

RADIO SERVICE BULLETIN

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ABBREVIATIONS.

The necessary corrections to the List of Radio Stations of the United States and to the International List of Radiotelegraph Stations, appearing in this Bulletin under the heading "Alterations and corrections," are published after the stations affected in the following order:

Name	=Name of station.
Loc.	=Geographical location: O=west longitude, N=north latitude, S=south latitude.
Call	=Call letters assigned.
System	=Radio system used and sparks per second.
Range	=Normal range in nautical miles.
W. l.	=Wave lengths assigned: Normal wave lengths in italics.
Service	=Nature of service maintained:
	PG=General public.
	PR=Limited public.
	P=Private.
	O=Government business exclusively.
Hours	=Hours of operation.
	N=Continuous service.
	X=No regular hours.
	m=a. m. (12 m=midday).
	s=p. m. (12 s=midnight).
Rates	=Ship or coast charges in cents: c=centa. (The rates in the international list are given in francs and centimes.)
I. W. T. Co.	=Independent Wireless Telegraph Co.
R. C. of A.	=Radio Corporation of America.
S. O. R. S.	=Ship Owners' Radio Service.

CRIMINALS: By direction of the Secretary of Commerce this publication is issued as an administrative report and is required for the proper transmission of the public business.

Co. = Company.
 Corp. = Corporation.
 & = And.
 Do = Ditto.
 C. w. = Continuous wave.
 V. t. = Vacuum tube.
 FX. = Fixed station; does not handle PG with ship stations.

NEW STATIONS.

Commercial land stations, alphabetically by names of stations.

Addition to the List of Radio Stations of the United States, edition of June 30, 1921, and to the International List of Radiotelegraph Stations published by the Berns Bureau.

Note.—Stations having a wave length of 300 meters transmit news, concerts, etc., and those having a wave length of 485 meters transmit market and weather reports.

Station.	Call signal.	Wave lengths.	Service.	Hours.	Station controlled by—
Aberdeen, Wash. ¹	KNP	300	PR/FX		North Coast Products Co.
Akron, Ohio ²	WGE	300	PR/FX		Buckeye Radio Service Co.
Ames, Iowa ³	WOF	300, 485	PR/FX	X	Iowa State College.
Anderson, Ind. ⁴	WMA	300	PR/FX		Arrow Radio Laboratories.
Anthony, Kans. ⁵	WBL	300	PR/FX	X	T. & H. Radio Co.
Athens, Ohio ⁶	WAAV	300	PR/FX		Athens Radio Co.
Auburn, Me. ⁷	WMB	300	PR/FX		Auburn Electrical Co.
Boston, Mass. ⁸	WAAJ	300	PR/FX		Eastern Radio Institute.
Bridgeport, Pa. ⁹	WBAJ	300, 485	PR/FX	X	Diamond State Fibre Co.
Charlestown, W. Va. ¹⁰	WAAJ	300	PR/FX		Radio Service Co.
Chicago, Ill. ¹¹	WAAF	300, 485	PR/FX	X	Union Stock Yards & Transit Co.
Cincinnati, Ohio ¹²	WIZ	300, 485	PR/FX		Cino Radio Manufacturing Co.
Clearfield, Pa. ¹³	WPI	300	PR/FX		Electric Supply Co.
Colorado Springs, Colo. ¹⁴	KHD	485	PR/FX	X	C. F. Aldrich Marble & Granite Co.
Columbia, Mo. ¹⁵	WAAW	300	PR/FX		University of Missouri.
Columbus, Ohio ¹⁶	WBAV	300	PR/FX	X	Erner & Hopkins Co.
Crafton, Pa. ¹⁷	WAAZ	300	PR/FX	X	Radio Service Corp.
Decatur, Ga. ¹⁸	WAAZ	300	PR/FX	X	Georgia Radio Co.
Decatur, Ill. ¹⁹	WDAO	300	PR/FX	X	James M. Hill University.
El Monte, Calif. ²⁰	KUY	300	PR/FX		Coast Radio Co.
Emporia, Kans. ²¹	WAAZ	300	PR/FX	X	Hollister-Miller Motor Co.
Eureka, Calif. ²²	KNJ	300	PR/FX	X	T. W. Smith.
Fort Worth, Tex. ²³	WBAP	300, 485	PR/FX	X	Wortham-Carter Publishing Co.

¹ Loc. (approximately) 0.123° 08' 15", N. 47° 00' 00"; range, 175; system, composite (v. t. telephone); hours, 1-3, 5-6, and 7-9.30 p. m.; rates, none.

² Loc. (approximately) 0.83° 32' 00", N. 41° 04' 00"; range, 50; system, composite (v. t. telephone); hours, 7-9.15 p. m. and Sunday, 10-11.30 a. m.; rates, none.

³ Loc. 0.93° 28' 30", N. 43° 01' 30"; range, 150; system, composite (v. t. telephone); rates, none.

⁴ Loc. 0.83° 42' 00", N. 40° 09' 02"; range, 50; system, composite (v. t. telephone); hours, 6.30-8.30 p. m.; rates, none.

⁵ Loc. (approximately) 0.93° 04' 00", N. 37° 09' 00"; range, 100; system, composite (v. t. telephone); rates, none.

⁶ Loc. 0.91° 05' 12", N. 39° 20' 15"; range, 75; system, composite (v. t. telephone); hours, 7-9 p. m.; rates, none.

⁷ Loc. (approximately) 0.70° 15' 00", N. 44° 06' 00"; range, 50; system, composite (v. t. telephone); hours, 10-11.45 a. m. and 8-9.45 p. m.; rates, none.

⁸ Loc. 0.71° 08' 30", N. 42° 21' 28"; range, 25; system, De Forest (v. t. telephone); hours, 9-10 p. m. on Monday, Wednesday, and Friday; rates, none.

⁹ Range, 25; system, composite (v. t. telephone); hours, 6.30-9.30 p. m.; rates, none.

¹⁰ Loc. 0.87° 38' 00", N. 41° 38' 00"; range, 200; system, composite (v. t. telephone); rates, none.

¹¹ Range, 200; system, composite (v. t. telephone); hours, 7.30-10 p. m.; rates, none.

¹² Loc. (approximately) 0.78° 30' 00", N. 41° 00' 00"; range, 50; system, composite (v. t. telephone); hours, 12 noon-12.30 p. m. and 6-7 p. m.; rates, none.

¹³ Loc. 0.104° 48' 41", N. 55° 51' 20"; range, 100; system, U. S. Signal Corps (v. t. telephone); rates, none.

¹⁴ Loc. 0.92° 19' 00", N. 38° 50' 22"; range, 50; system, Western Electric (v. t. telephone); hours, 10.10-10.30 a. m.; rates, none.

¹⁵ Loc. (approximately) 0.63° 00' 00", N. 32° 58' 00"; range, 75; system, composite (v. t. telephone); rates, none.

¹⁶ Loc. (approximately) 0.90° 02' 00", N. 40° 32' 00"; range, 50; system, composite (v. t. telephone); rates, none.

¹⁷ Range, 50; system, composite (v. t. telephone); rates, none.

¹⁸ Loc. (approximately) 0.39° 00' 00", N. 39° 50' 00"; range, 100; system, composite (v. t. telephone); rates, none.

¹⁹ Range, 50; system, composite (v. t. telephone); hours, 9 a. m.-9 p. m.; rates, none.

²⁰ Loc. (approximately) 0.26° 10' 00", N. 35° 30' 00"; range, 100; system, composite (v. t. telephone); rates, none.

²¹ Range, 50; system, composite (v. t. telephone); rates, none.

²² Range, 50; system, composite (v. t. telephone); rates, none.

Commercial land stations, alphabetically by names of stations—Continued.

Station.	Call signal.	Wave lengths.	Service.	Hours.	Station controlled by—
Granville, Ohio.	WJD	360	PR(FX)	X	Richard H. Howe.
Greenwich, Conn.	WAAQ	360	PR(FX)	X	New England Motor Sales Co.
Hamilton, Ohio.	WBAU	360	PR(FX)	X	Republican Publishing Co.
Harrisburg, Pa.	WBAK	400	PR(FX)	X	Pennsylvania State Police.
Hood River, Oreg.	KQP	360, 485	PR(FX)	X	Blue Diamond Electric Co.
Huntington, W. Va.	WJAR	360	PR(FX)		Groves-Thornton Hardware Co.
Kansas City, Mo.	WFB	360	PR(FX)		Central Radio Co.
Long Beach, Calif.	KSS	360	PR(FX)		Frost & Dean Radio Research Laboratory.
Los Angeles, Calif.	KFI	360	PR(FX)		Earl C. Anthony.
Do.	KHI	300, 600, 1650	PR(FX)	X	Southern California Edison Co.
Do.	KJG	360	PR(FX)	X	Standard Radio Co.
Do.	KNN	360	PR(FX)	X	Dulnek's.
Do.	KNE	360	PR(FX)	X	Beacon Light Co.
Do.	KNY	360	PR(FX)	X	Radio Supply Co.
Do.	KUS	360	PR(FX)	X	City Dye Works & Laundry Co.
Do.	KVT	300, 600, 1610	PR(FX)	X	Boulevard Express.
Do.	KWH	360	PR(FX)	X	Los Angeles Examiner.
Do.	KXG	360	PR(FX)	X	Brown Corporation.
Do.	KZI	360	PR(FX)	X	Irving S. Cooper.
Manhattan, Kans.	WTT	485	PR(FX)	X	Kansas State Agricultural College.
Marietta, Ohio.	WBAW	360	PR(FX)	X	Marietta College.
Marion, Mass. (Mata-podsett).	WRQ	1300	PR(FX)	N	R. C. of A.
Milwaukee, Wis.	WAAK	360	PR(FX)		Gimbel Bros.
Minneapolis, Minn.	WAAI	360	PR(FX)		Minnesota Tribune Co. and Anderson Beamish Co.
Do.	WBAD	360	PR(FX)		Sterling Electric Co. and Journal Printing Co.
Do.	WBAH	360	PR(FX)	X	The Daylan Co.
Do.	WCF	360	PR(FX)		Findley Electric Co.
Modesto, Calif.	KOQ	360	PR(FX)	X	Modesto Evening News.
Do.	KND	360	PR(FX)	X	Herald Publishing Co.
Moorestown, N. J.	WBAP	300	PR(FX)		Fred M. Middleton.

- Loc. 0 80° 31' 14", N. 10° 03' 31"; range, 25; system, composite (v. t. telephone); rates, none.
- Loc. (approximately) 0 33° 37' 30", N. 41° 02' 00"; range, 150; system, De Forest (v. t. telephone); rates, none.
- Range, 100; system, composite (v. t. telephone); rates, none.
- Loc. (approximately) 0 58° 55' 00", N. 40° 18' 00"; range, 200; system, Westinghouse (v. t. telephone); rates, none.
- Loc. 0 121° 18' 22", N. 45° 34' 45"; range, 50; system, composite (v. t. telephone); rates, none.
- Loc. (approximately) 0 32° 45' 00", N. 38° 20' 00"; range, 50; system, composite (v. t. telephone); hours, 12 noon-1 p. m., 4-6 and 7-9:30 p. m.; rates, none.
- Range, 100; system, composite (v. t. telephone); hours, 7-10 p. m.; rates, none.
- Range, 25; system, composite (v. t. telephone); hours, 7-9 p. m.; rates, none.
- Range, 50; system, composite (v. t. telephone); hours, 5-5:30 and 7:30-8 p. m. week days; 11 a. m.-12 noon and 5-6 p. m. Sunday; rates, none.
- Loc. (approximately) 0 115° 11' 00", N. 34° 09' 00"; range, 200; system, R. C. of A. (v. t. telephone and c. w. telegraph); rates, none.
- Loc. (approximately) 0 118° 18' 00", N. 34° 05' 00"; range, 100; system, composite (v. t. telephone); rates, none.
- Loc. 0 119° 14' 45", N. 34° 02' 30"; range, 200; system, composite (v. t. telephone); rates, none.
- Range, 100; system, composite (v. t. telephone); rates, none.
- Loc. (approximately) 0 118° 45' 00", N. 34° 03' 00"; range, 100; system, composite (v. t. telephone); rates, none.
- Range, 100; system, composite (v. t. telephone); rates, none.
- Range, 150; system, composite (v. t. telephone); rates, none.
- Range, 100; system, composite (v. t. telephone); rates, none.
- Loc. (approximately) 0 118° 05' 00", N. 34° 15' 00"; range, 50; system, composite (v. t. telephone); rates, none.
- Range, 25; system, composite (v. t. telephone); hours, 3-4 p. m. week days; 4-5 and 7:30-8:15 p. m. Sunday; rates, none.
- Loc. (approximately) 0 96° 40' 00", N. 39° 12' 00"; system, composite, 400; rates, none.
- Loc. 0 81° 28' 12", N. 39° 25' 24"; range, 30; system, composite (v. t. telephone); rates, none.
- Loc. 0 70° 46' 30", N. 41° 42' 45"; range, 4,000; system, Alexanderson alternator; rates, to Poland 24 c. per word.
- Range, 50; system, composite (v. t. telephone); hours, 1:30-2:30, 3:30-4:30, and 7:30-8:30 p. m.; rates, none.
- Loc. (approximately) 0 90° 18' 00", N. 44° 59' 00"; range, 75; system, composite (v. t. telephone); hours, 8-30 p. m.; rates, none.
- Loc. (approximately) 0 83° 18' 00", N. 44° 59' 00"; range, 200; system, composite (v. t. telephone); rates, none.
- Loc. 0 83° 25' 00", N. 44° 58' 20"; range, 100; system, composite (v. t. telephone); hours, 8-10 p. m.; rates, none.
- Loc. (approximately) 0 120° 10' 00", N. 37° 30' 00"; range, 100; system, Westinghouse (v. t. telephone); rates, none.
- Range, 100; system, composite (v. t. telephone); rates, none.
- Loc. (approximately) 0 75° 00' 00", N. 40° 00' 00"; range, 50; system, composite (v. t. telephone); hours, 9 a. m.-12 noon, Sunday; 4-7 and 10-12 (midnight); Tuesday, Thursday, and Saturday; rates, none.

Commercial land stations, alphabetically by names of stations—Continued.

Station.	Call letters.	Wave length.	Service.	Hours.	Station controlled by—
Newark, N. J. ¹	WAAM	360	PR(FX)		I. B. Nelson Co.
New Brunswick, N. J. ²	WRT	11500	PR(FX)	N	R. C. of A.
New Orleans, La. ³	WAAH	360	PR(FX)	X	Times-Picayune
Do. ⁴	WAAC	360	PR(FX)	X	Tulane University.
Do. ⁵	WBAM	360	PR(FX)		L. B. Remington.
New York, N. Y. ⁶	WBAY	360	PR(FX)	N	American Telephone & Tele- graph Co.
Norfolk, Va. ⁷	WSN	360	PR(FX)		Ship Owners Radio Service.
Omaha, Nebr. ⁸	WAAW	360	PR(FX)	X	Omaha Grain Exchange.
Orange, Tex. ⁹	WBAB	1625	PR(FX)	X	Hamilton Oil Corp.
Orange Field, Tex. ¹⁰	WBAB	1625	PR(FX)	X	Do.
Paterson, N. J. ¹¹	WBAN	360	PR(FX)		Wireless Phone Corp.
Peoria, Ill. ¹²	WBAY	590, 495	PR(FX)	X	Bradley Polytechnic Institute.
Philadelphia, Pa. ¹³	WFF	360	PR(FX)		St. Joseph's College.
Pike, Ky. ¹⁴	WAAI	1610	PR(FX)	X	Sullivan Food Creek Co.
Reno, Nev. ¹⁵	KOJ	360	PR(FX)	X	University of Nevada
Richmond, Va. ¹⁶	WBAZ	360	PR(FX)	X	Times-Dispatch Publishing Co.
Roswell, N. Mex. ¹⁷	KNJ	360	PR(FX)		Roswell Public Service Co.
Salt Lake City, Utah. ¹⁸	KZN	360, 485	PR(FX)	X	The Deseret News.
San Diego, Calif. ¹⁹	KEN	500, 450, 300	PR(FX)	X	A. E. Banks.
Do. ²⁰	KON	320	PR(FX)		Hotelwagger (Inc.).
Do. ²¹	KYU	300, 200, 1610	PR(FX)	X	Harvard Express.
Do. ²²	KYP	320	PR(FX)	X	Thearle Music Co.
San Francisco, Calif. ²³	KFO	340	PR(FX)	X	Hals Bros.
San Jose, Calif. ²⁴	KBC	320	PR(FX)	X	G. A. Hale & Co.
Savannah, Ga. ²⁵	WBAL	500, 200	PR	X	U. S. Shipping Board.
Seattle, Wash. ²⁶	KTW	320	PR(FX)		First Presbyterian Church.
Do. ²⁷	KZG	320	PR(FX)	X	Public Market & Market Stores Co.
Seldovia, Alaska ²⁸	KEA	300, 550, 600	PR and TG		Adam Lipke.
Shreveport, La. ²⁹	WAAQ	360	PR(FX)	X	Elliott Electric Co.

¹ Loc. (approximately) 0.74° 10' 00", N. 40° 41' 00"; range, 100; system, composite (v. t. telephone); hours, 9 a. m. to 12 midnight; rates, none.

² Loc. 0.74° 29' 15", N. 40° 50' 10"; range, 4,000; system, Alexanderson alternator; rates, to Italy 25 c. per word.

³ Loc. 0.90° 04' 09", N. 29° 53' 52"; range, 130; system, composite (v. t. telephone); rates, none.

⁴ Loc. (approximately) 0.90° 08' 00", N. 29° 53' 41"; range, 50; system, composite (v. t. telephone); rates, none.

⁵ Loc. (approximately) 0.90° 00' 00", N. 30° 00' 00"; range, 25; system, composite (v. t. telephone); hours, 12 noon-1 p. m.; 6-7 and 10-11 p. m.; rates, none.

⁶ Loc. 0.74° 02' 21", N. 40° 43' 33"; range, 100; system, Western Electric (v. t. telephone).

⁷ Loc. 0.75° 15' 30", N. 38° 51' 00"; range, 25; system, composite (v. t. telephone); hours, 10-11 a. m. and 4-5 and 7-8:30 p. m.; rates, none.

⁸ Loc. (approximately) 0.95° 00' 00", N. 42° 00' 00"; range, 100; system, composite (v. t. telephone); rates, none.

⁹ Loc. 0.93° 05' 10", N. 39° 10' 00"; range, 100; system, composite (v. t. telephone); rates, none.

¹⁰ Loc. 0.93° 07' 50", N. 39° 10' 00"; range, 10; system, composite (v. t. telephone and telegraph); rates, none.

¹¹ Loc. (approximately) 0.74° 10' 00", N. 40° 57' 20"; range, 75; system, composite (v. t. telephone); hours, 12 a. m.-1 p. m.; rates, none.

¹² Loc. (approximately) 0.59° 35' 00", N. 44° 43' 00"; range, 100; system, composite (v. t. telephone); rates, none.

¹³ Loc. 0.75° 09' 23", N. 39° 55' 25"; range, 30; system, De Forest (v. t. telephone); hours, 10.45 a. m. to 12.15 p. m. and 7.45-8.45 p. m. Sunday; 2.15-2.30 and 8.30-8.45 p. m. Monday, Wednesday, and Friday; rates, none.

¹⁴ Loc. (approximately) 0.32° 13' 00", N. 37° 30' 00"; range, 150; system, composite (v. t. telephone); rates, none.

¹⁵ Range, 100; system, composite (v. t. telephone); rates, none.

¹⁶ Loc. 0.77° 30' 00", N. 37° 35' 18"; range, 50; system, composite (v. t. telephone); rates, none.

¹⁷ Loc. (approximately) 0.104° 27' 00", N. 33° 24' 00"; range, 50; system, De Forest (v. t. telephone); hours, 8 a. m.-10 p. m.; rates, none.

¹⁸ Range, 200; system, composite (v. t. telephone); rates, none.

¹⁹ Range, 200; system, composite (v. t.) and composite, spark 1,200; rates, none.

²⁰ Range, 100; system, composite (v. t. telephone); hours 4-5 and 7.30-9 p. m. week days and 10-11 a. m. Sunday; rates, none.

²¹ Range, 150; system, composite (v. t. telephone); rates, none.

²² Range, 50; system, composite (v. t. telephone); rates, none.

²³ Range, 20; system, R. C. of A. (v. t. telephone); rates, none.

²⁴ Range, 20; system, composite (v. t. telephone); rates, none.

²⁵ Loc. 0.81° 07' 15", N. 35° 05' 15"; range, 150; system, Navy-Siman, 1,000; rates, none.

²⁶ Loc. 0.122° 19' 48", N. 47° 30' 27"; range, 100; system, composite (v. t. telephone); hours, 11.30 a. m. to 12.30 p. m. and 7.30-9 p. m. Sunday only; rates, none.

²⁷ Range, 50; system, composite (v. t. telephone); rates, none.

²⁸ Loc. (approximately) 0.152° 00' 00", N. 59° 53' 00"; range, 300; system, composite, 400; hours, 9-11 a. m., 2-3 and 6-8 p. m.; rates, 10 c. per word.

²⁹ Range, 100; system, composite (v. t. telephone); rates, none.

Commercial land stations, alphabetically by names of stations—Continued.

Station.	Call signal.	Wave lengths.	Service.	Hours.	Station controlled by—
South Bend, Ind. ¹	WBAQ	360	PR;FX)	X	Myron L. Harmon.
Spokane, Wash. ²	KOF	360	PR;FX)	X	Spokane Chronicle.
State College, N. Mex. ³	KOB	360, 485	PR;FX)		New Mexico College of Agriculture and Mechanic Arts.
St. Louis, Mo. ⁴	WAAB	360	PR;FX)	X	St. Louis Chamber of Commerce.
Do ⁵	WCK	360	PR;FX)		Stitz-Paez-Fuller.
Do ⁶	WEB	360	PR;FX)		Benwood Co.
St. Paul, Minn. ⁷	WAAH	360	PR;FX)		Commonwealth Electric Co.
Syracuse, N. Y. ⁸	WRAB	360	PR;FX)		Andrew J. Potter.
Tacoma, Wash. ⁹	WGB	360	PR;FX)		Wm. A. Mullins Electric Co.
Toledo, Ohio ¹⁰	WBAJ	360	PR;FX)		Marshall-Gorken Co.
Tulsa, Okla. ¹¹	WBAT	1525	PR;FX)	X	Hamilton Oil Corporation.
Tuscola, Ill. ¹²	WDZ	360	PR;FX)	X	James L. Bush.
W. Lafayette, Ind. ¹³	WAAA	360	PR;FX)	X	Purdue University.
Wichita, Kans. ¹⁴	WAAP	360	PR;FX)	X	Otto W. Taylor.
Wilkes-Barre, Pa. ¹⁵	WBAX	360	PR;FX)	X	John H. Stenger, Jr.
Youngstown, Ohio ¹⁶	WAAY	360	PR;FX)	X	Yehling-Rayner Piano Co.
Zanesville, Ohio ¹⁷	WPL	360	PR;FX)		Fergus Electric Co.

¹ Loc. (approximately) 0.86° 15' 00", N. 41° 40' 00"; range, 25; system, composite (v. t. telephone); rates, none.

² Loc. (approximately) 0.115° 55' 00", N. 45° 30' 00"; range, 100; system, composite (v. t. telephone); rates, none.

³ Loc. 0.106° 45' 50", N. 32° 17' 10"; range, 100; system, composite (v. t. telephone) and U. S. Navy spark, 1,000; hours, 7-10 p. m.; rates, none.

⁴ Loc. (approximately) 0.90° 15' 00", N. 38° 50' 00"; range, 150; system, composite (v. t. telephone); rates, none.

⁵ Loc. 0.93° 05' 15", N. 35° 38' 00"; range, 50; system, R. C. of A. (v. t. telephone); hours, 10.30-11.30 a. m., 3-4 and 7.30-8.30 p. m.; rates, none.

⁶ Loc. 0.50° 12' 15", N. 38° 38' 00"; range, 300; system, composite (v. t. telephone); hours, 5.30-10.30 p. m.; rates, none.

⁷ Range, 350; system, composite (v. t. telephone); hours, 8-10 p. m.; rates, none.

⁸ Loc. 0.76° 05' 05", N. 42° 02' 05"; range, 50; system, composite (v. t. telephone); hours, 7.30-8.30 p. m. Monday, Tuesday, and Wednesday; 7-7.30 p. m. Thursday, Friday, and Saturday; 6.30-7.30 p. m. Sunday.

⁹ Loc. 0.122° 25' 27", N. 47° 15' 27"; range, 100; system, composite (v. t. telephone); hours, 3-5 and 7.30-7.30 p. m.; rates, none.

¹⁰ Range, 300; system, composite (v. t. telephone); hours, 6-7.30 p. m. Monday, Wednesday, and Friday, 6-9 p. m. Tuesday, Thursday, and Saturday, and every afternoon from 12 noon-2 p. m.; rates, none.

¹¹ Loc. (approximately) 0.95° 00' 00", N. 35° 15' 11"; range, 100; system, composite (v. t. telephone and telegraph); rates, none.

¹² Range, 100; system, De Forest (v. t. telephone and telegraph); rates, none.

¹³ Loc. (approximately) 0.90° 50' 00", N. 40° 25' 00"; range, 50; system, composite (v. t. telephone); hours, 3-4 and 7-9.45 p. m.; rates, none.

¹⁴ Loc. 0.37° 22' 25", N. 37° 40' 13"; range, 300; system, composite (v. t. telephone); rates, none.

¹⁵ Loc. (approximately) 0.70° 00' 00", N. 41° 14' 40"; range, 250; system, composite (v. t. telephone); rates, none.

¹⁶ Loc. 0.90° 55' 40", N. 41° 05' 00"; range, 100; system, composite (v. t. telephone); rates, none.

¹⁷ Loc. 0.82° 05' 05", N. 39° 55' 00"; range, 25; system, De Forest (v. t. telephone); hours, 7-8.30 p. m.; rates, none.

Note.—Time for above hours is local.

Commercial ship stations, alphabetically by names of vessels.

Additions to the List of Radio Stations of the United States, edition of June 30, 1921, and to the International List of Radiotelegraph Stations published by the Bureau.

Name of vessel.	Call signal.	Rates.		Service.	Hours.	Owner of vessel.	Station controlled by.
		North and South American service	Trans-oceanic service				
A. A. Augustus ¹	KDXQ	Cents.	Cents.	PG	X	Pioneer S. S. Co.	R. C. of A.
Amazon	KDXP			PG	X	do.	Do.
Australia	KDXO			PG	X	do.	Do.
Bermice	KDYF					R. H. Arnold	
Boy Scout	KDYG					Waldo H. Brown	
Californian	KDYD	8	8	PG	X	American - Hawaiian S. S. Co.	
Coastwise ¹	KUZ	8	8	PG	X	Coastwise Transportation Co.	Do.
Columbia	WIR			PG		Pacific S. S. Co.	
E. P. Pierce ¹	KDXL			PG	X	Pioneer S. S. Co.	Do.
Frank Billings	KDXM			PG	X	do.	Do.
F. R. Hazard ¹	KDXK			PG	X	do.	Do.
G. A. Tomlinson ¹	KDXJ			PG	X	do.	Do.
Harold B. Nye ¹	KDXS			PG	X	do.	Do.
Images	KDYH					International Pathways Co.	
James P. Walsh ¹	KDXW			PG	X	Pioneer S. S. Co.	Do.
J. J. Sullivan	KDXV			PG	X	do.	Do.
John Stanton	KDXT			PG	X	do.	Do.
Joseph G. Butler, Jr.	KDXU			PG	X	do.	Do.
J. T. Hutchinson	KDXN			PG	X	do.	Do.
Levinthian ²	KDXH	8	8	PG	X	U. S. Shipping Board	I. W. T. Co.
Martin Mullen ²	KDXY			PG	X	Pioneer S. S. Co.	R. C. of A.
Price McKinney ²	KDXR			PG	X	do.	Do.
Oriental	KDXI	8	8	PG	X	U. S. Shipping Board	Do.
Polynesia ²	KDXN			PG	X	Pioneer S. S. Co.	Do.
Reliance	KDYE			PG	N	Atlantic Mail Corp.	
Resolute	KDYA			PG	N	do.	
Spray ²	KDYB			PG	X	John F. Gray	Owner of vessel.
Viking	KDYU			PG	X	George E. Billings	
Western World	KDYI	8	8	PG	N	U. S. Shipping Board	
William A. Payne ¹	KDXZ			PG	X	Pioneer S. S. Co.	R. C. of A.

¹ Range, 150; system, R. C. of A., 1,000; w. l., 300, 600; rates, Great Lakes service, 7 c. per word.

² Range, 300; system, Navy R. C. of A., 1,000; w. l., 300, 450, 600.

³ Range, 300; system, Fishbaken, 1,000; w. l., 300, 600.

⁴ Range, 50; system, composite (v. l.) and composite spark, 1,600; w. l., 300, 450, 600; rates, none.

Commercial land and ship stations, alphabetically by call signals.

[b=ship station, c=land station.]

Call signal.	Name.	Call signal.	Name.
KDXH	Levinthian.....	KDXZ	William A. Payne.....
KDXI	Oriental.....	KDYA	Resolute.....
KDXJ	G. A. Tomlinson.....	KDYB	Spray.....
KDXK	F. R. Hazard.....	KDYC	Viking.....
KDXL	E. P. Pierce.....	KDYD	Californian.....
KDXM	Frank Billings.....	KDYE	Reliance.....
KDXN	Polynesia.....	KDYF	Bermice.....
KDXO	Australia.....	KDYG	Boy Scout.....
KDXP	Amazon.....	KDYH	Images.....
KDXQ	A. A. Augustus.....	KDYI	Western World.....
KDXR	Price McKinney.....	KEA	Soldotia, Alaska.....
KDXS	Harold B. Nye.....	KEN	San Diego, Calif.....
KDXT	John Stanton.....	KFI	Los Angeles, Calif.....
KDXU	Joseph G. Butler, Jr.....	KOB	Tacoma, Wash.....
KDXV	J. J. Sullivan.....	RHD	Colorado Springs, Colo.....
KDXW	James P. Walsh.....	KHI	Los Angeles, Calif.....
KDXX	J. T. Hutchinson.....	KJC	Los Angeles, Calif.....
KDXY	Martin Mullen.....	KNI	Kureka, Calif.....

Commercial land and ship stations, alphabetically by call signals—Continued.

Call signal.	Name.	Call signal.	Name.
KNJ	Rogwell, N. Mex.	WAAY	Youngstown, Ohio.
KNN	Los Angeles, Calif.	WAAZ	Emporia, Kans.
KNB	Los Angeles, Calif.	WBAA	West Lafayette, Ind.
KNT	Aberdeen, Wash.	WBAB	Syracuse, N. Y.
KNV	Los Angeles, Calif.	WBAD	Minneapolis, Minn.
KOB	State College, N. Mex.	WBAE	Peoria, Ill.
KOE	Spokane, Wash.	WBAF	McCordsville, N. J.
KOF	Reno, Nev.	WBAF	Bridgeport, Pa.
KON	San Diego, Calif.	WBAH	Minneapolis, Minn.
KOQ	Modesto, Calif.	WBAJ	Toledo, Ohio.
KPO	San Francisco, Calif.	WBAK	Harrisburg, Pa.
KQP	Rock River, Oreg.	WBAL	Savannah, Ga.
KRQ	San Jose, Calif.	WBAM	New Orleans, La.
KSS	Long Beach, Calif.	WBAN	Paterson, N. J.
KPW	Seattle, Wash.	WBAO	Decatur, Ill.
KUR	Los Angeles, Calif.	WBAP	Fort Worth, Tex.
KUY	El Monte, Calif.	WBAQ	South Bend, Ind.
KUZ	Coastwise	WBAR	Orange, Tex.
KVT	Los Angeles, Calif.	WBAS	Orange Field, Tex.
KVU	San Diego, Calif.	WBAT	Tulsa, Okla.
KWH	Los Angeles, Calif.	WBAU	Hamilton, Ohio.
KXD	Modesto, Calif.	WBAY	Columbus, Ohio.
KXN	Los Angeles, Calif.	WBAW	Marietta, Ohio.
EYF	San Diego, Calif.	WBAX	Wilkes-Barre, Pa.
KZC	Seattle, Wash.	WBAZ	New York, N. Y.
KZI	Los Angeles, Calif.	WBAZ	Richmond, Va.
KZN	Salt Lake City, Utah	WBL	Anthony, Kans.
WAAB	New Orleans, La.	WBC	Minneapolis, Minn.
WAAC	New Orleans, La.	WCK	St. Louis, Mo.
WAAD	St. Louis, Mo.	WDC	Tulsa, Okla.
WAAP	Chicago, Ill.	WDE	St. Louis, Mo.
WAAC	Shreveport, La.	WDF	Columbia.
WAAC	St. Paul, Minn.	WEG	Cincinnati, Ohio.
WAAT	Elke, Ky.	WFI	Granville, Ohio.
WAAT	Boston, Mass.	WFM	Anderson, Ind.
WAAT	Milwaukee, Wis.	WFO	Auburn, Me.
WAAL	Minneapolis, Minn.	WGE	Akron, Ohio.
WAAM	Newark, N. J.	WGI	Ames, Iowa.
WAAN	Columbia, Mo.	WGF	Kansas City, Mo.
WAAP	Charlestown, W. Va.	WPI	Chardfield, Pa.
WAAP	Wichita, Kans.	WPI	Philadelphia, Pa.
WAAR	Greenwich, Conn.	WPL	Zanesville, Ohio.
WAAR	Huntington, W. Va.	WRF	Marton, Mass. (Metropolitan).
WAAS	Decatur, Ga.	WRT	New Brunswick, N. J. (Bound Brook).
WAAY	Athens, Ohio.	WBN	Norfolk, Va.
WAAY	Omaha, Neb.	WTG	Manhattan, Kans.
WAAX	Crafton, Pa.		

Government land stations, alphabetically by names of stations.

[Additions to the List of Radio Stations of the United States, edition of June 30, 1921, and to the International List of Radiotelegraph Stations published by the Bureau.]

Station.	Call signal.	Wave lengths.	Service.	Hours.	Station controlled by—
Amagansett, N. Y. (regular station). ¹	NBM	200, 275, 1851.	G	N	U. S. Navy.
Jupiter, Fla. (radio (compass station)). ²	NAQ	200.	PG	X	Do.

¹ 11-00. 0-72° 08' 12" N. 40° 58' 18" W; range, 200; system, U. S. Navy spark.

² Loc. 8-40° 54' 57" N. 26° 58' 58" W; range, 150; system, U. S. Navy spark.

Note.—Wave lengths in italics (this table only) are used for "listening in."

Government ship stations, alphabetically by names of stations.

[Additions to the List of Radio Stations of the United States, edition of June 30, 1921, and to the International List of Radiotelegraph Stations published by the Bureau.]

Station.	Call signal.	Station controlled by—
Appl.	NUPP	U. S. Navy.

¹ System, U. S. Navy; w. l., 300, 600; service PG; hours, N.

Government land and ship stations, alphabetically by call signals.

[b=ship station; c=land station.]

Call signal.	Name of station.	Call signal.	Name of station.
NAQ NBM	Jupiter, Fla. (radio compass).....c Amagansett, N. Y. (regular station)....c	NUDE	Apo.....b

Special land stations, alphabetically by names of stations.

(Additions to the List of Radio Stations of the United States, edition of June 30, 1922.)

Station.	Call signal.	Wave lengths.	Station controlled by—
Hay St. Louis, Miss.....	5ZAU	400, 375.....	Hubert E. De Ben, Front Street.
Birmingham, Ala.....	6ZAS	400, 375.....	John C. Hall, 1128 Eleventh Street, North Birmingham, Ala.
Crete, Nebr.....	0YU	400, 375.....	Duane College.
Gloucester, Mass.....	1XI	Variable.....	John Hays Hammond, jr.
Greencastle, Ind.....	0YJ	400, 375.....	De Pauw University.
Hoboken, N. J. (car No. 782).....	2XAJ	225, 275.....	Dunwade, Lackawanna & Western R. R. Co.
Houston, Tex.....	5XO	400, 375.....	George Mc. Douglas, 411 West Twenty- third Street.
Lewisburg, Pa.....	8XX	400, 375.....	Bucknell University.
Los Angeles, Calif.....	6XL	Variable from 400-350.	General Petroleum Research Labo- ratory, 2528 East Thirty-seventh Street.
New Orleans, La.....	5YU	400, 375.....	Tulane University.
Oklahoma City, Okla.....	5ZAT	400, 375.....	Lowell G. Dill, 112 West Fifth Street.
Philadelphia, Pa.....	5XA	250, 275.....	Howard R. Miller, 6313 North Park Avenue.
Portland, Oreg.....	7YN	400, 375.....	Franklin High School, Fifty-fourth Street and Twenty-ninth Avenue.
San Francisco, Calif.....	6ZW	400, 375.....	Harold R. Shaw, 807 California Street. L

Special land stations, grouped by districts.

Call signal.	District and station.	Call signal.	District and station.
1XI	First district: Gloucester, Mass.	6XL	Sixth district:
2XAJ	Second district: Hoboken, N. J. (car No. 782).	6ZW	Los Angeles, Calif.
3XA	Third district: Philadelphia, Pa.	7YN	San Francisco, Calif.
	Fifth district:	8XX	Seventh district: Portland, Oreg.
5XO	Houston, Tex.		Eighth district: Lewisburg, Pa.
5YU	New Orleans, La.	9YJ	Ninth district:
6ZAS	Birmingham, Ala.	9YU	Greencastle, Ind.
5ZAT	Oklahoma City, Okla.		Crete, Nebr.
5ZAU	Hay St. Louis, Miss.		

ALTERATIONS AND CORRECTIONS.

COMMERCIAL LAND STATIONS.

AKUTAN, ALASKA.—System, Kilbourne & Clark, 1000.

ATLANTA, GA. (WGM).—Range, 100; system, comp. (v. l. telephone); w. l., 360, 485; hours, 3.30-4, 6-6.30, and 9-9.30 p. m.; station operated and controlled by Georgia Railway & Power Co. (Atlanta Constitution).

BARNEGAT, N. J. (Tuckerton) (WCI).—Range, 4000.

CHARLOTTE, N. C.—W. l., 360, 485.

CHICAGO, ILL. (WGO).—Strike out all particulars.

CLEVELAND, OHIO (WCX).—Strike out all particulars.

- DES MOINES, IOWA (WGF).—Loc. $0.93^{\circ} 37' 00''$, N. $41^{\circ} 35' 00''$ (approximately); range, 150; system, composite (v. t. telephone); hours, 11 a. m.—10.30 p. m.; rates, none.
- DETROIT, MICH. (WDR).—Strike out all particulars.
- EGGLIK, ALASKA.—Loc. (approximately) $0.157^{\circ} 16' 00''$, N. $58^{\circ} 16' 00''$.
- EKUK, ALASKA.—Loc. (approximately) $0.156^{\circ} 30' 00''$, N. $56^{\circ} 49' 00''$.
- EL DORADO, KANS. W. I., 360, 485, 1610.
- ERIE, PA. (WJT).—Hours, 6.45—9.30 p. m. daily.
- FALSE PASS, ALASKA.—Range, 200; system, Kilbourne & Clark, 1000.
- FRANKFORT, MICH.—Hours, 8 a. m.—12 noon; 1-5 p. m.; 8 p. m.—12 midnight; and 1-5 a. m.
- HAWK INLET, ALASKA.—Range, 150.
- INDIANAPOLIS, IND. (WLK).—Loc. (approximately) $0.86^{\circ} 09' 00''$, N. $39^{\circ} 46' 00''$; w. l., 360, 485.
- KENAI, ALASKA.—Rates, to Anchorage, Alaska, 10 c. per word; minimum per radiogram, \$1.
- KOGGING, ALASKA (KVV).—Range, 300; w. l., 300, 450, 600, 1600.
- NEWARK, N. J. (WOR).—Loc. $0.74^{\circ} 10' 08''$, N. $40^{\circ} 44' 15''$; range, 200.
- NEW ORLEANS, LA. (WGV).—Loc. $0.30^{\circ} 04' 10''$, N. $29^{\circ} 56' 59''$; range, 150; hours, 12 noon—1 p. m. and 7—10 p. m.
- NEW YORK, N. Y. (WHB).—Strike out all particulars.
- NEW YORK, N. Y. (WHI).—System, composite, 480.
- NEW YORK, N. Y. (WWZ).—Loc. $0.73^{\circ} 59' 31''$, N. $40^{\circ} 53' 50''$; range, 100; system composite (v. t. telephone); hours, X.
- PHILADELPHIA, PA. (WHE).—Hours, 9 a. m.—6 p. m.
- ROCKLAND, ME.—Service PG and PR; rates, ship service (PG) 8 c. per word; PR, service to Swans Island, Me., 3 c. per word.
- TAMPA, FLA.—W. I., 300, 600.
- WASHINGTON, D. C. (WMCU).—Hours, 4.30—5.30 p. m. daily and 7.30—9 p. m. on Thursdays.

COMMERCIAL SHIP STATIONS, ALPHABETICALLY BY NAMES OF VESSELS.

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1921, and to the International List of Radiotelegraph Stations, published by the Bureau.]

- ALLIANCE.—Hours, N; rates, North and South American and transoceanic services, 8 c. per word.
- AMELIA.—System, R. C. of A., 1000; w. l., 300, 450, 600; station operated and controlled by I. W. T. Co.
- ANNETTA.—Station operated and controlled by I. W. T. Co.
- AVALON (KIZL).—Hart-Wood Lumber Co., owner of vessel.
- BANTU.—Range, 300; system, R. C. of A., 480; w. l., 300, 450, 600.
- BARACOA.—W. I., 300, 450, 600.
- BEAR TRIANGLE.—Range, 300; system, Navy-Wireless Specialty Apparatus Co., 1000; w. l., 300, 450, 600.
- BOLIVAR.—System, Navy-R. C. of A., 1000; w. l., 300, 450, 600.
- BREMERTON.—System, Navy-Kilbourne & Clark, 1000; station operated and controlled by I. W. T. Co.
- BRISTOL.—Station operated and controlled by R. C. of A.
- BROOKDALE.—Crosby Marine Corp. owner of vessel.
- BYRON D. BENSON.—Range, 300; system, R. C. of A., 1000; w. l., 300, 450, 600.
- C. A. SMITH.—Pacific States Lumber Co. owner of vessel.
- CATHAY.—Range, 300; system, R. C. of A., 1000; w. l., 300, 450, 600; hours, N.

- CATHWOOD.—Range, 300; w. l., 300, 600.
- CENTENNIAL STATE.—Name changed to President Adams.
- CHARLTON HALL.—Range, 150; system, R. C. of A., 1000.
- CIRCINUS.—System, R. C. of A., 480; w. l., 300, 450, 600.
- CITY OF ST. JOSEPH.—W. l., 300, 450, 600.
- CLAUSEUS.—System, R. C. of A., 480; w. l., 300, 450, 600.
- COEUR D'ALENE.—W. l., 300, 450, 600.
- CORA F. CRESSY.—A. W. Frost owner of vessel.
- COTTONPLANT.—Pacific States Lumber Co. owner of vessel.
- CRAIGDOWNE.—Name changed to Penobscot; station operated and controlled by R. C. of A.
- DANIEL KERN.—Range, 150; system, Kilbourne & Clark, 1000; w. l., 300, 450, 600; rates, 6 c. per word.
- EASTERN TRADER.—Station operated and controlled by R. C. of A.
- EDITOR.—Range, 300; system, Navy-Kilbourne & Clark, 1000; w. l., 300, 450, 600.
- EGREMONT.—System, Navy-Marconi, 1000.
- EL ALBA.—W. l., 300, 600.
- E. L. DORENY, THIRP.—W. l., 300, 450, 600.
- EL OCCIDENTE.—Range, 150.
- FORT WAYNE.—System, Navy-Marconi, 1000; w. l., 300, 450, 600; hours, X.
- HAMPDEN.—Station operated and controlled by R. C. of A.
- H. M. WHITNEY.—Whitney S. S. Corp. owner of vessel.
- ILLINOIS (WCZ).—Goodrich Transit Co. owner of vessel.
- INNOKO.—W. l., 300, 450, 600; station operated and controlled by I. W. T. Co.
- INVADER.—Range, 150; system, R. C. of A., 1000; w. l., 300, 600; service, PG; hours, X.
- ITALIA.—Station operated and controlled by R. C. of A.
- JACOB LUCKENBACH.—Range, 300; system, Federal arc; w. l., 300, 600, 1800; rates, North and South American and transoceanic services, 4 c. per word.
- JEFFERSON (KOD).—Range, 300; system, R. C. of A., 1000; w. l., 300, 450, 600; hours, X; rates, North and South American and transoceanic services, 5 c. per word; station operated and controlled by R. C. of A.
- JORANNA SMITH.—Pacific States Lumber Co. owner of vessel.
- KEROSKEE.—Range, 200; system, Navy-Simon, 1000; w. l., 300, 450, 600.
- KERESASTA.—Strike out all particulars.
- KERMANSBAH.—Strike out all particulars.
- KERMOOR.—Strike out all particulars.
- K. I. LUCKENBACH.—W. l., 300, 450, 600; hours, X.
- KING AND WINGE.—Strike out all particulars.
- LAKE GILTEDGE.—System, Navy-Marconi, 1000.
- LONE STAR STATE.—Name changed to President Taft.
- LYDIA.—W. l., 300, 450, 600.
- MANDARIN.—Name changed to Stuart Dollar; range, 300; system, R. C. of A., 1000; w. l. 300, 450, 600; station operated and controlled by R. C. of A.
- MIDDLESEX.—Station operated and controlled by R. C. of A.
- MOUNT SEWARD.—Strike out all particulars.
- MOUNT STERLING.—Strike out all particulars.
- NEW HAMPSHIRE.—Range, 150; system, Cutting & Washington, 1000; w. l., 300, 600; hours, X; rates, North and South American and transoceanic services, 8 c. per word.
- NEW HAVEN.—Range, 150; system, Cutting & Washington, 1000; w. l., 300, 600; rates, North and South American and transoceanic services, 8 c. per word.
- NEWPORT.—Range, 200; system, Kilbourne & Clark, 1000.
- NORFOLK.—Station operated and controlled by R. C. of A.
- ORCUB.—W. l., 300, 450, 600.

- PATRICK HENRY.—System, R. C. of A., 1000.
 PAWLET.—System, Navy-R. C. of A., 1000.
 QUAKER CITY.—System, Navy-Wireless Specialty Apparatus Co., 1000.
 RAFAEL.—Rajah S. S. Co. owner of vessel.
 RAYO.—System, R. C. of A., 1000; w. l., 300, 600.
 REAPER.—Range, 200; system, I. W. T. Co., 1000; w. l., 300, 450, 600.
 RED CLOUD.—Strike out all particulars.
 REPUBLIC.—Station operated and controlled by I. W. T. Co.
 RICHARD PECK.—Range, 150; system, Cutting & Washington, 1000; w. l., 300, 600; rates, North and South American and transoceanic services, 8 c. per word.
 ROBIN GOODFELLOW.—W. l., 300, 600.
 RUTH ALEXANDER.—Range, 300; system, Navy-Lowenstein, 1000; w. l., 300, 450, 600.
 RUTH E. MERRILL.—A. W. Frost owner of vessel.
 SAG HARBOR.—W. l., 300, 450, 600.
 SANTA BARBARA.—Range, 150; system, R. C. of A., 1000.
 SANTA CRUZ.—System, R. C. of A., 1000; w. l., 300, 450, 600.
 SATHUMA.—Range, 150; system, R. C. of A., 1000; w. l., 300, 450, 600; hours, N.
 SCOTTSBURG.—System, Navy-R. C. of A., 1000; w. l., 300, 450, 600.
 SEACONNET.—Range, 150; system, R. C. of A., 1000; w. l., 300, 600.
 SECURITY.—System, R. C. of A., 240.
 SHERMAN.—Station operated and controlled by I. W. T. Co.
 SNOQUALMIR.—Strike out all particulars.
 SONOMA.—Range, 300.
 SPRAY.—Range, 150; system, R. C. of A., 1000; w. l., 300, 450, 600; rates, North and South American and transoceanic services, 8 c. per word; station operated and controlled by R. C. of A.
 SPRINGFIELD.—Range, 300; system, Navy, 1000; w. l., 300, 450, 600.
 STAR OF LANLAND.—W. l., 300, 400, 600.
 SUFFOLK.—Station operated and controlled by R. C. of A.
 SUMOLCO.—Station operated and controlled by R. C. of A.
 SUNLSECO.—Station operated and controlled by R. C. of A.
 SURKO.—Station operated and controlled by R. C. of A.
 SUSANA.—Strike out all particulars.
 SUTRANCO.—Range, 300; system, Navy-Liberty, 1000; w. l., 300, 450, 600.
 TEXAS.—W. l., 300, 600.
 TIDEWATER.—System, R. C. of A., 1000; hours, N.
 TRANSPORTATION.—Range, 300; system, Navy-R. C. of A., 1000; w. l., 300, 450, 600; station operated and controlled by R. C. of A.
 UNDAUNTED (KDSJ).—G. F. Matthews owner of vessel.
 WELLINGTON.—Range, 150; system, R. C. of A., 1000.
 WEST CATANACR.—System, Navy-Wireless Specialty Apparatus Co., 1000; w. l., 300, 450, 600; hours, N; rates, North and South American and transoceanic services, 8 c. per word.
 WEST CHEROW.—Station operated and controlled by R. C. of A.
 WESTERN SCOUT.—System, Navy-Marconi, 1000; hours, N.
 WEST IVIS.—System, Navy-Marconi, 1000; w. l., 300, 450, 600.
 WEST JAFFREY.—Range, 300; station operated and controlled by S. O. R. S.
 WILLIAM GREEN.—Range, 300; system, R. C. of A., 1000.
 WOONSOCKET.—System, R. C. of A., 1000.
 W. S. REKEM.—Range, 300; system, R. C. of A., 1000; w. l., 300, 600.
 WYTHEVILLE.—Hours, N.

COMMERCIAL LAND AND SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS.

KDBL, *read* President Adams; KDWK, *read* President Taft; KDXD, *read* STREET Dollar; WXOI, *read* Penobscot; strike out all particulars following the call signals KDRO, KDVU, KLN, KNN, KQI, WCX, WDR, WGO, WGW, WHB, WJB, WJC, and WJEE.

GOVERNMENT LAND STATIONS, ALPHABETICALLY BY NAMES OF STATIONS.

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1921.]

NOTE. Wave lengths, in italics, cited below, for U. S. Navy stations are use 1 for "listening 12."

- AMAGANSSETT, N. Y. (radio compass station).—Loc. $0.72^{\circ} 08' 10''$, N. $40^{\circ} 57' 58''$.
 ANACOSTIA, D. C.—Range, 200; system, U. S. Navy (c. w.).
 ANNAPOLIS, MD. (NAK) (Naval Academy).—Range, 150; system, U. S. Navy, spark; w. l., strike out 600 and 975.
 ANNAPOLIS, MD. (NSS).—Range, 5000; system, U. S. Navy (c. w.); w. l. 7960, 3866, 10 110, 16 510, 17 145.
 ASTORIA, OREG.—System, U. S. Navy arc.
 BALBOA, C. Z.—Range, 300-3000; system, U. S. Navy spark and arc; w. l. (spark); 600, 975, 2250, 2400; w. l. (arc); 3950, 3860, 10 110, 16 510, 17 145.
 BALTIMORE, MD. Range, 80; system, U. S. Navy spark.
 BAR HARBOR, ME. (regular station).—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2400, 2760; w. l. (c. w.) 2750, 3750, 3950.
 BETHANY BEACH, DEL. (radio compass station).—Houra, N.
 BOSTON, MASS. (NAD).—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark); 600, 975, 1620; w. l. (c. w.), 3950, 5000.
 BUFFALO, N. Y.—Range, 200; system, U. S. Navy spark.
 CAPE HATTERAS, N. C. (regular station). System, U. S. Navy spark.
 CAPE MALA, PANAMA.—Range, 300, system, U. S. Navy spark.
 CAPE MAY, N. J. (regular station). Range, 150; system, U. S. Navy spark.
 CAYTE, P. J.—Range, 300-5000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2400, 2700; w. l. (c. w.), 3950, 5300, 9145, 11 500, 13 900.
 CAYEY, P. R. (El Cayey).—Range, 3,000; w. l., 9145, 10 110, 10 590.
 CHARLESTON, S. C.—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2250, 2400; w. l. (c. w.), 365, 3950, 4800.
 CHATHAM, MASS. (regular station).—Range, 200; system, U. S. Navy spark.
 CHICAGO, ILL. (NUR).—System, U. S. Navy spark; w. l. 600, 700.
 CLEVELAND, OHIO (NRH).—Range, 300-450; system, U. S. Navy spark and c. w.; w. l. (spark) 600, 1080; w. l. (c. w.), 2400, 3800, 4250.
 COCO SOLO, C. Z.—Range, 200; system, U. S. Navy c. w.; w. l., 607, 2750.
 COLON, C. Z.—Range, 300; system, U. S. Navy spark; w. l., 600, 975, 2750.
 CORDOVA, ALASKA.—Range, 300-2000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2400, 2700; w. l. (c. w.) 3950, 5950, 7100, 7500.
 DETROIT, MICH.—Range, 250; system, U. S. Navy spark; w. l., 600, 975.
 DULUTH, MINN.—Range, 200; system, U. S. Navy spark.
 DUTCH HARBOR, ALASKA.—Range, 300; system, U. S. Navy spark.
 EAGLE HARBOR, MICH.—System, U. S. Navy spark, w. l., 600, 700.
 EUREKA, CALIF. (regular station).—Range, 450-600; system, U. S. Navy spark and c. w.; w. l. (spark) 600, 975, 2650; w. l. (c. w.), 2400, 2650, 3950.
 GALVESTON, TEX.—System, U. S. Navy spark.
 GREAT LAKES, ILL.—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark) 600, 1988; w. l. (c. w.) 3800, 3950, 4900.
 GUAM, GUAM ISLAND.—Range 300-3500; system, U. S. Navy spark and c. w.; w. l. (spark) 600, 975, 2250, 2400; w. l. (c. w.) 3950, 6950, 9145, 11 500, 13 900.

- QUANTANAMO, CUBA.—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 150, 600, 975, 1870, 2400; w. l. (c. w.) 3950, 4525.
- HONOLULU, HAWAII (Pearl Harbor).—Range, 300-5000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2250; w. l. (c. w.) 9145, 9800, 11 500.
- HONOLULU, HAWAII (Heeia Point).—Range, 300-2500; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2250; w. l. (c. w.) 2400, 2650, 3950, 4800, 7900, 8875.
- INDIANHEAD, MD.—Range, 100; system, U. S. Navy spark; w. l. 365.
- JUNEAU, ALASKA.—Range, 450, system, U. S. Navy spark.
- JUPITER, FLA.—Range, 300; system, U. S. Navy spark.
- KETCHIKAN, ALASKA.—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 1870, 2400; w. l. (c. w.), 4525, 5000.
- KEY WEST, FLA., (regular station).—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 1988, 2400; w. l. (c. w.), 3950, 5700.
- KODIAK, ALASKA.—Range, 500; system, U. S. Navy spark.
- LAKEHURST, N. J.—Range, 200; system, U. S. Navy spark.
- LA PALMA, PANAMA.—Range, 300; system, U. S. Navy spark.
- MACKINAC ISLAND, MICH.—Range, 100; system, U. S. Navy spark.
- MANAGUA, NICARAGUA.—Range, 300; system, U. S. Navy spark.
- MANISTIQUE, MICH.—Range, 200; system, U. S. Navy spark; w. l., 600, 1080.
- MARSHFIELD, OREG.—Range, 300; system, U. S. Navy spark; w. l., strike out 2400.
- MIAMI, FLA.—Range, 300; system, U. S. Navy spark.
- MILWAUKEE, WIS.—System, U. S. Navy spark.
- MOBILE, ALA.—System, U. S. Navy spark.
- MOREHEAD CITY, N. C.—System, U. S. Navy spark.
- NAVASSA ISLAND, W. I.—Range, 150; system, U. S. Navy spark.
- NEW ORLEANS, LA. (NAT).—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 1832, 2400; w. l. (c. w.), 3950, 4600.
- NEWPORT, R. I.—Range, 300; system, U. S. Navy spark.
- NEW YORK, N. Y.—Range, 300; system, U. S. Navy spark.
- NOORVIK, ALASKA.—Loc. (approximately), 0.100° 00' 00", N. 67° 00' 00"; range, 275; system, U. S. Army; w. l., 1400; service, PR; hours, N.
- NOOPOLK, VA.—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 150, 600, 975, 1851, 2400; w. l. (c. w.), 3950, 5450.
- OLONGAPO, P. I.—System, U. S. Navy spark.
- PARIS ISLAND, S. C.—System, U. S. Navy spark.
- PASS A LOUTRE, LA.—Strike out all particulars.
- PEKING, CHINA.—Range, 1500; system, U. S. Navy spark and c. w.; w. l. (spark), 975, 1008; w. l. (c. w.), 3950, 4525.
- PENNACOLA, FLA.—Range, 300; system, U. S. Navy spark.
- PHILADELPHIA, PA.—Range, 300; system, U. S. Navy spark.
- POINT ISABEL, TEX.—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2250, 2400; w. l. (c. w.), 3950, 5000.
- PORT ARTHUR, TEX.—Range, 150; system, U. S. Navy spark.
- PORT AU PRINCE, HAITI.—Range, 300-600; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2250; w. l. (c. w.), 2250, 2400, 3825, 3950.
- PORT EADS, LA.—Range, 110; system, U. S. Army; w. l., 600, 1100; service, 0; hours, N.
- PORTLAND, ME.—Range, 300; system, U. S. Navy spark.
- PORTSMOUTH, N. H.—Range, 300; system, U. S. Navy spark.
- PUERTO OBALDIA, PANAMA.—Range, 300; system, U. S. Navy spark.
- PUGET SOUND, WASH.—Range, 300-2000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 1989; w. l. (c. w.), 3950, 5450, 7100, 7500, 7900.
- QUANTICO, VA.—Range, 150; system, U. S. Navy spark.

- SAN DIEGO, CALIF.—Range, 300-3000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 1988, 2400; w. l. (c. w.), 3650, 5200, 9800, 10 110, 11 500, 17 145.
- SAN DOMINGO, D. R.—Range, 300; system, U. S. Navy spark; w. l., 600.
- SAN FRANCISCO, CALIF. (regular station).—Range, 300-2500; system, U. S. Navy spark and c. w.; w. l. (spark), 150, 600, 975, 1908; w. l. (c. w.), 2400, 2900, 3950, 4650, 4800, 7100, 7900, 8375, 13 900, 17 145.
- SAN JUAN, P. R.—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2400, 2750; w. l. (c. w.), 3950, 5200.
- SAN PEDRO, CALIF.—Range, 300-600; system, U. S. Navy spark and c. w.; w. l. (spark), 150, 600, 975, 1851; w. l. (c. w.), 365, 2400, 2750, 3950, 4525.
- SAVANNAH, GA.—System, U. S. Navy spark.
- SAVVILLE, N. Y.—System, U. S. Navy c. w.; w. l., 9145, 10 516.
- SEATTLE, WASH.—Range, 200; system, U. S. Navy spark; w. l., strike out 975.
- SEWARD, ALASKA.—Range, 200; system, U. S. Navy spark.
- SITKA, ALASKA.—Range, 500-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2400, 2650; w. l. (c. w.), 3950, 4800.
- ST. AUGUSTINE, FLA.—Range, 300; system, U. S. Navy spark.
- ST. CROIX, V. I.—Range, 100; system, U. S. Navy spark.
- ST. GEORGE, ALASKA.—System, U. S. Navy spark.
- ST. PAUL, ALASKA.—Range, 300-1500; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2650; w. l. (c. w.), 3950, 5700.
- ST. PETERSBURG, FLA.—Range, 300-600; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2400, 2700; w. l. (c. w.), 2700, 3700, 3950; service, 0.
- ST. THOMAS, V. I.—Range, 150; system, U. S. Navy spark.
- TATGOSEH, WASH. (regular station).—Range, 450; system, U. S. Navy spark.
- TIEN-TSIN, CHINA.—Range, 400; system, U. S. Army; w. l., 600-1000; service, 0; hours, N.
- TUTUILA, SAMOA.—Range, 300-2300; system, U. S. Navy spark and c. w.; w. l. (spark), 600, 975, 2250, 2400; w. l. (c. w.), 3950, 4525.
- VLADIVOSTOK, RUSSIA.—Range, 1500; system, U. S. Navy, c. w.; w. l., 3950, 7000.
- WASHINGTON, D. C. (NAA) (Arlington, Va).—Range, 1000-1500; system, U. S. Navy spark and c. w.; w. l. (spark), 2650; w. l. (c. w.), 3950, 5950.
- WASHINGTON, D. C. (NAL) (Navy Yard).—Range, 300-1000; system, U. S. Navy spark and c. w.; w. l. (spark), 2650; w. l. (c. w.), 5950.
- WHITETISH POINT, MICH.—Range, 150; system, U. S. Navy spark.

GOVERNMENT SHIP STATIONS, ALPHABETICALLY BY NAMES OF VESSELS.

(Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1921.)

- Submarine chaser 295.—Strike out all particulars.
- Submarine chaser 301.—Strike out all particulars.

GOVERNMENT LAND AND SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS.

Strike out all particulars following the call signals, NBX, NOTC, and NOTL.

SPECIAL LAND STATIONS, BY NAMES OF STATIONS.

- ALDERSON, W. VA. (SYF).—Strike out all particulars.
- CHARLOTTE, N. C. (4XD).—W. l., 245, variable; address, Belvedere Ave.
- CHICAGO, ILL. (YAK).—Strike out all particulars.
- CHICAGO, ILL. (9ZN).—Address, 6433 Ravenswood Avenue.
- CINCINNATI, OHIO (8XAA).—Strike out all particulars.
- CLARINDA, IOWA (9ZAA).—Address, 216 North Sixteenth Street.
- COCHISE, ARIZ. (6 ZC).—Address, Box 24, Rancho de Casa Loma, Cochise, Ariz.

DETROIT, MICH. (8XAB).—Strike out all particulars.
 DETROIT, MICH. (8YJ).—Strike out all particulars.
 FOREST HILLS, PA. (8XZ).—Strike out all particulars.
 GALESBURG, ILL. (9XW).—Strike out all particulars.
 GLENRIDGE, N. J. (2XV).—Strike out all particulars.
 HOUSTON, TEX. (8ZO).—Address, 1918 Smith Street.
 JERSEY CITY, N. J. (2XAD).—Strike out all particulars.
 LANCASTER (2XW-tug).—Strike out all particulars.
 LANSING, MICH. (8XS).—Strike out all particulars.
 LOS ANGELES, CALIF. (6XD).—W. L., 275, 950; address, 637 South Hope Street.
 MANSFIELD, OHIO (8ZR).—Strike out all particulars.
 MARIETTA, OHIO (8ZT).—Strike out all particulars.
 MARION, MASS. (1ZE).—Address, 24 Allen Street.
 MIDDLETOWN, CONN. (1XAC).—Strike out all particulars.
 MIDDLETOWN, CONN. (1XN).—Station controlled by Wesleyan University.
 MINNEAPOLIS, MINN. (9XAO).—Strike out all particulars.
 MOSCOW, IDAHO (7ZM).—Address 107 Almon Street.
 NEW ORLEANS, LA. (5 YJ).—Strike out all particulars.
 NEW YORK, N. Y. (2XAF).—Strike out all particulars.
 NEW YORK, N. Y. (2XU).—Strike out all particulars.
 NEW YORK, N. Y. (2YB).—Strike out all particulars.
 NEW YORK, N. Y. (2YT).—Strike out all particulars.
 NUTLEY, N. J. —Strike out all particulars.
 OAKLAND, CALIF. (6XAM).—Address, 2201 Telegraph Avenue.
 PEORIA, ILL. (9XAF).—Strike out all particulars.
 PHILADELPHIA, PA. (3XAC).—Strike out all particulars.
 FORT RICHMOND, N. Y. (2XAA).—Strike out all particulars.
 ROCHESTER, N. Y. (8ZK).—Address, 600 Park Avenue.
 SAN FRANCISCO, CALIF. (8ZE).—Address, 1247 Forty-seventh Avenue.
 SAN JOSE, CALIF. (8ZAA).—Should read Los Angeles, Calif; address 747 Ottawa Street.
 SIOUX CITY, IOWA. (9ZF).—Strike out all particulars.
 SISCO No. 4 (2XAB-tug).—Strike out all particulars.
 SPRINGFIELD, OHIO. (8ZAA).—Address, 1119 South Fountain Avenue.
 WACO, TEX. (8ZAF).—Address, 723 North Thirteenth Street.
 WHEELING, W. VA. (8ZW).—Address, National Road.

MISCELLANEOUS.

LAND-STATION LICENSES.

All commercial land stations, experimental, and technical and training school stations are required to obtain a license before operating. The filing of the application or the assignment of radio call letters does not constitute authority for operating a station.

Paragraph 86 of the Regulations Governing Radio Communication, edition August 15, 1919, page 58, which authorized stations to be operated until the application for station license could be acted upon, was repealed on July 1, last. Owners of stations who fail to comply with the above requirements may expect action to be taken in accordance with the act of August 13, 1912, section 1.

APPLICATION FOR RADIO CALL LETTERS FOR SHIP STATIONS.

Application for radio call letters for ship radio stations should be made to radio inspectors or collectors of customs at the different ports and not to the office of this bureau in Washington. Application should be made at the time application is made for the official number or signal letters and not before such time.

DISTRIBUTION OF PUBLICATIONS.

The list of Commercial, Government, and Special Radio Stations is published annually as of July 1. Price, 15 cents.

The list of Amateur Radio Stations, not including Special Amateur Radio Stations, is published annually as of July 1. Price 15 cents.

The Radio Service Bulletin is published monthly, containing new commercial, Government and special stations, alterations and corrections, amendments to the Regulations Governing Radio Communication, short articles of interest to owners, and operators of radio stations, but does not include new amateur radio stations. Price, 5 cents per copy. Annual subscription price, 25 cents.

Radio Communication Laws of the United States, the International Radiotelegraphic Convention and Regulations Governing Radio Operators and the Use of Radio Apparatus on Ships and Land Stations. Price, 15 cents per copy.

All orders for the above publications and inquiries concerning them should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C.

Radio Stations of the World: Inquiries concerning the purchase of or subscription for the International List of Radio Stations of the World, the International List of Call Letters, and supplement thereto, should be addressed direct to the "International Bureau of the Telegraph Union, Radiotelegraph Service, Berne, Switzerland."

Do not make remittances to the Bureau of Navigation or to Radio Inspectors.

ALASKAN STATIONS OPENED.

The stations named below opened for the season, as follows:

Port Moller, Alaska (KWR), April 14, 1922.

Pirate Cove, Alaska (KONN), April 17, 1922.

Nelson Lagoon, Alaska (KXV), April 18, 1922.

Uyak, Alaska (KHA), April 25, 1922.

Kussilof, Alaska (KKAQ), May 2, 1922.

Chignik, Alaska (KHC), April 30, 1922.

INFORMATION FROM ROME BUREAU.

Italy.—Companies having accounts relative to radiograms exchanged between Italian ship stations operated by the Marconi Co. and foreign ship stations to forward their accounts to "Compagnia Internazionale Marconi per la Comunicazione Marittima, Rome, Via del Collegio Romano, 15. Accounts relative to radiograms exchanged between Italian ship station and land stations of other countries will be liquidated by the director general of electric services, telegraphic service, sixth bureau, Rome, as at present.

France.—The coast station at Mengam, near Brest, will in future communicate with vessels of the United States Shipping Board equipped with continuous wave apparatus.

Great Britain.—Effective January 1, last, the coast rate for the station at Poldhu is reduced to 1 franc, 35 centimes per word, no minimum.

Portugal.—The coast station at Porto is open for service.

DAILY POSITION OF VESSELS BY RADIO.

In addition to the list of stations published in the Radio Service Bulletin for last month, which receive position reports for transmission to New York, the following-named naval stations also receive such reports:

Station.	Call signal.	Station.	Call signal.
Bar Harbor, Me.....	NBD	Key West, Fla.....	NAR
Cape Hatteras, N. C.....	NDW	New Orleans, La.....	NAT
Jupiter, Fla.....	NAQ		

These reports will be forwarded "press collect," via Western Union to New York Commercial, Thirty-ninth Street, Ferry Building, Foot of Whitehall Street, New York, N. Y.

Position reports sent to naval stations other than those listed will not appear in the newspapers. Other stations may permit newspaper correspondents to obtain information from the reports on file, provided the correspondents, or their authorized messenger, calls personally in order that no expense or responsibility is incurred by the Navy.

REPORTING DERELICTS AND VESSELS IN DISTRESS.

It frequently happens that masters of vessels, when sighting derelicts or vessels in distress and in reporting them by radio fail to observe and report essential data as to the condition of the craft necessary before a search is begun by a United States Coast Guard cutter. In consequence of this neglect it frequently becomes necessary for the searching cutter to send radiograms in an effort to obtain the necessary information. To be complete, information concerning a derelict should state:

- (a) The general condition of the vessel.
- (b) Whether bottom up or awash.
- (c) Height of hull above water and any abnormal conditions as to buoyancy.
- (d) As to whether masts are standing, sails set, or otherwise.
- (e) Force and direction of wind.
- (f) Any observed current, its set and strength.

Similar descriptive information should also be furnished of vessels in distress. This information is necessary in order to determine roughly the direction and speed of drift of the derelict or vessel and also to give an idea of the appearance of the object sought.—From *Hydrographic Bulletin*, April 5, 1922.

ATTENTION OF ALL MASTERS.

Weather Bureau.—Masters of all vessels are reminded that all communications concerning weather should be forwarded to the Weather Bureau, Washington, D. C., and if sent by radio or telegraph should be addressed "Gov't Observer."

Under the subject "Weather" should be included all information of a meteorological nature, including reports on barometric pressures, winds, force and direction, and movements of all air strata. Forms and instructions for reports can be obtained from the Weather Bureau, Washington, D. C.

Hydrographic Office.—All hydrographic information which includes reports on ice, wrecks, derelicts, floating obstructions, and important changes in aids to navigation, should be addressed to the Hydrographic Office and any of its branch offices by mail, and to any of the following naval radio stations by radio, addressed "Gov't Hydro."

U. S. naval radio stations.	Call letters.	U. S. naval radio stations.	Call letters.
<i>Atlantic Ocean.</i>		<i>Pacific Ocean.</i>	
Boston.....	NAD	Balboa.....	NBA
New York.....	NAH	San Francisco.....	NPF
Philadelphia.....	NAL	North Head.....	NPE
Norfolk.....	NAM	Seattle.....	NVI
Baltimore.....	NBZ	<i>Great Lakes.</i>	
Charleston.....	NAO	Duluth.....	NIX
New Orleans.....	NAT	Chicago.....	NVR
Galveston.....	NKB	Buffalo.....	NNZ
St. Thomas, Virgin Islands.....	NAV	Cleveland.....	NRH
San Juan.....	NBH		
Navassa Island.....	NAW		
Guantanamo, Cuba.....	NKC		
Colon.....	NAX		

—From *Hydrographic Bulletin*, April 13, 1922.

FIRE UNDERWRITERS REVISING REQUIREMENTS FOR RADIO INSTALLATIONS.

Everyone who is concerned with electrical installations of any kind is familiar with the National Electrical Code, which embodies the regulations made by the National Board of Fire Underwriters to insure the safety of buildings or other structures in which electrical installations of any kind have been made. Buildings in which the electrical installations do not meet the underwriters' requirements are ordinarily either refused any insurance whatever, or insurance is carried only at a much higher premium. Rule 86 of the National Electrical Code covers the safety requirements for radio installations. The code is now in course of revision, and the recent developments in radio communication have made imperative a number of important changes in rule 86.

A committee has been considering a revised form of rule 86 to be recommended to the National Board of Fire Underwriters for adoption, and a tentative form of this rule has recently been published by the National Board of Fire Underwriters through its bulletin *Safeguarding America Against Fire*. The committee of the National Fire Protection Association, which has given consideration to this matter, includes representatives of amateur, commercial and Government radio interests, operating electric light companies, and operating telephone companies.

Some important changes have been made in drawing up the new tentative requirements. The Bureau of Standards has prepared a mimeographed circular containing the new tentative requirements, together with a discussion by Bureau of Standards engineers. The National Fire Protection Association and all others interested desire that any person who has suggestions which would be of help in determining the requirements which will be decided on finally, in the course of a few months, send in their suggestions for consideration to William S. Boyd, chairman, 175 West Jackson Boulevard, Chicago, Ill. Such suggestions should be received before September 1, 1922.

Any person who has real use for a copy of the mimeographed circular of the Bureau of Standards can secure a copy by sending a request for Bureau of Standards Letter Circular 62, "Proposed revision of rule 86 of the National Electrical Code on radio equipment," to the Bureau of Standards, Washington, D. C. *Submitted by Bureau of Standards.*

METHODS OF RADIO DIRECTION FINDING.

There are two distinct methods of using the radio direction finder as an aid to navigation to enable a ship to locate its position. In one system radio signals are transmitted from stations located on the shore and are received with radio direction finders located on the ship. In the other system the ship which desires to know its position transmits radio signals which are received at a number of radio compass stations located on shore, and the bearings observed at these shore radio compass stations are plotted and the ship notified as to its position by radio. Each of these methods has some particular advantages under certain conditions, and it is important that the proper method be used for each kind of service for which radio direction finding is employed.

The Bureau of Standards has recently issued a mimeographed circular which summarizes the advantages and disadvantages of each of these methods. This is Bureau of Standards Letter Circular 56, by P. W. Dunmore, "Methods of Radio Direction Finding as an Aid to Navigation: The Relative Advantages of Locating the Direction Finder on Shore and on Shipboard." Any person who is actively interested in radio direction finding work and has real use for this circular can obtain a copy of this Letter Circular 56 by addressing a request to the Bureau of Standards, Washington, D. C.—*Submitted by Bureau of Standards.*

PUBLICATIONS ON SIMPLE HOME-MADE RECEIVING SETS.

Inquiries are received at the Bureau of Standards for information regarding the construction of a simple receiving set which any person can construct in the home from materials which can be easily secured. Such inquiries have been particularly frequent recently, since the broadcasting by radio of market reports has been undertaken by the Bureau of Markets and Crop Estimates of the United States Department of Agriculture. In connection with the broadcasting of market reports, the Bureau of Markets and Crop Estimates has also received many inquiries for information regarding receiving sets. At the request of the Bureau of Markets and Crop Estimates, the Bureau of Standards has undertaken the preparation of a series of publications describing very simple radio receiving sets which can be made in the home. The first publication of this series describes a very simple single-circuit crystal detector set, having an inductance coil which is variable by steps and no condenser. Information is given concerning the construction and assembling of the various parts of the set, including the methods and materials required for constructing the variable inductor or tuning coil. The total cost of the material required for making this set, including a single telephone receiver, need not exceed \$10. This simple set will receive satisfactorily over comparatively short distances, but can not be expected to give the results which may be obtained with more elaborate sets, such as those containing electron tubes. This publication is Bureau of Standards Circular 120, Construction and Operation of a Simple Home-made Radio Receiving Outfit. This circular may be purchased for 5 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

The second publication of this series will be ready within a few weeks and will describe a two-circuit set equipped with a variable coupler. This set, of course, has greater selectivity than the single-circuit set. Most of the equipment of the simple-circuit set can be used in constructing the two-circuit set. This second publication is Bureau of Standards Circular —, Construction and Operation of a Two-Circuit Radio Receiving Equipment with Crystal Detector. Copies of this publication may be purchased for 5 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C. *Submitted by the Bureau of Standards.*

List of stations broadcasting market or weather reports (485 meters) and music, concerts, lectures, etc. (360 meters), alphabetically by call letters.

Call signal.	Owner of station.	Location of station.	Wave lengths.
KDKA	Westinghouse Electric & Manufacturing Co.	East Pittsburgh, Pa.	360
KDN	Leo J. Meyberg Co.	San Francisco, Calif.	360, 485
KDPT	Southern Electrical Co.	San Diego, Calif.	360
KFC	Northern Radio & Electric Co.	Seattle, Wash.	360
KFI	Earl C. Anthony.	Los Angeles, Calif.	360
KFU	The Precision Shop.	Gridley, Calif.	360
KFV	Foster-Bradbury Radio Store.	Yakima, Wash.	360
KFZ	Doerr-Mitchell Electric Co.	Spokane, Wash.	360
KGH	Wm. A. Mullins Electric Co.	Tacoma, Wash.	360
KGC	Electric Lighting Supply Co.	Hollywood, Calif.	360
KGF	Pomona Fixture & Wiring Co.	Pomona, Calif.	360
KGG	Hallbeck & Watson Radio Service.	Portland, Oreg.	360
KGN	Northwestern Radio Manufacturing Co.	do.	360
KGO	Altacons Radio Laboratory.	Altadena, Calif.	360
KGU	Marion A. Mulroey.	Honolulu, Hawaii.	360
KGW	Oregonian Publishing Co.	Portland, Oreg.	360
KGY	St. Martins College (Rev. S. Ruth).	Lacey, Wash.	360
KHD	C. F. Aldrich Machle & Granite Co.	Colorado Springs, Colo.	485
KHU	C. R. Elecraft & Co.	Los Angeles, Calif.	360
KHQ	Louis Wagner.	Seattle, Wash.	360
KJC	Standard Radio Co.	Los Angeles, Calif.	360
KJI	The Radio Shop.	Bunnyvale, Calif.	360
KJQ	C. O. Gould.	Stockton, Calif.	360
KJR	Vincent I. Krutz.	Seattle, Wash.	360, 485
KJS	Bjñe Institute of Los Angeles.	Los Angeles, Calif.	360

List of stations broadcasting market or weather reports (485 meters) and music, concerts, lectures, etc. (560 meters), alphabetically by call letters—Continued.

Call signal.	Owner of station.	Location of station.	Wave lengths.
KLB	J. J. Dunn & Co.	Pasadena, Calif.	360
KLN	Noggle Electric Works	Monterey, Calif.	360
KLF	Colin B. Kennedy Co.	Los Altos, Calif.	360
KLG	Warner Brothers	Oakland, Calif.	360
KLZ	Reynolds Radio Co.	Denver, Colo.	360, 485
KMC	Lindsay-Weatherill & Co.	Redley, Calif.	360
KMJ	San Joaquin Light & Power Corp.	Fresno, Calif.	360
KMO	Love Electric Co.	Tacoma, Wash.	360
KNI	T. W. Smith	Eureka, Calif.	360
KNJ	Roosevelt Public Service Co.	Roswell, N. Mex.	360
KNN	Bullcock's	Los Angeles, Calif.	360
KNR	Heacen Light Co.	do	360
KNT	North Coast Products Co.	Aberdeen, Wash.	360
KNV	Radio Supply Co.	Los Angeles, Calif.	360
KOA	Young Men's Christian Association	Denver, Colo.	465
KOB	New Mexico College of Agriculture & Mechanic Arts	State College, N. Mex.	360, 485
KOE	Spokane Chronicle	Spokane, Wash.	360
KOG	Western Radio Electric Co.	Los Angeles, Calif.	360
KOJ	University of Nevada	Reno, Nev.	360
KON	Holzwasser (Trn.)	San Diego, Calif.	360
KOP	Detroit Police Department	Detroit, Mich.	360
KOQ	Modesto Evening News	Modesto, Calif.	360
KPO	Hale Brothers	San Francisco, Calif.	360
KQL	Arno A. Kluge	Los Angeles, Calif.	360
KQP	Rise Diamond Electric Co.	Head River, Oreg.	360, 485
KQT	Electric Power & Appliance Co.	Yakima, Wash.	360
KQV	Doubleday-Hill Electric Co.	Pittsburgh, Pa.	360
KQW	Charles D. Harvold	San Jose, Calif.	360
KQY	Stubbs Electric Co.	Portland, Oreg.	360
KRE	Maxwell Electric Co.	Berkeley, Calif.	360
KBC	O. A. Hale & Co.	San Jose, Calif.	360
KBD	Post Dispatch	St. Louis, Mo.	360
KBL	The Hippodrom	San Francisco, Calif.	360
KBS	First & Dean Radio Research Laboratory	Long Beach, Calif.	360
KTW	First Presbyterian Church	Seattle, Wash.	360
KDD	Examiner Printing Co.	San Francisco, Calif.	360
KDE	City Dye Works & Laundry Co.	Los Angeles, Calif.	360
KDY	Coast Radio Co.	El Monte, Calif.	360
KVQ	J. C. Hoberich	Sacramento, Calif.	360
KWG	Portable Wireless Telephone Co.	Stockton, Calif.	360
KWH	Los Angeles Examiner	Los Angeles, Calif.	360
KXD	Harold Publishing Co.	Madison, Calif.	360
KXS	Braun Corporation	Los Angeles, Calif.	360
KXF	Theatre Music Co.	San Diego, Calif.	360
KYG	Wallard P. Hawley Jr.	Portland, Oreg.	360
KYI	Leo J. Meyberg Co.	Los Angeles, Calif.	360, 485
KYW	Westinghouse Electric & Manufacturing Co.	Chicago, Ill.	360, 485
KYY	The Radio Telephone Shop	San Francisco, Calif.	360
KZC	Public Market & Market Stores Co.	Seattle, Wash.	360
BZI	Irving S. Cooper	Los Angeles, Calif.	360
KZM	Fredson D. Allen	Oakland, Calif.	360
KZN	The Deseret News	Salt Lake City, Utah	360, 485
KZY	Atlantic-Pacific Radio Supplies Co.	Oakland, Calif.	360
WAAD	Times-Picayune	New Orleans, La.	360
WAAC	Tulane University	do	360
WAAD	St. Louis Chamber of Commerce	St. Louis, Mo.	360
WAAP	Union Stock Yards & Transit Co.	Chicago, Ill.	360, 485
WAAG	Elliott Electric Co.	Shreveport, La.	360
WAAH	Commonwealth Electric Co.	St. Paul, Minn.	360
WAAJ	Eastern Radio Institute	Boston, Mass.	360
WAAK	Gimbel Brothers	Milwaukee, Wis.	360
WAAI	Minnesota Tribune Co. & Anderson Beamish Co.	Minneapolis, Minn.	360
WAAH	I. R. Nelson Co.	Newark, N. J.	360
WAAN	University of Missouri	Columbia, Mo.	360
WAAO	Radio Service Co.	Charles Town, W. Va.	360
WAAP	Otto W. Taylor	Wichita, Kans.	360
WAAP	New England Motor Sales Co.	Greenwich, Conn.	360
WAAT	Greco-Therion Hardware Co.	Huntington, W. Va.	360
WAAS	Georgia Radio Co.	Decatur, Ga.	360
WAAV	Albans Radio Co.	Athens, Ohio	360
WAAW	Omaha Grain Exchange	Omaha, Nebr.	360
WAAZ	Radio Service Corp.	Crafton, Pa.	360
WAAZ	Yahring-Hayner Piano Co.	Youngstown, Ohio	360
WAAZ	Hollister-Miller Motor Co.	Emporia, Kans.	360
WAAZ	Midland Refining Co.	El Dorado, Kans.	360, 485
WAAA	Purdue University	West Lafayette, Ind.	360
WABH	Andrew J. Fetter	Syracuse, N. Y.	360
WBAO	Stirling Electric Co. and Journal Printing Co.	Minneapolis, Minn.	360
WBAE	Bradley Polytechnic Institute	Peoria, Ill.	360, 485

List of stations broadcasting market or weather reports (495 meters) and music, concerts, lectures, etc. (360 meters), alphabetically by call letters—Continued.

Call signal.	Owner of station.	Location of station.	Wave lengths.
WBAB	Fred M. Middleton	Moores-town, N. J.	360
WBAG	Deans and State Fibre Co.	Bridgeton, Pa.	360, 485
WBAH	The Dayton Co.	Minneapolis, Minn.	360
WBAJ	Marshall-Gierken Co.	Toledo, Ohio	360
WBAM	L. H. Remysson	New Orleans, La.	360
WBAN	Wireless Phone Corp.	Paterson, N. J.	360
WBAC	James Millikin University	Decatur, Ill.	360
WBAP	Wortham-Carter Publishing Co.	Fort Worth, Tex.	360, 485
WBAQ	Myron L. Harmon	South Bend, Ind.	360
WBAI	Republican Publishing Co.	Hamilton, Ohio	360
WBAY	Erner & Hepklas Co.	Columbus, Ohio	360
WBAA	Marjette College	Marjette, Ohio	360
WBAX	John H. Stenzer, Jr.	Wilkes-Barre, Pa.	360
WBAZ	American Telephone & Telegraph Co.	New York, N. Y.	360
WBZ	Times Dispatch Publishing Co.	Richmond, Va.	360
WBL	T. & H. Radio Co.	Anthony, Kans.	360
WBS	D. W. May (Inc.)	Newark, N. J.	360
WBT	Southern Radio Corp.	Charlotte, N. C.	360, 485
WBU	City of Chicago	Chicago, Ill.	360
WBV	Westinghouse Electric & Manufacturing Co.	Springfield, Mass.	360
WCE	Findley Electric Co.	Minneapolis, Minn.	360
WCI	A. C. Gilbert Co.	New Haven, Conn.	360
WCK	Stix-Barr-Feller	St. Louis, Mo.	360
WCM	University of Texas	Austin, Tex.	360, 485
WCN	Clark University	Worcester, Mass.	360, 485
WDM	Church of the Covenant	Washington, D. C.	360
WDT	Ship Owners Radio Service	New York, N. Y.	360
WDV	John O. Yeiser, Jr.	Omaha, Neb.	360
WDW	Radio Construction & Electric Co.	Washington, D. C.	360
WDY	Radio Corporation of America	Seaside Park, N. J.	360
WDZ	James L. Bush	Tuscola, Ill.	360
WEB	Reynolds Co.	St. Louis, Mo.	360
WEH	Midland Refining Co.	Tulsa, Okla.	485
WEY	Harburt-Hill Electrical Co.	Houston, Tex.	360, 485
WEW	St. Louis University	St. Louis, Mo.	485
WEY	Cosradio Co.	Wichita, Kans.	360, 485
WFI	Strawbridge & Clothier	Philadelphia, Pa.	360
WFO	Rike Kumbly Co.	Dayton, Ohio	360, 485
WDF	The Register & Tribune	Des Moines, Iowa	360
WGH	Montgomery Light & Power Co.	Montgomery, Ala.	360, 485
WGI	American Radio & Research Corp.	Medford Hillside, Mass.	360
WGL	Thomas P. J. Howlett	Philadelphia, Pa.	360
WGM	Genwin Railway & Power Co. (Atlantic Constitution)	Atlanta, Ga.	360, 485
WGR	Federal Telephone & Telegraph Co.	Buffalo, N. Y.	360, 485
WGT	The Fair	Chicago, Ill.	360
WGY	Interstate Electric Co.	New Orleans, La.	360
WGY	General Electric Co.	Schenectady, N. Y.	360
WHA	University of Wisconsin	Madison, Wis.	360, 485
WHD	West Virginia University	Morgantown, W. Va.	360
WHK	Warren R. Cox	Cleveland, Ohio	360
WHN	Richwood Times Printing & Publishing Co.	Richwood, N. Y.	360
WHQ	Rochester Times Union	Rochester, N. Y.	360, 485
WHU	William B. Duck Co.	Talado, Ohio	360
WHV	Stuart W. Seeley	East Lansing, Mich.	485
WHX	Iowa Radio Corp.	Des Moines, Iowa	360
WIK	K. & L. Electric Co.	Mechanicsport, Pa.	360
WIL	Continental Electric Supply Co.	Washington, D. C.	360
WIP	Chapel Brothers	Philadelphia, Pa.	360
WIZ	Cine Radio Manufacturing Co.	Cincinnati, Ohio	360, 485
WID	Richard H. Howe	Granville, Ohio	360
WII	White & Boyer Co.	Washington, D. C.	360
WIK	Service Radio Equipment Co.	Talado, Ohio	360
WIT	Electric Equipment Co.	Erie, Pa.	360
WIX	De Forest Radio Telephone & Telegraph Co.	New York, N. Y.	360
WIJ	Westinghouse Electric & Manufacturing Co.	Newark, N. J.	360
WKG	Joseph M. Zamolski Co.	Baltimore, Md.	360
WKN	Richardson-Crosby Co.	Marysville, Tenn.	360, 485
WKY	Oklahoma Radio Shop	Oklahoma City, Okla.	360, 485
WLB	University of Minnesota	Minneapolis, Minn.	360, 485
WLK	Hamilton Manufacturing Co.	Indianapolis, Ind.	360, 485
WLW	Crosley Manufacturing Co.	Cincinnati, Ohio	360
WMA	Arrow Radio Laboratories	Anderson, Ind.	360
WMB	Auburn Electrical Co.	Auburn, Me.	360
WMC	Columbia Radio Co.	Townsville, Ohio	360
WMI	Precision Equipment Co.	Cincinnati, Ohio	360, 485
WMO	Deebley-Bill Electric Co.	Washington, D. C.	360
WNJ	Shotton Radio Manufacturing Co.	Albany, N. Y.	360
WNO	Wireless Telephone Co. of Hudson County, N. J.	Jersey City, N. J.	360
WOC	Palmer School of Chiropractic	Davenport, Iowa	360, 485
WDE	Buckeye Radio Service Co.	Akron, Ohio	360

List of stations broadcasting market or weather reports (485 meters) and music, concerts, lectures, etc. (360 meters), alphabetically by call letters—Continued.

Call signal.	Owner of station.	Location of station.	Wave lengths.
WOH	Hatfield Electric Co.	Indianapolis, Ind.	360
WOL	Iowa State College	Ames, Iowa	360, 485
WOK	Pine Bluff Co.	Pine Bluff, Ark.	360
WOO	John Wanamaker	Philadelphia, Pa.	360
WOQ	Western Radio Co.	Kansas City, Mo.	360, 485
WOK	L. Hamberer & Co.	Newark, N. J.	360
WOS	Missouri State Marketing Bureau	Jefferson City, Mo.	485
WOT	Metropolitan Utilities District	Omaha, Neb.	360, 485
WOZ	Falladium Printing Co.	Richmond, Ind.	360
WPA	Fort Worth Record	Fort Worth, Tex.	360
WPH	Newspaper Printing Co.	Philadelphia, Pa.	360
WPF	Central Radio Co.	Kansas City, Mo.	360
WPG	Nashawag Poultry Farm	New Lebanon, Ohio	360
WPI	Electric Supply Co.	Cheerfield, Pa.	360
WPJ	St. Joseph's College	Philadelphia, Pa.	360
WPL	Burgis Electric Co.	Zanesville, Ohio	360
WPM	Thomas J. Williams	Washington, D. C.	360
WPO	United Equipment Co.	Memphis, Tenn.	360
WRK	Devon Bros. Electric Co.	Hamilton, Ohio	360
WRL	Union College	Schenectady, N. Y.	360
WRM	University of Illinois	Urbana, Ill.	360
WRP	Federal Institute of Radio Telegraphy	Camden, N. J.	360
WRR	City of Dallas (music and fire signal department)	Dallas, Tex.	360, 485
WRW	Tarrytown Radio Research Laboratory	Tarrytown, N. Y.	360
WSB	Atlanta Journal	Atlanta, Ga.	360, 485
WSL	J. & M. Electric Co.	Utica, N. Y.	360
WSN	Ship Owners Radio Service	Norfolk, Va.	360
WBV	L. M. Hunter and G. L. Carrington	Little Rock, Ark.	360
WSX	Erie Radio Co.	Erie, Pa.	360
WBY	Alabama Power Co.	Birmingham, Ala.	360
WTG	Kansas State Agricultural College	Manhattan, Kas.	485
WTK	Paris Radio Electric Co.	Paris, Tex.	360
WTP	George M. McBride	Bay City, Mich.	360
WWB	Daily News Printing Co.	Canton, Ohio	360
WWI	Ford Motor Co.	Dearborn, Mich.	360
WWJ	Detroit News	Detroit, Mich.	360, 485
WWL	Loyola University	New Orleans, La.	360
WWT	McCarthy Bros. & Ford	Rutland, N. Y.	360
WWZ	John Wanamaker	New York, N. Y.	360

SUPPLEMENTAL LIST—FROM MAY 1 TO MAY 12, 1922.

KBYL	Telegram Publishing Co.	Salt Lake City, Utah	360
KBYM	Savoy Theatre	San Diego, Calif.	360
KBYN	Great Western Radio Corp.	Redwood City, Calif.	360
KBYO	Carlson & Simms	San Diego, Calif.	360
KBYQ	Oregon Institute of Technology	Portland, Oreg.	485
KBYH	Pasadena Star-News Publishing Co.	Pasadena, Calif.	360
KIX	Tri-Union Publishing Co.	Oakland, Calif.	360
KNX	Electric Lighting Supply Co.	Los Angeles, Calif.	360
KOI	University of California	Berkeley, Calif.	360
KYI	Alfred Hätrel	Bakersfield, Calif.	360
KZV	Wannabeer Battery & Motor Co.	Wenatchee, Wash.	360
WLAD	Ohio Mechanics Institute	Cincinnati, Ohio	360
WCAB	Newburgh News Printing & Publishing Co.	Newburgh, N. Y.	360
WCAC	John Pink Jewelry Co.	Fort Smith, Ark.	360
WCAD	St. Lawrence University	Canton, Ohio	360
WCAE	Kaufman & Baer Co.	Pittsburgh, Pa.	360
WCAJ	Daily States Publishing Co.	New Orleans, La.	360
WCAK	Nebraska Wesleyan University	University Place, Neb.	360, 485
WCAL	Alfred P. Daniel	Houston, Tex.	360
WCAI	St. Ois' College	Noelthfield, Minn.	360
WCAM	Villanova College	Villanova, Pa.	360
WCAN	Southeastern Radio Telephone Co.	Jacksonville, Fla.	360
WCAO	Sanders & Stayman Co.	Baltimore, Md.	360
WCAQ	Central Radio Service	Decatur, Ill.	360
WCAR	Tri-State Radio Manufacturing & Supply Co.	Dellaware, Ohio	360
WCAS	Alamo Radio Electric Co.	San Antonio, Tex.	360
WCAT	William Hood Dunwoody Industrial Institute	Minneapolis, Minn.	360
WCAC	South Dakota State School of Mines	Rapid City, S. Dak.	485
WCAU	Philadelphia Radiophone Co.	Philadelphia, Pa.	360
WCB	Detroit Free Press	Detroit, Mich.	360, 485
WHB	Sweeney School Co.	Kansas City, Mo.	360, 485

CHATHAM STATION OF RADIO CORPORATION OF AMERICA CALL SIGNAL CHANGED.

Effective June 1 next, the call signal for the Chatham ship to shore station of the Radio Corporation of America will use call letters WIM in lieu of the present call, WCC. The Marion station which uses call signal WCC will continue to use this call as at present.

REPORT OF DEPARTMENT OF COMMERCE CONFERENCE ON RADIO TELEPHONY.

This conference was called by Secretary Hoover to consider general questions concerning the regulation of radio communication.

The following were invited to serve as members of the conference, the representatives of the Government departments being selected by their several departments:

- Dr. S. W. Stratton, chairman (Director of Bureau of Standards).
- Edwin H. Armstrong, Columbia University, New York, N. Y.
- Capt. Samuel W. Bryant, U. S. N., Navy Department.
- D. B. Carson, Commissioner of Navigation, Department of Commerce.
- J. C. Edgerton, Superintendent Radio Service, Post Office Department.
- Dr. Alfred N. Goldsmith, secretary Institute of Radio Engineers, New York, N. Y.
- Prof. I. A. Hazeltine, Stevens Institute of Technology, Hoboken, N. J.
- R. B. Howell, Metropolitan Utilities District, Omaha, Nebr.
- Prof. C. M. Jansky, jr., University of Minnesota.
- Hiram Percy Maxim, president American Radio Relay League, Hartford, Conn.
- Maj. Gen. George O. Squier, War Department.
- Representative Wallace H. White, jr., of Maine.
- W. A. Wheeler, Bureau of Markets and Crop Estimates, Department of Agriculture.

The conference was in session from February 27 to March 2, at the end of which time a tentative report was prepared. This report was sent to all persons who requested it, and to representatives of various interests which in the judgment of the Department of Commerce were interested. A large number of suggestions and comments were received. The conference had subsequent sessions on April 17, 18, and 19. All comments were considered, the general effect of the comments being to approve the substance of the preliminary report with a very few exceptions. The report as finally amended and adopted is given herewith.

In addition to the preparing a report on technical matters, the conference made recommendations as to essential points required in legislation to give the Secretary of Commerce authority necessary to accomplish the ends recommended, through the power to make and enforce regulations.

General resolutions adopted by the Radio Telephony Conference.

Resolved, That the Conference on Radio Telephony recommend that the radio laws be amended so as to give the Secretary of Commerce adequate legal authority for the effective control of—

(1) The establishment of all radio transmitting stations except amateur, experimental, and Government stations.

(2) The operation of nongovernmental radio transmitting stations.¹

Resolved, That it is the sense of the conference that radio communication is a public utility and as such should be regulated and controlled by the Federal Government in the public interest.

Resolved, That the types of radio apparatus most effective in reducing interference should be made freely available to the public without restrictions.

¹ It was the desire of the conference that the present authority of the Secretary of Commerce over the operation of radio transmitting stations be extended and that the Secretary of Commerce be granted authority to control the erection or establishment of certain classes of radio stations.

I. Allocation of wave bands for radio telephony.

A. It is recommended that waves for radio telephony be assigned in bands, according to the class of service, as given in the following table.

Throughout this report, both wave lengths and wave frequency are given. Wave length in meters is 300,000,000 divided by wave frequency in kilocycles per second.

Wave bands marked exclusive can be used for no other type of service; those marked nonexclusive are available for other types of radio communication, subject to regulation.

Use.	Wave length (meters).	Wave frequency (kilocycles per second).
(1) Transoceanic radio telephone experiments, nonexclusive. (See note 3).....	6,000	50
	5,000	60
(2) Fixed service radio telephony, nonexclusive. (See note 4).....	3,300	90.9
	2,850	105.3
(3) Mobile service radio telephony, nonexclusive.....	2,225	134.8
	2,500	120
(4) Government broadcasting, nonexclusive. (See note 1).....	2,050	146
	1,850	162
(5) Fixed station radio telephony, nonexclusive. (See note 5).....	1,650	181.8
	1,500	200
(6) Aircraft radio telephony and telegraphy, exclusive.....	1,550	193.5
	1,500	200
(7) Government and public broadcasting, nonexclusive.....	1,500	200
	1,450	206.9
(8) Radio beacons, exclusive. (See note 6).....	1,450	206.9
	970	309
(9) Aircraft radio telephony and telegraphy, exclusive.....	950	316
	850	353
(10) Radio compass service, exclusive. (See note 7).....	850	353
	750	400
(11) Government and public broadcasting, 200 miles or more from the seacoast, exclusive.....	750	400
	700	428
(12) Government and public broadcasting, 400 miles or more from the seacoast, exclusive.....	650	462
(13) Marine radio telephony, nonexclusive. (See note 8).....	750	400
	650	462
(14) Aircraft radio telephony and telegraphy, exclusive. (See note 8).....	525	571
	500	600
(15) Government and public broadcasting, exclusive.....	495	606
	485	618
(16) Private and toll broadcasting. (See note 9).....	485	618
	285	1,052
(17) Restricted special amateur radio telegraphy, nonexclusive. (See note 10).....	310	968
	285	1,052
(18) City and state public safety broadcasting, exclusive. (See note 11).....	275	1,091
	275	1,091
(19) Technical and training schools (shared with amateur). (See note 12).....	260	1,154
	275	1,091
(20) Amateur telegraphy and telephony (exclusive, 150 to 200 meters). (Shared with technical and training schools, 200 to 275 meters.) (See note 13).....	150	2,000
	150	2,000
(21) Private and toll broadcasting, exclusive.....	100	3,000
(22) Reserved.....	100	3,000

‡ Below.

† Above.

NOTE.—The terms used in the above schedule are defined as follows: "Broadcasting" signifies transmission intended for an unlimited number of receiving stations without charge at the receiving end. It includes:

(1) Government broadcasting, signifying broadcasting by departments of the Federal Government;

(2) Public broadcasting, signifying broadcasting by public institutions, including State governments, political subdivisions thereof, and universities and such others as may be licensed for the purpose of disseminating informational and educational service;

(3) Private broadcasting, signifying broadcasting without charge by the owner of a station, as a communication company, a store, a newspaper, or such other private or

public organization or person as may be licensed for the purpose of disseminating news, entertainment, and other services; and

(4) Toll broadcasting, signifying broadcasting where a charge is made for the use of the transmitting station.

NOTE 2.—A station carrying on two or more of the broadcasting services specified in classes 2, 3, and 4 must be licensed for each class of service.

NOTE 3.—When transoceanic radio telephone experiments are to be conducted the Department of Commerce should endeavor to arrange with other countries for the use of the wave band 5,000 to 8,000 meters assigned for this purpose.

NOTE 4.—The wave band from 2,850 to 3,300 meters may be used for fixed-service radio telephony only provided it does not interfere with service using continuous-wave telegraphy.

NOTE 5.—The wave band from 1,550 to 1,650 meters is for use of radio telephone communication over natural barriers, but is not exclusive of other services.

NOTE 6.—Radio beacons are radio-transmitting stations which transmit signals from which a mobile direction-finding station may determine its bearing or position.

NOTE 7.—Radio compass service is here used to signify a direction-finding service in which a mobile station transmits to one or more fixed stations which in turn transmit back the bearing or position of the mobile station.

NOTE 8.—The wave band from 525 to 650 meters is reserved for marine radio telegraphy exclusively.

NOTE 9.—Assignment of waves in band 16 will, in general, involve keeping the zones from 285 to 315 and from 425 to 475 meters open in coastal regions. Furthermore, in border regions, account should be taken of the wave lengths used in neighboring countries, and these should be suitably protected by a locally unused band of adjacent wave lengths.

NOTE 10.—The restricted special amateur wave of 310 meters is for use by a limited number of inland stations and only where it is necessary to bridge large, sparsely populated areas or to overcome natural barriers.

NOTE 11.—City and State public safety broadcasting should in small cities be conducted by interrupting the broadcast service of classes 2, 3, or 4 in case of emergency. In large cities this service will ordinarily have its own stations and will use the wave band 275 to 285 meters, assigned to such service. Private detective agencies desiring to operate radio telephone broadcasting service should be required to cooperate with municipal or State services in the use of the wave band 275 to 285 meters, assigned to the latter service.

NOTE 12.—By "technical and training school" in this report is meant a school which in the judgment of the Secretary of Commerce is carrying on sufficient instruction of the proper character for training men for the radio profession to warrant the granting of a station license for that purpose.

NOTE 13.—An amateur is one who operates a radio station, transmitting, receiving, or both, without pay or commercial gain, merely for personal interest or in connection with an organization of like interest.

NOTE 14.—The conference is of the opinion that broadcast transmitting stations should not in coastal regions be permitted on wave lengths closely adjacent to those assigned in the marine traffic and believes that its recommendations provide for adequate protection of such marine traffic. The conference recommends the assignment of wave lengths adjacent to those used in the marine traffic to inland stations under such conditions as to avoid interference with the marine traffic.

B. It is recommended that the Secretary of Commerce assign a specific wave length to each radio telephone broadcasting station (except Government and amateur stations), this course being within the band pertaining to the particular service of that station.

C. It is recommended that the wave band assigned to amateurs, 150 to 275 meters, be divided into bands according to the method of transmission, damped wave stations being assigned the band of lowest wave lengths, interrupted or modulated continuous wave radio telegraph stations the next band, radio telephone stations the next band, and finally unmodulated continuous wave radio telegraph stations the band of highest wave lengths. It is recommended that amateurs be permitted to carry on broadcasting within the wave length band assigned by the Secretary of Commerce to amateur radio telephony.

A damped wave is one composed of successive trains in which the amplitude of the oscillation after having reached its maximum decreases gradually. This refers to waves from spark transmitters or other types of transmitters having characteristic decrement similar to spark transmitters. Transmitters employing continuous wave oscillators in which the variation in frequency or amplitude is abrupt (as with the use of a chopper) are classed as damped wave transmitters.

An interrupted or modulated continuous wave is one in which the amplitude or the frequency is varied according to a simple periodic law of audible frequency. (This is commonly referred to as the interrupted continuous waves, or I. C. W.) A continuous wave transmitter employing a rectified plate voltage which is not a substantially constant direct voltage is classed as an interrupted or modulated continuous wave transmitter. **NOTE.** This included transmitters in which the variation in amplitude or frequency is effected in a gradual way only. (For abrupt variation see damped wave.)

An unmodulated continuous wave is one in which the permanent state is periodic and has substantially constant amplitude and frequency. (This includes waves in which the amplitude variation is effected simply by the manipulation of a key. This is commonly referred to as a continuous wave, or C. W.)

D. It is recommended that the present regulations governing experimental stations remain in effect. An experimental station is one operated exclusively for technical or scientific investigations.

E. 1. The conference experienced the greatest difficulty in providing even partly for the generally demanded services. The conference therefore disapproved of the elimination of essential services by the introduction of direct advertising which might be expected to require extensive assignment of wave bands if permitted at all.

2. Many services for which radio telephony might otherwise be desirable can not practically be conducted by this means on account of the interference which such use would cause with other services of a more essential nature or for which there is great public demand.

3. In view of the demand for broadcast service by the general public, it is not desirable to disseminate information over wide areas for purposes of point-to-point communication except where that communication can not be effectively maintained by other means.

4. A radio service in which a message is addressed or intended for a prescribed number of particular stations is not a broadcast service and is to be classed as a "multiple telegram" or "multiple telephone service." It was not thought advisable to use the much demanded short wave bands for communications of this nature, as they would serve a relatively small number. The available wave lengths for such multiple service messages are bands 2 and 5.

5. The conference is of the opinion that the use of radio communication for "point-to-point" communication over land in most cases constitutes an uneconomic use of the available wave bands and it is recommended that at the present state of the art such communication should be carried on by other means, in so far as possible.

6. The conference very carefully considered the proximity of wave bands assigned to amateurs and broadcast services, but deemed it essential to utilize all of the available wave bands.

7. It was felt that waves longer than 275 meters should not be assigned to technical and training school stations because of the needs of broadcast services greatly desired by a large portion of the public in that zone, and because the extension of amateur wave lengths and the organization of their use will enable their effective employment by the technical and training school stations.

II. *Power limitation, geographical distribution, and hours of operation of broadcasting stations.*

A. It is recommended that the Secretary of Commerce assign to each radio telephone broadcasting station a permissible power based on the normal range of the station, such normal ranges for the different classes of service to have the following average values, larger or smaller values being discretionary where conditions warrant:

Government broadcasting stations, 600 (land) miles.

Public broadcasting stations, 250 miles.

Private and toll broadcasting stations, 50 miles.

Normal range is the average reliable daytime ranges over which satisfactory communication can be obtained with good available receiving apparatus.

The conference recommends that broadcasting stations should not be allowed to use unlimited power because of the fact that this will limit the number of services which can be rendered within a given area to an undesirable extent.

(NOTE.—The Bureau of Standards of the Department of Commerce should make a study of the relation between the normal reliable range of a station and the antenna power on the basis of the use of good available receiving apparatus. It is recognized that this relation may change with the development of the radio art.)

B. It is recommended that the same wave (or overlapping wave bands) not be assigned to stations within the following distances from one another, except that these distances may be lowered if the normal ranges of the stations are correspondingly lowered:

For Government broadcasting stations, 1,500 miles.

For public broadcasting stations, 750 miles.

For private and toll broadcasting stations, 150 miles.

(NOTE.—The Bureau of Standards should make a study of the width of wave band (expressed in cycles per second) required for satisfactory radio telephony. It is recognized that this width depends on the methods of transmission and reception employed.)

C. It is recommended that the Secretary of Commerce cause an immediate study to be made of the best geographical distribution of broadcasting stations with the view of attaining the best service with a minimum of interference.

D. It is recommended that in cases where congestion of radio telephone broadcasting traffic exists, or threatens to exist, the Secretary of Commerce assign suitable hours of operation to existing or proposed radio telephone broadcasting stations.

III. *Considerations to be followed in granting licenses.*

A. It is recommended that in the case of conflict between radio communication services first consideration be given to the public not reached, or not so readily reached, by other communication services.

B. It is recommended that subject to public interest and to the reasonable requirements of each type of service the order of priority of the services be Government, public, private, toll.

C. It is recommended that the degree of public interest attaching to a private or toll broadcasting service be considered in determining its priority in the granting of

licenses, in the assignment of wave frequencies, and in the assignment of permissible power and operating time, within the general regulations for these classes of service.

D. It is recommended that toll broadcasting service be permitted to develop naturally under close observation, with the understanding that its character, quality, and value to the public will be considered in determining its privileges under future regulations.

E. It is recommended that direct advertising in radio broadcasting service be absolutely prohibited and that indirect advertising be limited to a statement of the call letters of the station and of the name of the concern responsible for the matter broadcasted, subject to such regulations as the Secretary of Commerce may impose.

F. It is recommended that when all available wave frequencies in any geographical region are already assigned, no further licenses for broadcasting be granted in that region until cause arises for the revocation of existing licenses.

G. It is recommended that private or toll broadcasting stations transmitting time signals shall transmit only official time signals and with authorization from and under conditions approved by the Secretary of Commerce.

H. It is recommended that the transmission of signals of such character or wave length as to deliberately interfere with the reception of official time signals constitutes grounds for the revocation or suspension of the transmitting station or operator's license.

I. It is recommended that license requirements for the operator of a radio telephone transmitting station include a knowledge of radio transmitting and receiving apparatus and of the International Morse Code, sufficient to receive at a rate of not less than 10 words per minute.

J. It is recommended that the establishment at any later date of any commercial transmitting stations having more than 1 kw. input to the antenna may, at the discretion of the Secretary of Commerce, be prohibited within 25 land miles of a Government or commercial station or in regions where congestion of radio traffic shall warrant such prohibition.

K. It is recommended that the sharpness of the emitted wave of the transmitting station affect the privileges extended to such station.

IV. *Recommendations relative to the amateur.*

A. It is recommended that the status of the amateur be established by law and that the limits of the wave band allotted to the amateur as given above in section I be specified in the law.

B. It is recommended that the amateur continue to be under the jurisdiction of the Department of Commerce.

C. It is recommended that for the purpose of self-policing among the amateurs, amateur deputy radio inspectors be created, elected from their number of the amateurs of each locality; that upon receipt of notice of such election the radio inspector in charge of the district in which such amateurs are located shall appoint the person chosen a deputy radio inspector, serving without compensation or for the sum of \$1 per year if compensation is legally required; that the duty of such amateur deputy inspector shall be to endeavor to the best of his ability to accomplish, under the direction of the district radio inspector, observance of the Radio Communication Laws and the Regulations of the United States and the observance of such local cooperation of measures as are agreed to in each community for the minimization of interference between the various groups of the public interested in radio; that such amateur deputy inspectors be clothed with whatever authority may be necessary in the opinion of the district radio inspector.

V. *Technical methods for the reduction of interference.*

A. It is recommended that the Secretary of Commerce at his discretion prohibit at any time the use of existing radio transmitting apparatus and methods which result in unnecessary interference, provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

B. It is recommended that the Secretary of Commerce at his discretion prohibit at any time the use of existing radio receiving apparatus which cause the radiation of energy, provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

NOTE.—"Certain forms of oscillating receivers cause the feeble radiation of continuous waves and may therefore be a source of local interference."

C. It is recommended that the Bureau of Standards make a study of the technical methods for the reduction of interference, with a view to publishing their findings, giving special attention to the following:

(1) The reduction of the rate of building up (increment) of oscillations in radiating systems. (This rapid building up of oscillations occurs in damped wave and interrupted continuous wave transmitters, and may, of course, be eliminated by the substitution of other types of transmitters. It may, however, be reduced in these types by proper circuit arrangements.)

(2) The reduction of harmonics in continuous wave transmitters and of irregularities of oscillation. ("Mush" in arc transmitters and "swinging" of the frequency in some continuous wave transmitters not employing a master oscillator.) "Mush" signifies small sudden irregularities occurring in the antenna current of arc transmitters. Swinging signifies relatively slow changes in the frequency of a transmitted wave.

A harmonic of a wave is a wave whose frequency is a multiple of that of the given wave. (The wave length of a harmonic is thus a submultiple of the wave length of the given wave.) It is often convenient to include as harmonics frequencies which are dependent on the frequency of the transmitter but which are not exact multiples.

(3) The comparison of the variable amplitude method with the variable frequency method of continuous wave telegraphy.

(4) The preferable methods of telephone modulation to avoid changes in the frequency of oscillation.

(5) The proper circuit arrangements of regenerative (including oscillating) receivers to avoid radiation of energy (as by the use of a radio-frequency amplifier with an untuned antenna or with a coil aerial.)

(6) The use of highly selective receiving apparatus, including a list of approved forms. NOTE.—A selective receiver is one which enables the user to hear a desired signal and to exclude the undesired signals. The more perfectly this is accomplished the more highly selective is the receiver.

(7) The use of receiving coil aeriols instead of antennae, with special reference to high selectivity.

(8) The reduction of interference with radio communication of other electrical processes, such as the operation of X-ray apparatus and electrical precipitation.

(9) The study and standardization of wavemeters. NOTE.—A wavemeter is an instrument for measuring wave frequency or wave length.

At a subsequent meeting of the full conference called by Secretary Hoover on April 17, 18, and 19, 1922, it was agreed to add to section 1 C the provision that the operation of Government stations be conducted in such a manner as not to interfere with the commercial traffic and broadcasting, and that whenever Government-owned stations are used for the transmission of commercial traffic and broadcasting, they shall conform to the regulations established by the Secretary of Commerce.

It was agreed to add a provision for the appointment by the President of an Advisory Committee to the Secretary of Commerce to consist of not more than 12 members, half of whom shall be from the Government and half from outside the Government.

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