	109.10	Purdue University, W. Lafayette, Ind.
W3XAD	43,000	6.97	RCA-Victor, Camden, N. J.	W9XM	2,850	105.30	Great Lakes Broadcasting, Chicago, Ill.
W3XAD	48,500	6.18	RCA-Victor, Camden, N. J.				

U. S. RELAY BROADCASTING STATIONS

Call	Kilocycles	Meters	Owner	Call	Kilocycles	Meters	Owner
W1XAZ	9,570	31.35	Westinghouse Elec., East Springfield, Mass.	W6XAF	2,938	112.10	Dept. Agriculture, Sacramento, Calif.
W2XAD	15,340	19.56	General Electric, Schenectady, N. Y.	W6XAF	5,870	51.11	Dept. Agriculture, Sacramento, Calif.
W2XAF	9,530	31.48	General Electric, Schenectady, N. Y.	W6XAL	6,080	49.34	Pacific-Western Broadcasting, Westminster, Calif.
W2XAG	550	545.00	General Electric, Schenectady, N. Y.	W6XAL	15,250	19.67	Pacific-Western Broadcasting, Westminster, Calif.
W2XAG	660	455.00	General Electric, Schenectady, N. Y.	W6XAL	21,500	13.95	Pacific-Western Broadcasting, Westminster, Calif.
W2XAG	790	380.00	General Electric, Schenectady, N. Y.	W6XN	12,850	23.35	General Electric, Oakland, Calif.
W2XAG	1,150	260.90	General Electric, Schenectady, N. Y.	W8XAL	6,060	49.50	Crosley Radio Corp., Cincinnati, Ohio
W2XAG	1,500	200.00	General Electric, Schenectady, N. Y.	W8XK	6,140	48.86	Westinghouse, East Pittsburgh, Pa.
W2XAL	6,040	49.67	Short Wave Bdcstg. Corp., Coytesville, N. J.	W8XK	9,570	31.35	Westinghouse, East Pittsburgh, Pa.
W2XAL	11,800	25.42	Short Wave Bdcstg. Corp., Coytesville, N. J.	W8XK	11,880	25.25	Westinghouse, East Pittsburgh, Pa.
W2XAL	15,250	19.67	Short Wave Bdcstg. Corp., Coytesville, N. J.	W8XK	15,210	19.72	Westinghouse, East Pittsburgh, Pa.
W2XAL	21,460	13.97	Short Wave Bdcstg. Corp., Coytesville, N. J.	W8XK	17,780	16.87	Westinghouse, East Pittsburgh, Pa.
W2XE	6,120	49.02	Atlantic Broadcasting, Jamaica, N. Y.	W8XK	21,540	13.93	Westinghouse, East Pittsburgh, Pa.
W2XE	11,810	25.34	Atlantic Broadcasting Co., Jamaica, N. Y.	W9XAA	6,080	49.34	Federation of Labor, Chicago, Ill.
W2XE	15,280	19.63	Atlantic Broadcasting Co., Jamaica, N. Y.	W9XAA	11,840	25.34	Federation of Labor, Chicago, Ill.
W2XZ	610	491.50	National Broadcasting, Bellmore, N. Y.	W9XAA	17,780	16.87	Federation of Labor, Chicago, Ill.
W3XAL	6,100	49.18	National Broadcasting, New York, N. Y.	W9XF	6,020	49.83	Great Lakes Broadcasting, Chicago, Ill.
W3XAU	6,060	49.50	Universal Broadcasting, Philadelphia, Pa.	W9XF	11,800	25.42	Great Lakes Broadcasting, Chicago, Ill.
W3XAU	9,590	31.28	Universal Broadcasting, Philadelphia, Pa.	W9XF	21,500	13.95	Great Lakes Broadcasting, Chicago, Ill.
W3XL	6,425	46.70	National Broadcasting, New York, N. Y.	W9XU	6,060	49.50	Mona Motor Oil Co., Council Bluffs, Iowa

SIMPLE TIME CHART

(Time changes every 15 degrees of Longitude East or West)

←WEST

LONGITUDE WEST OF GREENWICH	180°	165°	150°	135°	120°	105°	90°	75°	60°	45°	30°	15°	0°
PLACES ON, OR NEARLY ON, THE MERIDIAN INDICATED.	FIJI ISLANDS	UNALASKA	SEWARD	JUNEAU	LOS ANGELES	DENVER	CHICAGO	NEW YORK	BUENOS AIRES	RIO JANEIRO	AZORES	ICELAND	(GREENWICH) LONDON
TIME	Midnight	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon

↑ International date line. When it's Monday East of 180° it is Tuesday West of 180°. ↓

EAST→

LONGITUDE EAST OF GREENWICH	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
PLACES ON, OR NEARLY ON, THE MERIDIAN INDICATED.	(GREENWICH) LONDON	BERLIN	ODESSA CAIRO	ADEN	MAURITIUS ISL.	LAHORE	CALCUTTA	BATAVIA	MANILA	KOBE	EASTERN AUSTRALIA	NEW CALEDONIA	FIJI ISLANDS
TIME	Noon	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midnight

FOREIGN BROADCAST STATIONS

Call	Location	Kc.
	ALGERIA	
.....	Algiers	824
	ARGENTINA	
LP4	Buenos Aires	670
LR1	Buenos Aires	790
LR2	Buenos Aires	870
LR3	Buenos Aires	950
LR4	Buenos Aires	990
LR5	Buenos Aires	830
LR6	Buenos Aires	910
LR7	Buenos Aires	750
LR8	Buenos Aires	1150
LR9	Buenos Aires	1030
LS1	Buenos Aires	710
LS2	Buenos Aires	1190
LS3	Buenos Aires	1270
LS5	Buenos Aires	1070
LS6	Buenos Aires	1350
LS8	Buenos Aires	1230
LS9	Buenos Aires	1390
LT2	Concordia	810
32	Concordia	1327
LV2	Cordoba	911
LT7	General Pico	...
LT2	La Plata	685
LV8	Los Molinos	...
LT4	Mendoza	759
LT5	Parana	1249
LT3	Rosario	1090
LV5	Rosario	1369
LV6	Rosario	1079
LT6	San Juan	730
LT2	Villaguay	1140
	AUSTRALIA	
5CL	Adelaide	730
5DN	Adelaide	960
5KA	Adelaide	1200
5AD	Adelaide	1310
5AD	Adelaide	720
2AY	Albury	1320
2AY	Albury	1480
3BA	Ballarat	1300
3BO	Bendigo	1450
3BO	Bendigo	980
4QG	Brisbane	760
4BC	Brisbane	1145
4BC	Brisbane	880
4BK	Brisbane	1290
2CA	Canberra	1050
3KZ	Carlton	1350
4CH	Charleville	1170
3GL	Geelong	1400
2GN	Goulburn	1490
2MO	Gunnedah	1500
2MO	Gunnedah	1330
7ZL	Hobart	580
7HO	Hobart	890
7HO	Hobart	1160
7LA	Launceston	1080
7LA	Launceston	1100
2XN	Lismore	1340
4MK	Mackay	1190
3AR	Melbourne	610
3LO	Melbourne	800
3UZ	Melbourne	930
3DB	Melbourne	1180
3KZ	Melbourne	1350
2MV	Moss Vale	1220
2MV	Moss Vale	1460
2NC	Newcastle	1245
2HD	Newcastle	1415
2HD	Newcastle	1110
6WF	Perth	690
6ML	Perth	1010
6ML	Perth	1180
4RK	Rockhampton	930
2FC	Sydney	665
2BL	Sydney	855
2GB	Sydney	950
2UE	Sydney	1025
2KY	Sydney	1070
2UW	Sydney	1125
4GR	Toowoomba	1020
4TO	Townsville	1260
3TR	Trafalgar	1280
3WR	Wangaratta	1260
	AUSTRIA	
.....	Graz	851
.....	Innsbruck	1058
.....	Innsbruck	1376
.....	Klagenfurt	662
.....	Linz	1220
.....	Vienna	581
	BELGIUM	
EB4ED	Antwerp	1200
EB4GT	Bruxells	1150
ON4RB	Bruxells	590
EB4RC	Bruxells	1395
EB4FQ	Bruxells	1305
EB4CE	Chatelineau	1365
EB4FG	Dampremy	1430
EB4RG	Gand	1090
EB4RW	Liege	1070
EB4BQ	Marchienne	1035
EB4EX	Ottomont	1335
EB4CF	Verviers	1395
	BERMUDA	
TJW	Hamilton	1480
	BOLIVIA	
.....	La Paz	1713
CPX	La Paz	1000
	BRAZIL	
PRAM	Amparo	1304
PRAH	Bahia	857
PRAF	Belem	1363
PRAQ	Bello Horizonte	1090
PRAN	Curvtiba	882
PRAZ	Franca	1111
PRAJ	Juiz de Fora	857
PRAY	Mocy das Cruzes	1000
PRAD	Pelotas	920
PRAG	Porto Alegre	1090
PRAP	Recife	750
PRAI	Ribeirao Preto	1153
PRAA	Rio de Janeiro	750
PRAB	Rio de Janeiro	934
PRAC	Rio de Janeiro	833
PRAX	Rio de Janeiro	1364
PRAK	Rio de Janeiro	1153
PRAS	Santos	1000
PRAE	Sao Paulo	857
PRAR	Sao Paulo	1016
PRAL	Sao Paolo	750
PRAO	Sao Paolo	934
	CANADA	
CKGW	Bowmanville	910
CJBC	Bowmanville	910
CJSC	Bowmanville	910
CPRY	Bowmanville	910
10AE	Bowmanville	1199
10BQ	Brantford	1199
CKX	Brandon	540
CNRC	Calgary	690
CFCN	Calgary	690
CJCJ	Calgary	690
CHCA	Calgary	690
CFAC	Calgary	690
10BU	Canora	1199
CHCK	Charlottetown	960
CFCY	Charlottetown	960
CFCO	Chatham	1210
CHWK	Chilliwack	1210
CKMC	Cobalt	1210
CHMA	Edmonton	680
CKUA	Edmonton	580
CJCA	Edmonton	930
CNRE	Edmonton	930
CJRW	Fleming	600
CFNB	Fredericton	1210
CHNS	Halifax	930
CNRH	Halifax	930
CHCS	Hamilton	880
CHML	Hamilton	880
CKOC	Hamilton	880
CFJC	Kamloops	1120
10AY	Kelowna	1199
CFRC	Kingston	930
CFRB	King, York Co	960
CNRX	King, York Co	960
CJOC	Lethbridge	1120
10BU	Liverpool	1199
CJGC	London	910
CNRL	London	910
CKPR	Midland	930
CNRA	Moncton	630
CFCF	Montreal	1030
CJRM	Moose Jaw	600
10AB	Moose Jaw	1199
CFCH	North Bay	1200
CKCO	Ottawa	890
CNRO	Ottawa	600
CHWC	Pilot Butte	960
CFLC	Prescott	1010
CKPC	Preston	1210
10B1	Prince Albert	1199
CHRC	Quebec	880
CKCI	Quebec	880
CKCV	Quebec	880
CNRQ	Quebec	880
CNRD	Red Deer	840
CKLC	Red Deer	840
CHCT	Red Deer	840
CKCK	Regina	960
CJBR	Regina	960
CNRR	Regina	960
CFQC	Saskatoon	910
CNRS	Saskatoon	910
CJOR	Sea Island	1210
CKAC	St. Hyacinthe	730
CHYC	St. Hyacinthe	730
CNRM	St. Hyacinthe	730
CFBO	St. John	890
10AK	Stratford	1199
CHGS	Summerside	1120
CJCB	Sydney	880
CNRT	Toronto	840
CFCA	Toronto	840
CKOW	Toronto	840
CKCL	Toronto	580
CKNC	Toronto	580
CFCL	Toronto	580
CNRV	Vancouver	1030
CKCE	Vancouver	730
CJLS	Vancouver	730
CKFC	Vancouver	730
CKMO	Vancouver	730
CFCT	Victoria	630
CKCR	Waterloo	1010
10BP	Wingham	1199
CKY	Winnipeg	780
CNRW	Winnipeg	780
CKIC	Wolfville	930
CJGX	Yorkton	630
	CANAL ZONE	
NBA	Panama	845
	CANARY ISLANDS	
EAR5	Las Palmas	1071
	CEYLON	
YPB	Colombo	700
	CHILE	
.....	Asuncion	...
CMAI	Concepcion	870
CMAB	Santiago	625
CMAC	Santiago	804
CMAD	Santiago	938
CMAE	Santiago	1070
CMAF	Santiago	750
CMAK	Santiago	1333
CMAO	Santiago	1016
CMAQ	Santiago	1224
CMAT	Tacna	545
CMAJ	Valparaiso	1034
	CHINA	
CAB	Canton	689
XGY	Chekiang	977
COHB	Harbin	674
COMK	Mukden	731
XGZ	Nanking	1071
XOPP	Pekin	952
KRC	Shanghai	869
KSMS	Shanghai	1083
NKS	Shanghai	952
RSC	Shanghai	1276
XGX	Shanghai	1071
XGAH	Shanghai	937
COTN	Tientsin	625
GEC	Tientsin	1000
	CHOSEN	
JODK	Keijo	690
	COLOMBIA	
HJN	Bogota	684
	COSTA RICA	
TI4NRH	Heredia	980
TIC	San Jose	882
	CUBA	
CMBR	Arroyo Apolo	1500
CMHD	Caibarien	926
CMJA	Camaguey	1332
CMJC	Camaguey	1321
CMJE	Camaguey	856
CMGE	Cardenas	1375
CMHA	Cienfuegos	1154
CMHH	Cifuentes	870
CMHJ	Cifuentes	645
CMGA	Colon	834
CMCG	Guanabacoa	1285
CMCT	Guanabacoa	1500
CMAA	Guanajay	1090
CMCQ	Havana	1150
CMBP	Havana	1500
CMBH	Havana	1500
CMBL	Havana	1500
CMCU	Havana	1345
CMBY	Havana	1405
CMCD	Havana	1345
CMBC	Havana	955
CMBG	Havana	1070
CMBJ	Havana	1285
CMQ	Havana	1150
CMBA	Havana	1345
CMCA	Havana	1225
CMBX	Havana	1405
CMK	Havana	730
CMCJ	Havana	550
CMBZ	Havana	1010
CMBI	Havana	1405
CMBM	Havana	1285
CMCB	Havana	1070
CMCH	Havana	1285
CMX	Havana	900
CMC	Havana	730
CMBT	Havana	1070
CMBS	Havana	790
CMBF	Havana	1345
CMCF	Havana	900
CMCY	Havana	1345
CMW	Havana	588
CMBD	Havana	955
CMCR	Havana	1285
CMKF	Holguin	1363
CMBN	Los Pinos	1405
CMBW	Marianao	1010
CMCM	Marianao	1500
CMBK	Marianao	1405
CMBQ	Marianao	1405
CMCN	Marianao	1225
CMCQ	Marianao	660
CMCX	Marianao	1010
CMGD	Matanzas	1140
CMGC	Matanzas	1063
CMGB	Matauzas	1185
CMGF	Matanzas	977
CMGH	Matanzas	1249
CMGI	Matanzas	1094
CMAB	Pinar del Rio	1240
CMHB	Sagua la Grande	1500
CMHE	Santa Clara	1420
CMHI	Santa Clara	1110
CMKA	Santiago de Cuba	1450
CMKB	Santiago de Cuba	1200
CMKC	Santiago de Cuba	1034
CMKD	Santiago de Cuba	1100
CMKE	Santiago de Cuba	1240
CMKG	Santiago de Cuba	1176
CMKH	Santiago de Cuba	1327
CMHC	Tuinicu	791
	CZECHOSLOVAKIA	
OKR	Bratislava	1075
OKB	Brunn	878
OKK	Kosice	1024
.....	Moravska-Ostrava	1141
OKP	Prague	616
	DANZIG	
PTB	Danzig	662
	DENMARK	
.....	Copenhagen	1067
OXO	Kalundborg	260
	DOMINICAN REPUBLIC	
HIX	Santo Domingo	625
	DUTCH EAST INDIES	
.....	Bandoeng	968
PFC	Batavia	1364
	EGYPT	
.....	Cairo	869
.....	Cairo	909
	ESTONIA	
.....	Tallinn	1013
.....	Tallinn	747
.....	Tartu	1050
	FINLAND	
.....	Abo	1219
.....	Bjorenborg	1219
.....	Helsingfors	1357
OFA	Jakobstad	1031
OFC	Lahti	167
OFB	Pori	1373
OFD	Tampere	662
OFE	Turku	1220
OFG	Viipuri	1031
OFH		
	FRANCE	
F2BD	Agen	963
.....	Beziers	1413
.....	Bordeaux	986
.....	Grenoble	915
.....	Juan les Pino	1206
.....	Lille	1132
.....	Limoges	1020
.....	Lyon	644
YN	Lyon	1051
YR	Marsan	750
.....	Marseille	949
.....	Montpellier	1049
.....	Montpellier	1195
.....	Nimes	1250
.....	Paris	207
FL	Paris	671
FTTT	Paris	919
.....	Paris	174
.....	Paris	1265
.....	Rennes	1103
MRD	Toulouse	1175
.....	Toulouse	787
.....	Vitus	971

Call	Location	Kc.
	GERMANY	
.....	Aachen	1319
.....	Aix la Chapelle	662
.....	Augsburg	1112
.....	Berlin I	717
.....	Berlin II	1059
.....	Bremen	950
.....	Breslau	923
.....	Cologne	1319
.....	Dresden	940
.....	Flensburg	1373
.....	Frankfurt	769
.....	Freiburg	524
.....	Gleiwitz	1184
.....	Hamburg	806
.....	Hanover	535
.....	Kassel	1220
.....	Kaiserslautern	536
.....	Kiel	1292
.....	Konigsberg	1382
.....	Langenberg	634
.....	Leipzig	1158
.....	Magdeburg	1066
.....	Muehlacker	833
.....	Munich	563
.....	Munster	1319
.....	Nurnberg	1255
.....	Stettin	1060
.....	Stattgart	833
	GREAT BRITAIN	
2BD	Aberdeen	995
2BE	Belfast	1238
6BM	Bournemouth	1040
2LS	Bradford	1040
5WA	Cardiff	968
.....	Daventry, Regional	626
.....	Daventry, National	193
2DE	Dundee	1040
2EH	Edinburgh	1040
5SC	Glasgow	752
6KH	Hull	1040
2LS	Leeds	1500
6LV	Liverpool	1040
.....	London, Regional	842
.....	London, National	1150
2ZY	Manchester	796
5NO	Newcastle	1148
5PY	Plymouth	1040
6FL	Sheffield	1040
6ST	Stoke-on-Trent	1040
5SX	Swansea	1040
	GUATEMALA	
TGW	Guatemala City	571
	HAITI	
HHK	Port au Prince	920
	HOLLAND	
.....	Bloemendaal	1220
PFBI	Hilversum	280
.....	Hilversum	1004
PHI	Huizen	160
PCF	Scheveningen	280
	HONDURAS	
HRB	Tegucigalpa	1370
	HONG KONG	
ZBW	Victoria	845
	HUNGARY	
HAL	Budapest	550
	ICELAND	
.....	Akureyri	1563
TFA	Reykjavik	1499
TFU	Reykjavik	25
	INDIA	
VUB	Bombay	840
VUC	Calcutta	810
VUL	Lahore	882
VUM	Madras	769
	IRISH FREE STATE	
6CK	Cork	750
2RN	Dublin	940
	ITALY	
1BA	Bari	
1BZ	Bolzano	662
1FI	Firenze	
1GE	Genoa	779
1MI	Milan	599
1NA	Naples	905
1PA	Palermo	1410
1RO	Rome	680
2RO	Rome	
1TO	Torino	1094
1TR	Trieste	1211
	JAPAN	
JOLK	Fukuoka	680
JOFK	Hiroshima	850
JOJK	Kanazawa	710
JODK	Koijyo	820
JOGK	Kumamoto	790
JONK	Nagano	635
JOCK	Nagoya	810
JOKK	Okayama	700
JORK	Osaka	750
JOIK	Sapporo	830
JOHK	Sendai	770
JOPK	Shizuoka	778
JOAK	Tokyo	870
	KENYA	
7LO	Nairobi	750
	KWANTUNG	
JQAK	Darien	759
	LATVIA	
YLZ	Riga	571
	LITHUANIA	
RYK	Kaunas	150
	LUXEMBURG	
LOAA	Luxemburg	1344
	MEXICO	
XFC	Aguascalientes	804
XFF	Chihuahua	923
XEQ	Ciudad Juarez	750
XEA	Guadalajara	1200
XEE	Linares	1000
XEY	Merida	547
XEX	Mexico City	1190
XEN	Mexico City	731
XEB	Mexico City	1030
XFG	Mexico City	638
XEG	Mexico City	910
XFI	Mexico City	591
XEO	Mexico City	940
XER	Mexico City	674
XFX	Mexico City	840
XEZ	Mexico City	588
XFZ	Mexico City	860
XEK	Mexico City	990
XEH	Mexico City	1130
XETA	Mexico City	1140
XEFA	Mexico City	1250
XET	Monterey	630
XEI	Morelia	1000
XEFE	Nuevo Laredo	980
XEP	Nuevo Laredo	1400
XEF	Oaxaca	1132
XEV	Puebla	1035
XED	Reynosa	961
XEL	Saltillo	1090
XFA	Tacubaya	500
XFA	Tacubaya	600
XEM	Tampico	841
XES	Tampico	890
XEC	Toluca	1333
XEU	Vera Cruz	800
XETF	Vera Cruz	680
XFE	Villahermosa	804
	MONACO	
.....	Monaco	1266
	MOROCCO	
CNO	Casablanca	983
.....	Rabat	414
	NEWFOUNDLAND	
VOGT	Bell Island	890
VONA	St. Johns	950
VOWR	St. Johns	675
VOX	St. Johns	1400
SWMC	St. Johns	482
SRA	St. Johns	550
	NEW ZEALAND	
1YA	Auckland	900
1ZR	Auckland	1090
1ZI	Auckland	1428
1ZQ	Auckland	1188
3YA	Christchurch	980
3ZC	Christchurch	1199
2ZU	Dannevirke	1100
4YA	Dunedin	650
4ZB	Dunedin	1079
4ZO	Dunedin	1078
4ZM	Dunedin	1078
4ZL	Dunedin	1219
2ZE	Eketahuna	1210
2ZI	Gisborne	1150
3ZR	Greymouth	820
1ZH	Hamilton	630
2ZI	Hastings	1330
2ZL	Hastings	1330
4ZP	Invercargill	1160
4ZI	Invercargill	1160
1ZM	Manurewa	1210
2ZD	Masterton	1180
2ZH	Napier	1260
2YB	New Plymouth	1230
2ZF	Palmerston North	1049
2ZO	Palmerston North	1120
2ZP	Wairoa	820
2ZK	Wanganui	600
2ZG	Wanganui	600
2ZR	Wanganui	600
2YA	Wellington	719
2ZW	Wellington	1120
	NORWAY	
LKA	Alesund	671
LKB	Bergen	824
LKD	Bodo	662
LKF	Fredriksstad	815
LKH	Hamar	527
LKK	Kristianssand	1274
LKN	Notodden	671
LKO	Oslo	280
LKP	Porsgrund	662
LKR	Rjuken	671
LKS	Stavanger	1247
LKM	Tromso	662
LKT	Trondelag	608
	PERU	
OAX	Lima	790
OA4M	Lima	1428
	PHILIPPINE ISLANDS	
KZRC	Cebu	937
KZRM	Manila	618
	POLAND	
SP3	Krakow	530
SP4	Kattowitz	710
SP7	Lodz	1229
SP6	Lwow	779
SP2	Poznan	875
SP8	Warsaw	1402
SP1	Warsaw	270
SP5	Wilno	590
	PORTUGAL	
CT1AA	Lisbon	942
	ROUMANIA	
.....	Bucharest	759
	SALVADOR	
AQM	Salvador	785
RUS	Salvador	664
	SAMOA	
5ZA	Apia	940
	SIAM	
HSP1	Bangkok	857
HSP3	Bangkok	937
	SPAIN	
EAJ18	Almeria	1195
EAJ13	Barcelona	1119
EAJ1	Barcelona	860
EAJ15	Cartagena	1219
EAJ7	Madrid	708
EAJ2	Madrid	750
EAJ19	Oviedo	1119
EAJ8	San Sebastian	662
EAJ5	Seville	815
	SWEDEN	
SBE	Boden	250
SCA	Boras	1301
SCB	Eskilstuna	1220
SCC	Falun	932
SCD	Gavle	1471
SBB	Goteborg	932
SCE	Halmstad	1389
SCG	Halsingborg	1299
SBH	Horby	1167
SCF	Hudiksvall	1111
SCH	Jonkoping	1490
SCI	Kalmar	1220
SCJ	Karlskrona	1531
SCK	Karlstadt	1376
SCL	Kiruna	1220
SCM	Kristmehamn	1481
SCN	Malmberget	688
SBC	Malmo	1299
SBG	Motala	222
SCO	Norrkoping	1111
SCV	Orebro	1266
SCW	Ornskoldsvik	1376
SBF	Ostersund	389
SCP	Saffle	1220
SBA	Stockholm	688
SBD	Sundsvall	553
SCQ	Trollhattan	1112
SCR	Uddevalla	1058
SCS	Umea	1301
SCT	Uppsla	662
SCU	Varborg	1060
	SWITZERLAND	
HB3	Basel	941
.....	Basel	1229
.....	Berne	744
.....	Berne	1220
.....	Beromunster	653
.....	Geneva	395
.....	Lausanne	441
.....	Sottens	743
HBZ	Zurich	653
	TUNISIA	
TNU	Carthage	162
TUA	Tunis	235
	TURKEY	
TAE	Angora	193
TAL	Istanbul	250
.....	Osmanieh	250
	UNION OF SOVIET SOCIALIST REPUBLICS	
RW19	Achkhabad	333
RW60	Alma-Ata	310
RW36	Arkhangelsk	770
RW50	Armavir	587
RW35	Astrakhan	435
RW8	Bakou	238
RW43	Bakou	238
RW30	Dnepropetrovsk	511
RW21	Erivan	545
RW40	Gomel	621
RW23	Grozuyi	676
RW14	Irkoutsk	187
RW31	Ivanovo-Voznesensk	605
RW17	Kazan	550
RW17	Kazan	644
RW54	Khabarovsk	1052
RW54	Khabarovsk	320
RW1	Kharkov	320
RW20	Kharkov	704
RW9	Kiev	368
RW9	Kiev	200
RW33	Krasnodar	650
RW3	Lenigrad	300
RW53	Leningrad	300
RW27	Makhateh Kala	795
RW10	Minsk	429
RW1	Moscow	202
RW2	Moscow	417
RW37	Moscow	792
RW39	Moscow	792
RW58	Moscow	272
RW58	Moscow	268
RW49	Moscow	230
RW51	Naltchik	748
RW42	Nijni-Novgorod	394
RW6	Novosibirsk	238
RW13	Odessa	666
RW44	Omsk	471
RW45	Orenbourg	461
RW22	Onfa	444
RW22	Onfa	617
RW56	Penza	640
RW46	Petropavlovsk	686
RW29	Petrozavodsk	468
RW24	Piatigorsk	865
RW55	Pokrovsk	731
RW12	Rostov-sur-le-Don	353
RW16	Samara	521
RW16	Samara	404
RW18	Samarkand	342
RW52	Simferopol	630
RW52	Simferopol	725
RW24	Smolensk	551
RW26	Stalino	810
RW53	Sverdlovsk	540
RW32	Stavropol	608
RW5	Sverdlovsk	363
RW47	Tachkent	421
RW11	Tachkent	256
RW57	Tiraspol	833
RW57	Tiraspol	838
RW7	Tiflis	280
RW48	Tomsk	645
RW41	Veliki Oustug	560
RW63	Verkhneoudinsk	350
RW64	Vladikavkag	752
RW28	Vladivostok	634
RW28	Vladivostok	725
RW25	Voronej	385
RW25	Voronej	450
	URUGUAY	
CX6	Montevideo	650
CX10	Montevideo	730
CX12	Montevideo	770
CX14	Montevideo	810
CX16	Montevideo	850
CX18	Montevideo	890
CX20	Montevideo	930
CX22	Montevideo	970
CX26	Montevideo	1050
CX30	Montevideo	1130
CX32	Montevideo	1170
CX34	Montevideo	1210
CX36	Montevideo	1250
CX38	Montevideo	1290
CX40	Montevideo	1330
CX44	Montevideo	1410
CX46	Montevideo	1450
CX48	Montevideo	1490
CW40	Paysandu	1340
CW44	Paysandu	1420
CW32	Salto	1180
CW34	Salto	1220
CW36	Salto	1260
CW38	Salto	1300
CW30	Tucuarembo	1140
	UNION OF SOUTH AFRICA	
ZTC	Capetown	800
ZTD	Durban	738
ZTJ	Johannesburg	666
	VENEZUELA	
AYRE	Caracas	800
1BC	Caracas	960
	YUGOSLAVIA	
.....	Belgrade	696
.....	Ljubljano	527
.....	Zagreb	977

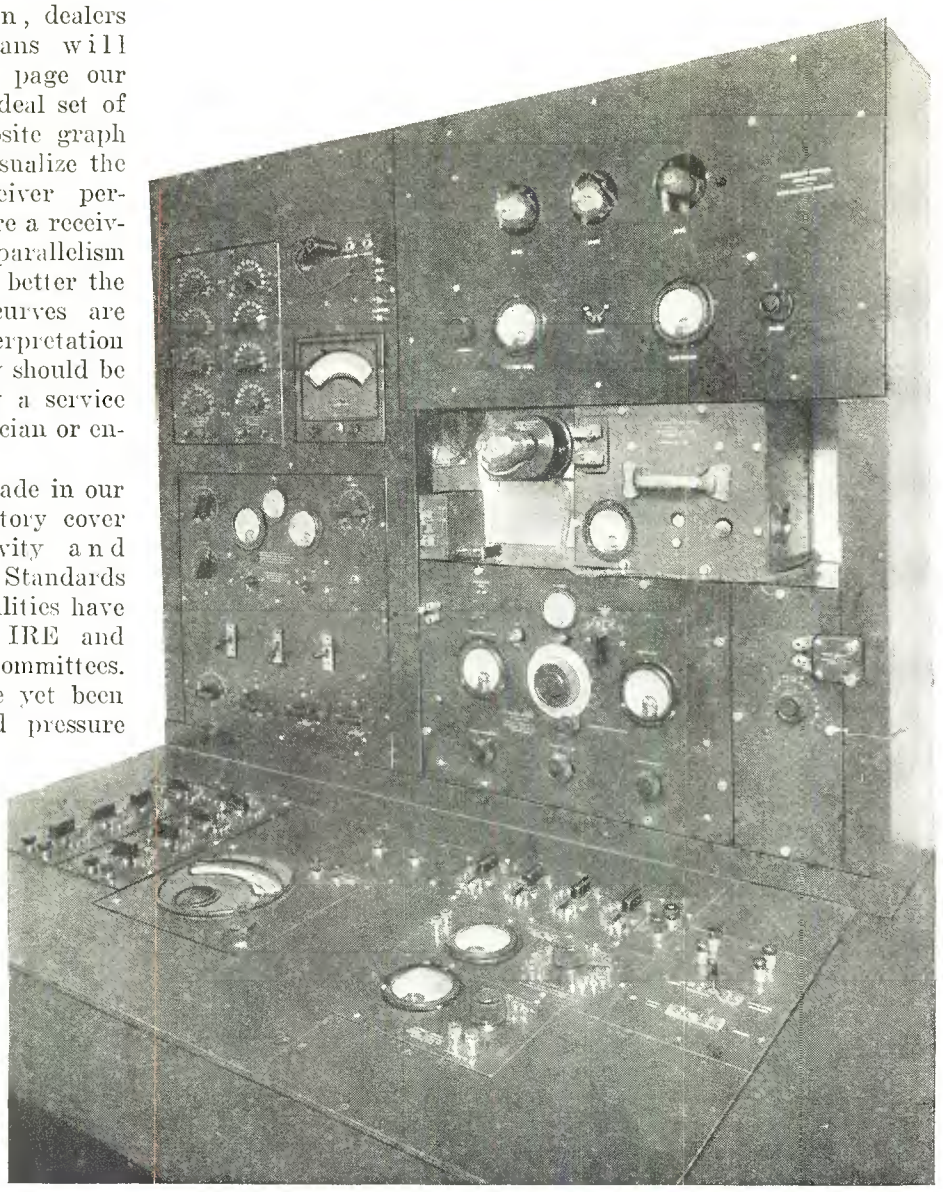
FOREIGN SHORT WAVE PHONE STATIONS

Call	Location	Kc.
	ARGENTINA	
LSX	Buenos Aires	10,352
LSG	Buenos Aires	19,900
LSN	Buenos Aires	21,200
	AUSTRALIA	
VK3ME	Melbourne	9,510
VK6AG	Perth	7,194
VK2ME	Sydney	10,526
VLK	Sydney	10,526
	AUSTRIA	
.....	Vienna	13,514
UOR2	Vienna	11,801
OUITH	Vienna	8,060
UOR2	Vienna	6,072
OHK2	Vienna	4,274
	BELGIUM	
	BOLIVIA	
	BRAZIL	
PPU	Rio de Janeiro	6,122
PPU	Rio de Janeiro	19,270
	BRITISH COLONIES	
VRY	Georgetown, Guiana	6,726
TJW	Hamilton, Bermuda	9,500
.....	Mombras, Kenya	13,895
.....	Mombras, Kenya	8,230
VQ7LO	Nairobi, Kenya	6,100
VS6WX	Singapore	7,190
	CANAL ZONE	
	CANADA	
VE9GW	Bowmanville, Que.	6,098
VAS	Glace Bay, N. S.	10,714
CJRX	Middle Church	11,720
VE9CL	Winnipeg, Man.	6,061
	CURACAO	
PJZ	Curacao	11,718
	CZECHOSLOVAKIA	
.....	Bratislava	5,000
OKIMPT	Prague	5,119
OKIMPT	Prague	4,412
	CHILE	
	CHINA	
XCTE	Shanghai	5,000
	COLOMBIA	
HKA	Barranquilla	5,837
HKD	Barranquilla	6,993
HKF	Bogota	7,194
HKF	Bogota	7,610
HKC	Bogota	6,250
HKX	Bogota	6,977
HKX	Bogota	7,143
	COSTA RICA	
TUH	Heredia	9,734
	CUBA	
CM2LA	Havana	10,007
CM2MK	Havana	9,360
CM6XJ	Tuinucu	15,008
	DANZIG	
EK4ZZZ	Danzig	7,500
	DENMARK	
OXZ	Skamlabaek	9,520
	DOMINICAN REPUBLIC	
HIX	Santo Domingo	4,610
	DUTCH EAST INDIES	
PMB	Bandoeng	20,620
PLE	Bandoeng	18,830
PLG	Bandoeng	15,957
PMY	Bandoeng, Java	5,172
PK2AF	Djocjacorta, Java	6,000
PK6KZ	Makassar	11,765
PK2AG	Semerang, Java	2,609
PK3AN	Surabaya, Java	6,036
.....	Surabaya	2,143
PK1AA	Weltevreden, Java	4,000
	ECUADOR	
.....	Riobamba	7,540
	EGYPT	
	ESTONIA	
	FIJI	
VPD	Suva	14,430
	FINLAND	
	FRANCE	
.....	Agen	9,760
FYR	Lyons	7,463
FYR	Lyons	5,172
.....	Nancy	19,350
F8AV	Nogent	3,750
FLJ	Paris	9,230
F8LH	Paris	7,317
.....	Paris	6,860
F8GC	Paris	4,918
.....	Pontoise-Seine-et-Oise	11,720
.....	Pontoise-Seine-et-Oise	11,905
.....	Pontoise-Seine-et-Oise	15,243
F8BP	Rugles	5,455
FTD	St. Assise	19,840
FRO	St. Assise	19,417
FRE	St. Assise	19,417
FTM	St. Assise	19,355
FTO	St. Assise	18,248
FTE	St. Assise	18,248
F8E	St. Assise	13,441
FQO	St. Assise	12,161
FQE	St. Assise	12,161
FTN	St. Assise	12,265
FTL	St. Assise	9,950
FTF	St. Assise	7,770
FTB	St. Assise	7,490
.....	Touraine	7,500
.....	Toulouse	6,122
	FRENCH COLONIES	
FM8KR	Constantine	7,009
FM8KR	Constantine	3,750
	GERMANY	
.....	Elberswalde	7,407
D4AFF	Kothen	7,042
DHA	Nauen	11,766
DHC	Nauen	15,200
.....	Nauen	6,020
DGW	Nauen	17,760
.....	Nauen	9,560
	GREAT BRITAIN	
GBK	Bodmin	18,105
GBK	Bodmin	9,260
G5SW	Chelmsford	11,750
GBX	Rugby	16,164
GBS	Rugby	18,310
GBW	Rugby	18,138
GBW	Rugby	14,493
GBU	Rugby	12,290
GBX	Rugby	12,195
GBS	Rugby	12,195
GBS	Rugby	9,020
GBS	Rugby	6,993
G2MN	Sonning-on-Thames	14,320
	HAITI	
	GUATEMALA	
	HOLLAND	
PBF5	Hague	6,438
PCJ	Hilversum	9,590
PCJ	Hilversum	15,220
PHI	Huizen	17,775
PCK	Kootwijk	18,400
PCV	Kootwijk	17,836
	HONDURAS	
HRB	Tegucigalpa	6,170
	HUNGARY	
HAT	Szekesfehervar	9,125
	ICELAND	
	INDIA	
VUB	Bombay	6,110
VUC	Calcutta	11,870
	INDO-CHINA	
F31CD	Chi-hoa	6,122
FZR	Saigon	16,216
FZR	Saigon	12,043
	IRISH FREE STATE	
	ITALY	
12RO	Rome	11,811
12RO	Rome	3,750
IMA	Rome	6,897
12RO	Rome	3,750
.....	Turin	3,750
HVJ	Vatican City	5,970
HVJ	Vatican City	15,120
	JAPAN	
J1AA	Kemikawa	17,301
J1AA	Kemikawa	8,000
	JUGOSLAVIA	
.....	Belgrade	10,000
	LATVIA	
	LITHUANIA	
	MADEIRA	
CT3AG	Funchal	6,383
	MEXICO	
XDA	Mexico City	14,634
XDA	Mexico City	9,380
XDA	Mexico City	6,818
XFD	Mexico City	6,667
XFD	Mexico City	9,091
XFD	Mexico City	11,111
XFA	Mexico City	6,977
XFA	Mexico City	7,143
XFA	Mexico City	21,249
	MONACO	
	MOROCCO	
CN8MC	Casablanca	6,881
CN8MC	Casablanca	5,882
.....	Rabat	12,610
.....	Rabat	9,300
....	Rabat	12,605
....	Rabat	9,300
	NEWFOUNDLAND	
VO8A	St. Johns	6,800
	NEW ZEALAND	
ZL2XX	Wellington	9,550
	NORWAY	
	PERU	
	PHILIPPINE ISLANDS	
KA1XR	Manila	12,245
KZRM	Manila	11,820
KZRM	Manila	9,570
KZRM	Manila	6,140
	POLAND	
.....	Poznan	11,001
.....	Poznan	8,900
	PORTUGAL	
PT1AA	Lisbon	7,143
.....	Oporto	12,000
	ROUMANIA	
.....	Bucharest	13,953
	SALVADOR	
	SHIP PHONE STATIONS	
GMJQ	SS. Belgenland	17,650
GMJQ	SS. Belgenland	13,040
GMJQ	SS. Belgenland	8,570
GMJQ	SS. Belgenland	4,762
DDDX	SS. Bremen	11,710
DDDX	SS. Bremen	7,560
IBDX	SS. Electra (Marconi's Yacht)	11,240
.....	SS. Hamburg	13,040
GDLJ	SS. Homeric	12,380
GDLJ	SS. Homeric	4,754
WSBN	SS. Leviathan	8,830
WSBN	SS. Leviathan	6,637
WSBN	SS. Leviathan	4,392
WSBN	SS. Leviathan	3,429
GFWV	SS. Majestic	17,590
GFWV	SS. Majestic	13,228
GFWV	SS. Majestic	4,430
GFWV	SS. Majestic	4,180
GLSQ	SS. Olympic	12,387
GLSQ	SS. Olympic	16,456
GLSQ	SS. Olympic	8,840
	SIAM	
HS2PJ	Bangkok	10,169
HSP2	Bangkok	9,500
HSP2	Bangkok	7,300
	SPAIN	
EAJ1	Barcelona	15,789
EAR96	Barcelona	6,522
EAR25	Barcelona	6,000
EAR58	Las Palmas, Canary Islands	7,210
EARI10	Madrid	7,026
EAR125	Madrid	7,026
EAJ25	Malaga	3000
EAR113	Viscaya	6,522
	SWEDEN	
.....	Motala	6,070
	SWITZERLAND	
HB9OC	Berne	9,130
HB9XD	Zurich	9,380
HB9XD	Zurich	7,229
HB9XD	Zurich	3,488
	TURKEY	
	UNION OF SOVIET SOCIALIST REPUBLICS	
RW15	Khabarovsk	4,273
RW3KAA	Leningrad	8,333
.....	Leningrad	11,111
.....	Leningrad	10,526
RW62	Minsk	6,420
RW61	Moscow	51,724
RW38	Moscow	5,514
RW59	Moscow	6,000
RW19	Tomsk	8,111
	URUGUAY	
	UNION OF SOUTH AFRICA	
ZTJ	Johannesburg	9,380
	VENEZUELA	

Receiver Performance Curve Section

SERVICE men, dealers and technicians will find on this page our conception of an ideal set of curves. The composite graph may be used to visualize the best possible receiver performance. The more a receiver's curves near parallelism with the ideal, the better the receiver. These curves are not capable of interpretation by a layman. They should be translated only by a service man, dealer, technician or engineer.

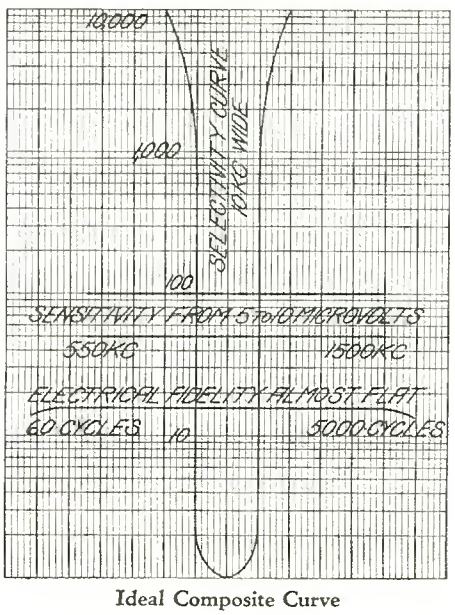
Measurements made in our engineering laboratory cover sensitivity, selectivity and electrical fidelity. Standards for these three qualities have been set by the IRE and RMA engineering committees. No standards have yet been adopted for sound pressure measurements. Until a standard is selected, our laboratory will measure only electrical fidelity, which disregards speaker response curves. The fourth measurement appearing with the sensitivity, selectivity and electrical fidelity curves represents power overload curves, or automatic volume control curves, as the case may be.



Definitions of the three major characteristics of a receiver are:

Sensitivity is that characteristic of a receiver which determines *to how weak* a signal it is capable of responding. It is measured quantitatively in terms of the input voltage required to give standard output. The ideal sensitivity, according to the graph on this page, would fall between the two lines, ranging from 10 to 5 microvolts (absolute) or less. This is an arbitrary value.

Selectivity is the degree to which a receiver is capable of *differentiating between* the desired signal, and signals of other carrier frequencies. This characteristic is not expressible by a single numerical value, but requires one or more graphs for its expression. Best selectivity possible would be somewhat like a "chimney" whose sides would be 10 kilocycles apart nearly all the way up the graph sheet. Selectivity as measured by our laboratory only concerns itself with energy entering the receiver via the input circuit (disregarding shielding effectiveness), since no standard has as yet been adopted to simulate selectivity conditions in the field.



Ideal Composite Curve

Fidelity is the degree to which the receiver *accurately reproduces* at its output terminals, the modulated form of the received wave impressed upon it. Ideal electrical fidelity curve would be a horizontal line almost flat over the frequency range from 60 to 5000 cycles. This range is also of an arbitrary width.

The photograph illustrates the equipment used in making the measurements. It conforms to the specifications of the IRE and RMA Standardization Committees. All test frequencies are determined by zero beat of a crystal-controlled dynatron oscillator. Voltmeters and microvoltmeters are periodically checked against calibrated standards for accuracy of adjustment. Individual conditions of measurement pertaining to each receiver will be found in the text accompanying each family of curves.

Since curves of all receivers are taken under the same conditions, it may be said that such curves constitute a yardstick by which receivers of the same general class may be compared, as long as this analysis is made by those technically competent to do so.

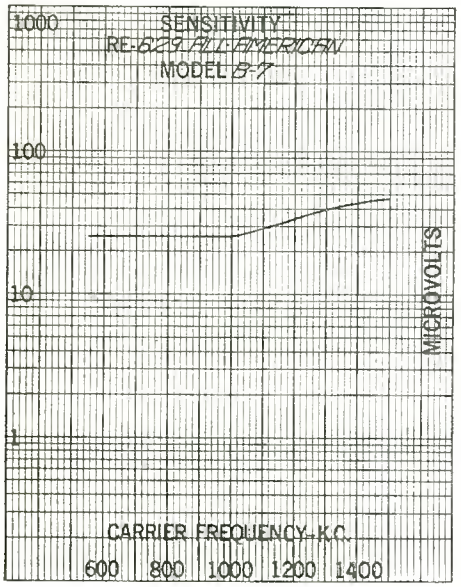
All-American Mohawk Lyric Model B-7

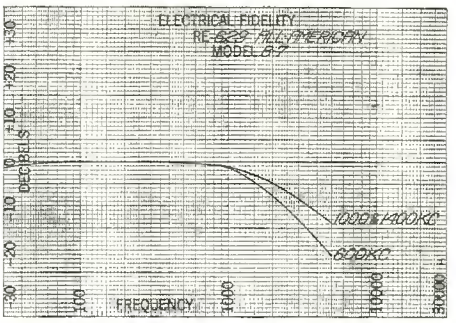
FROM measurements made in our laboratory on the All-American Mohawk "Lyric" model B-7 battery operated superheterodyne receiver, the accompanying curves were plotted.

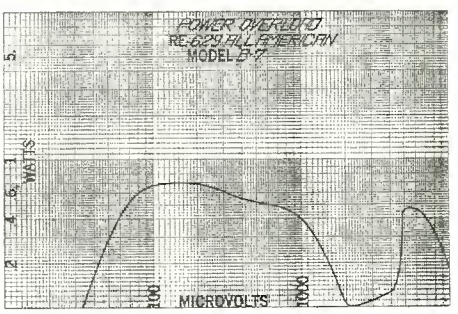
Modulated signals were coupled to the receiver's input circuit through the dummy antenna standard of 20 uh, 200 uuf and 25 ohms, with an output level of .05 watts. An impedance match to the 233 type pentode tube was furnished by a 7500 ohm resistance load. The output meter was capacitatively coupled to the plate of the output tube, which had an inductive load substituted for the magnetic speaker load. At 2 volts the A battery drain was .5 amperes and the B battery drain 24 milliamperes at 135 volts. For all tests the volume control was turned to its maximum position, alignment was unchanged from factory adjustment, and the tubes used were supplied with the receiver.

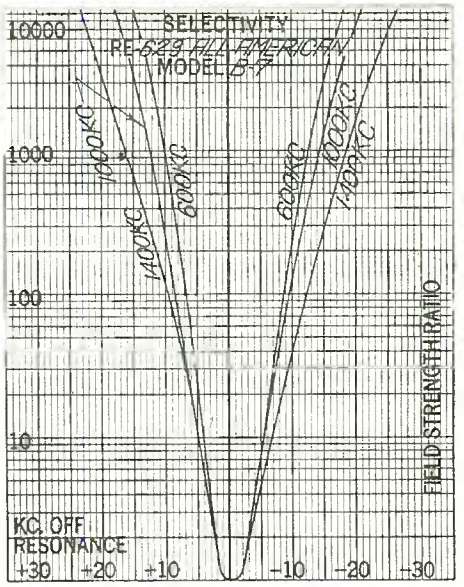
From the curve of column 1 the average sensitivity is taken to be 30.9 microvolts absolute or 7.7 microvolts per meter. From the power overload curve of column 2 maximum power output was found to be .685 watts delivered to the speaker, which figure disregards the harmonic content of the output wave form. Computed noise level maximum and minimum values are 1.85 per cent at 1000 k-c and .9 per cent at 550 k-c. Under the selectivity curves of column 3 are found the band widths in tabular form.

At the bottom of the page is the schematic wiring diagram of this receiver. Tubes used are a 232 r-f, 232 first detector, 230 oscillator, 232 second i-f, 232 second detector and a 233 output pentode. Oscillator energy is coupled to the grid coil of the second r-f transformer. Two ¼ microfarad condensers and two chokes furnish the necessary battery bypassing.



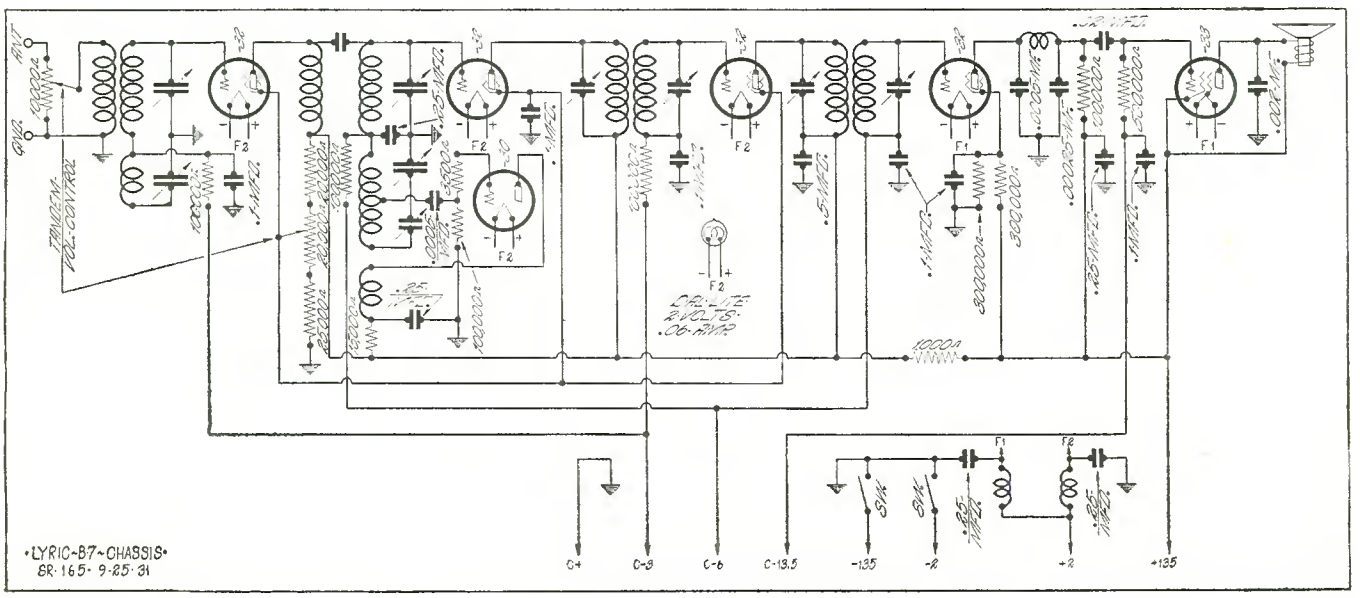






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	9.5	10.5	11.5
100	16	18	22
1000	23	27	35
10000	33.5	39	50



Brunswick Models 17-24

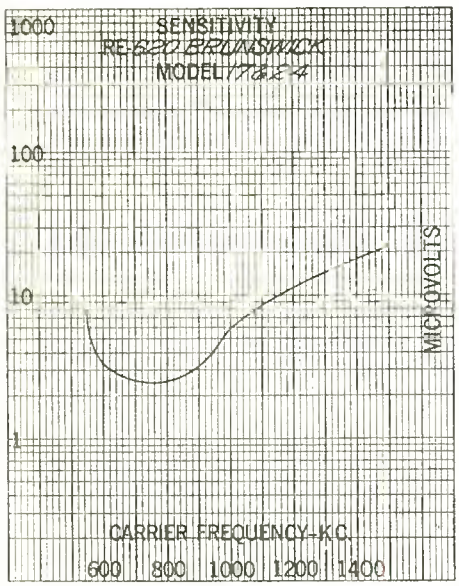
UPON measurement in our laboratory, the Brunswick models 17 and 24 produced the included overall receiver performance curves.

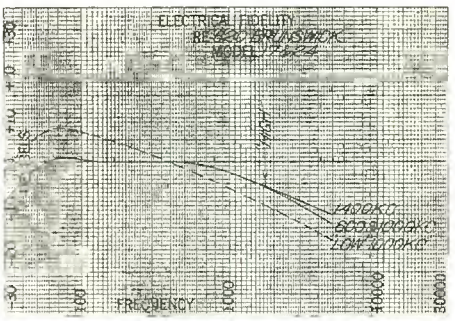
Input to the antenna circuit was through the standard dummy antenna of 20 uh, 200 uuf and 25 ohms, while the output was kept at the standard level of .05 watts. In making measurements, the voice coil circuit was opened to prevent a loading effect on the primary matching of tube impedances. The resistance load of 3750 ohms was connected from the plates to +B to match the 247 tubes operated in parallel, these plates being capacitatively coupled to the output measuring tube voltmeter. The maximum receiver sensitivity obtained in all of the tests made.

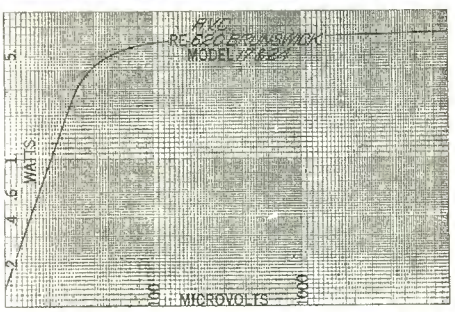
With an a-c line voltage of 112 volts, the line current drawn by the receiver power supply was .88 amperes. No readjustments in receiver alignment were made and the tubes employed were shipped with the set as standard equipment.

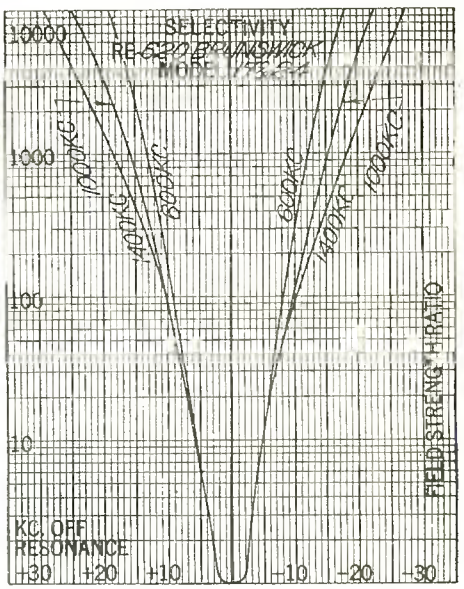
From the sensitivity curve of column 1, the average sensitivity is found to be 8 microvolts absolute, of which the equivalent is 2 microvolts per meter, using a standard antenna of four meters in effective height. The maximum noise level of 14.6 per cent occurred at 800 k-c, the point of greatest receiver sensitivity, and the minimum of .27 per cent at 550 k-c. A maximum output of 7.2 watts is taken from the automatic volume control curve of column 2 at an input of 10000 microvolts. This power output does not take into account the harmonic content of the wave form impressed upon the primary of the output transformer. Band widths will be found listed under the selectivity curves of column 3, from which they were measured.

Below is a schematic wiring diagram of the models 17 and 24. Tubes required are a 551 r-f, 224 first detector, 224 oscillator, 551 second i-f, 224 second detector, 227 automatic volume control tube, two 247s in parallel and the 280 full wave rectifier for B voltage supply for the receiver.



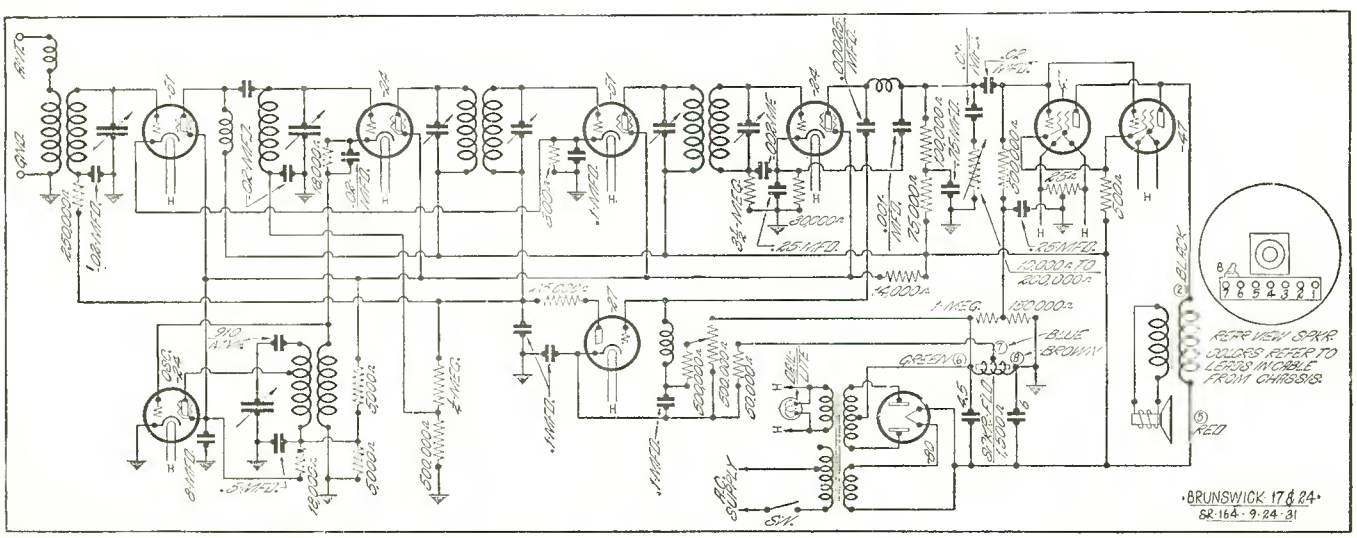






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	10.5	10.5	11
100	17.5	20	20
1000	25	31	37
10000	37	47	56

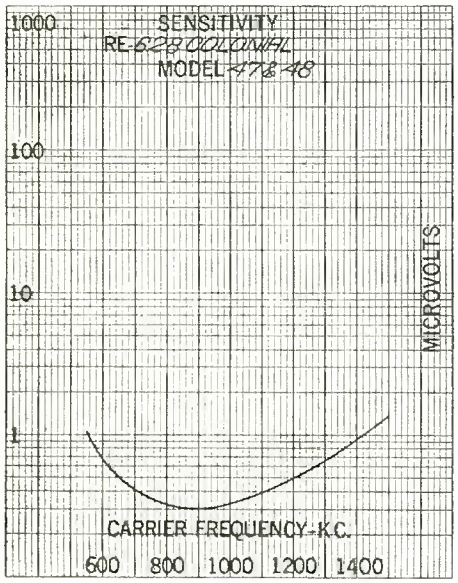


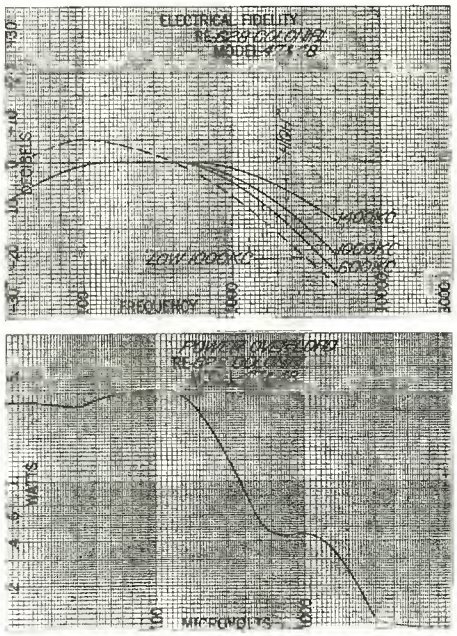
Colonial Models 47-48

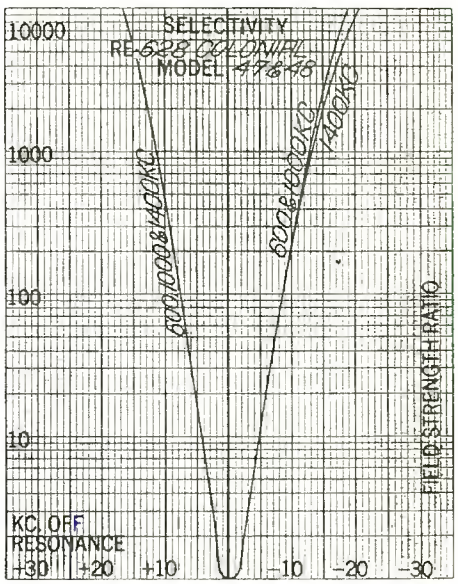
FROM our measurements on the Colonial models 47 and 48 the curves on this page were plotted as indices of their performance.

Signal generator input was through a dummy antenna standard of 20 uh, 200 uuf and 25 ohms across the receiver input circuit. In loading the push-pull 247 tubes, a pure resistance of 15,000 ohms was used to match their optimum plate load. The plates were capacitatively coupled to the output voltmeter and the standard output of .05 watts measured across the primary of the speaker transformer, with the voice coil disconnected in the secondary circuit. In testing, the sensitivity of the receiver was at maximum, the factory alignment was unaltered in our laboratory, and the tubes used were those included with the set. With an a-c line voltage of 111 volts, the current drain was .77 amperes.

The maximum noise level occurred at 800 k-c, the point of greatest sensitivity, and was 74 per cent in value. The minimum occurred at 550 k-c and had a value of 19 per cent. Band widths will be found under the selectivity curves, from which they were measured. In column 2 the power overload curve gives a maximum output of 4.23 in the primary of the output transformer, but the effect of harmonic distortion is not taken into account at this level.



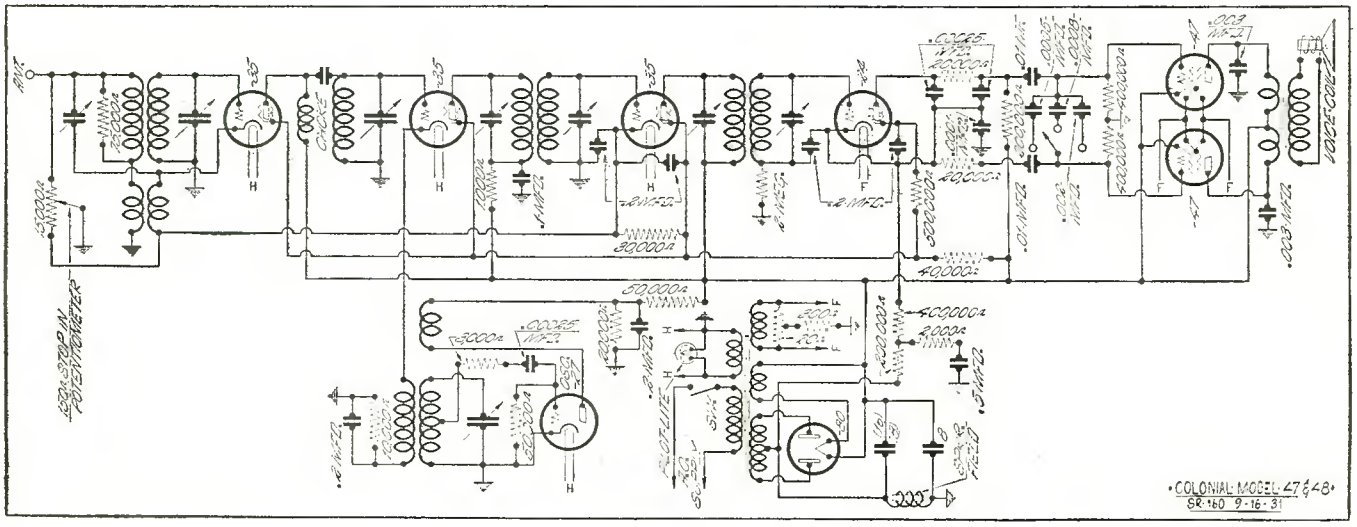




At the bottom of the page the schematic wiring diagram of the models 47 and 48 shows the tubes required to be a 235 r-f, 235 first detector, 235 second i-f, 224 second detector, 227 oscillator, coupled to the first detector cathode by means of a pick-up coil, push-pull 247 pentodes and a 280 full wave rectifier for the d-c supply. In this receiver the tone may be controlled by the selection of one of three condensers, which are connected to the plate of the second detector, and the higher frequencies are bypassed to the cathode circuit by the switch. Bias for the 247 pentode tubes is obtained by the voltage drop across a 300 ohm resistor grounding the mid point of the filaments. It will be noted that there are two secondary filament windings, one for the second detector and push-pull tubes and the other for the three 235s and 227 oscillator tube. The cathode bias is varied on the first and third 235 tubes and at minimum sensitivity the antenna circuit is connected directly to ground.

Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	9.5	9.5	9.5
100	16	16	16
1000	24	24	24.5
10000	35	35	36.5



Crosley Model 124 Chassis

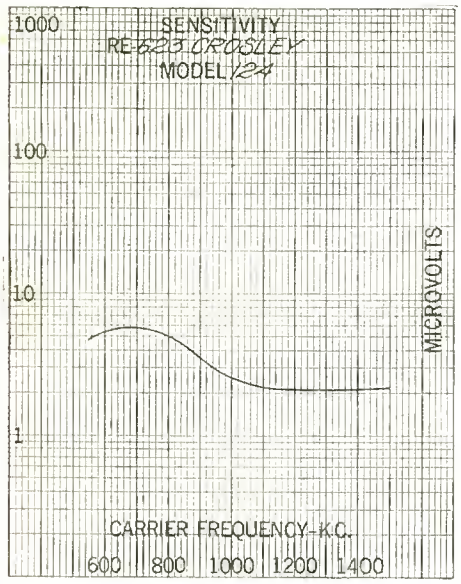
FROM recent measurements on the Crosley 124, the overall response curves shown on this page were plotted as indicative of this receiver's performance.

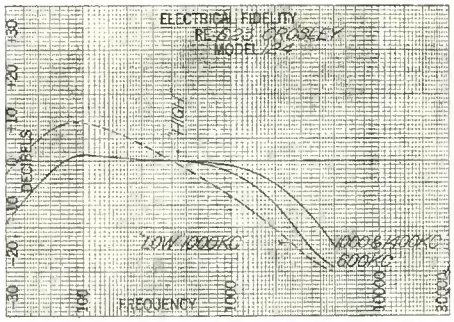
A dummy antenna standard of 20 uh, 200 uuf and 25 ohms coupled the signal from the generator to the input of the chassis. The 247 push-pull tubes were capacitatively coupled to the output device, the output level was kept at .05 watts, and the voice coil circuit was broken. To match the optimum plate impedance of the pentodes, the load resistance was adjusted to 15,000 ohms.

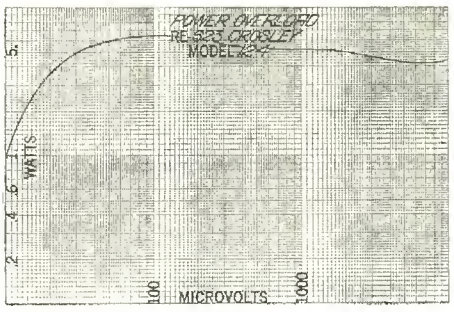
For all measurements the volume control was set at maximum. The line supply current was .86 amperes with an a-c voltage of 112 volts. No adjustments were made on the chassis and the tubes employed in testing were those included with the receiver.

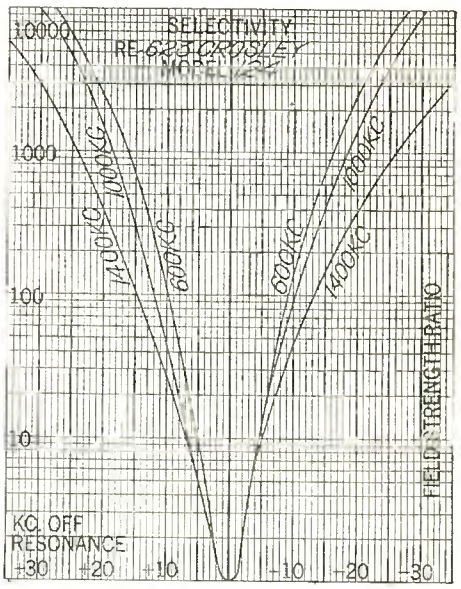
At 550 k-c the maximum noise level of 4.3 per cent occurred, with the minimum of 1.7 per cent at 1400 k-c. From the sensitivity curve of column 2 the average sensitivity is found to be 3.5 microvolts absolute corresponding to the value of .875 microvolts per meter. In column 2 the power overload curve gives a maximum output of 6.42 watts delivered to the speaker transformer primary, which value does not take into account the harmonic distortion present in the wave form at this output level.

Below is the wiring diagram of the 124 Crosley chassis. Its tube complement consists of a 235 r-f, 224 first detector, 227 oscillator, 235 second i-f, 227 second detector, two 247 pentodes in push-pull and the 280 full wave rectifier tube. Coupling the local oscillator to the first detector cathode circuit is accomplished by a pick-up coil on the oscillator coil. The speaker field is the only choke in the B supply bypassed with an 8 mfd and 6 mfd condenser. Volume control is obtained by varying the bias on the two 235 tubes with the potentiometer grounding the antenna at the minimum position, for effective cut-off of powerful local stations.



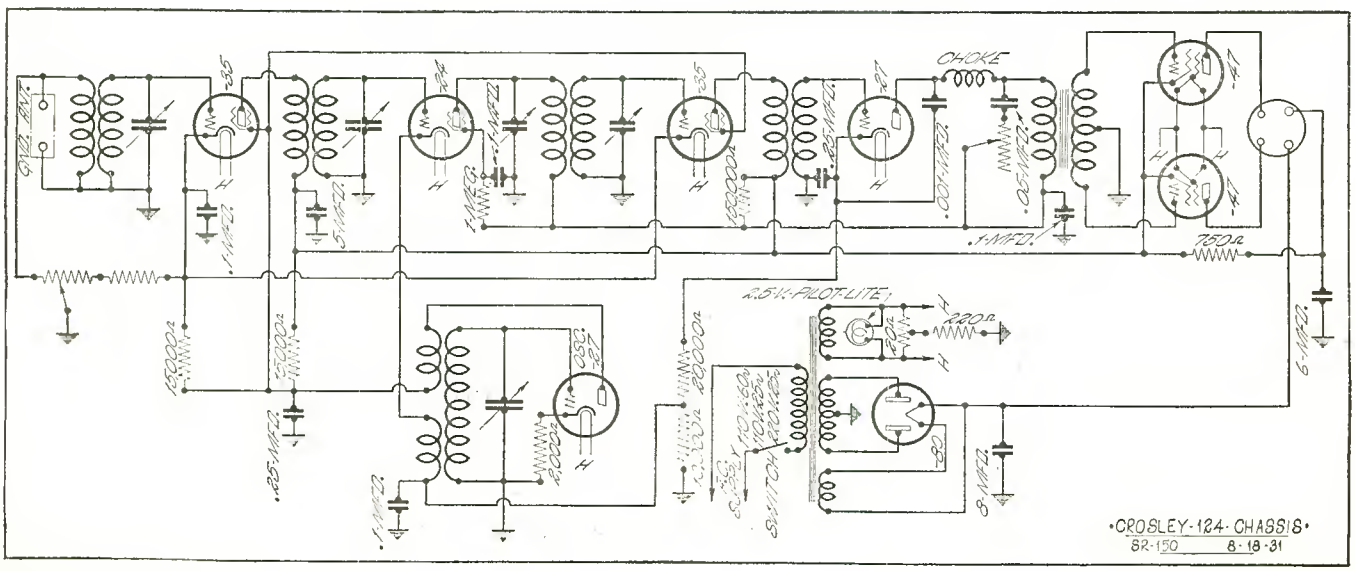






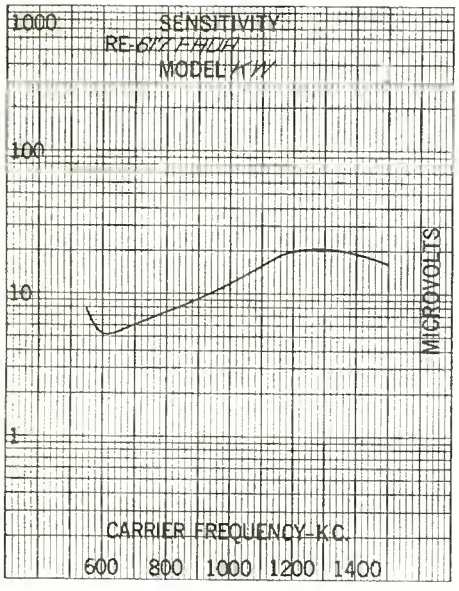
Band Widths

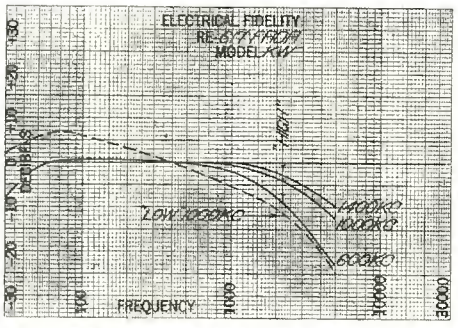
Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	9.5	11	12
100	19	22.5	28
1000	32	37	50
10000	55	60	——

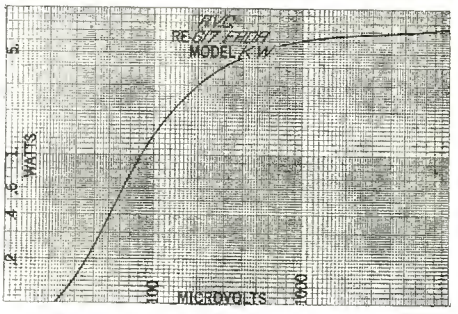


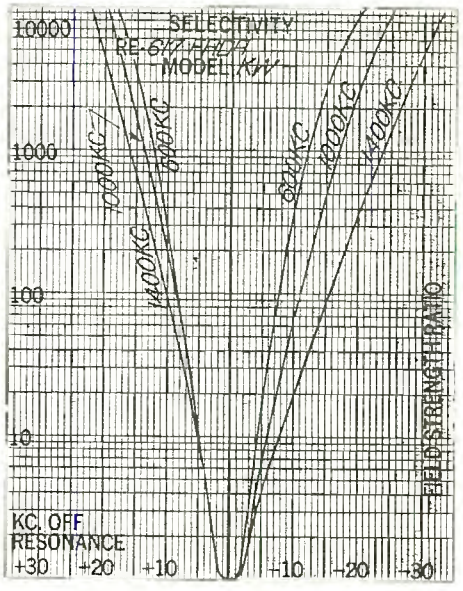
Fada Models KW 28-29

CURVES of the Fada models KW 28-29 are given herein as representative of these receivers. They are the first we have measured using a neon tube resonance indicator for tuning. It is of great help because of the apparent broadness in selecting a station, due to the automatic volume control feature.







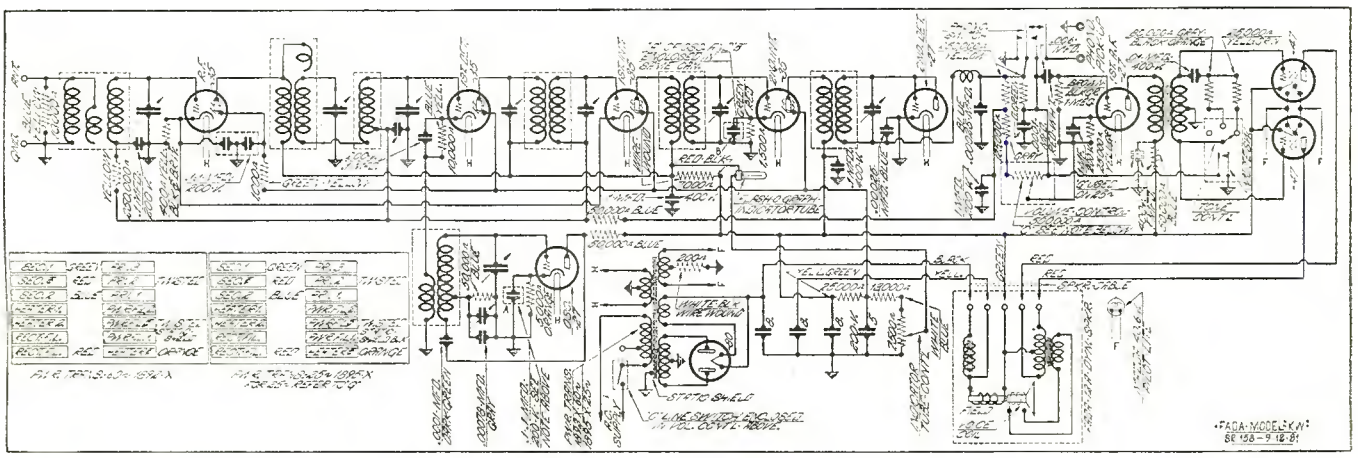


Signal to the receiver was through the standard dummy antenna of 20 mh, 200 muf and 25 ohms with a standard output level of .05 watts. The resistance load of 15,000 ohms matched the correct value of operating impedance of the two 247 tubes used in push-pull.

With an a-c line voltage of 110 volts, the current required by the receiver was 1.03 amperes. For all tests the volume control was set for maximum receiver sensitivity, the voice coil was opened, and the tubes used were those furnished by the manufacturer.

Average sensitivity, as taken from the curve of column 1, is 12.2 microvolts absolute, of which the equivalent in microvolts per meter is 3.05. At 600 k-c the noise level was 1.8 per cent, the maximum, with a minimum value at 1000 k-c of .6 of 1 per cent. The maximum power output, disregarding distortion of the wave form by harmonic content is 7.32 watts delivered to the speaker transformer primary at 10,000 microvolts input.

At the bottom of the page the schematic wiring diagram of this receiver will be found, and from it the tube complement is seen to be a 235 r-f, 235 first detector, 227 oscillator, 235 second i-f, 235 third i-f, 227 two-element second detector, 227 first audio, two 247 tubes in push-pull audio, and a 280 full-wave rectifier for the high voltage supply. From the schematic diagram of this receiver it can be seen that the flash-o-graph neon indicator tube has its high potential terminal connected to the plus B of the second r-f, first i-f and second i-f transformers, and its low potential side adjustable by means of a 7500 ohm potentiometer, one side of which is at ground potential, and determines the height of the illuminated column. Fluctuations of the plate voltage of the aforementioned tubes by the incoming carrier give the visual variation of the illuminated column. Tone control is accomplished by the selection of a three-point switch of two different resistance values and no resistance, connected in series with a by-pass condenser across the push-pull input transformer secondary.



Howard Radio Model O

MEASUREMENTS on the Howard model 0 recently made in this laboratory gave the performance curves printed herein.

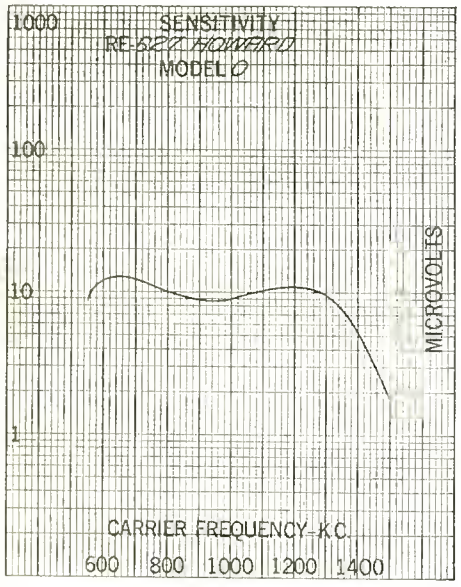
Input to this superheterodyne's antenna circuit was by means of the standard dummy antenna of 20 uh, 200 uuf and 25 ohms. A resistance load of 7500 ohms was used to match the operating impedance of the single 247 pentode output tube, since the voice coil was broken to eliminate its plate loading effect. The plate of the tube was capacitatively coupled to the output meter which read the voltage for the output standard of .05 watts. For all tests the volume control was turned to its maximum position.

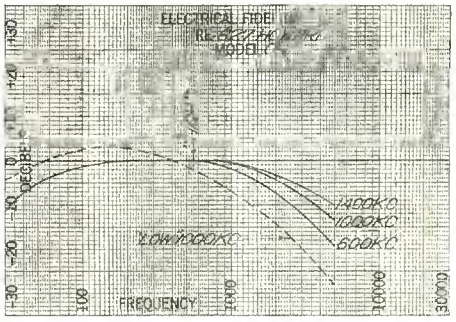
This receiver was not realigned in the laboratory, and the tubes used were those included with the chassis. A line current of .7 amperes was drawn with an a-c voltage of 112 volts.

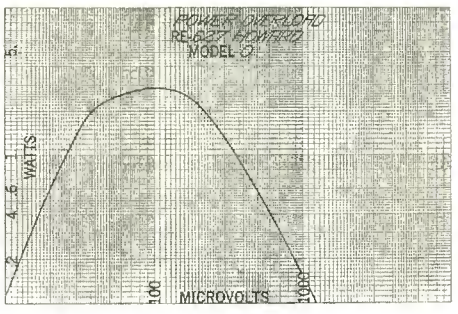
Average sensitivity as measured from our curve of column 1 is found to be 9.3 microvolts absolute or 2.3 microvolts per meter. Maximum power output taken from the power overload curve is 2.71 watts, with the harmonic distortion present at this level disregarded. Measured noise levels were .32 per cent at 600 k-c and 1.5 per cent at 1400 k-c, the minimum and maximum respectively. In column 3 the selectivity curves furnished the band widths which are tabulated under them.

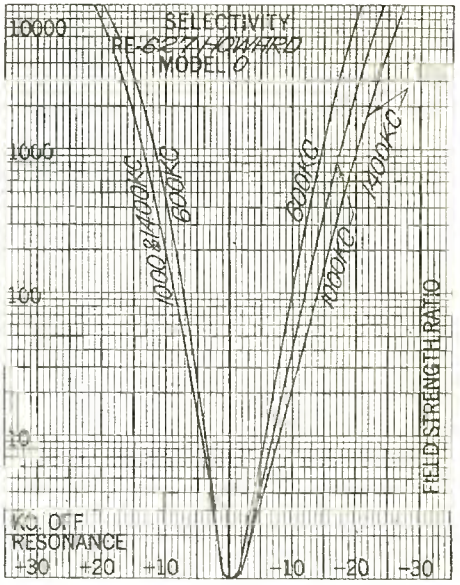
The schematic wiring diagram of this receiver will be found below.

Tubes required are a 551 r-f, 551 first detector, 551 second i-f, 227 second detector, 227 oscillator, 247 power pentode and a 280 rectifier tube. Oscillator energy is fed to the mixer by grid coupling. Bias voltages are changed on the three 551 tubes for sensitivity control by means of a potentiometer in the bleeder. For controlling the tone of this set, a .01 mfd. condenser and a variable resistance are connected across the secondary of the pentode input transformer.



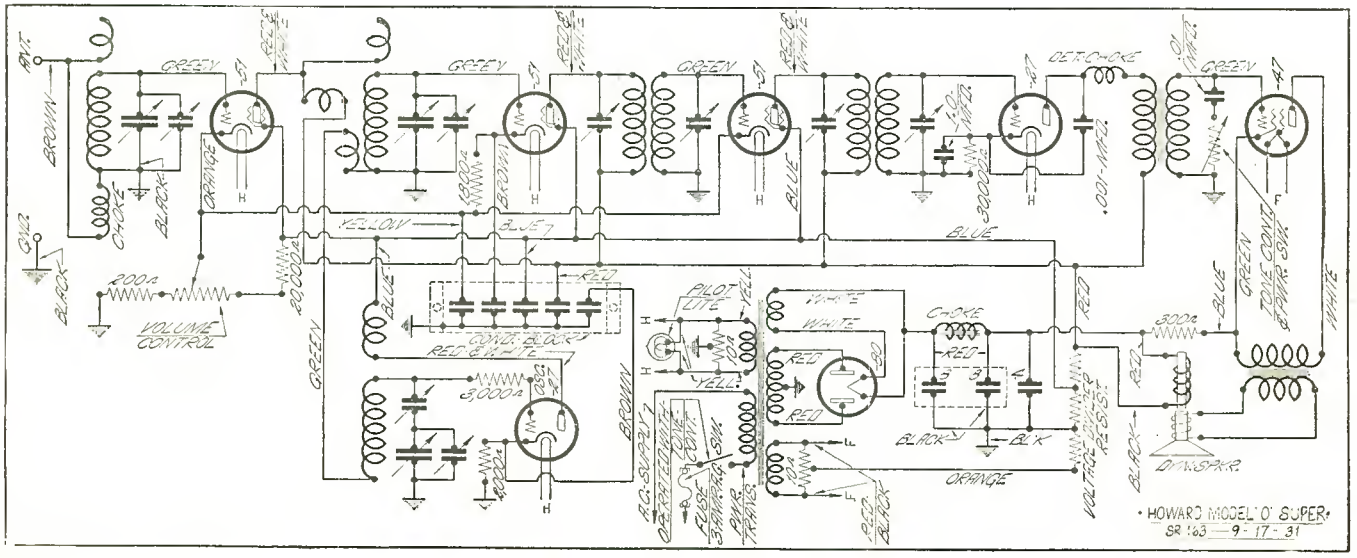






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	9.5	11.5	12.5
100	17.5	21	22.5
1000	26.5	31	34
10000	40	46	49



RCA-Victor Model R-50-55

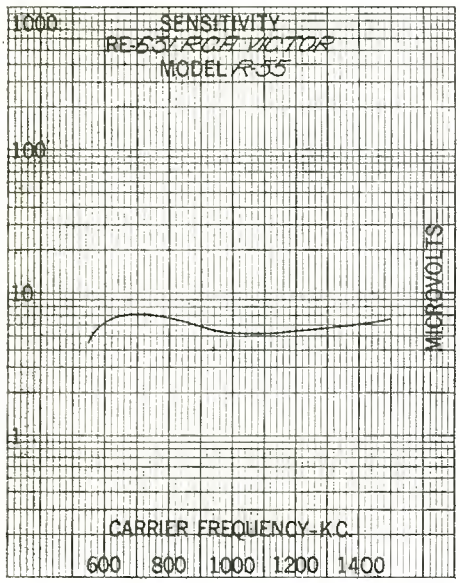
OUR measurements on the RCA-Victor Models R-50 and 55 gave the included curves, which may be taken as indicative of these superheterodynes' performance.

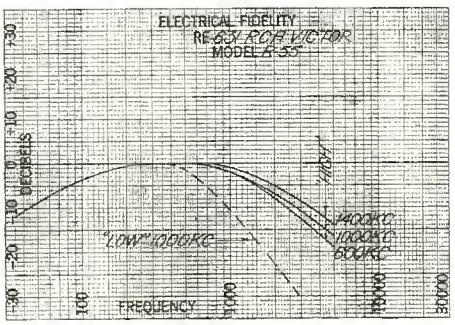
Signal input to the receivers was accomplished by means of a standard dummy antenna of 20 uh, 200 uuf and 25 ohms, while the output was maintained at .05 watts. To match the push-pull 247 output pentode tubes, a load resistor of 15,000 ohms was connected across the primary of the output transformer. Also, to prevent its loading effect, the voice coil was disconnected, and the power tube plates were capacitatively coupled to the output measuring tube voltmeter.

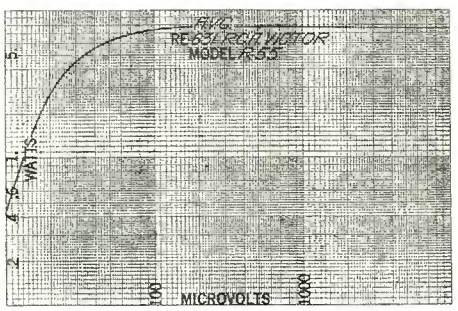
For all tests the tubes employed were those furnished with the set by the manufacturer, the volume control was set for maximum receiver sensitivity, and no realignment of tuned circuits was made. The receiver a-c line drain was 1 ampere with a line voltage of 112 volts.

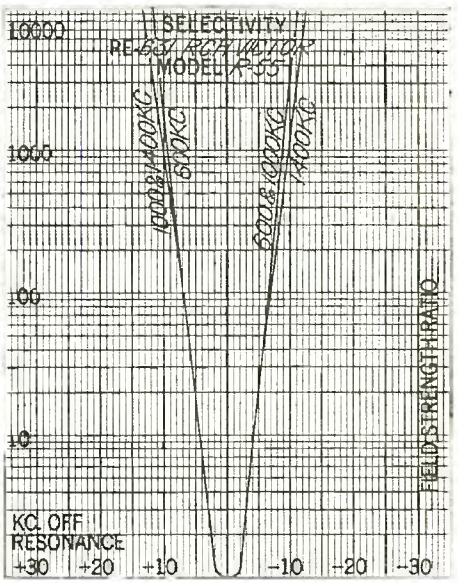
In column 1 the sensitivity curve shows an average value of 5.8 microvolts absolute, which is the equivalent of 1.45 microvolts per meter. Noise level minimum and maximum values were 23 per cent at 600 k-c and 40 per cent at 1400 k-c respectively. For maximum power output the curve in column 2 gives a value of 7.71 watts, though this value disregards the harmonies present in the output wave at this power output. Under the selectivity curves of column 3 are the measured band widths.

From the schematic circuit diagram at the bottom of the page, the tube complement is taken as a 235 r-f, 227 oscillator, 224 first detector, 235 second i-f, 235 third i-f, 227 automatic volume control tube, 227 second detector, two 247 output pentodes and a 280 full wave rectifier. For keeping the load of the output tubes more nearly constant, a resistor and a small condenser are connected across the plates. Tone control employs a tuned circuit using an iron core inductance and a .1 mfd. condenser.



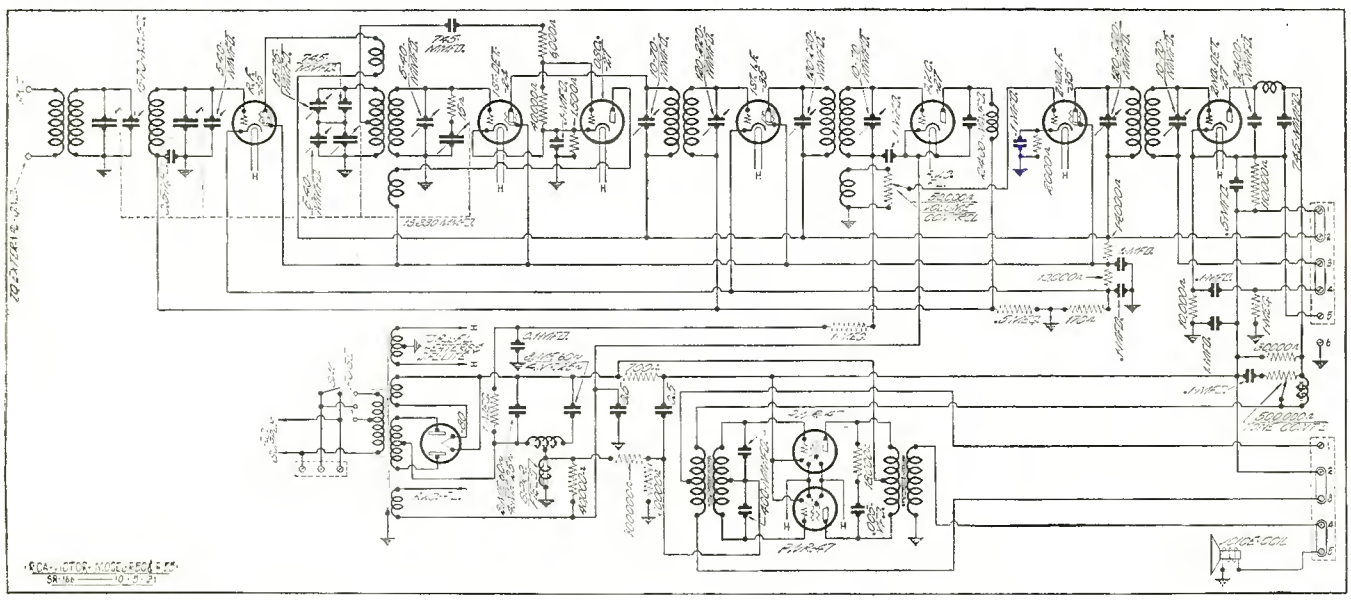






Band Widths

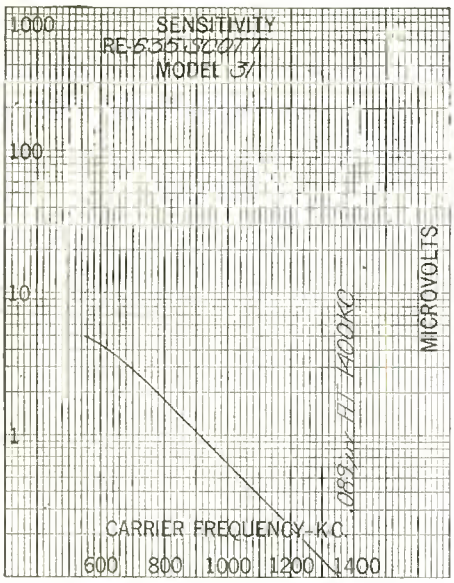
Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	8.5	8.5	8.5
100	13.5	13.5	14
1000	18.5	19.5	20
10000	23	24.5	26

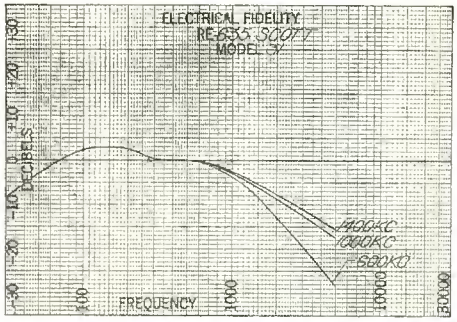


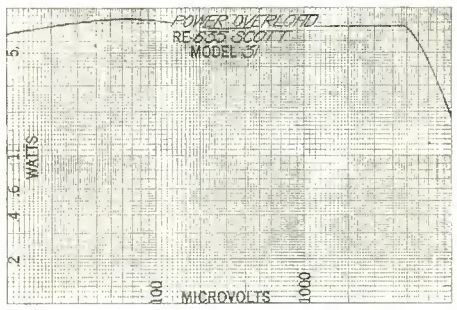
Scott All-Wave Model 31

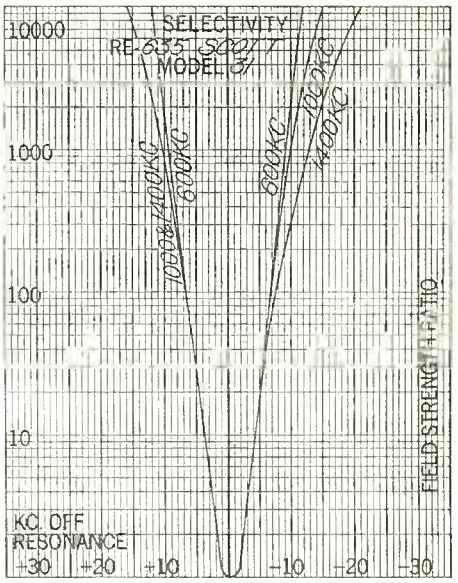
SCOTT'S All-Wave plug-in coil superheterodyne model 31 upon measurement in our laboratory gave the included overall performance curves.

For modulated signal input to the receiver the signal generator was coupled to the antenna and ground posts through the dummy antenna standard of 20 uh, 200 uuf and 25 ohms, with the power output level maintained at .05 watts. To match the two 245 tubes used in push-pull, a non-inductive resistance load of 4000 ohms was used across the primary of the output transformer. Output plates were capacitatively coupled to the output meter, since the voice coil was opened during all tests. No changes were made from factory alignment, the tubes used were received with the chassis, and the volume control was at its full position for maximum receiver sensitivity. A line current of .98 amperes was drawn with 111 volts a-c line voltage. Taken from the curve of column 1, the average absolute sensitivity in microvolts is 1.45, of which the equivalent in microvolts per meter is .36. Maximum power output delivered to the speaker transformer is 8.53 watts, but this value does not take into consideration the harmonic content of the output wave form. Under the curves of column 3 are found the band widths, from which they were taken.





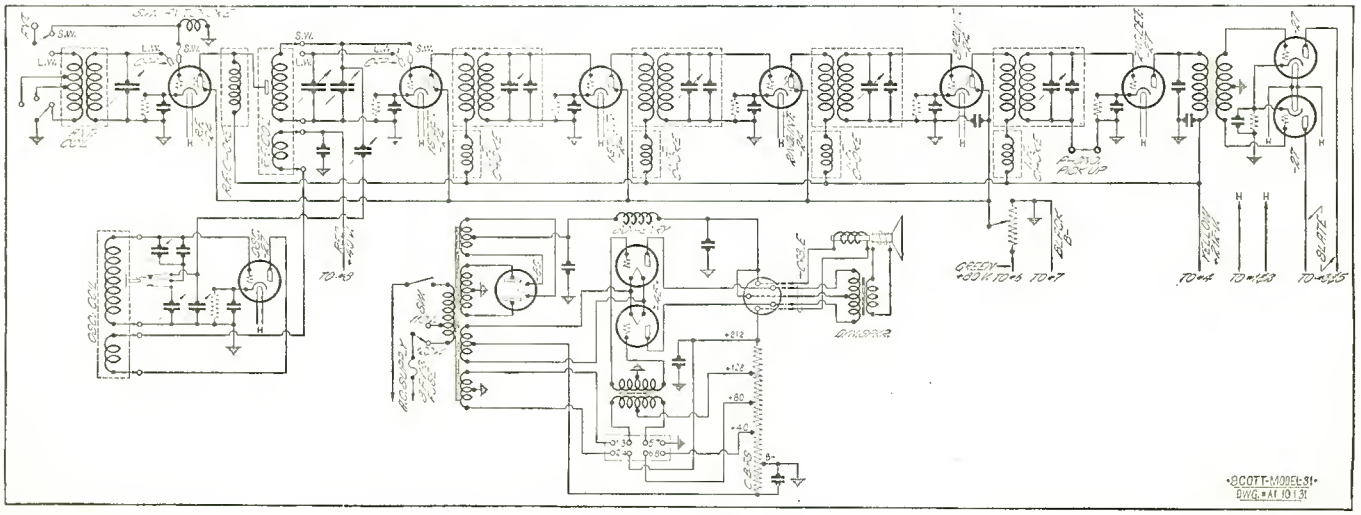




Below is the schematic wiring diagram of this superheterodyne. It will be seen that values are not given in detail but the manufacturer will gladly furnish to service men who require it all data on the model 31 in a service bulletin. The tube complement consists of a 224 r-f, 224 first detector, 224 second i-f, 224 third i-f, 224 fourth i-f, 227 second detector, 227 oscillator, two push-pull 227 second audio, two push-pull 245 output tubes and a 280 rectifier tube for d-c voltage supply to the receiver and dynamic speaker field. Volume control is obtained by means of a potentiometer, the ends of which are connected to + 80 volts and ground respectively and the arm to the screens of all 224 tubes. It will be noted that this receiver employs push-pull audio amplification in two stages. Local oscillator energy is coupled inductively to the grid circuit of the first detector.

Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	8	8	8
100	13.5	13.5	14
1000	18.5	20	23
10000	23.5	31	37



Silver-Marshall Model F

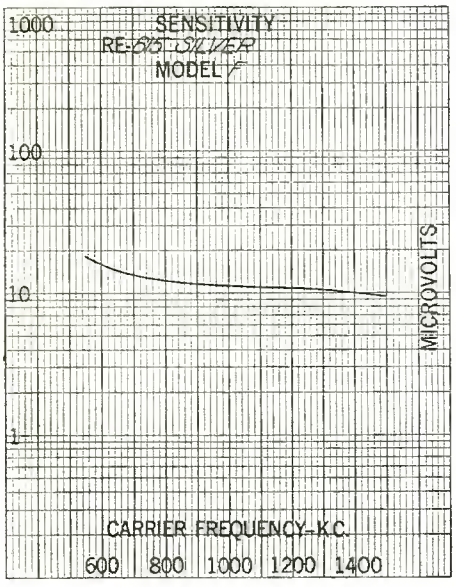
OVERALL performance of the Silver-Marshall, Inc. model F superheterodyne may be learned from the curves made on it recently in our laboratory.

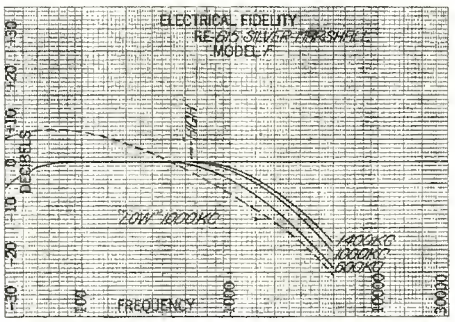
A dummy antenna standard of 20 uh, 200 uuf and 25 ohms was used to couple the signal generator to the receiver input circuit. To match the optimum plate load of the 247 pentode output tube, a resistance of 7500 ohms was connected from its plate to +B. Since the voice coil was disconnected during the measurements, the plate of the tube was capacitatively coupled to the output indicator, which read the standard value of .05 watts.

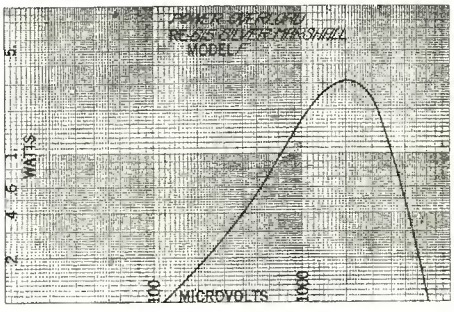
No changes were made in the alignment of the chassis from factory adjustment, the volume control was fixed for maximum receiver sensitivity, and the tubes employed in measurements were those supplied by the manufacturer with the set. With a line voltage of 115 volts, the line current was .75 amperes.

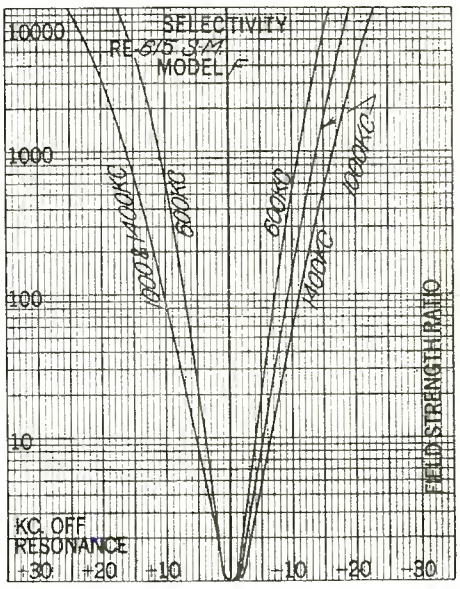
Average sensitivity as read from the sensitivity curve of column 1 is 13 microvolts absolute, which is 3.25 microvolts per meter, assuming a standard height antenna. At 550 k-c the noise level was 10 per cent, the minimum, and at 1400 k-c it was 31 per cent, the maximum value. Power output reached a maximum of 3.2 watts, which does not take into account the effect of the harmonics in the output wave form. Under the selectivity curves of column 3 will be found the band widths tabulated from them.

At the end of this article is reproduced the schematic wiring diagram for the model F receiver. From it the tubes required are seen to be a 224 first detector, 551 second i-f, 551 third i-f, 227 second detector, 227 oscillator. 247 output pentode and a 280 rectifier. Oscillator energy is coupled to the first detector cathode by means of a pick-up coil on the oscillator coil. Bias for the 247 output pentode is obtained by connecting a 450 ohm resistor from the center tap of the heater winding of the power transformer to ground. The volume control changes the cathode bias on the 551 type tubes and is placed in a bleeder circuit.



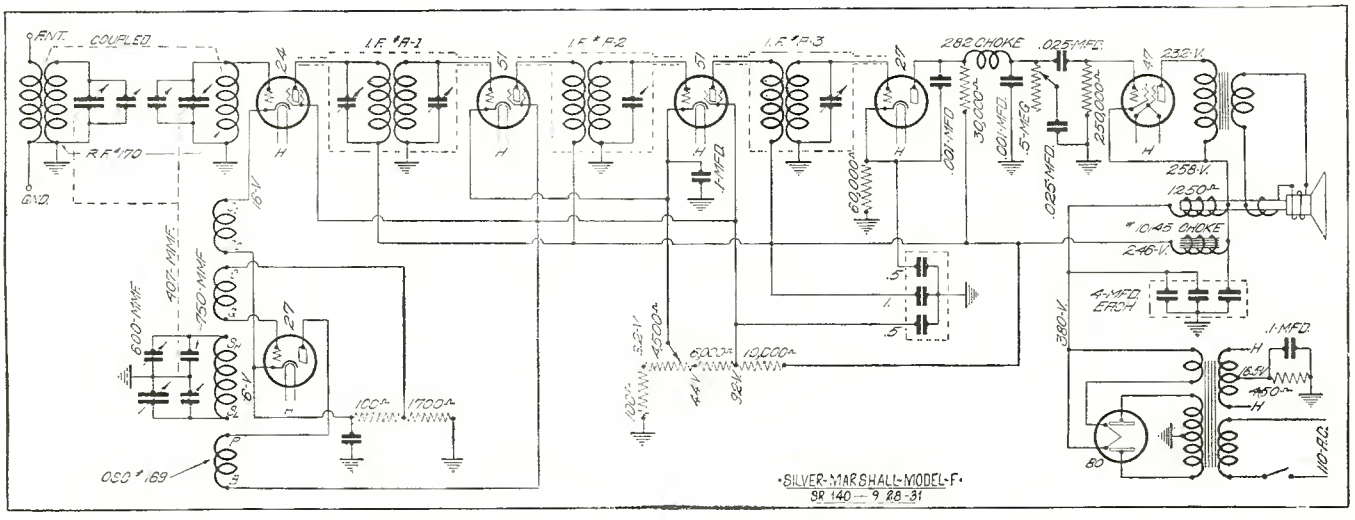






Band Widths

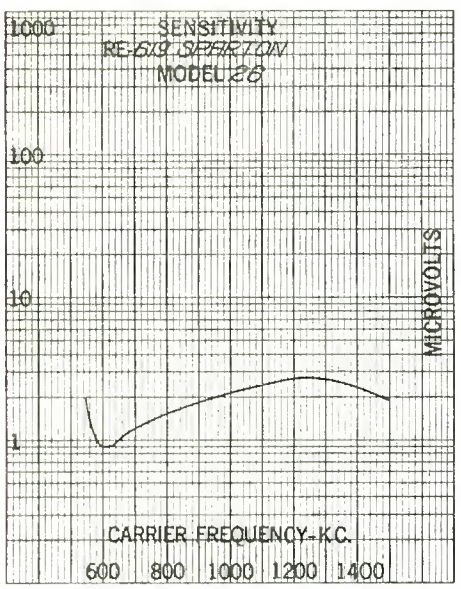
Times Field Strength	Kilocycles width 600 kc.	1000 kc.	1400 kc.
10	8	10.5	11.5
100	14.5	20	22
1000	22	30	32.5
10000	33.5	44	48



Sparton Models 25-26

FOR the Sparton models 25 and 26 manufactured by Sparks-Withington Co., we have the following performance curves plotted from results of our laboratory tests.

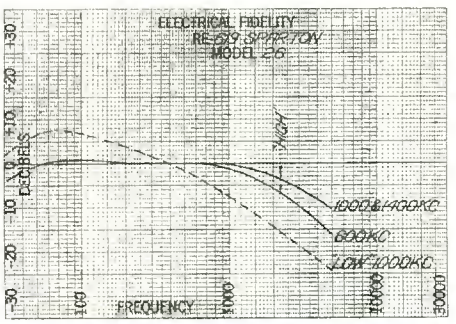
Energy from the standard signal generator was coupled to the input eir-

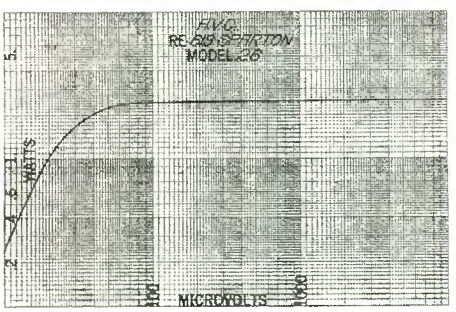


cuit of the receiver through the dummy antenna standard of 20 uh, 200 uuf and 25 ohms, while the output was kept constant at a value of .05 watts. The push-pull 445 output tubes were matched with a resistance load of 4000 ohms and because the voice coil circuit was broken, the plates were capacitatively coupled to the measuring voltmeter.

In all tests the volume control was fixed at its maximum sensitivity position. The tubes employed were those furnished with the receiver by the manufacturer and no changes were made from the manufacturers' alignment of circuits. A drain of .88 amperes resulted with an impressed a-c line voltage of 112 volts.

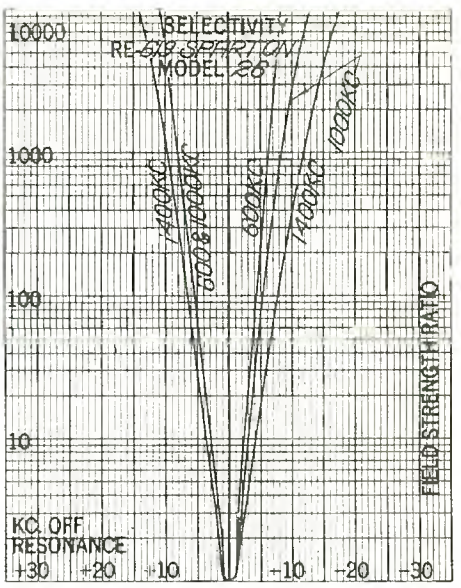
An average sensitivity of 1.89 microvolts absolute is taken from the sensitivity curve of column 1. This value corresponds to .47 microvolts per meter sensitivity, with a standard antenna. At 600 k-c the noise level was 27.4 per cent, the maximum, with a





minimum value of 2.6 per cent at 1400 k-c. Maximum power output developed in the primary of the output transformer is found to be 2.52 watts, as taken from the automatic volume control curve of column 2. Band widths are tabulated in column 3 under the selectivity curves, from which they were measured.

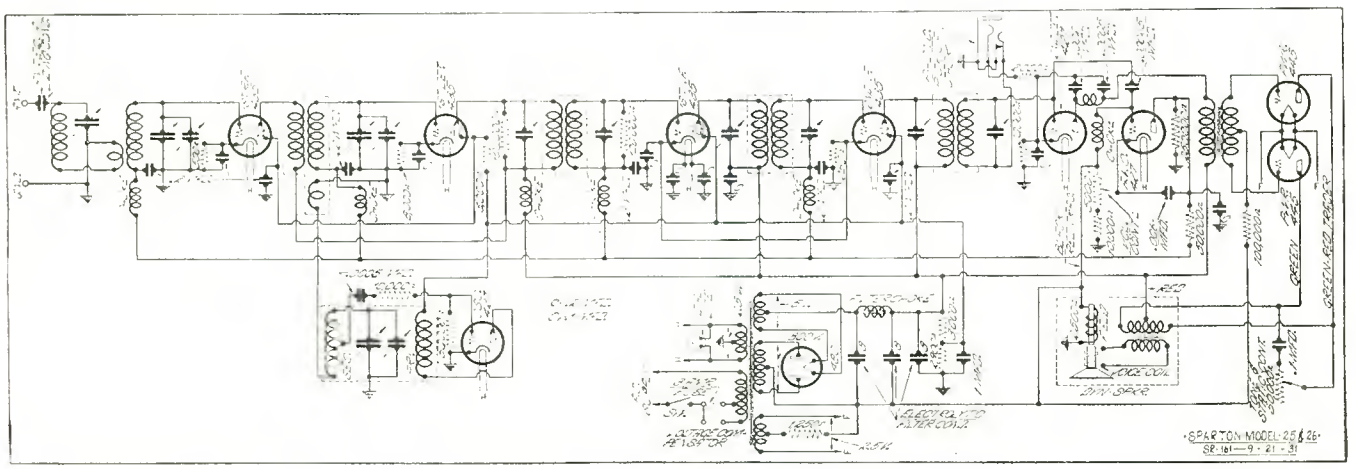
At the bottom of this page is a schematic wiring diagram of the new Sparton receivers. From it the tubes are found to be a 435 r-f, 435 first detector, 427 oscillator, 435 second i-f, 435 third i-f, 427 second detector, 427 automatic volume control tube, push-pull 445 tubes and a 480 full wave rectifier. Local oscillator energy is coupled to the grid of the first detector by means of a coupling coil on the second r-f transformer secondary. Automatic volume control varies the voltage on the grids of the r-f, first detector, second i-f and third i-f



tubes. Filtration of the B supply is accomplished by a choke in the B supply and the resistance network, with three 8 microfarad electrolytic condensers used in conjunction with it. The speaker field gives the necessary voltage drop from ground potential to -B for proper operation of the automatic volume control tube.

Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	5	6	8
100	10	11	14.5
1000	14.5	16.5	21.5
10000	19	23.5	31.5

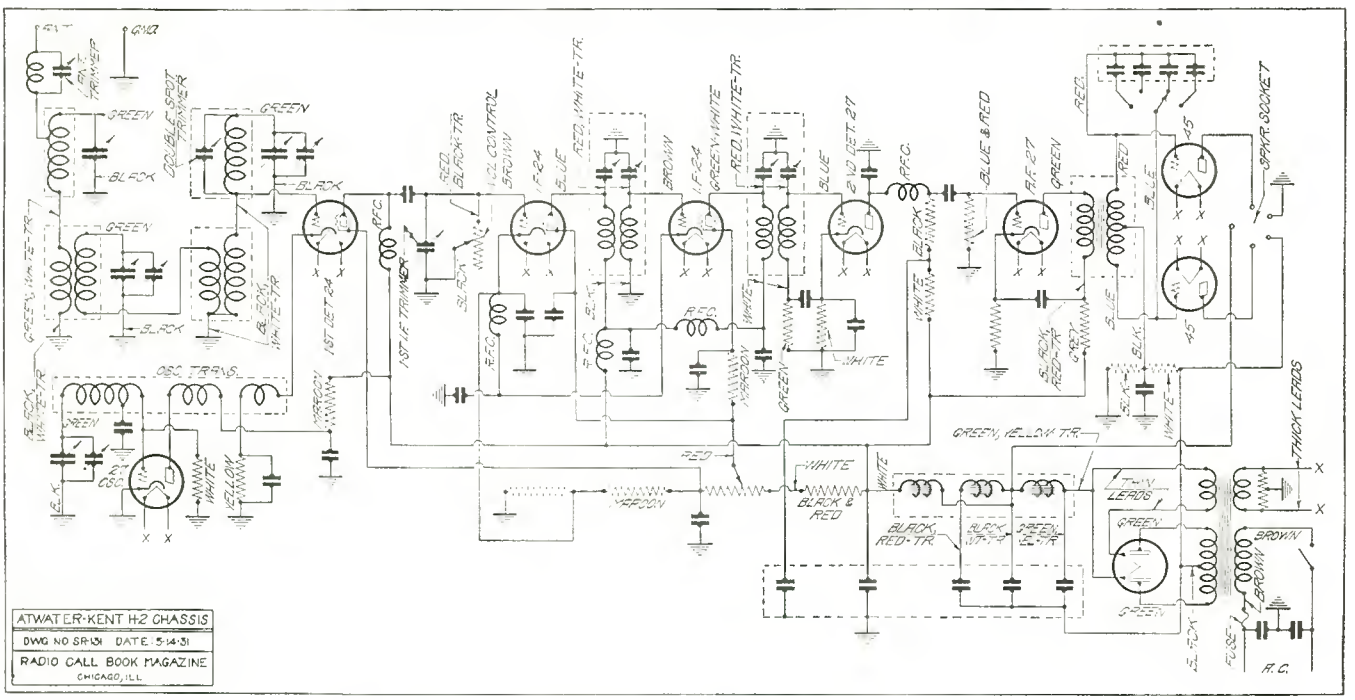


SCHEMATICS PUBLISHED TO DATE

Model	Published	Drawing No.
A. C. Dayton		
Navigator	November, 1929	SR24
Acme Mfg. Co.		
AC7	March, 1929	SR3
AC4	March, 1929	SR4
All-American Mohawk		
Lyric 90	November, 1930	SR74
Lyric 6	March, 1929	SR1
Lyric 8	March, 1929	SR2
Lyric J	October, 1931	SR128
Amrad		
70	November, 1929	SR22
81	March, 1930	SR44
84	January, 1931	SR106
Apex		
48	November, 1930	SR80
31 (U. S. Radio)	January, 1931	SR108
Atwater-Kent		
38	January, 1930	SR28
55, 55C (Cap.)	September, 1930	SR51
55, 55C (Ind.)	September, 1930	SR52
66	March, 1931	SR114
Audiola		
Series 31 (t.r.f.)	November, 1930	SR79
Super 31	March, 1931	SR111
Junior	March, 1931	SR112
Balkeit		
A	September, 1929	SR12
Bosch		
48	November, 1930	SR73
58	January, 1931	SR109
60	March, 1931	SR117
28-29	November, 1929	SR21
Auto	November, 1930	SR94
7DC	November, 1931	SR160
Bremer-Tully		
7-70	September, 1929	SR10
81-82	November, 1930	SR75
S81-82	October, 1931	SR126
Brunswick		
3KRO	November, 1929	SR23
15, 22, 32 and 42	November, 1930	SR86
S14	November, 1930	SR71
11, 12, 16	October, 1931	SR148
Colonial		
31AC	January, 1930	SR29
33 and 34 a-c	November, 1930	SR95
Crosley		
Roamio	September, 1930	SR67
40S, 41S, 42S, 82S	September, 1930	SR57
608 Gembox	March, 1929	SR5
705 Showbox	March, 1929	SR6
Jewelbox 704B	March, 1930	SR41
77	November, 1930	SR83
53, 54, 57	January, 1931	SR103
120	October, 1931	SR133
121-1	November, 1931	SR149
Dayfan		
5080	September, 1929	SR11
Delco		
Auto Radio	September, 1930	SR66
Edison		
R4, R5, C4	November, 1930	SR49
R6, R7	January, 1931	SR99
Erla		
Duo Concerto R-2	January, 1930	SR33
Eveready		
50	March, 1931	SR50
Fada		
7AC	September, 1929	SR13
35-35Z	November, 1930	SR70
Federal		
H	November, 1929	SR19
Freed-Eisemann		
NR80	November, 1929	SR20
Freshman		
2-N-12	September, 1929	SR14
General Motors		
A	November, 1930	SR68
120-A	November, 1931	SR116
S3A	November, 1931	SR154
Gilfillan Bros.		
100	January, 1930	SR32
Graybar		
600	March, 1930	SR42
Grebe		
7AC	November, 1929	SR17
AH1	November, 1930	SR96
Gulbransen		
Nine-in-Line	March, 1930	SR40
161	March, 1931	SR110
Howard		
S. G. A.	September, 1930	SR56
Green Diamond 8	September, 1929	SR16
H	October, 1931	SR145
SG-B	November, 1931	SR130
Jesse French, Jr.		
G	March, 1931	SR118
Kellogg		
523-528	November, 1930	SR77
Kennedy		
20	March, 1930	SR48
26	November, 1930	SR81
10	January, 1931	SR38
30-32	November, 1931	SR129
King		
J	January, 1930	SR31
Kolster		
K20, K22, K25 and K27	September, 1929	SR8
K21, K23, K24 and K28	March, 1930	SR45
K-43	November, 1930	SR72
K80	November, 1931	SR159
Kylectron		
70	November 1930	SR65
Majestic		
70	September, 1929	SR7
90B	September, 1930	SR55
130-A	November, 1930	SR84
50	January, 1931	SR98
20	October, 1931	SR124
60	October, 1931	SR138
15	November, 1931	SR157
Philco		
86-82	November, 1929	SR26
95	September, 1930	SR60
90-90A	November, 1931	SR156
Radiette		
F14	January, 1931	SR104
Radiola		
60	January, 1930	SR30
66	September, 1930	SR64
44	January, 1931	SR102
18	October, 1931	SR127
RCA-Victor		
R-7	October, 1931	SR137
Sentinel		
11, 12, 15, 16	March, 1931	SR115
106B	March, 1931	SR113
108A	October, 1931	SR146
108	November, 1931	SR123
111	November, 1931	SR155
Silver		
36A	January, 1931	SR105
30B	September, 1930	SR53
30	January, 1930	SR35
35-A	November, 1930	SR82
782	October, 1931	SR120
726SW	October, 1931	SR144
D-E	November, 1931	SR152
Slagle (Continental)		
9	January, 1930	SR27
R-20	March, 1930	SR46
Sonora		
5R	November, 1929	SR25
Sparton		
AC89	September, 1929	SR9
589	September, 1930	SR63
600, 610, 620	March, 1931	SR91
Splitdorf		
E175	January, 1930	SR36
Steinite		
261	September, 1929	SR15
70, 80, 95	November, 1930	SR76
600, 605, 630, 635	November, 1931	SR132

Model	*Published*	*Drawing No.*
Stewart-Warner		
950	September, 1930	SR62
Series 900	January, 1930	SR34
R100	January, 1931	SR85
102A	October, 1931	SR147
Stromberg-Carlson		
846	September, 1930	SR54
635-636	November, 1929	SR18
12-14	November, 1930	SR93
10-11	November, 1931	SR134
19-20	November, 1931	SR151
Transformer Corp.		
50	November, 1930	SR78
80-81	October, 1931	SR139
Temple		
8-60, 8-80, 8-90	March, 1930	SR37
SG 8-61, 8-81, 8-91	October, 1931	SR125
Transitone		
Auto Radio	November, 1930	SR69
Trav-Ler		
C	March, 1931	SR120
U. S. Radio		
37	March, 1930	SR39
26P	October, 1931	SR143
Victor		
R32, RE45, R52	September, 1930	SR61
R35, R39, RE57	January, 1931	SR101
Westinghouse		
WR-5	November, 1930	SR92
WR-4	January, 1931	SR107
WR10-12	November, 1931	SR137
Zaney-Gill		
54	March, 1931	SR119
Zenith		
52, 53, 54, 522, 532 and 542	March, 1930	SR43
71, 72, 73 and 77	November, 1930	SR97
A, B, C, D	November, 1931	SR141

Atwater-Kent Chassis Model H-2



Characteristics of New Tubes

Model No.	USE	Filament Volts	Filament Amperes	TEST DATA AVERAGE					
				Plate Volts	Screen and Grid Volts	Plate Current (ma)	Plate Resistance (Ohms)	Mutual Conductance (Micromhos)	Amplification Factor
230[1]	Detector Amplifier	2.0	.06	90	−4.5	2.0	12,500	700	8.8
231[2]	Power Amplifier	2.0	.130	135	−22.5	6.8	4,950	760	3.8
232[3]	R-F Amplifier	2.0	.06	135	−3/+67	1.5	800,000	550	400
233[4]	D-C Pentode	2.0	.260	135	−13.5	14	45,000	1,400	63
235[5]	Variable Mu	2.5	1.75 a-c	250	−3/+90	6.5	350,000	1,050	370
236[6]	Automotive Screen Grid	6.3	0.3	135	−1.5/+75	3.5	250,000	1,100	275
237[7]	Automotive Triode	6.3	0.3	135	−9	4.5	12,500	900	9
238[8]	Automotive Pentode	6.3	0.3	135	−13.5	8	110,000	900	100
247[9]	Output Pentode	2.5	1.5 a-c	250	−16.5/+250	32	38,000	2,500	95
866[10]	Rectifier	2.5	5.00	5,000		600			

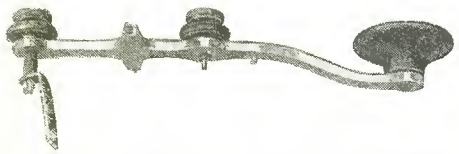
NOTES—[1], General Purpose Dry Cell; [2], Output Dry Cell, Power Output 150 m-w; [3], R-F Dry Cell; [4], Load Resistance 7500 ohms, Power Output .650 watts; [5], Interchangeable with 551; [6], D-C Screen Grid, Amplifier and Detector; [7], D-C General Purpose; [8], Load Resistance 15,000 ohms, Power Output 375 m-w; [9], Load Resistance 7000 ohms, Power Output 2.5 watts; [10], Heavy Duty Rectifier.

Power Keying With Ordinary Key

By HERMAN KOTT *

THE usual telegraph key despite its small contact points and all-round light construction may be employed as a power key for the operation of the most ambitious transmitter, thanks to the characteristics of a new electrical contact device. The Burgess vacuum contact, originally developed in Germany, is now available over a wide range of applications, not the least important of which is ideal power keying in the simplest and least expensive manner.

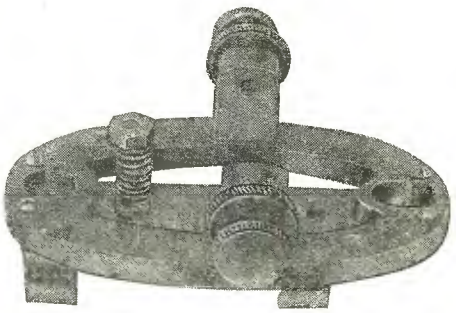
Briefly, the vacuum contact is an evacuated glass tube containing a pair of copper contacts actuated by an external glass rod. The device depends for its operation on the elasticity of a glass bellows which pivots the external glass rod and permits of transferring the outside actuating energy to the inside of the glass bulb where the contacts are pried apart. Normally, the contact is closed. A slight pressure—about 6 ounces or a movement of .02 inch—causes the contact to open. By applying a counter pressure so as normally to open the contact, the device may be employed for normally open circuits, with the counter pressure removed or counteracted to close the circuit.



Lever of telegraph key, showing connecting link fastened to rear stop screw

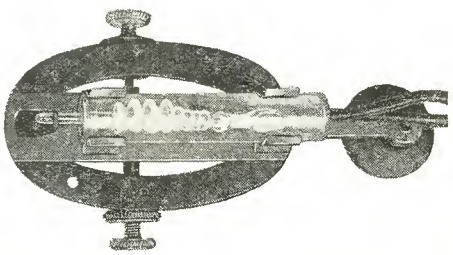
Power Keying

Handling 6 amperes continuously or 8 amperes intermittently, at 220 volts, without troublesome sparking or arcing and without corrosion or sticking, the vacuum contact is ideal for keying purposes. It can operate up to 40 times per second, without difficulty. It has an indefinitely long life as attested to by life tests running into the hundreds of millions of times. On the heaviest loads it may be shunted by a low value condenser so as to absorb the spark or arc that may take place particularly on inductive loads.

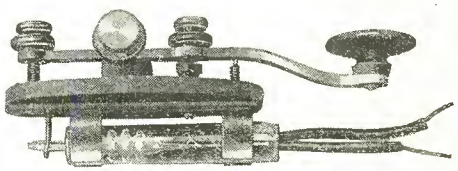


Standard telegraph key fitted with Burgess vacuum contact, thereby converting it into a flameproof power key, capable of keying up to 1300 watts

It is left largely to the ingenuity of the radio experimenter or amateur to apply the vacuum contact to any kind of key. The requirements are simply some means of holding the glass tube stationary, while applying the actuating energy to the end of the glass rod. The accompanying photographs suggest a simple method in the case of the ordinary telegraph key. It will be noted that the key frame is provided with a brass strip below, said strip carrying a pair of cartridge fuse clips to take the glass tube. The extension rod is actuated by a connecting lever which joins with the end of the back stop screw of the key lever. This connecting lever has a slot rather than a hole to fit about the glass rod, so that the glass rod is normally depressed to keep the contact open. When the key is depressed, the pressure is relieved on the glass rod, causing the contact to close. The desired swing may be had by adjusting the back stop screw and the front stop screw which takes the place of the usual lower contact point.



Bottom view of standard key fitted with Burgess vacuum contact



Key frame showing brass strip attached, carrying fuse clips, spring and front stop screw

Positive Contact

The vacuum contact key is exceptionally easy running and makes for ideal sending. The contact is positive, with a clean make and break absolutely devoid of chattering or hangovers. The key is positively flameproof, which is a consideration in aircraft radio installations.

Aside from the direct mechanical drive as above described, the vacuum contact has other interesting radio transmitter applications. It may be actuated by a flexible cable or Bowden wire, such as is employed for operating camera shutters, in remote keying. Again, it may be fitted to the ordinary telephone type relay, for electrical remote control.

[* Engineering Department, Burgess Battery Company.]

Try This on Your Water-Cooled Slide Rule!

"MATTY" Mattson, who handles publicity for the Chicago office of Westinghouse, is responsible for the following reaching the editorial desk:—

If a drowsy fly had started a Rip Van Winkle nap on the rim of this Westinghouse turbo generator rotor when it was installed in the Williamsburg power plant of the Brooklyn Edison Company 24 years ago, here's what would have happened:

He would have traveled 16,900,000 miles at a speed of more than four miles a minute.

This distance is equal to more than 30 round trips between the earth and the moon.

He would have whirled in his circular orbit 1,930 miles a day, figuring that the generator worked only 12 hours in each 24. Ordinarily such equipment operates 80 per cent of the time.

After working 24 years, the roto has been sent to its makers, the Westinghouse Electric and Manufacturing Company, to be rewound. When it is rejuvenated, it will be returned to Brooklyn with a new lease on life, to resume its service, and a younger fly can start another long nap.

The rotor is 80-½ inches in diameter, is of the pole type, rated at 10,000 kilovolt-amperes, and makes 750 revolutions per minute.

Speaker Field Copper Wire Table

Wire size	Ohms 1,000 ft.	Ohms lb.	Feet Ohm	Feet lb.	Turns sq. in.	Ohms cu. in.
14	2.521	.2028	396.6	80.44	177	.037
15	3.179	.3225	314.5	101.4	225	.060
16	4.009	.5128	294.4	127.9	282	.098
17	5.055	.8153	197.8	161.3	348	.146
18	6.374	1.296	156.9	203.4	431	.229
19	8.038	2.061	124.4	256.5	528	.354
20	10.14	3.278	98.66	323.4	647	.547
21	12.78	5.212	78.24	407.8	793	.845
22	16.12	8.287	62.05	512.2	980	1.315
23	20.32	13.18	49.21	648.4	1297	2.195
24	25.63	20.95	39.02	817.6	1590	3.400
25	32.31	33.32	30.95	1031.0	1970	5.31
26	40.75	52.97	24.54	1300.0	2395	8.15
27	51.38	84.23	19.46	1639.0	2980	12.75
28	64.79	133.9	15.43	2067.0	3990	21.50
29	81.70	213.0	12.24	2607.0	4870	33.10
30	103.0	338.6	9.707	3287.0	5960	51.20
31	129.9	538.4	7.698	4145.0	7330	79.40
32	163.8	856.2	6.105	5227.0	8960	122.3
33	206.6	1361.0	4.841	6591.0	11920	205.5
34	260.5	2165.0	3.839	8311.0	14500	315.0
35	328.4	3441.0	3.045	10480.0	17600	482.0
36	414.2	5473.0	2.414	13210.0	21700	750.0
37	522.2	8702.0	1.915	16660.0	28700	1250.0
38	658.5	13870.0	1.519	21010.0	34100	1870.0
39	830.4	22000.0	1.204	26500.0	43000	2980.0
40	1047.0	34980.0	.9550	33410.0	52000	4490.0
41	1333.0	54000.0	.7630	42000.0	.....	.....
42	1680.0	87400.0	.6050	52800.0	91700	12600.0
43	2120.0	132000.0	.4670	66400.0	.....	.....
44	2670.0	212500.0	.3850	82600.0	130600	28300.0

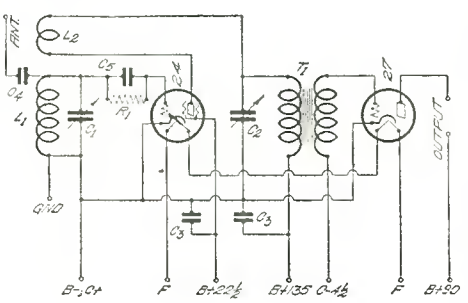
Making a Simple 20-160 Meter Set

An easily made short wave receiver is described in the following letter from one of our readers—Editorial Department:

"Enclosed please find drawings and brief description of my 20-160 meter short wave receiver. I am sending it wired to use a-c tubes as the majority of people are not interested in d-c sets, although in this design either can be used, as preferred. I find that with the use of the screen grid tube as a detector, more selectivity, distance and volume are obtained than with the 201A type.

I have tried many hook-ups for short wave receivers and can honestly say that this one deserves more credit than any I have built up to date. I also wish to say that one amateur on 85 meter 'phone discarded a well-known factory built receiver and replaced it with the one enclosed."—Wm. H. Henton, Box 853, Slater, Mo.

According to Mr. Henton, coils are to be wound on old four-prong tube bases, tickler coil on the bottom, small holes being drilled at the end of each winding. Wire is then drawn through and soldered in the prong at the bottom, being careful that no rosin or soldering paste insulates wire from pin. Both tickler and secondary are wound in the same direction. Coils are plugged into a standard UX socket and connections made from taps or lugs on it.



LEGEND

L1—30 turns, 28 DCC; L2—9 turns, 28 DCC; C1—5 plate variable condenser; C2—9 plate variable condenser; C3—.5 mfd condenser; C4—two 1" squares of aluminum spaced ⅛" apart; C5—.0001 mfd; T1—audio transformer 5:1 ratio; R1—grid leak 5-10 megohms; FF—series filaments across 5 volt center-tapped secondary. If 6 volt A battery is desired, use a 20 ohm rheostat in series with one filament lead.

Turns for 40-160 meters: secondary 30 turns No. 28 DCC, tickler 9 turns No. 28 DCC: 20-40 meters: 11 turns No. 26 DCC, 5 turns No. 26 DCC.

If condensers of the variable type named are not available, any variable condenser can be used by removing the plates and leaving the desired number. Condensers with metal frames preferred. as bakelite has considerable loss which must be avoided in short waves to the best advantage. Use two of the discarded plates from variable condensers to make an aerial coupling condenser.

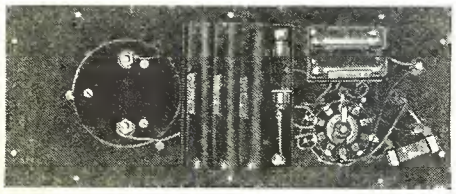
Mr. Henton states if care is taken in the construction of this receiver, surprising results will be obtained. Verification of reception has been received by the builder from England, South America, Honduras and other places, which space does not permit printing. Further detailed information may be had by writing Mr. Henton.

Useful Combination D-C Test Meter

IF an engineer or service man were limited to only one laboratory instrument, his choice would undoubtedly be that of a high resistance d-c voltmeter. This article describes a combination instrument, which is a high resistance d-c voltmeter and a d-c milliammeter. Voltage ranges are 10, 100, 500 and 1000 volts, with three current ranges, 1 ma, 10 ma and 100 ma. Since the instrument employed is a d-c 1 ma full scale milliammeter, the voltmeter is of the 1000 ohm per volt type. From Ohm's law we can find the required resistances for the chosen voltage ranges. For 10 volts the resistance necessary will be 10,000 ohms, 100 volts, 100,000 ohms, etc. The four required multiplier resistances are 10,000 ohms, 90,000 ohms, 400,000 ohms and 500,000 ohms.

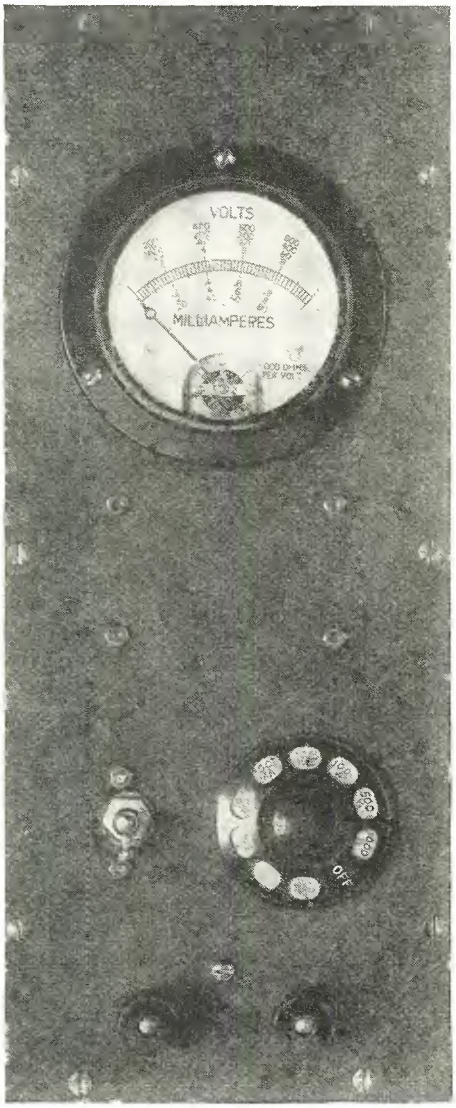
Choosing the Shunts

A seven-point switch and a single pole single throw switch are required for voltmeter and milliammeter scales. Choosing the shunt resistances for the 10 and 100 milliampere scales requires more labor than that for the multiplier resistors for the voltage scales. Perhaps the best procedure is to obtain a calibrated 0 to 100 ma d-c instrument and connect it in series with the instrument being built. In series with these connect a 45 volt B battery and a rheostat of about 25,000 ohms. Adjust the rheostat to give 10 ma on the accurate meter. If your meter reads off scale, the shunt is too high, and if it reads less than full scale, it is too low in value. When it is too high the easiest way to reduce it to the proper value is to interconnect some of the turns by soldering them. This may be repeated until the meter being calibrated agrees with the standard. Follow the same operations in adjusting the shunt for the 100 ma scale.



Multiplier Resistors

No trouble should be experienced in wiring this instrument from the circuit diagram of column 3. Multiplier resistors must be of the wire-wound type and accurate to 1 per cent if the readings are to be of any value. Close



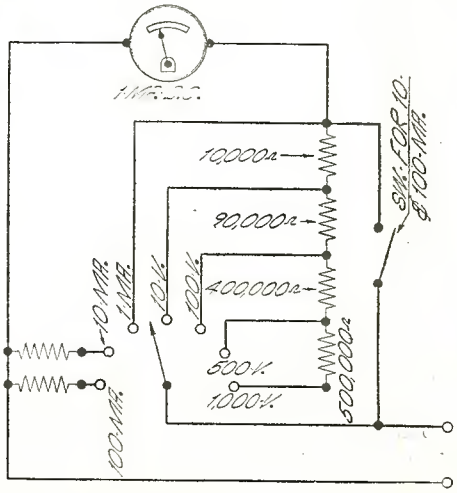
scrutiny of the back panel view shows that all resistors but one are of the vitreous type. These were special Ohmite resistors wound accurately to 1 per cent in resistance value. The one exception is a wire-wound resistor of the Super Akraohm type. There is no reason for mixing the styles except to illustrate two suitable classes of resistors. Ordinarily they would no doubt be of one style and make.

At the bottom of column 1 is the rear view of the panel showing the layout of resistors, switches and meter. It is to be noted that the resistors are mounted on a sub-panel so that no points of potential are exposed on the panel itself. The front panel layout is shown in the second column.

For the voltage and current ranges a Weston contact switch was used. However, this switch would not need to be of the bi-polar type. The single pole single throw switch is used to cut out the voltage scale multiplier resistors only when the current scales of 10 ma and 100 ma are being used, since the voltage multiplier resistors are in a series circuit and the current multiplier resistors in a parallel circuit. It can be seen also that advantage is taken of the fact that all resistors in the multipliers are used in succeeding scales. For example, the multiplier for the 10 volt scale is 10,000 ohms, which, when added to 90,000 ohms, gives 100,000 for the 100 volt scale. This value of 100,000 ohms when added to 400,000 ohms gives 500,000 ohms for the 500 volt scale, etc. In this way the cost of resistors is cut down because the price rises for increasing resistance values.

It would be thought that disregarding the internal resistance of the meter would cause inaccuracy of the voltage scales, but for a good instrument this value falls considerably under 50 ohms, usually in the neighborhood of 30 ohms. Fifty parts in 10,000, the lowest resistor used, is only ½ of 1 per cent, whereas the experimental error in reading the instrument is likely to exceed 2 per cent. A Jewell or Weston type meter is recommended for this test instrument.

A calibrated scale for the Jewell meter is available at a nominal cost from our laboratory.



Readers' Comments on the Monthly Issue

Chas. A. Philippi, San Antonio, Tex.: I am more than anxious to become a member of service, engineering, service man's open forum. I honestly believe that your October issue is the best all-around radio magazine today. Your magazine is extremely notable for its help, not only to the beginner, the advanced service man, but everyone else. I have followed your magazine in its growth and think it has topped them all for a long time when it comes to real curves and schematics of receivers.

Howard L. Ely, Gillespie, Ill.: In looking over your October issue I found exactly what I wanted to know, namely performance curves and schematics of various receivers. This open and above-board policy will not only help the service man, but also encourage the manufacturers to design better circuits.

Williamson's Motor Services, New Plymouth, New Zealand: I am anxiously awaiting the next issue as we here in New Zealand do not keep up to the minute of happenings in the States, owing to the distance. I think your idea is a very good one and am sure it will find favor with your many readers in New Zealand.

G. W. LeGrow, Portland, Me.: Wish to say that I consider your change to a monthly basis a very good move and the first copy very satisfactory as to arrangement and subject matter.

A. Faria, Georgetown, Demerara, British Guiana: I am pleased to note that you are now publishing the Call Book on a monthly basis and I feel sure that this change will be appreciated by all subscribers.

C. A. Wert, Darby, Pa.: I bought my October issue several days ago and want to say it surely contains a world of valuable information.

R. V. Dodge, Jr., San Diego, Calif. (Mr. Dodge draws a ring around the words "every month" in our announcement and adds "good news.")

Frank Irvine, Trident, Mont.: I just could not get along without the Call Book. It is *just right.*

F. G. Hookstra, Jersey City, N. J.: Sure glad to hear it will now be monthly, as four times a year caused too much waiting.

Wm. G. Benjamin, North Muskegon, Mich.: I am glad that you have decided to make the Call Book a monthly. The only fault I ever found with it was that it wasn't published often enough. It is the only magazine that tells one what he wants to know about various receivers. Facts are much more valuable than opinions and a half page of performance curves on a set tells one more than four rambling pages of whys and wherefores. Of course, I realize that some readers want curves, some want articles and some want diagrams, so if you give us some of each, we will all be satisfied.

John Merino, Superior, Ariz.: Am very glad that your magazine is to become a monthly publication. I have been a reader of your magazine for some time and find it very helpful in my work.

Thos. H. Elliott, Prince Rupert, B. C., Canada: It is with great pleasure that I am sending you the enclosed amount to complete the full year's subscription to your magazine. If it were 50c a month, it would still be worth the money. I am pleased to know that in the future it will be issued monthly, as three months is a long time to wait for one's favorite radio book.

Claude Krupka, Saginaw, Mich.: Allow me to commend you on your new policy of making the magazine a monthly issue, as I am greatly interested in this magazine.

N. A. Gardiner, Seattle, Wash.: Permit me to say that I believe you have now removed the only fault with the magazine. It was not published often enough.

F. J. Rybak, Cleveland, Ohio: I am enclosing a check to extend my subscription to your magazine up to a full year effective September 1. I am highly in favor of your magazine being published monthly.

A. Morganthale, Rainier, Wash.: Arrange your affairs to suit your convenience, but continue, and to the point. We don't want a bundle of paper and writing with no meaning. I am enclosing money order to bring my subscription up to two years beginning September 1.

Don Williams, Phoenix, Ariz.: I want to congratulate you on changing your magazine to a monthly. It more completely satisfies me than any other radio magazine, but its issues used to be too far apart. It's perfect now.

Walter Greenwood, Coffeen, Ill.: Wish you the best of success with the new monthly publication and hope it will be equally as good as the former ones.

Philip G. Hillkowitz, San Diego, Calif.: I am glad to see that you are publishing the magazine as a monthly, as it is in my estimation one of the best technical magazines in this country.

J. A. Strouse, Jackson, Ohio: Enclosed find the difference to bring my subscription up to a full year. I enjoy this magazine and it is a great help to me. Glad to hear it is going to be published every month.

R. D. Crutcher, Jr., Lewisburg, Tenn.: Am glad to know you are going to make it a monthly. Have often wondered why you did not. Get me in on the first of the month. Hope you continue your policy of giving schematics and laboratory tests on factory sets as I enjoy them.

A. C. Broker, East Cleveland, Ohio: Glad to have the Call Book every month. It is full of information which every technician needs.

Geo. E. Hairison, Toronto, Ont., Canada: Allow me to wish you the best of success with the new monthly plan and to congratulate you on the effectiveness of the past issues.

Richard T. Schultz, Ft. Wayne, Ind.: Am extremely glad to see your announcement that you will publish monthly instead of every three months as was formerly the case. I feel positive that published as a monthly, the sale of your magazine should increase.

Ray Shirley, Pismo Terrace, Calif.: Believe me you are certainly making the greatest move that any magazine has ever made. I for one will more than welcome the chance to get the best magazine of them all monthly instead of every three months. Have read the Call Book for over three years and could not get along without it. More power to you.

Jos. S. Lee, San Francisco, Calif.: I am glad to see the magazine published monthly, if it to be on the same standard as previous issues.

Geo. C. Picht, Jr., Philadelphia, Pa.: Your magazine as published in the past leaves little to be desired and I feel that if your magazine is carried forward on the monthly basis with the quality and nature of the contents unchanged, you cannot help but succeed.

John N. Noff, Camden, Tex.: Am greatly pleased at the Call Book becoming a monthly magazine, as it cannot come too often to suit me. Radio without the Call Book is like trying to pilot a ship without a chart.

C. H. Patterson, Niles, Ohio: Am very pleased to know we have one magazine that thinks enough of the service man to ask just what he is interested in. I have never missed a copy of the book and have them all on file

for reference books which I can rely on as a world of information.

W. W. Smith, Pitsburg, Ohio: I am associated with a radio dealer and have been a constant reader of your magazine. Can you supply me with set performance curves on the models listed: General Electric K-62, Crosley 124, Philco 90, Atwater-Kent 80, RCA Victor R-11, U. S. Apex 8 tube small model. Your favor in giving me the data asked above will be of valuable help to us.

Chet Aydelotte, East Gary Electric, East Gary, Ind.: Just to let you know how much I for one (suppose there are many, many more) appreciate the new order of the day, or rather month. You can make it daily if you care to and I will still feel it is not often enough. How about a fat, juicy article on servicing superhets including a list of troubles common only to same?

Anderson Motor Co., Fond du Lac, Wis.: We believe that you know everything. We are taking one or two radio journals now but they don't seem to know. We are looking around for a radio for automobiles, one that we could wholesale for Wisconsin and Northern Michigan, for a price that is right and a licensed set. Can you give us a list of names of manufacturers making a popular priced set that is licensed?

Gustave Simmons, Billings, Mont.: Glad to see the magazine in monthly form.

W. Ray Gallagher, Clearfield, Pa.: Am glad to hear that Radio Call Book Magazine and Technical Review is going to be published monthly instead of quarterly, as three months is a long time to wait for so interesting and instructive a magazine.

Geo. F. Doan, Kenora, Ont., Canada: Information respecting your publishing monthly is interesting news indeed. Have been reading the Call Book for I believe almost its entire lifetime and have found none better.

Oliver C. Stocker, Litchfield, Ohio: Wish you the best of luck in your monthly publication and hope it is as good every month as the old one was every third month.

A. R. Warling, Denver, Colo.: I believe this monthly arrangement will be much more satisfactory to myself as well as many other readers, as it will not be as long between issues and I felt a person ought to keep up on the latest oftener than was afforded by the quarterly issue.

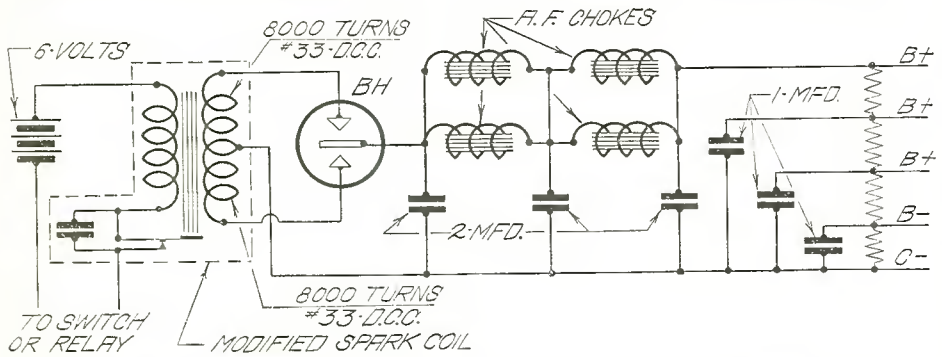
R. W. Hoffman, Chadds Ford, Pa.: You are making a very good change in the paper by having it printed by the month, providing you have it of the same type magazine as before. My reason for subscribing to your magazine is to get the service schematics on the different manufactured sets.

Ernest Van Winkle, Omaha, Nebr.: It was a great pleasure to receive your announcement that the magazine will be published every month. In this way all of your readers would have the latest news and information on the fast developing industry. I am sure all your subscribers will receive your announcement with as much gratitude as I do.

John B. Fix, Monroe, Mich.: Very pleased to learn that your magazine will now come every month. To fill out my two years subscription to September, 1933, I am enclosing check for the difference.

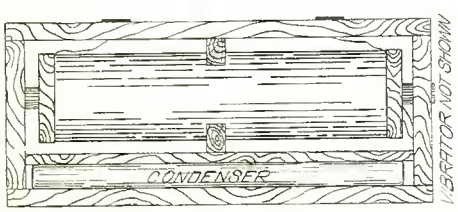
SUGGESTED AUTO B SUPPLY

A SUGGESTED method of securing auto B supply is contained in a recent contribution from Rudolph C. Schultz, 7958 S. Bishop, Chicago. A schematic of the method is shown below together with



a plan view of the spark coil needed for this B supply.

Examination of the schematic indicates the B supply consists simply of a simple Raytheon rectifier of the BH type, using a special spark coil instead of the usual power transformer. Mr. Schultz' method is to take a regular Ford model T spark coil, bake out in an oven its tar compound, wooden coil supports removed and the coil unsoldered and pulled out. The length and diameter of the core of the secondary (after the high tension coil is removed) is used to accommodate the new secondary of 16,000 turns of No. 30 dcc, wound either layer fashion or slipshod. A center tap is provided at 8000 turns. The new coil is reassembled and the tar poured back in.

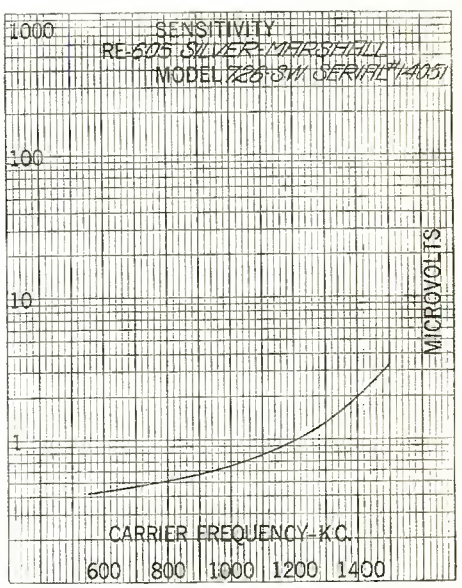


The ends of the secondary are connected to the filament of the Raytheon, whose plate is connected to the double choke. Two chokes in parallel are used to prevent burn-outs due to improper adjustments or wear of the vibrator.

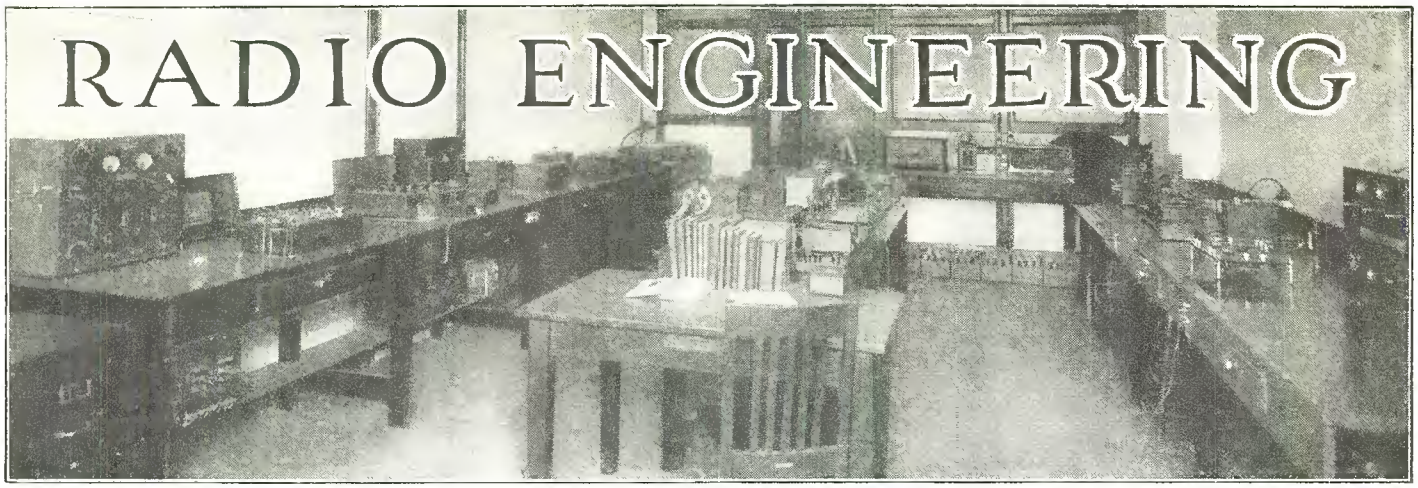
Between the output of the filtering system and the center tap is connected the B voltage supply resistor. All parts are mounted on a piece of sheet metal, making the unit fit tight within the regular B battery can, approximately 8"x10½"x9". The unit is controlled by either a switch connected in the most convenient place or a current relay connected in the filament circuit of the radio.

Mr. Schultz states that this method of B supply would prove satisfactory providing the lighting system is not used at the same time as the radio on account of the increased battery load, which, however, might be reduced by the installation of an oversized car battery.

Later Silver Production



A later production model of the Silver-Marshall 726 SW has been furnished by the maker to our laboratory. On being realigned by the factory, the sensitivity curve shown above was secured



Elementary Analysis of Resonant Circuits

UPON the electrical condition called resonance depends the entire radio industry, receiver, transmitter and television, and all other electrical industries in general. It is the basis of the entire electrical art, for without this circuit quality none would exist today. In bringing the heading "Radio Engineering" back to our readers, it is fitting that we should choose such an all-embracing subject. Remember that we shall be happy to act upon suggestions of our readers in choosing the technical content of these pages, though we do not believe that treatment of such material should be of too deep a mathematical nature. We hope to present helpful facts which may be used by the man who is not so well versed in engineering, but who can add, divide and subtract and knows the simple, ordinary electrical and radio terminology.

Two Kinds of Resonance

There are two types of resonance, series, with which we are mainly concerned, and parallel. Of the two the first is worthy of most consideration, since it makes possible the so-called tuning of a radio receiver to the exclusion of unwanted station programs. Perhaps resonance is the most interesting of electrical phenomena, for it presents aspects which are, at first glance, of contradictory nature. For any circuit made up of a condenser and an inductance there is a frequency known as the resonant frequency of that circuit which holds only for those particular values of inductance and capacity. At this specified frequency the current flowing in the circuit is the greatest, with only the resistance limiting it. From a practical standpoint the resistance plays no part in determining the resonant frequency. In a tuned circuit it is desirable to have the greatest selectivity possible in order to be able to exclude frequencies which are undesirable, i.e., those of different value from the tuned frequency of the circuit. The selectivity depends upon the resistance of the circuit. If the resistance is only half as great the current at resonance, assuming a fixed voltage across the circuit, will be twice as great and the circuit will be more selective than it was. If, on the other hand, the resistance is double, the current will be only half as great and the circuit less selective. Ohm's law for the d-c circuit is given by $I = \frac{E}{R}$. In a-c circuits the resistance symbol is changed to the impedance symbol Z, but the formula still holds and becomes $I = \frac{E}{Z}$. This term Z is made up of three distinct parts, of which the first is the resistance term R. A condenser has what is known as capacity reactance, denoted in ohms, and an inductance has inductive reactance also measured in ohms.

Many persons not well versed in mathematics immediately turn to another page when they see formulae given, but it should be remembered that these are only easy ways of giving ratios or showing how various things are related to each other.

Capacity reactance is given by the simple expression $X_C = \frac{1}{2\pi fC}$ where X_C is in ohms, f is the frequency in cycles per second and C is the condenser capacity in farads, the latter being millions of microfarads. Pi is a term having an approximate value of 3.1416 appearing in all wave theory. Inductive reactance is found from $X_L = 2\pi fL$. Here the terms remain the same as before with the exception of L, which is in henrys, i.e., millions of microhenrys. The complete expression for the impedance Z then becomes $Z = \sqrt{R^2 + (X_L - X_C)^2}$. When the condition of resonance occurs, X_L and X_C being equal and opposite in sign, reduce to zero, whereupon Z becomes R.

In resonance the formula is $f = \frac{1}{2\pi\sqrt{LC}}$. This can be written for convenience in calculating as $L = \frac{1}{4\pi^2 f^2 C}$ and $C = \frac{1}{4\pi^2 f^2 L}$. We can determine the frequency, inductance or capacity at resonance, if the other two values are known, by simple substitution of those values in the proper formula.

Let us assume that we have a radio frequency coil for a circuit to cover the broadcast band and we wish to know approximately how large a tuning condenser to use. The coil has a value of 220 microhenrys and the lowest broadcast frequency is 550 k-c. We shall substitute these figures in the third formula to arrive at the value of C required.

Then f = 550000

L = .000220

Whence

$$C = \frac{1}{4\pi^2(220 \times 10^{-6})\ (550 \times 10^3)^2}$$

$$C = \frac{1}{(4)\ (9.9)\ (220)\ (550)^2}$$

$$C = \frac{10^{-4}}{(39.6)\ (22)\ (303)}$$

$$C = \frac{10^{-6}}{2640}$$

C = .000379 mfd.

From this value we would pick a variable condenser of approximately 390 to 400 micromicrofarads so that the circuit tuned a little beyond 550 k-c.

For a second example let us take a condenser of 4 mfd. capacity and an inductance of 5 henrys. Because both of these values are large, it can immediately be seen that the frequency term for resonance will be low in value.

Then $C = 4 \times 10^{-6}$ farads
and $L = 5$ henrys.
Substituting to find the resonant frequency we have

$$f = \frac{1}{2\pi\sqrt{(5)(4 \times 10^{-6})}}$$

$$f = \frac{1}{2\pi(4.47 \times 10^{-3})}$$

$$f = \frac{10^3}{28.05}$$

$f = 35.6$ cycles per second.

Now let us take an 8 mfd condenser and use a 60 cycle a-c voltage supply. What value of inductance will be required to make a series resonant circuit at this frequency? Then $C = 8 \times 10^{-6}$ and $f = 60$.

$$\text{Then } L = \frac{1}{4\pi^2(8 \times 10^{-6})(60)^2}$$

$$\text{and } L = \frac{10^6}{(39.6)(8)(3600)}$$

$$L = \frac{10^6}{114 \times 10^4}$$

from which $L = .877$ henrys.

Let $R = 10$ ohms resistance. Then at resonance the current will be $I = \frac{E}{R} = \frac{110}{10} = 11$ amperes. We shall take all of the resistance in the inductance only. The voltage across the inductance is $E = IZ$, where Z replaces the symbol R in Ohm's law as explained above and,

$$E_L = I\sqrt{R^2 + X_L^2}$$

$$E_L = I\sqrt{R^2 + (2\pi fL)^2}$$

$$E_L = 11\sqrt{(10)^2 + \{(6.28)(60)(.877)\}^2}$$

$$E_L = 11\sqrt{(10)^2 + (331)^2}$$

$$E_L = 11\sqrt{100 + 109600}$$

$$E_L = 11\sqrt{109700}$$

It will be noted that the resistance term is negligible in comparison with the reactance.

$E_L = (11)(331.5)$ or
$E_L = 3646.5$ volts across the inductance. For the condenser,

$$E_C = I\sqrt{R^2 + X_C^2}$$

$$E_C = I\sqrt{R^2 + \left(\frac{1}{2\pi fC}\right)^2}$$

$$E_C = 11\sqrt{0 + \left(\frac{1}{2\pi(60)(8 \times 10^{-6})}\right)^2}$$

$$E_C = \frac{11}{2\pi(60)(8 \times 10^{-6})}$$

$E_C = (11)(331)$ or
$E_C = 3641$ volts across the condenser.

These voltage values are real, though seemingly impossible with a supply voltage of only 110. We shall now check back in the impedance formula.

$$E_T = IZ$$

$$E_T = 11\sqrt{R^2 + (X_L - X_C)^2}$$

$$E_T = 11\sqrt{(10)^2 + (331 - 331)^2}$$

$$E_T = 11\sqrt{100} = 110 \text{ volts}$$

The two reactive voltages may be represented by vectors 180 degrees apart and thus cancelling each other at resonance, since they are the same length. Vector analysis is a study in itself, and an explanation will not be attempted in this article.

If we investigate the matter of selectivity, we shall see why the resonant frequency gives the highest current flow. We shall need only the impedance formula which we have used heretofore. In our circuit with $L = .877$ henrys, $C = 8$ mfd and $R = 10$ ohms, let us see what the current will be if we impress 110 volts at 40 cycles across the circuit.

$$\text{Then } X_L = 2\pi(40)(.877)$$

$$X_C = \frac{10^6}{2\pi(40)(8)}$$

$$\text{Also } Z = \sqrt{(10)^2 + (220 - 496.7)^2}$$

$$\text{and } Z = \sqrt{100 + (-276.7)^2}$$

$$Z = \sqrt{100 + 76800}$$

$$Z = \sqrt{76900}$$

$$Z = 277 \text{ ohms}$$

Then the current will be $I = \frac{110}{277} = .397$ amperes. In other words, going 20 cycles off resonance the current has been reduced by a factor of 27.7. Had the resistance of the inductance been only 5 ohms, this current ratio would have been approximately doubled. In other words, this circuit is selective to frequency. Calculations show the impedance to be 659 ohms when the frequency is changed to 25 cycles per second. This gives a current ratio to resonance of 65.9 times, or the current is only .167 amperes compared to 11 amperes for resonance.

Program for Rochester I. R. E., Nov. 9-10 Meeting

Monday, November 9

8:30 A.M.—Registration.

9:30 A.M.—Technical Session, R. H. Manson presiding.

Battery Design Problems of the Air Cell Receiver by F. T. Bowditch, Radio Engineer, National Carbon Company.

European Reception Conditions by W. A. MacDonald, Chief Engineer, Hazeltine Service Corporation.

Pentode Circuit Operation by David Grimes, Engineer in Charge, RCA Licensee Laboratory.

12:30 P.M.—Luncheon.

Welcome by Stephen B. Story, City Manager.

2:00 P.M.—Technical Session, R. R. Manson presiding.

Magnetic Cores for High Frequencies by W. J. Polydoroff, Director of Research, Johnson Laboratories.

3:00 P.M.—Engineering Session, L. C. F. Horle presiding.

5:00 P.M.—Inspection of Exhibits.

6:30 P.M.—Group Dinner.

8:00 P.M.—Technical Session, R. H. Manson presiding.

Experimental Visual Broadcasting by A. B. Chamberlain, Chief Engineer, Columbia Broadcasting System.

Advances in Ultra Short Wave Transmission and Reception by Eduard Karplus, Research Engineer, General Radio Company.

Tuesday, November 10

9:00 A.M.—Technical Session, C. P. Edwards presiding.

Correlation of Radio Tube and Receiver Designs by Roger Wise, Chief Engineer, Hygrade-Sylvania Corporation.

Recent Developments in Amplification & Detection Systems by P. O. Farnham, Development Engineer, Radio Frequency Laboratories.

Use of Suppressor Grids in Radio Tubes by E. W. Ritter, Development Engineer, RCA Radiotron Company.

An Examination of Selectivity by R. H. Langley, Consulting Engineer.

12:30 P.M.—Group Luncheon.

2:00 P.M.—Engineering Session, L. C. F. Horle presiding.

4:00 P.M.—Inspection of Exhibits.

6:30 P.M.—Banquet.

A. H. Hoyt, toastmaster.

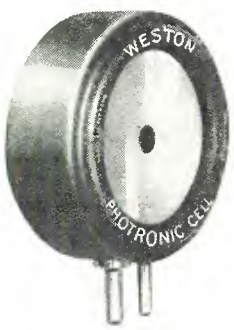
The Radio Business by O. H. Caldwell, Editor of "Electronics."

Entertainment.

NEW PRODUCTS FOR THE TRADE

Weston Photoelectric Cell

The development of the Weston Photronic cell, illustrated here, with its performance characteristics and its utter simplicity of design marks a sensational advance and fulfills the need for an ideal type of photo electric cell. Notwithstanding the superiority of this Photronic cell, it is exceptionally low in cost as is also its auxiliary apparatus. Its discovery now places photo cell equipment well within reach of every amateur experimenter.



Electronic in its character, the Weston Photronic cell employs a highly light sensitive disc which transforms light energy directly into electrical energy without the use of any auxiliary voltage whatsoever. Its response to light variations is instantaneous and sufficient current is developed to directly operate Weston relays without the use of auxiliary apparatus or any battery. It delivers about one micro-ampere per foot-candle of light intensity. When exposed to direct sunlight the output is approximately 5 milliamperes. The cell resistance varies from about 1500 ohms for 10 foot-candle light intensity to about 300 ohms for 240 foot-candle intensity.

As far as is known, the life of the cell is practically unlimited and a continuous current flow does not harm it in any way. Since it does not contain any liquid nor require vacuum or gas, there is nothing to get out of order as it is not subject to physical or chemical change and it has a constant output. It can be exposed to direct sunlight without deterioration, has no dark current since its energy is derived directly and only from light; no drifting, hence no circuit adjustments are necessary; no fatigue and it is non-microphonic.

The Photronic cell is enclosed in a handsome moulded black Bakelite case fitted at the bottom with two connection prongs which fit into the standard UX radio tube socket. It is rugged in construction and is so simple in design that there is nothing to get out of order. The case is 2¼ inches in diameter and 1 inch in thickness.

Zierick Screen Grid Clip

This new screen grid clip has been developed by the F. R. Zierick Mfg. Works, 68-72 East 131st Street, New York, N. Y., and is being marketed as their Number 117.

After extensive tests of fitting these on tubes 30,000 times, the clips still held their tension.

These clips are made of brass and are hot tinned to insure easy soldering. They are meeting the demand for a low priced screen grid clip, lacking none of the advantages of the higher priced clips.

Samples will be supplied to manufacturers desiring to test them.

Broadcast Stations W. E. Equipped

Nineteen radio stations have been equipped by Electrical Research Products with Western Electric reproducing equipment for broadcasting electrically recorded radio programs since August 1 of this year.

Up to date, 147 stations have installed Western Electric equipment and the great majority of them have complete double 33⅓ and 78 rpm equipment.

Stations that have been equipped since August 1 are: KFYR—Bismarck, N. D.; KLO—Ogden, Utah; KSL—Salt Lake City, Utah; KSOO—Sioux Falls, N. D.; KSTP—St. Paul, Minn.; WAAM—Newark, N. J.; WDOD—Chattanooga, Tenn.; WFBL—Syracuse, N. Y.; WIP-WFAN—Philadelphia, Pa.; WLIT—Philadelphia, Pa.; WNAX—Yankton, S. D.; WPRO—Providence, R. I.; WRVA—Richmond, Va.; K G W—Portland, Ore.; WWVA—Wheeling, W. Va.; WJAG—Norfolk, Neb.; WPG—Atlantic City, N. J.; WNOX—Knoxville, Tenn.; WODX—Mobile, Ala.

Stromberg Remote Control

With the opening of the radio season, dealers throughout the country are looking for some new form of radio with which they can stimulate sales and increase their profits.

The Stromberg-Carlson Telephone Mfg. Company, Rochester, N. Y., backed by 37 years in the manufacture of telephone transmitting and receiving apparatus, announces a new residence type electrical remote control system, which gives complete remote control of both radio and records.

By push buttons in a small control box, one may, from any part of the house: (1) Start or stop a radio receiver; (2) Start or stop a multi-record phonograph at the same time switching from radio to phonograph, or vice versa; (3) Tune silently and automatically to any of eight favorite stations; (4) Tune silently and visually (meter tuning) to other stations; (5) Adjust radio volume; (6) Adjust phonograph volume; (7) Switch any of four loud speakers on or off; (8) Switch off radio, loud speakers and phonograph all by one button.

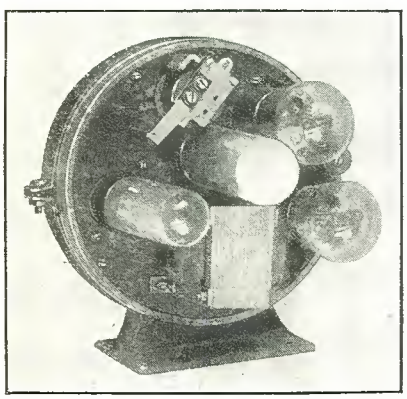
The new system is composed of radio, phonograph units in separate console cabinets or in combination cabinets; or one or both may be concealed from view. With the provision of complete remote control of an entire system, the radio receiver

loses its claim to a place in the living room and may be relegated to any dry place in the attic, basement, garage or a convenient closet or cupboard.

The control boxes are equipped with ten foot or thirty foot flexible cords. The portable type is 10 inches by 3¾ inches by 2½ inches in size, and weighs about a pound. Control boxes for mounting flush in walls can also be had.

Burgess Light Relays

Available in package form, ready for use by simply inserting the attachment plug into the nearest a-c or d-c outlet, the Burgess a-c light relay is designed to operate in factory, store, home and outdoors on the usual 110-volt a-c supply. It consists of a Burgess radiovisor bridge feeding a 427 type vacuum tube as the amplifier, which in turn actuates a power relay. The circuit contains in addition a power transformer, filter condenser, necessary resistors and by-pass condensers. A second 427 tube serves as the rectifier.



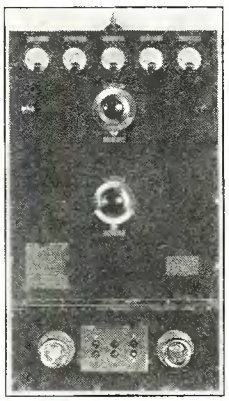
In the case of the d-c unit, intended for operation on the usual 110-volt d-c supply, a bridge is employed, together with the newly perfected 430 type 2-volt tube, voltage reducing resistor, circuit resistors, by-pass condensers and power relay. An interior view of the a-c light relay is shown above.

Both a-c and d-c light relay circuits may be arranged with open power relay contacts when the cell is in either light or dark condition, depending on the requirements of the desired application. The components are mounted on a circular platform enclosed in an aluminum housing which is supported by means of a ring bracket, the arrangement permitting of turning the unit to bring the bridge window in line with the actuating source of light. The circuit to be controlled is conected with the relay contacts. If the Burgess vacuum contact is employed with the relay, the unit will control equipment drawing up to 1320 watts, or 6 amperes at 220 volts.

Simplest applications of these units are: control of electric lighting systems; counting of vehicles, packages, parts or other units; a burglar alarm; sorting; automatic door opener, and smoke detector.

R. C. Powell Equipment

In the equipment shown in this illustration, manufactured for the Navy department by R. C. Powell & Co., Inc., New York City, is a combined cw and phone transmitter. This company has also recently developed the type 53 equipment, the transmitter being light and compact and weighing 150 lbs. It contains automatic switching and protection circuits, automatic frequency control, 100 per cent modulation and high quality reproduction of voice and music for broadcasting. The power output is 50 watts, both telephone and cw telegraph, giving a range of from 40 to 50 miles under ordinary conditions on the low frequencies and several thousand miles on the short wave bands.



New Electrad Circular

A new circular just issued by Electrad, Inc., 175 Varick St., New York City, has been issued for the benefit of service men, as well as the dealer or jobber who is doing service work.

On the back page of the circular are shown the basic circuits for which Electrad replacement volume controls are designed. According to the circular, just five types of Electrad replacement volume controls are required in the service man's kit to service 343 standard receivers.

Mention is also made in the circular that the Electrad replacement volume control guide is now available to those who will write the company on their business letter-head.

Tilton Color-Code Chart

The R. M. A. standard color code, now in practically universal use, can still be sometimes puzzling to the service man without some chart for ready reference. There are for example over 400 different resistor values now in use, each with its own three-color signature.

A new celluloid vest pocket indicator made by the Tilton Mfg. Co. 15 E. 26th St., New York City, gives in a flash the correct color combination for every possible value. The actual size is approximately 4 in. by 1 in.

Correction

On page 52 of the October issue of this magazine under the heading "I. R. C. Resistor Data," where the engineering bulletin was described, an illustration of the Resistor Replacement Guide was shown in error. The illustration was in no way related to the text, since the article dealt with an engineering bulletin for engineers and technicians.

Belden Aerial Kits

Belden Manufacturing Company, 4689 W. Van Buren Street, Chicago, announces that an entirely new carton has been designed for the line of Belden Aerial Kits. The new cartons are printed in three colors, attractively decorated in the modern manner.

As usual, the Belden Radio Line contains aerial kits for complete price range. All numbers are packed in the new cartons which are uniform in size and design.

DayraD Direct Reading Tester

With base dimensions of 9" x 17" and with the back panel 12" high the Type 360 DayraD direct reading tube tester is an ideal instrument for stores and departments where space is limited but where tube sales are an important part of the merchandising. It is announced by The Radio Products Company, Dayton, Ohio.

This instrument is all a-c operated. Tubes are tested at voltages sufficiently high and appropriate to make the readings reliable and accurate.

A separate tube socket is provided for each type of tube. Similar tubes are grouped and each group of sockets is of colored bakelite in contrast to the adjacent group.

The large meter scale is divided into three sections, Good, Weak, and Poor. Tests are made for quality, shorts, and opens.

The cabinet is finished in instrument black and is of hard-wood.

(NOTE: Do not read this advertisement unless you are interested in establishing yourself in a permanent, attractive position.)

Hundreds of Men Have Asked Us —But We Want YOU!

THINK BACK

Fifty years ago the safety razor was unknown.
Twenty-five years ago radio broadcasting was unknown.
Ten years ago iceless refrigeration for the masses seemed an idle dream.
A year ago a time switch for home use was unheard of!

Be a MARK-TIME *Control Specialist*

A Brand New Profession Calling for the Training You May Already Have!

THINK AHEAD

History repeats itself. Three years from now—how many of the 20,000,000 wired homes in America will be using Mark-Time Switches? And who will be reaping the benefit? Will it be you? Send the coupon below today if you think you can qualify as a Mark-Time Control Specialist.

TRADE THE MARK MARK-TIME SWITCH

MARK-TIME *Is a Magic Servant*

It controls lighting, appliances and other electrically operated equipment automatically. It turns ON. It turns OFF. Set it and forget about it. Lights will turn on when they are needed and shut off before they become a needless expense. Forgotten appliances will cease to be a fire hazard. Percolators, toasters, flat irons, curling irons, grills, heaters, fans, warming pads, sun lamps, oil burners and ventilators—all of these will work as long as they wanted to but no longer. Radios will automatically turn on at a favorite program or turn off after they have played you to sleep. Various models of Mark-Time Switches provide timing intervals from as short as 15 seconds to as long as 12 hours. Wall switches are easily installed. List prices of portable and receptacle models range from $2.50 to $9.50. And MARK-TIME costs nothing to run.

Ever since the Mark-Time Switch was first put on the market, we have been literally besieged by direct selling organizations and individual canvassers. All of them realize the sales possibilities of the Mark-Time Switch. All of them have wanted us to allow them to sell it.

But we don't want them all.

We want only men of a special type and a more stable background—men who are not merely canvassers—men who have had the experience and training that we feel *you* have acquired.

The successful Mark-Time Control Specialist will be the man who has a talent for salesmanship and, in addition, the following: a practical knowledge of electricity, familiarity with appliances of all kinds and an understanding of electrical wiring regulations. His will be a profession that is dignified, interesting and unlimited in opportunity. He will have a recognized place in the community, and he will be given a generous territory right where he lives.

You too will agree that the sales opportunities of Mark-Time are tremendous. But do not be misled by your own enthusiasm. Mark-Time is destined to be a money maker for everyone connected with it, but hard work is required even though there is no competition and this new invention sells practically on sight. You can share in the fortunes it will create if you are the right man—and if you develop your opportunities with intelligence and patience.

When you have decided that you are fitted to be the Mark-Time Control Specialist in your community, fill out and mail the coupon below. But do not delay!

M. H. RHODES, Inc.
American-Industrial Building
Hartford, Conn.

From your description of the necessary qualifications, I believe that I would be a successful Mark-Time Control Specialist.
Please write me in detail about the opportunities that this new profession offers.

Name .....

Street .....

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

SERVICE BLUE PRINTS

FOR SERVICE MEN, TECHNICIANS AND EXPERIMENTERS

ACCURATE, clear and dependable drawings of nearly every standard circuit. These schematics are drawn to a large scale and so simplified that the whole circuit may be visualized almost instantaneously. This enables the service man to work rapidly and accurately. There is no need for microscopes or clairvoyance in reading our prints.

No. SR24	A. C. Dayton Navigator	$0.50
No. SR3	Acme AC7	.50
No. SR4	Acme AC4	.50
No. SR1	All-American Mohawk 6	.50
No. SR2	All-American Mohawk 8	.50
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No. SR167	All-American Mohawk (Lyric) S-7	.50
No. SR128	All-American Mohawk (Lyric) Model J	.50
No. SR22	Amrad 70 A. C.	.50
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No. SR108	Apex Series 31	.50
No. SR28	Atwater-Kent 38	.50
No. SR51	Atwater-Kent 55 and 55C (Cap. Coupled)	.50
No. SR52	Atwater-Kent 55 and 55C (Inductive Coupled)	.50
No. SR114	Atwater-Kent 66	.50
No. SR131	Atwater-Kent Super H-2 Chassis	.50
No. SR79	Audiola 31	.50
No. SR111	Audiola Super 1931	.50
No. SR112	Audiola Junior	.50
No. SR12	Balkeit A	.50
No. SR162	Bosch 7 (D.C.)	.50
No. SR21	Bosch 28 and 29	.50
No. SR73	Bosch 48	.50
No. SR94	Bosch Auto Radio 89	.50
No. SR109	Bosch 58	.50
No. SR117	Bosch 60	.50
No. SR10	Bremer-Tully 7-70	.50
No. SR75	Bremer-Tully 81 and 82	.50
No. SR126	Bremer-Tully S-81 and S-82	.50
No. SR23	Brunswick 3KRO	.50
No. SR148	Brunswick 11, 12, 16	.50
No. SR71	Brunswick S-14	.50
No. SR86	Brunswick 15, 22, 32, 42	.50
No. SR164	Brunswick 17 and 24	.50
No. SR78	Clarion 50	.50
No. SR139	Clarion 80 and 81	.50
No. SR29	Colonial 31AC	.50
No. SR95	Colonial 33 and 34 A. C.	.50
No. SR160	Colonial 47 and 48	.50
No. SR47	Columbia (Chicago) SGS	.50
No. SR103	Crosley 53 and 54	.50
No. SR5	Crosley 60S Gembox	.50
No. SR6	Crosley 705 Showbox	.50
No. SR41	Crosley Jewelbox 704B	.50
No. SR57	Crosley 40S, 41S, 42S and 82S	.50
No. SR67	Crosley "Roamio" (Auto Radio)	.50
No. SR83	Crosley 77	.50
No. SR133	Crosley 120	.50
No. SR149	Crosley 121	.50
No. SR150	Crosley 124	.50
No. SR11	DayFan 50S0	.50
No. SR66	Delco Auto Radio	.50
No. SR87	Delco Police Short Wave Receiver 3003	.50
No. SR99	Edison R6 and R7	.50
No. SR49	Edison R4, R5, C4	.50
No. SR33	Erla DuoConcerto R-2	.50
No. SR50	Eveready Series 50	.50
No. SR158	Fada KW	.50
No. SR13	Fada 7AC	.50
No. SR70	Fada 35 and 35Z	.50
No. SR19	Federal H	.50
No. SR20	Freed-Eisemann NR-80	.50
No. SR14	Freshman 2-N-12	.50
No. SR92	General Electric H-31	.50
No. SR166	General Electric H-32	.50
No. SR107	General Electric T-41	.50
No. SR137	General Electric S-22	.50
No. SR68	General Motors A	.50
No. SR154	General Motors S-3-A	.50
No. SR32	Gilfillan 100	.50
No. SR42	Graybar 600	.50
No. SR92	Graybar 700	.50
No. SR107	Graybar 67S	.50
No. SR96	Grebe Synchrophase AH-1	.50
No. SR17	Grebe 7AC	.50
No. SR59	Grebe SK-4	.50
No. SR40	Gulbransen Nine-in-Line	.50
No. SR110	Gulbransen 161	.50
No. SR16	Howard Green Diamond 8	.50
No. SR163	Howard 0	.50
No. SR56	Howard SG-A	$0.50
No. SR130	Howard SG-B	.50
No. SR145	Howard H	.50
No. SR118	Jesse French Jr. "G"	.50
No. SR77	Kellogg 523	.50
No. SR38	Kennedy 10	.50
No. SR48	Kennedy 20	.50
No. SR81	Kennedy 26	.50
No. SR129	Kennedy 30 and 32	.50
No. SR31	King Model J	.50
No. SR8	Kolster K20; K22; K25 and K27	.50
No. SR45	Kolster K21; K23	.50
No. SR72	Kolster K43	.50
No. SR159	Kolster 80 and 82	.50
No. SR65	Kylectron 70	.50
No. SR124	Majestic 20	.50
No. SR157	Majestic Chassis 15	.50
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No. SR7	Majestic 70	.50
No. SR55	Majestic 90; 90B; 91; 92 and 93	.50
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No. SR26	Philco 86-82	.50
No. SR156	Philco 90 and 90-A, Series B	.50
No. SR60	Philco 95	.50
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No. SR127	RCA 18	.50
No. SR102	RCA 44	.50
No. SR30	RCA 60	.50
No. SR64	RCA 66	.50
No. SR92	RCA 80	.50
No. SR107	RCA 48	.50
No. SR166	RCA Victor R-50 and R-55	.50
No. SR137	RCA-Victor Superette	.50
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No. SR113	Sentinel 106-B	.50
No. SR146	Sentinel 108-A	.50
No. SR155	Sentinel 111	.50
No. SR123	Sentinel Super Midget 108	.50
No. SR152	Silver-Marshall D and E	.50
No. SR140	Silver-Marshall F	.50
No. SR153	Silver-Marshall G	.50
No. SR35	Silver-Marshall 30	.50
No. SR53	Silver-Marshall 30-B	.50
No. SR82	Silver-Marshall 35-A	.50
No. SR144	Silver-Marshall 726 SW	.50
No. SR105	Silver Super 36-A	.50
No. SR120	Silver Midget 782-12	.50
No. SR27	Slagle (Continental) 9	.50
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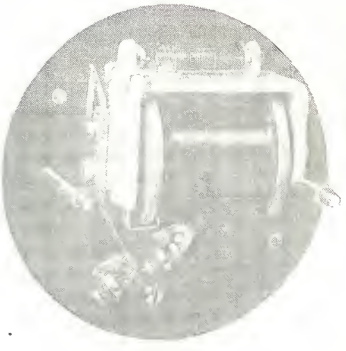

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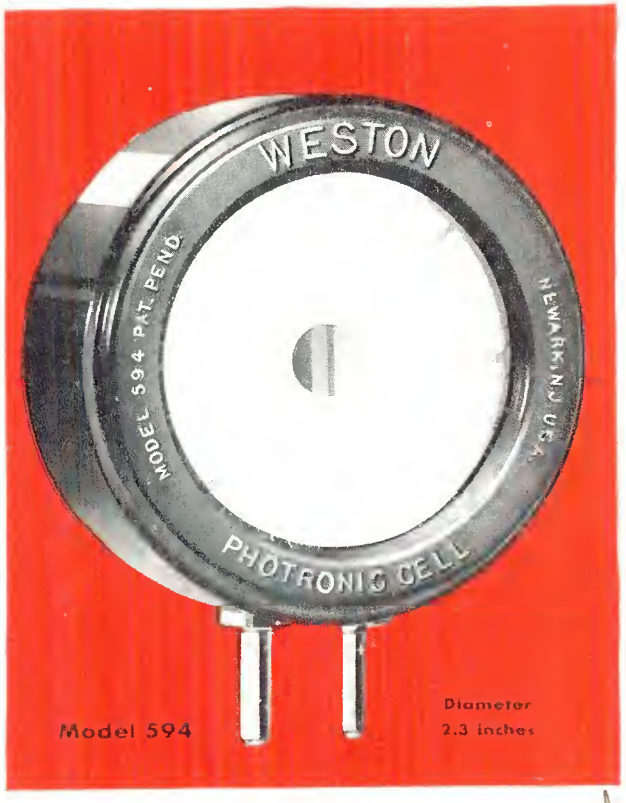

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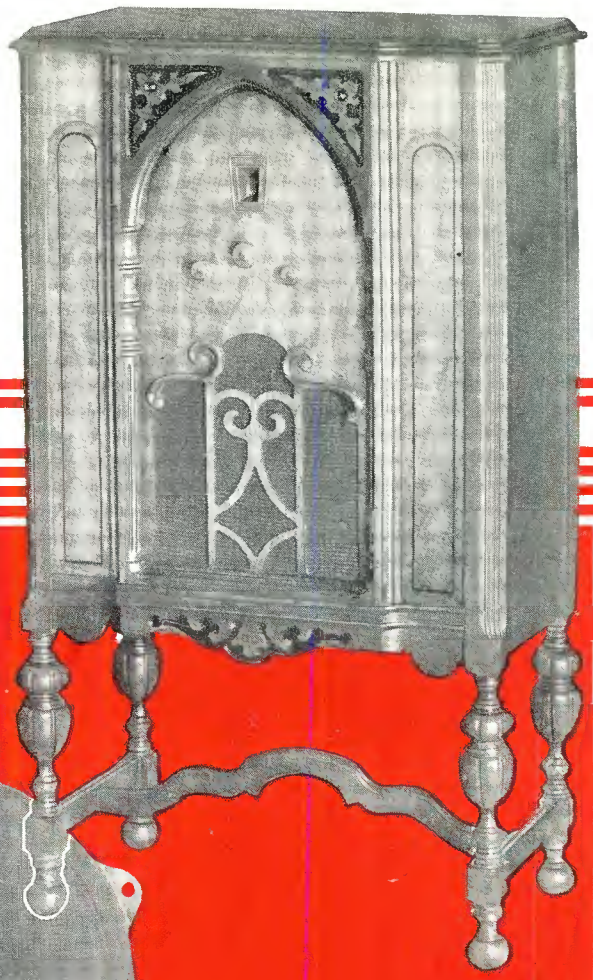

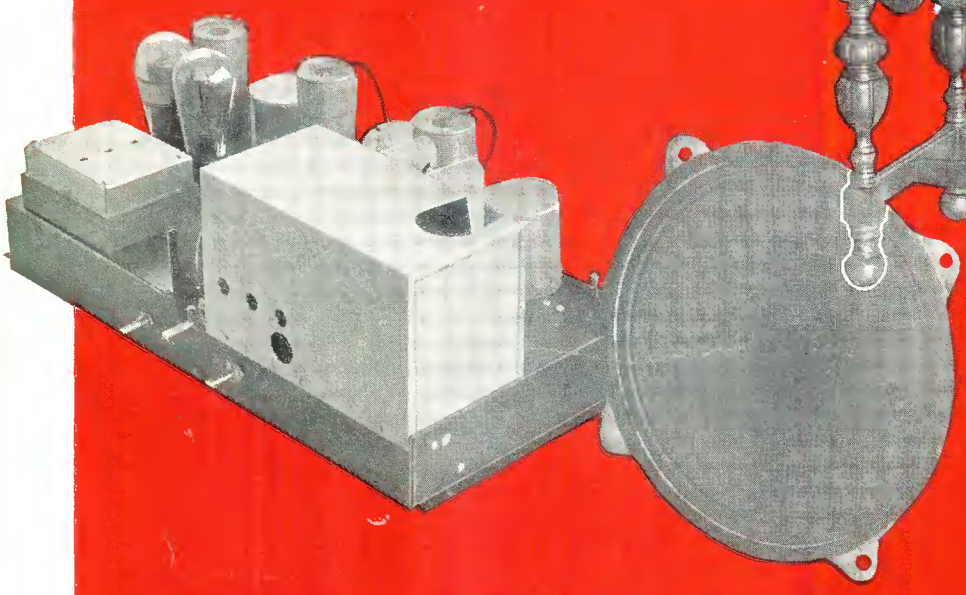

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