Radio Call Book Magazine and Technical Review

Established 1921

25¢

CONTENTS

for November, 1931

Performance curves and schematics of following receivers:

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

SERVICE - ENGINEERING - SALES

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Radio Call Book Magazine

AND TECHNICAL REVIEW

Established 1921

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NOVEMBER, 1931

Vol. 12, No. 4

Table of Contents

Editorial

Letters from dealers, distributors, service men and engineers are beginning to appear in increasing numbers on the editor's desk, showing a keen interest in the content of the magazine now that it's appearing monthly. Dealer and distributor interest centers in the performance curves printed on ten standard receivers, by means of which dealers and distributors can not only select a line to handle, but may also use this same information in merchandising the performance and quality of a receiver to the public. Service men are particularly grateful for the schematics at the bottom of the curve pages because they thus secure information otherwise unobtainable for sometimes months. Naturally the engineers are glad to see their own designs as well as the designs of their contemporaries.

Any idea that the contents of our magazine was not carefully read was recently dispelled in the case of the article on page 45 of the October issue, where we told of service men having used a .00025 mfd fixed condenser for cutting down the tuning range on receivers to hear police calls. Eagle-eyed D. D. Israel, Chief Development Engineer of Crosley at Cincinnati, immediately wrote us suggesting that while this might work out on some receivers, it would not do so on those in which the wiring capacity exceeded 30 mmf. Originally we should have stated that the cop calls covered under the arrangement we mentioned included only the local stations on 1712 kc, and there only on such receivers as had a low minimum capacity consisting of the condenser's minimum and the wiring capacity. To cover police calls on the higher frequencies such as 2400 kc, it is not likely that even a 50 mmf fixed condenser in place of the .00025 would be satisfactory. Reference to police station assignments will give the reader an idea of frequencies occupied by these services, from which he may determine where such a tuning range change might be successful.

Now that the Federal Radio Commission is back from its vacation, it has issued its General Order No. 119, whose full scope of changes for February 1, 1932, is fully set forth in a 39-page mimeographed bulletin. However, we are not going to ask you to read 39 pages of material, so we have abridged the essentials into an article on page 47 of this number, showing what changes will be effective February 1, several of which will be of interest to designing engineers of the various receiver companies, particularly the addition of the 1550 kc visual sound track.—Editor.

Radio Service Men

Read My 2nd Big Offer

TO MAKE YOU

MORE MONEY

REMEMBER HOW, in 1928, my special offer on the Knapp "A" Power Kit enabled you to make money you could not otherwise have made? Well, here I am again in 1931—when profit-making troubles you more than ever—with an even finer money-maker for you. Right at this difficult time I have persuaded one of my affiliated industries to make you a proposition that is a sure winner.

DAVID W. KNAPP

With it you can mystify radio owners with the speed with which played-out condensers can be replaced. And you can mystify yourself with the profit you can make doing it!

No more waiting days and days for new condensers to come from the factory. No more having to put a whole flock of condensers in a set—just because one has gone bad.

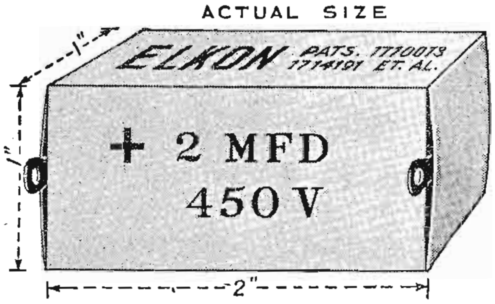
Thirty minutes after you diagnose the trouble, you have the set back in your customer's home. And your total replacement cost is a single, inexpensive, compact little Elkon condenser on which you can make a long profit both for material and labor.

Instead of replacing an entire condenser box you melt the pitch, remove the bad condenser, stick in a new Elkon, and replace the pitch.

ELKON CONDENSERS

NON-AQUEOUS HIGH VOLTAGE

ACTUAL SIZE



is the condenser all the best-known 1931 radio manufacturers are using. It is the most compact radio condenser ever made. Is noted for its low leakage and its excellent power factor.

I'm printing an actual size diagram of the 2MFD-450 Volt type. Notice how small it is. Then take my word as to how LARGE your profit can be if you will mail the money-making coupon.

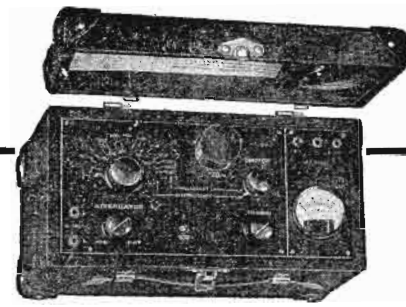
Don't fail to get the details of this offer. The coupon brings them at no expense to you.

MAIL THIS ☞

Elkon Division
P. R. MALLORY CO., Inc.
1131 Call St.
Indianapolis, Ind.

Please mail me the details of Mr. Knapp's money-making offer for Radio Service Men.

NAME . . . .
ADDRESS . . . .
CITY & STATE . . . .



Readrite

No. 550

OSCILLATOR

(Licensed by A. T. & T. Co.)

$18 Net to Dealer $30 List **$21** Net to Dealer With Output Meter

If not at your Jobbers we will ship direct when remittance accompanies order.

A sturdy modulated instrument, carefully made. Completely shielded with separate battery compartment. Furnished with 22½ v. and 3 volt batteries. Uses one '30 tube. Covers broadcast band (550-1500 k.c.) and intermediate band (120-185 k.c.). Operating instructions attached in case cover with shielded wire leads. Very compact. In leatherette case 6 x 11½ x 5½". Weighs but 8 pounds. Built to high standards.

Every serviceman should have the No. 550 Oscillator to align r.f. gang condensers, locate defective r.f. transformers, adjust i.f. transformers, check oscillator stage and determine sensitivity of a receiver. A necessary instrument. Get yours today.

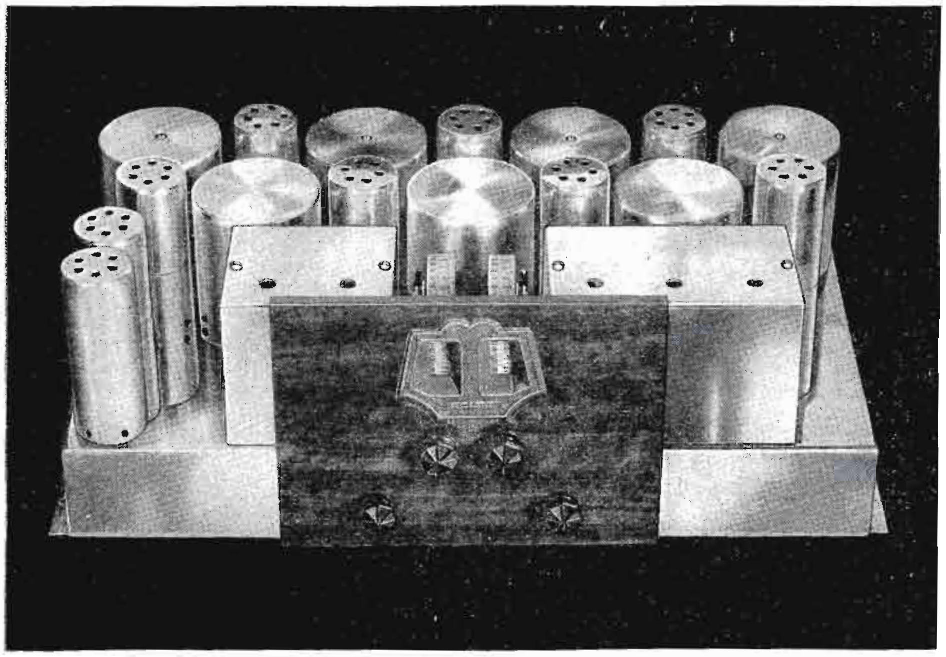
Write for Catalog of Servicing Instruments

READRITE METER WORKS

Established 1904

10 College Avenue BLUFFTON, OHIO

Why be satisfied with less than 'Round the World Reception?



There is a new thrill in Radio—the thrill of actually tuning in the other side of the world—Japan, Indo-China, France, England, Australia, Germany and South America. Not code, but voice, music and song, loud and clear—often so perfect that its quality matches the finest nearby domestic stations. Such is the daily service being given by Scott All-Wave Receivers located in all parts of the country and operating under all sorts of conditions. And the tone of the Scott All-Wave is *naturalness* itself. Think of it! England and Japan, thousands of miles away from each other, yet only a quarter inch apart on the dial of the Scott All-Wave. A fractional turn of the tuning control and either is yours to listen to with an abundance of loud speaker volume. Unbelievable? Read the letters reproduced below. They are but a few of the hundreds received!

The truly amazing performance of which the Scott All-Wave is capable is the natural result of combining advanced design and precision engineering. The system of amplification employed in this receiver is far in advance of any other—and the Scott All-Wave is built in the laboratory, by laboratory experts to laboratory standards so that its advanced design is taken fullest advantage of. Each receiver is tested, before shipment, on reception from either 12RO, Rome, 5SGW, Chelmsford, England, or VK3ME, Melbourne, Australia.

Why be satisfied with less than a Scott All-Wave can give you? The price of this receiver is remarkably low. Mail the coupon for full particulars.

Read What Scott All-Wave Owners Say About This Great Receiver

England on an indoor aerial . . .
"London, England, comes in with great volume on an indoor aerial, which I have to use on account of static. Can get all the volume I want with the volume control turned up most of the time only one-quarter."
—*W. J. McD., Intervale, N. H.*

'Round the world . . .
"Have heard 'Big Ben' strike midnight in London; Grand Opera from Rome; the 'Marseillaise' played in France and at 8:30 a. m. have heard the laughing Jack-ass from VK2ME at Sydney, Australia."
—*C. L. B., Chicago, Illinois*

China, too . . .
"Static conditions have been extremely bad this Summer. However, we have been getting regular reception on G5SW at Chelmsford, England, 12RO at Rome, Italy, F3ICD, Indo-China, and VK3ME at Melbourne, Australia."—*S. F. S., Lock, Utah.*

Paris for 3 hours . . .
"Yesterday I tuned in station FYA at Paris and received them for three hours with considerably more volume than Rome; El Prado, Ecuador, comes in very clear and loud every Thursday evening."
—*S. O. K., Tuskegee, Alabama*

Records Australia . . .
"Last Saturday night I received VK2ME, Sydney, Australia, loud enough to make a recording on my home recorder. It certainly gave me a great thrill to hear the announcer say, 'The time is now 20 minutes to 4, Sunday afternoon' when it was 20 minutes to 12 Saturday night here."
—*J. R. C., Highland, Mass.*

Germany to Australia . . .
"I hear England, France, Italy, daily while Ecuador, Colombia, Honduras and Germany and Manila come in quite often. VK2ME at Sydney, Australia, comes in very well."
—*J. M. B., Wierton, West Virginia*

Austria . . .
"I have tuned in VK3ME at Melbourne with enough volume to be heard across the street. I listened last evening to France, Italy, Austria, as well as G5SW in England and several other European stations. The SCOTT is all you claim and then some."
—*R. N. B., Fullerton, Penna.*

E. H. SCOTT RADIO LABORATORIES, INC., 4450 Ravenswood Ave., Dept. CB11, Chicago
(Formerly Scott Transformer Co.)

The SCOTT
ALL-WAVE
15-550 METER SUPERHETERODYNE

Clip------------------------

E. H. SCOTT RADIO LABORATORIES, INC.
(Formerly Scott Transformer Co.)
4450 Ravenswood Ave., Dept. CB11, Chicago, Ill.

Send me full particulars of the Scott All-Wave.

Name..............................

Street..............................

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

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.

KFGQ
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., W. E. Whitmore, 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., 5000 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.

KMPC
1120 kc, Inglewood, Calif., Dalton's, Inc., 500 w, P.

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, 50 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
830kc, 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, 20000 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, KSEI Broadcasting Assn., 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, Tuscon, 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., 5000 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, American Insurance Union, 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, 1500 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., Jordan & Burk, 500 w, E.

WCSH
940 kc, Portland, Me., Congress Square Hotel Co., 1000 kc, 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 Broadcatsing 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.

WDWF
1210 kc, Providence, R. I., Dutee W. Flint and The Lincoln Studios, 100 w, E.

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
1200 kc, Emory, Va., Emory and Henry College, 100 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
600 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 & 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., 20 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, Berrien Springs, 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, 1250 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 WDWF.

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., Macon Junior Chamber of Commerce, 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.

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.

WOBT
1310 kc, Union City, Tenn., Sun Publishing Co., 100 w, C.

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, 25 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, Poughkeepsie, 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.

WPSC
1230 kc, State College, Pa., Pennsylvania State College, 500 w, day, E.

WPTF
680 kc, Raleigh, N. C., Durham Life Insurance Co., 1,000 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, 50 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., Woodruff Furniture Co., 10 w, C.

WRBL
1200 kc, Columbus, Ga., David Parmer, 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.

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.

WWJ
920 kc, Detroit, Mich., Evening News Assn., 1000 w, E.

WWL
850 kc, New Orleans, La., Loyola University, 5000 w, C.

WWNC
570 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.

Consolidated Broadcast List

Call Town

KABC—San Antonio, Tex.
KBPS—Portland, Ore.
KBTM—Paragould, Ark.
KCRC—Enid, Okla.
KCRJ—Jerome, Ariz.
KDB—Santa Barbara, Calif.
KDFN—Casper, Wyo.
KDKA—Pittsburgh, Pa.
KDLR—Devils Lake, N. D.
KDYL—Salt Lake City, Utah
KECA—Los Angeles, Calif.
KELW—Burbank, Calif.
KEX—Portland, Ore.
KFAB—Lincoln, Neb.
KFAC—Los Angeles, Calif.
KFBB—Great Falls, Mont.
KFBK—Sacramento, Calif.
KFBL—Everett, Wash.
KFDM—Beaumont, Tex.
KFDY—Brookings, S. D.
KFEL—Denver, Colo.
KFEQ—St. Joseph, Mo.
KFGQ—Boone, Iowa
KFH—Wichita, Kans.
KFI—Los Angeles, Calif.
KFIO—Spokane, Wash.
KFIU—Juneau, Alaska
KFIZ—Fond du Lac, Wis.
KFJB—Marshalltown, Iowa
KFJF—Oklahoma City, Okla.
KFJI—Astoria, Ore.
KFJM—Grand Forks, N. D.
KFJR—Portland, Ore.
KFJY—Fort Dodge, Ia.
KFJZ—Fort Worth, Tex.
KFKA—Greeley, Colo.
KFKB—Milford, Kans.
KFKU—Lawrence, Kans.
KFKX—Chicago, Ill.
KFLV—Rockford, Ill.
KFLX—Galveston, Tex.
KFMX—Northfield, Minn.
KFNF—Shenandoah, Iowa.
KFOR—Lincoln, Neb.
KFOX—Long Beach, Calif.
KFPL—Dublin, Tex.
KFPM—Greenville, Tex.
KFPW—Ft. Smith, Ark.
KFPY—Spokane, Wash.
KFQD—Anchorage, Alaska
KFQU—Holy City, Calif.
KFQW—Seattle, Wash.
KFRC—San Francisco, Calif.
KFRU—Columbia, Mo.
KFSD—San Diego, Calif.
KFSG—Los Angeles, Calif.
KFUL—Galveston, Tex.
KFUO—St. Louis, Mo.
KFUP—Denver, Colo.
KFVD—Culver City, Calif.
KFVS—Cape Girardeau, Mo.
KFWB—Hollywood, Calif.
KFWF—St. Louis, Mo.
KFWI—San Francisco, Calif.
KFXD—Nampa, Idaho
KFXF—Denver, Colo.
KFXJ—Edgewater, Colo.
KFXM—San Bernardino, Calif.
KFXR—Oklahoma City, Okla.
KFXY—Flagstaff, Ariz.
KFYO—Abilene, Tex.
KFYR—Bismarck, N. D.
KGA—Spokane, Wash.
KGAR—Tucson, Ariz.
KGB—San Diego, Calif.
KGBU—Ketchikan, Alaska
KGBX—St. Joseph, Mo.
KGBZ—York, Neb.
KGCA—Decorah, Ia.
KGCR—Watertown, S. D.
KGCU—Mandan, N. D.
KGCX—Wolf Point, Mont.
KGDA—Mitchell, S. D.
KGDE—Fergus Falls, Minn.
KGDM—Stockton, Calif.
KGDY—Huron, S. D.
KGEF—Los Angeles, Calif.
KGEK—Yuma, Colo.
KGER—Long Beach, Calif.
KGEW—Fort Morgan, Colo.
KGEZ—Kalispell, Mont.
KGFF—Alva, Okla.
KGFG—Oklahoma City, Okla.
KGFI—Corpus Christi, Tex.
KGFJ—Los Angeles, Calif.
KGFK—Moorhead, Minn.
KGFL—Raton, N. M.
KGFW—Ravenna, Neb.
KGFX—Pierre, S. D.
KGGC—San Francisco, Calif.
KGGF—So. Coffeyville, Okla.
KGGM—Albuquerque, N. M.
KGHF—Pueblo, Colo.
KGHI—Little Rock, Ark.
KGHL—Billings, Mont.
KGIQ—Twin Falls, Idaho
KGIR—Butte, Mont.
KGIW—Trinidad, Colo.
KGIX—Las Vegas, Nev.
KGIZ—Grant City, Mo.
KGJF—Little Rock, Ark.
KGKB—Brownwood, Tex.
KGKL—San Angelo, Tex.
KGKO—Wichita Falls, Tex.
KGKX—Sandpoint, Idaho
KGKY—Scottsbluff, Nebr.
KGMB—Honolulu, Hawaii
KGMP—Elk City, Okla.
KGNF—North Platte, Nebr.
KGNO—Dodge City, Kans.
KGO—San Francisco, Calif.
KGRS—Amarillo, Tex.
KGU—Honolulu, T. H.
KGVO—Missoula, Mont.
KGW—Portland, Ore.
KGY—Lacey, Wash.
KHJ—Los Angeles, Calif.
KHQ—Spokane, Wash.

Call Town

KICK—Red Oak, Ia.
KID—Idaho Falls, Idaho
KIDO—Boise, Idaho
KIT—Yakima, Wash.
KJBS—San Francisco, Calif.
KJR—Seattle, Wash.
KLCN—Blytheville, Ark.
KLO—Ogden, Utah
KLPM—Minot, N. D.
KLRA—Little Rock, Ark.
KLS—Oakland, Calif.
KLX—Oakland, Calif.
KLZ—Denver, Colo.
KMA—Shenandoah, Ia.
KMAC—San Antonio, Tex.
KMBC—Kansas City, Mo.
KMED—Medford, Ore.
KMJ—Fresno, Calif.
KMLB—Monroe, La.
KMMJ—Clay Center, Neb.
KMO—Tacoma, Wash.
KMOX—St. Louis, Mo.
KMPC—Beverly Hills, Calif.
KMTR—Los Angeles, Calif.
KNX—Hollywood, Calif.
KOA—Denver, Colo.
KOAC—Corvallis, Ore.
KOB—State College, N. M.
KOCW—Chickasha, Okla.
KOH—Reno, Nev.
KOIL—Council Bluffs, Ia.
KOIN—Portland, Ore.
KOL—Seattle, Wash.
KOMO—Seattle, Wash.
KONO—San Antonio, Tex.
KOOS—Marshfield, Ore.
KORE—Eugene, Ore.
KOY—Phoenix, Ariz.
KPCB—Seattle, Wash.
KPJM—Prescott, Ariz.
KPO—San Francisco, Calif.
KPOF—Denver, Colo.
KPPC—Pasadena, Calif.
KPQ—Wenatchee, Wash.
KPRC—Houston, Tex.
KQV—Pittsburgh, Pa.
KQW—San Jose, Calif.
KRE—Berkeley, Calif.
KREG—Santa Ana, Calif.
KRGV—Harlingen, Tex.
KRLD—Dallas, Tex.
KRMD—Shreveport, La.
KROW—Oakland, Calif.
KRSC—Seattle, Wash.
KSAC—Manhattan, Kans.
KSCJ—Sioux City, Ia.
KSD—St. Louis, Mo.
KSEI—Pocatello, Idaho
KSL—Salt Lake City, Utah
KSMR—Santa Maria, Calif.
KSO—Clarinda, Ia.
KSOO—Sioux Falls, S. D.
KSTP—St. Paul, Minn.
KTAB—San Francisco, Calif.
KTAR—Phoenix, Ariz.
KTAT—Ft. Worth, Tex.
KTBR—Portland, Ore.
KTBS—Shreveport, La.
KTFI—Twin Falls, Idaho
KTHS—Hot Springs, Ark.
KTLC—Houston, Tex.
KTM—Los Angeles, Calif.
KTRH—Houston, Tex.
KTSA—San Antonio, Tex.
KTSL—Shreveport, La.
KTSM—El Paso, Tex.
KTW—Seattle, Wash.
KUJ—Longview, Wash.
KUOA—Fayetteville, Ark.
KUSD—Vermillion, S. D.
KUT—Austin, Tex.
KVI—Tacoma, Wash.
KVL—Seattle, Wash.
KVOA—Tucson, Ariz.
KVOO—Tulsa, Okla.
KVOR—Colorado Springs, Colo.
KVOS—Bellingham, Wash.
KWCR—Cedar Rapids, Ia.
KWEA—Shreveport, La.
KWG—Stockton, Cal.
KWJJ—Portland, Ore.
KWK—St. Louis, Mo.
KWKC—Kansas City, Mo.
KWKH—Shreveport, La.
KWLC—Decorah, Ia.
KWSC—Pullman, Wash.
KWWG—Brownsville, Tex.
KXA—Seattle, Wash.
KXL—Portland, Ore.
KXO—El Centro, Calif.
KXRO—Aberdeen, Wash.
KXYZ—Houston, Tex.
KYA—San Francisco, Calif.
KYW—Chicago, Ill.
WAAB—Quincy, Mass.
WAAF—Chicago, Ill.
WAAM—Newark, N. J.
WAAT—Jersey City, N. J.
WAAW—Omaha, Neb.
WABC—New York City, N. Y.
WABI—Bangor, Me.
WABO—Rochester, N. Y.
WABZ—New Orleans, La.
WACO—Waco, Tex.
WADC—Tallmadge, Ohio
WAGM—Mars Hill, Me.
WAIU—Columbus, Ohio
WALR—Zanesville, Ohio
WAPI—Birmingham, Ala.
WASH—Grand Rapids, Mich.
WAWZ—New York, N. Y.
WBAA—Lafayette, Ind.
WBAK—Harrisburg, Pa.
WBAL—Baltimore, Md.
WBAP—Fort Worth, Tex.
WBAX—Wilkes-Barre, Pa.

Call Town

WBBC—Brooklyn, N. Y.
WBBL—Richmond, Va.
WBBM—Chicago, Ill.
WBBR—Brooklyn, N. Y.
WBBZ—Ponca City, Okla.
WBCM—Bay City, Mich.
WBCN—Chicago, Ill.
WBEN—Buffalo, N. Y.
WBEO—Marquette, Mich.
WBGF—Glens Falls, N. Y.
WBHS—Huntsville, Ala.
WBIG—Greensboro, N. C.
WBIS—Boston, Mass.
WBMS—Hackensack, N. J.
WBNX—New York, N. Y.
WBOQ—New York, N. Y.
WBOW—Terre Haute, Ind.
WBRC—Birmingham, Ala.
WBRE—Wilkes-Barre, Pa.
WBSO—Needham, Mass.
WBT—Charlotte, N. C.
WBTM—Danville, Va.
WBZ—Boston, Mass.
WBZA—Springfield, Mass.
WCAC—Storrs, Conn.
WCAD—Canton, N. Y.
WCAE—Pittsburgh, Pa.
WCAH—Columbus, Ohio
WCAJ—Lincoln, Neb.
WCAL—Northfield, Minn.
WCAM—Camden, N. J.
WCAO—Baltimore, Md.
WCAP—Asbury Park, N. J.
WCAT—Rapid City, S. D.
WCAU—Philadelphia, Pa.
WCAX—Burlington, Vt.
WCAZ—Carthage, Ill.
WCBA—Allentown, Pa.
WCBD—Zion, Ill.
WCBM—Baltimore, Md.
WCBS—Springfield, Ill.
WCCO—Minneapolis, Minn.
WCDA—New York, N. Y.
WCFL—Chicago, Ill.
WCGU—Brooklyn, N. Y.
WCHI—Chicago, Ill.
WCKY—Covington, Ky.
WCLB—Long Beach, N. Y.
WCLO—Janesville, Wis.
WCLS—Joliet, Ill.
WCMA—Culver, Ind.
WCOA—Pensacola, Fla.
WCOC—Meridian, Miss.
WCOD—Harrisburg, Pa.
WCOH—Yonkers, N. Y.
WCRW—Chicago, Ill.
WCSC—Charleston, S. C.
WCSH—Portland, Me.
WDAE—Tampa, Fla.
WDAF—Kansas City, Mo.
WDAG—Amarillo, Tex.
WDAH—El Paso, Tex.
WDAY—Fargo, N. D.
WDBJ—Roanoke, Va.
WDBO—Orlando, Fla.
WDEL—Wilmington, Del.
WDEV—Waterbury, Vt.
WDGY—Minneapolis, Minn.
WDIX—Tupelo, Miss.
WDOD—Chattanooga, Tenn.
WDRC—Hartford, Conn.
WDSU—New Orleans, La.
WDWF—Providence, R. I.
WDZ—Tuscola, Ill.
WEAF—New York, N. Y.
WEAI—Ithaca, N. Y.
WEAN—Providence, R. I.
WEAO—Columbus, Ohio
WEBC—Superior, Wis.
WEBQ—Harrisburg, Ill.
WEBR—Buffalo, N. Y.
WEDC—Chicago, Ill.
WEDH—Erie, Pa.
WEEI—Boston, Mass.
WEEU—Reading, Pa.
WEHC—Emory, Va.
WEHS—Evanston, Ill.
WELK—Philadelphia, Pa.
WELL—Battle Creek, Mich.
WENR—Chicago, Ill.
WEPS—Worcester, Mass.
WEVD—New York, N. Y.
WEW—St. Louis, Mo.
WEXL—Royal Oak, Mich.
WFAA—Dallas, Tex.
WFAM—La Porte, Ind.
WFAN—Philadelphia, Pa.
WFBC—Knoxville, Tenn.
WFBE—Cincinnati, Ohio
WFBG—Altoona, Pa.
WFBL—Syracuse, N. Y.
WFBM—Indianapolis, Ind.
WFBR—Baltimore, Md.
WFDF—Flint, Mich.
WFDV—Rome, Ga.
WFDW—Talladega, Ala.
WFEA—Manchester, N. H.
WFI—Philadelphia, Pa.
WFIW—Hopkinsville, Ky.
WFLA—Clearwater, Fla.
WFOX—Brooklyn, N. Y.
WGAL—Lancaster, Pa.
WGAR—Cleveland, Ohio
WGBB—Freeport, N. Y.
WGBC—Memphis, Tenn.
WGBF—Evansville, Ind.
WGBI—Scranton, Pa.
WGBS—New York, N. Y.
WGCM—Gulfport, Miss.
WGCP—Newark, N. J.
WGES—Chicago, Ill.
WGH—Newport News, Va.
WGL—Fort Wayne, Ind.
WGMS—Minneapolis, Minn.
WGN—Chicago, Ill.
WGR—Buffalo, N. Y.
WGST—Atlanta, Ga.

Call Town

WGY—Schenectady, N. Y.
WHA—Madison, Wis.
WHAD—Milwaukee, Wis.
WHAM—Rochester, N. Y.
WHAP—New York, N. Y.
WHAS—Louisville, Ky.
WHAT—Philadelphia, Pa.
WHAZ—Troy, N. Y.
WHB—Kansas City, Mo.
WHBC—Canton, Ohio
WHBD—Mt. Orab, Ohio
WHBF—Rock Island, Ill.
WHBL—Sheboygan, Wis.
WHBQ—Memphis, Tenn.
WHBU—Anderson, Ind.
WHBY—Green Bay, Wis.
WHDF—Calumet, Mich.
WHDH—Boston, Mass.
WHDI—Minneapolis, Minn.
WHDL—Tupper Lake, N. Y.
WHEC—Rochester, N. Y.
WHFC—Cicero, Ill.
WHIS—Bluefield, W. Va.
WHK—Cleveland, Ohio
WHN—New York, N. Y.
WHO—Des Moines, Iowa
WHOM—Jersey City, N. J.
WHP—Harrisburg, Pa.
WIAS—Ottumwa, Ia.
WIBA—Madison, Wis.
WIBG—Elkins Park, Pa.
WIBM—Jackson, Mich.
WIBO—Chicago, Ill.
WIBR—Steubenville, Ohio
WIBU—Poynette, Wis.
WIBW—Topeka, Kans.
WIBX—Utica, N. Y.
WICC—Bridgeport, Conn.
WIL—St. Louis, Mo.
WILL—Urbana, Ill.
WILM—Wilmington, Del.
WIOD—Miami, Fla.
WIP—Philadelphia, Pa.
WIS—Columbia, S. C.
WISJ—South Madison, Wis.
WISN—Milwaukee, Wis.
WJAC—Johnstown, Pa.
WJAG—Norfolk, Neb.
WJAK—Marion, Ind.
WJAR—Providence, R. I.
WJAS—Pittsburgh, Pa.
WJAX—Jacksonville, Fla.
WJAY—Cleveland, Ohio
WJAZ—Chicago, Ill.
WJBC—LaSalle, Ill.
WJBI—Red Bank, N. J.
WJBK—Highland Park, Mich.
WJBL—Decatur, Ill.
WJBO—New Orleans, La.
WJBT—Chicago, Ill.
WJBU—Lewisburg, Pa.
WJBW—New Orleans, La.
WJBY—Gadsden, Ala.
WJDX—Jackson, Miss.
WJJD—Chicago, Ill.
WJKS—Gary, Ind.
WJMS—Ironwood, Mich.
WJR—Detroit, Mich.
WJSV—Alexandria, Va.
WJTL—Oglethorpe University, Ga.
WJW—Mansfield, Ohio
WJZ—New York, N. Y.
WKAQ—San Juan, P. R.
WKAR—E. Lansing, Mich.
WKAV—Laconia, N. H.
WKBB—Joliet, Ill.
WKBC—Birmingham, Ala.
WKBF—Indianapolis, Ind.
WKBH—La Crosse, Wis.
WKBI—Chicago, Ill.
WKBN—Youngstown, Ohio
WKBO—Jersey City, N. J.
WKBS—Galesburg, Ill.
WKBV—Connersville, Ind.
WKBW—Buffalo, N. Y.
WKBZ—Ludington, Mich.
WKJC—Lancaster Pa.
WKRC—Cincinnati, Ohio
WKY—Oklahoma City, Okla.
WKZO—Berrien Springs, Mich.
WLAC—Nashville, Tenn.
WLAP—Louisville, Ky.
WLB—Minneapolis, Minn.
WLBC—Muncie, Ind.
WLBF—Kansas City, Kans.
WLBG—Petersburg, Va.
WLBL—Stevens Point, Wis.
WLBW—Oil City, Pa.
WLBX—Long Island City, N. Y.
WLBZ—Bangor, Me.
WLCI—Ithaca, N. Y.
WLEY—Lexington, Mass.
WLIB—Chicago, Ill.
WLIT—Philadelphia, Pa.
WLOE—Boston, Mass.
WLS—Chicago, Ill.
WLSI—Providence, R. I.
WLTH—Brooklyn, N. Y.
WLVA—Lynchburg, Va.
WLW—Cincinnati, Ohio
WLWL—New York, N. Y.
WMAC—Syracuse, N. Y.
WMAK—Buffalo, N. Y.
WMAL—Washington, D. C.
WMAQ—Chicago, Ill.
WMAZ—Macon, Ga.
WMBA—Newport, R. I.
WMBC—Detroit, Mich.
WMBD—Peoria Heights, Ill.
WMBF—Miami, Fla.
WMBG—Richmond, Va.
WMBH—Joplin, Mo.
WMBI—Chicago, Ill.
WMBJ—Wilkinsburg, Pa.
WMBO—Auburn, N. Y.

Call Town

WMBQ—Brooklyn, N. Y.
WMBR—Tampa, Fla.
WMC—Memphis, Tenn.
WMCA—New York, N. Y.
WMMN—Fairmont, W. Va.
WMPC—Lapeer, Mich.
WMRJ—Jamaica, N. Y.
WMSG—New York, N. Y.
WMT—Waterloo, Ia.
WNAC—Boston, Mass.
WNAD—Norman, Okla.
WNAX—Yankton, S. D.
WNBF—Binghamton, N. Y.
WNBH—New Bedford, Mass.
WNBO—Silver Haven, Pa.
WNBR—Memphis, Tenn.
WNBW—Carbondale, Pa.
WNBX—Springfield, Vt.
WNBZ—Saranac Lake, N. Y.
WNJ—Newark, N. J.
WNOX—Knoxville, Tenn.
WNYC—New York, N. Y.
WOAI—San Antonio, Tex.
WOAN—Memphis, Tenn.
WOAX—Trenton, N. J.
WOBT—Union City, Tenn.
WOBU—Charleston, W. Va.
WOC—Davenport, Ia.
WOCL—Jamestown, N. Y.
WODA—Paterson, N. J.
WODX—Mobile, Ala.
WOI—Ames, Ia.
WOKO—Poughkeepsie, N. Y.
WOL—Washington, D. C.
WOMT—Manitowoc, Wis.
WOOD—Grand Rapids, Mich.
WOPI—Bristol, Tenn.
WOQ—Kansas City, Mo.
WOR—Newark, N. J.
WORC—Worcester, Mass.
WOS—Jefferson City, Mo.
WOV—New York, N. Y.
WOW—Omaha, Neb.
WOWO—Ft. Wayne, Ind.
WPAD—Paducah, Ky.
WPAP—New York, N. Y.
WPAW—Pawtucket, R. I.
WPCC—Chicago, Ill.
WPCH—New York, N. Y.
WPEN—Philadelphia, Pa.
WPG—Atlantic City, N. J.
WPOE—Patchogue, N. Y.
WPOR—Norfolk, Va.
WPSC—State College, Pa.
WPTF—Raleigh, N. C.
WQAM—Miami, Fla.
WQAN—Scranton, Pa.
WQAO—New York, N. Y.
WQBC—Vicksburg, Miss.
WQDM—St. Albans, Vt.
WQDX—Thomasville, Ga.
WRAK—Williamsport, Pa.
WRAM—Wilmington, N. C.
WRAW—Reading, Pa.
WRAX—Philadelphia, Pa.
WRBJ—Hattiesburg, Miss.
WRBL—Columbus, Ga.
WRBQ—Greenville, Miss.
WRBX—Roanoke, Va.
WRC—Washington, D. C.
WRDO—Augusta, Me.
WRDW—Augusta, Ga.
WREC—Memphis, Tenn.
WREN—Lawrence, Kans.
WRHM—Minneapolis, Minn.
WRJN—Racine, Wis.
WRNY—New York, N. Y.
WROL—Knoxville, Tenn.
WRR—Dallas, Tex.
WRUF—Gainesville, Fla.
WRVA—Richmond, Va.
WSAI—Cincinnati, Ohio
WSAJ—Grove City, Pa.
WSAN—Allentown, Pa.
WSAR—Fall River, Mass.
WSAZ—Huntington, W. Va.
WSB—Atlanta, Ga.
WSBC—Chicago, Ill.
WSBT—South Bend, Ind.
WSEN—Columbus, Ohio
WSFA—Montgomery, Ala.
WSIX—Springfield, Tenn.
WSJS—Winston-Salem, N. C.
WSM—Nashville, Tenn.
WSMB—New Orleans, La.
WSMK—Dayton, Ohio
WSOC—Gastonia, N. C.
WSPA—Spartanburg, S. C.
WSPD—Toledo, Ohio
WSUI—Iowa City, Ia.
WSUN—Clearwater, Fla.
WSVS—Buffalo, N. Y.
WSYB—Rutland, Vt.
WSYR—Syracuse, N. Y.
WTAD—Quincy, Ill.
WTAG—Worcester, Mass.
WTAM—Cleveland, Ohio
WTAQ—Eau Claire, Wis.
WTAR—Norfolk, Va.
WTAW—College Station, Tex.
WTAX—Springfield, Ill.
WTBO—Cumberland, Md.
WTEL—Philadelphia, Pa.
WTFI—Toccoa, Ga.
WTIC—Hartford, Conn.
WTMJ—Milwaukee, Wis.
WTNT—Nashville, Tenn.
WTOC—Savannah, Ga.
WWAE—Hammond, Ind.
WWJ—Detroit, Mich.
WWL—New Orleans, La.
WWNC—Asheville, N. C.
WWRL—Woodside, N. Y.
WWSV—Pittsburgh, Pa.
WWVA—Wheeling, W. Va.
WXYZ—Detroit, Mich.

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, WGBS

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:
WJAR, 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

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, WEHC, WEPS, KMLB, KGFJ, KWG

1210 Kilocycles, 247.8 Meters—Canadian Shared:
WJBI, WGBB, WCOH, WOCL, WLCI, WPAW, WDWF, WLSI, WJW, WBAX, WJBU, WMBG, WSIX, WJBY, WRBQ, WGCM, KWEA, KDLR, KGCR, KFOR, WHBU, KFVS, WEBQ, WQDX, 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, WXYZ

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, WGAL, WSAJ, WBRE, WKBC, WOBT, 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

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, KFXY, 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

LIST OF POLICE BROADCASTING STATIONS

Call	Kilocycles	Meters	Location
WPDO	2,458	122.05	Akron, Ohio
WPDN	1,712	175.23	Auburn, N. Y.
KGPJ	1,712	175.23	Beaumont, Tex.
KSW	2,410	124.50	Berkeley, Calif.
WRDU	1,596	187.97	Brooklyn, N. Y.
WMJ	2,422	123.86	Buffalo, N. Y.
WBR	257	1,165.00	Butler, Pa.
KGOZ	2,470	121.50	Cedar Rapids, Iowa
WPDV	2,458	122.05	Charlotte, N. C.
WPDB	1,712	175.23	Chicago, Ill.
WPDC	1,712	175.23	Chicago, Ill.
WPDD	1,712	175.23	Chicago, Ill.
WKDU	1,712	175.23	Cincinnati, Ohio
WRBH	2,452	122.34	Cleveland, Ohio
KVP	1,712	175.23	Dallas, Tex.
KGPN	2,470	121.50	Davenport, Iowa
WKDT	1,596	187.97	Detroit, Mich.
WCK	2,410	124.50	Detroit, Mich.
WPDX	2,410	124.50	Detroit, Mich.
KGPF	2,416	124.17	El Paso, Tex.
WPDF	2,440	123.00	Flint, Mich.
WPDZ	2,470	121.50	Fort Wayne, Ind.
WPEB	2,440	123.00	Grand Rapids, Mich.
WJL	257	1,165.00	Greensburg, Pa.
WRDR	2,410	124.50	Grosse Point Village, Mich.
WBA	257	1,165.00	Harrisburg, Pa.
WMO	2,410	124.50	Highland Park, Mich.
WMDZ	2,440	123.00	Indianapolis, Ind.
WRDS	1,662	180.51	Ingham, Mich.
KGPE	2,422	123.86	Kansas City, Mo.
WPDT	2,470	121.50	Kokomo, Ind.
WPDL	2,440	123.00	Lansing, Mich.
KGPL	1,712	175.23	Los Angeles, Calif.
WPDE	2,440	123.00	Louisville, Ky.
WPEC	2,470	121.50	Memphis, Tenn.
WNDA	2,440	123.00	Miami, Fla.
WPDK	2,452	122.34	Milwaukee, Wis.
KGPB	2,416	124.17	Minneapolis, Minn.
WPY	438	685.00	New York, N. Y.
WPY	500	600.00	New York, N. Y.
KGPH	2,452	122.34	Oklahoma City, Okla.
KGPI	2,470	121.50	Omaha, Neb.
KGJX	1,712	175.23	Pasadena, Calif.
WPDJ	2,416	124.17	Passaic, N. J.
WPDP	2,440	123.00	Philadelphia, Pa.
WPDU	1,712	175.23	Pittsburgh, Pa.
KGPP	2,452	122.34	Portland, Ore.
WPDH	2,416	124.17	Richmond, Va.
WPDR	1,712	175.23	Rochester, N. Y.
KGPC	1,712	175.23	St. Louis, Mo.
WPDS	2,416	124.17	St. Paul, Minn.
WPDM	2,440	123.00	St. Petersburg, Fla.
KGOY	1,712	175.23	San Antonio, Tex.
KGPD	1,596	187.97	San Francisco, Calif.
KGPD	2,410	124.50	San Francisco, Calif.
KGPM	2,410	124.50	San Jose, Calif.
KGPA	1,596	187.97	Seattle, Wash.
KGPK	2,470	121.50	Sioux City, Iowa
WPEA	1,712	175.23	Syracuse, N. Y.
WRDQ	2,470	121.50	Toledo, Ohio
WPDA	2,416	124.17	Tulare, Calif.
KGPO	2,452	122.35	Tulsa, Okla.
KGPG	2,410	124.50	Vallejo, Calif.
WPGW	2,410	124.50	Washington, D. C.
WDX	257	1,165.00	Wyoming, Pa.
WPDG	2,458	122.05	Youngstown, Ohio

U. S. VISUAL BROADCASTING STATIONS

Call	Kilocycles	Meters	Owner
1XAV	2,850	105.30	Short Wave & Television, Boston, Mass.
W2XAB	2,750	109.10	Atlantic Broadcasting, New York, N. Y.
W2XBC	2,750	109.10	United Research Corp., Long Island City, N. Y.
W2XBU	2,000	150.00	Harold E. Smith, Beacon, N. Y.
W2XCD	2,000	150.00	DeForest Radio Co., Passaic, N. J.
W2XCR	2,100	142.90	Jenkins Television, Jersey City, N. J.
W2XCR	2,000	150.00	Jenkins Television, Jersey City, N. J.
W2XCW	2,100	142.90	General Electric, Schenectady, N. Y.
W2XDA	1,544	194.30	Atlantic Broadcasting, New York, N. Y.
W2XR	2,850	105.30	Radio Pictures, Inc., Long Island City, N. Y.
W3XAD	43,000	6.97	RCA-Victor, Camden, N. J.
W3XAD	48,500	6.18	RCA-Victor, Camden, N. J.
W3XAD	60,000	5.00	RCA-Victor, Camden, N. J.
W3XAD	2,100	142.90	RCA-Victor, Camden, N. J.
W3XK	2,000	150.00	Jenkins Laboratories, Wheaton, Md.
W6XS	2,100	142.90	Don Lee, Inc., Los Angeles, Calif.
W8XAV	2,100	142.90	Westinghouse, East Pittsburgh, Pa.
W9XAA	2,750	109.10	Federation of Labor, Chicago, Ill.
W9XAB	1,564	191.82	Federation of Labor, Chicago, Ill.
W9XAO	2,000	150.00	Western Television Corp., Chicago, Ill.
W9XAP	2,100	142.90	Daily News, Chicago, Ill.
W9XD	43,000	6.97	Journal Company, Milwaukee, Wis.
W9XD	48,500	6.18	Journal Co., Milwaukee, Wis.
W9XD	60,000	6.00	Journal Co., Milwaukee, Wis.
W9XG	2,750	109.10	Purdue University, W. Lafayette, Ind.
W9XR	2,850	105.30	Great Lakes Broadcasting, Chicago, Ill.

U. S. RELAY BROADCASTING STATIONS

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

ALGERIA

Call	Location	Kc.
......	Algiers	824

ARGENTINA

Call	Location	Kc.
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
J2	Concordia	1327
LV2	Cordoba	911
LT7	General Pico	...
LT2	La Plata	685
LV3	Los Molinos	...
LT4	Mendoza	759
LT5	Parana	1249
LT3	Rosario	1090
LV5	Rosario	1369
LV6	Rosario	1079
LT6	San Juan	730
LP2	Villaguay	1140

AUSTRALIA

Call	Location	Kc.
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

Call	Location	Kc.
......	Graz	851
......	Innsbruck	1058
......	Innsbruck	1376
......	Klagenfurt	662
......	Linz	1220
......	Vienna	581

BELGIUM

Call	Location	Kc.
EB4ED	Antwerp	1200
EB4GT	Bruxells	1150
ON4RB	Bruxells	590
EB4RC	Bruxells	1395
EB4FO	Bruxells	1305
EB4CE	Chatelineau	1365
EB4FG	Dampremy	1430
EB4RG	Gand	1090
EB4RW	Liege	1070
EB4BQ	Marchienne	1035
EB4EX	Ottomont	1335
EB4CF	Verviers	1395

BERMUDA

Call	Location	Kc.
TJW	Hamilton	1480

BOLIVIA

Call	Location	Kc.
......	La Paz	1713
CPX	La Paz	1000

BRAZIL

Call	Location	Kc.
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	Mogy 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

Call	Location	Kc.
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
10BI	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
CHLS	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

Call	Location	Kc.
NBA	Panama	845

CANARY ISLANDS

Call	Location	Kc.
EAR5	Las Palmas	1071

CEYLON

Call	Location	Kc.
VPB	Colombo	700

CHILE

Call	Location	Kc.
......	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

Call	Location	Kc.
CAB	Canton	689
XGY	Hangchow	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

Call	Location	Kc.
JODK	Keijo	690

COLOMBIA

Call	Location	Kc.
HJN	Bogota	684

COSTA RICA

Call	Location	Kc.
TI4NRH	Heredia	980
TIC	San Jose	882

CUBA

Call	Location	Kc.
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
CMCO	Marianao	660
CMCX	Marianao	1010
CMGD	Matanzas	1140
CMGC	Matanzas	1063
CMGB	Matanzas	1185
CMGF	Matanzas	977
CMGH	Matanzas	1249
CMGI	Matanzas	1094
CMAB	Pinar del Rio	1249
CMHB	Sagua la Grande	1500
CMHE	Santa Clara	1429
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	1249
CMKG	Santiago de Cuba	1176
CMKH	Santiago de Cuba	1327
CMHC	Tuinicu	791

CZECHOSLOVAKIA

Call	Location	Kc.
OKR	Bratislava	1075
OKB	Brunn	878
OKK	Kosiee	1024
......	Moravska-Ostrava	1141
OKP	Prague	616

DANZIG

Call	Location	Kc.
PTB	Danzig	662

DENMARK

Call	Location	Kc.
......	Copenhagen	1067
OXO	Kalundborg	260

DOMINICAN REPUBLIC

Call	Location	Kc.
HIX	Santo Domingo	669

DUTCH EAST INDIES

Call	Location	Kc.
......	Bandoeng	968
PFC	Batavia	1364

EGYPT

Call	Location	Kc.
......	Cairo	869
......	Cairo	909

ESTONIA

Call	Location	Kc.
......	Tallinn	1013
......	Tallinn	747
......	Tartu	1050

FINLAND

Call	Location	Kc.
......	Abo	1219
......	Bjorenborg	1219
OFA	Helsingfors	1357
OFC	Jakobstad	1031
OFB	Lahti	167
OFD	Pori	1373
OFE	Tampere	662
OFG	Turku	1220
OFH	Viipuri	1031

FRANCE

Call	Location	Kc.
F2BD	Agen	963
......	Beziers	1413
......	Bordeaux	986
......	Grenoble	915
......	Juan les Pino	1206
......	Lille	1132
......	Limoges	1020
YN	Lyon	644
YR	Lyon	1051
......	Marsan	750
......	Marseille	949
......	Montpellier	1049
......	Montpellier	1195
......	Nimes	1250
FL	Paris	207
FPTT	Paris	671
......	Paris	919
......	Paris	174
......	Paris	1265
......	Rennes	1103
MRD	Toulouse	1175
......	Toulouse	787
......	Vitus	971

GERMANY

Call	Location	Kc.
......	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	1060
......	Muehlacker	833
......	Munich	563
......	Munster	1319
......	Nurnberg	1255
......	Stettin	1060
......	Stuttgart	833

GREAT BRITAIN

Call	Location	Kc.
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

Call	Location	Kc.
TGW	Guatemala City	571

HAITI

Call	Location	Kc.
HHK	Port au Prince	920

HOLLAND

Call	Location	Kc.
......	Bloemendaal	1220
PFBI	Hilversum	280
......	Hilversum	1004
PH9	Huizen	160
PCF	Scheveningen	280

HONDURAS

Call	Location	Kc.
HRB	Tegucigalpa	1370

HONG KONG

Call	Location	Kc.
ZBW	Victoria	845

HUNGARY

Call	Location	Kc.
HAL	Budapest	550

ICELAND

Call	Location	Kc.
......	Akureyri	1563
TFA	Reykjavik	1999

INDIA

Call	Location	Kc.
VUB	Bombay	840
VUC	Calcutta	810
VUL	Lahore	882
VUM	Madras	769

IRISH FREE STATE

Call	Location	Kc.
6CK	Cork	750
2RN	Dublin	940

ITALY

Call	Location	Kc.
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

Call	Location	Kc.
JOLK	Fukuoka	680
JOFK	Hiroshima	850
JOJK	Kanazawa	710
JODK	Keijyo	820
JOGK	Kumamoto	790
JONK	Nagano	635
JOCK	Nagoya	810
JOKK	Okayama	700
JOBK	Osaka	750
JOIK	Sapporo	830
JOHK	Sendai	770
JOPK	Shizuoka	778
JOAK	Tokyo	870

KENYA

Call	Location	Kc.
7LO	Nairobi	750

KWANTUNG

Call	Location	Kc.
JQAK	Darien	759

LATVIA

Call	Location	Kc.
YLZ	Riga	571

LITHUANIA

Call	Location	Kc.
RYK	Kaunas	150

LUXEMBURG

Call	Location	Kc.
LOAA	Luxemburg	1344

MEXICO

Call	Location	Kc.
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

Call	Location	Kc.
......	Monaco	1266

MOROCCO

Call	Location	Kc.
CNO	Casablanca	983
......	Rabat	414

NEWFOUNDLAND

Call	Location	Kc.
VOGT	Bell Island	890
VONA	St. Johns	950
VOWR	St. Johns	675
VON	St. Johns	1400
8WMC	St. Johns	682
8RA	St. Johns	550

NEW ZEALAND

Call	Location	Kc.
1YA	Auckland	900
1ZR	Auckland	1090
1ZJ	Auckland	1320
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
2ZJ	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

Call	Location	Kc.
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

Call	Location	Kc.
OAX	Lima	790
OA4M	Lima	1428

PHILIPPINE ISLANDS

Call	Location	Kc.
KZRC	Cebu	937
KZRM	Manila	618

POLAND

Call	Location	Kc.
SP3	Krakow	530
SP4	Kattowitz	710
SP7	Lodz	1229
SP6	Lwow	779
SP2	Poznan	875
SP8	Warsaw	1402
SP1	Warsaw	270
SP5	Wilno	690

PORTUGAL

Call	Location	Kc.
CT1AA	Lisbon	942

ROUMANIA

Call	Location	Kc.
......	Bucharest	759

SALVADOR

Call	Location	Kc.
AQM	Salvador	785
RUS	Salvador	664

SAMOA

Call	Location	Kc.
5ZA	Apia	940

SIAM

Call	Location	Kc.
HSP1	Bangkok	857
HSP3	Bangkok	937

SPAIN

Call	Location	Kc.
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

Call	Location	Kc.
SBE	Boden	250
SCA	Boras	1301
SCB	Eskilstuna	1220
SCC	Falum	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	Kristmehamm	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

Call	Location	Kc.
HB3	Basel	941
......	Basel	1229
......	Berne	744
......	Berne	1220
......	Beromunster	653
......	Geneva	395
......	Lausanne	441
......	Sottens	743
HBZ	Zurich	653

TUNISIA

Call	Location	Kc.
TNU	Carthage	162
TUA	Tunis	235

TURKEY

Call	Location	Kc.
TAE	Angora	193
TAL	Istanbul	250
......	Osmanieh	250

UNION OF SOVIET SOCIALIST REPUBLICS

Call	Location	Kc.
RW19	Achkhabad	333
RW60	Alma-Alta	310
RW36	Arkhangelsk	770
RW50	Armavir	587
RW35	Astrakhan	435
RW8	Bakou	238
RW43	Bakou	238
RW30	Dnepropetrovsk	511
RW21	Erivan	343
RW40	Gomel	621
RW23	Groznyi	676
RW14	Irkoutsk	187
RW31	Ivanovo-Voznesensk	603
RW17	Kazan	550
RW17	Kazan	644
RW54	Khabarovsk	1052
RW4	Kharkov	320
RW20	Kharkov	704
RW9	Kiev	368
RW9	Kiev	290
RW33	Krasnodar	650
RW3	Leningrad	300
RW53	Leningrad	300
RW27	Makhatch 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	Oufa	444
RW22	Oufa	617
RW56	Penza	640
RW46	Petropavlovsk	686
RW29	Petrozavodsk	468
RW24	Platigorsk	865
RW55	Pokrovsk	730
RW12	Rostov-sur-le-Don	353
RW16	Samara	521
RW16	Samara	404
RW18	Samarkand	342
RW52	Simferopol	630
RW52	Simferopol	725
RW24	Smolensk	531
RW26	Stalino	810
RW53	Sverdlovsk	540
RW32	Stavropol	608
RW5	Sverdlovsk	363
RW47	Tachkent	421
RW11	Tachkent	256
RW57	Tiraspol	838
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

Call	Location	Kc.
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

Call	Location	Kc.
ZTC	Capetown	800
ZTD	Durban	738
ZTJ	Johannesburg	666

VENEZUELA

Call	Location	Kc.
AYRE	Caracas	800
1BC	Caracas	960

YUGOSLAVIA

Call	Location	Kc.
......	Belgrade	696
......	Ljubljano	527
......	Zagreb	977

FOREIGN SHORT WAVE PHONE STATIONS

ARGENTINA

Call	Location	Kc.
LSX	Buenos Aires	10,352
LSG	Buenos Aires	19,900
LSN	Buenos Aires	21,200

AUSTRALIA

Call	Location	Kc.
VK3ME	Melbourne	9,510
VK6AG	Perth	7,194
VK2ME	Sydney	10,526
VLK	Sydney	10,526

AUSTRIA

Call	Location	Kc.
....	Vienna	13,514
UOR2	Vienna	11,801
OUITH	Vienna	8,060
UOR2	Vienna	6,072
OHK2	Vienna	4,274

BELGIUM

BOLIVIA

BRAZIL

Call	Location	Kc.
PPU	Rio de Janeiro	6,122
PPU	Rio de Janeiro	19,270

BRITISH COLONIES

Call	Location	Kc.
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

Call	Location	Kc.
VE9GW	Bowmanville, Que.	6,098
VAS	Glace Bay, N. S.	10,714
CJRX	Middle Church	11,720
VE9CL	Winnipeg, Man.	6,061

CURACAO

Call	Location	Kc.
PJZ	Curacao	11,718

CZECHOSLOVAKIA

Call	Location	Kc.
....	Bratislava	5,000
OKIMPT	Prague	5,119
OKIMPT	Prague	4,412

CHILE

CHINA

Call	Location	Kc.
XCTE	Shanghai	5,000

COLOMBIA

Call	Location	Kc.
HKA	Barranquilla	5,837
HKD	Barranquilla	6,993
HKF	Bogota	7,194
HKF	Bogota	7,610
HKC	Bogota	6,250
HJN	Bogota	—
HKX	Bogota	6,977
HKX	Bogota	7,143

COSTA RICA

Call	Location	Kc.
TIH	Heredia	9,734

CUBA

Call	Location	Kc.
CM2LA	Havana	10,007
CM2MK	Havana	9,360
CM6XJ	Tuinucu	15,008

DANZIG

Call	Location	Kc.
EK4ZZZ	Danzig	7,500

DENMARK

Call	Location	Kc.
OXZ	Skamlabaek	9,520

DOMINICAN REPUBLIC

Call	Location	Kc.
HIX	Santo Domingo	4,610

DUTCH EAST INDIES

Call	Location	Kc.
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

Call	Location	Kc.
....	Riobamba	7,540

EGYPT

ESTONIA

FIJI

Call	Location	Kc.
VPD	Suva	14,430

FINLAND

FRANCE

Call	Location	Kc.
....	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
FSE	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

Call	Location	Kc.
FM8KR	Constantine	7,009
FM8KR	Constantine	3,750

GERMANY

Call	Location	Kc.
....	Elberswalde	7,407
D4AFF	Kothen	7,042
DHA	Nauen	11,760
DHC	Nauen	15,200
....	Nauen	6,020
DGW	Nauen	17,760
....	Nauen	9,560

GREAT BRITAIN

Call	Location	Kc.
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

Call	Location	Kc.
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

Call	Location	Kc.
HRB	Tegucigalpa	6,170

HUNGARY

Call	Location	Kc.
HAT	Szekesfehervar	9,125

ICELAND

INDIA

Call	Location	Kc.
VUB	Bombay	6,110
VUC	Calcutta	11,870

INDO-CHINA

Call	Location	Kc.
F3ICD	Chi-hoa	6,122
FZR	Saigon	16,216
FZR	Saigon	12,043

IRISH FREE STATE

ITALY

Call	Location	Kc.
I2RO	Rome	11,811
I2RO	Rome	3,750
IMA	Rome	6,897
I2RO	Rome	3,750
....	Turin	3,750
HVJ	Vatican City	5,970
HVJ	Vatican City	15,120

JAPAN

Call	Location	Kc.
J1AA	Kemikawa	17,391
J1AA	Kemikawa	8,000

JUGOSLAVIA

Call	Location	Kc.
....	Belgrade	10,000

LATVIA

LITHUANIA

MADEIRA

Call	Location	Kc.
CT3AG	Funchal	6,383

MEXICO

Call	Location	Kc.
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

Call	Location	Kc.
CN8MC	Casablanca	6,881
CN8MC	Casablanca	5,882
....	Rabat	12,610
....	Rabat	9,300
....	Rabat	12,605
....	Rabat	9,300

NEWFOUNDLAND

Call	Location	Kc.
VO8A	St. Johns	6,800

NEW ZEALAND

Call	Location	Kc.
ZL2XX	Wellington	9,550

NORWAY

PERU

PHILIPPINE ISLANDS

Call	Location	Kc.
KA1XR	Manila	12,245
KZRM	Manila	11,830
KZRM	Manila	9,570
KZRM	Manila	6,140

POLAND

Call	Location	Kc.
....	Poznan	11,001
....	Poznan	8,900

PORTUGAL

Call	Location	Kc.
PT1AA	Lisbon	7,143
....	Oporto	12,000

ROUMANIA

Call	Location	Kc.
....	Bucharest	13,953

SALVADOR

SHIP PHONE STATIONS

Call	Location	Kc.
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
1BDX	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

Call	Location	Kc.
HS2PJ	Bangkok	10,169
HSP2	Bangkok	9,500
HSP2	Bangkok	7,300

SPAIN

Call	Location	Kc.
EAJ1	Barcelona	15,789
EAR96	Barcelona	6,522
EAR25	Barcelona	6,000
EAR58	Las Palmas, Canary Islands	7,210
EAR110	Madrid	7,026
EAR125	Madrid	7,026
EAJ25	Malaga	3000
EAR113	Viscaya	6,522

SWEDEN

Call	Location	Kc.
....	Motala	6,070

SWITZERLAND

Call	Location	Kc.
HB9OC	Berne	9,130
HB9XD	Zurich	9,380
HB9XD	Zurich	7,229
HB9XD	Zurich	3,488

TURKEY

UNION OF SOVIET SOCIALIST REPUBLICS

Call	Location	Kc.
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

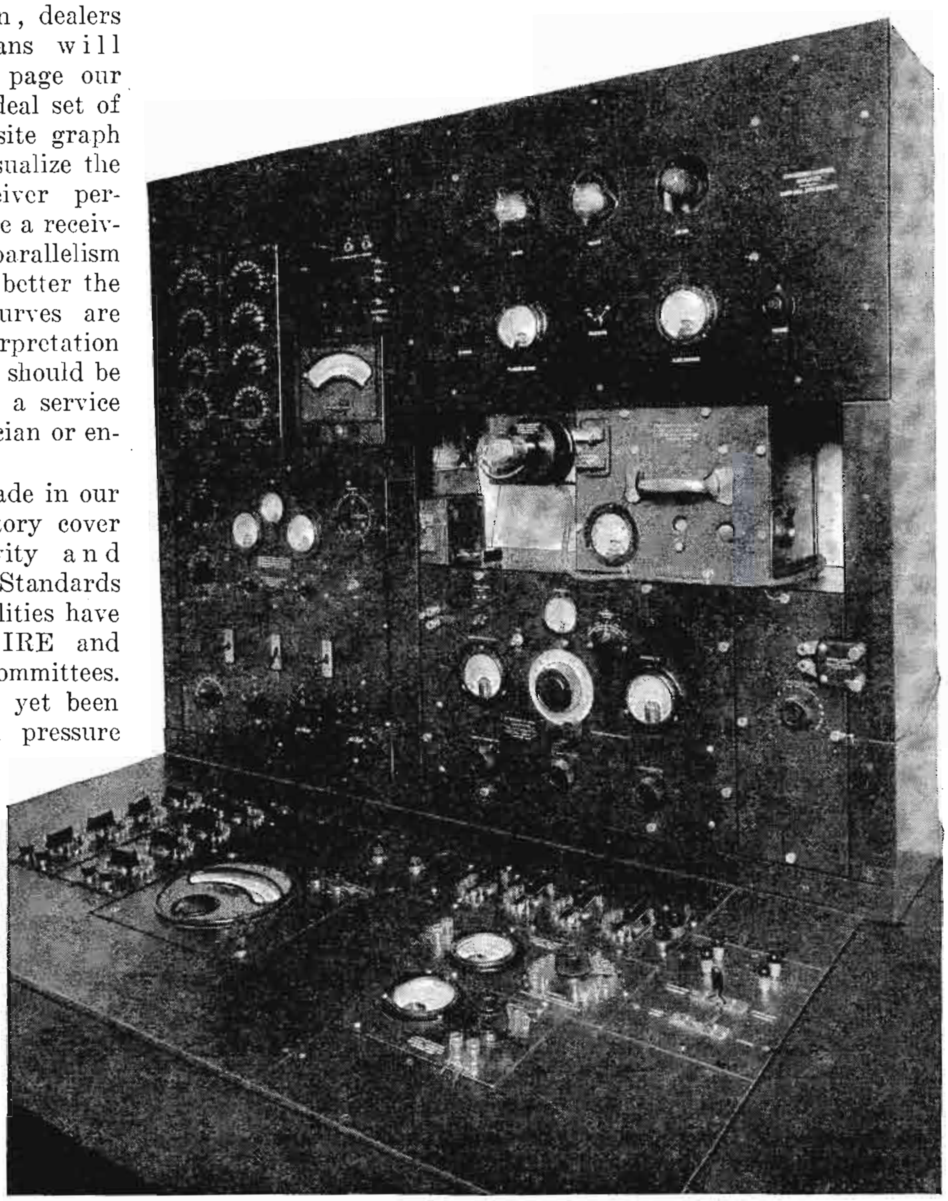
UNION OF SOUTH AFRICA

Call	Location	Kc.
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.

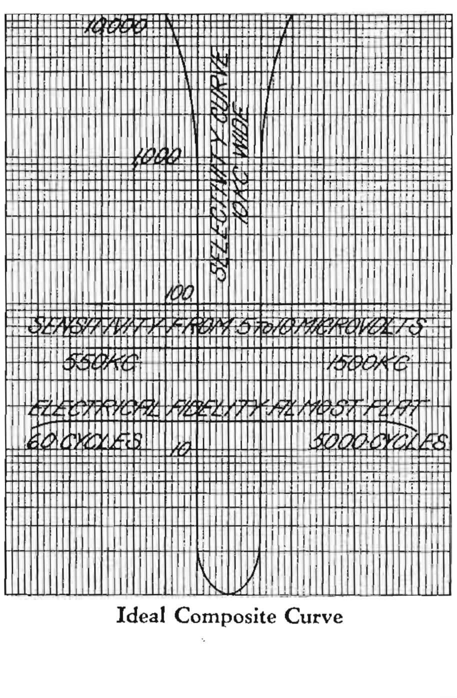


Measurements made in our engineering laboratory cover sensitivity, selectivity and electrical fidelity. Standards for these three qualities have been set by the IRE and RMA engineering committees. No standards have yet been adopted for sound pressure measurements. Until a standard is selected, our laboratory 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.

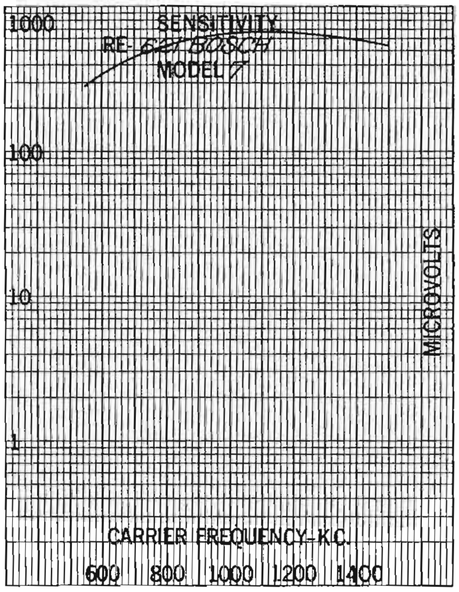
The photograph illustrates the equipment used in making the measurements. It conforms to the specifications of the IRE and RMA Standardization Committees. All test frequencies are determined by zero beat of a crystal-controlled dynatron oscillator. Voltmeters and microvoltmeters are periodically checked 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.

American Bosch Model 7DC

OVERALL response curves of the American Bosch Model 7 d-c receiver are given in this article. This chassis is for use in districts having a line supply of 110 volts direct current.

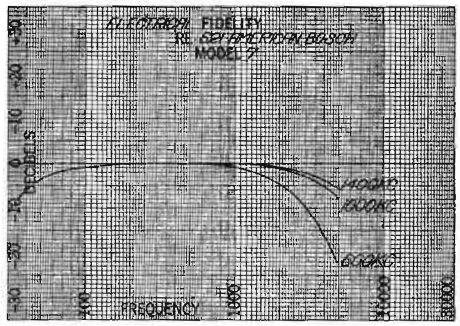
A dummy antenna of 20 uh, 200 uuf and 25 ohms coupled the output

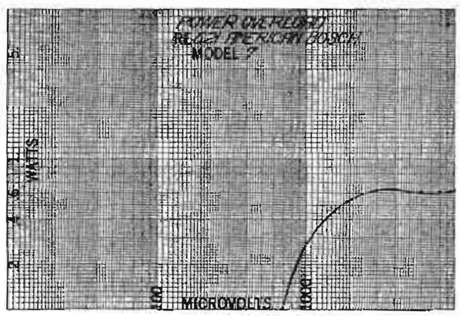


of the signal generator to the receiver input. Load resistance was made 7500 ohms to match the 233 pentode power tube. Its plate was capacitatively coupled to the output meter, and the voice coil circuit was opened for measurements purposes. A standard level of .05 watts power output was maintained in all tests.

Alignment of the receiver was left at factory adjustment, and the tubes used were those furnished in the receiver by the maker. On the 110 volt d-c line the current drain of the receiver was .35 amperes.

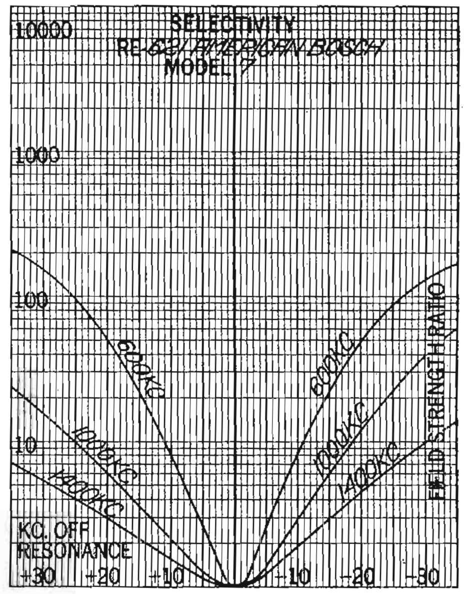
Measured noise level values were 11.9 per cent at 600 k-c, the maximum, and 3.8 per cent at 1400 k-c. From the sensitivity curve of column 1, the average sensitivity is computed to be 620 microvolts absolute or 155 micro-





volts per meter. Power output of the receiver reached a maximum value of .63 watts, as seen from the power overload curve of column 2, disregarding the distortion due to harmonics introduced in the wave form. Under the selectivity curves are the band widths of the Model 7.

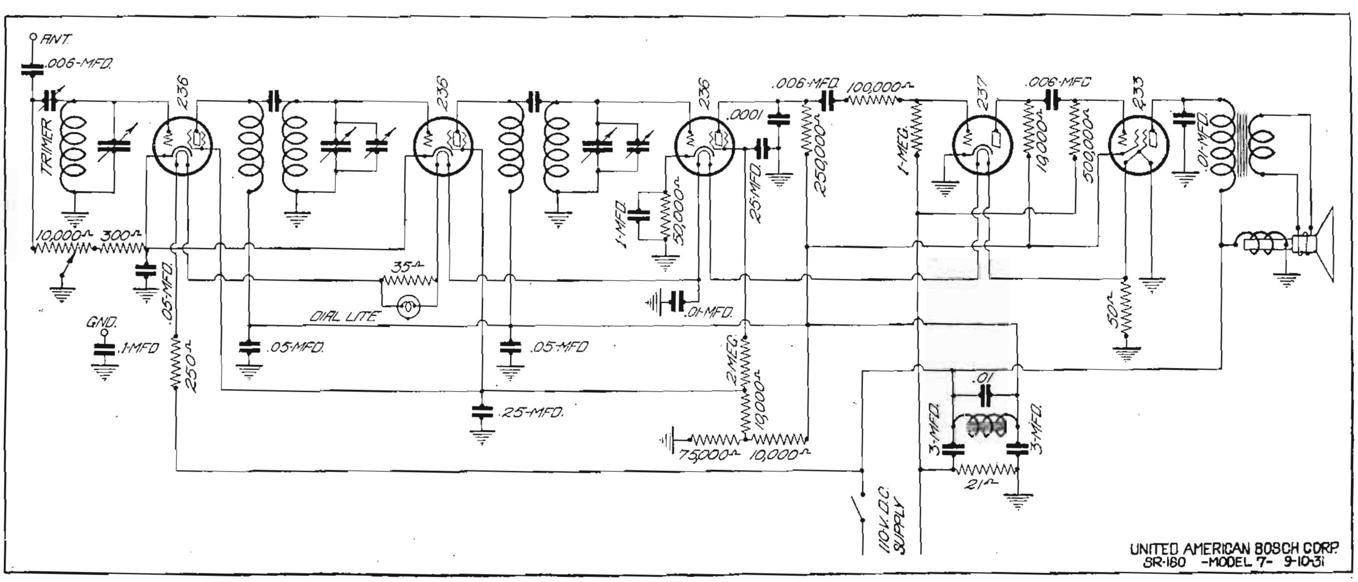
From the schematic wiring diagram of this receiver, the tubes required are found to be a 236 first r-f, 236 second r-f, 236 detector, 237 first audio and a 233 power output pentode. It can be seen that the filaments and pilot light are all connected in series. The use of cathode type tubes on d-c circuits eliminates the need for other less desirable



means of obtaining grid bias. A small filter consisting of a choke and two 3 microfarad bypass condensers is used to eliminate the commutator ripple present in most commercial direct current lines.

Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	22	44	70
100	52	..	..
1000	..	..	..
10000	..	..	..

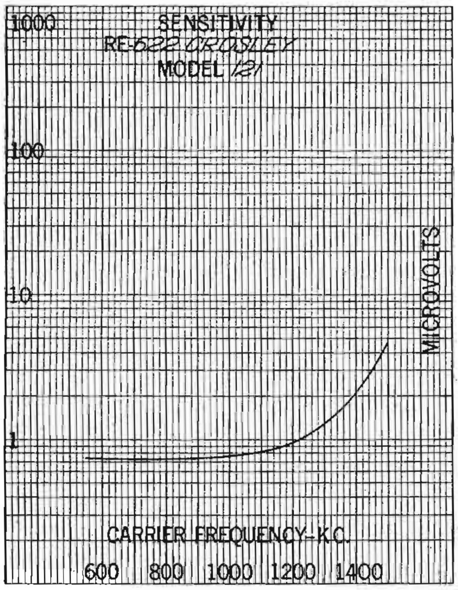


Crosley Chassis 121-1

CROSLEY'S model 121 super chassis gave the performance curves printed with this article.

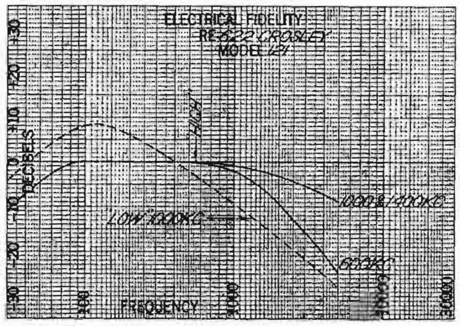
A dummy antenna of 20 uh, 200 uuf and 25 ohms was used on the r-f input circuit of this receiver, and a 15000 ohm resistance load matched the output impedance of two 247 output tubes employed in push-pull, the latter being coupled capacitatively to the output device. All measurements were made with the voice coil disconnected, the sensitivity of the receiver at maximum, and an output level of .05 watts.

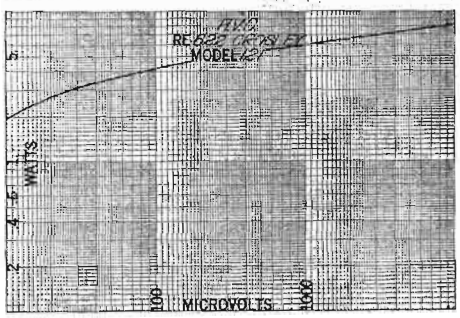
Factory alignment was not disturbed during the tests, and the tubes employed were those furnished by the manufacturer with this receiver. The drain at 114 volts a-c supply was 1.15 amperes. At 600 k-c the noise level was 23 percent, the maximum value, while at 1400 k-c it was 3 percent.

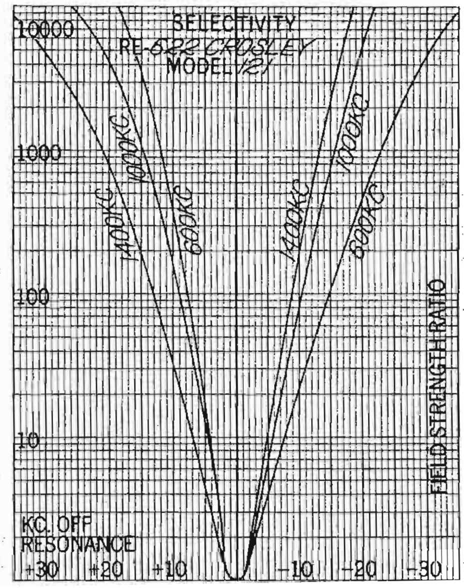


From the curves of sensitivity in volume one, the absolute sensitivity is computed to be 1.24 microvolts, which corresponds to .31 microvolts per meter. Power output maximum is seen to be 8.3 watts supplied to the voice coil transformer primary. However, this value does not take into account the harmonic content of the audio wave form. The curve of automatic volume control is given in column two below the fidelity curve. A tabulation of the band widths measured from the selectivity curves of column three will be found under them.

Ten tubes are required, a 551 first r-f, 551 second r-f, 551 first detector, 224 oscillator, a 551 second i-f, 227 rectifier, 227 first audio, 247s in push-pull, and a 280 full-wave rectifier. The automatic volume control level setting device is a potentiometer which controls the audio voltage on the grid of the second 227 tube. On the schematic diagram the point marked P is for phonograph pick-up reproduction of records. In addition to the speaker field, a choke is used for hum elimination, the field being used in the voltage supply to all tubes but the output. Grid bias on the r-f, first detector and second i-f tubes is varied by the automatic volume control. Each of the above-named grid circuits is brought to ground potential by bypass condensers, as shown on the wiring diagram found at the end of this article.

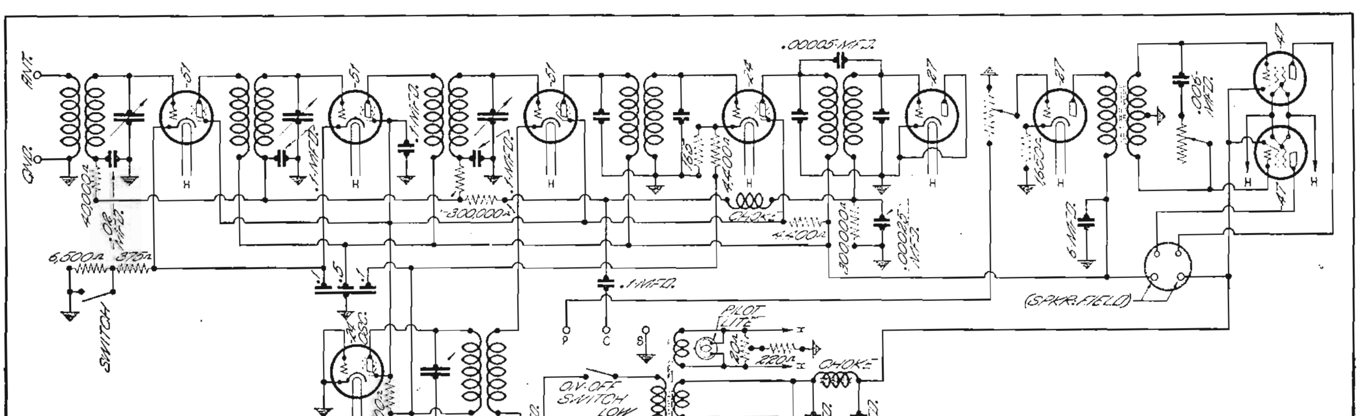






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	9	10.5	15
100	16.5	19.5	28
1000	25	30.5	44
10000	37	48	72



General Motors Model S-3-A

PERFORMANCE curves plotted from our laboratory measurement data on the General Motors Model S-3-A are found on this page.

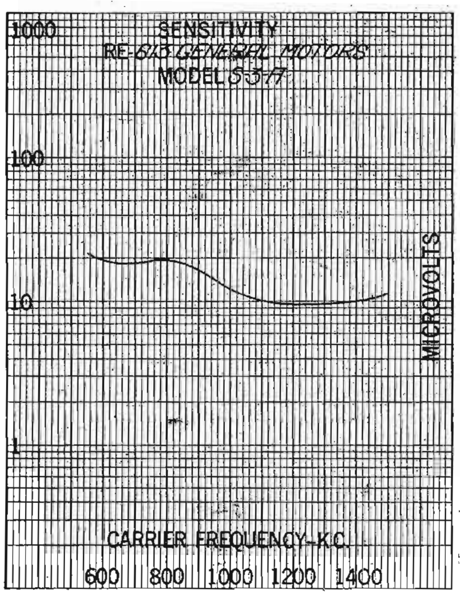
For receiver signal input, the dummy antenna of 20 uh, 200 uuf and 25 ohms was connected from the signal generator output to the receiver antenna circuit. To match the load impedance of the push-pull 245 power tubes, the output resistance was adjusted to 4000 ohms, and the standard output level of .05 watts maintained during all measurements. Because the voice coil was opened for correct plate loading with resistance only, the power tube plates were capacitatively coupled to the output device.

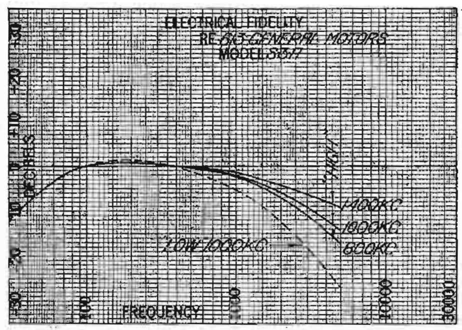
The power transformer primary current was .98 amperes with an impressed line voltage of 112 volts. No adjustments were made to the receiver alignment, and tubes were supplied with the set by the manufacturer.

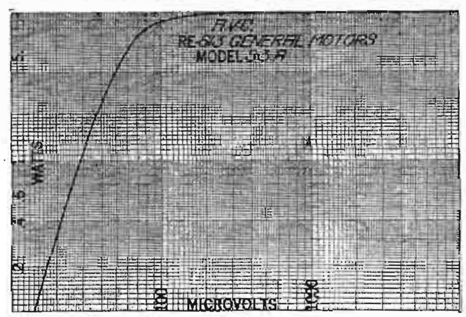
Maximum noise level was 54 per cent at 1400 k-c, with a minimum of 1.4 per cent at 550 k-c.

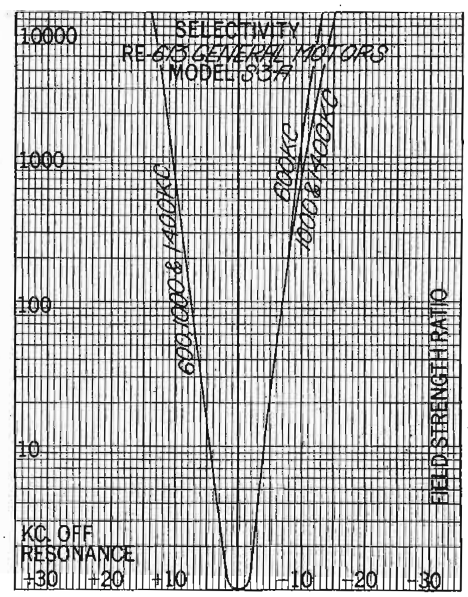
From the sensitivity curve of column 1, the average is computed to be 15 microvolts absolute or 3.75 microvolts per meter. For maximum power output, from the automatic volume control curve of column 2, we find ten watts audio power in the primary of the speaker transformer, disregarding the harmonic distortion of the audio wave form at such a power level. Under the selectivity curves of column 3 are the band widths measured from them.

From the schematic wiring diagram below it is seen that the automatic volume control tube varies the grid bias on the 235 r-f and 235 i-f tubes. Tubes required for this receiver are a 235 r-f, 224 first detector, 235 second i-f, 235 third i-f, 227 second detector, two 245 tubes in push-pull, 227 oscillator, 227 automatic volume control, and the 280 rectifier tube. For the choke in the +B supply filter the speaker field, which is tuned to the hum frequency by a .5 microfarad condenser across it, forms a hum trap circuit. Tone control is accomplished by means of a .1 microfarad condenser in series with a 50,000 ohm variable resistor, both connected across the output plates. Two more chokes are employed, a 200 millihenry choke in series with the minus B lead to the automatic volume control tube grid, and another filter choke in the B return. Energy from the local oscillator is supplied to the first detector tube by plate to screen coupling.



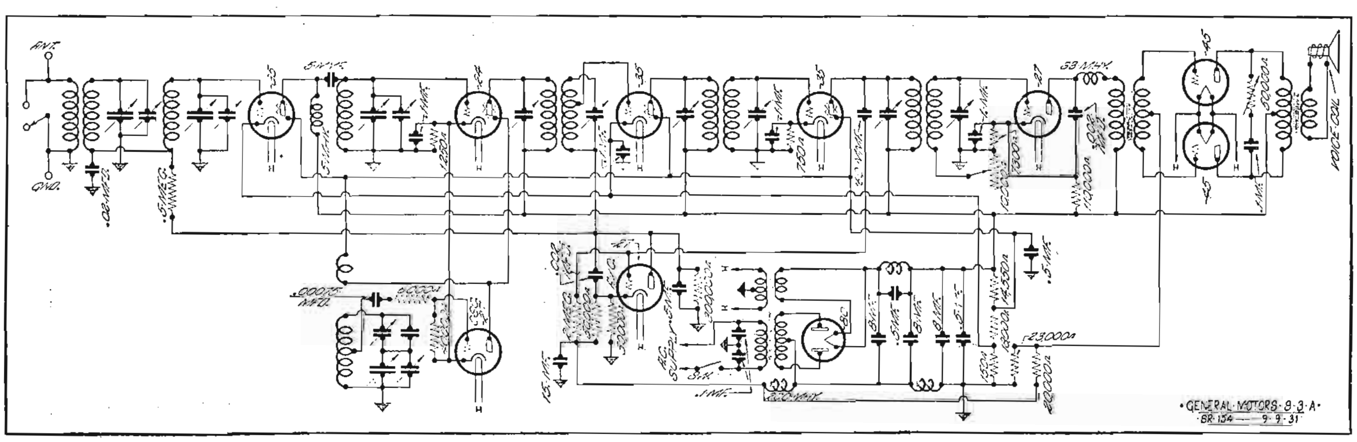






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	9	9	9
100	14.5	14.5	14.5
1000	20	21	21
10000	27	29	29

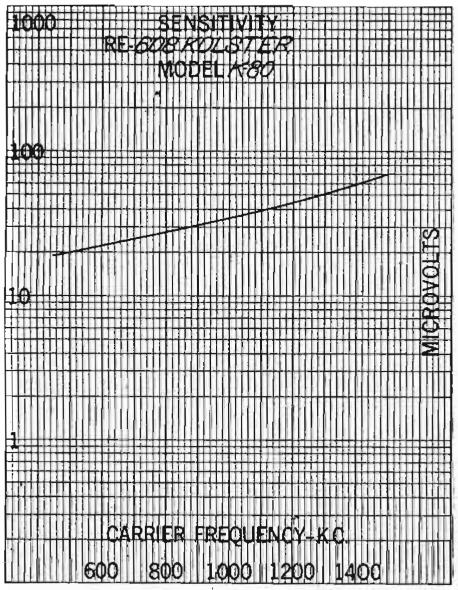


Kolster Model K-80

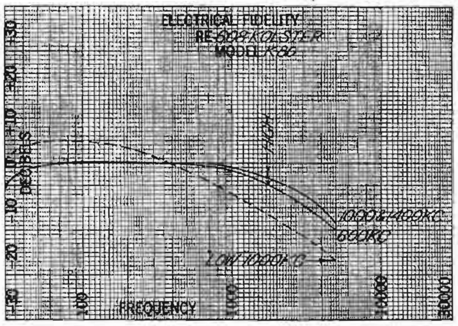
CURVES of the Kolster Model K-80 receiver, plotted from our recent measurements, are included in this article.

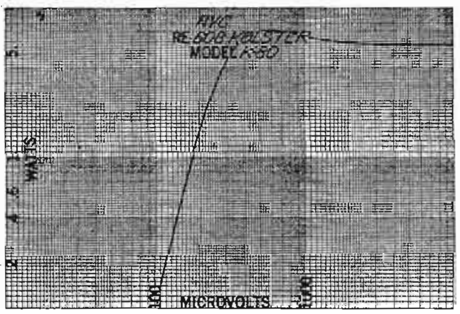
Modulated input to the receiver input circuit was through the dummy antenna standard of 20 uh, 200 uuf and 25 ohms. For matching the load impedance of the push-pull 247 pentodes, the output resistance was made 15,000 ohms, with a power output standard of 0.5 watts. With the voice coil circuit broken, the power tube plates were coupled to the output tube voltmeter by two capacitors.

No changes were made in the factory alignment of this chassis, and the tubes used were those shipped with the receiver. At 111 volts a-c input, the line current supply was 1.02 amperes.

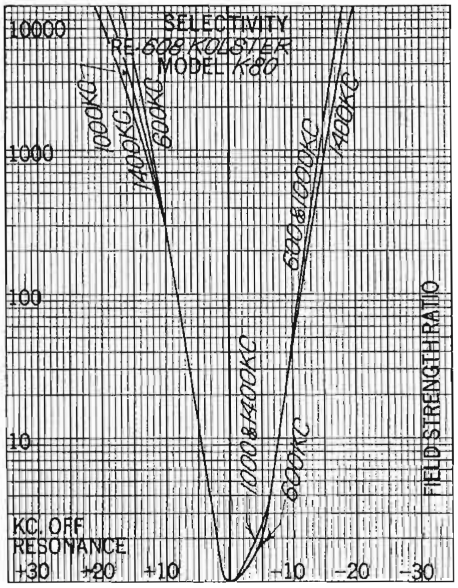


At 1400 k-c the noise level was one-tenth of one per cent, the minimum, while at 550 k-c it was 1.5 per cent, the maximum measured value. Average sensitivity is taken from the sensitivity curve of column 1 as 38 microvolts absolute, which corresponds to 9.5 microvolts per meter. In column 2 the automatic volume control curve gives the maximum audio power output as 7.07 watts. This figure does not take into account the harmonics present in the audio wave supplied to the speaker transformer. Band widths are tabulated under the selectivity curves, from which they were taken, in column 3.



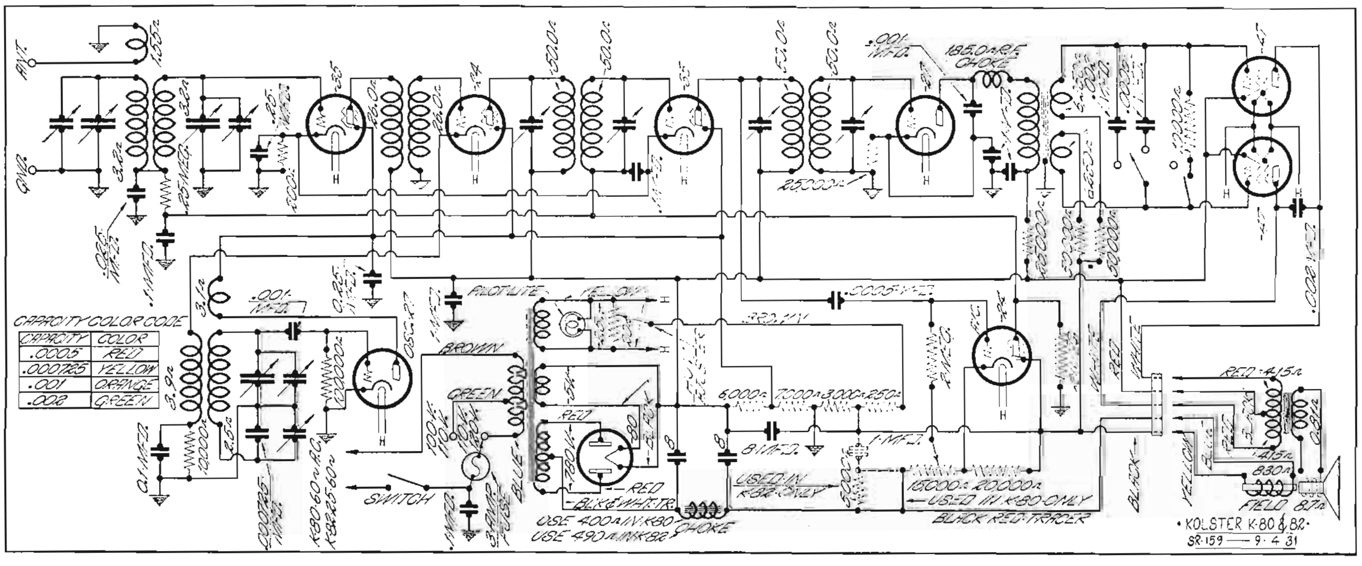


At the bottom of the page is a schematic wiring diagram for the K-80 receiver. From it the tube complement is seen to consist of a 235 r-f, 224 first detector, 227 oscillator, 235 second i-f, 227 second detector, push-pull 247s, 224 automatic volume control tube, and the 280 full-wave rectifier. Local oscillator energy is fed to the cathode of the first detector. Automatic volume control is obtained by variation of the grid bias of the 235 r-f and 235 i-f tubes by the 224 automatic volume control tube.

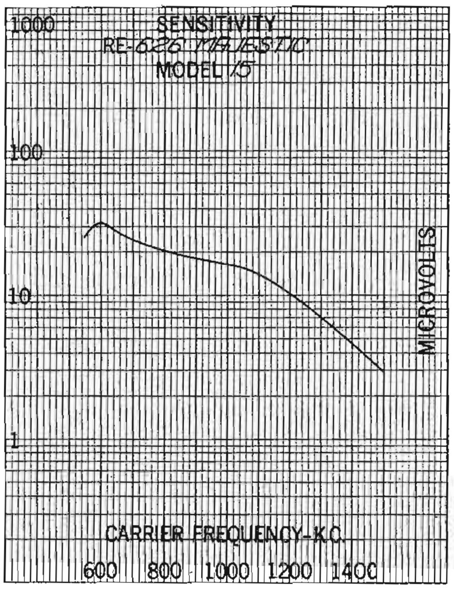


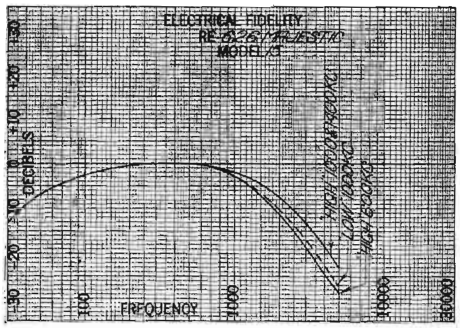
Band Widths

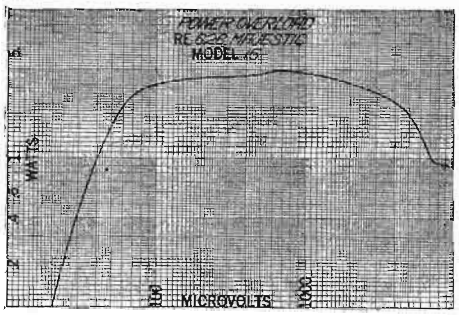
Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	12	12	12
100	18	18	18.5
1000	26.5	27	29
10000	35	37	41

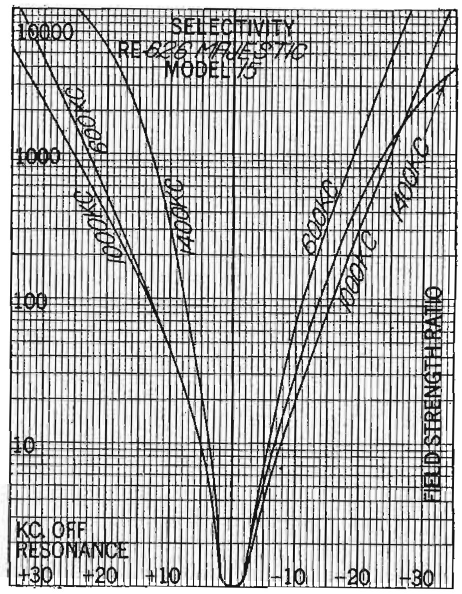


Majestic Radio Model 15









MEASUREMENTS on the Majestic Model 15 superheterodyne midget chassis were the first that we have made on a five tube superheterodyne utilizing the first detector as an oscillator.

Signal generator input to the receiver was through a standard dummy antenna of 20 uh, 200 uuf, and 25 ohms. Because the voice coil was open during all measurements, the plate of the 247 output tube, loaded with 7500 ohms resistance to match its specified operating impedance value, was capacitatively coupled to the output meter, which indicated the standard power output of .05 watts.

No changes were made in the trimmer adjustments from factory alignment, and the tubes employed were furnished as standard equipment with the receiver. With an a-c line voltage of 114 volts, the receiver drain was .57 amperes.

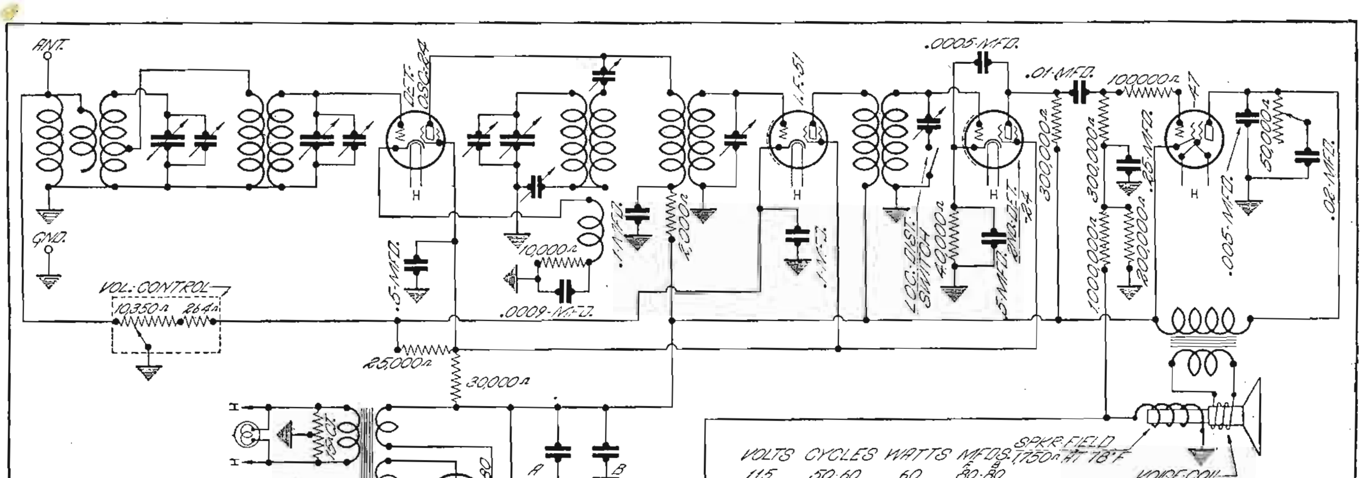
Average sensitivity was found to be 18.7 microvolts from the sensitivity curve of column 1, which value is the equivalent of 4.9 microvolts per meter. At 550 k-c the noise level was negligible, while the maximum of 1.3 per cent occurred at 600 k-c, with six-tenths of one per cent at 1400 k-c.

Maximum power output of 3.84 watts was supplied to the primary of the speaker input transformer, but this figure disregards the harmonic content of the voltage wave form. From the selectivity curves of column 3 the band widths were taken. They will be found tabulated under these curves.

Tubes required are only five in number, a 224 first detector and oscillator, 551 second i-f, 224 second detector, 247 pentode power tube and a 280 rectifier. The speaker field is used in the B return lead to give grid bias to the 247 by means of the drop across it to ground.

Band Widths

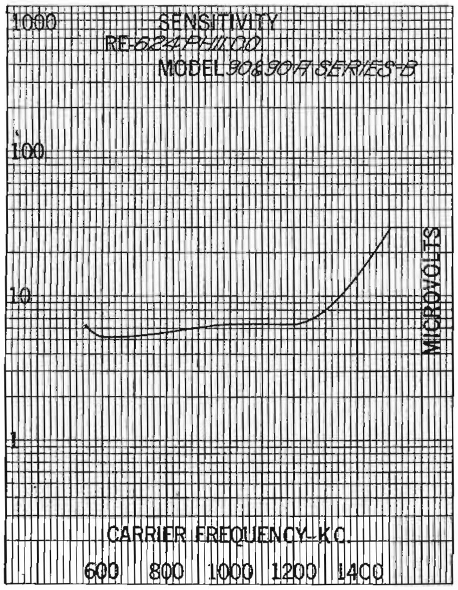
Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	10.5	13	12
100	24	29.5	21.5
1000	42	50.5	37
10000	61	68	75



Philco Models 90, 90A, Series B

PHILCO 90 and 90A series B performance curves plotted from our measurements of recent date are given in this article.

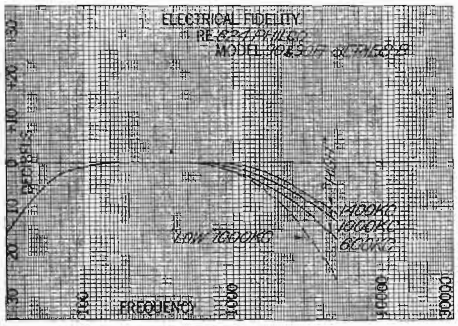
For signal input, the standard dummy of 20 uh, 200 uuf and 25 ohms was connected to the receiver antenna circuit. To match the single pentode output tube, the load re-

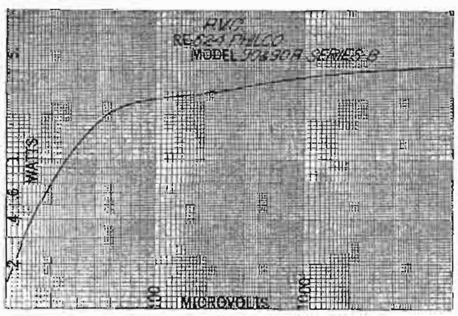


sistance was adjusted to 7500 ohms with the plate capacitatively coupled to the output tube voltmeter, since the voice coil was open during the tests.

Factory alignment was unaltered for the measurements, and tubes were shipped with the chassis as standard equipment. A line voltage of 112 volts a-c resulted in a line current of 72 amperes.

In column 1 is the sensitivity curve, which has an average value of 7.4 microvolts absolute, of which the equivalent is 1.85 microvolts per meter. From the automatic volume control curve of column 2, the maximum output is found to be 4.26 watts, disregarding distortion caused by the harmonics at this power level, measured at the speaker input transformer. The maximum noise level is 11.3 per cent, which occurs at 1000 k-c, with the minimum at 550 k-c of 4 per cent. Tabulated band widths measured from the selectivity curves

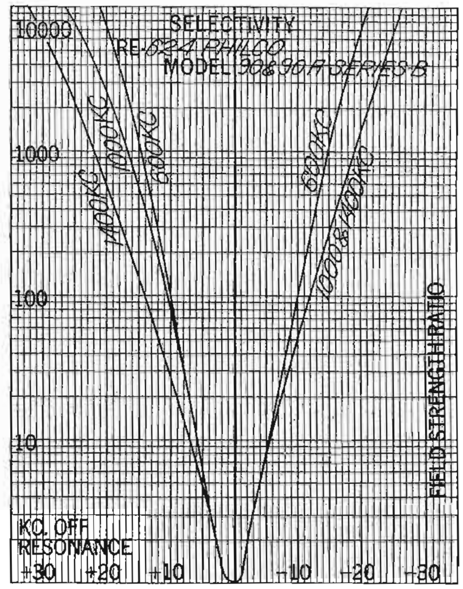




of column 3 are found under them.

Below is the receiver schematic wiring diagram of the models 90 and 90A. Tone control consists of selecting, by means of a switch, one of three bypass condensers which bypass the higher audio frequencies from the plate of the 247 tube to ground. For elimination of disturbances which might enter the set through the a-c line, two bypass condensers are connected across the line, their common center grounded.

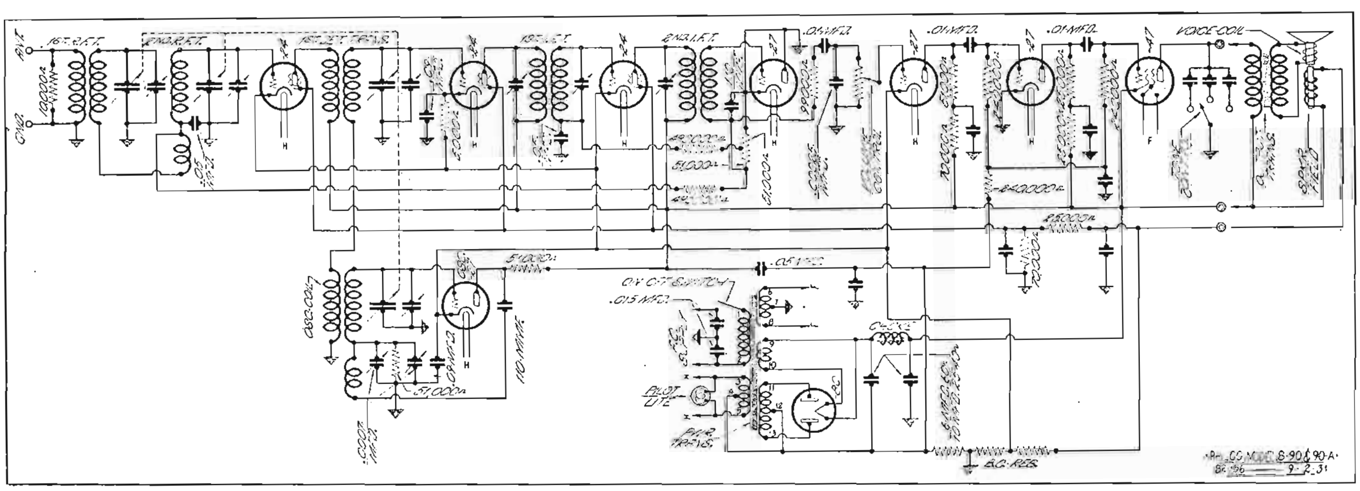
Tubes required are a 224 r-f, 224 first detector, 224 second i-f, 227 two-element detector, 227 oscillator, 227 first audio, 227 second audio, 247 output, and a 280 full wave rectifier. A choke and the speaker field with the attendant filter condensers are used to eliminate ripple in the B supply. Grid bias for the 227 second audio tube is obtained from a resistor in the B return lead, which makes ground



positive with respect to minus B of the system. In this receiver the oscillator is coupled to the first detector grid by means of a pick-up coil in inductive relation to the oscillator grid coil. The 247 pentode power tube picks its bias from the same point utilized for the second audio tube mentioned in this paragraph.

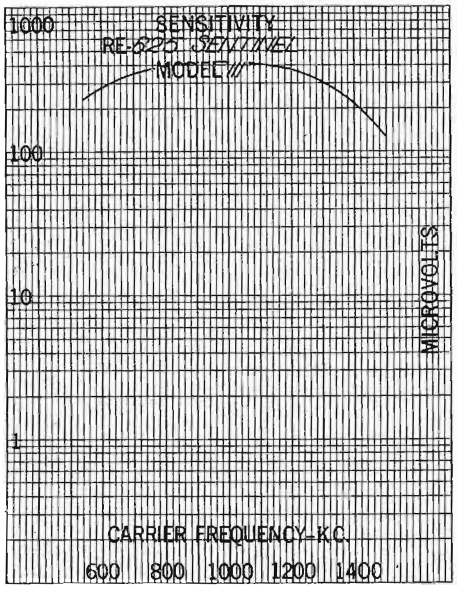
Band Widths

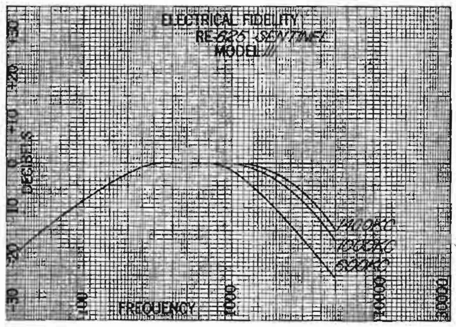
Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	11.5	12	12.5
100	20	22.5	41
1000	30	36	41
10000	42	53	58.5

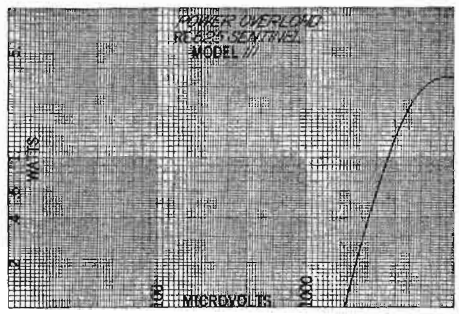


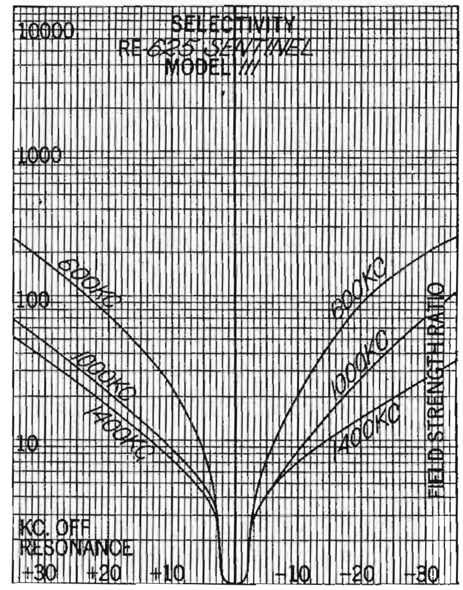
Sentinel Model 111

FROM overall measurements of the Sentinel model 111 manufactured by United Air Cleaner Corp., the following curves were plotted as indicative of its performance. An input dummy antenna of 20 uh, 200 uuf and 25 ohms fed the generator signal to the receiver input









system, while a resistive load of 7,500 ohms in the output matched the 247 pentode power tube. Since the voice coil was disconnected during all measurements, the plate of the power tube was coupled with a capacity to the tube voltmeter. The level of .05 watts as standard output was used at all times.

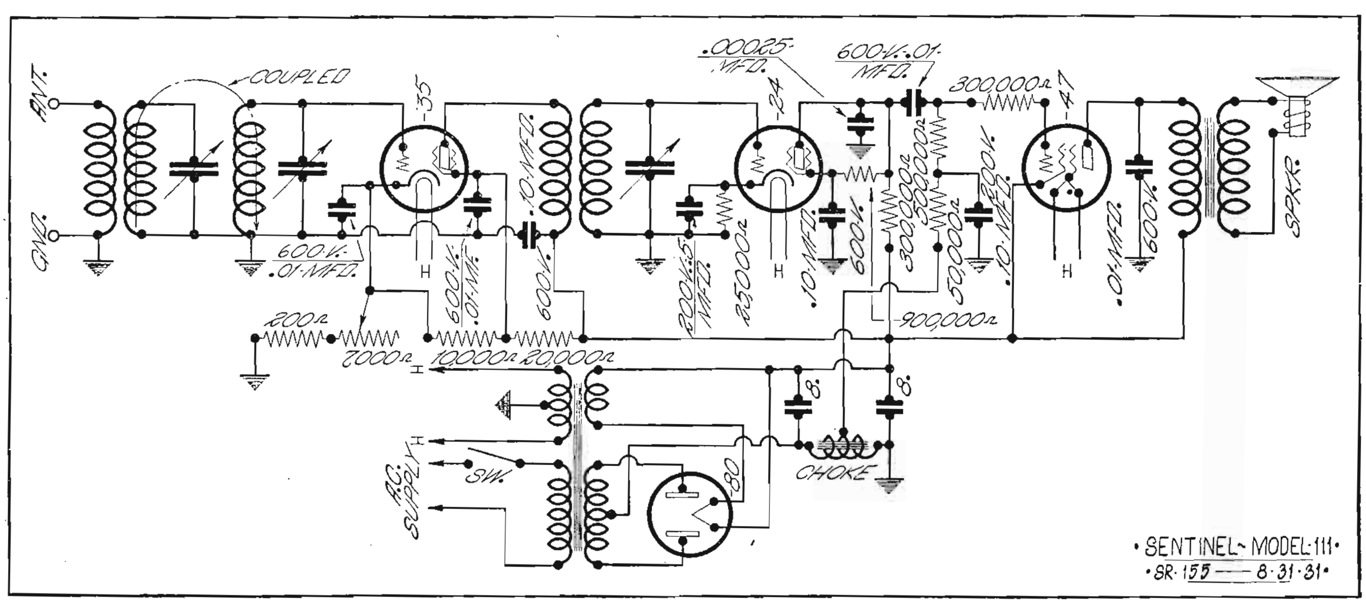
During tests the receiver was at maximum sensitivity. Its line drain was .52 amperes with an a-c voltage of 115. No readjustment was made in the alignment of the tuned circuits, and the tubes were furnished with the chassis by the manufacturer.

The average sensitivity computed from the sensitivity curve was found to be 309 microvolts absolute, of which the equivalent sensitivity in microvolts per meter is 77. Band widths are tabulated in column three under the model 111 selectivity curves. Because the noise level of the receiver was so low, it was found unnecessary to measure it. A maximum power output of 3.44 watts is found from the power overload curve of column two, disregarding the harmonics in the audio wave form.

Only four tubes are used in this chassis, a 235 first r-f, 224 detector, 247 pentode and the 280 rectifier. From the schematic wiring diagram at the bottom of the page it will be seen that the antenna stage is an inductively coupled band pass of two tuned circuits. A tapped choke in the B return lead supplies the filtering inductance as well as the divider circuit for grid bias on the 247 output pentode. Variation of the cathode bias of the 235 tube gives the necessary sensitivity control of this receiver.

Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	12	23.5	29
100	45	73	..
1000	..	..	..
10000	..	..	..



Silver-Marshall Models D-E

RESULTS of measurements of the Silver model D and E receivers made in our laboratory are shown in the curves accompanying this article.

Input from the generator to the set was through the dummy antenna standard of 20 uh, 200 uuf and 25 ohms, while the output resistance was adjusted to 15000 ohms to match the optimum plate load of the pentodes. Since the voice coil was opened during all measurements, the output plates were capacitatively coupled to the output tube voltmeter. A standard level of .05 watts power output was used for all tests.

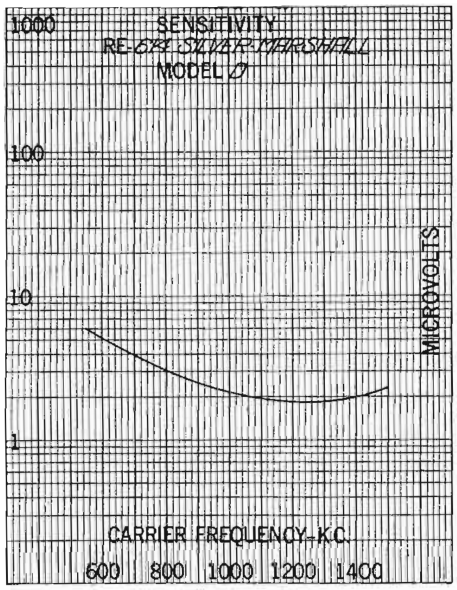
Factory adjustment of this receiver was unaltered, and the tubes used were those furnished with the set. During all measurements the volume control was turned to maximum position. At 115 volts the line current supply was .93 amperes a-c.

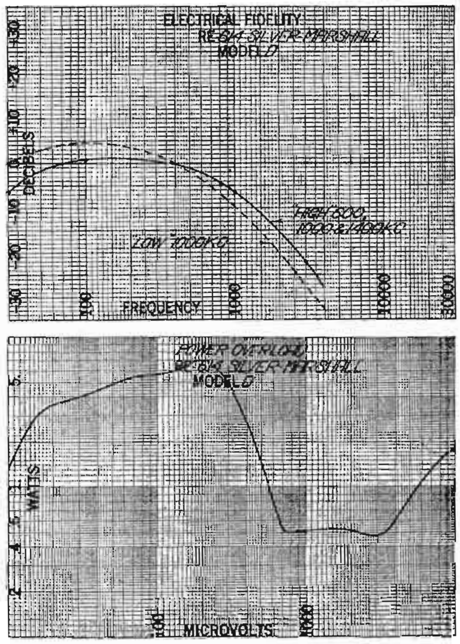
Computation from the sensitivity curve gives an average value of 3.5 microvolts absolute or .875 microvolts per meter sensitivity. This curve is found in column one. Maximum power output delivered to the speaker transformer was 7 watts, disregarding the distortion of the output due to harmonics introduced in the wave form. In column three, under the selectivity curves, are the measured band widths in kilocycles. The minimum noise level is 8 percent at 600 k-c, and 33 percent at 1400 k-c, the maximum.

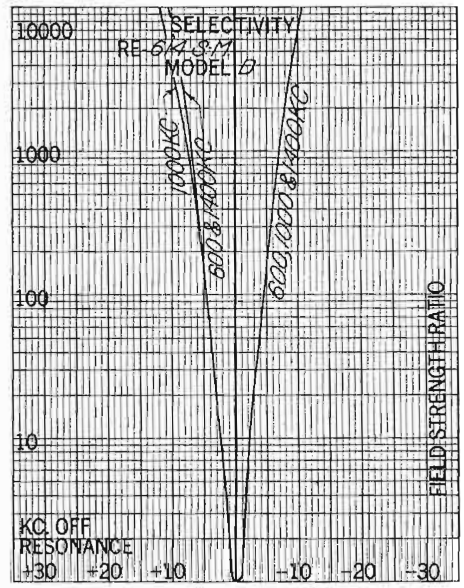
Under the four performance curves is printed the schematic diagram of the models D and E receivers.

Tubes necessary for operation are a 551 r-f, 227 oscillator, 224 first detector (given as 551 on the schematic), 551 second i-f, 551 third i-f, 227 second detector, two 247 pentodes as output power tubes, and a 280 rectifier.

Tone control is accomplished by bypassing the higher audio frequencies as desired by means of a half megohm variable resistance in series with a .025 microfarad resistor shunted from the second detector plate circuit to the cathode. The speaker field forms the first section of the B filter, with a choke following it in the supply to all tubes but the pentodes. For volume control, the cathode bias of the r-f, second i-f and third i-f is varied by means of a 4500 ohm potentiometer.

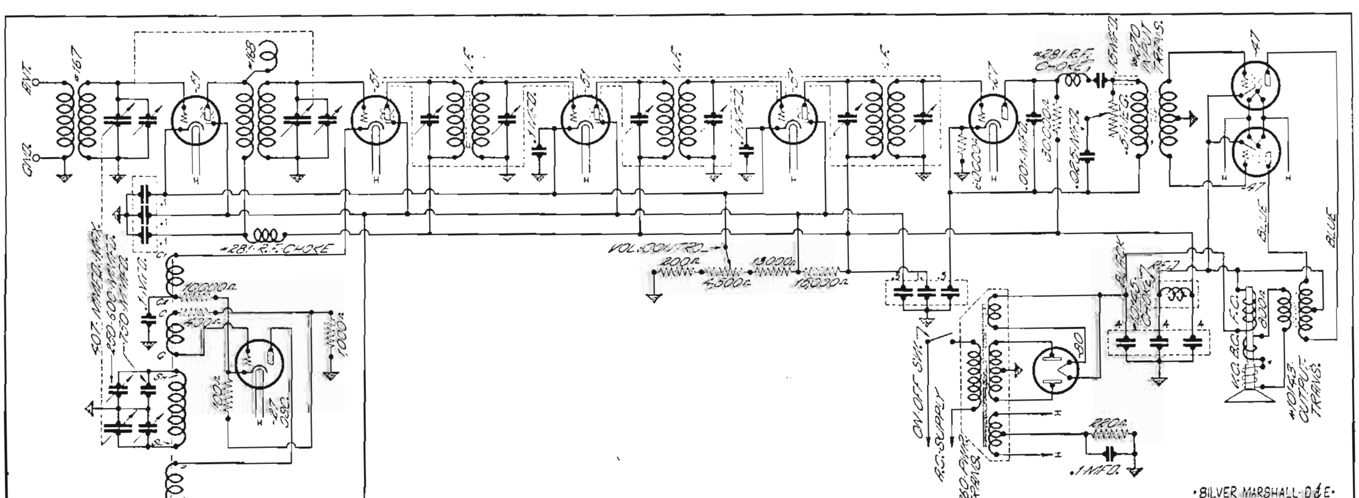






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	4	4	4
100	9	9	9
1000	15	15.5	15
10000	21	22	21



Stromberg-Carlson Models 19-20

WHEN measured in our laboratory, the Stromberg-Carlson models 19 and 20 superheterodynes gave the curves printed herewith.

A standard dummy antenna of 20 uh, 200 uuf and 25 ohms coupled the signal generator output to the receiver, and the 245 output tubes in push-pull were matched with a resistive load of 4000 ohms. Standard output level of .05 watts was maintained in all tests, with the voice coil disconnected for correct loading of the output tubes which were coupled capacitatively to the tube voltmeter.

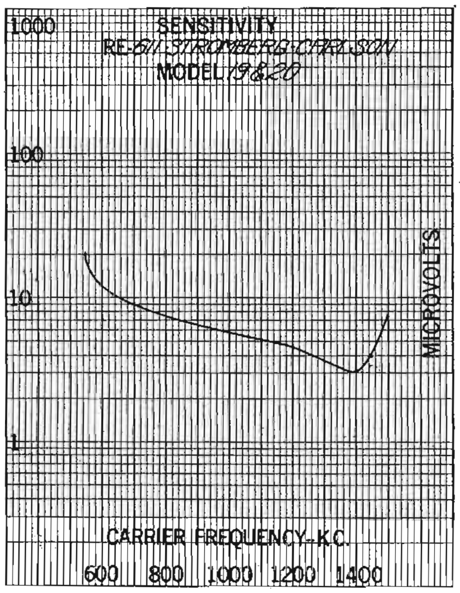
With a line voltage of 112, the receiver drain was .94 amperes. At all times the volume control was at maximum setting, and the factory alignment of the r-f and i-f was not changed. The tubes used were those included with the chassis.

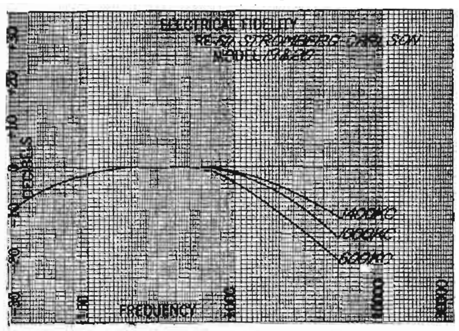
Average sensitivity found from the curve of column one is 7.5 microvolts absolute, corresponding to 1.9 microvolts per meter with a standard four-meter antenna. Band widths in kilocycles for the four field strength ratios will be found under the selectivity curves of this receiver in column three. Five watts of audio power is the maximum output to the output transformer, with harmonic distortion disregarded. At 550 k-c the noise level was .6 of 1 percent, the lowest value, while the highest, 6.1 percent, occurred at 1400 k-c.

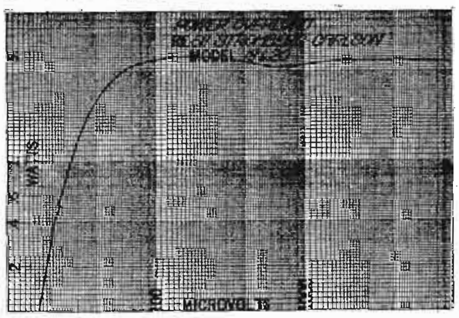
At the bottom of the page is the schematic wiring diagram of this receiver.

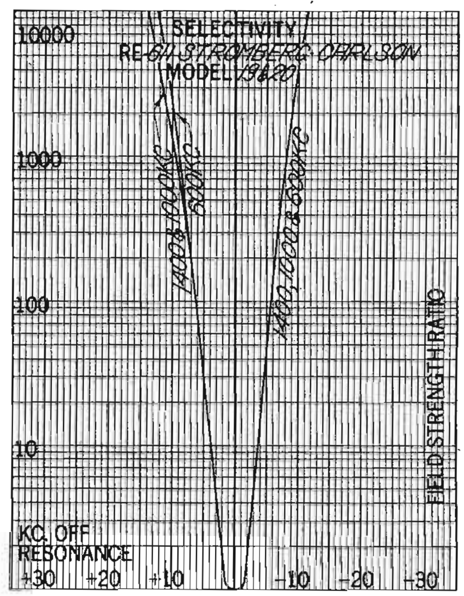
A phonograph pick-up jack is provided for phonograph record reproduction from the grid of the second detector tube.

The tube complement consists of a 235 r-f, 235 first detector, 227 oscillator, 235 second i-f, 235 third i-f, 227 second detector, 245s in push-pull and a 280 full-wave rectifier. A tapped audio choke is used in the B supply filter.



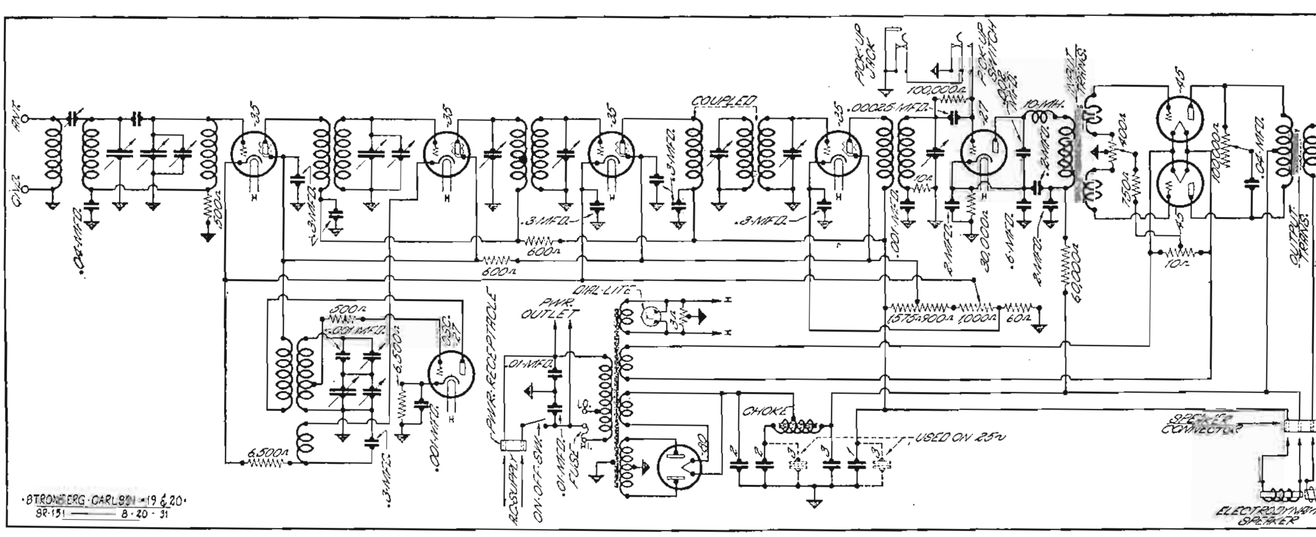






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	7.5	7.5	7.5
100	12	12	12
1000	17	18	18
10000	23.5	25	25



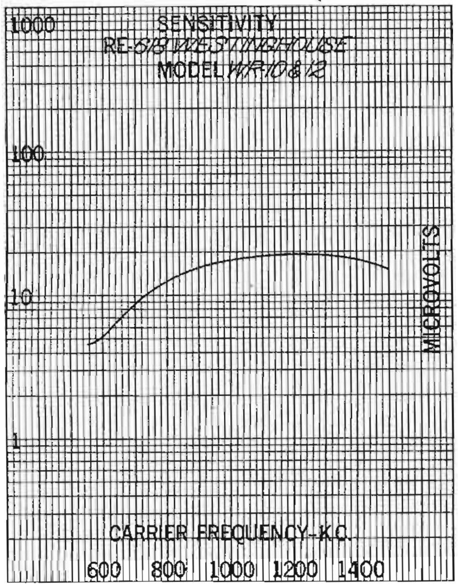
Westinghouse Models WR10-12

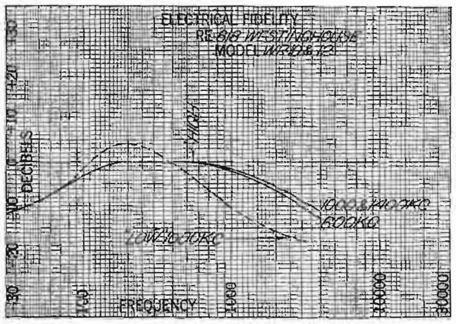
WESTINGHOUSE superheterodyne models WR10 and 12 response curves from our recent measurements are found on this page.

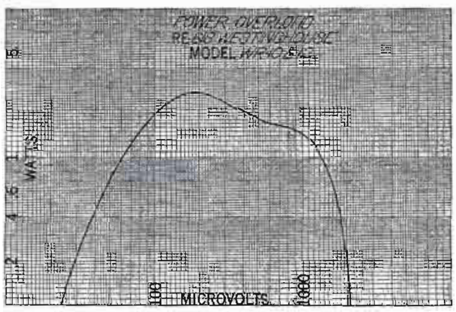
Input to the receiver antenna circuit was through a 20 uh, 200 uuf and 25 ohm standard dummy antenna. With the voice coil circuit open, the 245 plates were coupled capacitatively to the 4000 ohm resistance load used to match their output impedance. An output of .05 was maintained as standard.

No change was made in the receiver alignment from factory adjustment, and the tubes were supplied with the receiver. For all tests the volume control was set for maximum receiver sensitivity. The a-c line current was .61 amperes with the line voltage supply of 111 volts.

From the sensitivity curve of column one, the calculated average sensitivity in microvolts absolute is 23.2, equivalent to 5.8 microvolts per meter.

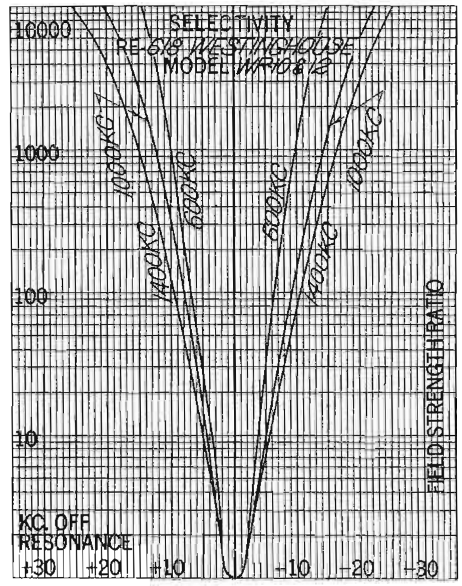






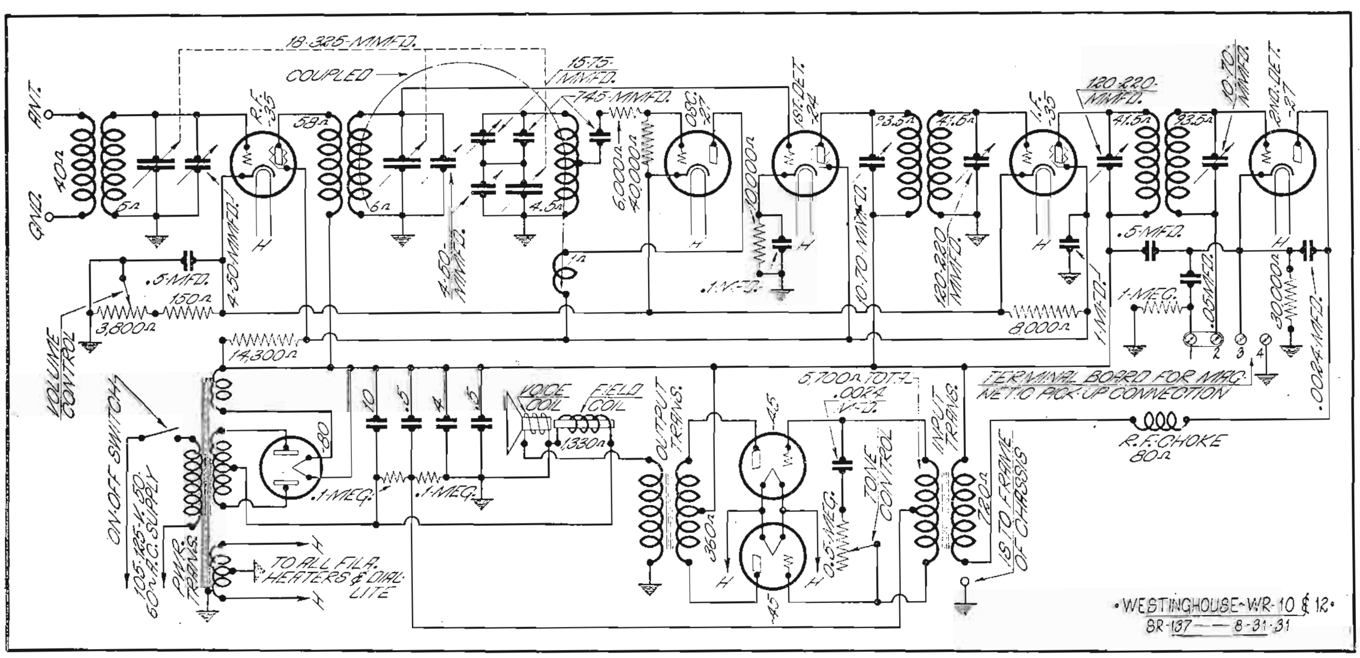
Maximum power output to the speaker is 2.77 watts, not considering the harmonic distortion of the wave form at this power level. Under the selectivity curves, in tabular form, are the band widths taken from it.

This superheterodyne, the schematic of which will be found under this article, requires a 235 r-f, 227 oscillator, 224 first detector, 235 second i-f, 227 second detector, 245 output tubes in push-pull and a 280 full-wave rectifier tube. Variation of the cathode bias of the r-f and second i-f tubes gives volume control of the set, while the coupling of oscillator energy to the mixer is inductive. Here the field coil of the dynamic speaker is in the B return lead, which grounds one side of the field as well as the voice coil.



Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	7	9.5	11
100	13	17	20
1000	20	26.5	32
10000	29	43	50



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		
90	November, 1930	SR74
6	March, 1929	SR1
8	March, 1929	SR2
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
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
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
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
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
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
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
Philco		
86-82	November, 1929	SR26
95	September, 1930	SR60
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
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
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

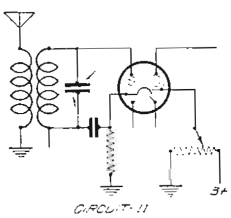
Model	Published	Drawing No.
Stewart-Warner		
950	September, 1930	SR62
Series 900	January, 1930	SR34
R100	January, 1931	SR85
102A	October, 1931	SR147
Stromberg-Carlson		
846	September, 1930	SR54
635-636	November, 1929	SR18
12-14	November, 1930	SR93
Transformer Corp.		
50	November, 1930	SR78
80-81	October, 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
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

Most Popular Volume Control Methods

THERE are approximately twenty-two means of controlling volume of a radio receiver, and practically all of these methods have been used in receiving sets.

Six Major Classes

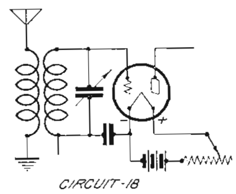
A review by our service department of the recently issued "Volume Control Guide for Service Men," prepared by Central Radio Laboratories, 900 E. Keefe Ave., Milwaukee, Wis., discloses the fact these methods can practically be divided into six major classes, as indicated here.



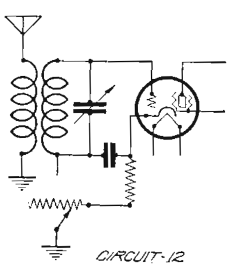
The screen grid potentiometer was quite popular when the screen grid tubes came into use

Covers 310 Models

In surveying the 310 models on which the 22 methods are used, it is seen that 169, more than half, are employing the six systems shown in the drawings. It is interesting to observe their order of importance in the following list:



Here's an old timer—the filament rheostat for volume control. It was used on either d-c or a-c sets, but its day is past



The grid bias control is also popular in both 227 and 224 sets. It will be more so in receivers using the 551 type tubes, though the potentiometer will be used instead of a rheostat

Order of Importance

Circuit 11, screen grid potentiometer control, 44 models.

Circuit 12, cathode bias rheostat control, 29 models.

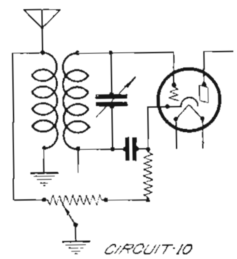
Circuit 18, filament control (an old timer), 29 models.

Circuit 10, antenna and bias control, single, 26 models.

Circuit 20, antenna and bias control, double, 21 models.

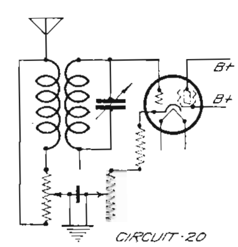
Circuit 1, antenna or r-f primary potentiometer, 20 models.

The remaining 141 models employ a total of 16 volume control methods besides the six systems illustrated schematically in this article, but these are not indicated in the present article because their importance hardly warrants it. The receivers included a number of those using battery power for the filaments and extended up to those receivers using the a-c screen grid tubes.

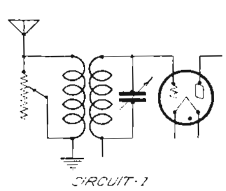


In this a potentiometer serves a double function, governing antenna input and cathode bias simultaneously with a single unit

Service men will find the Volume Control Guide of considerable help in replacement work. Copies of the guide may be secured by writing the Centralab organization at the address shown above.

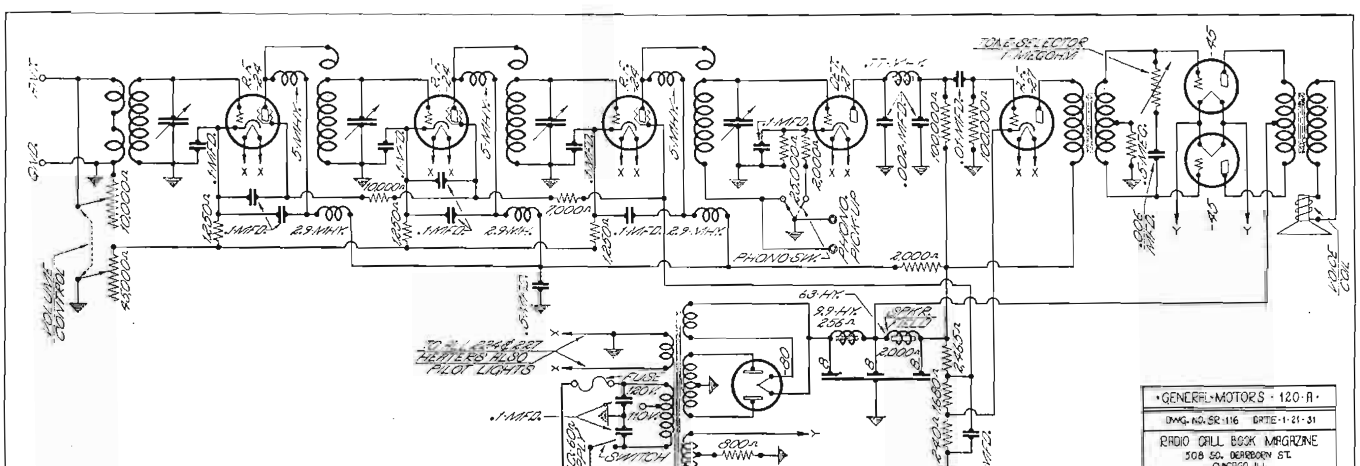


The same end is achieved here as in circuit 10, though in this case the potentiometer is a double unit

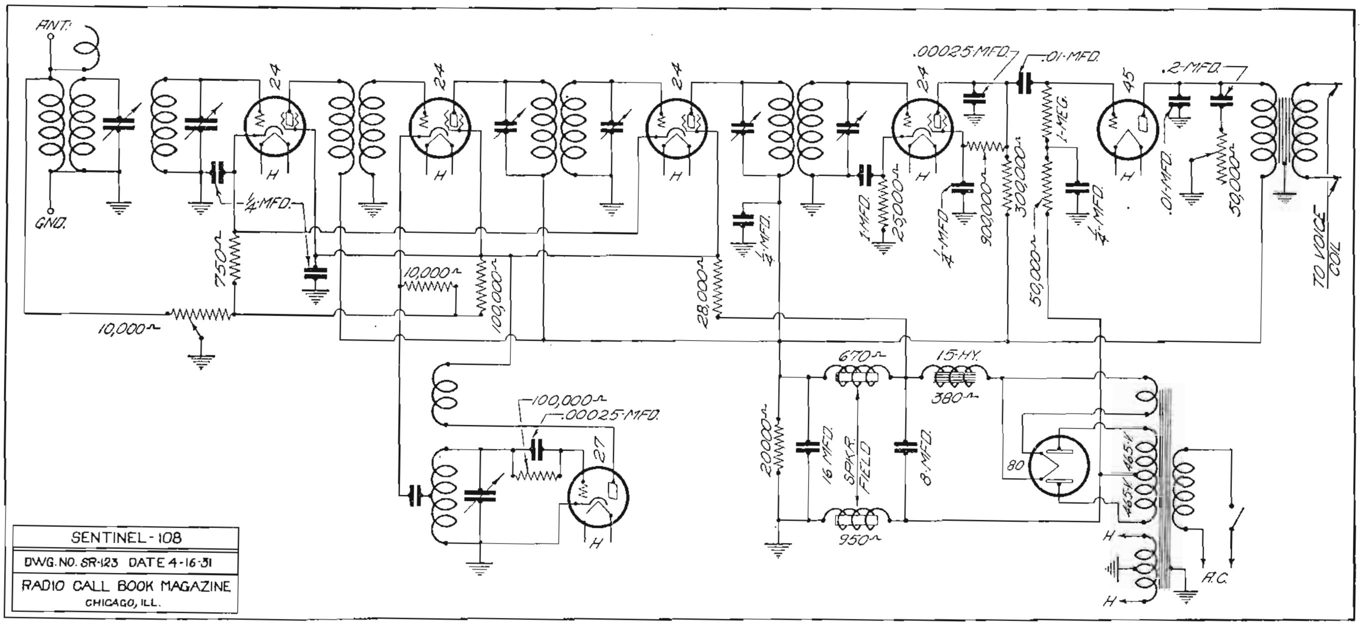


Antenna input is controlled by the rheostat shown in this drawing. The same idea could be applied to the primary of one of the r-f transformers

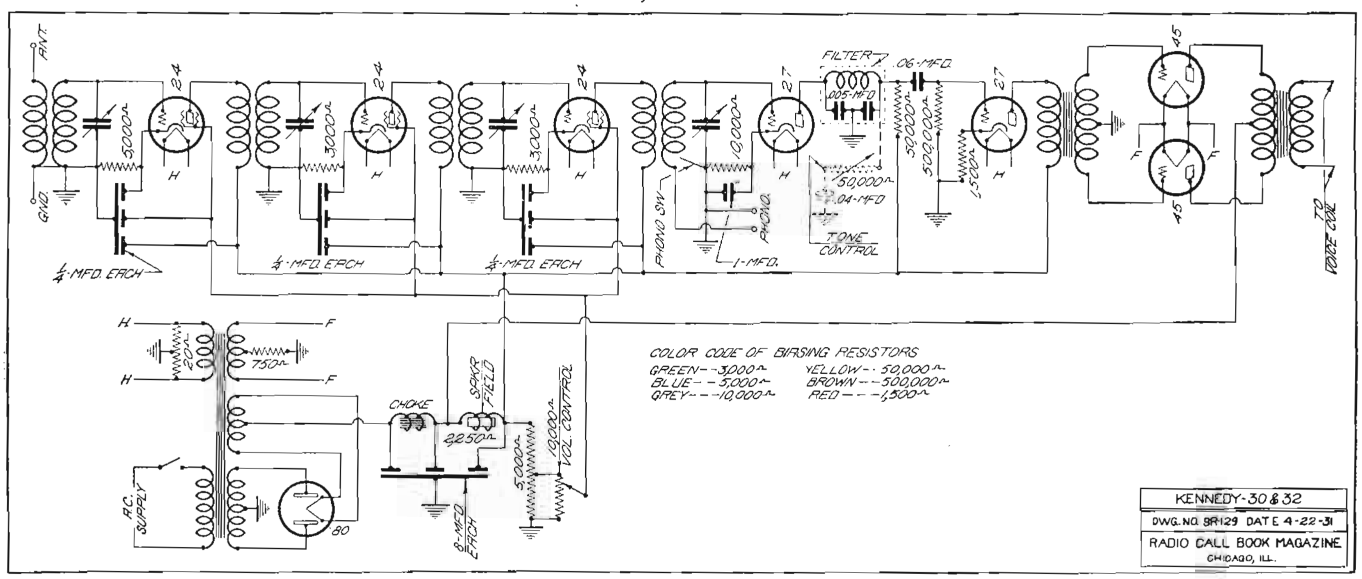
Schematic on General Motors 120-A



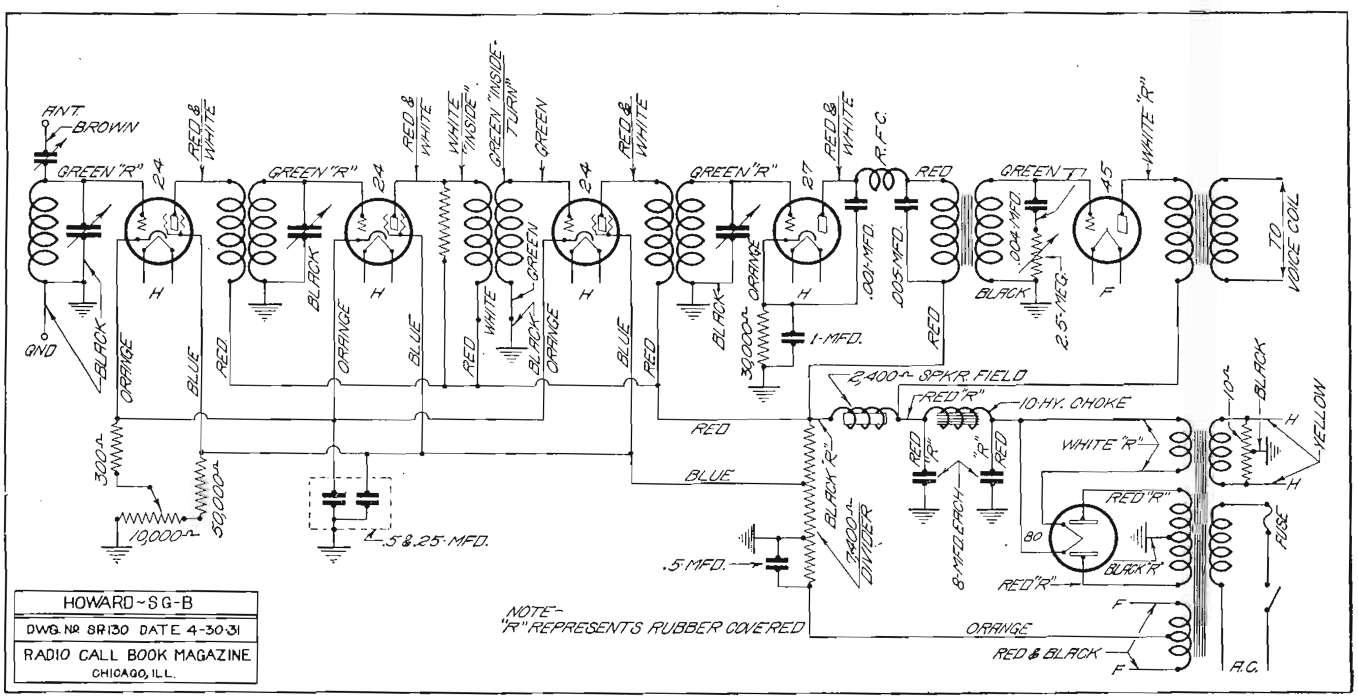
Sentinel Model 108



Kennedy Models 30-32



Howard Model SG-B



Capacity Meter for Service Man

HOW many times have you picked up a small or large paper bypass condenser which is unmarked or has had its capacity value obliterated in some unfortunate accident, or one of which you do not know the accuracy of the marking? Now you can build an instrument which is so inexpensive and so simple that an hour's work will complete it with a very small outlay in cash. The continual need of this capacity meter places it in a category of the voltmeter for usefulness.

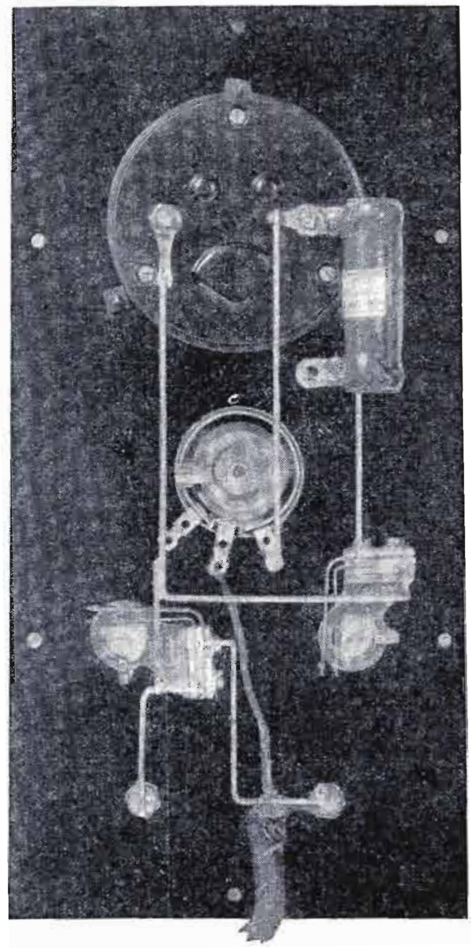
Not Hard to Make

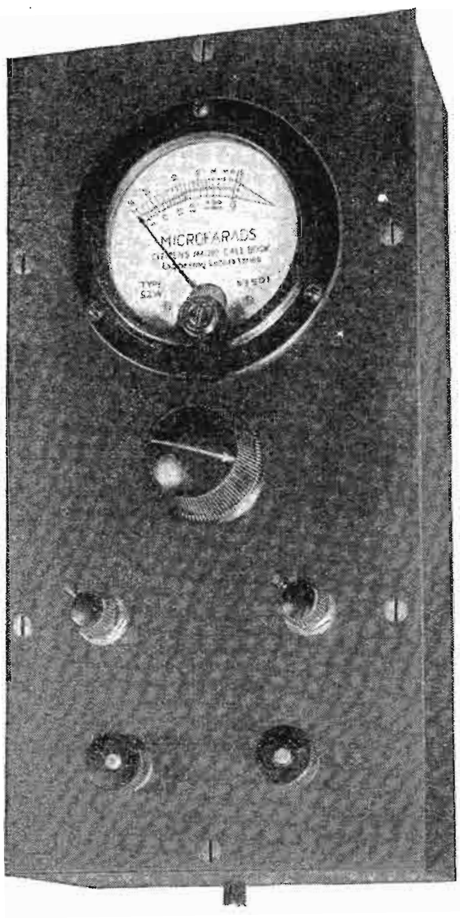
The only item of expense is the 0-150 volt a-c Weston voltmeter. The two single pole single throw switches may be of any make, and the 3000 ohm rheostat used for zero adjustment should be wire wound. The 1000 ohm resistor shown should be of very good accuracy, preferably of the vitreous type. Two binding posts, an attachment cord and plug, a bakelite or composition panel, and a box, complete the parts' list. The wiring is very simple and neat, the latter due to the supports offered by the parts found on the panel.

How It Works

Let us see how this instrument works. We know that the voltage drop or the voltage developed across an impedance may be found if the impedance is known. In this case the a-c resistance of the condensers to be measured is not considered, which leaves a reactance only to cause a voltage drop. This is given by the expression $X_c = \frac{1}{2\pi fC}$, where C is in microfarads. The frequency is 60 cycles, assuming the line remains nearly constant, as it does now in all cities and large communities. Then the reactance becomes $\frac{.00265}{C}$. We also know that the greater the reactance, the greater the voltage drop across it, and hence, with increasing capacity values, the drop becomes less.

The voltmeter is in series with the capacity to be measured. Its reading depends on the voltage drop across its internal impedance also. Therefore the two voltage drops added vectorially equal the line voltage. Knowing the meter impedance, we can calculate by the above expression the voltage which will be read by the latter with various values of capacity in series with it, with the whole combination across a 110 volt 60 cycle a-c line.

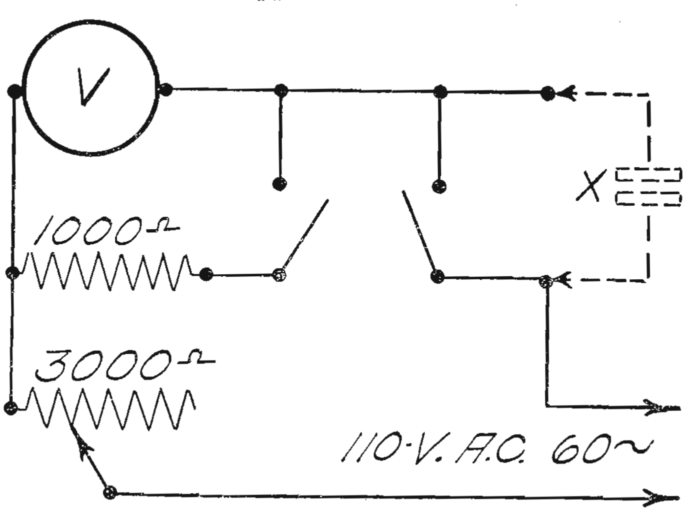




For the larger values of capacity, it is necessary to shunt the meter with a 1000 ohm resistor as shown, since the drop across the meter otherwise would be too large compared to that across the condenser to be measured. The capacity scale of the two ranges which must be pasted over the 0-150 scale of the Standard Weston 0-150 volt a-c meter may be obtained from our laboratory at cost. We have not developed a scale for other voltmeters having different scale lengths and divisions.

Operation

Adjust the pointer of the meter to the left end of the special scale. Then plug the cord into a standard 60 cycle outlet. Close the right-hand switch and the left-hand switch and adjust the meter by means of the rheostat to the last right-hand division of the scale. Then open the switch on the right-hand side. Place the condenser across the terminals and note the reading. If there is no deflection whatsoever, the condenser is open. If the deflection is to the extreme right, it is shorted. If it is too small for this scale, only a slight movement of the pointer to the right will be seen. In the latter case, disconnect the condenser, close the right-hand switch and open the left one. Then adjust to the right end of the scale with the rheostat. Open the right-hand switch and connect the condenser again, reading its value on the upper scale.



Results of Our 551 Questionnaire

AT a time when the type 551 tube as made by the independents and the 235 as redesigned by the Radiotron interests was first being introduced, our editorial department sent a questionnaire to most of the receiver engineers to learn to what extent these new tubes could be used in the older t.r.f. sets in place of the 224.

The questionnaire read as follows:

"With type 551 tubes having practically identical plate voltage, C bias, plate current and screen voltage as the 224, we have found that some of the older t-r-f-jobs using 224's may be considerably improved by substituting the 551.

"To get an accurate idea of how this applies to all factory receivers we would appreciate your engineering and service department going over your earlier models and seeing to what extent this substitution can be recommended, so we may inform our dealer and service readers in a forthcoming issue."

Two forms were provided:

One. Following models of our receivers may use 551 tubes in the r-f positions without involving any circuit changes.

Two. To use type 551 tubes in the r-f stages of the following models it will be necessary to use cathode control, eliminating the screen control entirely.

In the data following will be found the statements of engineers and service departments of a large number of manufacturers. Much of the material herein shown will be of help to service men who may wish to make such changes as are suggested. The material is presented for the benefit of all interested:

ROBERT F. HERR

Service Engineer, Philadelphia Storage Battery Co.

In order to use these tubes in any Philco model rather complicated changes in wiring are necessary. We believe that the earlier Philco models are giving satisfactory performance and do not recommend making these changes. The results are always doubtful when changes are made in the receiver circuit out in the field.

KENDALL CLOUGH

Chief Engineer, Silver-Marshall, Inc.

I regret to state that I am very hesitant to commit myself on any recommendation for use of variable-mu tubes in old receivers without specific investigation of their operation in such jobs. There are several other features to be considered besides the matter of applied voltages and I am afraid that with many service men there would be more confusion resulting than aid. Inasmuch as such receivers are probably already equipped with local distance switches, and adequate volume control, there would appear to be little gain from the use of a variable-mu tube, providing the receivers are properly designed at the outset.

Readers interested in the history of the variable mu type tube may refer to page 42 of the January 1931 issue of this magazine in which appeared a digest of the material contained in Contributions from the Radio Frequencies Laboratories, No. 22, "Reduction of distortion and cross-talk in radio receivers by means of variable mu tetrodes" by Stuart Ballantine and H. A. Snow. The paper itself was presented at the November, 1930, meeting of the I.R.E. at Rochester.

Numbers of the variable mu tubes mentioned were made by Arcturus, Grigsby-Grunow and Raytheon companies who cooperated with the Boonton Research Corp., in manufacturing studies.

In the beginning the tubes were known as 551's with a definite set of characteristics; the Radiotron type was 235 which in the very beginning had different values from the 551 but which was revised to be interchangeable with the 551. Both Radiotron and Cunningham advised us of the revisions but not in time to include the 235 type in the original questionnaire. Today the 551 and 235 are the same. —Editor.

L. F. BEACH

General Service Dept., United American Bosch Corp.

Regarding the use of type 551 tubes in our receivers, we wish to advise you that we would not recommend the use of this tube in any of our sets of past manufacture. We have, in all of our models designed for use with type 224 tubes, provided a double volume control which automatically produces the same effect as the type 551 is designed to do. In other words, there is no necessity for the use of these tubes and no improvement will be noted.

V. D. LANDON

Development Engineer, Grigsby-Grunow Co.

Concerning the substitution of the G-51 tube in our Model 30 and 50 radio receivers, we are of the opinion that nothing will be gained by substituting this tube in any position of either of these receivers, inasmuch as these models were designed for use of the G-24 tube.

EDWIN BRADSHAW

Engineering Dept., Wells-Gardner & Co.

At the present time we do not recommend the substitution of the 551 type tube in our sets using the 224 tube. In order to use this tube, it will be necessary that you replace the volume control which is not an easy matter for the person attempting to make the change. It would be necessary to go to a volume control manufacturer to get a new control and it is very doubtful whether he could get the kind that would be suitable for the use to which he intends to put it, which would probably cause him to throw up his hands in disgust and condemn the information supplied by you.

RAY H. MANSON

Chief Engineer, Stromberg-Carlson Tel. Mfg. Co.

This is not possible without major changes. Do not see any advantage in such a change of tubes in previous models. Receivers should be used with the tubes for which they were designed.

GWIN C. HARRIS

Research Engineering Dept., Thomas A. Edison, Inc.

Edison receivers models R6 and R7 use 224 type tubes and do not operate with 551 tubes satisfactorily. The sets have A. V. C. and it is felt there would be no appreciable advantage in using the new tube in these models.

BYRON B. MINNIUM

Chief Engineer, Stewart-Warner Corp.

None. We do not recommend it in any of our previous models, as it involves too many changes to be worthwhile.

J. W. MILLION, JR.

Chief Engineer, Audiola Radio Co.

All models with bias control can use 551's for those r-f '24 operating on the volume control. We do not recommend changing sets not designed with cathode control.

DORMAN D. ISRAEL

Chief Development Engineer, The Crosley Radio Corp.

Crosley chassis 77-1 used in Administrator, Arbiter and Director. Change r-f cathode resistance to 100 ohms. Change detector cathode resistor from 20,000 to 6,000 ohms. Sensitivity will be about the same; selectivity about the same or slightly better.

Chassis used in models 40S, 41S, 42S and 82S. Change r-f cathode resistor to 100 ohms. Change maximum limit resistor from 725 to 3500. Sensitivity will be about the same; selectivity about the same or slightly better.

Chassis 77 used in Arbiter, Administrator and Dictator. Change r-f cathode resistance from 20,000 to 6,000 ohms. Sensivity will be about the same; selectivity slightly improved.

Amrad chassis 84 used in Sondo and Rondeau. Changes are identical with those of chassis 77, 53, 54, 57 and 58. No change in r-f cathode resistance. If 551 tube is used in detector stage, change detector cathode resistor from 10,000 to 6,000 ohms. The sensitivity will not be as good after this change; selectivity will be slightly better.

Chassis 91 Roamio. Change grid overload resistor from 60,000 to 20,000 ohms. Change detector cathode resistor from 10,000 to 6,000 ohms. Performance will be about the same.

E. J. DOYLE

Chief Engineer, Transformer Corp. of America

We do not recommend using 551 on any model Clarion t-r-f circuit in view of drop in sensitivity. See attached sensitivity and selectivity percentages (arbitrary units) as checked on a representative Clarion 61. This would apply more or less on other Clarion t-r-f sets.

CHAS. J. VICTOREEN

Chief Engineer, Steinite Mfg. Co.

None—without slight loss of sensitivity. We do not recommend any of the old models being changed over, but have several in the course for development for use with these tubes.

A. CROSSLEY

Chief Engineer, Howard Radio Co.

We do not recommend the use of 551 tubes in any of our equipment for the following reasons:

First, in all our old receivers we require a definite plate voltage and a definite screen voltage, and in order to obtain this we use a low resistance B stick. With such a B stick arrangement, we cannot substitute the 551 tube for the 224 because as soon as we go up on the cathode bias, we immediately rob the screen voltage. The 551 tube, also the 235 tube are very critical with reference to screen voltage. You cannot tolerate more than a plus or minus 10% screen voltage, variation without impairing the performance of the 551 tube, because if you change the screen voltage, you immediately reduce the cut-off voltage, as far as the cathode bias is concerned, and the grid voltage, plate current, characteristic curve are changed to an alarming degree. In our model SG-A receiver, or in other receivers wherein the 224 tube was employed, you have no balancing arrangement in the power pack design to permit the proper balancing of screen grid voltage when you go up on the cathode bias voltage. For instance, in our model SG-A receiver the screen voltage is approximately 70 volts, and if we should use a high enough bias on our cathode to obtain 40 volts, we would immediately reduce the screen grid voltage to 30 volts which, of course, makes the 551 tube a different type of tube than it was intended to be. If you so design the power pack and the dependent circuits, it is possible to hold the screen voltage within plus or minus 10% and at the same time use cathode bias voltages as high as 45 volts.

If you substitute the 551 tube for the 224 and you do not hold the screen grid voltage within reasonable limits, it will cut off much more quickly than the 224 tube and you will have a very poor operating receiver. In fact, it is worse than the 224 tube, so that, as far as we are concerned, we do not recommend the substitution of 551 tubes in any of our receivers in place of the 224. The wonderful features of the 551 tube are a function of whether or not you can get a large grid voltage swing without the plate current cutting off too soon, and if you so design your receiver to hold the screen grid voltage within reasonable limits, then you can have the benefits of the large voltage swing on the grid with the consequent reduction in cross-talk and what-not.

L. OLMSTEAD

Engineer, Brunswick Radio Corp.

Models S-14, S-31, S-31 a-c, B-15, B-22, B-32, B-42 a-c. In the above models, the 551 type tubes increase sensitivity when used in the r-f stages, but when used in the detector stages decrease is noticed due to the fact that the 551's draw almost twice as much plate current as the —24 type tubes. This can be corrected, however, by shunting detector B plus resistor with resistor of equal value.

P. B. GEBHARDT

Chief Engineer, Colin B. Kennedy Corp.

None, up to 1931-a models, about to be announced. All future models (this season) will be adapted for either 224 or 551 r-f tubes. Model 26-antenna section as is, re-wire cathodes, r-f tubes through 50,000 ohm section with 250,000 ohm bleeder from B plus for bias (to cathodes). Model 32—same alterations. Model 30—has single 10,000 ohm screen control—use 50,000 ohm bleeder (B plus to cathodes). Model 42 has single 10,000 ohm antenna control, rewire same as model 30. Above suggestions make use of same volume controls.

GEO. P. MARRON

Tech. Div., Sales Dept., Colonial Radio Corp.

Models 32 a-c and d-c, 36 a-c and d-c, 38 a-c and d-c, 39 a-c, 41 a-c and d-c, 33 a-c and d-c, 34 a-c and d-c, 35 a-c, 42 a-c and d-c. Not necessary to make any changes.

Dynatron Oscillator for All Frequencies

THIS dynatron, all frequency oscillator, has been designed and built up in our laboratory because we feel that an instrument of this type is a necessity for nearly every service man and laboratory worker. It has been reduced to extreme simplicity in design and parts, consistent with ruggedness, ease of operation, and very low constructional cost.

Negative Resistance Characteristic

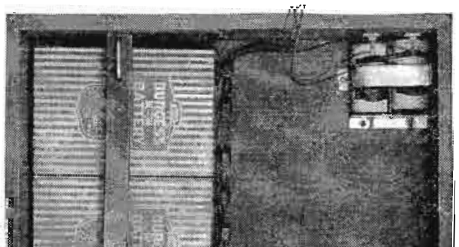
The dynatron type of oscillator is not new, dating to the advent of the screen grid tube, but little will be found on its practical applications to every-day needs. Then too, many circuit adaptations are elaborate, and the oscillator may not be stable over a wide range of frequencies. We cannot go into the theoretical aspects of this type of oscillator circuit in so limited space beyond saying that the dynatron makes use of the negative-resistance characteristic of a four electrode tube which results at low plate voltages. The frequency stability of such an oscillating circuit is far superior to that using a triode; in fact it compares very nearly to a quartz-crystal controlled oscillator without temperature control. This means it is almost as stable as the tuned circuit itself when the voltages are kept reasonably constant.

Plug-in Coils Used

The coils which are used are the standard General Radio type 384, only one being required for each desired frequency band. On the front view of the completed oscillator is shown a coil plugged in the four tip jacks for mounting purposes. A Weston type 301, 0-5 d-c voltmeter or its equivalent is mounted on the panel for reading the tube filament voltage. The tuning dial shown on the right side should be large enough to permit fine adjustments in frequency setting. It may be calibrated for each coil, preferably plotted on cross-section paper so that any desired frequency may be picked. The on-off switch may be placed in series with either filament lead. The filament supply is connected by means of the tip jacks shown in the upper left corner. Binding posts may be used if they are found more convenient for this purpose.

The filament voltage is supplied by two large flashlight cells, and is made

adjustable by means of a 30 ohm rheostat in the minus filament lead. The B voltage supply consists of two small sized 45 volt B batteries. From the schematic diagram it will be seen that the +22.5 volt tap which gives the plate voltage is grounded. The screen uses the maximum of 90 volts, while minus B is connected to the minus filament after the filament rheostat. The tube is of the new 232 d-c screen grid type. The tuning condenser, preferably of the SLF type for ease of calibration, may be of any good manufacture. Tip jacks permit a pair of phones to be connected to the output



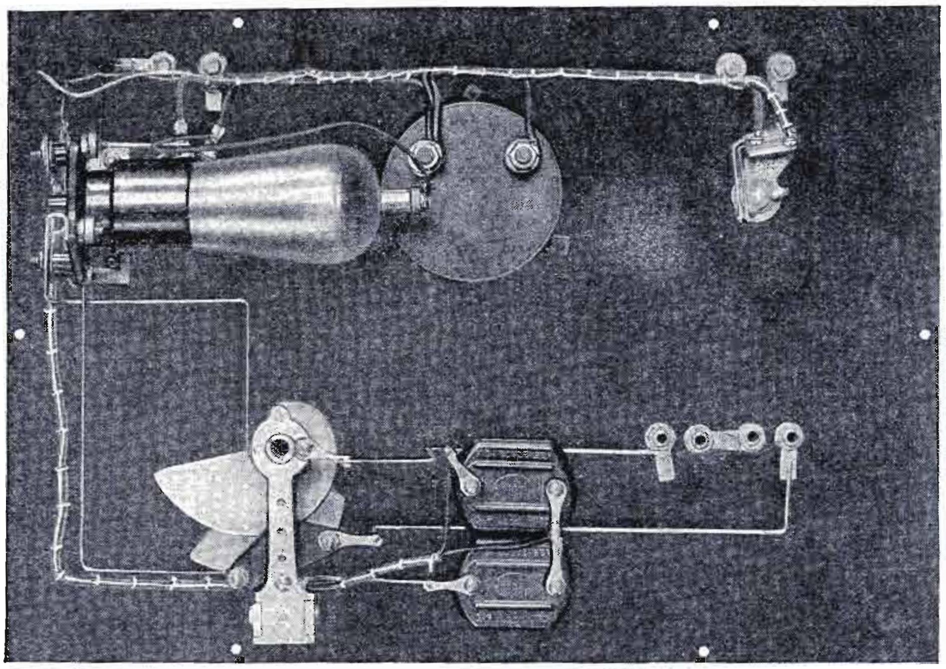
of the oscillator. The outside overall dimensions of the unit are 14 inches long, 12 inches high, and 5¼ inches deep. Felt or rubber feet should be mounted on the bottom. The panel suggested is of three-sixteenths or quarter inch bakelite or high quality composition.

Loose Coupling Advisable

In operation, coupling loosely to the coil is advised. Even the radiation pick-up may be great enough for the purpose. It is of great importance in wiring the oscillator to use extreme precaution to prevent possible future movement or variation of leads or parts because the consequent variation of frequency due to minute changes in circuit capacitance. It is no more difficult to do the job right the first time than to do it right the second.

The three views printed in this article are the front view of the finished unit, the interior of the case showing the layout of the batteries in their relative positions, and the back of the panel on which all of the circuit essentials are mounted. The schematic diagram also included is self-explanatory in every detail. In building any equipment with the prevailing racketeering parts prices, one must use extreme care in selection to insure quality of merchandise, for eventually poor parts must be replaced with good ones with a loss of time, money and patience.

The primary use of an oscillator of this type is as a standard for the purpose of heterodyning with another oscillator, modulated, or with a station carrier. The reader undoubtedly is experienced with the grief resulting from an attempt to beat a modulated signal and reach a zero beat on which he could depend. Such practices give results which mean nothing if accuracy is desired and are to be condemned. If a wave meter is used, care must always be taken to couple as loosely as practicable due to the drag or "sucking in" of an oscillator



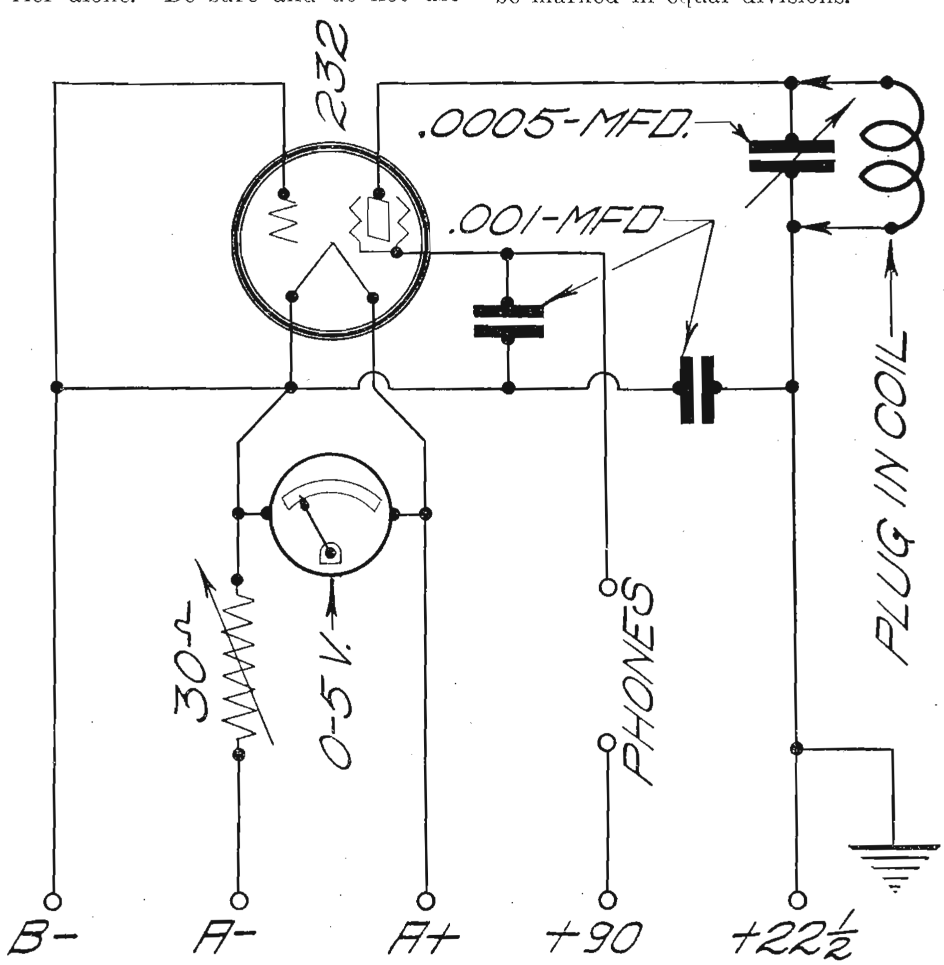
by another coupled, tuned circuit closely coupled to it. This is very serious in this type of oscillator because the output is not high. Because of this fact, it is used only as a standard by which to calibrate another oscillator with greater output. The latter may be modulated as desired, but the modulation must be removed during the beat process.

Rich in Harmonics

A dynatron oscillator is rich in harmonics, a favorable asset if their use is clearly understood. This asset is of most value when the pocketbook can afford few plug-in coils of the type used here, and for short wave work it becomes most pronounced. Remembering that harmonics are always multiples of the fundamental and never fractions, let us illustrate the procedure required in this latter case. Assuming the fundamental to be 1000 kilocycles, the second harmonic is 2000 kilocycles, the third 3000 kilocycles, the fourth 4000 kilocycles, etc. Though there is no theoretical limit to the number of harmonics, in general the output decreases for succeeding frequencies. Remember that these frequencies may be used for beat note purposes also just as the fundamental, but more difficulty may be experienced when using the higher harmonics.

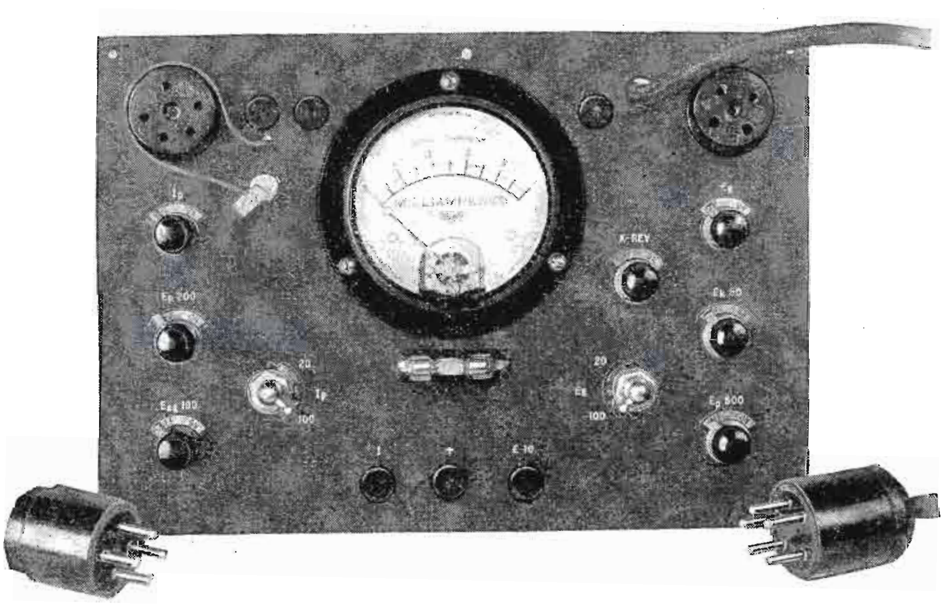
Perhaps a word about calibration would not be amiss. If the oscillator is to be calibrated in the broadcast band for instance, connect up a broadcast receiver, preferably not a superheterodyne, though such a receiver may usually be used successfully. Tune in a station known to use a crystal-controlled oscillator. The tuning need not be exact since it enters into the measurement only in that it makes an audible signal and does not affect the frequency in any way. Then attach, in addition to the receiving antenna, a short piece of insulated wire to the antenna post. Bring one end of this wire near the coil of the dynatron oscillator, making a few loops if necessary for sufficient coupling. Tune the dynatron until a heterodyne whistle is heard in the speaker. Wait for a break in the program and tune the dynatron to zero beat with the carrier alone. Be sure and do not use more coupling than is absolutely necessary. Repeat this procedure for at least eight points over the band, with more at the ends than in the middle of the range. The curve will be almost a straight line when plotted if the condenser is SLF, with slight bends at the points of maximum capacity and minimum capacity. If a wave meter is used, any oscillator signal will replace the station carrier.

For all frequencies above the broadcast band, the procedure may be a bit more difficult. If a short wave receiver is available, it may be used to good advantage. In this case tune in on the harmonics known stations. Very good results will be had on the first few harmonics, though after the fourth or fifth it is usually impossible to pick up multiples of the broadcast band frequencies unless the location is quite near the broadcast stations. For the higher frequencies, more dependable short wave transmission stations may be used. In these cases, the procedure is identical with that of calibrating the broadcast band of frequencies. It is absolutely essential in choosing short wave stations to use only the larger stations, such as those broadcasting in conjunction with WJZ, KDKA, WGY, KGO, etc. Otherwise the same problem arises which with broadcast band stations which do not employ quartz crystal frequency control. The dial scale should be marked in equal divisions.



How to Make a Small Set Analyzer

ONE of our readers designed a small set analyzer for general use at a very low cost. Because it is very inexpensive, it has its limitations. We might name them so there will be no misunderstanding later. It will not test pentodes or rectifier tubes and it requires an external filament voltmeter, for which binding posts have been provided. Two views are given with this article, a front view and a panel rear view. A schematic wiring diagram is also included, from which this unit can be easily wired. A 0-1 milliampere d-c. milliammeter is the heart of the unit and may be of any good manufacture, such as the Jewell meter illustrated.



Parts on Panel

On the rear of the panel are mounted all the parts required for the instrument. All resistors including the 20,000 ohm, 50,000 ohm and 80,000 ohm are of the wire-wound type and within one per cent of their rated values. Resistors R1 and R2, as noted, which must be adjusted for the internal resistance of the milliammeter, are of low value.

Making the Shunts

A description of the method that may be pursued in making up the shunts for the meter when used for the twenty and one hundred milliampere scales follows:

Secure an accurate 100 m.a. milliammeter. Put it in series with the meter on the panel to be calibrated. Connect the whole circuit in series with a wire wound rheostat of about 10,000 ohms and a 45 volt B battery. Then put an 8 ohm wire-wound resistor in the place it is to occupy, and switch the panel meter to the 20 mil position. Next connect the 45 volt B battery and adjust the 10,000 ohm rheostat to give a reading of 20 mils on the standard meter.

If the meter on the panel goes off scale it indicates the shunt value is too high. If the panel meter doesn't read 20 mils it shows the shunt value is too low.

When it is determined the shunt resistance is too high, solder two or three wires of the resistor together, thus shorting those turns and lowering the resistance. Then re-check until the shunt resistance value just permits a reading of 20 mils on the panel meter. The same procedure may be adopted with the 100 mil shunt.

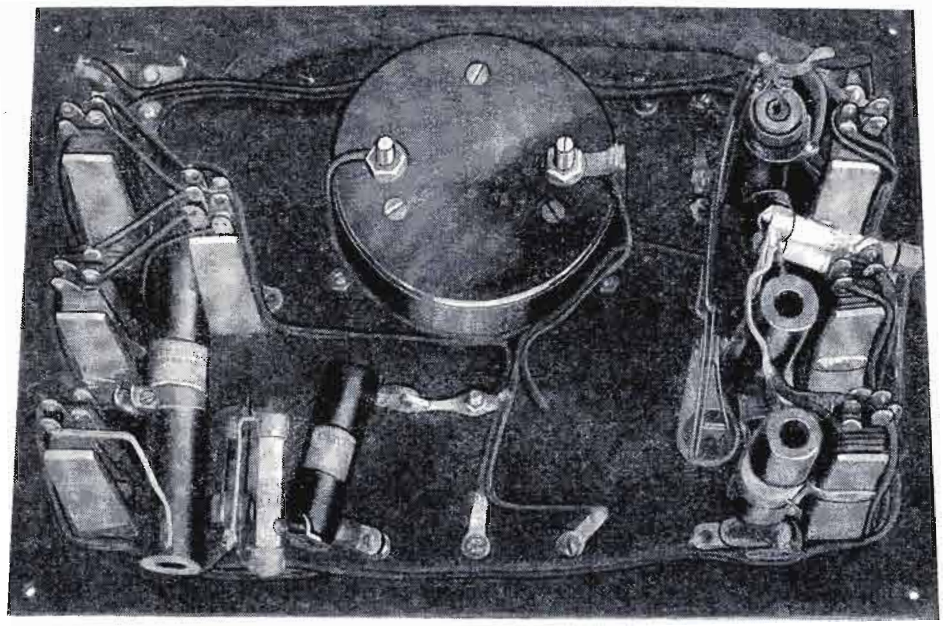
Location of Switches

The nine switches are located on the back of the panel as follows: under the four-prong socket on the left side is the double-pole single-throw switch marked E_g. Under it is a double-pole single-throw switch which is E_k 0-50. Below this, at the bottom, is a double-pole single-throw switch marked E_p 0-500. The resistor shown next to these three switches is a 300,000 ohm wire-wound unit. On the right of it, and midway up the panel is a double-pole double-throw switch for K-Rev. Under it is a single-pole single-throw switch marked E_g 20,100. Over it is a resistor of 80,000 ohms resistance, and to its right is a wire-wound unit of 100,000 ohms.

On the extreme right are mounted three switches, the top one of which is a double-pole single-throw for I_p. The center unit is a double-pole single-throw marked E_p 0-200, and below it is another double-pole single-throw for E_{sg} 0-100. Another small switch will be found to the left of these switches marked 20,000 and is single-pole single-throw. A tapped shunt for the millampere scale is at the top of the right-hand row of three resistance units. In the center is a resistance of 100,000 ohms wire-wound, as is the bottom unit. The two resistors mounted near the top in this row are, 50,000 and 20,000 ohms. Above can be seen the five-prong unit for UY type tubes.

Meter on Panel

The front panel view shows two binding posts at the top, one on each side of the meter for connecting an external filament voltmeter. At the



left is a grid connection with a lead which connects to the post on the panel for tubes whose grids connect on the socket. This lead otherwise connects to tubes whose grids are found at the top of the glass bulb, such the UX 222 and UY 224 types. At the bottom are three binding posts for use of the meter as the 1 milliammeter or 0-10 volt voltmeter as marked.

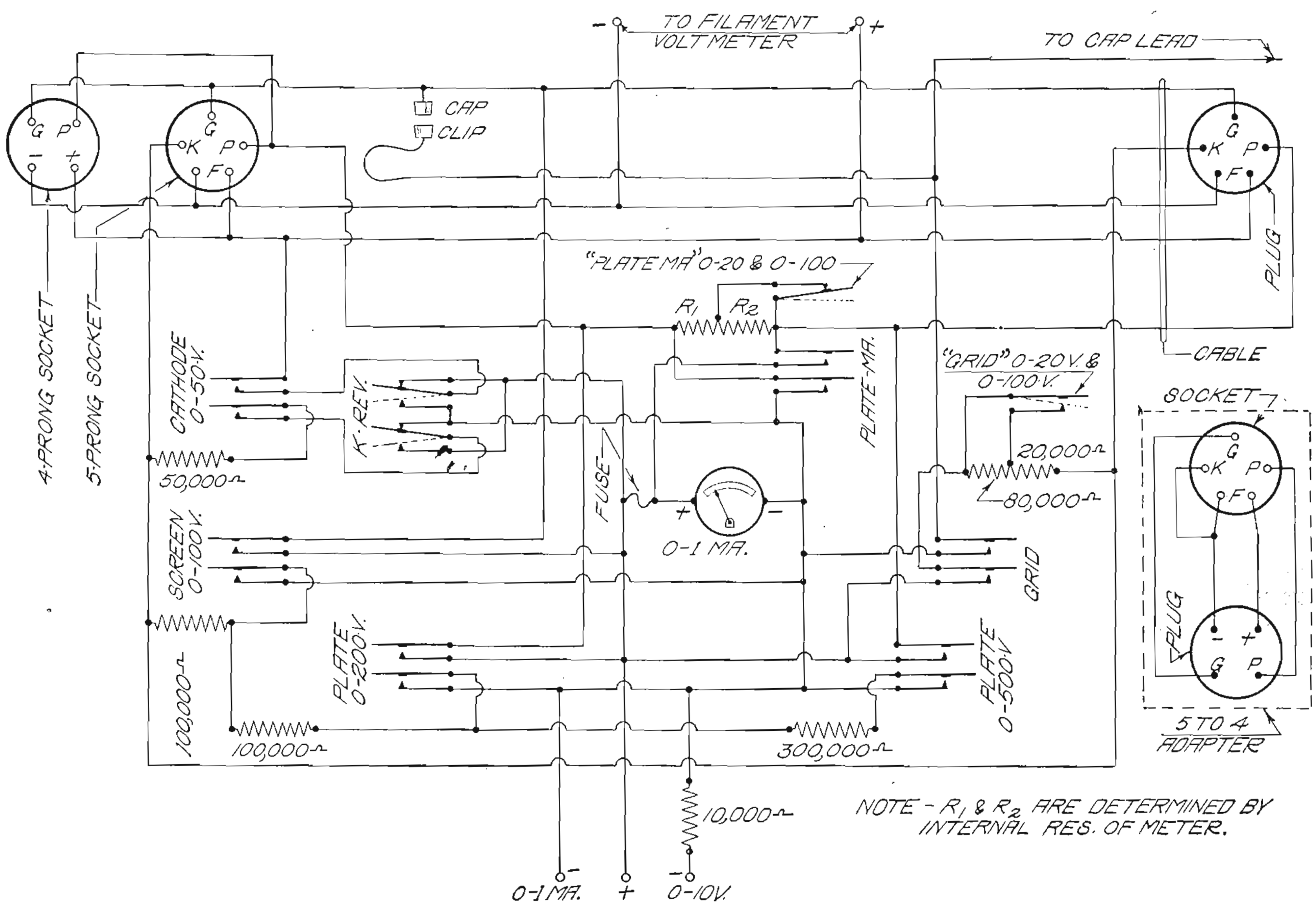
How It Is Used

To use the meter as a d-c voltmeter of 1,000 ohms per volt resistance, connect to the cathode and plate terminals of the socket mounted on the panel. In this case the voltmeter range is determined by the setting of the various switches marked E_p. As a d-c milliammeter, connect from the plate of the socket to the plate of the plug, in which case the scale will be determined by the setting of the switch marked I_p 20, 100, and I_p.

For continuity, use up to 7½ volts external battery and connect to the bottom binding posts marked plus and E-10. It will be possible to use this meter as an ohmmeter also by connecting the resistor in series with the battery and using the binding post marked plus and one, when Ohm's law gives R equals $\frac{E}{I}$. In such a case for any degree of accuracy the battery voltage would need to be known exactly.

Fuse for Safety

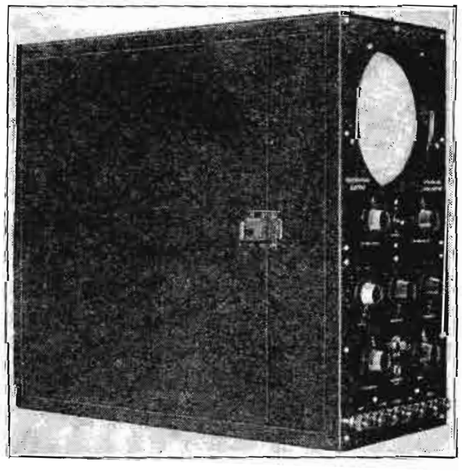
The fuse shown under the meter on the front side is of 1/32 ampere value. A smaller fuse could be used but it would be more likely to blow with small, harmless surges. The one used affords all of the necessary protection to the milliammeter. As in the case of all analyzers, remove the tube from the set, put it in the test socket and put the plug in the set socket. A hook-up for a five-prong to four-prong adapter is given on the right side of the schematic diagram.



Westinghouse Cathode-Ray Oscilloscope

ORIGINALLY developed for television, the latest Westinghouse cathode-ray oscilloscope places in the hands of engineers a portable, high speed instrument, free from moving parts and especially suitable for visualizing periodic electrical phenomena. It easily catches events lasting but a millionth of a second. The curve traced on the oscilloscope's screen is brilliant enough to be seen in daylight, making the device of considerable importance in lecture rooms for demonstrating such difficult problems as the effects of circuits on wave form. A special multivibrator circuit gives linear timing when wanted; but this new instrument, unlike the ordinary oscillograph, is not tied down to "time" as abscissa—it accurately plots any two variables against each other.

Briefly, the oscilloscope, looking like a big bottle, is a large vacuum tube with a hot filament "cathode ray gun" at one end and a 7 in. diameter fluorescent screen at the other—the bottle's bottom. Anodes surrounding the filament focus the cathode ray on the screen, which glows bright-green in the spot where the ray touches it. The ray can be moved up-and-down



or sidewise (the bottle being horizontal) by controlling coils or plates at the sides of the bottle. The ray is thus an inertialess pointer which traces a curve, the coordinates being any two variables that may be put on the control coils or plates. The ray may trace the curve in a few millionths of a second but the fluorescence lasts long enough for the eye to catch it.

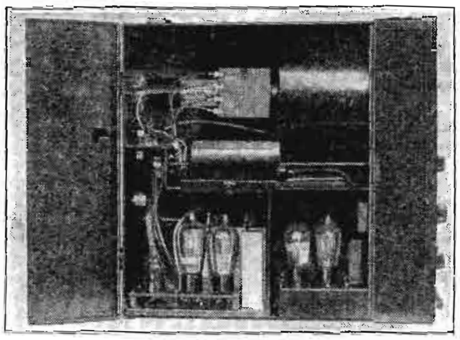
Like astronomers who predict the existence of a new planet long before telescopes are able to see it but are finally corroborated by the improvements in instruments, the "cathode-ray bottle" enabled Dr. Slepian to finally visually demonstrate his basically new theory of what happens when an arc is extinguished.

In striking contrast to its obvious possibilities in universities and research laboratories, the oscilloscope is used as a production shop test for the new porous block Autovalve lightning arrester. Each block gets an individual test — the tester touches the switch of a 50,000 volt surge set which supplies the lightning stroke and sees before him, on the oscilloscope screen, the exact performance curve. Such actual shop test, or commercial demonstration, of arresters has never before been practical.

The new oscilloscope can simultaneously show two separate waves in their true phase relation, by using a simple synchronous distributor which rapidly switches the input terminals of the instrument from one wave to the other. Sustained vocal sounds, musical instruments, even noisy machinery, can be studied by the device.

This handy Westinghouse oscilloscope will not replace the usual oscillograph in the proper field of the latter, but will undoubtedly open up a new field of its own—perhaps allow shop testing of apparatus in a way we cannot now imagine.

A vibrating mirror type of an oscillograph, useful as it is, has inherent disadvantages which are impossible to overcome in practice. For one thing, the mirrors suspended on fine wires, do have inertia, which is possessed by all substances with



mass. The limiting frequency is measurable in thousands of cycles in the ordinary type. For synchronizing, a small motor must be used with attendant noise, vibration and inconvenience. There are no moving parts whatsoever in the new Westinghouse product, with the result that there cannot be any wear or deterioration from such causes. As noted above, the time of exposure may be in millionths of a second only, whereas with former types such times needed to be multiplied a hundred-fold for visual observation of the phenomena to be studied. The old type oscillographs in general could hardly be classed as portable instruments due to their size, shape and weight.

In column 1 is the outside view of the oscilloscope showing all of the controls conveniently mounted on the front panel below the fluorescent screen end of the cathode-ray tube. The interior of this instrument is readily accessible.

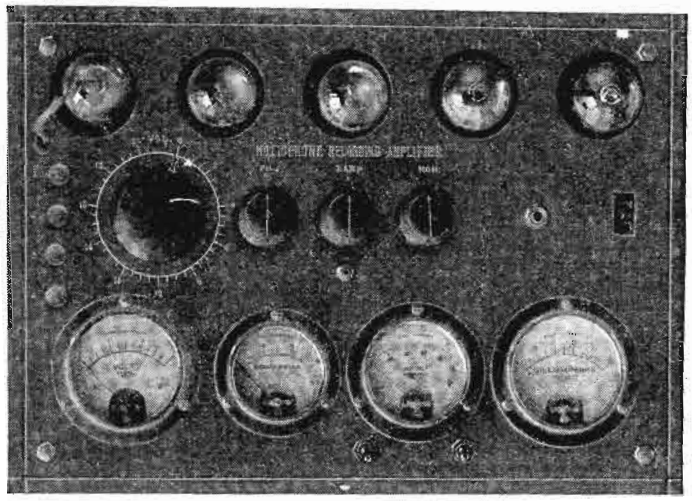
A view of the tube itself, the heart of the instrument, is shown in detail in column 2. The coils or plates for deflection and control of the cathode-ray are contained in the container mounted near the base of the tube.

From the interior view of column 3, it is apparent that vacuum tubes give the necessary control and amplification desired of the disturbance to be observed.

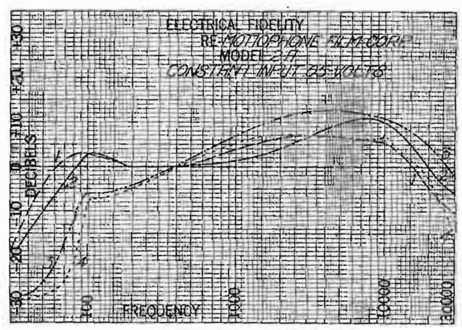
Novel Film Recording Audio Amplifier

FOR film recording of sound using the variable density type of modulation, an amplifier of the kind illustrated herein is an approach to the ideal recorder. A first glance at the electrical fidelity curves discloses the fact that the high frequency response is excellent, even to 30,000 cycles, a frequency inaudible to the human ear. This response is incidental beyond ten or twelve thousand cycles, but it shows what can be done with properly designed equipment. Such fidelity is remarkable in that three transformers were used in the circuit, each acting as an attenuation factor to very high frequency reproduction due to the capacity between windings. Curve 2 is the amplifier response without the input transformer L. Curve 4 is representative of the normal recording fidelity with an input microphone transformer, while curve 3 is the same with the second audio stage cut out. Curve 1 is the audio response using another type of transformer. Bass is apparently lacking on the representative curves 3 and 4. It might be well to discover just why such an apparent distorted output should give excellent theatre reproduction when the film is finally projected.

The first element to consider is the condenser microphone used for the audio pick-up. It may or may not have a flat characteristic, due to design, but probably will be lacking in high response. Should it also lack in low note sensitivity, the transformer giving curve 1 would remedy this in addition to any discrepancy at the treble end of the spectrum. We will assume that the recording lamp will be perfectly flat, for it is of a type with no frequency discrimination. When the sound track is developed, the natural granular nature of the silver in the emulsion produces some aberration. Since the highest notes are very fine horizontal lines, they would, therefore, suffer in sharpness and definition. When the positive is printed this process is again repeated. Reproducing amplifiers and cells in theatre projection are claimed to have flat fidelity characteristics and, if true or not, we shall assume such to be the case.

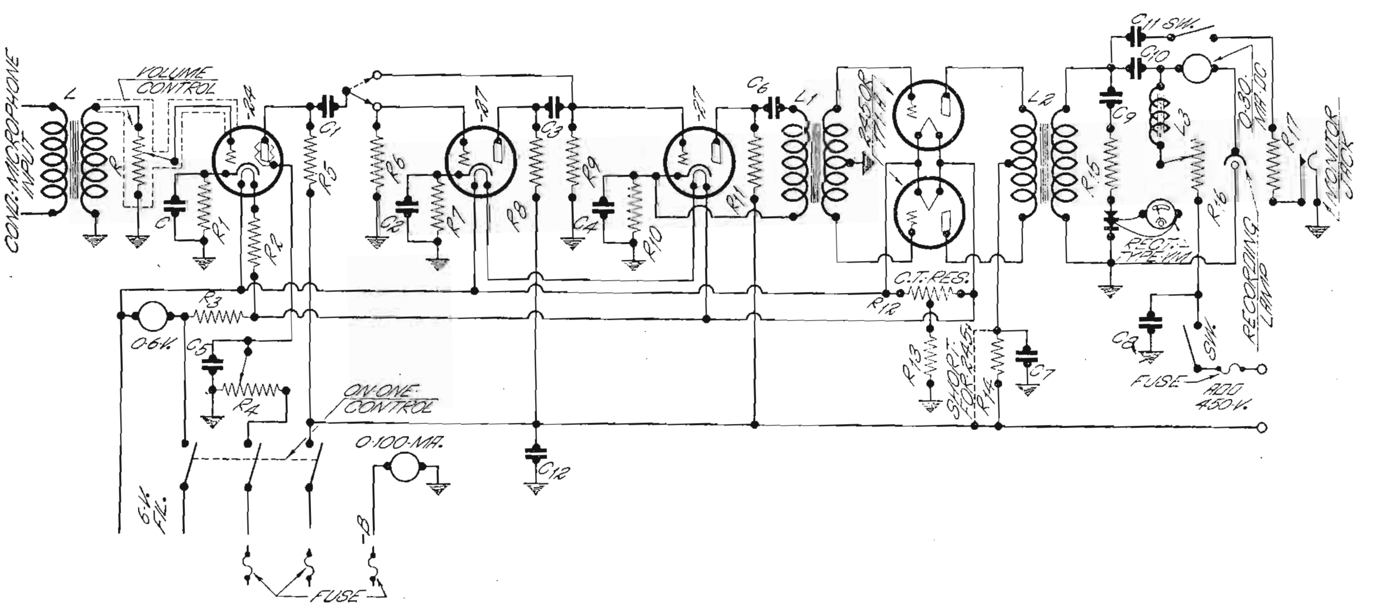


The biggest factor is that of high frequency absorption in the theatre itself due to the design of the interior, draperies, ornaments and the like.



Because of this last fact, if no others were considered, we should, therefore, need much more high response than bass. The natural consequence of the loss of highs is that the bass, by comparison, is pronounced, even giving a barrel effect to the quality, resulting in no distinct consonants and almost unintelligible speech.

This amplifier is of a portable type employing a dry B battery for plate supply and a storage battery for the filaments. For the man who wishes to apply this type of amplifier to his own uses, it would be practicable to use an a-c power and filament supply. If the 245 output tubes do not give sufficient power output, the 250 or 247 type can be substituted. This particular problem does not enter in recording, since only voltage amplification sufficient for proper modulation of the recording lamp is required. Bass resonance will be accentuated as C_6 on the schematic diagram is increased in capacity. The present value is only .1 microfarad, giving the resonant point the value of about 100 cycles. With a .15 microfarad condenser, it would fall near 70 cycles.

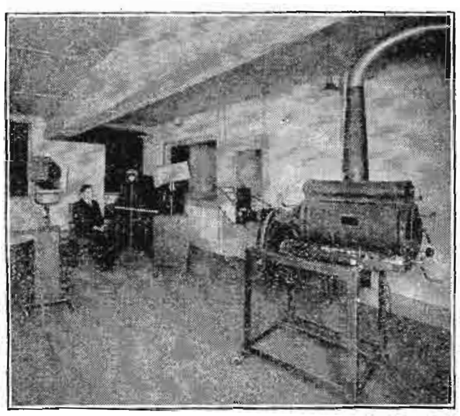


Camera and Cameraman Enter Television

WITH the appearance of the television camera, operated by a cameraman, television definitely steps out of the close-up stage. In place of the flying spot type of pick-up (subject swept by tiny light beam reflected back on photocells), the camera calls for a flood-lighted subject, indoors or outdoors. Experimental as the television camera may be today, it definitely marks a new and more promising era in the development of this new art form of seeing at a distance.

The television camera developed by engineers of the Jenkins Television Corporation might well be taken for the typical motion picture camera. The cameraman follows the action by means of a large view-finder, a monitor televisor in that it reproduces the image exactly as sent over the line to the transmitter. Also, the cameraman wears headphones for listening to the characteristic buzz-saw television signals. So trained have these television cameramen become they can tell just how much detail is contained in the signals by the whine in the headphones.

In television pick-up, the subject must be analyzed in strips or lines, since there is no known method today of handling the subject as a single unit. Present standard scanning system is 60 horizontal lines, repeated 20 times per second. Usual method of scanning is to sweep the subject with a beam of light, reflected light from the subject at any moment being picked up by light-sensitive cells, which translate the varying light values into corresponding electrical terms.



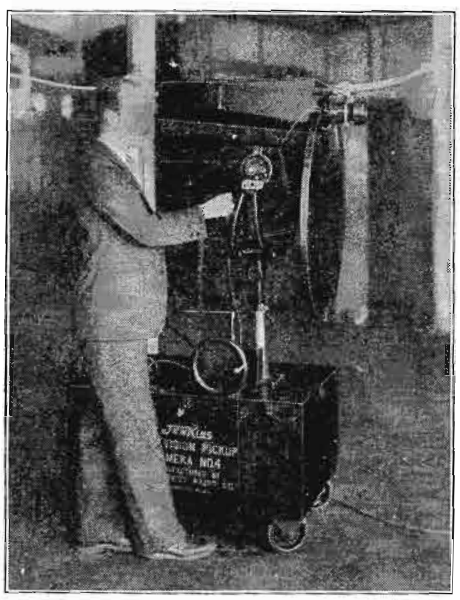
An earlier method of picking up television subjects by means of the flying spot. The subject is swept line by line with a beam of light from the scanner projector at right. The photo-electric cells on each side of the subject pick up the reflected light values

Newer Method

In the television camera pick-up, the subject is flood-lighted or brightly and uniformly illuminated. The light-sensitive cell is placed in a light-proof box exposed only to the light that comes through a lens and scanning disc. The scanning of the light-sensitive cell therefore takes the place of the light scanning of the subject itself. The camera comprises a light-sensitive cell, scanning disc, lens, amplifier, monitor, batteries and necessary accessories.

Use Light Filters

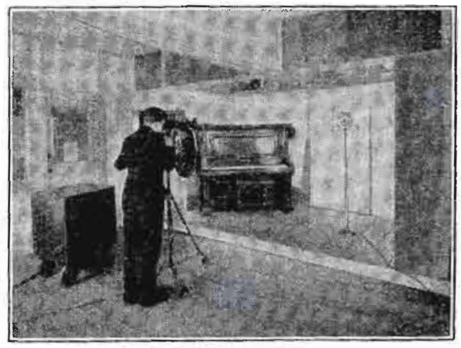
Because of the powerful lighting required when working indoors, it is necessary to consider the eyesight of the performers. The lamps are mounted on the sides, top and bottom of the stage, properly shielded from the camera. Over alternate lamps are placed special optical filters. The filter on one lamp permits the red and infrared rays to flood the stage, while the next lamp is filtered so the blue part of the light floods the stage. This light filtration protects the eyes



Television camera mounted on a battery-driven truck, designed by the engineers of the Jenkins Television Corp. and the De-Forest Radio Co.

of the performers. Fortunately, the light-sensitive cell employed in the television camera is most responsive to the blue and red portions of the spectrum, with very little response to the yellow portion. All the brilliancy of illumination most trying on the eyes of the performers is of little value in actuating the light-sensitive cell of the camera. Hence it is feasible, with negligible loss of illumination, to filter out entirely the center or yellow portion of the spectrum by means of suitable light filters.

Because of the bulk and weight of the television camera, it is mounted on a battery-driven truck. The cameraman can drive the camera to any



Television camera in use at the DeForest experimental television station, W2XCD, at Passaic, N. J., in conjunction with flood-lighted stage

point on the studio floor or on location for the purpose of picking up the desired scene. The camera is connected with the control panel by means of a flexible shielded cable.

From the foregoing brief description, the flexibility of this new camera device is obvious. With it the Jenkins and DeForest engineers have been able to televise plays involving a plot with three or more persons, a prize fight on a restricted stage, and of course singers, pianists and other musicans. Ballet dancers and clog dancers have been televised with excellent results.

In the studio at Passaic, N. J., immediately behind the camera, is an open window through which, on sunshiny days, the camera is turned outdoors. Cars on the streets a block away, as well as signs on buildings a block or more away, are readily observed in the camera's monitor. An airplane a half mile away can be distinguished as it crosses the field of the camera.

Ballgames Next?

The success in operating the television camera has been such that the Jenkins-DeForest engineers are now developing a truck on which will be placed a camera with a long flexible cable on a reel, so that the truck may be driven to a baseball game, to the arrival of some notable, or to any other outdoor event to be televised.

Set Manufacturers and Brand Names

Manufacturer	Address	Brand
Acme Mfg. & Elec. Co.	1440 Hamilton Ave., Cleveland, Ohio	Acme
Advance Elec. Co.	1260 W. 2nd St., Los Angeles, Calif.	Falck
All-American Mohawk Corp.	North Tonawanda, N. Y.	Lyric
Amrad Division	Crosley Radio Corp., Cincinnati, Ohio	Amrad
Andrea, F. A. D., Inc.	Long Island City, N. Y.	Fada
Atchison Radio Mfg. Co.	125 N. 6th St., Atchison, Kans.	Atchison
Atwater-Kent Mfg. Co.	4700 Wissahickon Ave., Philadelphia	Atwater-Kent
Audiola Radio Co.	430 S. Green St., Chicago	Audiola
Automatic Radio Mfg. Co.	332 A St., Boston, Mass.	Tom-Thumb
Brown & Manhart	6219 S. Hoover St., Los Angeles, Calif.	Ranger
Browning-Drake Corp.	224 Calvary, Waltham, Mass.	Browning-Drake
Brunswick Radio Corp.	120 W. 42nd St., New York City	Brunswick
Cardinal Radio Mfg. Co.	2812 S. Main St., Los Angeles, Calif.	Cardinal
Cardon-Phonocraft Corp.	E. Michigan & Horton, Jackson, Mich.	Cardon-Sparks
Carteret Radio Lab.	254 W. 18th St., New York City	Carteret
Champion Radio Mfg. Corp.	1865 W. Gage Ave., Los Angeles, Calif.	Champion
Cleartone Division	Cincinnati Time Recorder Co., 1731 Central Ave., Cincinnati, Ohio	Cleartone
Colonial Radio Corp.	25 Wilbur Ave., Long Island City, N. Y.	Colonial
Columbia Phonograph Co.	1819 Broadway, New York City	Columbia
Continental Radio Corp.	Ft. Wayne, Ind.	Star-Raider
Crosley Radio Corp.	Cincinnati, Ohio	Crosley
Davison-Haynes Mfg. Co.	1012 W. Washington Blvd., Los Angeles	Angelus
De Forest Radio Co.	Passaic, N. J.	DeForest
Delco Radio Corp.	Dayton, Ohio	Delco
Echophone Radio Mfg. Co.	104 Lake View Ave., Waukegan, Ill.	Echophone
Edison, Thos. A., Inc.	Orange, N. J.	Edison
Electrical Research Lab.	1731 W. 22nd St., Chicago	Erla
Elmore-Lambing Radio Co.	1205 S. Olive St., Los Angeles, Calif.	Singer
Find-All Radio Co.	285 Madison Ave., New York City	Find-All
Flint Radio Co., Inc.	3446 S. Hill St., Los Angeles, Calif.	Flint
French, Jesse, & Sons Co.	New Castle, Ind.	Jesse-French
General Electric Co.	Bridgeport, Conn.	General Electric
General Motors Radio Corp.	Dayton, Ohio	General Motors
Gilbert, R. W.	2357 W. Washington Blvd., Los Angeles	Gilbert
Gilfillan Bros., Inc.	1815 Venice Blvd., Los Angeles, Calif.	Gilfillan
Gray & Danielson Mfg. Co.	2101 Bryant St., San Francisco, Calif.	Remler
Graybar Elec. Co.	Graybar Bldg., New York City	Graybar
Grebe, A. H., & Co., Inc.	70 Van Wyck Blvd., Richmond Hill, N. Y.	Grebe
Griffin Smith Mfg. Co.	1224 Wall St., Los Angeles, Calif.	Royale
Grigsby-Grunow Co.	5801 Dickens Ave., Chicago	Majestic
Gulbransen Co.	3232 W. Chicago Ave., Chicago	Gulbransen
Herbert H. Horn	1629 S. Hill St., Los Angeles, Calif.	Tiffany Tone
High Frequency Laboratories	3900 N. Claremont Ave., Chicago	Minuet
Howard Radio Co.	South Haven, Mich.	Howard
Howard, Austin A., Corp.	1725 Diversey Pkwy., Chicago	Austin
Hyatt Elec. Corp.	406 N. Madison St., Woodstock, Ill.	Hyatt
Jackson-Bell Co.	1682 W. Washington St., Los Angeles, Calif.	Jackson-Bell
Jewel Mfg. Co.	222 S. West Temple St., Salt Lake City	Jewel
Keller-Fuller Mfg. Co.	1573 W. Jefferson, Los Angeles, Calif.	Radiette
Kellogg Switchboard & Supply Co.	1066 W. Adams St., Chicago	Kellogg
Kemper Radio Corp., Ltd.	1236 Santee St., Los Angeles, Calif.	Kemper-Kompak
Kennedy, Colin B., Corp.	South Bend, Ind.	Kennedy
King Mfg. Co.	254 R St., Buffalo, N. Y.	King
Kolster Radio Corp.	200 Mt. Pleasant Ave., Newark, N. J.	Kolster
Long Radio Co.	2810-12 S. Main St., Los Angeles	Cardinal
Marti Radio Corp.	Ampere, N. J.	Marti
Master Radio Mfg. Co.	1682 W. 35th Pl., Los Angeles, Calif.	Master
Mid West Radio Corp.	Cincinnati, Ohio (410 E. 8th St.)	Miraco
Mission Bell Radio Mfg. & Distr. Co.	1125 Wall St., Los Angeles, Calif.	Mission
National Transformer Mfg. Co.	5100 Ravenswood Ave., Chicago	Balkeit
National Transformer Mfg. Co.	5100 Ravenswood Ave., Chicago	National
Patterson Radio Corp.	239 S. Los Angeles St., Los Angeles	Patterson
Philadelphia Storage Battery Co.	Ontario & C Sts., Philadelphia, Pa.	Philco
Pierce-Airo, Inc.	113—4th Ave., New York City	Pierce-Airo
Pierce-Airo, Inc.	113—4th Ave., New York City	De Wald
Pilot Radio & Tube Co.	Lawrence, Mass.	Pilot
Pioneer Radio Co.	Plano, Ill.	Pioneer
Plymouth Radio Corp.	2625 N. Main St., Los Angeles, Calif.	Plymouth
Powell Mfg. Co.	6121 S. Western Ave., Los Angeles, Calif.	Powell
Premier Elec. Co.	Grace & Ravenswood Ave., Chicago	Premier
RCA Victor Co., Inc.	233 Broadway, New York City	Radiola
RCA Victor Co., Inc.	233 Broadway, New York City	Victor
Republic Radio Co.	3940-46 Grand Ave., Chicago	Republic
Roth-Downs Mfg. Co.	2512 University Ave., St. Paul, Minn.	Orpheus
Seeley Elec. Co.	1818 West 9th St., Los Angeles, Calif.	Lark
Silver-Marshall, Inc.	6401 W. 65th St., Chicago	Silver
Simplex Radio Co.	Monroe & King Sts., Sandusky, Ohio	Simplex
Sparks-Withington Co.	Jackson, Mich.	Sparton
Stein, Fred W.	1200 Main St., Atchison, Kans.	Aztec
Steinite Mfg. Co.	Ft. Wayne, Ind.	Steinite
Sterling Mfg. Co.	2831 Prospect Ave., Cleveland, Ohio	Sterling
Stewart-Warner Corp.	1826 Diversey Pkwy., Chicago	Stewart-Warner
Story & Clark Radio Corp.	173 N. Michigan Ave., Chicago	Story & Clark
Stromberg-Carlson Tel. Mfg. Co.	Rochester, N. Y.	Stromberg-Carlson
Transformer Corp. of America	Keeler & Ogden Ave., Chicago	Clarion
Trav-Ler Mfg. Co.	1818 Washington Blvd., St. Louis	Trav-Ler
United Air Cleaner Corp.	9705 Cottage Grove Ave., Chicago	Sentinel
United American Bosch Corp.	Springfield, Mass.	Bosch
United Engine Co.	Lansing, Mich.	——
U. S. Radio & Television Co.	Marion, Ind.	Apex
Vaga Mfg. Corp.	718 Atlantic Ave., Brooklyn, N. Y.	Vagabond
Waltham Radio Corp., Ltd.	4228 S. Vermont Ave., Los Angeles	Waltham
Ware Mfg. Corp.	Trenton, N. J.	Ware
Westinghouse Elec. & Mfg.	150 Broadway, New York City	Westinghouse
Zenith Radio Corp.	3620 Iron St., Chicago	Zenith

Revise Commercial Waves Next February

OF interest to receiver design engineers is the recently announced fact that on account of developments in the technique of radio communication, the Federal Radio Commission has just issued an order doubling the number of commercial frequencies by cutting in half the separation between channels and thereby necessitating a general reallocation of wave lengths assigned to commercial and experimental stations.

The order, which was issued upon recommendation of the engineering division, is the outgrowth of an exhaustive study and follows proposals made at the recent conference of the International Technical Consulting Committee on Radio Communications, which met at The Hague last fall.

Operators of radio communication stations are given until February 1, 1932, to prepare for the change, which is based on a reduction of separation from two-tenths to one-tenth per cent between frequencies above 1,500 kilocycles.

This increases the number of channels available for allocation between 10 kilocycles and 28,000 kilocycles from 1,814 to 3,025.

The broadcast band, which ranges from 550 to 1,500 kilocycles, is not affected by the reallocations. Provision is made, however, to care for the prospective needs of experimental visual broadcasting in so far as sound accompaniment is concerned.

The new allocations were worked out under the supervision of Dr. C. B. Jolliffe, Chief Engineer of the Commission, by engineers of the commercial and international communications sections.

A significant change reflected in the new alignment is that showing that the short-wave band considered available for commercial operations has been extended from 23,000 to 28,000 kilocycles, making available 175 additional frequencies on the one-tenth separation basis. Heretofore 23,000 kilocycles has been recognized as the commercial outpost for radio, under international treaty agreed to at the Radiotelegraph Conference held at Washington in 1927 under the chairmanship of Herbert Hoover as Secretary of Commerce.

The allocation establishes the channel of 1,550 kilocycles, just outside the broadcast band, as the "visual broadcasting sound track." Heretofore the channel of 1,604 kilocycles was so assigned, but was outside the reach of the ordinary broadcast receiving set.

With the new frequency, however, it is expected that the ordinary broadcast receiver will pick up voice broadcasts on it, and thus will obviate the need for a special short-wave receiver to pick up voice accompaniment to television sent in the short-wave band. Moreover, the location of this channel, just 50 kilocycles above the extremity of the broadcast band, also allows the 50-kilocycle separation deemed necessary between broadcast channels in the same locality to avoid cross-talk interference with stations on adjacent wave lengths.

From General Order 119 issued by the Federal Radio Commission on September 3, we are picking out the high lights which may be of interest to engineers and others, showing the allocations as they will probably stand on February 1, 1932.

Services	*Frequencies*
Broadcast	550-1500
Visual Sound Track	1550
State Police	1574, 2506
Experimental Visual Broadcasting	1600-1700
Aviation	1706
Police	1712
Amateurs	1716-2000
Experimental Visual Broadcasting	2004-2300
Police	2412-2472
State Police	2506
Experimental Visual Broadcasting	2752-2848
Ship Phone	3125-3150
Coast Phone	3420-3440
Amateurs	3500-4000
Ship Phone	4175-4200
Coast Phone	4750-4775
Relay Broadcast	6020-6140
Amateurs	7000-7300
Relay Broadcast	9500-9600
Relay Broadcast	11,700-11,900
Ship Phone	13,185-13,260
Amateurs	14,005-14,395
Relay Broadcast	15,100-15,340
Relay Broadcast	17,750-17,810
Relay Broadcast	21,460-21,540

The assignment of frequencies for television transmissions on an experimental basis was changed only in one respect. To bring one band for visual broadcasting into closer proximity with the broadcast band, the Commission exchanged the band from 2,850 to 2,950 kilocycles for the band from 1,600 to 1,700 kilocycles, the former band being assigned to aviation. Thus, it was explained, the new sound track channel of 1,550 kilocycles is adjacent to the new television channel, with the 1,550 kilocycle channel itself being next to the broadcast band.

In the frequency range from 10 to 1,500 kilocycles, covering fixed, government, maritime, state police, aircraft and broadcast services, the number of channels, under the new allocations, is increased from 561 to 674. In the bands from 1,500 to 6,000 kilocycles, relating to fixed, government, maritime, municipal police, television, experimental, amateur, aviation, general communication, and other miscellaneous services, the number of frequencies is increased from 639 to 974 under the 1/10 per cent separation.

The largest increase, however, is in the high frequency range from 6,000 to 28,000 kilocycles, covering the trans-oceanic services, ship telegraph and telephone, government, aviation, amateur, experimental relay broadcasting and unreserved facilities. This increase is from 624 channels on the 2/10 per cent separation, to 1,377 on the 1/10 per cent separation, taking into consideration also the increased range of the band from 23,000 to 28,000 kilocycles.

The order sets out in detail the communications band widths required for the various types of emissions, such as Morse telegraphy, telephony, automatic radio printers; facsimiles, picture transmissions, television and the like.

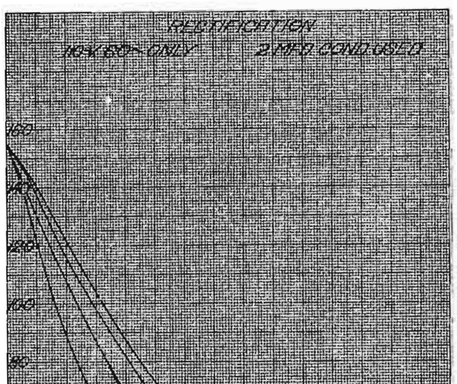
The importance of frequency stability or minimum wave-wabbling is emphasized in the order, which details a comprehensive list of requirements as to tolerances for the different classes of stations, all representing a tightening-up of requirements as contained in existing regulations.

Making Simple Half-Wave Rectifier

IT occurred to the writer some time ago that, since there are many uses for a comparatively low voltage direct current supply, it would be interesting to see what could be done in this channel without going to the expense of a power transformer and the use of a standard rectifier tube. The particular use which started the train of thought in this direction was for a unit to be used as a combination broadcast band and intermediate frequency generator modulated with an audio oscillator, both radio and audio tubes to have their plate voltage supply from a common source. Thereupon two sets of tests were run by which to choose the best suited three-element tube as a half-wave rectifier.

Regulation Curves

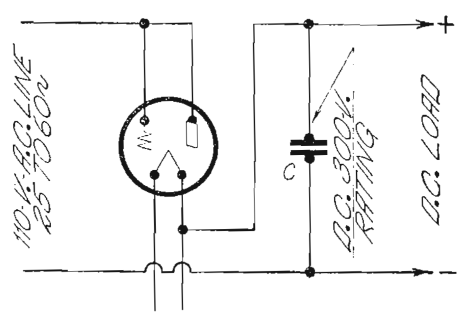
In effect the two sets of curves accompanying this article are regulation curves of the rectifiers. Those of column one are made with a value of two microfarads for C, and those of column three are made with a four microfarad condenser in the output circuit. As will be seen from the diagram of column two, the circuit is the very height of simplicity. The plate and grid are tied together to form the electron receiver, while the filament emits them. The filament is plus, as usual, and one side of the a-c line minus B. Only one precaution must be observed, and that is that one side of the a-c line



is the ground side of the system, and if a receiver makes a metallic connection to the system in any way, and is in turn grounded, chances are even that the wrong side of the line will be grounded, resulting in a short circuit. For this reason it is advisable to use a fuse which may be placed in either of the supply lines of the voltage supply.

A small filament transformer is desirable for heating the filament of the rectifier, and, if it has a center tap on the winding, this should be used for the plus B connection. Otherwise either filament lead will do. Such a transformer is not prohibitive in price if it must be bought.

It is very noticeable that the voltage regulation improves with increased capacity across the output. With no load the maximum d-c voltage is the peak a-c voltage, which in turn is $\sqrt{2}$ times the line voltage, or 155.5 volts in this case, the ultimate without voltage transformation. The regulation would improve if more than one rectifier were used, that is, paralleling them. In this manner almost any load may be drawn.

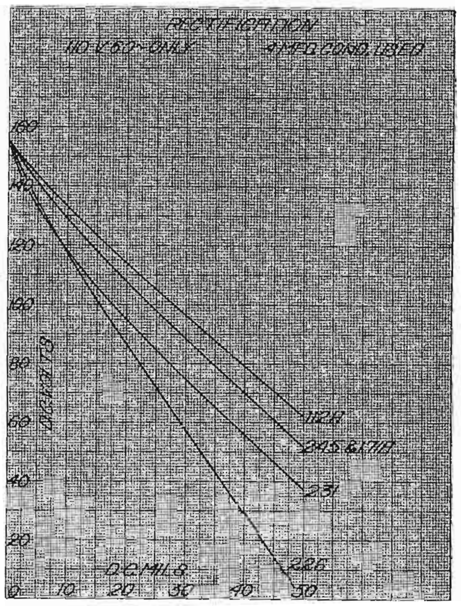


Remember, that in any case it is inadvisable to have a drain of more than 50 or 75 percent in excess of the normal specified plate current. This is particularly true of the 231 type tube, but the 245 tube had no signs of overheating at the 50 milliampere drain. In both curves the 112A type tube showed the best regulation of the tubes used in this experiment. However, the normal specified plate current for this type of tube is only 7 milliamperes which, when increased by 100 percent, is only 14. The limiting current in any case is governed, first, by the plate dissipation, and, second, by the life of the filament as an electron source. Of the two, the operating conditions which these rectifiers would find make the second of greatest importance.

It will be noted that only coated filament type tubes were used because of the superiority of emission. These rectifiers should never be operated at a load sufficient to cause the least perceptible glow between the plate and filament. A low resistance audio choke might be used to cut down the hum component if a nearer approach to pure d-c is desired. Twenty-five cycle line voltage supply was not available, but the frequency of the line voltage is entirely immaterial as far as the operation of the rectifier is concerned.

Small Receivers

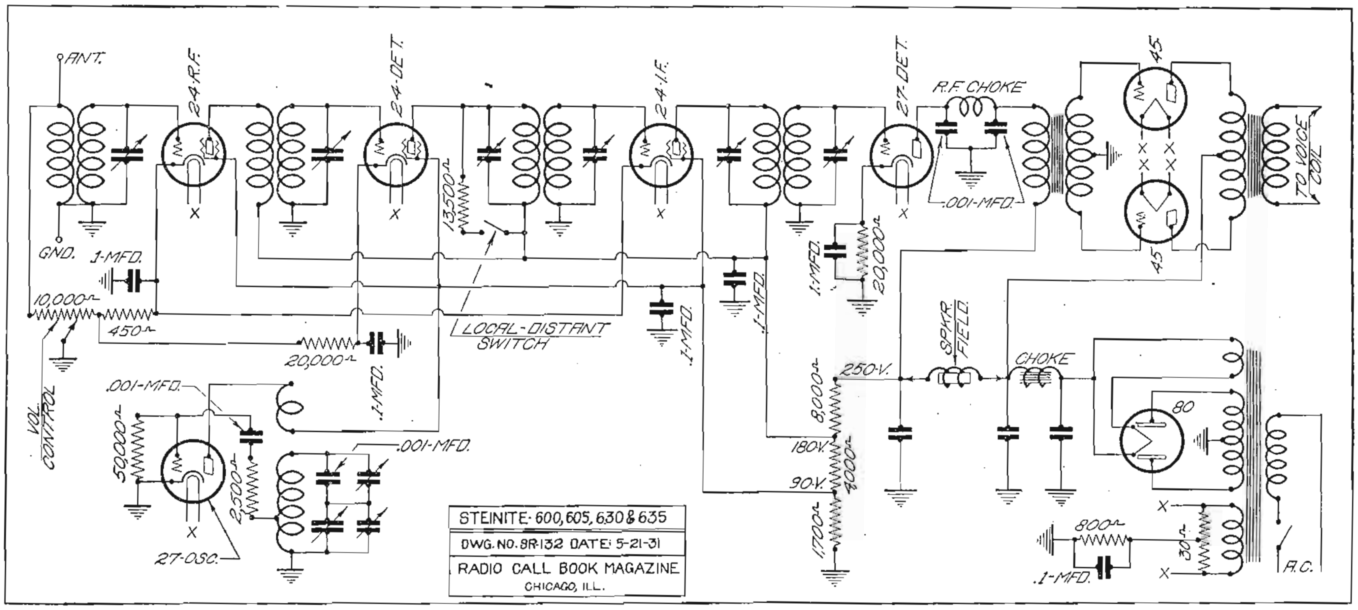
Such a rectifier might find an application in an inexpensive, small radio receiver. In this case it would



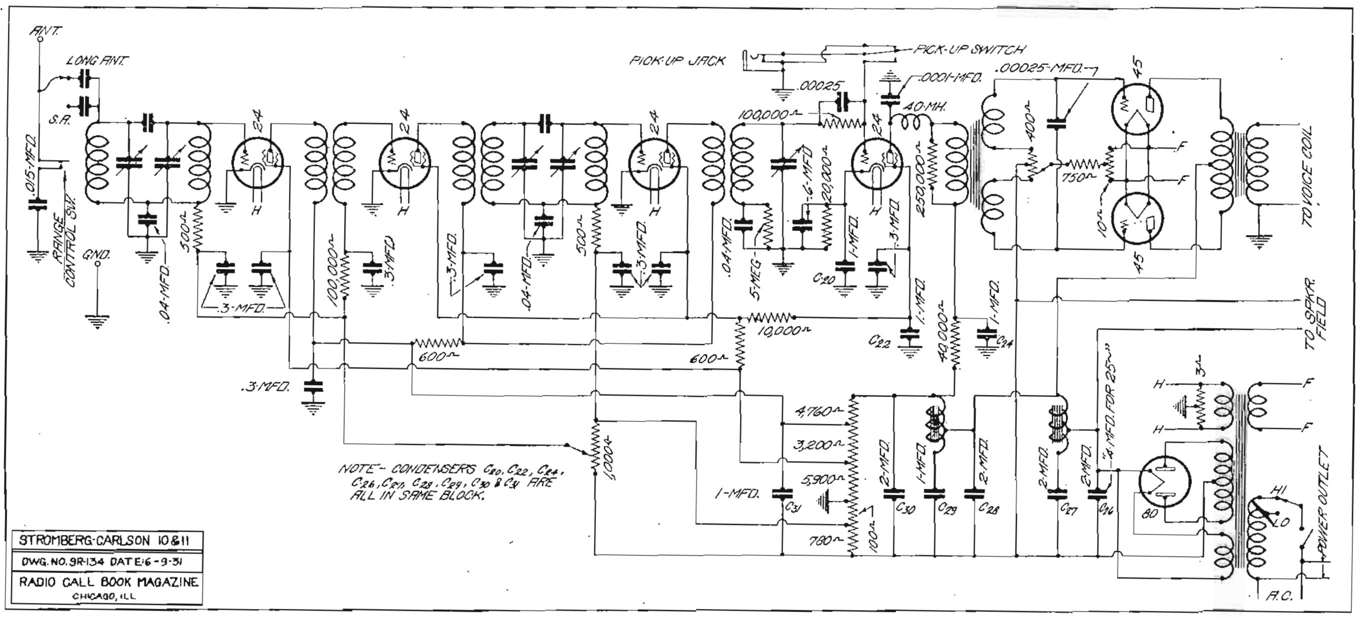
be imperative to use a low resistance audio choke and two large capacity filter units, one on each side of the choke, to make the hum level low enough for any sort of audio quality. These capacitors would likely be of the electrolytic type with their value in the neighborhood of 8 microfarads. The use of a choke serves to increase the voltage noticeably, and it smooths the ripple voltage of the rectified supply. A three tube set, excluding the rectifier, would not require more than about 20 or 25 milliamperes of B current at 120 volts.

A small dynamic speaker might very easily be excited by paralleling its field with the high voltage supply but its exciting current would need to be limited to about 10 mils, which would give a field dissipation of 1.2 watts, sufficient for fair sensitivity and power handling capacity. If this speaker were equipped with a "bucking coil," the hum level would be practically unnoticeable with a modulated signal. The suggested tube complement for such a midget receiver would be two 224 type tubes and a 171-A, or a 551 type, 224 type and a 171-A. A two-gang condenser would give fair enough selectivity for pleasing local reception, but a three-gang might be used so that the antenna circuit could be made a two-circuit band pass system. For uses of comparatively heavy duty, such as a receiver, the 245 type of tube is recommended as being inexpensive and able to stand the high drain.

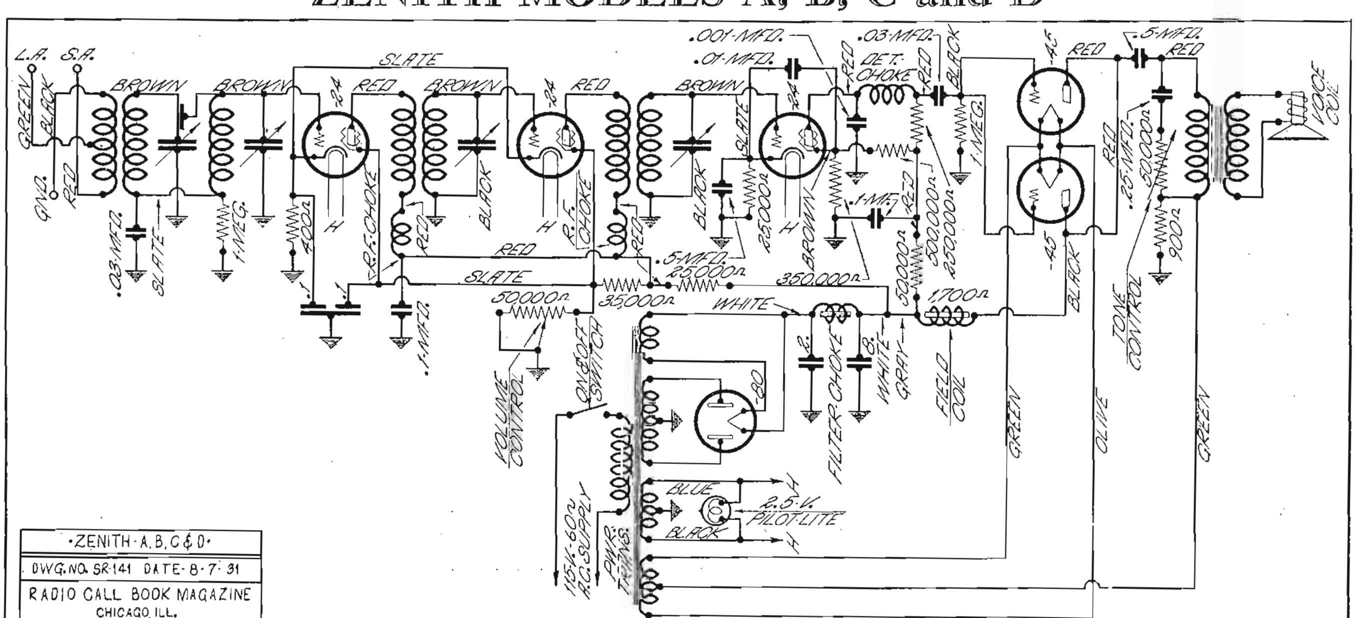
STEINITE MODELS 600, 605, 630 and 635



STROMBERG-CARLSON MODELS 10, 11



ZENITH MODELS A, B, C and D



NEW PRODUCTS FOR THE TRADE

New Littlefuse

Designed to provide an inexpensive means of fusing the A and B circuits of automobile and battery sets without the use of an exposed cutout, the Littlefuse Laboratories, 1772 Wilson Ave., Chicago, have marketed a Gryp-connector, No. 1039 illustrated here.

The connectors are made of tinned spring brass and about 5 pounds pull is needed to withdraw the Littlefuse. All metal parts are covered by a gum rubber sleeve and the entire assembly hangs in the line by the wire soldered to it. The overall length is 2 inches. The 1/8 ampere Littlefuse is usually employed in protecting the B circuit of sets using the new 2 volt tubes or the 199 type.

Samson Pam-o-graph

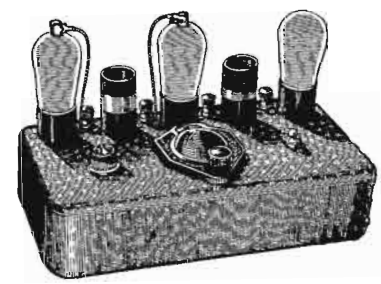
Among the new products announced this season by the Samson Electric Co., Canton, Mass., is a recording phonograph known as the Pam-o-graph, installed in a beautiful solid walnut cabinet stand. It is designed for operation from the ordinary 110 volt 60 cycle lamp socket.

Recording, on an aluminum disc, is done through a broadcast type two-button carbon microphone suspended in an adjustable microphone stand. Sound level is shown by means of a neon bulb visual volume indicator.

The unit comes complete with tubes, microphone, microphone stand, 15 feet of microphone cable, recording needle and a package of special bamboo playback needles. The company, if addressed at the location shown above, will be glad to furnish literature on this latest product.

Walker Super-Converter

With the passage of summer and the renewal of interest in short wave reception, the Workrite Radio Corp., 1817 E. 30th St., Cleveland, Ohio, is announcing the Model 3X George W. Walker Super Converter illustrated below.



Especially designed for battery receiving sets, it requires 6 volts of A current and 35 volts of B. It connects to the same batteries or eliminators as the receiver. This model converter uses two of the newly developed and efficient screen grid 36 tubes and one of the 37 type. While this model is designed for battery type receivers, it may also be used with a-c receivers providing the proper d-c voltages are used.

Jensen Speaker Data

Engineering data covering the Jensen electro-dynamic speaker is contained in a recent bulletin from the Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago. It is available to engineers, distributors and dealers who will write for it at the above address.

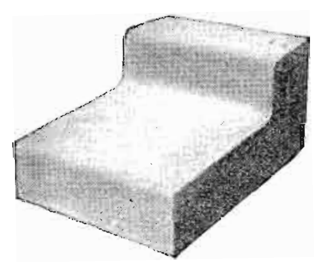
In the data sheet it is stated that all Jensen speaker response curves have been run in accordance with the new tentative standards listed under "Tests of Electro Acoustic Devices" given in the 1931 I. R. E. Yearbook. The curves were run in a 15,000 cubic foot "dead" room and are of the close-up steady state type. The actual attenuator setting at each peak and valley is given in the curve ordinate.

Two sets of curves, one the response characteristics, and the other the magnetization, are shown on the back of each sheet describing the various models made by Jensen.

Because of the large variation in the effective baffle size of different cabinets, the curves have been plotted for an infinite baffle.

"See-All" Scanner Kit

Illustrated below is the "See-All" scanner kit recently announced by the Television Mfg. Corp. of America, 5 Union Square, New York City.



The kit is complete with instruction book and blue print showing how to assemble the scanner and giving data on a short wave television receiver as well.

Shallcross Resistance Boxes

In a recent bulletin No. 900, which is available from the Shallcross Mfg. Co. at 700 Parker Ave., Collingdale, Pa., there is described a megohm decade resistance box designed for the specific requirements of the physicist, research engineer and others engaged in scientific investigation. It is calibrated to an accuracy of .1 per cent. maximum voltage 5000. The lowest range box is 1,100,000 ohms in ten thousand ohm steps, while the highest range is 60,000,000 ohms in one million ohm steps.

This is merely one of the products made by this company. A wide range of accurate wire-wound resistances for general purposes is described in bulletin No. 100, which the manufacturer will be glad to supply upon request.

Dubilier Reduces Prices

New developments in design and production, together with an anticipated increased demand, have justified marked reductions in the list prices of Dubilier high-voltage con-

densers, according to the Dubilier Condenser Corp. of New York City.

Without sacrificing in the least the more than liberal safety factor and long life for which they are known, the Dubilier high-voltage condensers of types 686-A, 689-A and 688-A 690-A, of 1000, 1500, 2000 and 3000 volts, and 1 to 4 mfd capacity, have been reduced in price to the point where the new list prices average from one-fifth to one-third less than the former list prices.

Gernsback Refrigeration Manual

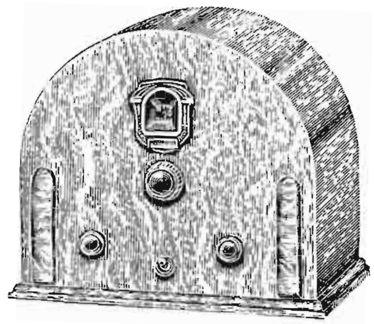
One of the recent publications reaching the editorial desk is a copy of the Official Refrigeration Service Manual, edited and prepared by the Gernsback Publication, Inc., 96 Park Place, New York.

The book, which is an imposing volume in limp leather and loose-leaf form, has been especially prepared for the radio service man who may find it desirable to increase his income during the summer time by servicing refrigerators.

Complete data on each type is given so that both the home equipment as well as business and industrial equipment can be serviced. The data contained is so comprehensive that with this volume a service man need feel no hesitancy in tackling any installation.

R. S. L. Super Converter

A four-tube short wave superheterodyne converter recently announced by the Radio Service Laboratories, 440 S. Dearborn St., Chicago, is housed in an attractive walnut cabinet



to harmonize in appearance with regular broadcast receiver.

The converter has self-contained power supply, together with switching arrangement, so that either short wave or broadcast reception can be recorded without the necessity of changing the light cord and the antenna wires.

The converter uses two 551 tubes, a 224 and a 280. This unit can be applied to any type of radio set.

New Flechtheim Condensers

A. M. Flechtheim & Co., Inc., of 136 Liberty St., New York City, have announced several new types of small, compact, low and high voltage, by-pass and filter condensers for all types of repair work such as encountered by service men everywhere.

Their new catalog No. 24 lists these types which are available in all ranges of capacity from .1 to 4 mfd, 200 volts; 400 volts; 600 volts and 1000 volts, d-c.

Especially outstanding amongst the new types of condensers offered by the Flechtheim Co. is the type NU rated at 600 volts, d-c, uncased condenser of exceedingly pleasing design which can readily fit into the smallest space for replacing burned out condensers.

The A. M. Flechtheim Co. will gladly send their latest literature upon request.

New Aerial Substitute

Among several of the products made by the Western Coil and Electrical Co., of Racine, Wis., manufacturers of the Radiodyne receivers, is an antenna substitute known as their Radiaerial and shown in the illustration below.

The device is for use in locations where an antenna substitute would give better results than the erection of a regular antenna. The unit has three terminals, one going to the antenna connection on the set, another to the ground connection on the set, and the third going to ground or a convenient radiator in the room.

DeJur-Amsco Transitor

DeJur-Amsco announces the production of an intermediate frequency amplifying transformer—the Transitor, for which a high order of electrical efficiency is claimed. The Transitor is made in three standard broadcast types, the variations being in the order of selectivity, and include a sharply tuned filter stage, a standard type and a very broadly tuned unit especially engineered for use in the Stenode receivers. The Transitor is said to be characterized by an unusually high gain, and is the result of considerable laboratory research.

Under average circuit conditions the units may be peaked, by means of small semi-fixed condensers anywhere from 167 to 183 k-c. Literature describing the Transitor, containing curves and engineering data, may be obtained upon request from the manufacturer.

THORDARSON TRANSFORMERS—LATEST TYPE

Plate Supply Transformers. All Fully Mounted

T-2098—1100 c. t. and two 7½ volt c. t. fil. windings, special $ 7.00
T-2950—1350 center tapped and two 7½ volt c. t. fil. windings 13.00
T-2385—550 and 750 volts each side of c. t. List $16.50, net price 9.25
T-2387—1000 and 1500 volts each side of center tap, special 12.70
T-2388-A—1500 and 2000 volts each side of center 500 watt 17.00
T-2389-A—1500 and 2000 volt each side of center 1000 watts 23.00

Fil. Supply Transformer

T-2230—One 7½ volt c. t. fil., winding 35 watts, special 4.25
T-2382—12 volts center tapped 80 watts, special 5.70
T-2383—12 volts center tapped 175 watts, special 8.75
T-3680—2½ volts 10 amps. 7000 volt insulated, designed for u. x. 866 mercury vapor tubes, special 7.00

Thordarson Microphone Transformers.

T-2357—Single button to match all microphones, special 2.35
T-3180—Double button microphone transformer of highest quality obtainable for use with Western Electric, Kellogg and other high grade mikes, special 8.75

Thordarson Line and Tube, Line to Line Coupling Transformers

T-3474—Tube to line, special 7.50
T-3475—Line to tube, special 7.50
T-3476—Line to line, special 7.50

Thordarson Choke Coils for Xmitter, etc.

T-2376—Key click choke, 1½ henry, 200 mill., special 2.95
R-196 —30 henry, 80 mill 2.35
T-2071—30 henry, 150 mill., 3000 volt, ins. 8.25
T-2027—30 henry, 300 mill., 3000 volt, ins. 10.75
T-2073—30 henry, 500 mill, 3000 volt, ins. 11.85
Weston new type three, No. 566 set analyzer, special 83.00
Arsco U.X. 852 sockets 1.35
Slightly used 860's 22.00
One only, new U.X. 851 tube, guar 250.00
Used U.X. 851 tube, guar 125.00
Perryman mercury vapor U.X. 280 1.45
Zenith 30 henry, 85 mill. choke .89
Receiver type R.F. chokes, unmounted .25
Kodel microphone cases, unassembled 2.25
Thordarson push-pull input transformers for 245 2.50
Assorted pigtail resistors, all sizes in stock, dozen 1.00
R.E.L. plug-in coil forms **$1.50** Base 1.50
West. Elec. single button microphone trans. Head only 1.95
G.E. ½ watt neon bulbs **$0.55** 2 watt .75
Thordarson 2½ volt, 16 amp. trans. Mfrs. model 3.75
Flechtheim 2 mfd. 1500 volt trans., cond. pigtail leads 4.00
Single, open, closed, double circuit, etc., jacks .15
Mershon 8 mfd. electrolytic condensers .75
Aluminum 5x6x9 monitor cans, assembled alcoa 2.65
Hardwick-Hindle 10,000 ohm 60 watt trans., grid leak resistor .60
Acme 180 volt B and 40 volt C, eliminators, complete with tube 9.75
Soldering irons **$0.90** Heavy duty type 1.65
Gud variable condensers, all sizes **$0.75** up to 1.00
Beautiful kitchen clocks, electric 2.95
G.E. oil immersed, 40-45 mfd., 2000 volt working voltage 20.00
Arsco new U.X. 866's, guaranteed 1000 hours 3.35
Arsco fil. transformer, wire leads, two 7½ c. t. 2½ amps windings and 1½ and 2½ fil. windings, special 3.00
Arsco calibrated monitors with batteries, three coils and individual calibrated charts 9.35
Arsco calibrated wave meters 6.25
Arsco r.f. transmitter chokes .50
Arsco 50 watt sockets .95
Arsco 75 watt sockets 1.35
Arsco 204-A sockets 1.95
Arsco sockets for 212-A or D tubes 3.50
Arsco 2 mfd. 1000 volt condensers .70
Arsco 3½ mfd. 1000 volt condensers .90
Arsco 4 mfd. 1000 volt condensers 1.00
Arsco 2 mfd. 1150 volt, sealed in fiber box. Beautiful job 1.50
Arsco 4 mfd. 1250 volt oil impregnated condensers, working voltage 3.25

600 Volt		800 Volt	
1 mfd	$0.20	1 mfd	.30
2 mfd	.25	2 mfd	.40
3½ mfd	.35	3½ mfd	.50
4 mfd	.40	4 mfd	.60

Above condensers all unmounted but sealed in paraffin. Sturdy leads.

Arsco 1 mfd. 3500 volt transmitting filter condensers 9.50
Arsco 2 mfd. 3500 volt transmitting filter condensers 14.00
Arsco 1 mfd. 3000 volt transmitting filter condensers 8.50
Arsco 2 mfd. 3000 volt transmitting filter condensers 12.50
Arsco 4 mfd. 2000 volt transmitting filter condensers 9.50
Arsco 8 mfd. 2000 volt transmitting condensers 12.50
Arsco 16 mfd. tapped at 8 mfd. 1250 volts D.C. 8.50
Arsco 1 mfd. 1500 volt condensers 2.00
Arsco 2 mfd. 1500 volt condensers 3.50
Arsco 4 mfd. 1500 volt condensers 5.75

All above transmitting condensers are working voltage. Arsco high voltage condensers guaranteed unconditionally one year.

Universal Microphones, Model BB 14.50
Universal Microphones, Model KK 28.00
Universal Microphones, Model LL 40.00
Universal Baby Mikes, Q.R.Q. 2.85
Universal Baby Mikes with switch, 25 ft. cord 4.35
Universal handi-mikes—single button 5.85
Universale handi-mikes—double button 8.85

Samson Pam Amplifiers, New and in Original Cartons

Pam 19-20 uses two 281, two U.X. 250, two U.Y. 227. List $175, net price 59.50
Pam 16-17 uses one 281, two 210, one 227. List $125, net $49.50
Genuine R.C.A. U.X. 852 tubes, new orig. carton 25.00
G.E. five watt 1162 navy tubes .50
U.X. 230 or 231 non-microphonic R.C.A. licensed tubes .90
U.X. 232 screen grid tubes 1.25
Baldwin type G phones. List $12.00, net price 4.95
Flechtheim 4 mfd. 1500 volt porc. ins. condensers 7.00
Tested and functioning, not guar., 250 tubes .95
U.X. or U.Y. sockets, each .12
Crystal blanks, finished and oscillating 2.75
Crystal blanks, unfinished 1.75
Crystals, specify anywhere in the 80 meter band, guar. to oscillate 4.75
Sangamo .00025, .0005, .002, .001, 5000 volt condenser 1.12
Enameled aerial wire No. 12, 100 ft., solid .90
Enameled aerial wire No. 12, 200 ft., solid 1.65

Stand-off insulators, similar to General Radio, each **$0.10**; dozen, this month only, for **$0.75**

The National A.C. short wave five. List $79.50, net $46.00
National power pack for same. List $34.50, net 19.65
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The above set, when ordered complete with power pack, wired and assembled for 70.00
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Wired and assembled for, extra 5.75
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Slightly used R.C.A. U.V. 211 17.00
Slightly used W.E. 211-E in original cartons 15.00
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R.C.A. licensed 233 D.C. pentode 1.65
R.C.A. licensed 247 A.C. pentode 1.14
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Genuine National .0005 23-plate var. condensers. List $5.00 1.65
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R.C.A. U.X. 240 hi-mu tube, new 1.00
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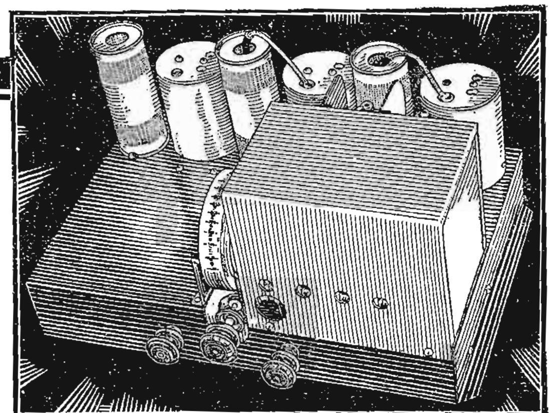

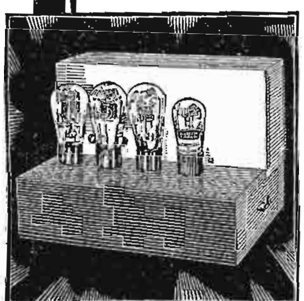

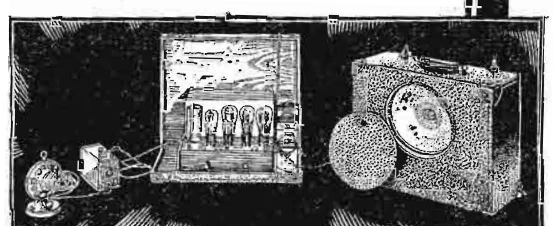

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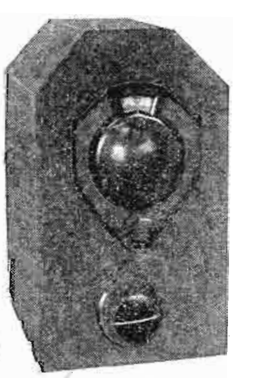

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

OF RADIO CALL BOOK MAGAZINE AND TECHNICAL REVIEW, published monthly at Chicago, Illinois, for April 1, 1931. State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared Chas. O. Stimpson, who, having been duly sworn according to law, deposes and says that he is the Publisher of the RADIO CALL BOOK MAGAZINE AND TECHNICAL REVIEW and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Chas. O. Stimpson, Chicago, Ill.; Editor and Managing Editor, Fred A. Hill, Chicago, Ill.; Business Manager, H. Anheiser, Chicago, Ill.

2. That the owner is (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given): Citizens Radio Service Bureau, Chicago, Ill.; Chas. O. Stimpson, Chicago, Ill.; H. Anheiser, Chicago, Ill.; F. A. Hill, Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are (if there are none, so state): There are none.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (this information is required from daily publications only).

CHAS. O. STIMPSON,
Publisher.

Sworn to and subscribed before me this 27th day of March, 1931.

NELLIE E. RYAN, Notary Public.

(My commission expires July 25, 1932.)

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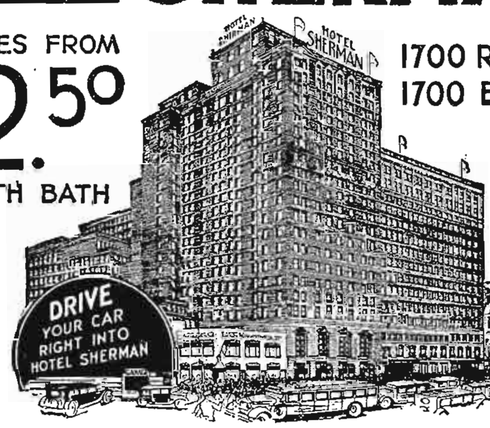

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3. Gradual adjustment of volume from full on to absolute zero. A special output is provided for neutralizing.
4. Heavy shielding of the complete unit including batteries eliminates all stray radiation and thereby permits most accurate receiver adjustments.
5. Two '30 type tubes are used. Separate radio and audio frequency oscillator stages assure dependable operation.
6. Oscillator note may be adjusted to suit the operator.
7. A special adjustment allows any intermediate frequency to be "spotted" at a convenient point on the dial. This saves much time in peaking intermediate stages of the same make receiver.
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DEALERS AND DISTRIBUTORS

When looking over your red ink figures at the end of the month, just remember that here are some of the contributing causes for those carmine entries:

Greed for dividends
Sales at any cost
Lack of company sales policies
Plethora of hokum
Paucity of honesty
Peripatetic sales managers
Ditto advertising managers
Unthinking dealers and distributors
The depression

● You can supply your own remedy. If you were regaled with fewer photographic studies of sales managers a-golfing, ad managers a-swimming and manufacturers a-stock-marketing, you'd find time to demand a sales policy with watertight price protection and adequate dealer profit.

● You'd also find that selling based on performance and quality would administer the K. O. to bologna and buncombe. Lift your head above the miasma of specious claims and see the sun shining on definite standards of performance.

● Realize that you're spending more time and making less money selling the unpedigreed felines and canines. It's just as easy to elevate the public appreciation of quality as it is to depress it into the mire of low price.

● Performance curves published monthly in this magazine give you a yardstick by which you can intelligently select a line to handle. Accompany this by an honest sales policy that guarantees price protection and profits, and you're on your way out of the woods.

● Think it over!

RADIO CALL BOOK MAGAZINE
AND TECHNICAL REVIEW