Radio Call Book Magazine and Technical Review

Established 1921

25¢

CONTENTS

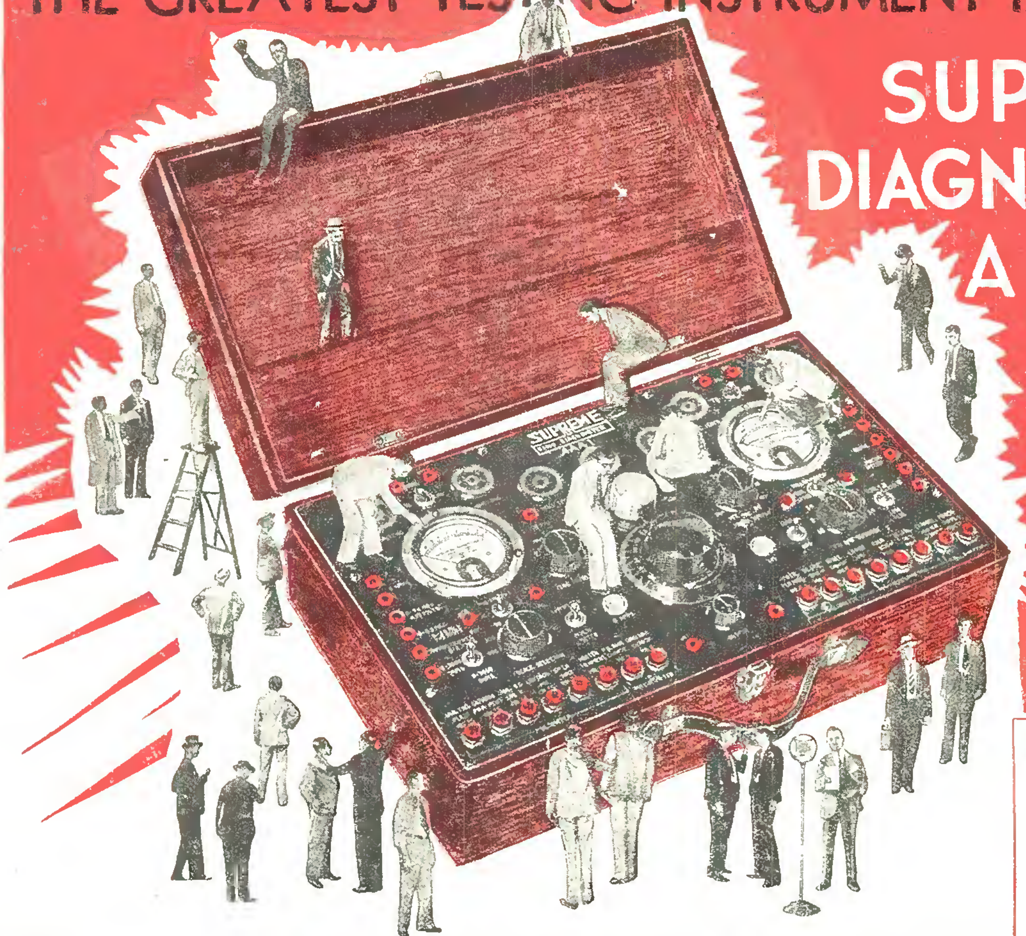
for October, 1931

Performance curves and schematics of following receivers:

SERVICE - ENGINEERING - SALES

ANNOUNCING!

THE GREATEST TESTING INSTRUMENT IN HISTORY!



SUPREME DIAGNOMETER AAA1

SUPER-DIAGNOMETER
plus
Shielded OSCILLATOR
plus
Advanced TUBE TESTER

combined in this master, ultra-modern model, at the price of one. Genuine economy!

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A Super Diagnometer with meter ranges to 2500 volts; a Completely Shielded Oscillator calibrated for every frequency between 90 and 1500 kilocycles; Tube Testing, Ohm-Megohmmeter features never before incorporated in any service instrument. 4 instruments in 1 at the price of one! Space won't permit, words can't tell, the complete amazing narrative of this Supreme engineering triumph. All Jobbers will soon be stocked, but the ones listed in panel to right are those selected for the pre-showing of this sensational new instrument on September 1st, and now have the 1932 Model DIAGNOMETER ON DISPLAY AND AVAILABLE FOR DEMONSTRATION. Go see it today. It may be possible for you to

get yours FREE!

See the Model AAA1 at the New York Show, New York demonstration rooms, 130 W. 42nd St. Also at Philadelphia Show, M & H Sporting Goods Co.

Disinterested judges will award a NEW Model AAA1 to the person who writes the best letter on the subject "WHY I PREFER A SUPREME DIAGNOMETER—MODEL AAA1—FOR MODERN SERVICE." Everyone is eligible. Write us today for complete contest rules. Ask your jobber—or one of those listed here—to demonstrate. Hurry—contest closes October 15th, 1931. See the DIAGNOMETER. Write us for contest rules. *This may be your "Supremely" Lucky Day!*

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San Francisco:
Kierulff & Ravenscroft—121 Ninth St.
Leo J. Meyberg Co.—70 Tenth St.

COLORADO

Denver:
General Elec. Supply Corp.—1433 Lawrence

INDIANA

Indianapolis:
Kruse Radio, Inc.—29-33 W. Ohio St.

LOUISIANA

New Orleans:
Electrical Supply Co.—201 Magazine St.

MISSOURI

St. Louis:
Van-Ashe Radio Co.—10th and Walnut St.

NEW YORK

New York City:
Royal-Eastern Elec. Supply Co. — 16-18 West 22nd St.
Sun Radio Co.—64 Vesey St.
Times Appliance Co.—333 West 52nd St.
Wholesale Radio Serv. Co., Inc. — 36-38 Vesey St.

OREGON

Portland:
Wedel Company, Inc.—443 Washington St.

PENNSYLVANIA

Philadelphia:
M & H Sporting Goods Co.—512 Market St.

TENNESSEE

Memphis:
Orgill Bros. & Co.—505-515 Tennessee St.

TEXAS

San Antonio:
Southern Equipment Company

WASHINGTON

Seattle:
Harper-Meggee, Inc.—4th & Blanchard
Wedel Company, Inc.—520 Second Avenue

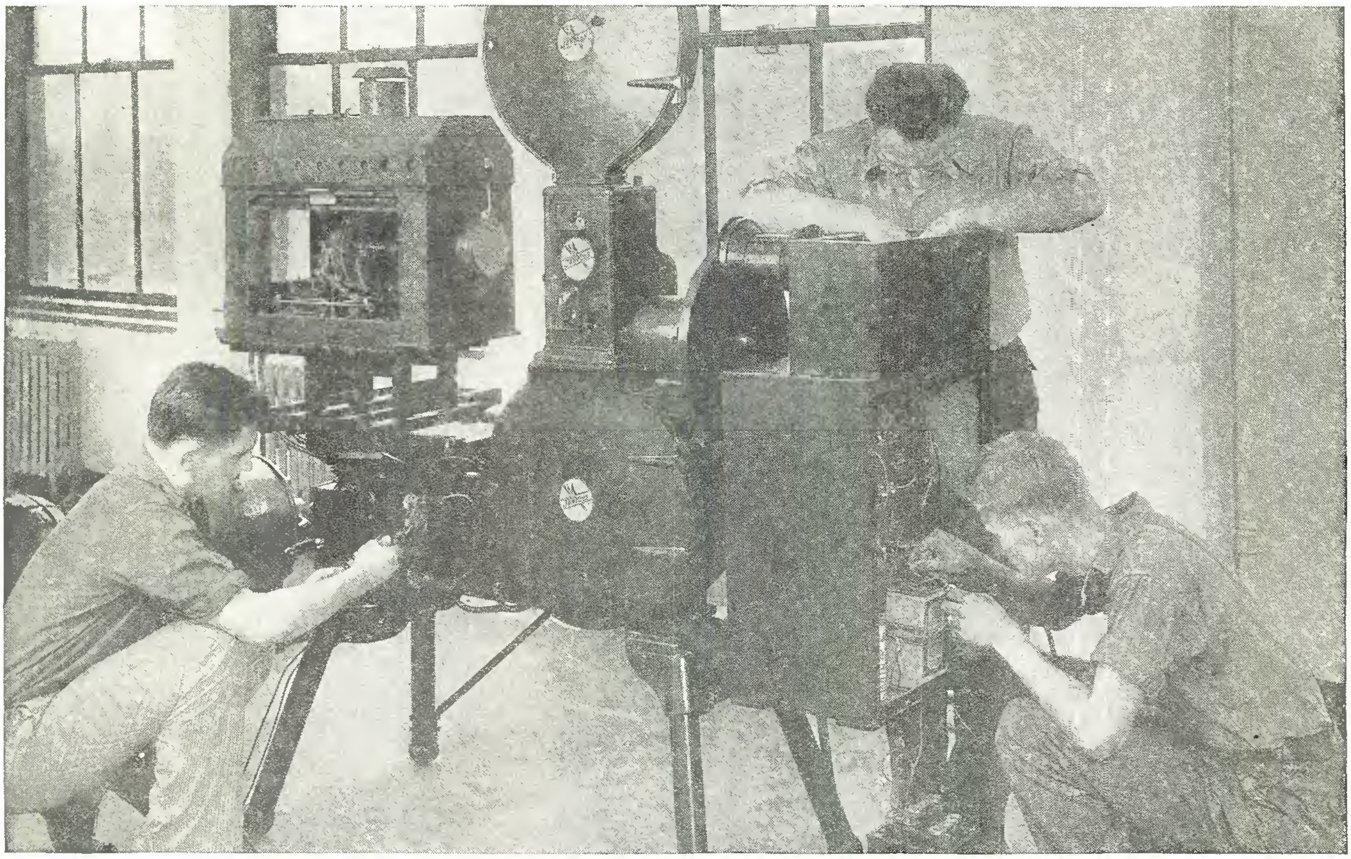
Spokane:
Spokane Radio Company, Inc.

WISCONSIN

Sheboygan:
J. J. Koepsell Company

WRITE US TODAY FOR CONTEST RULES

RADIO CALL BOOK MAGAZINE AND TECHNICAL REVIEW, October, 1931. VOL. XII, No. 3. Published monthly at Chicago, Ill. Subscription price, $2.00 per year. 25 cents per copy. Entered as second-class matter January 24, 1930, at the Post Office of Chicago, Ill., under the Act of March 3, 1879. Citizens Radio Service Bureau, Inc., Publishers, 508 S. Dearborn St., Chicago.



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Radio Call Book Magazine

AND TECHNICAL REVIEW

Established 1921

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OCTOBER, 1931 Vol. 12, No. 3

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Editorial

We have reason to feel you will welcome with open eyes the first copy of this magazine published on a monthly basis. First because it meets with the desires you've often expressed to us for more frequent appearance, and second because it enables us to adopt the policy of "curves-and-schematic-on-the-same-page" to consolidate the vital information on a receiver.

It will be helpful for dealers and service men to carefully read the message on the back cover, and the performance curve explanation on page 22 so that proper interpretation may be made of the curves covering the ten standard receivers shown in this number. Ten more will appear each month.

Another helpful article is that by Virgil M. Graham, radio engineer of Stromberg-Carlson which appears on page 20.

Many features of interest to the service man and the experimenter will be found in the Service and Repair Section. Perhaps you've an idea that would help other readers—send it to us and we'll pass it along.

The greatest indication of the value of this magazine's service to you lies in its list of subscribers which naturally we wish to see grow normally from month to month. So if we've pleased you in this issue, while others may "say it with flowers" you can tell us the good news by using one of the handy subscription blanks to be found herein. —EDITOR.

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.

KMBC
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, Springfield, Mass., Westinghouse E. & M. Co., 15,000 w, E.

WBZA
990 kc, Boston, Mass., Westinghouse E. & M. Co., 500 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.
KDLB—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.
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.
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—Springfield, Mass.
WBZA—Boston, 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.
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.
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.
WRBO—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:
WOAN, 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, WIBU, WMBG, WSIX, WJBY, WRBO, 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	Call	Kilocycles	Meters	Location
WPDO	2,458	122.05	Akron, Ohio	WPEC	2,470	121.50	Memphis, Tenn.
WPDN	1,712	175.23	Auburn, N. Y.	WNDA	2,440	123.00	Miami, Fla.
KGPJ	1,712	175.23	Beaumont, Tex.	WPDK	2,452	122.34	Milwaukee, Wis.
KSW	2,410	124.50	Berkeley, Calif.	KGPB	2,416	124.17	Minneapolis, Minn.
WMJ	2,422	123.86	Buffalo, N. Y.	WPY	438	685.00	New York, N. Y.
WBR	257	1,165.00	Butler, Pa.	WPY	500	600.00	New York, N. Y.
KGOZ	2,470	121.50	Cedar Rapids, Iowa	KGPH	2,452	122.34	Oklahoma City, Okla.
WPDV	2,458	122.05	Charlotte, N. C.	KGPI	2,470	121.50	Omaha, Neb.
WPDB	1,712	175.23	Chicago, Ill.	KGJX	1,712	175.23	Pasadena, Calif.
WPDC	1,712	175.23	Chicago, Ill.	WPDJ	2,416	124.17	Passaic, N. J.
WPDD	1,712	175.23	Chicago, Ill.	WPDP	2,440	123.00	Philadelphia, Pa.
WKDU	1,712	175.23	Cincinnati, Ohio	WPDU	1,712	175.23	Pittsburgh, Pa.
WRBH	2,452	122.34	Cleveland, Ohio	KGPP	2,452	122.34	Portland, Ore.
KVP	1,712	175.23	Dallas, Tex.	WPDH	2,416	124.17	Richmond, Va.
KGPN	2,470	121.50	Davenport, Iowa	WPDR	1,712	175.23	Rochester, N. Y.
WKDT	1,596	187.97	Detroit, Mich.	KGPC	1,712	175.23	St. Louis, Mo.
WCK	2,410	124.50	Detroit, Mich.	WPDS	2,416	124.17	St. Paul, Minn.
WPDX	2,410	124.50	Detroit, Mich.	WPDM	2,440	123.00	St. Petersburg, Fla.
KGPF	2,416	124.17	El Paso, Tex.	KGOY	1,712	175.23	San Antonio, Tex.
WPDF	2,440	123.00	Flint, Mich.	KGPD	1,596	187.97	San Francisco, Calif.
WPDZ	2,470	121.50	Fort Wayne, Ind.	KGPD	2,410	124.50	San Francisco, Calif.
WFEB	2,440	123.00	Grand Rapids, Mich.	KGPM	2,410	124.50	San Jose, Calif.
WJL	257	1,165.00	Greensburg, Pa.	KGPA	1,596	187.97	Seattle, Wash.
WRDR	2,410	124.50	Grosse Point Village, Mich.	KGPA	2,452	122.40	Seattle, Wash.
WBA	257	1,165.00	Harrisburg, Pa.	KGPK	2,470	121.50	Sioux City, Iowa
WMO	2,410	124.50	Highland Park, Mich.	WPEA	1,712	175.23	Syracuse, N. Y.
WMDZ	1,712	175.23	Indianapolis, Ind.	WRDQ	2,470	121.50	Toledo, Ohio
WRDS	1,662	180.51	Ingham, Mich.	WPDA	2,416	124.17	Tulare, Calif.
KGPE	2,422	123.86	Kansas City, Mo.	KGPO	2,452	122.35	Tulsa, Okla.
WPDT	2,470	121.50	Kokomo, Ind.	KGPG	2,410	124.50	Vallejo, Calif.
WPDL	2,440	123.00	Lansing, Mich.	WPGW	2,410	124.50	Washington, D. C.
KGPL	1,712	175.23	Los Angeles, Calif.	WDX	257	1,165.00	Wyoming, Pa.
WPDE	2,440	123.00	Louisville, Ky.	WPDG	2,458	122.05	Youngstown, Ohio

U. S. VISUAL BROADCASTING STATIONS

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

U. S. RELAY BROADCASTING STATIONS

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

SIMPLE TIME CHART

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

← WEST

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

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

EAST →

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

FOREIGN BROADCAST STATIONS

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
LV8	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
2MK	Bathurst	1155
3BO	Bendigo	1450
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	620
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	580

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	895
COHB	Harbin	674
COMK	Mukden	714
XGZ	Nanking	606
COPK	Peking	937
KRC	Shanghai	869
KSMS	Shanghai	1082
NKS	Shanghai	952
RSC	Shanghai	1276
XGX	Shanghai	1071
XGAH	Shanghai	937
COTL	Tientsin	625
GEC	Tientsin	1000

CHOSEN

Call	Location	Kc.
JODK	Keijo	690

COLOMBIA

Call	Location	Kc.
HJN	Bogota	684

COSTA RICA

Call	Location	Kc.
TINRH	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	1315
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	Kosice	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	171
......	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	Lahoro	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	600
1NA	Naples	906
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
VOX	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
2ZM	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	Kristinehamm	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
......	Berne	744
......	Geneva	395
......	Lausanne	441
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
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
RW56	Penza	640
RW46	Petropavlovsk	686
RW29	Petrozavodsk	468
RW34	Piatigorsk	865
RW55	Pokrovsk	730
RW12	Rostov-sur-le-Don	353
RW16	Samara	521
RW18	Samarkand	342
RW52	Simferopol	630
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
RW28	Vladivostok	634
RW25	Voronej	385

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	695
......	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
OFTTH	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	6,720
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.
EK1ZZZ	Danzig	7,500

DENMARK

Call	Location	Kc.
OXZ	Skamlaback	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
FSAV	Nogent	3,750
FLJ	Paris	9,230
FSLH	Paris	7,317
....	Paris	6,860
FSGC	Paris	4,918
FSBP	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.
FMSKR	Constantine	7,009
FMSKR	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.
F31CD	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
IBDX	SS. Electra (Marconi's Yacht)	11,210
....	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	8,849

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	4,274
RW3KAA	Leningrad	8,333
....	Leningrad	11,111
....	Leningrad	10,526
RW62	Minsk	6,420
RW51	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

Measurements on Receiver Chassis

By Virgil M. Graham *

WITHIN the last few years methods of measurement of certain electrical characteristics of receiver chassis have been standardized by committees of the Institute of Radio Engineers. These methods and characteristics are used by all radio engineering laboratories doing broadcast receiver work, and have come to be as common as any ordinary laboratory measurement.

There are a number of characteristics thus measured, but the three major ones are sensitivity, selectivity, and fidelity. The results are plotted on standardized forms and are readily understood by all engineers doing this sort of work. These characteristics are defined by the Institute of Radio Engineers as follows:

Sensitivity

Sensitivity of a radio receiver is that characteristic of the radio 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 a standard output.

Selectivity

The selectivity of a radio receiver is the degree to which the radio 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.

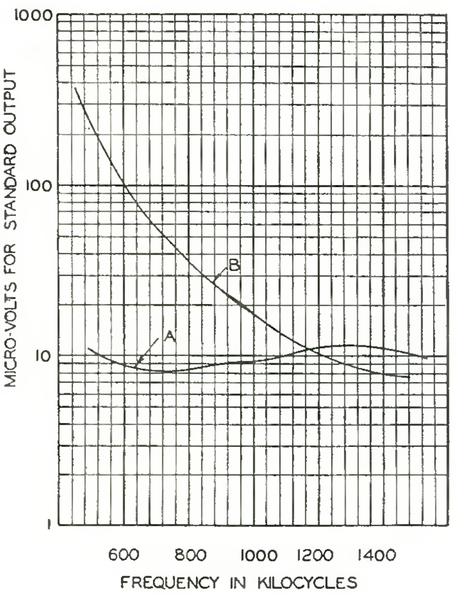


Fig. 1. Curve A illustrates good sensitivity since this curve does not depart materially from the 10 microvolt line. Curve B represents extremely poor sensitivity as it varies widely over the range

* Radio Engineer, Stromberg-Carlson Telephone Manufacturing Co.

Fidelity

The fidelity of a radio receiver is the degree to which the radio receiver accurately reproduces at its output the form of the signal which is impressed upon it. The fidelity of a radio receiver is measured by the accuracy of reproduction, at the output terminals, of the modulation of the received wave.

There has unfortunately come about a policy on the part of some magazines to publish these electrical characteristics of the chassis as representative of the overall results obtained from the receiver. Such practice is very misleading to the layman, as he is easily deceived by the looks of a curve, and also does not take into account the fact that such characteristics are not the overall characteristics of the receiver.

Layman's Reaction

Let us consider the layman's reaction to the characteristics in the order

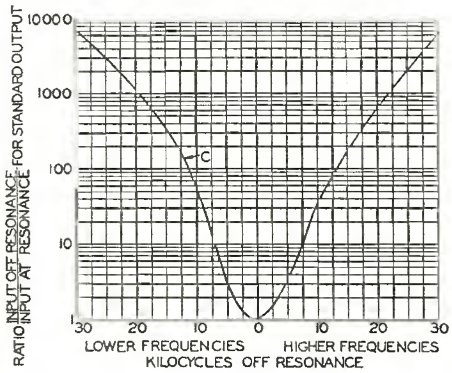


Fig. 2A. Selectivity is here shown plotted on 4 cycle paper, while in Fig. 2B it is plotted on 3 cycle paper, which makes a whale of a difference in the eyes of an engineer

mentioned. In one instance on record the layman examining several sensitivity curves of different receivers published in a magazine decided that Receiver A was nowhere near as good as Receiver B because the sensitivity curve of A was wavy while B had a nice smooth curve. The truth of the matter, as seen by an engineer, was exactly the opposite. The sensitivity curve of A was wavy to be sure, but

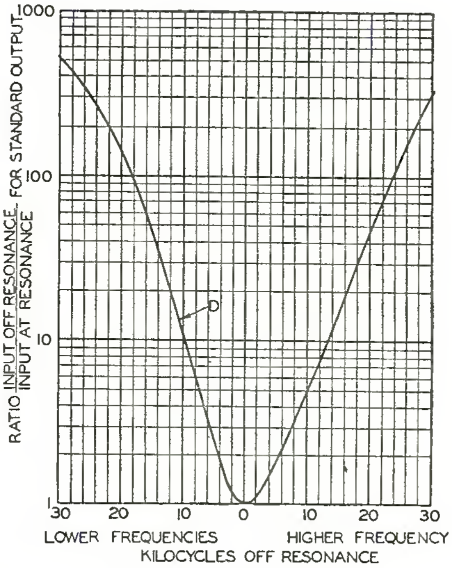


Fig. 2B. A layman might think the selectivity in curve D was better than that shown in curve C of Fig. 2A. But he'd be wrong, for curve C in Fig. 2A is the better of the two

it was centered on the ten-microvolt line throughout the whole range and the "waves" did not extend more than two microvolts above and below that line, thus giving uniform sensitivity over the whole range, as the "waves" of those amounts are negligible. The curve of B, on the other hand, while a "smooth" curve, ran from around ten microvolts at one end of the range to several hundred microvolts at the other. This, of course, rendered the latter end of the range useless for all except local reception. This is illustrated in Fig. 1.

Selectivity curves of different receivers, if plotted on the same coordinates, give a good idea of the relative selectivity of the receivers, but they must be read by an engineer who appreciates the effects of different degrees of selectivity, and notes whether a receiver is good on adjacent channel selectivity and poor two or three channels away or vice versa. He must also note whether or not the selectivity varies widely over the tuning range or whether it is substantially uniform as it should be. It is unfortunate that published selectivity curves are not always plotted on the same coordinates, as failure to do this greatly misleads the layman who usually does not read the figures, but looks only at the shape of the curve. To cite another actual incident, an engineer who was not familiar with the standardized methods of taking and plotting these curves was shown the selectivity characteristics of two sets, C and D. The

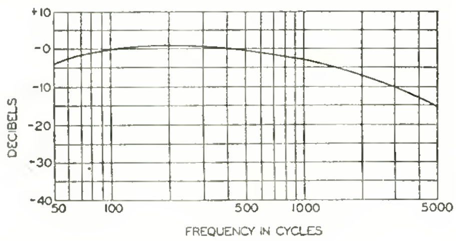


Fig. 3A. Shows electrical fidelity only, while the overall fidelity (or what the listener hears) is shown in Fig. 3B by the wavy line

curves showed C to be very much more selective than D. However, C was plotted on four cycle semi-log paper with the graph occupying about half the sheet, while D was plotted on three cycle paper occupying the whole sheet. (See Fig. 2.) The divisions on the horizontal or frequency axes were the same. The engineer unhesitatingly pronounced D to be very much better than C. The layman, of course, would do the same thing without discovering his mistake as the engineer did later on.

The selectivity characteristics are intended to show the ability of the receiver to tune out unwanted stations. Therefore, as these curves are taken under conditions where the signal is introduced through the antenna post they do not show the actual "operating" selectivity of a poorly shielded receiver. Such a receiver picks up nearby signals on tubes, coils, tuning capacitors, wiring, etc., and a great deal of signal comes in without passing through some of the tuning systems. This means that a totally shielded receiver will give the results indicated by the selectivity curves

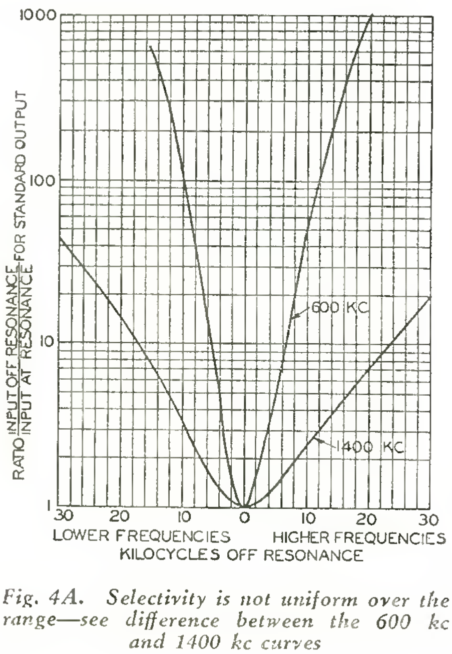


Fig. 4A. Selectivity is not uniform over the range—see difference between the 600 kc and 1400 kc curves

when used near a powerful station, while the poorly shielded receiver gives poor selectivity under the same conditions.

Now we get to the fidelity curve, which really should be called the "electrical fidelity." When the fidelity curve of a receiver is published it is invariably understood by the average reader to represent the overall response of the receiver. This view is, of course, completely wrong. Such a curve represents the electrical characteristics of the receiver as it picks up the modulated radio wave, rectifies it, and then amplifies the audio frequencies. This fidelity curve does not show the characteristics of the loud speaker or the acoustic properties of the cabinet such as baffling effect or "cabinet resonance." (See Fig. 3.) Only acoustic measurements taken under proper conditions with very complicated equipment show these factors up. The average reader will take the fidelity curve of a midget receiver and that of a full sized, high quality receiver and will point out that the responses at 100 cycles are comparable. He, of course, does not appreciate that the lack of baffling effect of the midget practically kills any possibility of response at 100 cycles, while the large console receiver with efficient loud speaker gives good response at that frequency.

Audio Power Output

Here we should consider an additional characteristic not mentioned before, but one in which there are good possiblities of a misunderstanding. The audio power output of the chassis is often given as an index of the sound output of the whole receiver. If the same loud speaker is used with two chassis having different power outputs the comparison is a fair one. However, this rating is worthless when comparing two receivers having different loud speakers. A receiver with an efficient loud speaker fed from one 245 tube may give an equal or greater sound output than another with an inefficient small sized loud speaker fed with two pentodes in push-pull. In fact, some manufacturers advertising high power output stages are forced to use that power to obtain anywhere near acceptable results on account of inefficient loud speakers.

In connection with both the selectivity and fidelity curves it should be noted that a receiver with extreme selectivity lacks response in the high audio frequency range. This means that beyond a certain degree of selectivity the audio quality suffers. One might look at a sharp pointed selectivity curve and say that the receiver was excellent, but if he realizes the effect of this "knifelike" selectivity he will look for the loss in audio quality indi-

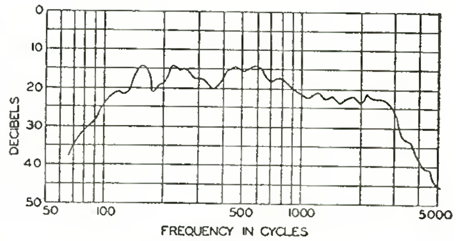


Fig. 3B. This curve takes into account the acoustic properties of the cabinet and the frequency response of the speaker, truly an overall response curve

cated by lack of high frequency response in the fidelity curve. (See Fig. 4.) Also, it should be noted that if the selectivity is not reasonably uniform over the tuning range the fidelity varies considerably when tuning from a 600-kilocycle station to a 1400-kilocycle station.

Another point of interest is that a receiver with little background noise may be very deficient in high frequency response. This deficiency of highs with corresponding "quiet" operation may be marked by a peak in the fidelity curve between 2000 and 3000 cycles.

Expert Should Interpret

The legitimate use of measurements of electrical characteristics is in design work, where they serve as an indispensable tool to the radio engineer. Their use for publicity purposes was never intended and is bound to be misleading when *their interpretation is attempted by laymen.* The radio engineer can tell from his measurements of the chassis and his stage-by-stage analysis what circuit changes have to be made to obtain the desired result, and can accurately check the results of such changes. He knows from experience what certain shapes and peculiarities in the curves mean and what to do to correct them. He knows with what apparatus the chassis is to be used and what characteristics are needed to secure the desired overall results. On the other hand, the average layman is about as well able to judge the overall performance of a receiver from its electrical curves as he would be the physical condition of a person from an examination of his instantaneous blood-pressure curves.

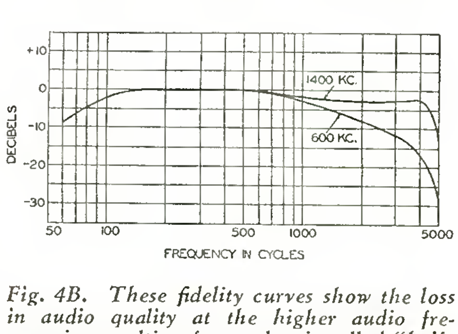
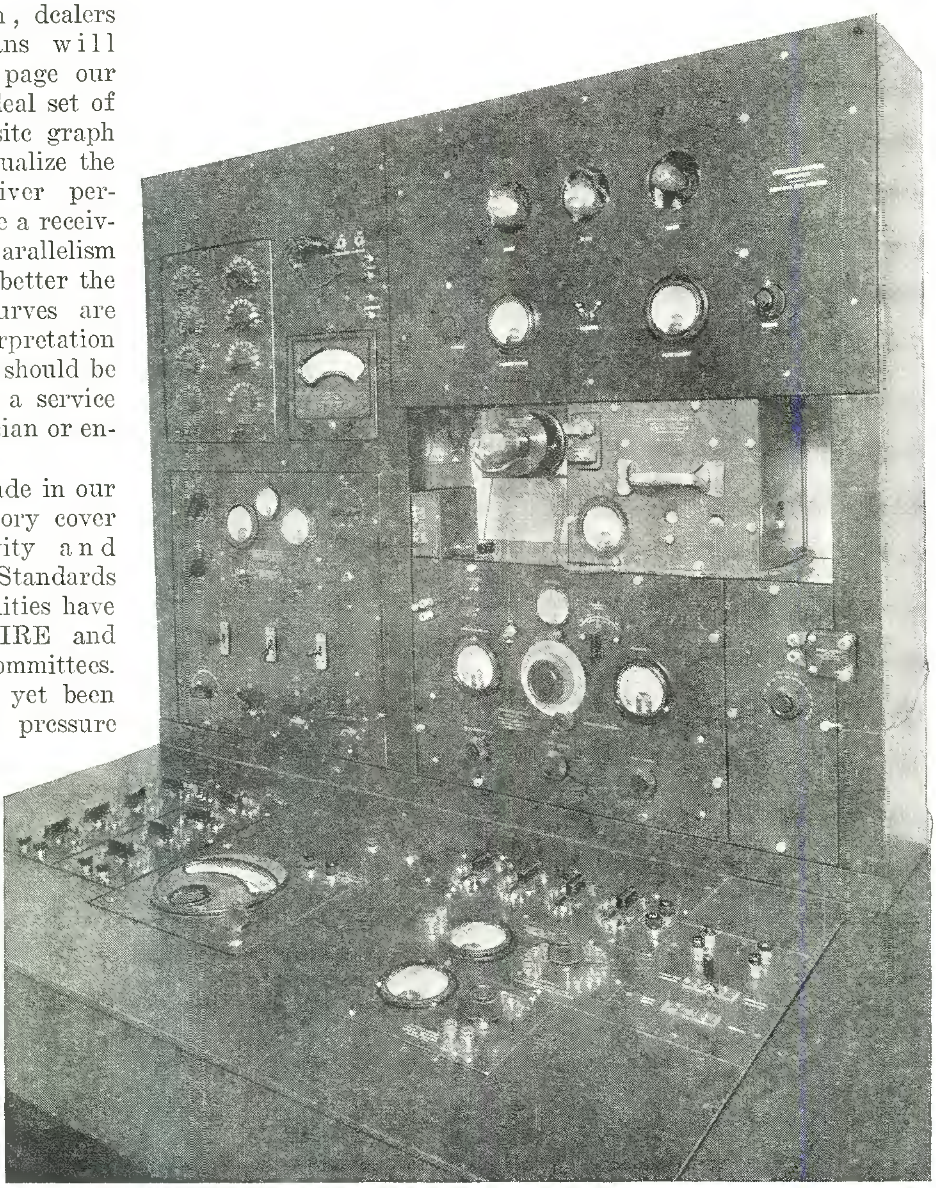


Fig. 4B. These fidelity curves show the loss in audio quality at the higher audio frequencies resulting from what is called "knife like" selectivity at lower radio frequencies

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.

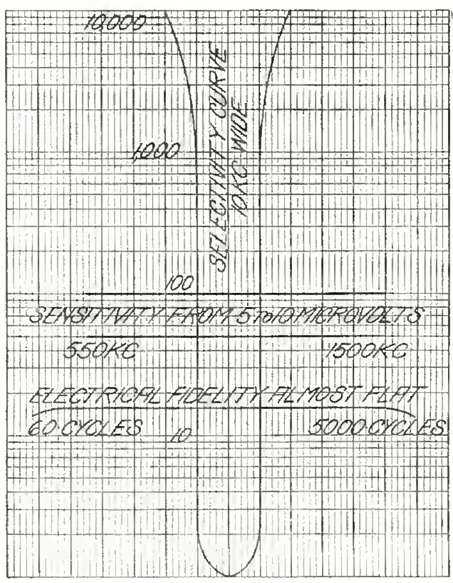


Measurements made in our engineering laboratory cover sensitivity, selectivity and electrical fidelity. Standards for these three qualities have been set by the IRE and RMA engineering committees. No standards have yet been adopted for sound pressure measurements. Until a standard is selected, our laboratory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

Brunswick Chassis 11, 12, 16

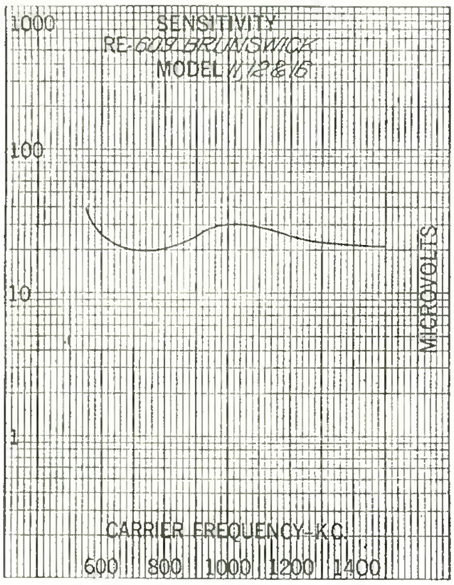
UPON measuring the overall electric performance of the Brunswick model 16, the following curves were plotted, which are also for models 11 and 12 made by the same manufacturer.

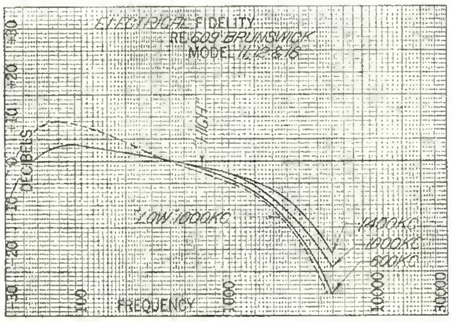
A standard dummy antenna of 20 uh, 200 uuf and 25 ohms was used on the input. The output impedance was made at 7500 ohms to match the 247 tube. The voice coil was disconnected during measurements, and the output plate was capacitatively coupled to the output voltmeter.

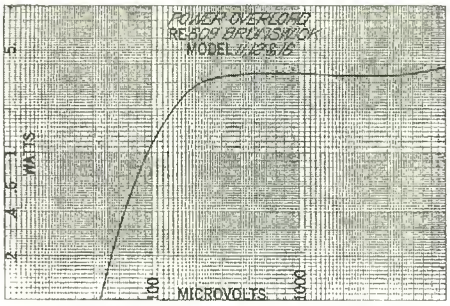
The receiver alignment was left at factory adjustment, and the tubes used were those furnished with the receiver by the manufacturer. The volume control was turned to maximum sensitivity position. With a line voltage of 113 volts, the receiver drew .76 amperes.

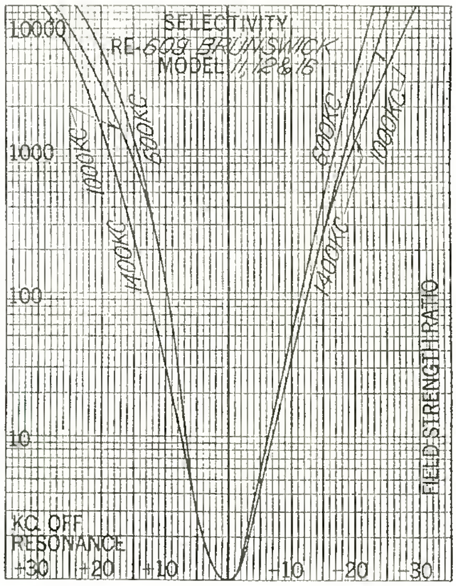
On the model 16 sensitivity curve in column one, the average sensitivity is 27.2 microvolts absolute, which is equivalent to 6.8 microvolts per meter. In column two, the power overload curve gives the maximum audio output power as 3.8 watts, which disregards harmonic distortion in this curve. Band widths are found under the selectivity curves of column three, from which they were derived. This receiver had no measurable noise level below 1000 kc and had a maximum of .64% at 1400 kc.

The schematic diagram of this receiver follows directly under the overall response curves. The required tubes are a 224 oscillator, 551 r-f, 224 first detector, 551 second i-f, 224 second detector, 247 output power pentode, and a 280 rectifier. The bias on the r-f and second i-f 551 tubes is varied for volume control of the receiver. The tone control bypasses the higher audio frequencies from the second detector plate circuit. The field of the dynamic speaker is the only choke used for the filtration of a-c hum. The speaker is also supplied with a bucking coil. The 224 oscillator is directly coupled to the cathode of the first detector by means of the grid coil of the oscillator. Both the intermediate transformers are of the tuned-grid, tuned-plate type. The second detector is resistance coupled to the output tube.



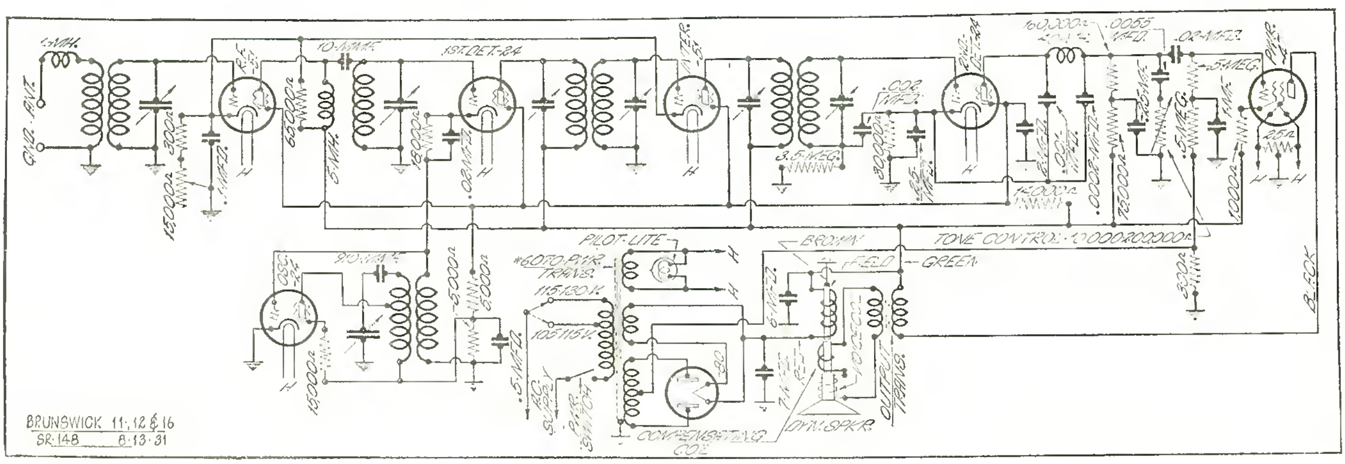






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	13	14	15
100	21.5	23	25.5
1000	31.5	35	39
10000	47	52.5	58.5



Crosley Model 120 Chassis

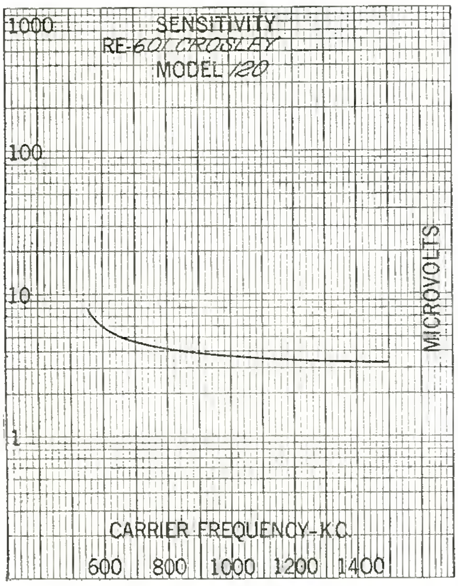
RESULTS of our measurements on the Crosley model 120 receiver are given in the response curves which are printed on this page.

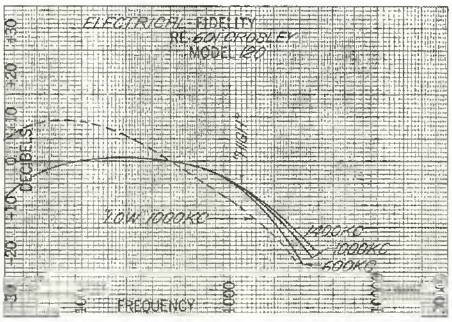
A standard dummy antenna of 20 uh, 200 uuf and 25 ohms was used on the input. The output impedance was adjusted to 4000 ohms to match the push-pull 245 tubes. The output standard of .05 watts was used. The voice coil was disconnected during measurements, while the output was capacitatively coupled.

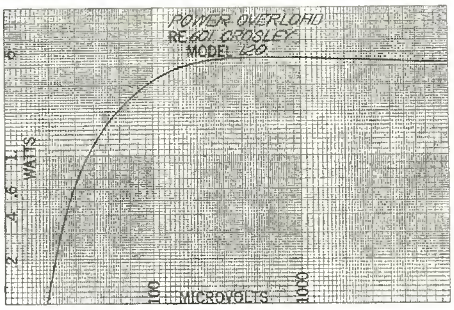
The alignment of the set was left at factory adjustment and the tubes used were those furnished with the receiver by the manufacturer. The volume control was set at maximum. With a line voltage of 115 volts, the receiver drew .90 amperes.

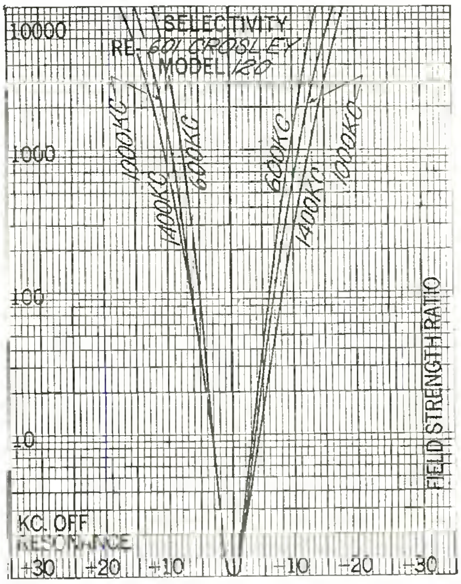
From the sensitivity curve of model 120 in column one, the average sensitivity was found to be 4.6 microvolts absolute, equivalent to 1.15 microvolts per meter. In column two the power overload curve shows the maximum audio power output to the speaker to be 4.57 watts. The effect of the harmonic content of the output wave form is disregarded in this curve. The band widths will be found under the selectivity curve in column three, from which they were measured.

The schematic diagram of this receiver follows directly under the response curves. The tube complement is made up of a 224 oscillator, coupled to the first detector cathode by means of a pickup coil, 224 r-f, 224 first detector, 224 second i-f, 227 second detector, two 245 tubes in push-pull and one 280 full-wave rectifier. In this model, the speaker field forms the second choke unit in the filter system for the rectified current. The volume control operates on the cathodes of the r-f and second i-f tubes.



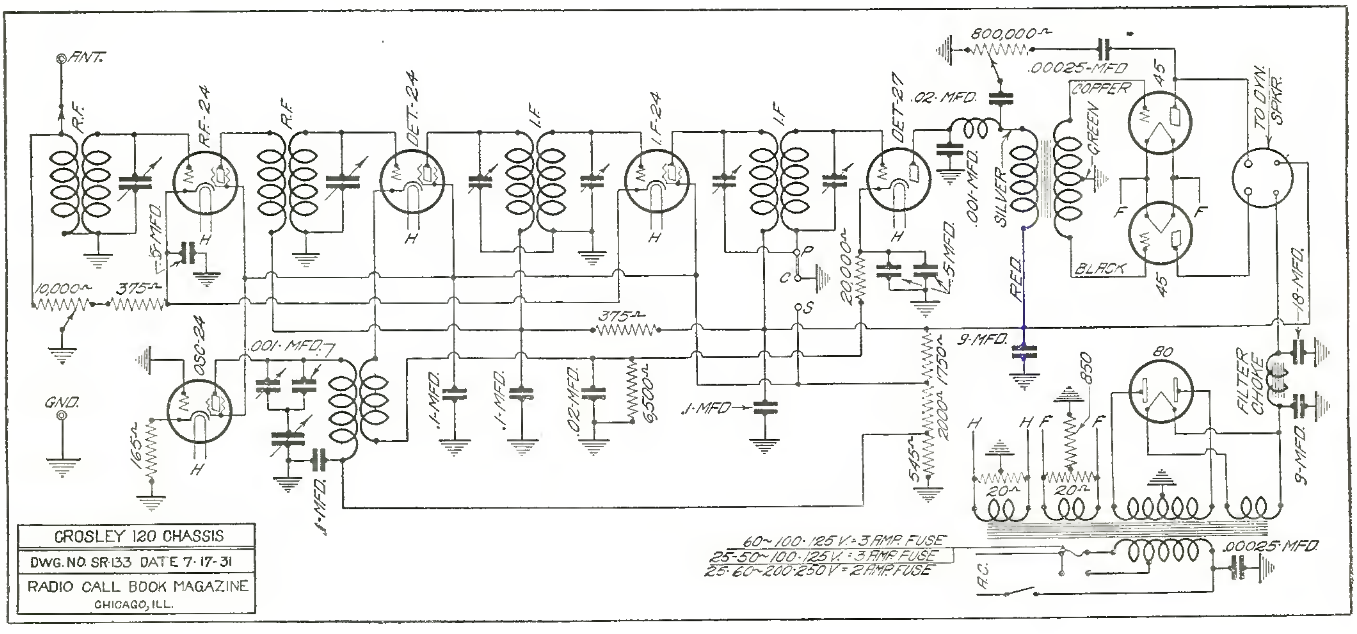






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	6	7	7.5
100	11.5	13	14
1000	17	20	23
10000	26	31	35



Howard Super Model H

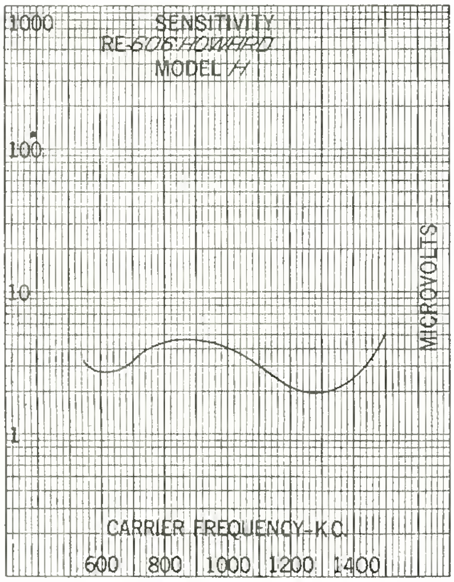
MEASUREMENTS of the Howard Radio Co.'s model H receiver gave the curves included in this article.

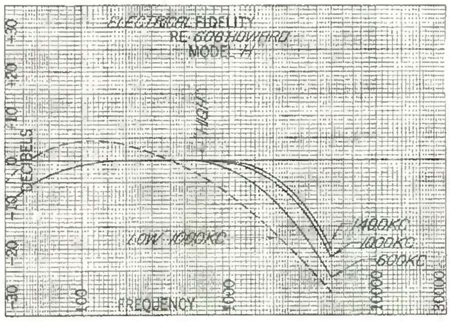
The input was coupled to the standard dummy antenna of 20 uh, 200 uuf and 25 ohms, while the output impedance was adjusted to 15,000 ohms for the two 247 tubes in push-pull. The output was kept at .05 watts, and the voice coil was open during measurements. The output tubes were capacitatively coupled.

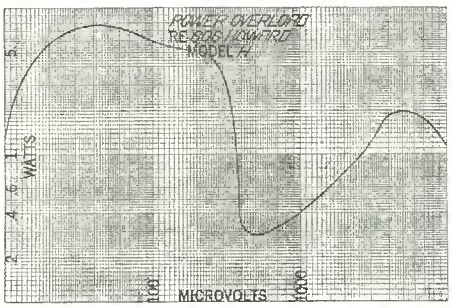
The alignment of the receiver was not changed from the factory adjustment, and the tubes used were those shipped by the manufacturer with the set. The volume control was turned to maximum setting, and the receiver drew .9 amperes at 115 volts a-c line input.

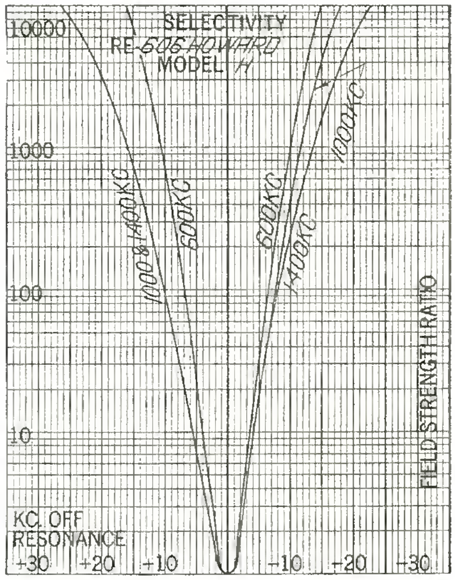
The curve giving the sensitivity, found in column one, shows an average of 3.2 microvolts absolute corresponding to .8 microvolts per meter. The power overload curve in column two gives a maximum output of 7.7 watts, disregarding the harmonic distortion of the output audio power. The highest noise level was 4.2% of standard output at 1400 kc. and the lowest was .8% at 550 kc. Under the selectivity curves in column three are tabulated the band widths.

At the bottom of the page will be found the schematic diagram of this receiver. The tubes required for this receiver are a 227 oscillator, 551 r-f, 551 first detector, 551 second i-f, 227 second detector, two push-pull 247 output tubes, and a 280 full-wave rectifier. The oscillator is coupled to the grid of the first detector, while the volume control affects the bias of the r-f, first detector and the second i-f tubes.



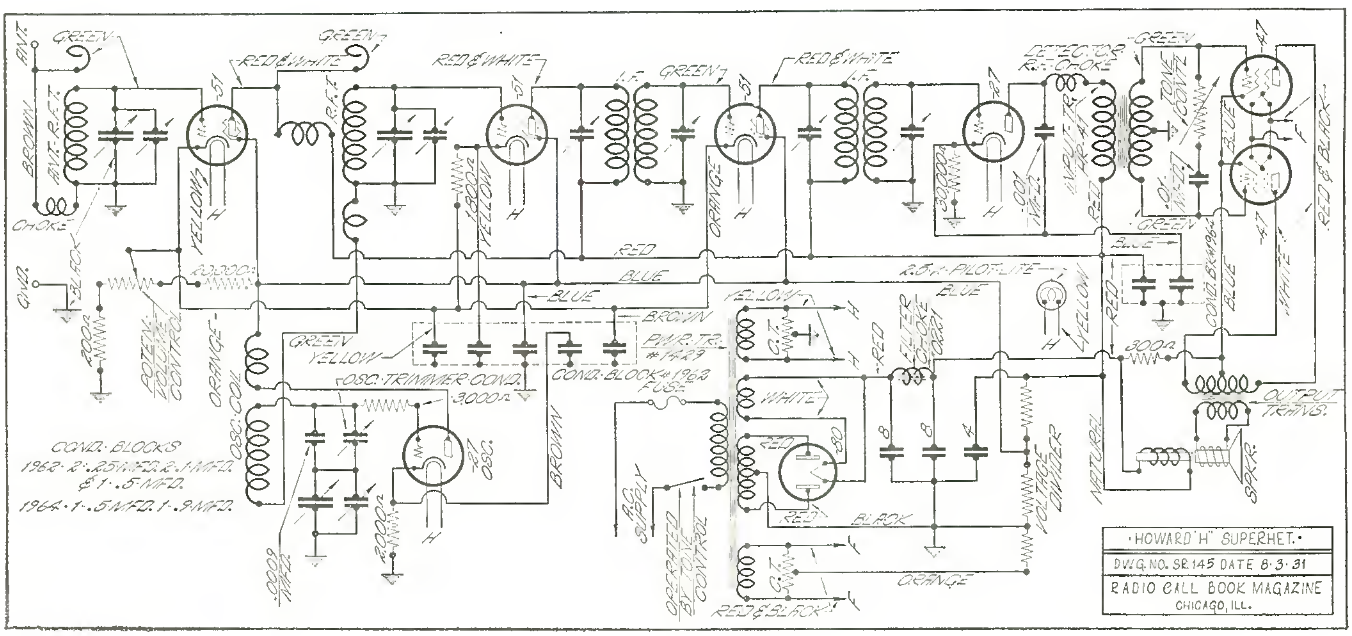






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	7.5	10	10
100	13.5	17.5	18
1000	20.5	27.5	29.5
10000	31	44	49



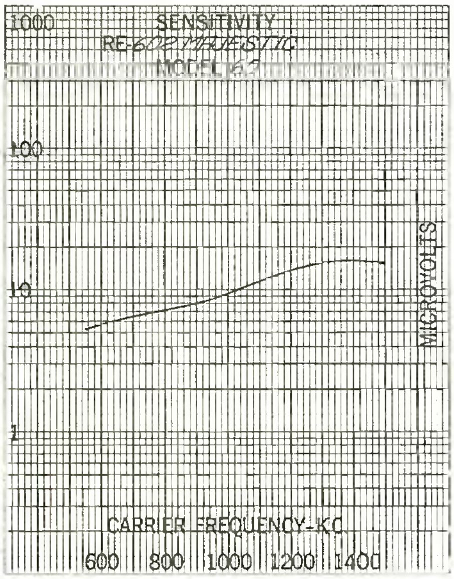
Majestic Model 60 Chassis

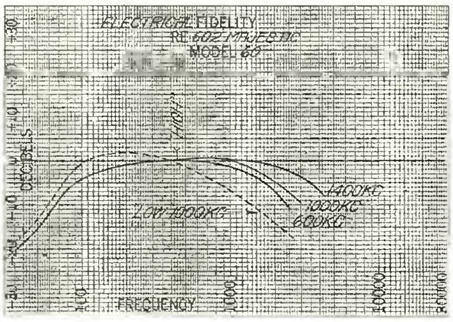
RECENT measurements on the Majestic model 60 radio receiver gave response curves which will be found on this page.

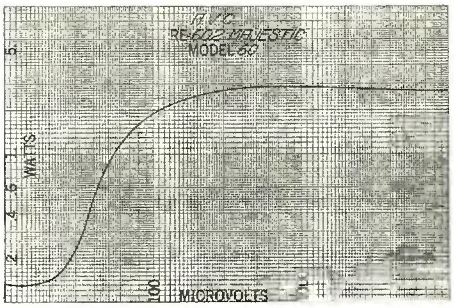
The dummy antenna standard of 20 uh, 200 uuf and 25 ohms was connected to the input circuit. To match the push-pull 245 tubes used in the output of the receiver, the impedance was adjusted to 4000 ohms, and the output standard of .05 watts was maintained. The voice coil was disconnected during measurement, and the plates capacitatively coupled.

Factory alignment was left undisturbed, and the tubes furnished with the set by the manufacturer were used in the tests. Volume control was set at maximum. The a. c. line voltage was 110 volts and the drain of the receiver was 1.1 amperes.

The average sensitivity, as taken from the curve of column one, was found to be 9.8 microvolts absolute which corresponds to 2.5 microvolts per meter. From the power overload curve in column two, the maximum power output is 2.81 watts, disregarding the harmonic content of the signal.

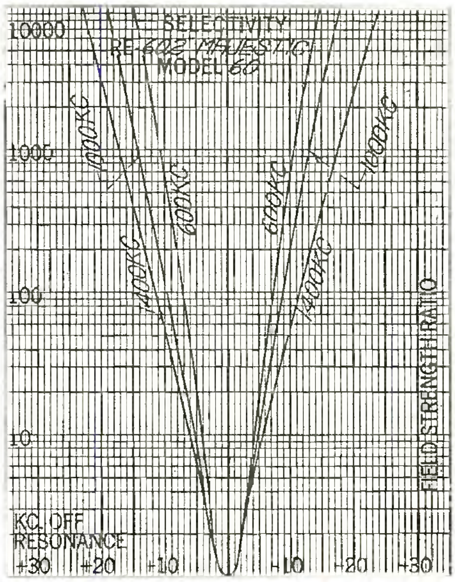






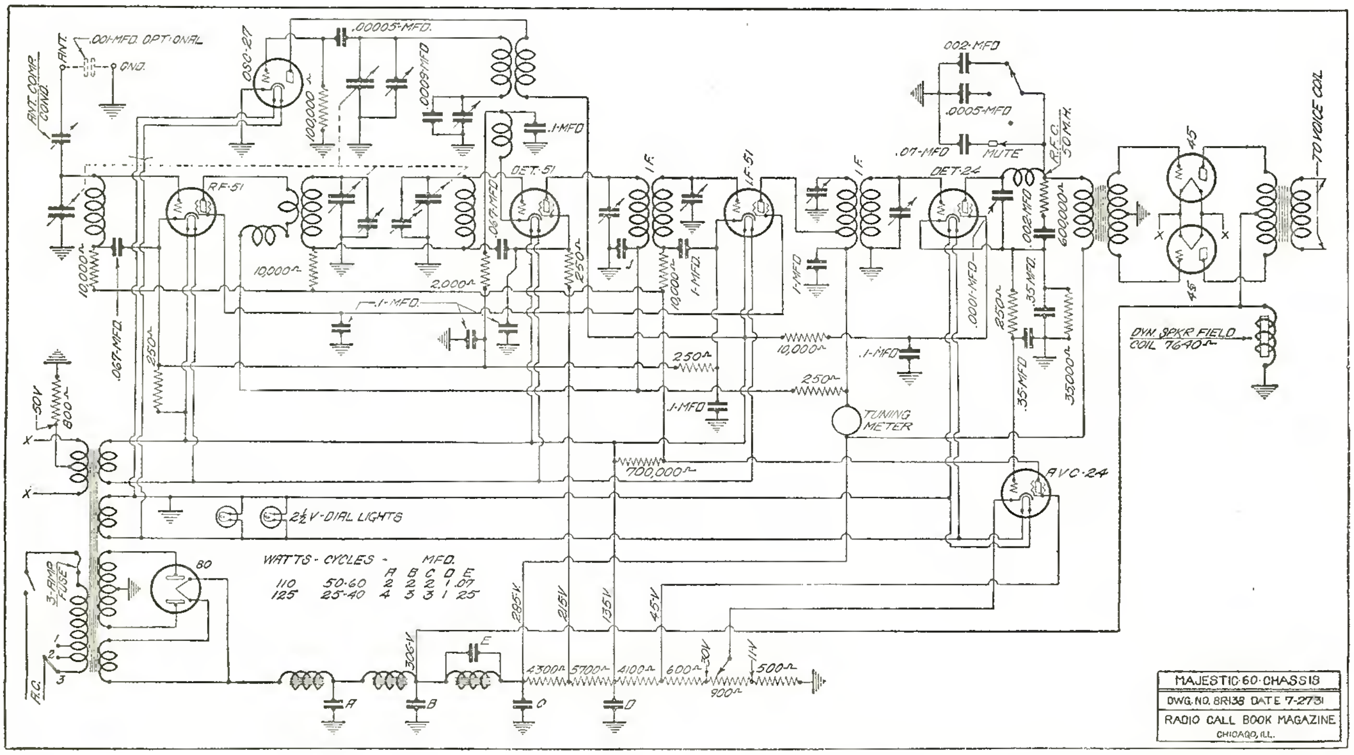
This receiver employs an automatic volume control and visual signal resonance indication. From the selectivity curve in column three, measured band widths are given directly below it.

The schematic wiring diagram of this receiver will be found at the bottom of this page.



Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	8.5	10	11.5
100	15	19	23
1000	21	27	35
10000	30	37	47

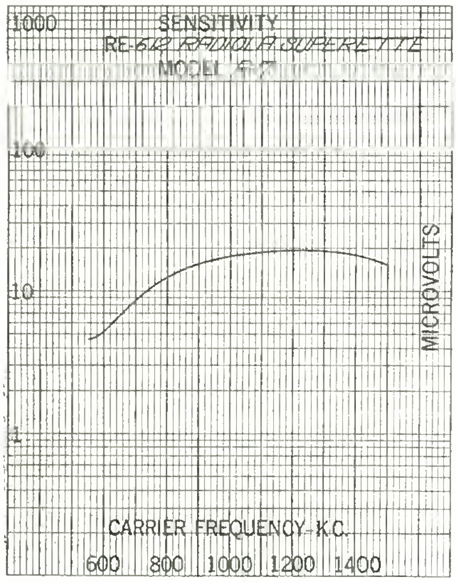


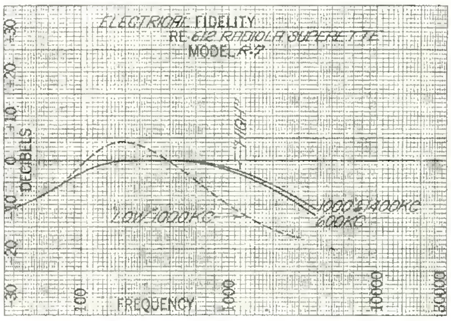
RCA-Victor Superette Model R-7

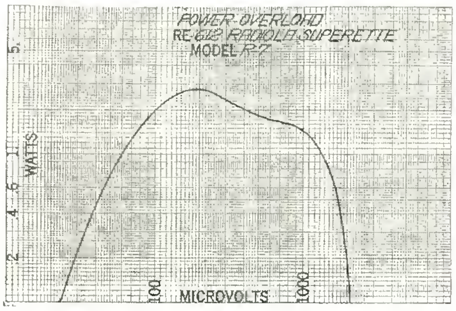
OUR results of laboratory measurements of the RCA-Victor Radiola Superette receiver model R7 are shown in the curves included in this article.

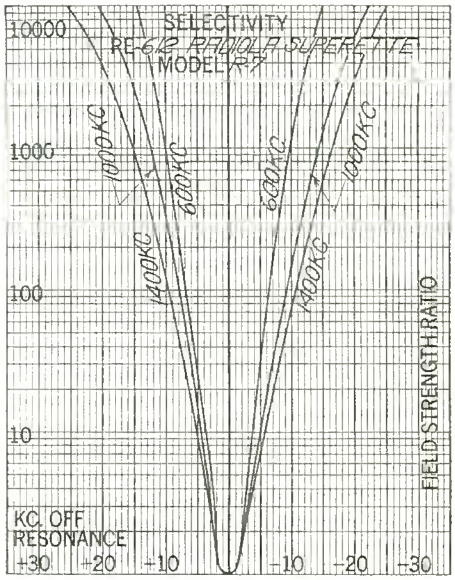
A standard dummy antenna of 20 uh, 200 uuf and 25 ohms was used on the input circuit. To match the impedance of the two 245 tubes in push-pull, the output load was made 4000 ohms. An output of .05 watts was maintained during all measurements. While the tests were in progress the voice coil was disconnected, and the output plates were capacitatively coupled to the output measuring device. The receiver alignment remained at factory adjustment, and the tubes employed were those furnished with the set. The volume control was set for maximum volume at all times. This receiver had a drain of .61 amperes at 111 volts line voltage.

The average sensitivity of this receiver, measured from the curve in column one, is 23.2 microvolts absolute, of which the equivalent is 5.8 microvolts per meter. The power overload curve gives the maximum power output at 30% modulation as 2.77 watts, disregarding the harmonic distortion introduced in the output. The band widths taken from the sensitivity curves are tabulated under them. The receiver's schematic diagram will be found under the performance curves at the bottom of the page. This superheterodyne requires a 227 oscillator, 235 r-f, 224 first detector, 235 second i-f, 227 second detector, push-pull 245, and 280 rectifier tubes. The grid of the first detector is coupled inductively to the oscillator tube. Volume control is effected by variation of the cathode voltage of the r-f and the second i-f tubes. In this receiver, the speaker field is connected in the ground return lead of the B voltage supply and is of 1330 ohms resistance. One side of the voice coil is grounded to the chassis.



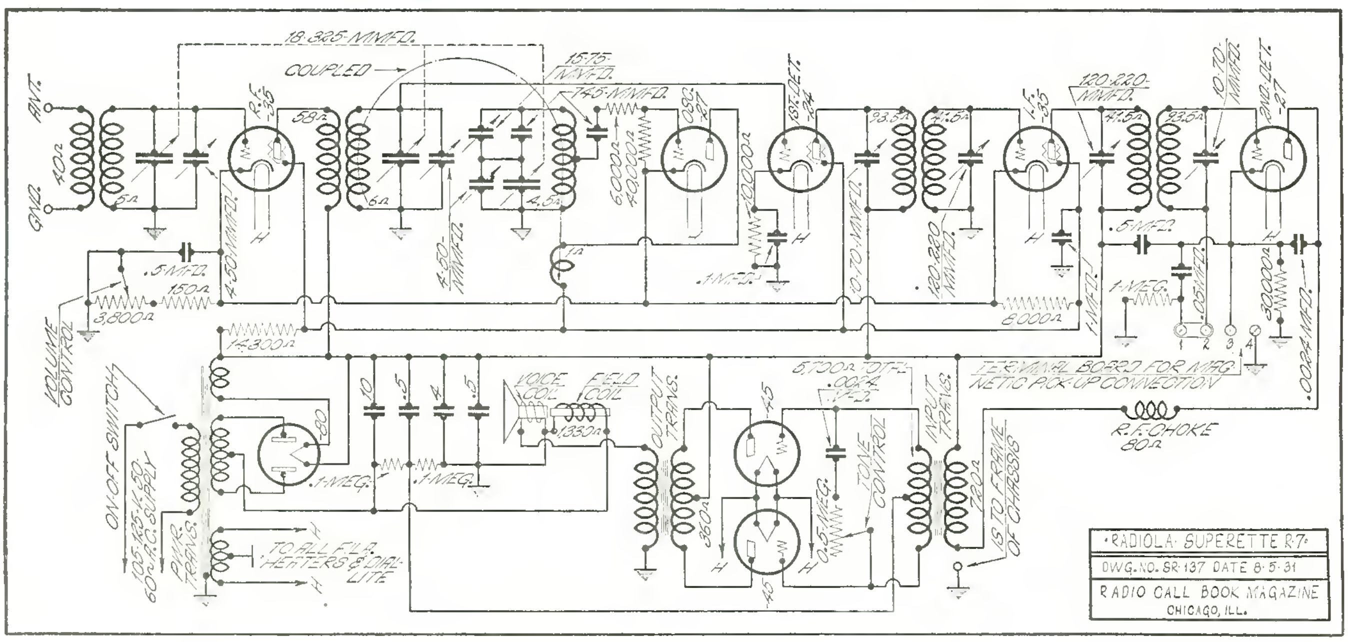






Band Widths

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



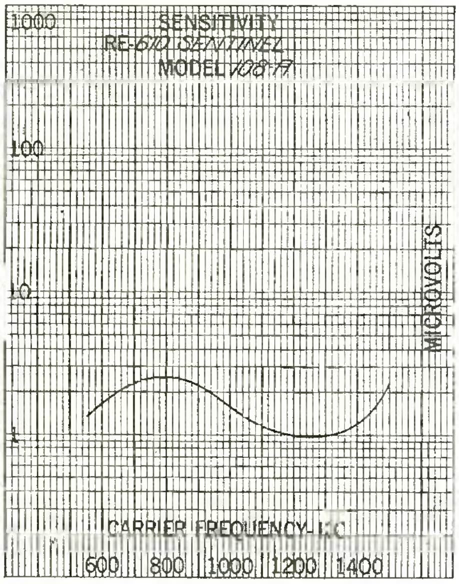
Sentinel Model 108-A

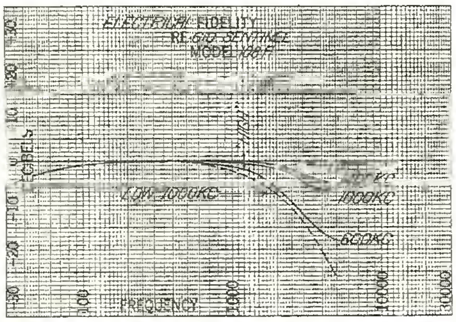
THESE response curves are the results of our laboratory measurements on the Sentinel model 108-A receiver recently tested.

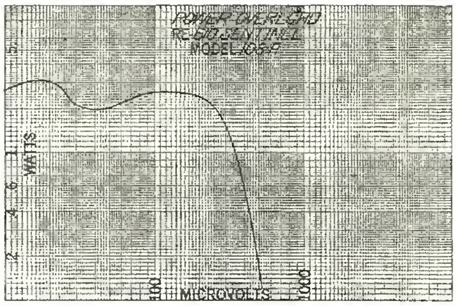
A standard dummy antenna of 20 uh, 200 uuf and 25 ohms was employed on the receiver input circuit. To match the single 247 output tube, the output load was adjusted to 7500 ohms, with a standard output of .05 watts maintained during all tests. The output was coupled capacitatively, and the voice coil circuit broken while the measurements were in progress. Factory alignment of this receiver was not disturbed, and the tubes used were furnished with the set by the maker. Tests were all made at full volume setting of the volume control. A line supply voltage of 113 volts made the receiver drain 1 ampere.

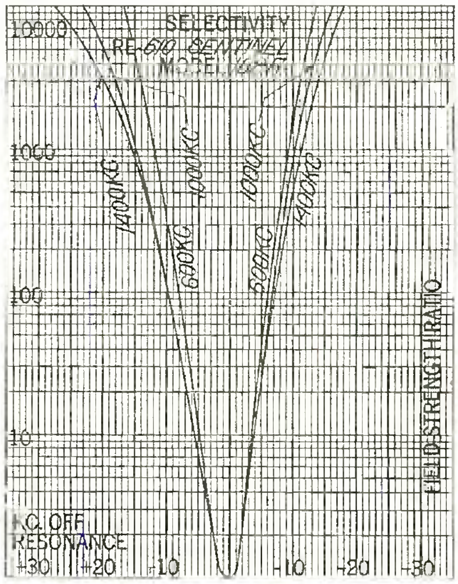
The average sensitivity, as taken from the sensitivity curve of column one, is 1.68 microvolts absolute or .42 microvolts per meter. The power overload curve gives a maximum audio output of 3.06 watts to the speaker, not taking into account harmonic content of the wave form. From the selectivity curves the band widths were measured as found under these curves in column three.

The schematic wiring diagram is given at the end of the article under the performance curves of this receiver.



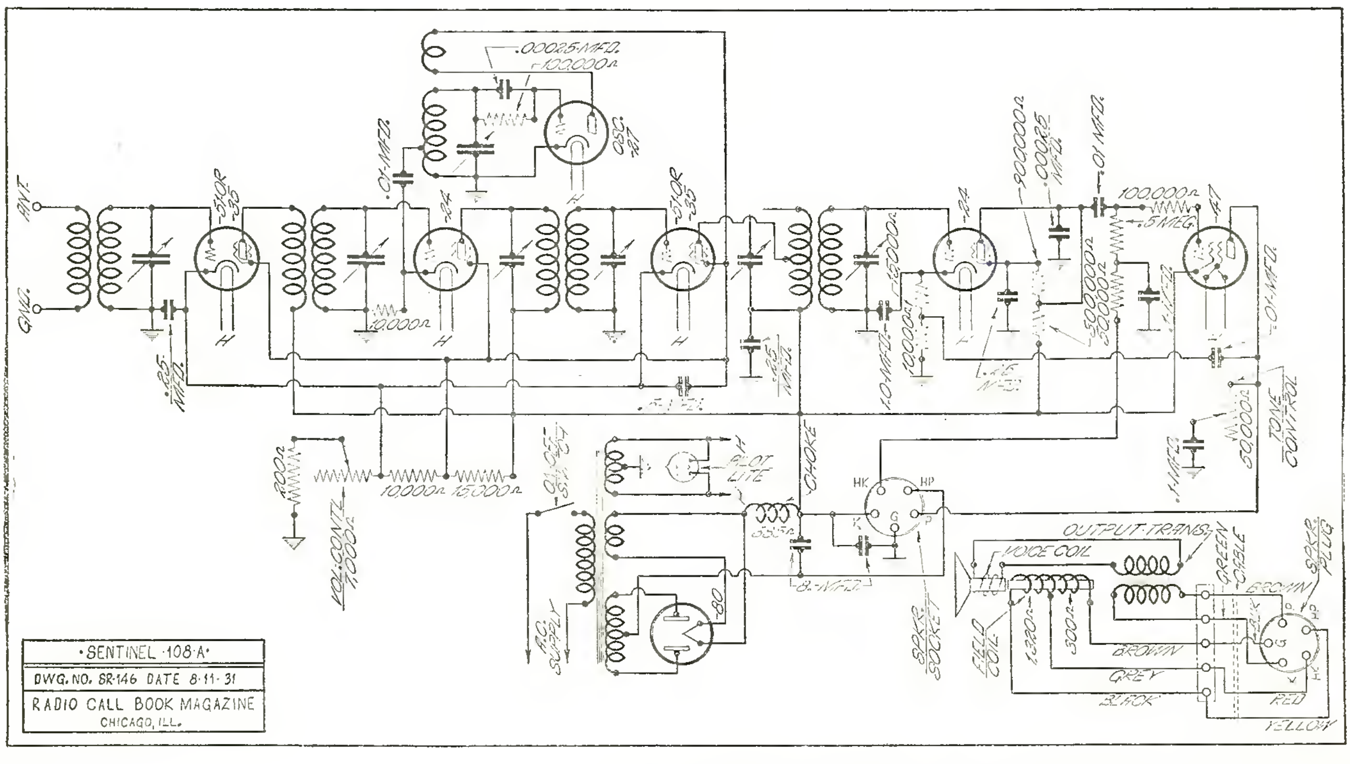






Band Widths

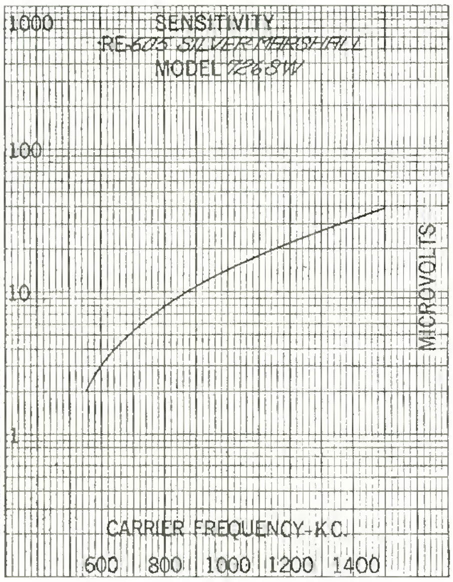
Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	7.5	9.5	9.5
100	14.5	17	17
1000	21	25	27
10000	29	39.5	45



Silver-Marshall Model 726-SW

CURVES found on this page are indicative of the performance of the Silver-Marshall 726 SW broadcast band of this combination short wave and broadcast receiver, measured only on the broadcast band.

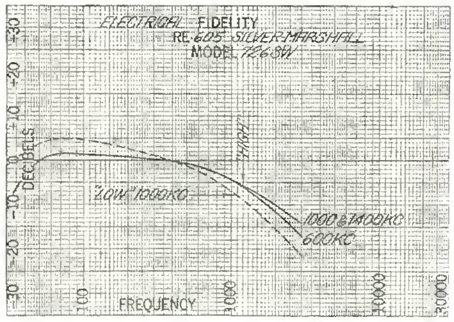
A standard dummy antenna of 20 uh, 200 uuf and 25 ohms coupled the generator output to the receiver. The

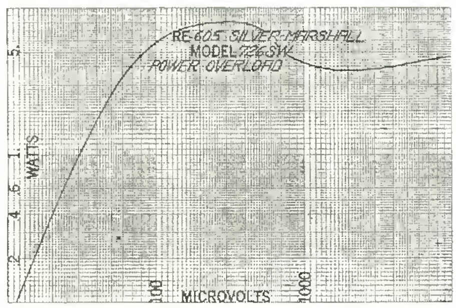


load impedance was 15,000 ohms to match the 247 tubes in push-pull used in the output. The output wattage was .05, and the voice coil was opened while the tests were in progress, with the plates capacitatively coupled to the output meter.

Factory alignment was not changed, and the tubes in the set were those included with the receiver by the maker. Maximum setting of the volume control was used. The line voltage supply of 110 volts gave the receiver a drain of 1.02 amperes.

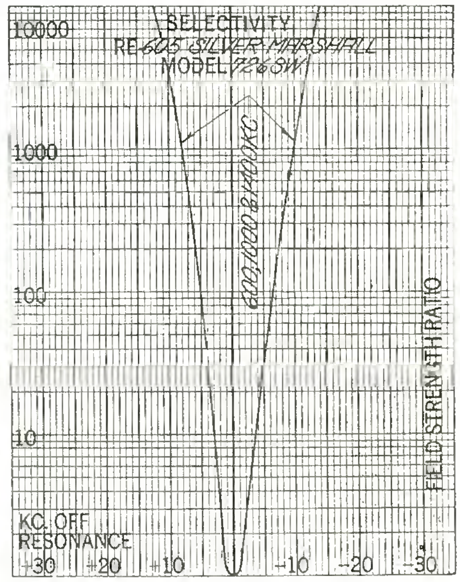
In column one, the sensitivity curve shows the average sensitivity to be 18.4 microvolts absolute or 4.6 microvolts per meter. The power overload curve in column 2 shows the maximum power output as 8 watts. However, this figure disregards harmonic content in the output signal to the speaker. The highest noise level was 28% at 550 kc. and the lowest 1.5% at 1400 kc. The





band widths, figured from the selectivity curves in column three, are found under that graph.

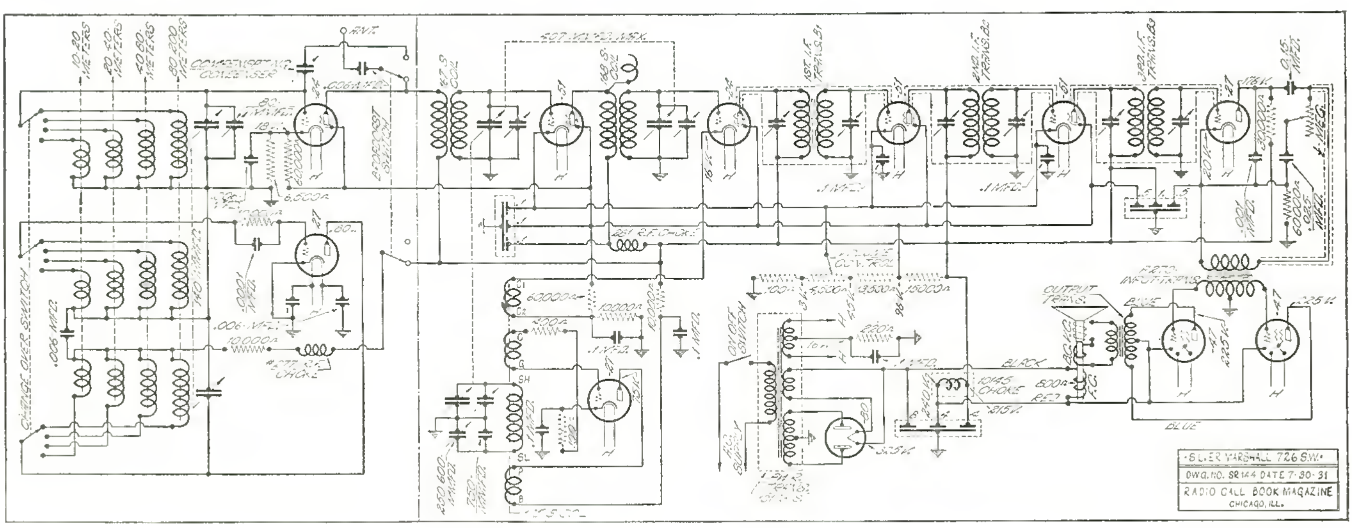
The receiver's schematic diagram is found at the bottom of the page. We find the following tube complement for this combination short and long wave receiver: a 227 long wave oscillator, 227 short wave oscillator, 224 short wave first detector, 551 r-f, 224 long wave first detector, 551 second i-f, 551 third i-f, 227 second detector, two 247 output tubes in push-pull, and one 280 rectifier tube to furnish the d-c supply voltages. The change-over switch and the switching arrangement for the four short wave bands covered may be seen at the left end of the schematic wiring diagram. The total band coverage, both short and long wave, is from 10 to 545 meters without a break. The short wave oscil-



lator is coupled to the first detector grid circuit, while the long wave oscillator is coupled to the first detector cathode circuit. The volume control varies the bias voltages on the r-f, second and third i-f tubes. The dynamic speaker has a bucking coil.

Band Widths

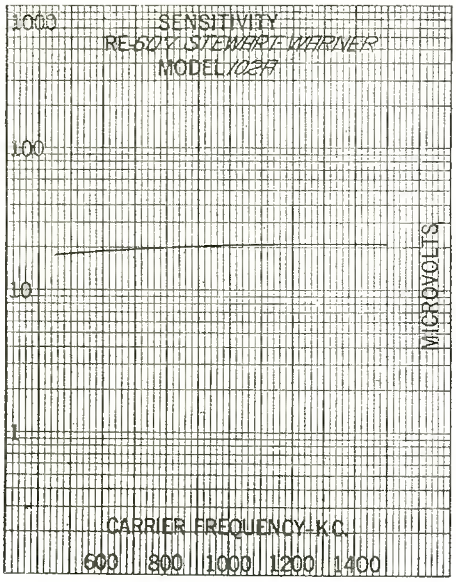
Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	7	7	7
100	12	12	12
1000	18	18	18
10000	26	26	26



Stewart-Warner 102A Chassis

THESE curves are the result of our overall measurements on the Stewart-Warner model 102-A receiver recently tested in our laboratory.

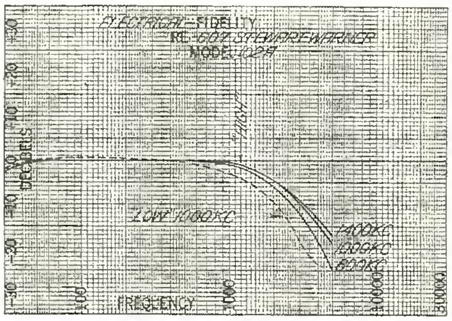
A standard dummy antenna of 20 uh, 200 uuf and 25 ohms coupled the signal generator output to the receiver input circuit. The load impedance was adjusted to 7500 ohms to match

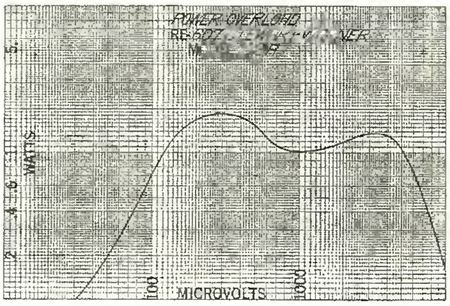


the 247 type output pentode. The standard output level of .05 watts was used, and the voice coil was disconnected during all measurements. The plate of the output tube was capacitatively coupled to the output indicator.

The receiver was measured at factory alignment, and the tubes employed were furnished with the set by its manufacturer. The volume control was set for maximum sensitivity. Line voltage of 115 volts gave the receiver a drain of .8 amperes.

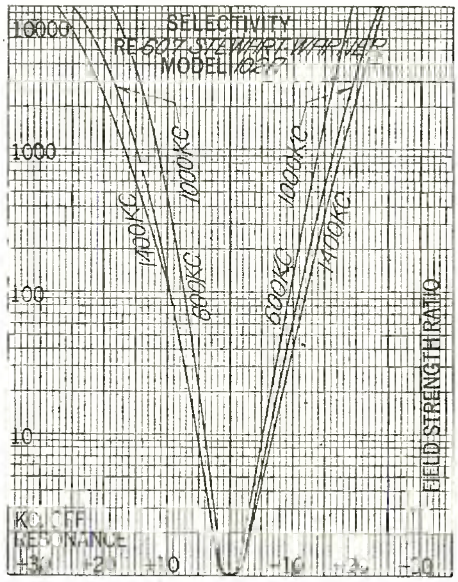
On the sensitivity curve in column one, the computed average is 20.6 microvolts absolute or 5.1 microvolts per meter. The maximum power, as indicated by the power overload curve of column two, is 1.94 watts delivered to the speaker input trans-





former. This figure disregards the harmonic distortion at this power output level. The band widths are tabulated under the selectivity curves of column three. The maximum noise level occurred at 800 kc with a value of 2.16% and the minimum at 1400 kc with a value of 1.06%.

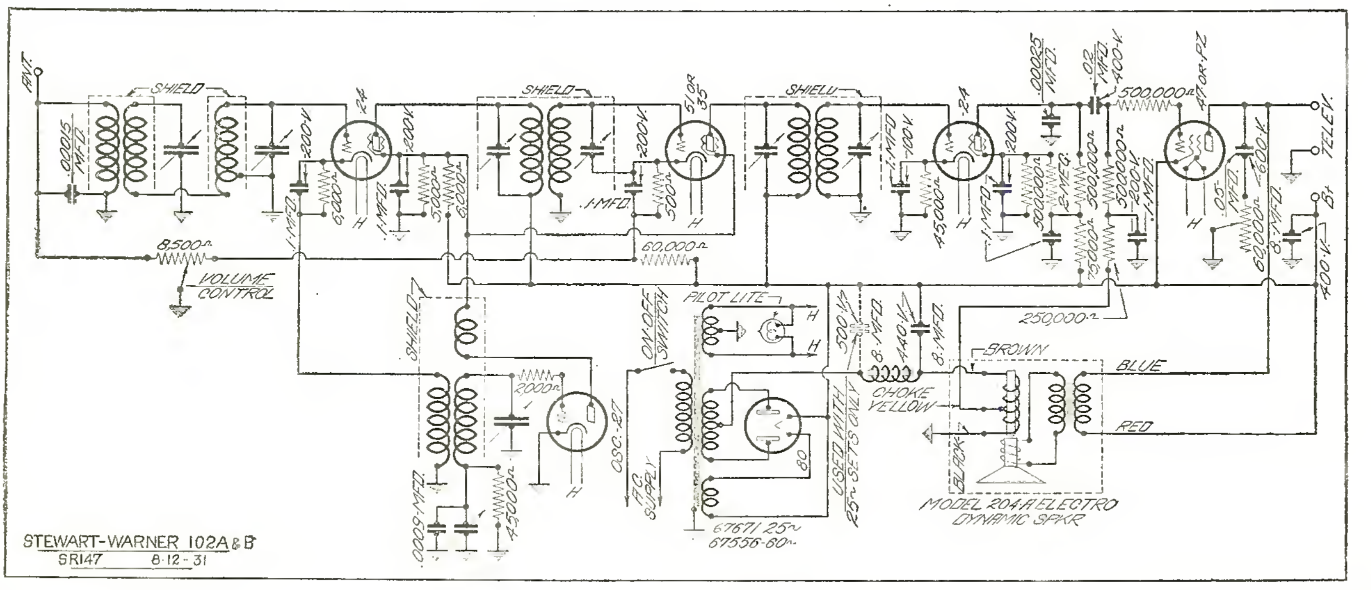
The receiver schematic wiring diagram is found under this report. This superheterodyne employs a 227 oscillator, 224 first detector, 551 second i-f, 224 second detector, 247 single pentode output, and 280 full-wave rectifier tubes. The volume control varies the cathode voltage of the second intermediate tube for sensitivity change. The speaker field, which is tapped, acts as a voltage divider circuit from



the choke to ground potential. Television jacks are supplied at the output stage.

Band Widths

Times Field Strength	Kilocycles width 600 kc.	1000 kc.	1400 kc.
10	9	12	13
100	17	20	23
1000	25	31	35
10000	38	48	51



T. C. A. Clarion Model 80-81

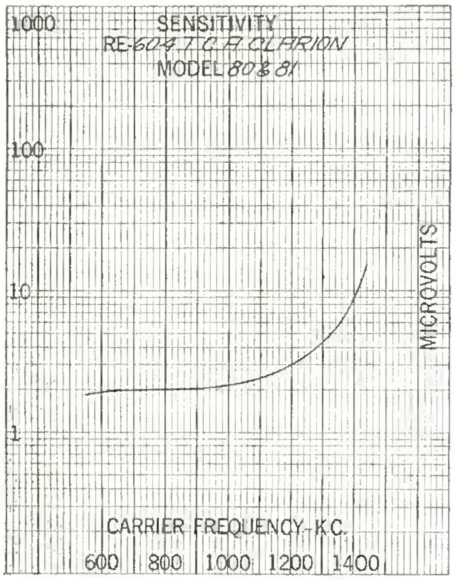
On measurement in our laboratory recently, the Clarion models 80 and 81, manufactured by the Transformer Corporation of America gave the curves published in this article.

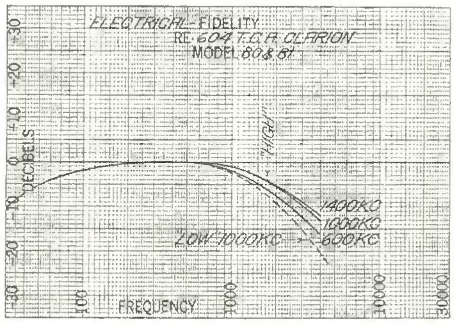
The 20 uh, 200 uuf and 25 ohm standard dummy was connected to the antenna input circuit. To match the single 247 output tube, the load impedance was adjusted to 7500 ohms with the plate capacitatively coupled to the output measuring system. The standard output was .05 watts.

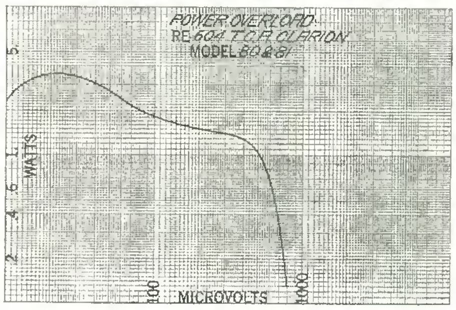
The alignment, as made by the factory, was unaltered, and the tubes furnished by the manufacturer were used in the tests. Maximum volume control setting was used in all tests made. The receiver drain was 1 ampere with a line voltage of 115 volts, 60 cycles.

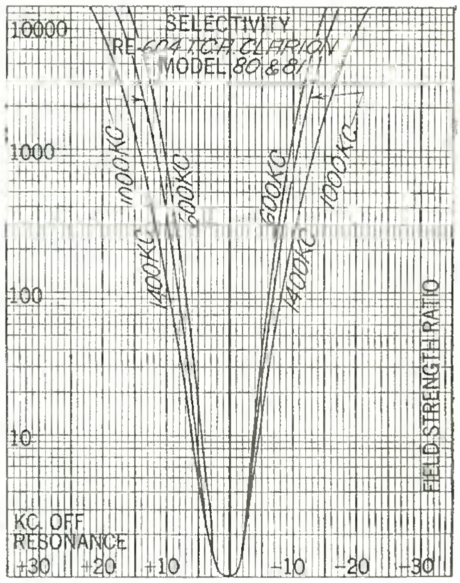
From the sensitivity curve in column one, the average sensitivity in microvolts absolute is 5.8, equivalent to 1.54 microvolts per meter. The maximum power output as taken from the power overload curve in column two is 3.52 watts, this figure not taking into account the harmonic content of the output wave. The band widths are found in column three under the selectivity curves and are measured from these latter performance curves.

At the bottom of this page is given the schematic wiring diagram of the Clarion models 80 and 81. From it the tube complement of these receivers is found to be, a 227 oscillator, 551 first r-f, 551 first detector 551 second i-f, 224 second detector, 247 output audio tube, and a 280 full wave rectifier tube to supply the necessary rectified voltages. The oscillator is inductively coupled to the cathode of the first detector for energy transfer. First and second intermediate frequency transformers are of the tuned-plate, tuned-grid type. It will be noted that the speaker field is connected in the B return system. Volume control varies the cathode bias on the r-f and second i-f tubes. The 224 screen grid second detector is resistance coupled to the 247 pentode output tube.



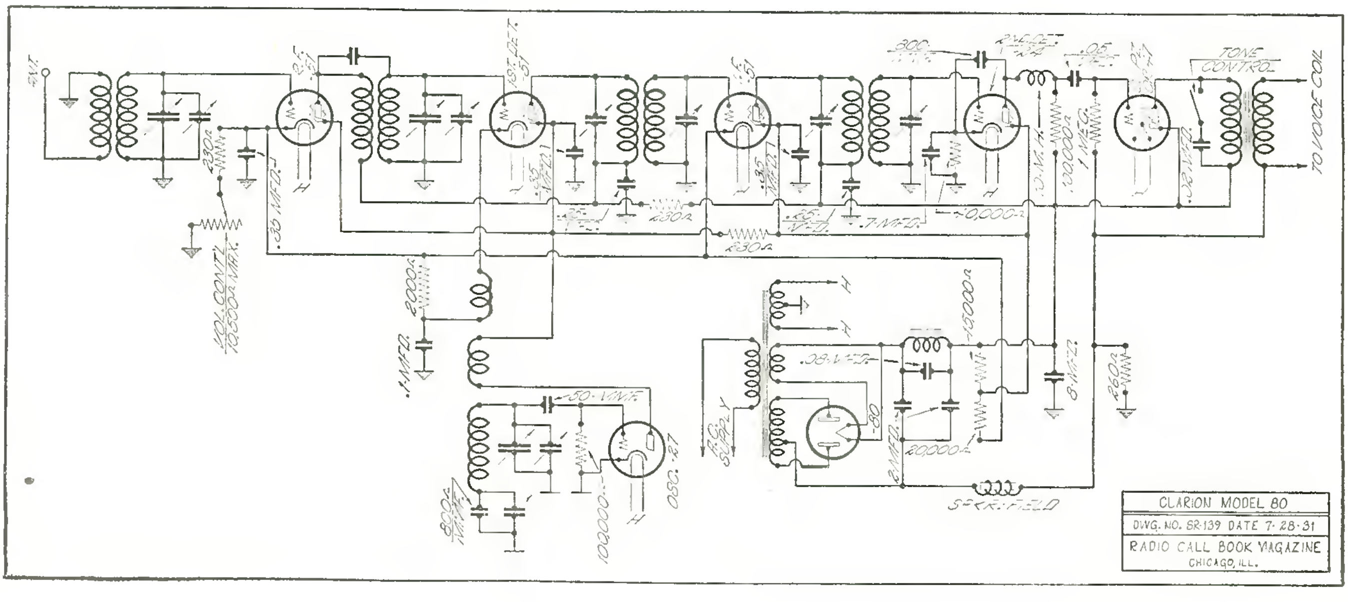






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	8	10	11
100	13	15	18
1000	20	22.5	28
10000	31	35	44



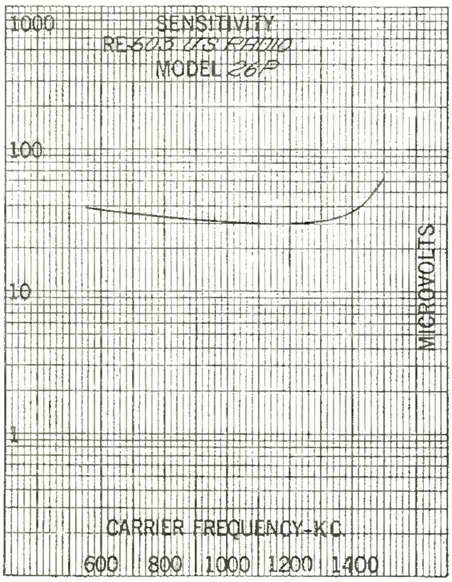
U. S. Radio Model 26-P

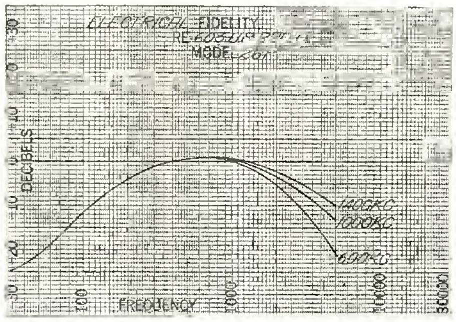
U. S. Radio Model 26 Gloritone receiver, upon measurement in our laboratory, gives the response curves included on this page. A standard dummy antenna of 20 uh, 200 uuf and 25 ohms was used on the input. The output impedance was adjusted to 7500 ohms to match a single 247 output tube used in this receiver. Standard output was maintained at .05 watts. The voice coil was disconnected during measurements, and the output was capacitatively coupled.

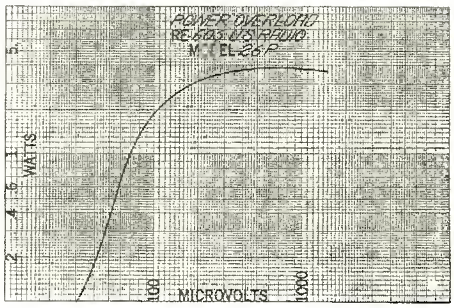
The factory alignment of the receiver was not varied, and the tube complement used was that furnished with the set by the manufacturer. The volume control was turned on full. At 115 volts line voltage, the receiver drain was .52 amperes.

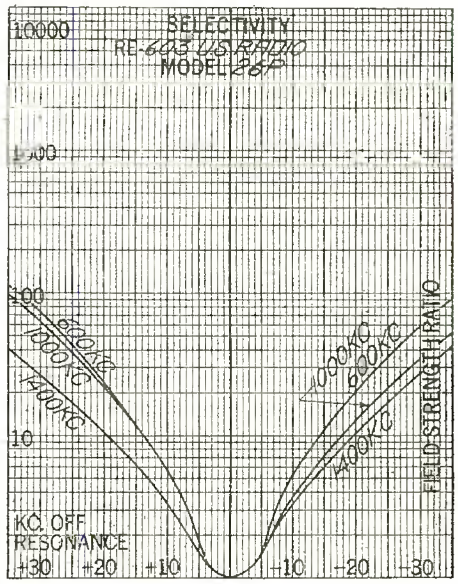
The sensitivity curve of the Model 26-P, in column one, gives an average sensitivity of 36 microvolts absolute or 9 microvolts per meter. From the power overload curve in column two the maximum audio power output to the speaker is found to be 3.87 watts. This does not take into consideration the harmonic content of the output. The band widths are measured from the selectivity curve, in column three, and are found in tabular form under it.

Under the performance curves is printed the schematic diagram of the receiver circuit.



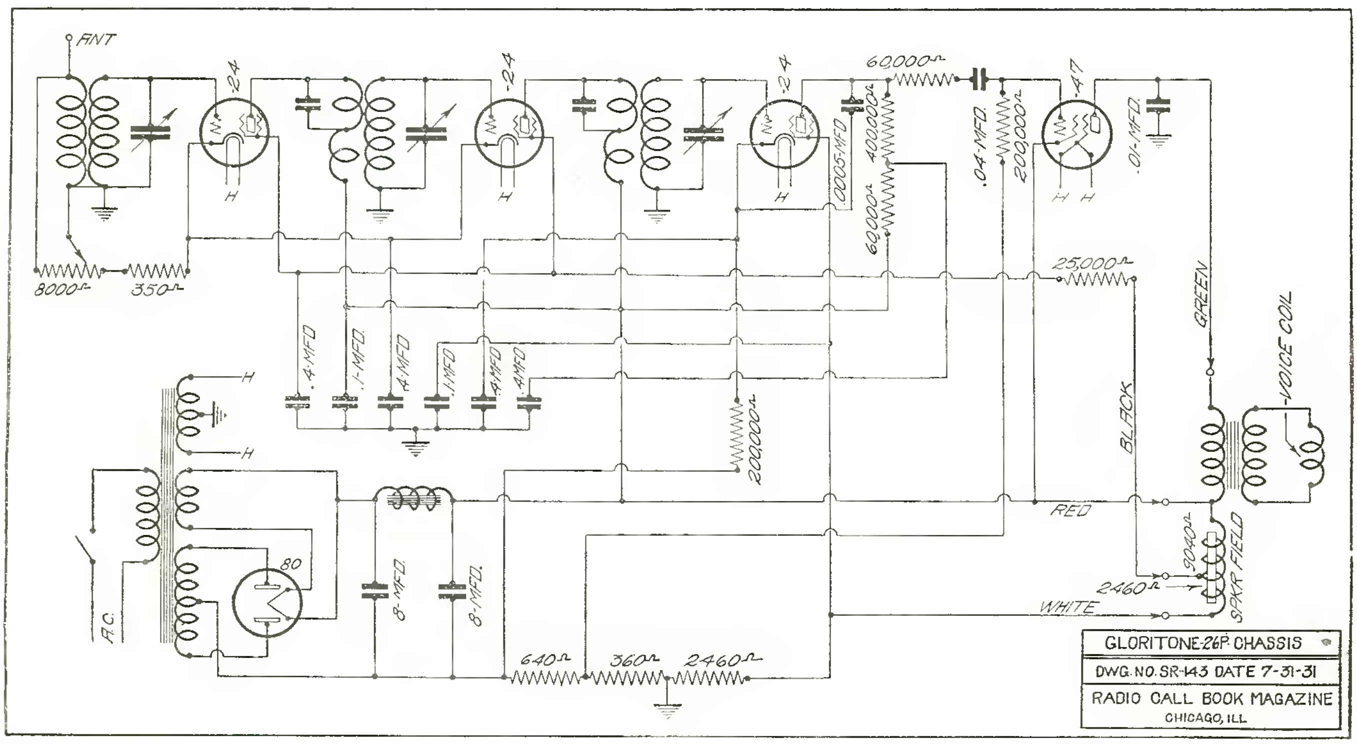






Band Widths

Times Field Strength	*Kilocycles width* 600 kc.	1000 kc.	1400 kc.
10	27	31	39
100	59	67	..
1000	..	..	..
10000	..	..	..



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
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
Brunswick		
3KRO	November, 1929	SR23
15, 22, 32 and 42	November, 1930	SR86
S14	November, 1930	SR71
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
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
A111	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
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
Philco		
86-82	November, 1929	SR26
95	September, 1930	SR60
Radiette		
F14	January, 1931	SR104
Radio Corp.		
60	January, 1930	SR30
66	September, 1930	SR64
44	January, 1931	SR102
Sentinel		
11, 12, 15, 16	March, 1931	SR115
106B	March, 1931	SR113
Silver		
36A	January, 1931	SR105
30B	September, 1930	SR53
30	January, 1930	SR35
35-A	November, 1930	SR82
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
Stewart-Warner		
950	September, 1930	SR62
Series 900	January, 1930	SR34
R100	January, 1931	SR85
Stromberg-Carlson		
846	September, 1930	SR54
635-636	November, 1929	SR18
12-14	November, 1930	SR93
Transformer Corp.		
50	November, 1930	SR78
Temple		
8-60, 8-80, 8-90	March, 1930	SR37
Transitone		
Auto Radio	November, 1930	SR69
Trav-Ler		
C	March, 1931	SR120
U. S. Radio		
37	March, 1930	SR39
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

All-American Lyric Model J Chassis

SCHEMATIC details of the Lyric model J receiver made by the All-American Mohawk Corporation, North Tonawanda, N. Y., will be found in the drawing on this page, Figure 2, together with the tube characteristics in the table shown in Figure 1.

Aligned at Factory

The receiver is ganged at the factory at several points on the dial. If aligning is necessary the following is the procedure: Connect modulated oscillator output to antenna and ground posts; then output meter on output of receiver. (In production tests they are using a thermo-galvano meter in series with voice coil of speaker, and recommend this method. The meter is a Weston model 425. A 5 ohm rheostat is connected across the meter for deflection adjustment, and the meter placed in series with the voice coil.) (In some test sets an output meter is supplied which may be used instead of the method indicated before.)

Split Plate Adjustments

The set should first be aligned at 1400 kc by tuning the receiver to the 1400 kc signal from the test oscillator, adjusting for highest reading on the output meter. If output meter goes off scale, decrease signal input from the generator. Then adjust trimmer for maximum reading. The same procedure should be followed at 1100 kc, 750 kc and 570 kc, except that when ganging at those frequencies the trimmers *must not be touched,* but the adjustment should be made by bending carefully the sections of the split end plates of the variable condenser.

Summary of Possible Troubles

A summary of possible troubles follows:

R-f system weak or dead: r-f secondary open; no voltage on plates due to open primary winding; loose connection due to improper soldering; defective primary tuning condenser; open resistors or volume control; open r-f choke.

A-f system weak or dead: audio coupling resistor defective; audio coupling condenser defective; 245 grid bias resistor defective; tone control condenser shorted or grounded; speaker or speaker cable defective.

A. C. Hum: defective rectifier tubes; open section of the high voltage winding of the power transformer; socket prongs grounded to chassis pan; grounded biasing resistors; defective electrolytic condensers, or faulty detector tubes.

Broad tuning: poor ganging of variable condenser; too long an antenna; immediate proximity to powerful broadcasting station; improper adjustment of volume control.

LYRIC A. C. MODEL J

Tube Type	Position In Set	A Volts	B Volts	C Volts	Cathode Volts	Screen Volts	Normal Plate M. A.	Plate M. A. Grid Test	Change
224	1 RF	2.25	250	....	2.5	70	....	....	....
224	2 RF	2.25	250	....	2.5	70	....	....	....
224	3 RF	2.25	250	....	2.5	70	....	....	....
224	Det	2.25	180*	....	3.0	60*	....	....	....
245	Pwr	2.25	250	50*	....	....	....	....	....
280	Rect	4.8	360	AC	....	....	....	....	....

Note:—Voltages measured with 1,000 ohm per voltmeter. Antenna disconnected.
*Due to resistance of circuit these voltages can only be accurately measured with an electrostatic voltmeter.
Line voltage 114. Volume Control full on.

Figure 1. The average tube voltages on the Lyric model J chassis are those given in the service manual of the manufacturers

Start at Speaker First

In checking for trouble it is recommended that a start be made at the speaker end and work towards the antenna. In this way all parts of the set are checked and removed from suspicion one by one until the fault is located.

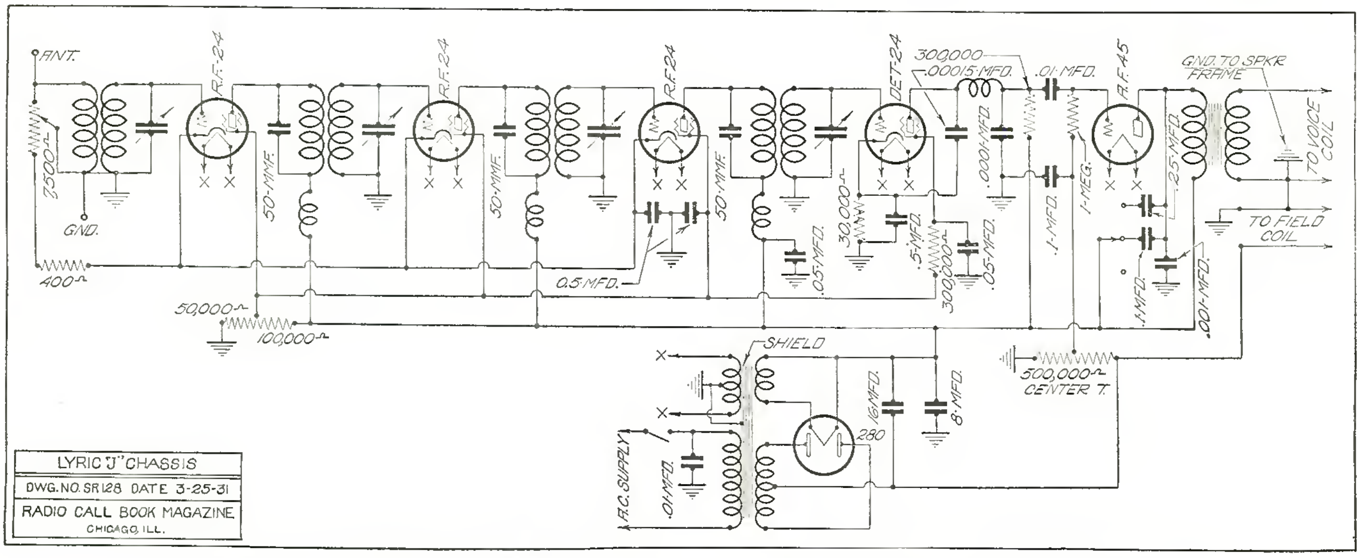


Figure 2. A wiring diagram of the Lyric model J chassis is shown in the schematic here illustrated

Bremer-Tully Models S-81 and S-82

ANOTHER of the receivers on which considerable demand exists for a schematic diagram and service notes is the Bremer-Tully, two of whose models were known as S-81 and S-82. The wiring diagram for these may be seen in the drawing in Figure 2, while a table of average tube voltages is found in Figure 1 on this page.

Eight tubes are used in the S-81 and S-82. Of these, three are screen grid r-f amplifiers, one is a screen grid power detector, one is the 227 first audio stage feeding into a pair of 245 tubes in pushpull. The 280 rectifier makes the eighth tube.

While ballast tube D-110 (Duresite 110) is normally intended for use on these models, there are special conditions encountered where the line voltage is extremely high where it is advisable to use the type D-105.

In the majority of cases where hum is encountered it may be traced directly to a gassy or otherwise defective detector tube. Try each of the screen grid tubes in the detector socket (the one nearest the tuning dial) using the one as a detector that gives least hum. There are two hum minimizing potentiometers on the socket power unit chassis which should be adjusted as they are also an important factor in control of hum. If a steady 120 cycle hum is heard the condensers in the plate supply filter should be examined for opens and shorts. With set operating a spark should result when the terminals of any good condenser are shorted. For open circuits try connecting externally a condenser of the same capacity across the terminals of the condenser under test. Decrease of hum would indicate the condenser under test is open. If hum is heard only when a station is tuned in it might be a peculiar condition existing in the lighting lines, and can usually be eliminated by grounding the ballast tube side of the line through a .25 mfd condenser.

A brilliantly lit ballast tube is usually an indication of a short in the voltage supply system. Providing the set does not work it may be due to a defective ballast tube. This may be further localized by removing the speaker field plug. If, with this plug out, the ballast tube glow reduces it is a fairly good indication that the plate, or green, wire is shorted to ground.

Tube Type	Position In Set	A Volts	B Volts	C Volts	Cathode Volts	Screen Volts	Normal Plate M. A.	Plate M. A. Grid Test	Change
227	1 RF	2.5	152	13	13	....	3.0	6.1	3.1
227	2 RF	2.5	152	13	13	....	3.0	11.8	8.8
227	3 RF	2.5	152	13	13	....	3.0	11.8	8.8
227	Det	2.5	152	....	....	....	3.2	3.2	....
227	1 AF	2.6	44	13	13	....	3.7	4.3	.6
245	PP	2.4	148	....	....	....	26.0	30.0	4.0
245	PP	2.4	148	....	....	....	26.0	30.0	4.0
280	Rect	4.7	256	....	....	....	40	per plate	

BREMER-TULLY MODEL S-81, S-82

Ballast tube 77V-AC.
Line voltage 120. Volume Control maximum.

Figure 1. Average tube values on the Bremer-Tully models S-81 and S-82 may be found by an inspection of the table shown here

Adjustment of the trimmers on the condenser gang should only be made to improve reception from a weak set, and then when other methods have failed. To make this adjustment tune in a weak station as near the end of the 1500 kilocycle end of the dial as possible. With the lock nuts loose adjust the four screws to give the loudest signal. With this adjustment completed the lock nuts should be tightened up again. One factor to observe when making this operation is not to continually increase the capacity of the trimming condensers as the high frequency tuning limit of the set will thus be lowered.

In the case of hunting for cause of noise in a set, remove one tube at a time (beginning at the first r-f stage) until noise stops, which will indicate stage in which noise originates. If the source is found in either the detector or first audio stage, one of the fixed resistors in these circuits may be noisy. Other sources of noise are leaky condensers, rosin solder joints, broken down insulation and shorted or loose connections.

Since the Bremer-Tully outfit was absorbed by Brunswick the technical service work is handled from Muskegon, Mich. Inquiries regarding service, etc., should be addressed to the technical service division, Bremer-Tully Co., Muskegon, Mich.

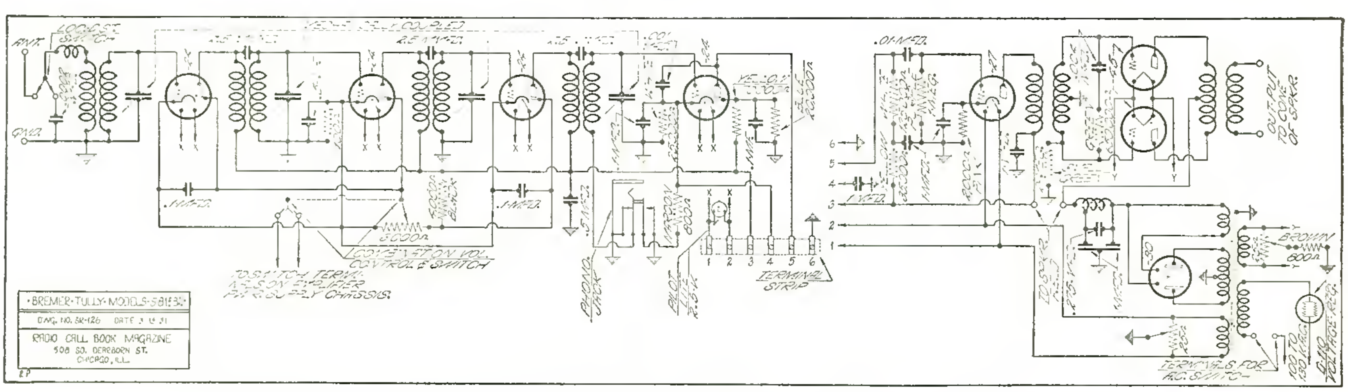


Figure 2. Electrical details of the receiver described on this page may be found in the schematic drawing above

Majestic 20 Chassis in Three Models

RESPONSE curves of the Majestic 20 whose schematic diagram is shown on this page, were published in the March, 1931, issue of this magazine on page 63. The chassis designation is model 20 and it is used in Majestic models 21, 22 and 23.

The receiver is of the superheterodyne type and uses 8 tubes in all. A table of average tube voltages may be found in Figure 1.

Grids of all the tubes except the oscillator return directly to ground. Bias for the oscillator is obtained by a 100,000 ohm resistor between grid and ground. The cathodes of the r-f and i-f amplifiers connect through the 5650 ohm volume control and a 158 ohm resistor to ground. Schematic diagram should read 5650 instead of 4800 ohms. The first detector cathode connects to a 2000 ohm resistor in series with the cathodes of the r-f and i-f amplifiers. The second detector cathode returns to ground through a 35,000 ohm resistor.

On account of using the new G-51 multi-mu screen grid tube the use of a double volume control has been eliminated. Instead volume control is obtained by the single 5650 ohm rheostat in the voltage divider system which varies the bias on the r-f amplifier, first detector and i-f amplifier tubes.

In cases where low sensitivity is encountered the first step taken to remedy the condition should be the checking of the r-f type G-51 tubes. Tubes having a low amplification factor in any of these positions will seriously affect the sensitivity of the receiver. These procedures should always be taken prior to any attempts at remedy by realignment of the condenser gang.

A small compensating condenser is provided to adjust the reflected capacity of the antenna. Adjustment of this condenser is possible through the hole in the rear of the chassis. When the receiver is operating a station between 1000 and 1400 kilocycles should be tuned in, and the volume control adjusted to low volume. Then adjust the antenna compensating condenser until maximum volume is attained. Further adjustment of this condenser is not necessary unless the length or position of the antenna is changed.

Alignment procedure on the chassis model 20 in which an output meter is required follows:

I. F. alignment. Connect oscillator for i-f alignment, and set it in operation. Align each aligning condenser on the i-f transformers to give maximum signal. After all four condensers have been aligned at 175 kilocycles this stage should not be again adjusted. Alignment should not be done on this stage unless it is definitely decided it is required.

R. F. and oscillator alignment. Tune in station about 1500 kc (or use local oscillator). Align antenna compensator, r-f stage and oscillator tuning condenser. Antenna compensator is on back of chassis. R-f stage and oscillator aligning condensers are on the gang condenser.

Oscillator tracking condenser alignment. Tune in station, or local oscillator at 600 kc. Adjust both tuning control and tracking condenser simultaneously to give maximum output. This will be obtained by rocking tuning control across resonance point while adjusting tracking condenser to give maximum output at resonance. Oscillator tracking condenser is on left end of chassis, directly below power transformer.

MAJESTIC MODEL 21, 22, 23

Tube Type	Position In Set	A Volts	B Volts	C Volts	Cathode Volts	Screen Volts	Normal Plate M. A.	Plate M. A. Grid Test	Change
G51	1 RF	2.32	180	....	3	90	5	....	....
G27	Osc.	2.32	90	....	....	....	4	....	....
G51	1 Det	2.32	180	....	8	90	1	....	....
G51	IF	2.32	180	....	3	90	5	....	....
G27	2 Det	2.32	255	....	21	....	.8	....	....
G45	PP	2.36	275	45	....	....	28.	....	....
G45	PP	2.36	275	45	....	....	28.	....	....
G80	Rect	4.88	410	....	....	....	40	each plate	

Note:—All plate, screen grid, control grid and cathode voltages are measured from ground (chassis) with a standard 1,000 ohms per volt voltmeter.
Volume Control maximum.

Figure 1. In this table will be found the typical tube values on the Majestic model 20 chassis

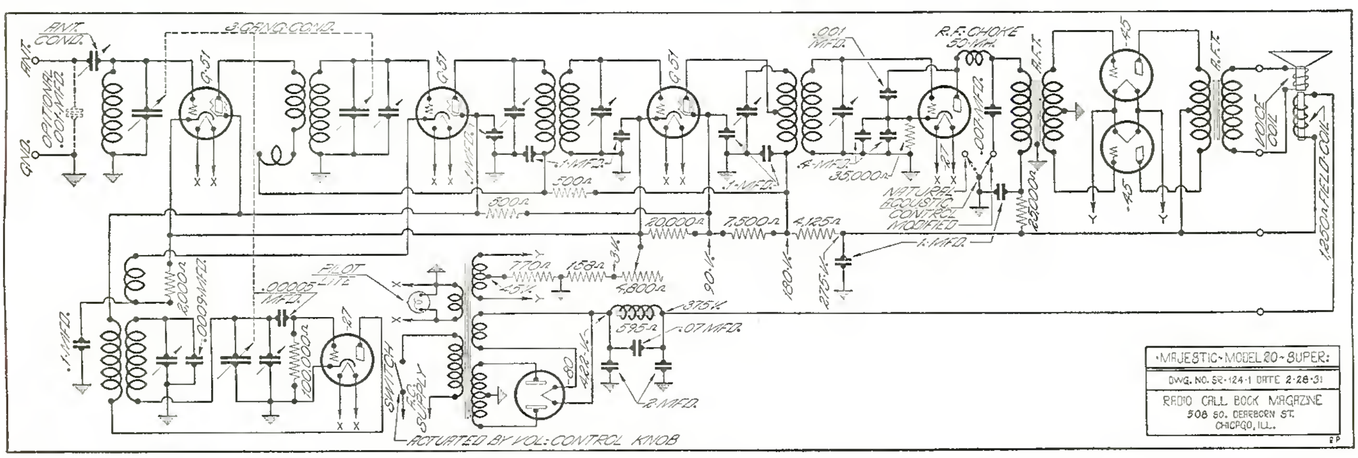


Figure 2. The electrical details of the Majestic 20 can be ascertained by referring to the diagram printed here. Note that volume control resistance should be 5650 ohms instead of 4800

Service Notes on the Radiola Model 18

ONE of the earlier models made by RCA on which numerous service requests are received is the model 18 using four 226, one 227, one 171A and a 280 rectifier. The schematic of the receiver and its power supply is shown in the diagram, Figure 2, while a table of average tube operating characteristics may be found in Figure 1.

Many Editions Made

Instructions for servicing this model are contained in the service notes on the Radiola 18, which we observe have been reprinted as late as January, 1931, indicating there must have been many, many thousands of these receivers sold, and that there are still plenty of them in use now that require servicing.

The service data chart contained in the service notes gives a brief statement of indication, cause and remedy for a number of conditions. The following symptoms and causes should be studied, but only after first ascertaining that trouble is not in the antenna or tubes:

No signals. Defective operating switch; loose volume control arm; defective power cable; defective r-f transformer; defective a-f transformer; defective bypass condenser; defective socket power unit.

Weak signals. Compensating condenser out of adjustment; defective power cable; defective line switch; defective r-f transformer; defective a-f transformer; dirty tube prongs; defective bypass condenser; defective main tuning condensers; low voltages from socket power unit; defective socket power unit.

Poor quality. Defective a-f transformer; defective bypass condenser; dirty contact arm of volume control; dirty prongs of tubes.

Howling. Compensating condenser out of adjustment; detector 227 howl; defect in audio system; open grid circuit in any stage.

Excessive hum. Defective center tapped resistance unit; socket plug position; line voltage low.

Tubes fail to light. Operating switch not "on"; defective operating switch; defective input a-c cord; defective power transformer; no a-c line voltage.

Play in station selector. Loose knob; slack cable.

Remedies for the above causes are of course obvious to any service man.

Compensator Adjustment

The compensating condenser should not be touched until it has been definitely shown that no other defect exists. If condenser needs adjustment following is the correct procedure: Use non-metallic screw driver whose diameter does not exceed ¼ inch (either wood or bakelite will do):

Put Radiola 18 in operation in usual manner, tuning to station on low wavelength. To reach adjusting screw on compensator break the brown paper seal and insert screw driver through the hole at the bottom of the tuning condenser assembly.

Correct Method

With volume control at maximum, turn screw to right until set goes into oscillation. Then turn screw to left until oscillation and any howl ceases with volume control at maximum. In some cases it may need interchange of 226's in r-f stages before proper adjustment is found. This is the correct adjustment to get maximum sensitivity and tone quality from this model. Replace brown seal with another one, dated and initialed to prevent tampering with the adjustment.

RADIOLA MODEL 18

Tube Type	Position In Set	A Volts	B Volts	C Volts	Cathode Volts	Screen Volts	Normal Plate M. A.	Plate M. A. Grid Test	Change
226	1 RF	1.3	122	8	....	....	4.5	8.5	4.0
226	2 RF	1.3	122	8	....	....	4.5	8.5	4.0
226	3 RF	1.3	122	8	....	....	4.5	8.5	4.00
227	Det	2.2	22	0	....	....	3.0	3.1	.1
226	1 AF	1.3	120	8	....	....	4.2	7.8	3.6
171A	2 AF	4.6	172	41	....	....	13.0	15.0	2.0
280	Rect	4.6	......	......	....	....	37.	per plate	

Line voltage 112, on 120 volt tap. Volume Control maximum.

Figure 1. This table shows the average tube operating characteristics on the Radiola 18 as taken with a standard tube tester

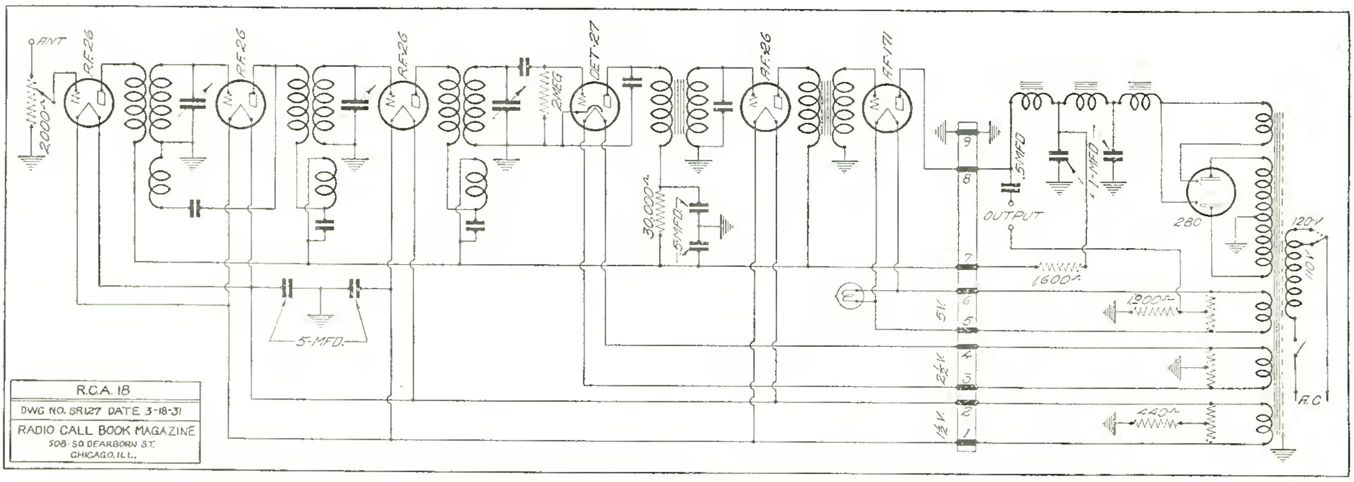


Figure 2. All the electrical data available in the service notes on the Radiola 18 is contained in this schematic diagram

Silver Midget Super Chassis 782

SCHEMATIC details of the Silver 782 super midget chassis are shown in the drawing Figure 2, with average tube operating characteristics in the table, Figure 1.

Alignment procedures on this type of super, which *must not* be done on a metal top table, are indicated below:

Use Output Meter

IF amplifier alignment. Use Dayrad type 180 test oscillator and output meter (or equivalent). Output meter should connect to receiver output. Leads from test oscillator connect to cap of first detector, and ground of receiver. Receiver antenna post may also have to be grounded to prevent local interference. Adjust oscillator to 175 kc, place local-distant switch in "distant" position, and advance volume control to half or full on. Test oscillator output should be adjusted to give convenient reading on output meter. Alignment is effected by adjustment of trimmer screws which are accessible through the top of the i-f transformer housing. Trimmer screws on plate circuits of the i-f are 180 volts above ground. Hence use only insulated screwdriver for aligning. Trimmer screws should be adjusted for maximum reading on the output meter. If output meter goes off scale, reduce input from test oscillator. Recheck alignment to get maximum output meter readings, then remove test oscillator lead from cap of 224 and replace lead-in clip to cap of first 224.

Careful Adjustment

RF amplifier and oscillator alignment. Since chassis is out of cabinet, temporary pointer must be made so with set screw on shaft of drive shaft released and variable against its stop pin in minimum capacity, temporary pointer will line up exactly with stop marking on the dial. Rotate dial until the 1400 kc marking is directly opposite temporary dial pointer. Great care should be taken in this adjustment. Test oscillator should now be connected to antenna and ground posts of receiver through a 150 mmfd condenser in series with antenna post. With oscillator at 1400 kc oscillator trimmer at extreme left of oscillator variable, should be adjusted for maximum output. After this adjust other trimmers on gang in succession. To check oscillator alignment at 600 kc disconnect wire from the second oscillator trimmer on micarta strip and connect this wire to a separate 350 or 500 mmf variable whose rotor plates are connected to chassis. Start test oscillator up at 600 kc and tune receiver to that frequency. Now rotate added variable until signal is shown on output meter, adjusting test oscillator for convenient reading on the output meter. Now rotate receiver dial so gang condenser turns to point where maximum output meter reading is secured. Leave receiver dial and adjustment of four trimmers on gang alone. Remove external condenser. The wire between oscillator section of gang condenser and the second oscillator trimmer should be replaced and soldered. Now with bakelite screwdriver adjust this oscillator low frequency trimmer by means of adjusting screw in back of micarta mounting stop until output meter reads a maximum. This completes the alignment, which should be rechecked to make certain of best results.

SILVER MODEL

Tube Type	Position In Set	A Volts	B Volts	C Volts	Cathode Volts	Screen Volts	Normal Plate M. A.	Plate M. A. Grid Test	Change
224	1 Det	2.16	200	....	6	68.	3.2	....	....
227	Osc.	2.14	68	....	5	....	5.0	....	....
224	1 IF	2.18	200	....	1.6	68.	5.7	....	....
224	2 IF	2.19	200	....	2.3	68	5.6	....	....
227	2 Det	2.20	200	7	20.0	....	.8	....	....
245	PP	2.25	245	47	....	....	29.0	....	....
245	PP	2.25	245	46	....	....	28.0	....	....
280	Rect	5.1	400	....	....	....	40 per plate		

Line voltage 110. Volume Control maximum.

Figure 1. This table shows the average tube operating values on the Silver midget super chassis 782

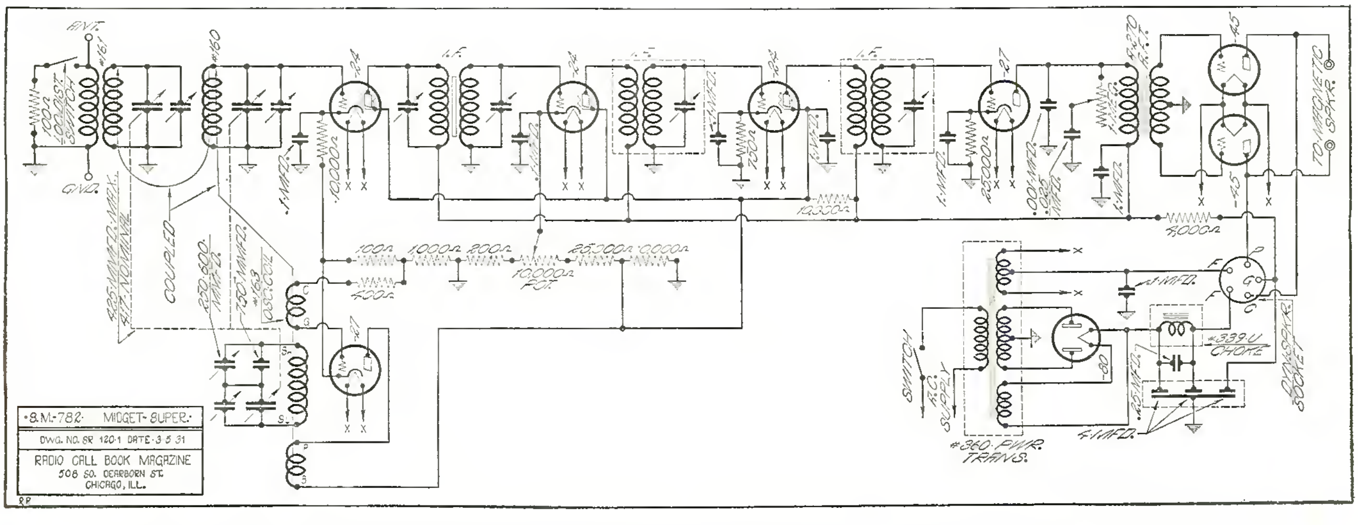


Figure 2. The wiring diagram of the Silver model 782 midget super is shown in the illustration above

Temple S. G. Models 8-61, 8-81, 8-91

On account of the large number of requests from service men for a schematic drawing and service notes on the Temple models 8-61, 8-81 and 8-91 we are showing the diagram at the bottom of this page, even though the receiver is no longer manufactured, its maker having discontinued some time ago. This heavy demand for a diagram by which the jobs can be serviced may be explained by the number of these sets unloaded on the market when the company went out of business.

There is not a great deal of difference between these models and the previous ones known as the Temple 8-60, 8-80 and 8-90, the details of which were shown in Drawing SR 37, printed on page 74 of the March, 1930, issue of this magazine. The main difference is the introduction of two screen grid tubes, one used in the first radio frequency stage, and the other in the third r-f stage. As will be seen in the schematic on this page the first r-f is not tuned.

A table of the average tube voltages will be found in Figure 1. Variations of a slight nature from the values shown in this table are to be expected, but any great deviation should indicate either a poor rectifier tube, or a defective power pack.

No C voltage on the 227 tubes denotes a shorted cathode resistor (1400 ohms fixed shown at left in diagram). In the case of no bias on the 224 tubes it might indicate either a shorted bypass condenser (.05 mfd) or an open or shorted 400 ohm resistor used in the cathode-ground circuit of either of the two 224 tubes. No C voltage on the output tubes indicates a defective resistor in the filament to ground circuit of the 245 tubes, or a shorted bypass condenser across the 900 ohm portion of the large resistor.

Any excessive hum in the receiver might be curbed by carefully examining the detector and first audio tubes. Tested tubes that are known to be good should be substituted in these positions until improvement is shown.

ployed, this being in the last r-f stage.

Input to the receiver is through an antenna coil spanned with a 12,000 ohm variable resistor which serves as a volume control. In some models the volume control was a single one, whereas in later models the twin element type was utilized.

TEMPLE MODELS 8-61, 8-81, 8-91

Tube Type	Position In Set	A Volts	B Volts	C Volts	Cathode Volts	Screen Volts	Normal Plate M. A.	Plate M. A. Grid Test	Change
224	1 RF	2.1	150	1.6	1.6	75	4.0	6.0	2.0
227	2 RF	2.1	150	9.0	9.0	....	6.0	9.5	3.5
224	3 RF	2.1	150	1.6	1.6	75	4.0	6.0	2.0
227	4 RF	2.1	150	9.0	9.0	....	6.0	9.5	3.5
227	Det	2.1	45	....	....	....	3.0	3.4	.4
227	1 AF	2.1	140	10	10	....	5.0	6.5	1.5
245	PP	2.3	230	40	....	....	22.0	26.0	4 0
245	PP	2.3	230	40	....	....	22.0	26.0	4.0
280	Rect	....	....	....	....	....	46	per plate	

Line voltage 110 set on 110 tap. Volume Control maximum.

Figure 1. Values shown in this table are average for the Temple models 8-61, 8-81 and 8-91

On receivers bearing serial numbers under 7500 the pilot light was in parallel with the 227 filaments. On serials higher than 7600 the pilot light is in parallel to the 245 filaments.

Where in the 227 models of this receiver there were four grid suppressors used, in the screen grid model shown schematically here it will be seen that only one suppressor is employed, this being in the last r-f stage.

It will be seen the field coil of the dynamic is being used at the output end of the filter choke, the maximum high voltage going to the plus B connection of the output transformer, while the field coil drops this high voltage to a lower value for use, after passing through resistors, on the plates of the receiver tubes.

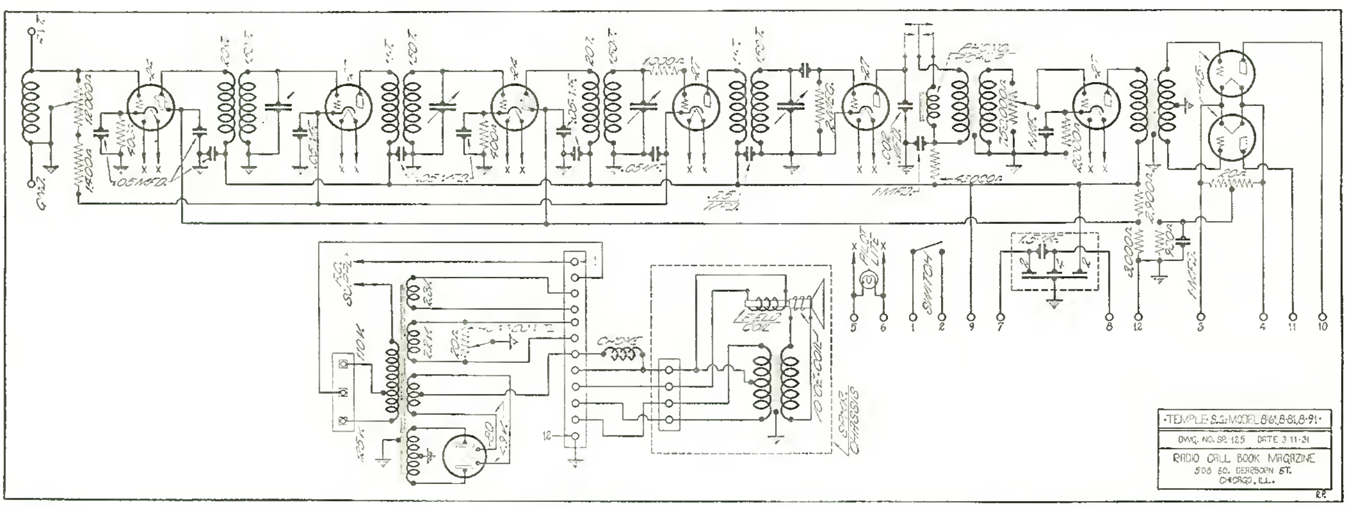


Figure 2. The electrical details of the Temple receiver using two screen grid tubes is shown here in response to a demand on the part of service men

New Meter Reads Micromhos Directly

SINCE the mutual conductance of a radio tube gives a good index of the performance to be expected from that particular tube, it has always been desirable to know the value of a tube's mutual conductance so that in making a selection of tubes for a given receiver the service man or dealer may choose those tubes filling the requirements, without having to devote too much time to the measurement process.

To fill a need along this line, the Weston Electrical Instrument Corp., of Newark, N. J., has recently developed a new instrument for the direct measurement of the mutual conductance of all radio tubes having an amplification factor between 5.5 and 42, and of all screen grid tubes.

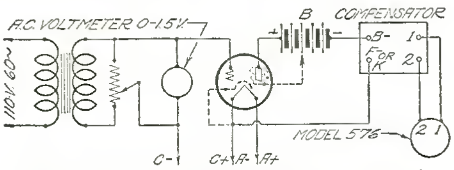


Figure 1. In this drawing is the schematic for connecting up the mutual conductance meter for direct reading of the mu of tubes ranging from 5.5 to 42, and all screen grid tubes

The instrument is of the copper oxide rectifier type with a $7\frac{1}{4}$-inch diameter case for flush mounting. A photograph of the new meter which reads directly in micromhos is illustrated in Figure 2. A compensator mounted in a box approximately $3\frac{1}{2}$ by 7 inches is supplied as a part of the instrument. This box is arranged for surface mounting.

To measure the mutual conductance of a tube it is necessary to apply one volt, 60 cycles a-c to the grid. The other elements of the tube are energized with their standard rated d-c voltage and the compensator dial is set for the value most nearly corresponding to the mu of the tube under test. The mutual conductance is read directly on the meter scale.

The signal voltage of exactly one volt is easily obtained by means of a small step-down transformer with a 1.5 volt voltmeter and a potentiometer connected across the secondary so that the voltage may be adjusted in case of variations in the line voltage. The schematic diagram in Figure 1 shows the method of hooking up the circuit for the mutual conductance meter.

Figure 2. Weston's new meter for direct reading in micromhos is illustrated in this photograph. A description of the circuit is contained in the story on this page

WGY Uses Film Record for Auditions

STUDIO equipment that permits a singer to hear herself as others hear her over the radio has been installed at WGY, the Schenectady station of the General Electric Co.

Every singer, before she is permitted to go on the air must give an audition and it is customary at such auditions for the musical director to listen to the voice as reproduced by a loud speaker. In this way it becomes possible to judge the voice, not for real quality, but for its adaptability for radio. Experience has taught that a perfectly fine concert voice may be a complete failure after it has passed from transmitter to receiver to loud speaker. Some singers when told that their voices are not suitable for radio accept the decision with good grace. Others regard this explanation as a polite way of refusing them an opportunity to be heard upon the air.

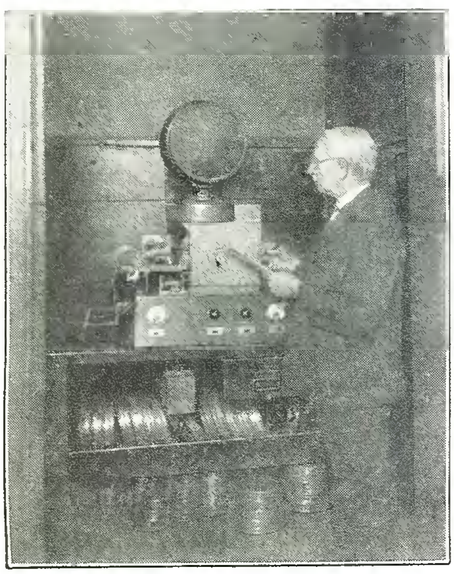


Figure 3. This photograph shows the film sound recorder with the speaker at the top. Below the recorder may be seen tins containing reels of film on which sound has been recorded. Critic is seen listening to a recorded program

Station WGY has solved this difficulty by installing a film sound recorder as a part of the studio equipment. When this film is reproduced through a loud speaker, the voice is heard exactly as it would appear through a loud speaker after it had been picked up from the air.

When a singer appears at WGY for an audition, and if there is any doubt about the suitability of her voice for radio, a film record is made as she sings. The recorder is in another room, connected to the microphone by wire. If after hearing the film record the radio critic finds it necessary for the singer to hear the record, invariably the singer accepts the evidence of her own sense of hearing and thanks the management of the station for saving her from a performance which must have been below her standard, and which might result in a loss of concert engagements instead of increasing her professional prestige.

The film sound record also proves valuable in training announcers. The announcer's voice is recorded and he, hearing the reproduction, has a chance to correct faulty speech, over-emphasis or wrong inflection.

The director of the orchestra is afforded an incomparable medium to experiment with the placement of instruments with respect to the microphone. The same group may play the same selection two or three times, changing position of the instruments with each playing.

The equipment also permits the recording of feature programs during rehearsal. The director, listening to the reproduction may find imperfections which escaped notice.

Figure 4. In this picture is the artist at the microphone which is connected by wire with the film recorder and reproducer illustrated in Figure 3

Multipliers for Full Scale Voltages

FOUR diagrams shown in the drawing to the right illustrate suggested combinations of resistors connected in series to give four full scale voltages with one meter. The diagrams are adapted from Stock List No. 8 of the Ohmite Manufacturing Co., Chicago.

Meter Multipliers

The resistors for this purpose are known as meter multiplier resistors, and the accuracy of resistance on these particular units is indicated as within 1 per cent.

Service men and others who have occasion to make up multi-range meters will find a copy of this stock list worth while since there are also tables whereby one may determine the total ohms required and the stock numbers of resistors to be used to obtain desired full scale voltage. A copy of the stock list mentioned above will be sent to anyone writing the Ohmite Manufacturing Co., at 636 North Albany Ave., Chicago.

Current Ratings

Another interesting table in the pamphlet is a table of ratings for the various resistors listed by stock numbers. One column gives the stock number, next the resistance in ohms, then the maximum current in milliamperes, followed by the maximum potential across the resistor in volts.

Have Other Uses

Besides their use as meter multiplier resistors, the units shown are also recommended for the construction of Wheatstone bridges, resistance boxes and other special laboratory and test equipment. The units are wound single layer with complete insulation between turns and low inductance and distributed capacity.

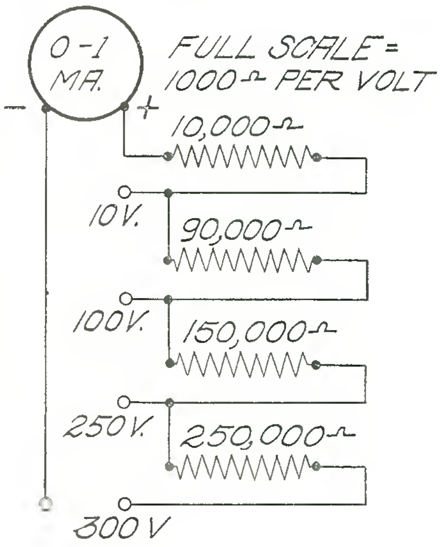


FIG.-1

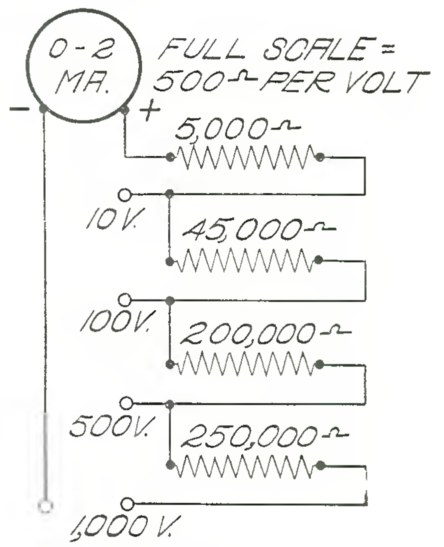


FIG.-2

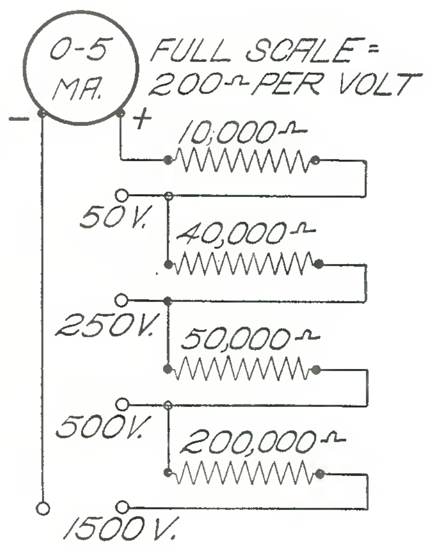


FIG.-3

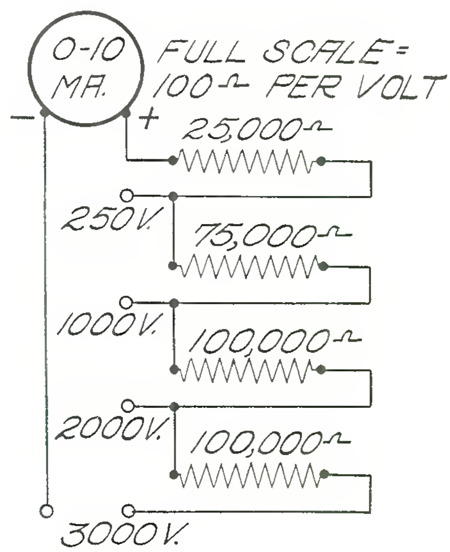


FIG.-4

W9XAO Has Television Listeners Club

TELEVISION programs broadcast in the Chicago area have reached such a point that a club known as the "Ninety-Nine Club" has been organized for listeners of W9XAO, the short wave television outlet of Station WIBO. A special program for these club members is broadcast every Friday night from 9 to 10 p. m. Central standard time. Wayne Myers, who five years ago was chief announcer at WIBO, is now director of programs for the television station W9XAO, on 150-143 meters.

The Western Television Corp., who are manufacturing transmission and reception television apparatus, is located at 29 South LaSalle, Room 401, while the studio and laboratory is located at 6312 Broadway, both in Chicago.

Kits are made for the amateurs while the televisor in a complete cabinet is made for the home. The Greater Chicago area is represented by the firm of Hudson-Ross, Inc., 111 North Canal St., Chicago.

According to latest advices, L. P. Garner is in charge of research for the corporation, W. N. Paker in charge of transmitter design, and A. F. Conto in charge of the W9XAO transmitter.

RCA Centralized Radio Antenna System

A SIMPLIFIED antenna system of radically new design, which provides maximum efficient antenna and ground connections for radio receivers in an entire building at little cost, has been developed by the RCA Victor Company, in Camden.

200 Sets on 1 Aerial

With the new system, as many as 200 radio receivers, regardless of type or manufacture, can be operated and tuned simultaneously to different programs, although all are fed from one common antenna. Because of its simplicity of design, requiring no special conduits for the wiring, the Antenaplex system, as it is called, will be especially valuable for those buildings which were heretofore prevented from utilizing a central antenna system by prohibitive installation costs, the announcement stated.

Solves Apartment Problem

"Radio has come to occupy an important place in our daily lives, and in the crowded living arrangements of the city it has not always been possible for every one to enjoy the same high quality of reception, even if the radio receiver itself was of sufficiently good manufacture," said Quinton Adams, Manager of the Engineering Products Division, who made the announcement. "In a large apartment building, for instance, it is not practical for each set owner to erect his own antenna. Even if space and appearance were no problems, some would get better reception than others through choicer location of either the antenna or the apartment. The RCA Antenaplex system is a modern, scientific solution of this problem."

Eliminates Antenna Maze

A single, scientifically constructed antenna is installed on the roof, doing away at once with the tangle of antennae and lead-in wires which disfigure so many buildings. A lead-in wire is run from the antenna to a penthouse, or other convenient housing on the roof, where it is connected to the Antensifier, or amplifying equipment, and to the 110 volt lighting supply. From there, a flexible, metal-sheathed cable, less than three-eighths of an inch in diameter, literally "pipes" the radio frequency energy from the antenna to the various wall plate outlets throughout the building.

Outlets in Each Room

The cable terminates in a wall plate which, for convenience, may also include an electric socket for supplying current to the radio receiver, in addition to antenna and ground connections. Each receiver in the building, according to Mr. Adams, is furnished with exactly the same high grade of reception, regardless of location.

According to the description of the system as given in a bulletin on this subject, the antenna should be installed at the highest practicable location, between suitable supports, which will raise the antenna high and clear above surrounding objects and so that the insulated portion will be approximately horizontal and about 75 to 80 feet in length. The down lead, taken from one end of this wire, should be about 20 to 25 feet in length, should enter the wall or roof of the building through a suitable weather-proof lead-in insulator, and should terminate at the nearest antensifier (amplifier) box. An approved lightning arrester, properly grounded, should be installed.

Equipment in Penthouse

The antensifiers should be located in a penthouse or other interior portion of the building, protected from the weather and excessive heat, where they may be conveniently accessible. A 110 volt supply, with suitable fused cut out for each antensifier should be installed and connected to the antensifier with metal conduit. Each amplifier unit requires approximately 120 watts. There are three type 245 tubes used, supplied from a 280 rectifier, as may be seen in the photograph at the beginning of this article.

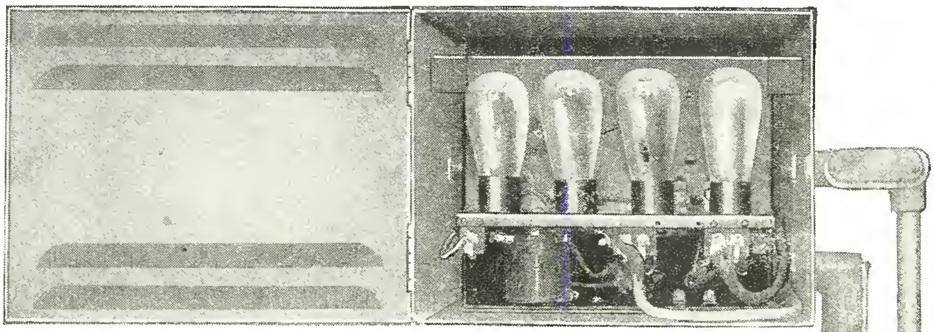


Figure 1. This photograph shows one of the RCA antensifiers with the lid open to show the tubes inside. Three of the type 245 and one of the type 280 tubes are employed, the latter being the rectifier. The connection from the antenna is made to the terminal on the shelf at the left, while the output of the amplifier consists of the two terminals shown at the right on the metal shelf

Amplifier Supplies 50 Outlets

One antensifier will supply as many as 50 outlets, and where the feeder cable does not exceed 250 feet in length as many as 25 additional outlets may be employed. Where the feeder line is 500 feet and not more than 50 outlets are to be used, one antensifier will be sufficient. Where more than 50 outlets are to be used and the feeder line is longer than 250 feet, two antensifiers should be used, one at the antenna end, and one midway between the antenna and the far end of the feeder line. However, if the layout of the system makes it possible, the feeder line should be divided into two approximately equal lengths, with both antensifiers at the antenna end. As many as five antensifiers may

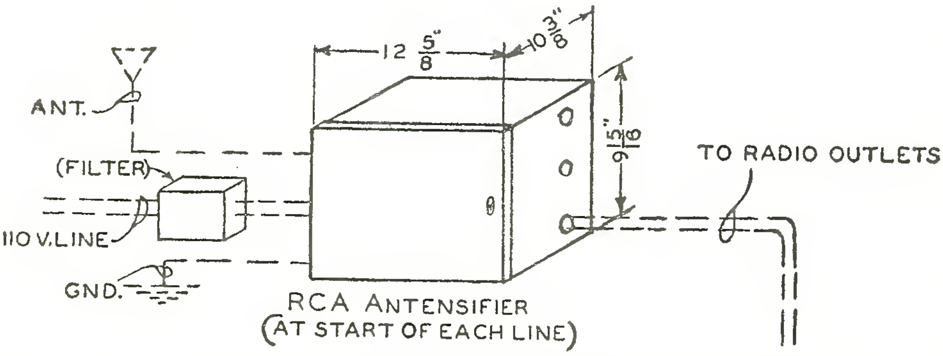


Figure 2. This is a graphic diagram of the antensifier shown in Figure 1

be connected to one antenna. Reference to the diagram shown in Figure 4 gives an idea of the typical layouts for use of the RCA antenaplex system.

Uses Two Grounds

Two ground points are imperative on this system. One ground is at the antensifier and the other at the end of the line. These points should have the best possible type of ground. For this purpose a water supply pipe with running water should be used, but not a drain pipe.

Should Filter Power Line

Dimensions of the antensifier which is illustrated photographically in Figure 1, are $12\frac{5}{8}$ inches long, $9\frac{15}{16}$ inches high, and $10\frac{3}{8}$ inches deep. An examination of the drawing in Figure 2 indicates the method of connection, the antenna coming in through a connection at the left in the photograph Figure 1. Figure 2 also indicates that the 110 volt power line should be filtered. Radio outlets emerge through the conduits shown at the right of the picture, the cable or feeder consisting of a conductor encased in insulation, a copper ribbon, and a lead sheath. The cable is known as RCA Cabloy. Its weight per 500 foot reel is about 125 pounds. The overall diameter of the Cabloy is five-sixteenths of an inch.

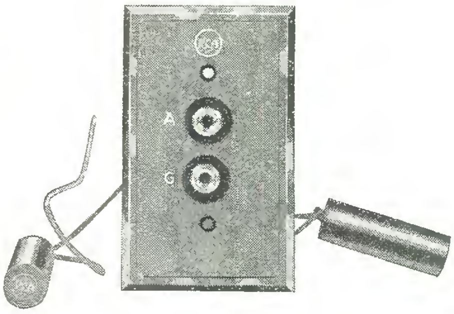


Figure 3. Outlets consisting of aerial and ground connections are installed in each room or apartment where service is desired. The tubular units at the sides of the outlet are known as Taplets and one of these is used in each outlet to connect to the feeder cable

Make Good Electrical Connections

In running the Cabloy from one outlet to another it is not necessary to cut it entirely in two. It is only necessary to make an incision two inches long in the lead sheath, in such a manner that the insulated conductor and the copper ribbon may be withdrawn from the sheath to facilitate making the necessary connections to the taps. However, it may be more convenient under certain conditions to cut entirely through the Cabloy in which case it is highly important to make a good electrical union between the two insulated conductor ends, and between the two copper ribbon ends. Whether the Cabloy is cut entirely through, or merely opened up for these connections, it is highly important to thoroughly insulate the cotton covered conductor from the copper ribbon and lead sheath by means of rubber tape wrapping. Rubber tape should also be applied over the entire splice and should run well up and over the ends of the lead sheath with a view towards keeping all moisture out of the Cabloy. After the rubber has been applied, a layer of friction tape should be applied in the same manner to keep the rubber tape in place, and eliminate moisture.

Plenty of Signal Strength

It is stated that each radio receiver connected to such a system will receive signals equal to 100 per cent or better of the signals obtainable by an individual antenna connection.

This arrangement should prove a boon to owners of apartment and hotel buildings in the metropolitan and suburban areas since it settles the antenna problem once for all. Incidentally architects may find it interesting since it will permit them to make allowances on projected jobs to include space for additional wires in the wiring shafts.

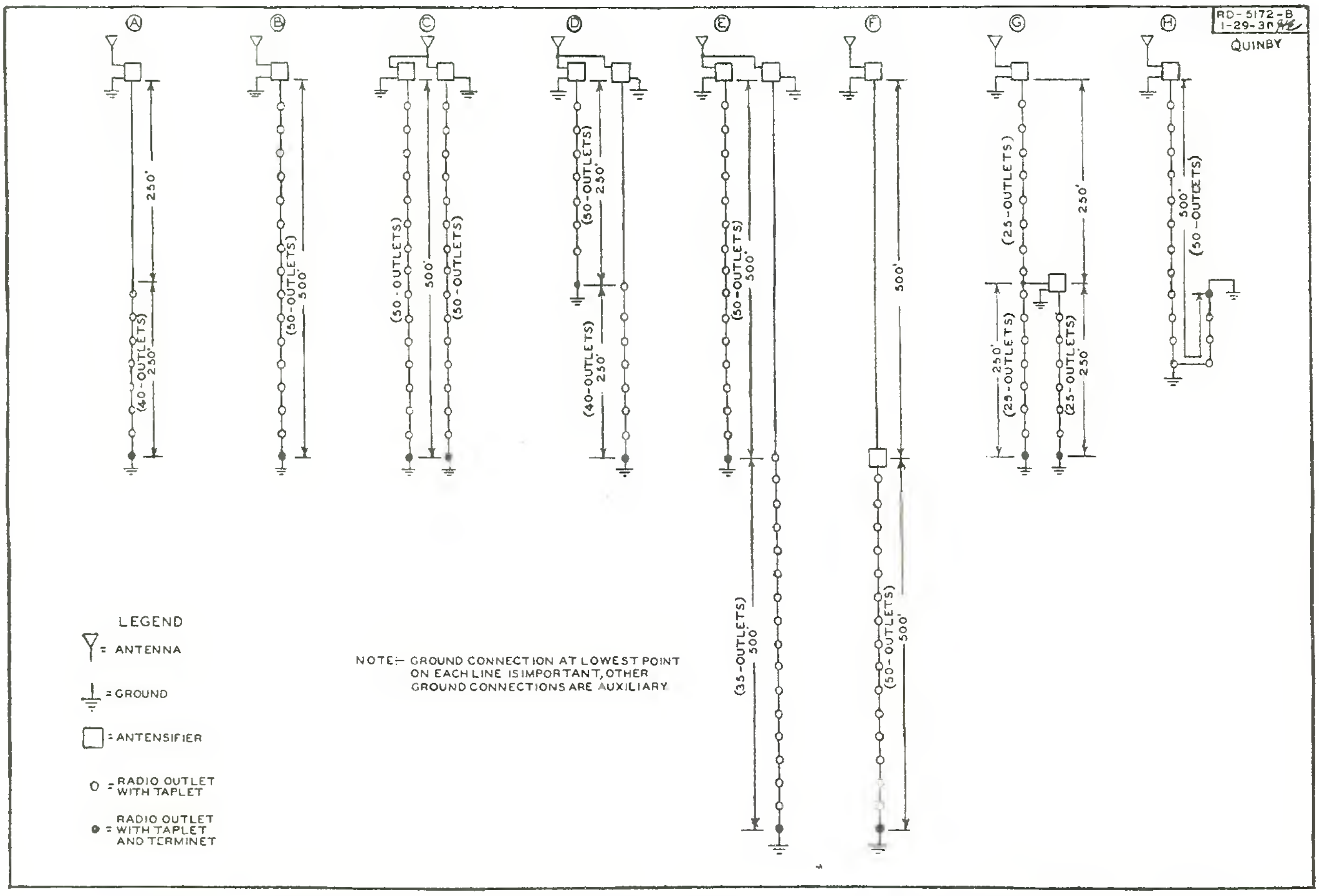


Figure 4. This drawing shows typical layouts for the RCA antenaplex system described in this article

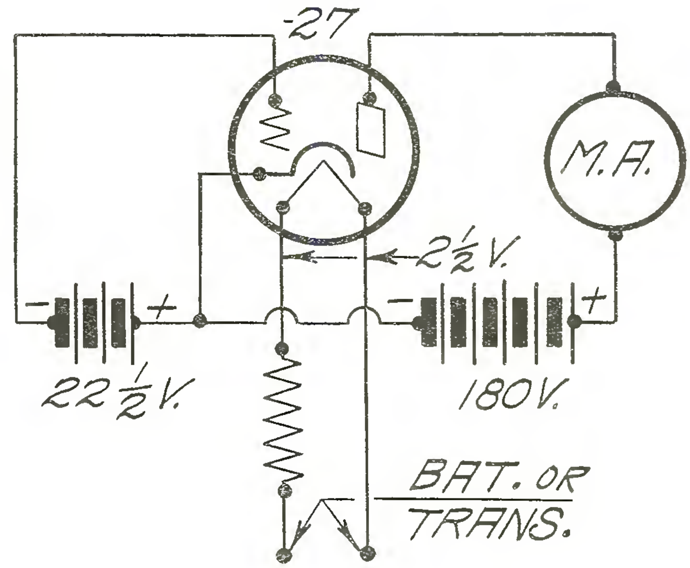
How to Find 227 Detector Efficiency

IT has been ascertained that 227 tubes vary widely in their ability to function efficiently as detectors, according to a recent service bulletin issued by J. N. Golten, of the radio service department of the Stewart-Warner Corporation.

This variation is so great that on a given signal, changing the detector tube may cause the output of the set to increase several hundred per cent.

According to the bulletin mentioned, detector coefficient (detector efficiency) is entirely independent of such measurable tube characteristics as mutual conductance, amplification factor, or plate impedance, so that this important factor cannot be indicated by a commercial tube tester. It is quite possible for a tube testing "fair" on a tube tester to be a far superior detector to a "good" tube.

Figure 1. This diagram illustrates a detector efficiency tester for 227 tubes as disclosed in a recent service bulletin for Stewart-Warner distributors and dealers as issued by J. N. Golten of the radio service department of that corporation. The description of the method is found in the accompanying article. Note that voltage values are critical and must not be changed.



It is an extremely simple matter to determine the value of a 227 tube as a detector. All that is required is a tube socket, a source of filament supply, 180 volts of B battery, 22½ volts of C battery and a 0-1 or 0-2 milliammeter. If the milliammeter is not available, a high resistance voltmeter (1000 ohms per volt) with a full scale reading of 10 volts or less will do almost as well.

The set-up of parts is made according to the diagram reproduced on this page, Figure 1.

The detector efficiency of any good 227 tube is indicated by its plate current when inserted in the test socket. *The lower the plate current the better the tube will act as a detector.* With the values of plate potential and grid bias given, the plate current will vary between .02 and .5 milliamperes. A reading of .02 milliamperes indicates a very good detector. It is assumed, of course, that the tube is capable of supplying normal plate current in a standard tube tester, since obviously a dead tube will give the lowest reading.

If a detection coefficient set-up is made it is imperative that the plate voltage be kept at 180 volts and the grid potential at 22½ volts. If these values are changed by even a small amount the wrong conclusion may be drawn from the plate current readings.

In a series of experiments conducted to determine the value of the above test Mr. Golten found that the power output of a standard Stewart-Warner R-100 receiver could be more than tripled merely by using a detector tube that gave the lowest plate current reading, no other changes being made to the set.

West Coast Radio Interference Data

A RECENT report of the radio interference bureau of the Pacific Radio Trade Association at San Francisco discloses several interesting facts that may interest service men who are called in to locate interference.

Complaints Investigated

According to the report, during the year 1930, a total of 3,648 complaints were investigated in the Bay area (covering San Francisco, Oakland, Berkeley, etc.). Of this total the following is a segregation according to number of complaints and the percentage they bear to the total:

Total complaints investigated...3,648

	Per cent
Utilities (1844)	50.5
Trouble found in set (350)	9.6
Cleared by itself (324)	8.8
Defective wiring in buildings (271)	7.4
Defective aerials, grounds (233)	6.3
Heating pads (223)	6.1
Miscellaneous (191)	5.2
Wrong address or moved (104)	2.8
Flashing signs (81)	.22
Oil burners (72)	.19
Amateurs (46)	.12
Motors (30)	.08
Elevators (22)	.06
Violet rays (22)	.06
Diathermy (20)	.05
Battery chargers (15)	.04

Expenses Shared

Expense of operations for the year totalled $9,600, or $2.65 per complaint. The Pacific Gas & Electric Co., Great Western Power Co., Key System, Ltd., Southern Pacific Railway Co., Market Street Railway Co., and the Sacramento Short Line subscribed to a total of $6,780, the balance of $2,720 being paid out of funds of the Pacific Radio Trade Association.

Locates and Measures Interference

A FACT-FINDING instrument for radio fault-finders which takes the guess out of trouble hunting and accurately measures the quantity of electrical interference in microvolts-per-meter, has been developed by the general engineering laboratory of the General Electric Co. It is illustrated in the photograph accompanying this article.

The new instrument is called a radio noise meter and is not to be confused with meters made to measure noises audible to the human ear. This meter records the quantity of noise, generally described as electrical interference, made audible only by radio receivers.

The meter locates the source of the noise and measures its intensity. The need for a measuring instrument has been felt for some time, and such organizations as the National Electric Light Association, the Radio Manufacturers Association and the National Electric Manufacturers Association have been hampered in their efforts to improve radio receiving conditions by the lack of a standard testing instrument and a standard of measurement.

With the noise meter it makes possible a comparison of the test results of different investigators; it gives manufacturers of electrical apparatus a means for measuring the amount of radio noise created by the apparatus, and the meter also gives an invaluable method of obtaining data upon which fair and reasonable rules and ordinances may be based. Many municipalities, anxious to protect radio listeners from excessive electrical interference, have passed ordinances limiting "permissible" interference. The trouble, heretofore, has been to define "permissible."

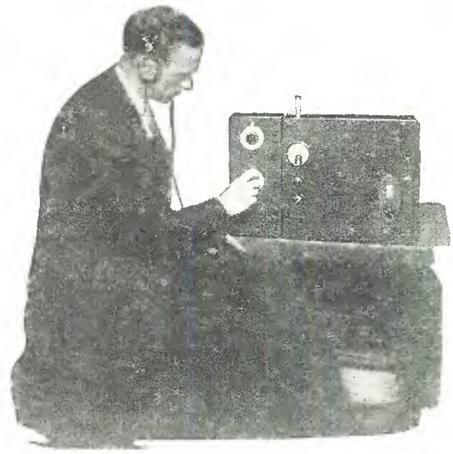


Figure 1. This photograph shows an engineer using the new G. E. radio noise meter which can be used to locate and measure electrical interference

The radio noise meter consists of two parts, a receiver unit to detect and indicate radio noise, and a calibrating unit to measure the intensity of the noise in microvolts-per-meter which is the customary unit of measurement of radio signals.

The receiver is enclosed in an aluminum box and weighs thirty pounds. Six tubes are used. The pickup is obtained with a rod antenna two meters long. Using the meter a radio noise corresponding to a field intensity of three microvolts-per-meter may be measured. With the headphones it is possible to measure still lower noise levels. A search coil may be used to investigate noises around motor brushes, transformer ground leads, etc.

The calibrating unit is also enclosed in an aluminum box which is fastened to the side of the receiver. The calibrating unit is so designed that the radio noise may be measured with any antenna that may be used with the receiver. The output of the calibrating unit may be varied from zero to 10,000 microvolts-per-meter.

A feature of the instrument is the standard noise created and by means of which it becomes possible to measure the intensity of the interfering noise. Operation of the instrument consists in adjusting the intensity dial until the standard noise reads the same on the meter as the radio noise. The intensity in microvolts-per-meter is then read from a curve. Switching from standard to radio noise is accomplished by depressing and releasing a key switch. The standard noise is obtained by alternately charging a network of small condensers from a dry battery and discharging into the antenna in such a way as to produce a noise that closely imitates the usual transmission line noise.

The portability of the instrument makes it readily applicable to tests in the field, in the home, or wherever the radio noise may occur. It is especially useful to measure radio noise on transmission lines, house wiring, around distribution points, or electrical apparatus of any description.

Cut Tuning Range to Hear Cop Calls

SERVICE men have advised our editorial department that in many instances they have been able to drop the wave length range of a receiver for some customer so that it will tune in a limited number of police calls.

The arrangement is an ingenious one and is illustrated in the photograph which accompanies this article. It consists essentially of a Sangamo fixed condenser of the same capacity as the tuning condenser (usually .00025 mfd) in the receiver, a shorting switch and two lugs. One of these condensers is put in series with the variable tuning condenser section of each stage of r.f. which serves to cut down the tuning range when the switch is open, and to restore the original range when the switch is closed. By means of the lugs the little condensers may be soldered to the stator of the variable, the other lug going to the grid and coil connection of the tube.

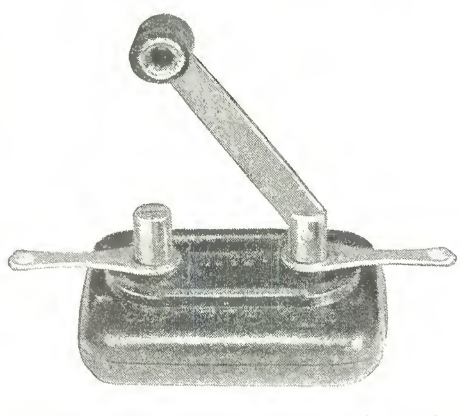


Figure 2. Here is shown a simple fixed condenser with shorting switch which may be used to drop the tuning range of a variable

Those police station signals whose allocations fall slightly below 200 meters may be tuned in with this arrangement. One condenser is required for each variable used in the r.f. stages.

Reference to the broadcast section of this issue will indicate the number of police department broadcast stations operating in the United States.

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

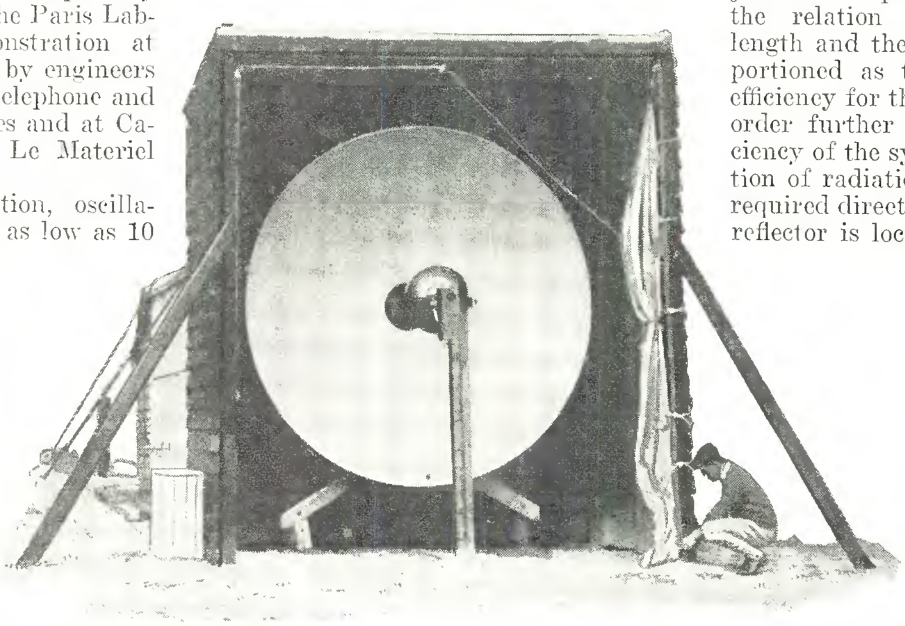
Micro Ray System Opens New Channels

ON the cliffs at St. Margaret's Bay, Dover, England, on Tuesday, March 31st, the International Telephone and Telegraph Laboratories, Hendon, England, in cooperation with the Laboratories of Le Materiel Telephonique, Paris, France, gave a successful international demonstration of a new ultra short wave radio telephone and telegraph equipment and circuit between Dover, England, and Calais, France. This equipment was largely developed by French engineers in the Paris Laboratories. The demonstration at Dover was conducted by engineers of the International Telephone and Telegraph Laboratories and at Calais by engineers of Le Materiel Telephonique.

In this demonstration, oscillations of wave lengths as low as 10 centimeters designated as "micro rays" were used for the first time to provide a high quality two-way radio telephone circuit. From distances covered and results obtained, it was quite clear that the equipment employed can readily be adapted to commercial use. Though a certain number of experimenters have already succeeded in generating and utilizing oscillations of such wave lengths nothing beyond what may be described as laboratory investigations has up to now resulted. The enormous advance in technique shown by the present demonstration definitely indicates that the range of wave lengths as low as 10 centimeters are now available for commercial radio transmission.

In the demonstration a link had been established between a station on the cliffs of St. Margaret's Bay, near Dover, and a similar station across the Channel at Blanc Nez, near Calais. The two-way radio telephone circuit using a wave length of 18 centimeters was noteworthy for the quality of speech received. Not only was it well up to the standard of a high quality telephone circuit, but it showed no signs of being affected by fading, a disability from which waves in this frequency are apparently immune.

When compared with radiations of the more usual wave lengths, micro rays present many striking features. For example, their extremely short wave length permits the use of electro-optical devices more usually associated with light, such as reflectors or refractors in addition to diminutive antennae systems. A further similarity between these radiations and light is that fog, rain, and such like climatic effects, as well as day and night, do not materially interfere with the propagation of the waves.



A new field of radio communication was opened up last March when the radio experts of the International Telephone and Telegraph Laboratories in cooperation with the Le Materiel Telephonique of Paris conducted two-way radio telephone conversation between Dover and Calais on a wavelength of 18 centimeters, using aerials less than an inch long and a power of half a watt, just sufficient to light a flash light bulb.

The photograph shows the transmitter employed at Dover. By means of apparatus associated with the 10 foot reflector seen in front of the hut, rays oscillating sixteen hundred million times a second are projected into space. To avoid coupling the receiver is situated about 80 yards from the transmitter at each terminal and is arranged to be in its electro-optical shadow. The arrangement will be apparent from Figure 2. The same wavelength is used both for sending and receiving.

Photo courtesy laboratories of International Telephone and Telegraph and Le Materiel Telephonique.

The two stations at Dover and Calais were in all essentials identical. Each comprised a transmitter and receiver with terminal equipment of normal design for connecting them together so as to give facilities for two-way communication.

Figure 3 shows the essential features of the transmitter, and Figure 5 is a reproduction of the photograph of the transmitter at Dover. The outgoing signals are applied to a micro-radion tube in which the high frequency oscillations are generated. A short transmission line connects the micro-radion tube to the radiating system or doublet which is about two centimeters long, in contrast to the enormous system usually employed. The amplitude of this high frequency current along the doublet at any instant is substantially the same. The doublet is situated at the focus of a paraboloidal reflector some three meters in diameter. After concentration of the rays by the paraboloidal reflector into a fine pencil of rays somewhat similar to light rays sent out by a searchlight, they are projected into space. In the reflector the relation between the focal length and the diameter is so proportioned as to insure maximum efficiency for the diameter used. In order further to increase the efficiency of the system by the prevention of radiation other than in the required direction, a hemi-spherical reflector is located at the opposite side of the doublet to the paraboloidal reflector and having the doublet at its centre. This serves to collect all the radiation propagated in a forward direction and to reflect it back again towards the source. The radius of the hemi-spherical reflector is so chosen that when the reflected radiations reach the focus again they are in phase with those being radiated at that instant. The appropriate length of the radius depends upon the wave length, the relation being that it should be substantially a multiple of half wave lengths, namely, N multiplied by Lambda divided by two. The factor "N" is so chosen that the radius shall be large enough to insure that the reflector has satisfactory electro-optical properties, but not so large as to intercept unduly the radiations reflected forward from the paraboloidal reflector.

The function of this hemi-spherical reflector is illustrated in Figure 1, the effect of diffraction being neglected in this description, although in practice it must be taken into account. It will be seen that the direct radiations such as AB pass straight to the paraboloidal reflector and so are directed towards the distant receiver, whereas waves such as AC are reflected by the

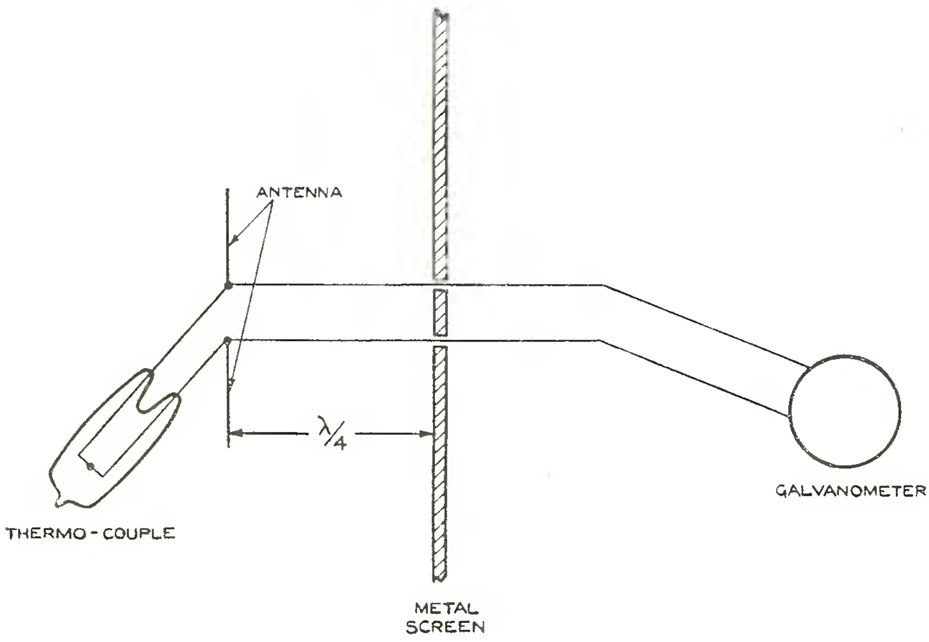


FIG. 4.

hemi-spherical reflector back through A onto the paraboloidal mirror at D, and so out in the required direction.

It is estimated that the gain due to the paraboloidal reflectors on one channel is of the order of 46 decibels to which the hemi-spherical reflectors add another 6 decibels.

A further interesting point is the arrangement made for measuring the high frequency output at the transmitter. For this purpose an aperture is provided in the centre of the paraboloidal reflector through which part of the radiation passes. By making the diameter of the aperture slightly smaller than that of the hemi-spherical reflector no loss of radiated power results. The radiations passing through the aperture fall upon the special measuring instrument employed, as indicated diagrammatically in Figure 4. This takes the form of a wave meter calibrated for and normally set to the transmitted frequency. It comprises a small receiving antenna in which the induced e.m.f. is used to act upon a thermo couple junction. The readings of the associated galvanometer are an indication of the radiated power, while the distance between the antenna and metal screen, being adjustable, also enables wave length measurements to be made. In the demonstration the wave length used was 18 centimetres while the radiated power was about half a watt.

The receiver is a counterpart of the transmitter except that no high frequency measuring device is provided. That is to say, it comprises a doublet connected by a transmission line to the micro-radion tube where detection takes place. Paraboloidal and spherical mirrors exactly similar to those of the transmitter are also provided for concentrating the received waves upon this doublet.

To avoid coupling, the receiver is situated about 80 yards from the transmitter at each terminal and is arranged to be in its electro-optical shadow, adequate allowance being made for diffraction. The arrangement will be apparent from Figure 2. The same wave length is used both for sending and receiving.

The success of this demonstration has definitely shown that a wave length range as low as 10 centimetres has been opened up.

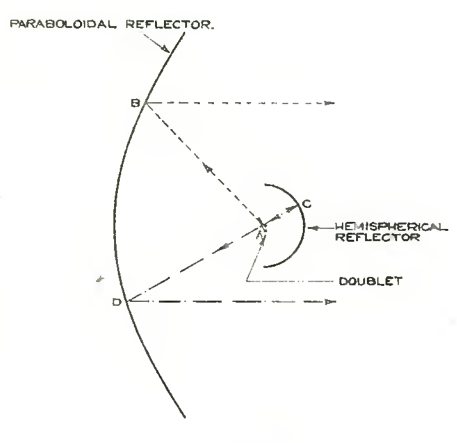


FIG. 1.

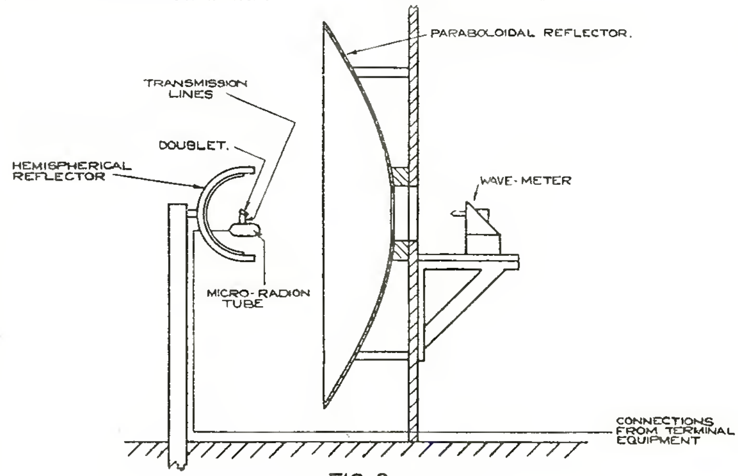


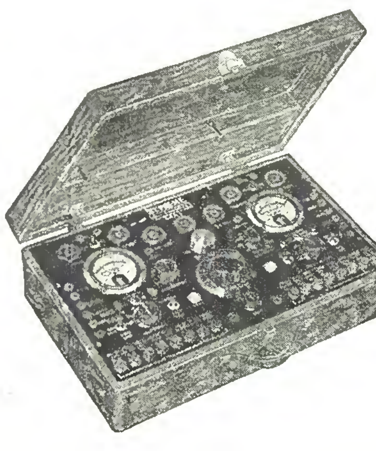
FIG. 3

FIG. 2

NEW PRODUCTS FOR THE TRADE

New Supreme Diagnometer

Announcement is made by Supreme Instruments Corp., Greenwood, Miss., of their AAA-1 Diagnometer incorporating in one instrument all of the essentials heretofore required of a multiplicity of servicing instruments. According to the manufacturer, the AAA-1 is new from stem to stern and is a combination of five service instruments built as a single unit, which can be used as a portable radio laboratory, new shop equipment, mounted on the wall or back of a test bench as a test panel. Special brackets may be obtained for wall mounting which accommodate the snip hinges and snap lock on the diagnometer case.

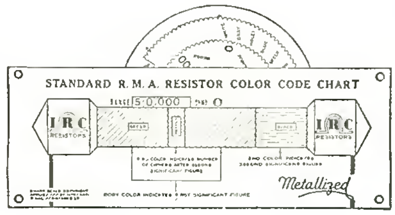


The five major testing functions of the instrument are: analyzer, tube tester, shielded oscillator, ohmeter and capacitor tester.

Incidental to the introduction of this new model, Supreme Instruments Corp. announces a contest for service men throughout the industry. A group of prizes will be given for the best letters on the subject "Why I Prefer a Supreme Diagnometer AAA-1 for Modern Service." The contest is open to anybody. Full rules and regulations may be obtained from the Supreme Instruments Corp. at the address shown above. The contest closes midnight October 15, judges being disinterested persons of recognized standing.

Automatic Resistor Chart

Through an ingenious adaptation of the circular slide rule idea, the identification of resistor values by means of standard color code markings is reduced to simplest terms. The markings are in the form of a body color, a ring color and an end color, the combination indicating a definite resistance value for the unit so marked. The problem of "reading" the three markings in resistance terms has heretofore been a serious one for service men and others. However, by means of the simple automatic chart now available, the markings may be translated immediately into resistance values, or, contrariwise, the resistance values may be translated into corresponding markings.

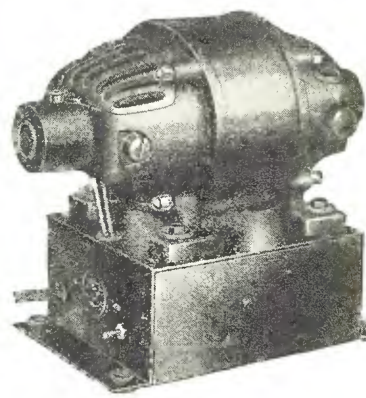


The R. M. A. resistor color code chart takes the form of a celluloid chart with three adjustable dials. As the three dials are adjusted so as to bring the identifying color markings before the openings on the main face representing the resistor markings, the corresponding resistance value in ohms appears in the large opening. If, on the other hand, a given resistance value is shown in the large opening, then the markings for that value are instantly indicated.

The International Resistance Company 2006 Chestnut St., Philadelphia, Pa., has developed the resistor color code chart for radio service men, radio set designers, production men and others engaged in practical radio work. One of these charts will be sent without charge to any radio worker who really has use for same.

New Janette Converters

The Janette Manufacturing Company, 556 W. Monroe St., Chicago, announces the addition of two new rotary converters to their line.

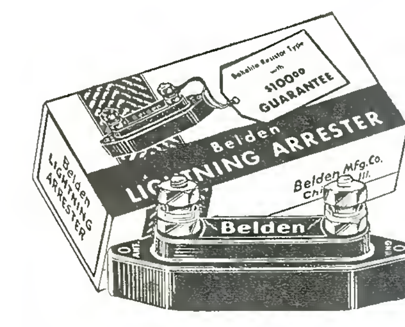


One of these new converters, called type CA-25-F, is available for 32 volts d-c. only. It develops 60 watts of 110 volt 60 cycle alternating current and its consumption is only 4 amperes. It is designed specially for the operation of a. c. midget sets on 32 volt farm lighting systems.

The second new Janette converter is called type CA-18-F. It develops an output of 150 watts of 110 volt 60 cycle a. c. and is available for operation of 32, 115 or 230 volts d. c.

Belden Lightning Buster

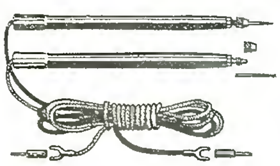
Belden Manufacturing Company, 4689 W. Van Buren Street, Chicago, Illinois, announces a new Lightning Arrester with a $100 guarantee that lists for 25c.



The new arrester, or Lightning Buster as they have named it, is of the resistor type with a bakelite shell. The entire unit is approximately 2" long and weighs 1 oz. The small size makes for convenient handling and neat, unobtrusive installation. In performance it does everything that a larger size arrester does. The compact housing of the Lightning Buster encloses the same size and type of resistance parts used in the large arresters.

Buddy Test Prods

A set of handy test prods illustrated in this column has just been announced by the Buddy Mfg. Co., 80 Cortlandt St., New York. It will be noted that the illustration shows removable points for the test prods and one particular feature is the use of a common phonograph needle to puncture insulation or corrosion. The manufacturer states the first improvement made in test prods in eight years may be found in this product.



Newark Patent Notice

It is announced by the Newark Wire Cloth Co., 351-365 Verona Ave., Newark, N. J., manufacturers of wire cloth for every industrial purpose, that they have been granted patent No. 1,808,-526 on "Sealedged" Wire Cloth which is now so much used in radio tubes.

Cell Coupling Cable

G-M Laboratories, Inc., 1735 Belmont Ave., Chicago, announce the perfection of a new cell coupling cable for use in sound equipment. This cable has five times the capacity reactance of standard microphone cable so frequently used in sound equipment, and in addition, is non-microphonic.

The use of this cable reduces the attenuation of high frequencies, eliminating to a large degree the frequency discrimination of most P. E. C. amplifiers. This results in increased brilliance of reproduction of the human voice and instrumental music.

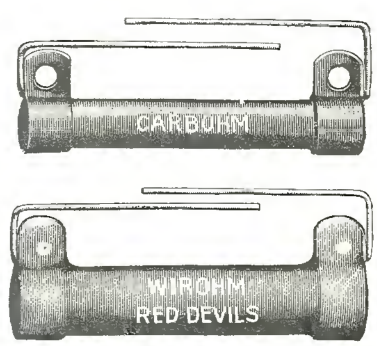
Those interested in this cable may obtain information by asking for G-M bulletin No. 134.

Two Ohmite Products

Ohmite Mfg. Co., 636 N. Albany Ave., Chicago, announces the formation of a Radio Resistor Department for the manufacture of two new types of units especially designed and developed for use in radio receivers.

The new units are:

1. Carbon resistors in all resistance values having the trade name of "Carbohm," intended for use in dissipating one watt and less.



2. Wire wound resistors up to 25,-000 ohms even smaller in size than three watt carbon resistors, and covered with a new red cement which they have developed. These units are known under the trade name of "Wirohm Red Devils." These are capable of dissipating up to ten watts and although wire wound they compare very favorably in price with carbon units of the three and five watt sizes. They can be furnished with lugs or leads and can also be supplied with an intermediate tap which makes them very economical to use. Larger units with many taps are also made up to order.

These two types of units—"Carbohm" and "Wirohm Red Devils" cover the complete requirements for radio receiver resistors.

Browning-Drake Long Wave Set

A new universal type superheterodyne receiver for Europe and Australia has just been brought on the market by the Browning-Drake Radio Corporation of West Townsend, Mass.

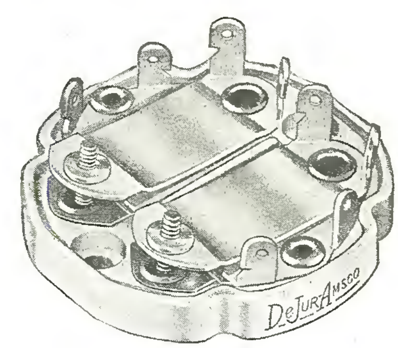
Hitherto American manufacturers have excelled in radio apparatus in all parts of the world but in Europe it is necessary that a set receive the wave band of 1,000 to 2,000 meters in addition to the band of 200 to 550 meters.

The new Browning-Drake receiver is a special superheterodyne using seven tubes and may be operated on either band by a change-over switch. Variable mu and pentode tubes are used as well as continuous tone control and full vision dial.

The Browning-Drake Radio Corporation is considerably in hopes of increasing its export business to a large extent through this new item which has been designed with the advice and technical assistance of European engineers.

DeJur-Amsco Varitor

Known as the Varitor, the DeJur-Amsco Corp., 95 Morton St., New York, is marketing a small fixed, variable capacitor for use in radio receiver and oscillator circuits.



According to the literature accompanying the product, it gives the following requirements: adequate variation in capacity, adequate total capacity, permanence of adjustment, rapid but micrometric adjustment, high electrical efficiency, adaptable to production specifications and methods and guaranteed against mechanical or electrical fault requiring replacement.

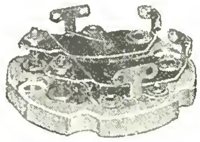
Trav-Ler Gets License

Trav-Ler Mfg. Corp. announces granting of a license under RCA patents to manufacture receivers, radio-phonograph combinations and television receivers and apparatus.

Coincident with the securing of their RCA license, Trav-Ler announces its intention to go into production immediately and market through its jobber and dealer trade a complete line of radio receivers including both tuned radio frequency and superheterodyne types. A superheterodyne auto radio and short wave sets are included.

Hammarlund I. F. Condensers

A small size, double intermediate tuning condenser for use in intermediate transformer units in midget superheterodynes, has just been developed by the Hammarlund Manufacturing Company, 424 West 33rd Street, New York City. It measures only 1-15/16" in diameter and is available in capacity ranges of from 10 mmf. to 70 mmf.; 70 mmf. to 140 mmf., and 140 mmf. to 220 mmf. It is known as the MICD type.



The same unique constructional feature embodied in the larger types are incorporated in this model. Treated isolantite bases, insuring moisture-proof characteristics, are used. Sclerescope tested phosphor bronze, selected mica films, solder dipped terminals, fibre "shock pad," and cut thread screws are among the features of this new condenser. They have ample space for coil mounting with excellent provision for capacity adjustment.

Pacent Home Talkies

Definite information covering home talkies has been prepared in the form of a plan intended for jobbers of the Pacent Electric Co., Inc., 91 Seventh Avenue, New York.

In the information is a list of all available film which may be purchased or rented through film producers or their agents, together with an interesting sales bulletin showing how jobbers and dealers can profitably handle the line.

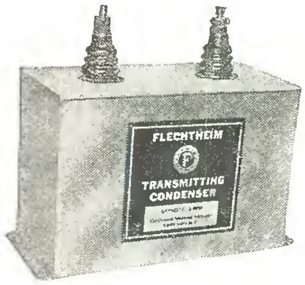
Volume Control Guide

Of interest to dealers and service men is the second edition of the volume control guide prepared by Central Radio Laboratories at Milwaukee, Wisconsin, the cover of which is illustrated here.

This guide, just off the press, shows how to service old and new receivers with a small stock of Centralab replacement volume controls.

High Voltage Condensers

Of interest to broadcast station engineers and other technicians is the new Flechtheim type VM high voltage transmitting condensers rated for continuous duty at 5,000 volts d-c., 3,300 rms. rectified a-c.



According to the announcement, the type VM illustrated here is available in improved construction, which slightly increases its physical dimensions and makes its continuous operation at rated voltage a matter of the greatest safety. Scores of stations have found the type VM a solution to their filter condenser problems. A copy of price list No. 23 showing the entire Flechtheim line will be of interest to station operators.

Studebaker Development

A new product known as the Elim-O-Stat developed by the Studebaker laboratories is being announced by the DePree Sales Co. of South Bend, Indiana. The system consists of the Elim-O-Stat and a special aerial with shielded lead-in.

Igrad Repair Department

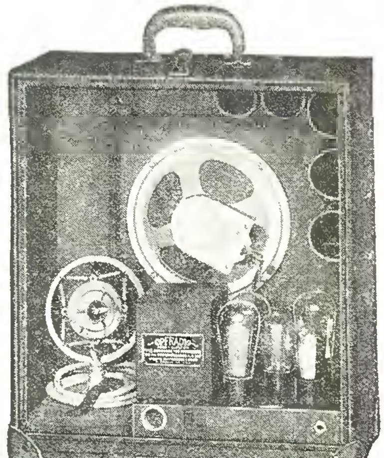
A condenser repair department for the benefit of servicemen has recently been established by the Igrad Condenser & Mfg. Co., 4322 Lake Ave., Rochester, N. Y. According to the statement, the department supplies replacements for any make of power pack condenser block, and at a reasonable charge if the serviceman will send in the old defective block. It is stated that the repair department will also furnish individual sections for blocks where required.

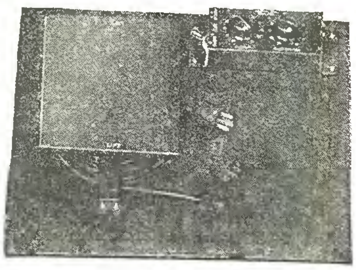
Magnavox Engineering Bulletin

General engineering data on Magnavox dynamic speakers and Mershon electrolytic condensers and test methods has been prepared in the form of booklets by the Magnavox Co., Ltd., 155 E. Ohio St., Chicago. These technical booklets are for radio and electrical engineers and will represent a valuable addition to any engineer's collection. They will be gladly sent upon application to the Magnavox Co.

Operadio Portable P. A. System

The Operadio Manufacturing Company of St. Charles, Illinois, has added to their line of large public address equipment a portable public address system. The complete unit is carried in a single perfectly balanced carrying case, the front of which is utilized as a baffle for the self-contained dynamic speaker. Complete with tubes, microphone, and all accessories, the weight is only forty pounds.





The input from the two-button microphone that is supplied, or from any 200 ohm phonograph pick-up, is raised by the three-stage amplifier to a volume level sufficient for addressing a group of people that may be assembled in a room 1,000 feet square. The amplifier operates from 110 volt, 60 cycle, A. C., and supplies power for all accessories including the dynamic speaker and two-button microphone.

A control panel is provided with separate volume controls for microphone and phonograph input, and a change-over switch for shifting the amplifier to either input. The cover provides stowage for a 50-foot rubber covered microphone lead and a 25-foot A. C. line cord. A jack is provided that allows from one to four additional A. C. dynamic or magnetic speakers to be operated without affecting the output of the main speaker.

Alden 247 Adapters

According to recent announcements from the Alden Products Co., 715 Center St., Brockton, Mass., they have marketed new adapters for using the 247 pentode in place of the 245, as well as a twin adapter for using the 238 pentode in sets that have the 171 push-pull output stage. This company is also supplying a latch lock analyzer plug handle for manufacturers of the various analyzers. This locks the testing adapter to the plug so that when the plug is removed from the socket in the set under test, the adapter always comes with the handle. It is released by pushing the latch in the side of the handle.

I. R. C. Resistor Data

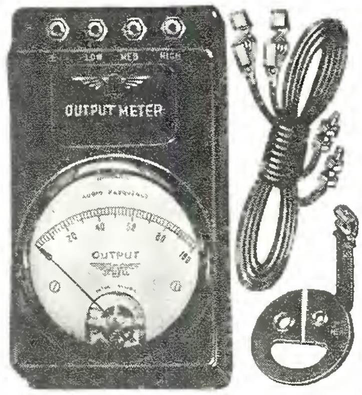
An engineering bulletin covering the remarkable features of the new Type "K" metallized resistors has just been issued by the International Resistance Company, 2006 Chestnut Street, Philadelphia, Pa.

This bulletin not only deals qualitatively with such features as permanence, overload characteristics, humidity characteristics, load characteristics, voltage coefficient, aging, temperature coefficient, radio frequency characteristics, noise and mechanical strength, but also includes ample quantitative data in its text and graphs. A copy may be had for the asking.

J-M-P Test Oscillator

A new test oscillator has just been marketed by the J-M-P Mfg. Co. of Milwaukee, Wisconsin, producing fundamental frequencies from 115 to 280 kilocycles and harmonics from 230 to 1680 (sixth harmonic of 280) and higher. According to the manufacturer, the scale for fundamental kilocycles has a division line for each kilocycle up to 200 and beyond 200 a line for every two kilocycles. Wide shifts from one part of the scale to another are easily made by turning the knob, the scale being direct reading and not requiring the necessity for a calibration curve.

Radio Servicemen's Output Meter



An output meter for use by radio servicemen has been announced by the Jewell Electrical Instrument Company of 1642-U Walnut Street, Chicago, Ill. Radio men have found that the human ear cannot be depended upon when making accurate adjustments of radio frequency stages. This instrument allows the serviceman to see when the point of best adjustment is reached. Three measuring ranges are provided to adapt it to the output circuit of any receiver. Furnished with leads, test clips and socket adapter. List price $15.00.

Burgess Light Sensitive Cell

Illustrated here is the Burgess radiovisor bridge, a new light sensitive cell representing original development work by British engineers, followed by the ingenuous application of German technicians and scientists, and the adaptation of the cell and its circuits to American practice by engineers of the Burgess Battery Co. at Madison, Wisconsin.

The new cell or bridge consists of a tall glass tube with a three-prong base. Inside the bulb is a flat plate occupying the center and supported by two heavy lead-in wires. The plate is of glass, on the front side of which are two interlocking comb-like electrodes of gold, fused in place. These electrodes are covered over by a thin layer of selenium like enamel, the conductivity of which changes with the amount of light falling on it, thereby providing a light sensitive cell.

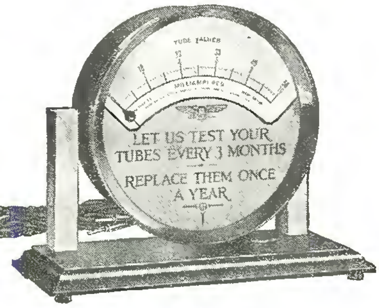
Erie Resistor Indicator

Radio engineers have been interested in seeing the three-scale celluloid indicator made by the Erie Resistor Corp. of Erie, Pa., which indicates the resistor body, tip and dot standard for the RMA color code.

We are advised that the Erie Resistor Corp. will be glad to send such an indicator to radio engineers who will write for it at Erie, Pa.

Jewell Tube-Sellers

The new Tube-Seller just announced by the Jewell Electrical Instrument Company, 1642-U Walnut Street, Chicago, Ill., provides the radio dealer with a totally new method of merchandising radio tubes. These Tube-Sellers are "full vision" tube merchandisers. Tube values are read on two meters—a big easy-reading demonstration meter which faces the customer—a small meter on the test panel for the convenience of the salesman. Both meters read together and accurately indicate tube condition.



The big indicating meter wins customer confidence just as do the double scales on grocery and meat market weighing machines. Pattern 214 is the finest tube merchandiser and the most convenient tube checker ever produced for the radio dealer. It is complete in every detail for rapid and accurate tube testing. Such features as a pre-heater and short checker, rotary filament voltage switch, and a means for testing output pentode tubes, are provided.

The Pattern 219 Tube-Seller offers the advantages of the large demonstration meter, Pattern 213, used in conjunction with a counter-type tube tester, the familiar Jewell Pattern 209. The demonstration meter is connected by a ten foot cord. This instrument tests all standard types of tubes. Output pentodes may be tested.

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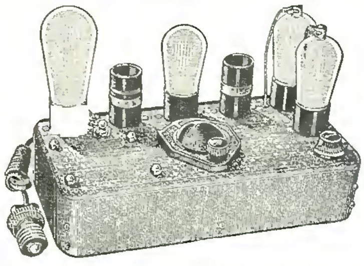


GEORGE W. WALKER Super-Converter "Model 4X"

For 105-120 Volts, 50-60 Cycle A.C. Current (Completely assembled and including coils) **$39.50** Less Tubes

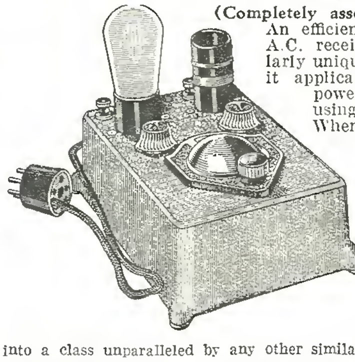
Designed to produce performance with the utmost simplicity and ease of operation. This converter represents extraordinary value, being economically priced to meet a popular market. Employs 2 No. '24 Screen Grid, 1 No. '27 and 1 No. '80 type tubes.

Each converter is equipped with a combination power and antenna switch, providing for the selective use of either converter or receiver without the need of disconnection. The convenience of this innovation is apparent.

All of our A.C. converters furnish their own voltages, having complete built-in power packs, making hazardous and bothersome connection to the receiver unnecessary. An '80 type tube is employed as a rectifier to insure long life and freedom from hum.

George W. Walker "Special A.C." Short Wave Adapter Less Tubes **$18.50**

(Completely assembled and including coils)



An efficient short wave adapter for all A.C. receivers. This adapter is singularly unique, for its special design makes it applicable to radio receivers using power detection as well as those using a Screen Grid tube detector. When plugged into the receiver detector tube socket, a special built-in audio circuit automatically converts the detector into an additional stage of audio amplification, resulting in surprisingly strong volume. The regenerative detector, which requires a No. '27 type tube, provides for still greater volume and selectivity. These exclusive features place the Walker adapter into a class unparalleled by any other similar device.

Efficient plug-in coils of 14 to 200 meters are furnished. The simplicity of operation and connection will appeal to those unfamiliar with short wave devices. This inexpensive adapter should prove most ideal for reception of foreign and other far distant stations. The reception of vivid news, broadcast by the police, has proven extremely entertaining and exciting. These events can be closely followed as they occur.

George W. Walker Super-Converter "Model 3X"

For Battery Receivers (Completely assembled and including coils) **$28.50** Less Tubes

Specially designed for battery receivers. Requires 6 volts of "A" current and 135 volts of "B" current. Connects to the same batteries or eliminators as the receiver. This model converter uses 2 of the newly developed and efficient Screen Grid No. '36 tubes and 1 No. '37 type tube, utilizing the latest in tube achievement. While this model converter is designed for battery type receivers, it may also be used with A.C. receivers, providing the proper D.C. voltages are used.

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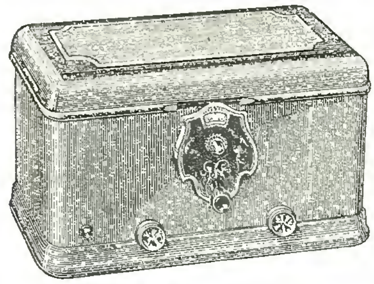


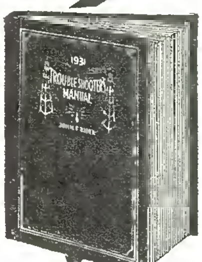
GEORGE W. WALKER Super-Converter "Model 4"

For 105-120 Volts, 50-60 Cycle A.C. Current (Completely assembled and including coils) **$65.00** Less Tubes

In this deluxe model regeneration is employed in the detector circuit, which is the prime requisite of the experienced and exacting short wave fan. Enclosed in an attractive two-toned finished metal cabinet which will harmonize with the finest furniture. One Screen Grid No. '24, 2 No. '27 and 1 No. '80 type tubes are used.

Tunes a wave band of 14 to 200 meters. The selection of the proper condenser capacities and inductances result in the ability to cover the popular short wave bands of 23 to 50 meters, without the need of changing coils. To prevent losses, due to uncertain contact, we continue to use the reliable and efficient plug-in coils.

As manufacturers exclusively of short wave apparatus, we are in position to offer the results of our exhaustive research with short wave and super-heterodyne circuits. Our broad guarantee is only possible as a result of the care exercised in the inspection of this merchandise. Each device is tested in actual operation and is released only after its performance has met with our rigid requirements.



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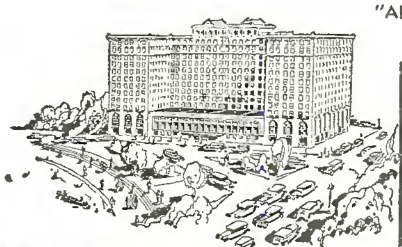

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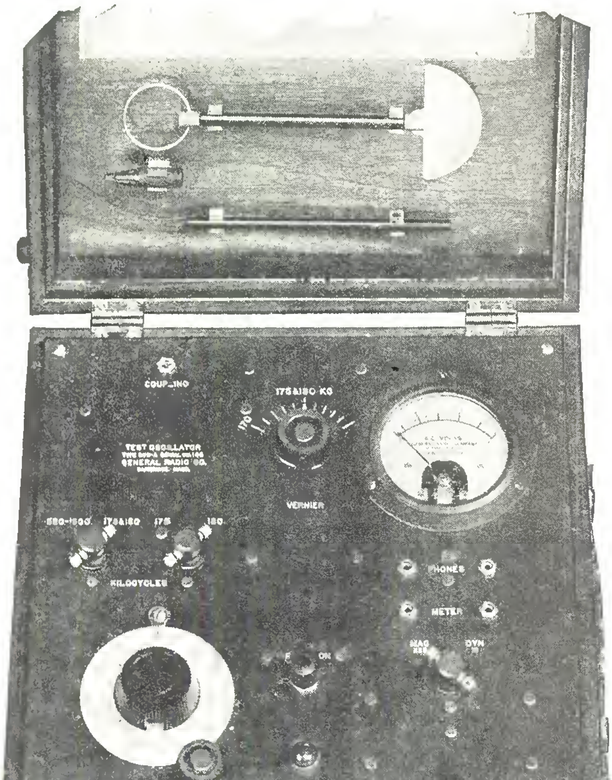

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No. SR105	Silver Super 36-A	.50
No. SR120	Silver Midget 782-12	.50
No. SR27	Slagle (Continental) 9	.50
No. SR46	Slagle (Continental) R-20	.50
No. SR25	Sonora Delux 5R	.50
No. SR91	Sparton 600; 610 and 620	.50
No. SR9	Sparton AC89	.50
No. SR58	Sparton 931	.50
No. SR63	Sparton 589	.50
No. SR36	Splitdorf E-175	.50
No. SR15	Steinite 261	.50
No. SR76	Steinite 70; 80 and 95	.50
No. SR132	Steinite 600, 605, 630 and 635	.50
No. SR147	Stewart-Warner 102 A and B	.50
No. SR34	Stewart-Warner 900	.50
No. SR62	Stewart-Warner 950	.50
No. SR85	Stewart-Warner R-100A, R and E	.50
No. SR134	Stromberg-Carlson 10 and 11	.50
No. SR93	Stromberg-Carlson 12 and 14	.50
No. SR18	Stromberg-Carlson 635 and 636	.50
No. SR54	Stromberg-Carlson 846	.50
No. SR37	Temple 8-60; 8-80 and 8-90	.50
No. SR125	Temple 861; 881 and 891	.50
No. SR69	Transitone Auto Radio	.50
No. SR121	Trav-Ler Model C	.50
No. SR143	U. S. Radio & Television (Gloritone) 26P	.50
No. SR39	U. S. Radio & Television 37	.50
No. SR119	Vitatone 54 (Zaney-Gill Corp.)	.50
No. SR101	Victor Micro-Synchronous R-35; R-39 and RE-57	.50
No. SR61	Victor R-32; RE45 and R52	.50
No. SR92	Westinghouse WR-5	.50
No. SR107	Westinghouse WR-4	.50
No. SR141	Zenith A, B, C and D	.50
No. SR97	Zenith 71; 72; 73 and 77	.50
No. SR43	Zenith 52; 53; 54; 522; 532 and 542	.50

Public Address Systems

No. SR100	Amer-Tran PA-86	$0.50
No. SR90	Silver-Marshall 692	.50
No. SR122	Silver 679-B Amp.	.50
No. SR88	Webster (Racine, Wis.) A37-50	$0.50
No. SR89	Webster (Chicago) DH-250	.50

Kit Receiver Blueprints—Primarily for Service Work

Full sized blueprints are available of any circuit ever published in the Call Book. Space permits listing only a few of the more popular ones. Write us if the desired print is not shown here.

No. 32	Scott "World's Record" Super Eight	$1.00
No. 56	Improved Browning-Drake	1.00
No. 68	Improved Remler 45 K. C. Super-heterodyne Receiver (5 drawings)	1.00
No. 73	Magnaformer Super-heterodyne Receiver (5 drawings)	1.00
No. 99	Magnaformer 9-8 A. C. (5 drawings)	1.00
No. 123	World's Record Super Ten and Power Pack (6 drawings)	$1.00
No. 167	Scott World's Record SG Nine "Power Pack Operated" (4 drawings)	1.00
No. 231	Custom-built Model World's Record Shield Grid A. C. 10 (4 drawings)	1.00
No. 246	Pilot Super-Wasp Short Wave Receiver (3 drawings)	1.00

Graphic Wiring Diagrams

No. 101	World's Record Economy Super 8	$0.60
No. 174	Sargent-Rayment Seven Receiver	.60
No. 202	Silver-Marshall 730 Four Tube Receiver	.60
No. 221	Modulated Oscillator	$0.60
No. 236	S-M 722 A. C. Screen Grid Receiver	.60
No. 244	S-M S. G. A. C. 712 Rec. (to be used with 677 Power Pack)	.60
No. 245	S-M 677 Power Pack (to be used with 712 Receiver)	.60

Schematic Wiring Diagrams

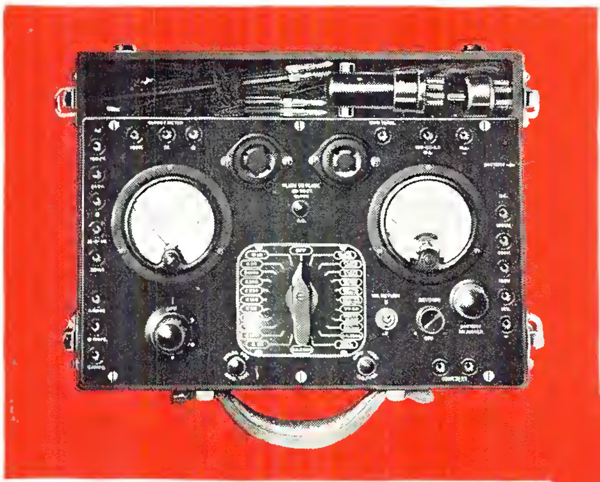
No. 174a	Sargent-Rayment Seven Receiver	$0.50
No. 211a	Magnaformer 1929 A. C. Super	.50
No. 221a	Modulated Oscillator	.50
No. 223a	Silver-Marshall 720 A. C. Shield Grid Six	.50
No. 234a	HFL Mastertone Receiver, A. C.	.50
No. 236a	S-M 722 A. C. Screen Grid Receiver	.50
No. 237a	S-M 735 Short Wave A. C. Receiver	.50
No. 238a	Lincoln 8-40 Screen Grid A. C. Super	$0.50
No. 244a	S-M S. G. A. C. 712 Rec. (to be used with 677 Power Pack)	.50
No. 245a	S-M Power Pack (to be used with 712 Receiver)	.50
No. 254a	Lincoln DeLuxe Ten A. C. S. G. Receiver	.50
No. 255a	Silver-Marshall 722 S. G. D. C. Receiver	.50
No. 266a	Lincoln DeLuxe 31	.50

Any of the above blue prints will be sent postpaid by return mail upon receipt of the proper amount. C. O. D. orders not accepted.

CITIZENS RADIO SERVICE BUREAU 508 SOUTH DEARBORN STREET 7TH FLOOR—CHICAGO, ILLINOIS

Good Equipment

the first step to **bigger servicing Profits**

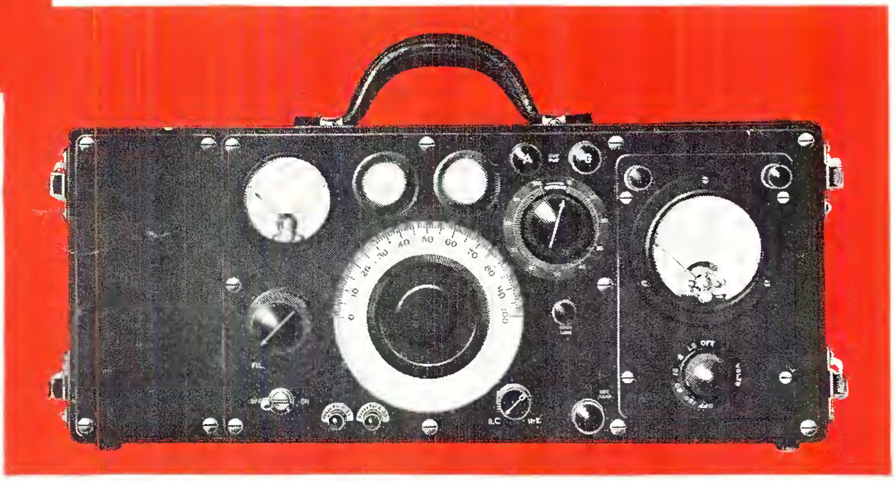


Good equipment promotes rapid, thorough, complete work—satisfied customers. "Call-backs" are cut down. Profits go up.

Set and tube trouble must be quickly and definitely located. Its extent easily determined. With complete, reliable test equipment, you save time and labor—prevent errors—build profits.

Designed to make radio servicing even more efficient, engineered by an organization who successfully developed test sets for central stations, manufacturers and railroads—Weston Radio Test Equipment is a paying investment—a practical solution to bigger service profits.

Write for Booklet J



OSCILLATOR (Model 590)

To correctly align the tuning unit of radio receivers, the salesman's kit should include a portable oscillator.

The Weston Oscillator offers distinctive advantages—completely contained in a thick cast aluminum case for perfect shielding—has high accuracy throughout—both broadcast and intermediate band. Has grid-dip meter to indicate definitely that oscillator is working—especially designed attenuator controls its output smoothly and gradually from practically zero to approximately 5,000 microvolts.

The tuning dial is made of matt celluloid, one-half of which can be calibrated in pencil at the will of the operator.

Uses of Weston Oscillator

1. Aligning or ganging condensers.
2. Neutralizing.
3. Aligning R. F. and I. F. stages.
4. Comparing Selectivity and Sensitivity.
5. Locating trouble by means of Grid Dip Meter—shorted tuning condenser, shorted turns in R. F. transformers, rosin joints, intermittent and open connections.

RADIO TEST SET (Model 566—type 3)

All the necessary and required tests on any radio receiver and all type tubes can be made with Weston Model 566, type 3 Radio Test Set.

The location and extent of trouble is determined quickly, accurately, and reliably. The new Model 566 is designed to make servicing easier, better, and more profitable.

Some of the many tests with Model 566—type 3:—A. C. and D. C. Filament Voltages . . . Plate Voltages . . . Control Grid Voltages . . . Screen Grid Voltages . . . Screen Grid Currents . . . Indicating gas content in power tubes . . . Plate Currents . . . Cathode Voltages . . . Space Charge Grid Voltages . . . Space Charge Grid Currents . . . Tubes in receiver under operating conditions . . . Both plates of type '80 Rectifiers . . . Multi-Mu and Pentodes without adapters . . . Continuity of Circuits . . . Resistances—Ohmmeter has two ranges—0-10,000 and 0-100,000 ohms. Has battery voltage adjuster . . . Condensers from .001 (by-pass) to 2.0 mfd. direct from A. C. line without use of adapters or resisters . . . Inductances from 5 to 50 henries . . . Input to receiver . . . Speaker Coil currents . . . Voltage Ranges: 1000/250/100/25/10 volts D. C., 1000/200-16/8/4 volts A. C. . . . Current Ranges: 4/8 amperes A. C., 100/20 milliamperes A. C., 100/25/2.5 milliamperes D. C.

Output meter with 100/5 volt ranges for:—Aligning Condensers . . . Comparing Selectivity . . . Comparing Sensitivity . . . Checking gain of amplifiers . . . Indicating hum . . . Indicating overload in audio amplifiers . . . Measuring voltage output of power transformers from tube sockets.

SERVICE MANUAL

Complete Service Manual given *FREE* with every Model 566-type 3. It tells the probable causes of poor reception, how to locate and fix them.

Convenient payment plan if desired

WESTON

ELECTRICAL INSTRUMENT CORPORATION

574 FRELINGHUYSEN AVENUE . . . NEWARK, N. J.

DEALERS AND SERVICEMEN

Beginning in this issue every month you will find performance curves on ten standard receivers showing sensitivity, selectivity and electrical fidelity curves together with the schematic diagrams of the models measured. This change from a quarterly to a monthly publication gears us up to the faster tempo of the radio industry, while the "curves-and-schematic-on-the-same-page" idea is the culmination of our pioneering work started nearly two years ago as the unbiased authority on receiver performance based on definite standards.

● Performance curves provide for the dealer and service man a new sales appeal, that of selling by the yardstick of "here's what a receiver will do" and "here's how it will sound." These two fundamentals can be made potent to a public that has grown wary of claims and weary with strident notes where faithful reproduction should be expected.

● Write your distributor or manufacturer for information on how to merchandise receivers through performance curves, or we will be glad to give you the data if you will ask for it.

● You realize the necessity for more intensive sales methods than ever before. We're putting this yardstick method in your hands—use it! We'll be glad to help you.

RADIO CALL BOOK MAGAZINE
AND TECHNICAL REVIEW