DEPARTMENT OF COMMERCE

RADIO SERVICE BULLETIN

ISSUED MONTHLY BY RADIO DIVISION

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CONTENTS

ABBREVIATIONS AND SYMBOLS

The necessary corrections to the list of Commercial and Government 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. W=west longitude. N=north latitude. S=south latitude. E=east longitude.
Call	=Call signal (letters) assigned.
Type of wave	=Classified as follows: A1=continuous wave (tube), A, arc=continuous wave, A2=interrupted continuous wave, A3=phone, B=spark.
Range	=Normal range in nautical miles.
W. l.	=Wave lengths in meters; normal wave lengths in italics.
Fy.	=Frequency in kilocycles; normal frequency in italics; wave length in parenthesis.
Service	=Nature of service maintained: FX=Point-to-point (fixed service), PG=general public (ship to shore), PR=limited public, RC=radio compass, FA=aeronautical station, AB=aviation beacon, RF=directional radiobeacon (ship work), P=private, O=Government business exclusively.
Hours	=Hours of operation: N=Continuous service, X=no regular hours.
F. T. Co.	=Federal Telegraph Co.
I. R. T. Co.	=Intercity Radio Telegraph Co.
I. W. T. Co.	=Independent Wireless Telegraph Co.
K. & C.	=Kilbourne & Clark Manufacturing Co.
M. R. T. Co.	=Mackay Radio & Telegraph Co.
R. C. A.	=Radio Corporation of America.
R. M. C. A.	=Radiomarine Corporation of America.
T. R. T. Co.	=Tropical Radio Telegraph Co.
U. R. Corp.	=Universal Radio Corp.
W. S. A. Co.	=Wireless Specialty Apparatus Co.
C. w.	=Continuous wave.
I. c. w.	=Interrupted continuous wave.
A. c.	=Alternating current.
V. t.	=Vacuum tube.
U. S. L.	=Applies only to the list of Commercial and Government Radio Stations of the United States.
Δ	=Equipped with a radio compass (direction finder).

NEW STATIONS

Commercial land stations, alphabetically, by names of stations

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations published by the Berne Bureau]

Station	Call signal	Frequency in kilocycles, wave length in parenthesis	Service	Hours	Station controlled by—
California (portable) [1]	KRB	2,938 (112.1), 5,870 (51.11)	FX	X	State Department of Agriculture (California).
Do.[1]	KRN	2,938 (112.1), 5,870 (51.11)	FX	X	Do.
Lansing, Ill.[2]	WCQ	290 (1,034)	AB	X	Ford Motor Co.
Los Angeles, Calif.[3]	KRM	2,938 (112.1), 5,870 (51.11)	FX	X	State Department of Agriculture (California).
New York, N. Y.[4]	WHD	5,570 (53.86), 6,365 (47.13), 8,230 (36.45), 11,040 (27.17), 16,460 (18.226).	PG	X	New York Times Co.
Sacramento, Calif.[5]	KRJ	2,938 (112.1), 5,870 (51.11)	FX	X	State Department of Agriculture (California).
San Francisco, Calif.[6]	KRG	2,938 (112.1), 5,870 (51.11)	FX	X	Do.
San Jose, Calif.[7]	KRH	2,938 (112.1), 5,870 (51.11)	FX	X	Do.
Sebastopol, Calif.[8]	KRD	2,938 (112.1), 5,870 (51.11)	FX	X	Do.

[1] Type of wave (system), A1.
[2] Type of wave (system), A2.
[3] Loc. (approximately) 118° 15′ 00″ W., 34° 03′ 00″ N.; type of wave (system), A1.
[4] Type of wave (system), A2, rates, 10 cents per word, minimum $1.
[5] Loc. (approximately) 121° 30′ 00″ W., 38° 35′ 00″ N.; type of wave (system), A1.
[6] Loc. (approximately) 122° 25′ 00″ W., 37° 37′ 00″ N.; type of wave (system), A1.
[7] Loc. (approximately) 121° 53′ 00″ W., 37° 20′ 00″ N.; type of wave (system), A1.
[8] Loc. (approximately) 128° 53′ 00″ W., 38° 23′ 00″ N.; type of wave (system), A1.

Commercial ship stations, alphabetically, by names of vessels

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

Name of vessel	Call signal	Rates	Service	Hours	Owner of vessel	Station controlled by—
Chahunta [1]	WTBK	8	PG	X	Lincoln County Tug & Barge Co.	Owner of vessel.
Churruca [2]	KZPC	8	PG		Ty Camico Sobrino	
Gypsy [3]	WTBJ		P	X	C. R. Holmes	Do.
J. A. Bailey [4]	WTBL		PG	X	Cleveland Cliffs S. S. Co	
Magallanes [2]	KZDM	8	PG		Gutirrez Hermanos	Do.
Malvern	WRBP				C. P. Whitehead	
San Carlos [2]	KZDC	8	PG		Tanon Navigation Co	Do.
Virginia	WSBW	8	PG	N	American S. S. Lines	

[1] Type of wave (system), B; fy., 375 (800), 425.5 (705), *500 (600)*.
[2] Type of wave (system), B; fy., 396 (756), *500 (600)*, hours, 7 a. m. to 12 noon, 1 to 5 and 7 to 10.30 p. m.
[3] Type of wave (system), A3; fy., 500 (600).
[4] Rates, Great Lakes service, 4 cents per word.

Commercial land and ship stations, alphabetically, by call signals

[b, ship station; c, land station]

Call signal	Name of station		Call signal	Name of station	
KRB	California (portable)	c	KZPC	Churruca	b
KRD	Sebastopol, Calif	c	WCQ	Lansing, Ill	c
KRG	San Francisco, Calif	c	WHD	New York, N. Y	c
KRH	San Jose, Calif	c	WRBP	Malvern	b
KRJ	Sacramento, Calif	c	WSBW	Virginia	b
KRM	Los Angeles, Calif	c	WTBJ	Gypsy	b
KRN	California (portable)	c	WTBK	Chahunta	b
KZDC	San Carlos	b	WTBL	J. A. Bailey	b
KZDM	Magallanes	b			

Broadcasting stations, alphabetically, by call signals

Call signal	Location of station (address)	Owner of station	Frequency in kilocycles, wave length in parenthesis	Power (watts)
WMMN	Fairmont, W. Va., Hotel Fairmont	Holt-Howe Novelty Co	890 (337)	[1] 250 [2] 500
KOH	Reno, Nev., 38 West First Street	Jay Peters (Inc.)	1,370 (218.8)	100

[1] Night. [2] Day.

NOTE.—Construction permits issued for these stations. They are not to be licensed until after Nov. 11, 1928.

Broadcasting stations, alphabetically, by names of States and cities

[Additions to the List of Radio Stations of the United States, edition of June 30, 1928]

State and city	Call signal	Frequency in kilocycles, wave length in parenthesis	Power (watts)
Nevada: Reno	KOH	1,370 (218.8)	100
West Virginia: Fairmont	WMMN	890 (337)	[1] 250 [2] 500

[1] Night. [2] Day.

Government land stations, alphabetically, by names of stations

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Station	Call signal	Frequency in kilocycles, wave length in parenthesis	Service	Hours	Station controlled by—
Barnegat Lightship, N. J.[1]	WRA	410.4 (731), *500 (600)*	O	------	Department of Commerce, Bureau of Lighthouses.
Cheboygan Range, Mich.[2]	WWG	3,410 (88)	FX	X	Do.
Dry Tortugas Light Station, Fla.[3]	WST	300 (1,000), 425.5 (705), 500 (600).	RF	------	Do.
Fort Kamehameha, Hawaii[4]	WTO	352.7 (850)	FX	X	United States Army.
Fort Ruger, Hawaii[5]	WTP	352.7 (850)	FX	X	Do.
Fort Worth, Tex.[6]	KKJ	3,350 (89.6), *3,370 (89)*, *5,940 (50.51)*, 5,960 (50.34).	FX	X	Department of Commerce, Bureau of Lighthouses.
Fourteen Foot Shoals, Mich.[7]	WWE	3,410 (88)	FX	X	Do.
Kansas City, Mo.[8]	KRC	3,350 (89.6), *3,370 (89)*, *5,940 (50.51)*, 5,960 (50.34).	FX	X	Do.
Key West, Fla.[9]	WBP	*3,370 (89)*, 3,380 (88.8), *5,940 (50.51)*, 5,960 (50.34).	FX	X	Do.
Oklahoma City, Okla.[8]	KQK	3,350 (89.6), *3,370 (89)*, *5,940 (50.51)*, 5,960 (50.34)	FX	X	Do.
Pleasant Valley, Nev.[6]	KSQ	3,360 (89.3), *3,370 (89)*, 5,930 (50.59), *5,940* (50.51).	FX	X	Do.
Poe Reef Lighthouse, Mich.[8]	WRJ	3,410 (88)	FX	X	Do.
Portland Lightship, Me.[9]	WPB	300 (1,000), 410.4 (731), 500 (600).	RF	------	Do.
Schofield Barracks, Hawaii[10]	WZJ	185 (1,620)	FX	X	United States Army.
Unionville, Mo.[8]	KMH	3,350 (89.6), *3,370 (89)*, *5,940 (50.51)*, 5,960 (50.34).	FX	X	Department of Commerce, Bureau of Lighthouses.

[1] Loc. (approximately) 74° 01′ 00″ W., 40° 08′ 00″ N.; type of wave (system), A2.
[2] Loc. 84° 28′ 20″ W., 45° 38′ 51″ N., type of wave (system), A3.
[3] Loc. 82° 55′ 13″ W., 24° 37′ 59″ N., type of wave (system), A2.
[4] Loc. (approximately) 157° 47′ 00″ W., 21° 19′ 00″ N.
[5] Loc. (approximately) 157° 47′ 00″ W., 21° 17′ 00″ N.
[6] Type of wave (system), A1.
[7] Loc. 84° 26′ 10″ W., 45° 40′ 57″ N., type of wave (system), A3.
[8] Loc. 84° 21′ 35″ W., 45° 41′ 40″ N., type of wave (system), A3.
[9] Loc. 70° 05′ 38″ W., 43° 31′ 30″ N., type of wave (system), A2; for further particulars see list of radiobeacon stations in list of Commercial and Government Radio Stations of the United States, edition June 30, 1928.
[10] Loc. (approximately) 158° 04′ 00″ W., 21° 30′ 00″ 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
KKJ	Fort Worth, Tex.....c	WRJ	Poe Reef Lightship, Mich.....c
KMH	Unionville, Mo.....c	WST	Dry Tortugas Light Station, Fla.....c
KQK	Oklahoma City, Okla.....c	WTO	Fort Kamehameha, Hawaii.....c
KRC	Kansas City, Mo.....c	WTP	Fort Ruger, Hawaii.....c
KSQ	Pleasant Valley, Nev.....c	WWE	Fourteen Foot Shoals, Mich.....c
WBP	Key West, Fla.....c	WWG	Cheboygan, Mich.....c
WPB	Portland Lightship, Me.....c	WZJ	Schofield Barracks, Hawaii.....c
WRA	Barnegat Lightship, N. J.....c		

Special land stations, alphabetically, by names of stations

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1928]

Station	Call signal	Frequency in kilocycles, wave length in parentheses	Power (watts)	Station controlled by—
California: Sacramento [1]	W6XAF	2,938 (112.1), 5,870 (51.11)	500	State department of agriculture (California).
New York:				
New York [1]	W2XBR	6020 (49.83)	500	Baruchrome Corporation.
Schenectady	W2XBN	Over 3,000 (1 to 100)	500	Union College Radio Club.

[1] Relay broadcast.

Special land stations, grouped by districts

Call signal	District and station	Call signal	District and station
	Second district:	W6XAF	Sixth district: Sacramento, Calif.
W2XBN	Schenectady, N. Y.		
W2XBR	New York, N. Y.		

ALTERATIONS AND CORRECTIONS

COMMERCIAL LAND STATIONS

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

BRECKENRIDGE, TEX.—Fy., add 181.8 (1,650).
BUFFALO, N. Y. (WAM).—Fy., add 5,570 (53.86), 5,615 (53.42), 8,370 (35.84).
CALIFORNIA (KGHT, PORTABLE).—Call changed to KJT, effective January 1, 1929.
CALIFORNIA (KGHU, PORTABLE).—Call changed to KJW, effective January 1, 1929.
CALIFORNIA (KGHV, PORTABLE).—Call changed to KJY, effective January 1, 1929.
CALIFORNIA (KGHW, PORTABLE).—Call changed to KJZ, effective January 1, 1929.
CLEVELAND, OHIO (WTL).—Fy., add 5,570 (53.86), 5,615 (53.42), 8,370 (35.84).
DETROIT, MICH. (WDI).—Fy., add 5,570 (53.86), 5,615 (53.42), 8,370 (35.84).
DULUTH, MINN. (WRL).—Fy., add 5,570 (53.86), 5,615 (53.42), 8,370 (35.84).
ELGIN, ILL.—Call changed to WNB, effective January 1, 1929.
FIFTH ZONE (KGIA, PORTABLE).—Call changed to KHP, effective January 1, 1929.

FIFTH ZONE (KGIB, PORTABLE).—Call changed to KHS, effective January 1, 1929.
FIFTH ZONE (KGIC, PORTABLE).—Call changed to KHW, effective January 1, 1929.
FIFTH ZONE (KGID, PORTABLE).—Call changed to KHZ, effective January 1, 1929.
HONOLULU, HAWAII (KYB).—Fy., 134.17 (2,236).
KAHUKU, HAWAII (KGI).—Fy., 18.6 (16,129).
KAHUKU, HAWAII (KIE).—Fy., 18 (16,670).
MARION, MASS. (MATAPOISETT—WRQ).—Fy., 22.35 (13,423).
NEW YORK, N. Y. (WSF).—Controlled by M. R. T. Co.
PORT HOBRON, ALASKA.—Rates, 6 cents per word.
ROCKY POINT, N. Y. (WEF).—Fy., 9,490 (31.612).
ROCKY POINT, N. Y. (WKM).—Fy., 15,907 (18.86).
ROCKY POINT, N. Y. (WSS).—Fy., 18.8 (15,957).
SAYVILLE, N. Y.—Controlled by M. R. T. Co.
SEATTLE, WASH. (KPA).—Loc. (approximately) longitude same, latitude 47° 21′ 00″ N.
TUCKERTON, N. J. (WCI).—Fy., 18.4 (16,304).
TUCKERTON, N. J. (WGG).—Fy., 22.1 (13,575).

COMMERCIAL SHIP STATIONS, ALPHABETICALLY, BY NAMES OF VESSELS

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

ABANGAREZ.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
ADAM E. CORNELIUS.—W. l., *715*, 875.
AGWIMEX.—W. l., *600*, 660, 705, 730, 800.
AGWISTONE.—W. l., *600*, 660, 705, 730, 800.
AIMEE.—Type of wave (system), A1–2; w. l., *600*, 660, 705, 750, 800.
ALASKAN.—W. l., *600*, 705, 800.
ALASKA STANDARD.—Type of wave (system), A2; w. l., *600*, 640, 660, 705, 800.
ALBATROSS.—Owner of vessel, James A. Ross.
AMOLCO.—W. l., *600*, 640, 705, 750, 800.
ANCON.—W. l., *600*, 660, 705, 730, 800.
ARCADIA.—W. l., *600*, 640, 705, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
ARDMORE.—W. l., *600*, 705, 800, 1,875, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190.
ATENAS.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
AXTEL J. BYLES.—W. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190, 2,400.
BALLCAMP.—Type of wave (system), A2; w. l., *600*, 705, 800.
BELFAST.—Type of wave (system), A2.
BETHORE.—Owner of vessel, Ore S. S. Corporation.
BIBOCO.—W. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,987, 2,013, 2,098, 2,128, 2,190, 2,290.
BROAD ARROW.—W. l., *600*, 640, 705, 750, 800.
BUTTERCUP.—W. l., *600*, 705, *715*, 800, 875, 1,875.
CACIQUE.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800.
CALMAR.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
CAMARGO.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800, 1,875, 1,961, 1,987, 2,069, 2,098, 2,128.
CAMDEN (KDKL).—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
CAPILLO.—W. l., *600*, 705, 800.
CAPTAIN A. F. LUCAS.—Type of wave (system), A1–2; w. l., *600*, 705, 750, 800.
CARENCO.—Name changed to Executive.
CARTAGO.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
CASIANA.—W. l., *600*, 640, 705, 750, 800.
CELTIC.—Type of wave (system), B; w. l., *600*, 705, 800.
CERRO EBANO.—W. l., *600*, 640, 705, 750, 800.
CHARLES PRATT.—W. l., *600*, 640, 705, 750, 800.

CHARLIE WATSON.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
CHATHAM.—W. l., *600*, 640, 705, 750, 800, 1,987, 2,098, 2,128, 2,190.
CHELSEA.—Name changed to Eleanor Boling; owner of vessel, Commander Richard E. Byrd.
CHESTER O. SWAIN.—Type of wave (system), B and A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,013, 2,069, 2,098, 2,128, 2,190, 2,400.
CHESTER SUN.—Type of wave (system), A2.
CHETOPA.—W. l., *600*, 705, 800.
CHILCOP.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
CHILSCO.—W. l., *600*, 705, 800.
CHINA ARROW.—Type of wave (system), A2; w. l., *600*, 640, 660, 705, 750, 800.
CHRISTY PAYNE.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,013, 2,069, 2,098, 2,128, 2,190, 2,400.
CITY OF CLEVELAND III.—Type of wave (system), B and A1–2; w. l., *715*, 875, 1,796.
CITY OF DETROIT III.—W. l., *715*, 875, 1,796.
CITY OF EUREKA.—Name changed to Explorer.
CITY OF HONOLULU.—Type of wave (system), A1–2–3; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190, 2,400.
CITY OF LOS ANGELES.—W. l., *600*, 705, 800, 1,987, 2,098, 2,400.
CITY OF VICTORIA.—Type of wave (system), B; w. l., *600*, 705, 800.
CITY OF WEATHERFORD.—Station controlled by R. M. C. A. (U. S. L.).
COASTWISE.—W. l., *600*, 705, 800.
COMBER.—W. l., *600*, 640, 705, 750, 800.
COMMERCIAL GUIDE.—W. l., *600*, 640, 705, 750, 800.
COPPENAME.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
COQUINA.—W. l., *600*, 705, 800.
CORSICANA.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800.
COVENA.—W. l., *600*, 705, 800.
CRAMPTON ANDERSON.—W. l., *600*, 640, 705, 750, 800.
CRESSIDA.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,013, 2,069, 2,098, 2,128, 2,190, 2,400.
CRISTOBAL.—W. l., *600*, 660, 705, 730, 800.
CUBA.—W. l., strike out 750.
CUBORE.—Owner of vessel, Ore S. S. Corporation.
CULBERSON.—Type of wave (system), A, Arc and B; w. l., *600*, 705, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
DENALI.—Hours N and X.
DERBLAY.—Hours N and X.
DERBYLINE.—W. l., *600*, 660, 705, 730, 800.
D. G. SCOFIELD.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
DIANA DOLLAR.—Type of wave (system), B.
DICKENSON.—Type of wave A2; w. l., *600*, 640, 705, 750, 800.
DILWORTH.—W. l., *600*, 705, 800, 1,875, 1,911, 1,987, 2,098, 2,400.
DIXIE.—Type of wave A1–2; w. l., *600*, 705, 750, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
DIO.—W. l., *600*, 660, 705, 730, 800.
DORCHESTER.—W. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190.
DOROTHY BRADFORD.—Type of wave (system), B; Service, P. G.; Hours, X.
DUNGANNON.—W. l., *600*, 660, 705, 730, 800.
DURANGO.—W. l., *600*, 705, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
EASTERN DAWN.—W. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,987, 2,013, 2,098, 2,128, 2,190, 2,290.
EASTERN GLADE.—W. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
EASTERN STATES.—W. l., *715*, 800, 875, 1,796.
ECUADOR.—W. l., *600*, 705, 800, 1,911, 1,987, 2,098, 2,400.
EDENTON.—Station controlled by R. M. C. A. (U. S. L.).
EDGEMOOR.—W. l., *600*, 705, 800.
EDMORE.—Name changed to Grays Harbor; owner of vessel, Tacoma-Oriental S. S. Co.

EDWARD L. SHEA.—W. l., *600*, 640, 705, 750, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
E. J. SADLER.—W. l., *600*, 640, 705, 800.
EL COSTON.—W. l., *600*, 640, 705, 750, 800.
ELISHA WALKER.—W. l., *600*, 640, 705, 750, 800.
EL LAGO.—Type of wave (system), B.
EL MUNDO.—Hours X.
EL OCEANO.—W. l., *600*, 640, 705, 750, 800.
EL SEGUNDO.—W. l., *600*, 640, 705, 750, 800.
ESPARTA.—W. l., *600*, 640, 660, 705, 800.
ESTRADA PALMA.—W. l., strike out 750.
EVANGELINE.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190.
EVELYN.—W. l., strike out 660 and 730.
EVERETT (WJCQ).—W. l., *600*, 640, 705, 750, 800.
FABIA.—W. l., *600*, 640, 705, 750, 800.
FALCON.—*600*, 640, 705, 750, 800.
FELTORE.—Owner of vessel, Ore S. S. Corporation.
F. H. HILLMAN.—Type of wave (system), A1–2; w. l., *600*, 660, 705, 730, 800.
FIRE BOAT No. 31.—W. l., strike out 600.
FIRE BOAT No. 44.—W. l., strike out 600.
FIRMORE.—Owner of vessel, Ore S. S. Corporation.
FISHERMAN.—Type of wave (system), A2; w. l., *600*, 705, 800.
FOAM.—W. l., *600*, 640, 705, 750, 800.
FORT ARMSTRONG.—Type of wave (system), B; w. l., *600*, 705, 800.
FOUR WINDS.—Type of wave (system), A1 and 2; w. l., *600*, 640, 705, 800; service, P. G.
F. Q. BARSTOW.—W. l., *600*, 640, 705, 750, 800.
FREDERIC R. KELLOGG.—W. l., add 640.
FRED W. WELLER.—W. l , *600*, 640, 705, 750, 800.
GALENA.—Owner of vessel, Texas Co.
GENERAL W. C. GORGAS.—Hours N and X.
GEORGE G. HENRY.—W. l., *600*, 640, 705, 750, 800.
GLEN WHITE.—W. l., *600*, 705, 800.
GOLDEN CLOUD.—W. l., strike out 875.
GOLDEN COAST.—W. l., strike out 875.
GOLDEN FOREST.—W. l., *600*, 705, 800, 1,875, 1,987, 2,098, 2,400.
GOLDEN PEAK.—W. l., strike out 875.
GOLDEN STATE.—W. l., *600*, 705, 800, 1,987, 2,098, 2,190, 2,400.
GOOD WILL.—W. l., *600*, 640, 660, 705, 800.
GOVERNOR COBB.—W. l., strike out 750.
GREATER BUFFALO.—W. l., *715*, 875, 1,796.
GREATER DETROIT.—W. l., *715*, 875, 1,796.
GREYLOCK.—W. l., *600*, 705, 800, 1,875, 1,911, 1,987, 2,128, 2,190.
GUINEVERE.—W. l., *600*, 750, 800.
GULF OF MEXICO, W. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
HALEAKALA.—Hours N.
HAMILTON.—W. l., strike out 1,875, 1,887, 1,987, 2,098, 2,400.
HANLEY.—W. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,987, 2,013, 2,098, 2,128, 2,190, 2,400.
HAWAIIAN STANDARD.—Type of wave (system), A2.
HENRY M. FLAGLER —W. l., strike out 750.
HERMAN FALK.—W. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
H. M. FLAGLER.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
H. M. STOREY.—W. l., *600*, 640, 705, 750, 800.
HOG ISLAND.—Name changed to Express.
HOMER.—Type of wave (system), A2; w. l., *600*, 640, 660, 705, 730, 750, 800.
HOWICK HALL.—W. l., *600*, 640, 705, 750, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
H. T. HARPER.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
HUMACONNA.—W. l., *600*, 705, 800.
ILLINOIS (KFMC).—W. l., *600*, 1,100.
INVADER.—W. l., *600*, 640, 705, 750, 800.

IROQUOIS (KGGY).—Type of wave (system), B.
J. A. MOFFETT.—W. l., *600*, 705, 750, 800.
J. C. DONNELL.—W. l., *600*, 640, 705, 750, 800.
JOHN W. WEEKS.—W. l., 1,100 meters.
JOSEPH R. PARROTT.—W. l., strike out 750.
KENTUCKY.—W. l., *600*, 705, 800, 2,098, 2,190, 2,400.
LAKE BENBOW.—Type of wave (system), A2; w. l., strike out 715 and 875.
LAKE CHARLES.—Call changed to WTBN, effective December 1, 1928.
LAKE ELLITHORPE.—W. l., add 800.
LAKE ORMAC.—Type of wave (system), A1–2; w. l., 17.857, 26.79, 35.93, 53.57; *600*, 640, 660, 705, *715*, 730, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190.
LA PLACENTIA.—W. l., *600*, 640, 705, 750, 800.
LARA.—W. l., *600*, 640, 705, 750, 800.
LARRY DOHENY.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
LEBORE.—Owner of vessel, Ore S. S. Corporation.
LIMON.—W. l., *600*, 640, 660, 705, 730, 750, 800.
LURLINE.—W. l., *600*, 640, 705, 730, 750, 800.
M. A. BRADLEY.—W. l., add 800.
MAKAWAO.—W. l., *600*, 660, 705, 730, 800.
MAKAWELI.—W. l., add 800.
MAKENA.—W. l., add 705.
MAKIKI.—Type of wave (system), A1–2; w. l., add 640 and 750.
MALOLO.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190, 2,400.
MALIBU.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 750, 800.
MALSAH.—Owner of vessel, Moore and McCormack Co.
MANCHURIA.—W. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
MANGORE.—Owner of vessel, Ore S. S. Corporation.
MANINI.—W. l., *600*, 660, 705, 730, 800.
MANOA.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,400.
MATSONIA.—Type of wave (system), A1–2–3; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190, 2,400.
MAUI.—Type of wave (system), A1–2–3; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,400.
MELROSE.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800.
MIAMI.—W. l., *600*, 705, 800.
MINNEKAHDA.—Type of wave (system), A, arc and A2; w. l., *600*, 705, 800, 1,875, 1,961, 1,987, 2,013, 2,098, 2,128, 2,156, 2,190.
MIST.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
MONTEBELLO.—W. l., *600*, 660, 705, 750, 800.
NARBO.—Station controlled by R. M. C. A.
N. & K. No. 2.—Type of wave (system), A1–2; w. l., *600*, 660, 705, 750, 800.
NEVADA.—W. l., *600*, 705, 800.
NEW JERSEY.—W. l., *600*, 660, 705, 730, 800.
NORFOLK.—W. l., *600*, 705, 800.
NOURMAHAL.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190.
OAKSPRING.—Station controlled by R. M. C. A. (U. S. L.).
ONONDAGA.—W. l., *600*, 640, 705, 750, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
ONTARIO.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800.
PACIFIC FIR.—W. l., *600*, 660, 705, 730, 800.
PADNSAY.—Owner of vessel, American-West African Line.
PARISMINA.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2098, 2,128, 2,190.
PATRICK HENRY.—Type of wave (system), A and B; w. l., *600*, 705, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,013, 2,041, 2,069, 2,098, 2,128, 2,158, 2,190, 2,222, 2,256, 2,290, 2,400.
PAWLET.—Owner of vessel, Oceanic and Oriental Navigation Co.
PENMAR.—W. l., *600*, 640, 705, 750, 800.
POINT ARENA.—Type of wave (system), B; w. l., *600*, 660, 705, 730, 800.
POINT FERMIN.—W. l., *600*, 705, 800.
PRESIDENT JACKSON.—W. l., *600*, 705, 800, 1,875, 1,987, 2,098, 2,400.

PRESIDENT MCKINLEY.—W. l., *600*, 705, 800, 1,987, 2,098, 2,128, 2,190.
PRESIDENT TAFT.—W. l., *600*, 705, 800, 2,098, 2,400.
PRESIDENT VAN BUREN.—W. l., *600*, 705, 800.
PRISCILLA.—W. l., *600*, 640, 705, 750, 800.
PROVIDENCE.—W. l., *600*, 640, 705, 750, 800.
PURITAN.—Type of wave (system), A2.
RICHMOND.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800.
RIPPLE.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
RICHFIELD.—W. l., *600*, 640, 705, 750, 800.
RELIEF.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190.
R. J. HANNA.—W. l., *600*, 640, 705, 750, 800.
SAN JOSE.—W. l., *600*, 640, 660, 705, 730, 750, 800.
SAN MATEO.—W. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190, 2,400.
SAN PEDRO.—Type of wave (system), A1–2.
SANTORE.—Owner of vessel, Ore S. S. Corporation.
SARAMACCA.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
SATURN.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
S. C. T. DODD.—W. l., *600*, 640, 705, 750, 800.
SEA KING.—W. l., *600*, 705, 800.
SELMA CITY.—W. l., *600*, 705, 800.
SEMINOLE (WNCX).—Type of wave (system), A2; w. l., *600*, 640, 705, 800.
S. M. SPALDING.—W. l., add 640.
STANDARD ARROW.—W. l., *600*, 705, 800.
STANDARD SERVICE.—Type of wave (system), A1–2.
STEEL NAVIGATOR.—W. l., *600*, 705, 800.
STEELORE.—Owner of vessel, Ore S. S. Corporation.
STEEL VOYAGER.—W. l., *600*, 640, 705, 750, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
SUMAR.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
SUN.—Type of wave (system), B and A2; w. l., *600*, 640, 705, 750, 800.
SURINAME.—W. l., 600, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
SWIFTEAGLE.—Type of wave (system), A, arc and A2; w. l., *600*, 640, 705, 800, 1,887, 1,961, 1,987, 2,098, 2,128, 2,190.
SWIFT SCOUT.—Type of wave (system), A2; w. l., *600*, 705, 750, 800.
SWIFTWIND.—W. l., *600*, 660, 705, 730, 800.
SYLVAN ARROW.—W. l., *600*, 640, 705, 750, 800.
TACHIRA.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
TASHMOO.—Type of wave (system), B; w. l., *600*, 705, 800.
TEXAN.—W. l., *600*, 660, 705, 800.
THOMAS H. WHEELER.—W. l., *600*, 640, 705, 750, 800.
THOMAS P. BEAL.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
TOPA TOPA.—Type of wave (system), A, arc and B; w. l., *600*, 700, 705, 1,875, 1,911, 1,961, 1,987, 2,013, 2,069, 2,098, 2,128, 2,190, 2,222, 2,256, 2,290, 2,400.
TRANSPORTATION.—W. l., *600*, 640, 705, 750, 800.
TURRIALBA.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
UNICOI.—W. l., *600*, 705, 800.
VIDOR.—Name changed to Hies-Maro; type of wave (system), B; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,013, 2,069, 2,098, 2,128, 2,190, 2,400.
VITTORIO EMMANUELE III.—W. l., *600*, 705, 800.
VOLUNTEER.—Station controlled by R. M. C. A. (U. S. L.).
WALTER A. LUCKENBACH.—W. l., *600*, 705, 800, 1,987, 2,098, 2,190, 2,400.
WANDERER.—W. l., *600*, 705, 800.
WEST CAJOOT.—Name changed to Golden Bear; owner of vessel, Oceanic & Oriental Navigation Co.
WEST CAMPGAW.—Owner of vessel, American-West African Line.
WEST CAPE.—W. l., *600*, 660, 705, 730, 800.
WEST CHETAC.—Station controlled by R. M. C. A. (U. S. L.).
WEST GRAMA.—Type of wave (system), B.

WEST HARSHAW.—Station controlled by R. M. C. A. (U. S. L.).
WEST ISLETA.—W. L., *600*, 705, 800.
WEST ISLIP.—Name changed to Golden Rod; owner of vessel, Oceanic & Oriental Navigation Co.
WEST NOTUS.—W. l., *600*, 705, 800, 1,875, 2,098, 2,400.
WILD GOOSE.—Type of wave (system), A2; w. l., *600*, 705, 750, 800.
WILHEMINA.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 705, 730, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190, 2,400.
WILLBORO.—W. l., *600*, 705, 800.
WILLETT.—Read Willett; type of wave (system), B; w. l., *600*, 705, 800.
WILLIAM C. ATWATER (WTOU).—W. l., *600*, 705, 800.
WILLIAM F. HUMPHREY.—Type of wave (system), A1–2.
WINONA COUNTY.—W. l., *600*, 705, 800.
W. J. HANNA.—W. l., *600*, 640, 705, 750, 800.
W. L. STEED.—W. l., *600*, 640, 705, 750, 800.
W. M. IRISH.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800.
WM. ROCKEFELLER.—W. l., *600*, 640, 705, 750, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
W. S. MILLER.—W. l., *600*, 640, 705, 750, 800.
W. S. RHEEM.—Type of wave (system), A1–2; w. l., *600*, 640, 660, 750, 800.
YORKMAR.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
ZAREMBO.—W. l., *600*, 705, 800.
Strike out all particulars of the following-named vessels: Celtic, Commercial, Pathfinder, Floridian, Silver Shell.

COMMERCIAL LAND AND SHIP STATIONS, ALPHABETICALLY, BY CALL SIGNALS

KDDM, *read* Executive; KDKS, *read* Willet; KEFT, *read* Explorer; KEXX, *read* Golden Bear; KGCK, *read* Hies-Maro; KIKX, *read* Golden Rod; KILJ, *read* Grays Harbor; KODV, *read* Express; WFAT, *read* Eleanor Boling; the following-named stations calls will be changed effective January 1, 1929: KGHT to KJT, KGHU to KJW, KGHV to KJY, KGHW to KJZ, KGIA to KHP, KGIB to KHS, KGIC to KHW, KGID to KHZ, WNBT to WNB, WBCM to WTBN, effective December 1, 1928; strike out all particulars following the call signals WACE, WBCX, WCDE, WGDA.

BROADCASTING STATIONS, BY CALL SIGNALS

[Alterations and corrections to be made to the list of Commercial and Government Radio Stations of the United States, edition of June 30, 1928]

KEKJ (Beverly Hills, Calif.).—Power, 500.
KFWF (St. Louis, Mo.).—Power, 100.
KGGM (Inglewood, Calif., portable).—Changed to Albuquerque, N. Mex.
KMIC (Inglewood, Calif.).—Power, 500.
KWCR (Cedar Rapids, Iowa).—Power, 100.
WABC (New York, N. Y.).—Power, 5,000.
WBES (Salisbury, Md.).—Call changed to WSMD.
WCBS (Springfield, Ill.).—Power, 100; 6 p. m. to 6 a. m.
WCLS (Joliet, Ill.).—Power, 100.
WCRW (Chicago, Ill.).—Power, 100.
WCWK (Fort Wayne, Ind.).—Power, 100.
WEAM (North Plainfield, N. J.).—Disregard notice of deletion in Bulletin No. 134; power, 100; w. l., 263; fy., 1,140.
WEDC (Chicago, Ill.).—Power, 100.
WHBU (Anderson, Ind.).—Power, 100.
WHFC (Chicago, Ill.).—Power, 100.
WJBI (Red Bank, N. J.).—Power, 100.
WJBL (Decatur, Ill.).—Power, 100 night, 250 day.
WKBB (Joliet, Ill.).—Power, 100.
WKBO (Jersey City, N. J.).—Power, 250.
WKBQ (New York, N. Y.).—Power, 250.
WLBX (Long Island City, N. Y.).—Power, 100.
WLTH (Brooklyn, N. Y.).—Power, 500.
WSBC (Chicago, Ill.).—Power, 100.

Strike out all particulars of the following-named stations: KFQA (St. Louis, Mo.), KWUC (Le Mars, Iowa), WAIZ (Appleton, Wis.), WGWB (Milwaukee, Wis.), WHBM (Chicago, Ill., portable), WIBJ (Chicago, Ill., portable), WJBA (Joliet, Ill.), WKBG (Chicago, Ill., portable), WMBB (Homewood, Ill.), WMBJ (McKeesport, Pa.), WMBW (Youngstown, Ohio), WNAL (Omaha, Nebr.), WOK (Homewood, Ill.), WPEP (Waukegan, Ill.).

GOVERNMENT LAND STATIONS, ALPHABETICALLY, BY NAMES OF STATIONS

[Alterations and corrections to be made to the list of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations, published by the Berne Bureau]

ATLANTA, GA.—Type of wave (system), A1; fy., 3,340 (89.8), *3,370* (*89.05*), 5,925 (50.65), *5,940* (*50.8*); hours, N.

BETHANY BEACH, DEL.—NSD remains as radio-compass group call; NBN, individual call.

BLUE CANYON, CALIF.—Fy., *3,370* (*89*), 3,395 (76.4), *5,940* (*50.51*), 5,950 (50.42).

CAMP LEWIS, WASH.—*Read* Fort Lewis, Wash.

GREENSBORO, N. C.—Type of wave (system), A1; fy., 3,340 (89.8), *3,370* (*89.05*), 5,925 (50.65), *5,940* (*50.8*); hours, N.

MOLINE, ILL.—Call changed to WNI; type of wave (system), A1; fy., 3,350 (89.55), *3,370* (*89.05*), *5,940* (*50.8*), 5,960 (50.32); hours, N.

RELIEF LIGHTSHIP No. 72.—*Read* Relief Lightship No. 80.

RICHMOND, VA.—Type of wave (system), A1; fy., 3,340 (89.8), *3,370* (*89.05*), 5,925 (50.65), *5,940* (*50.8*); hours, N.

SPARTANBURG, S. C.—Type of wave (system), A1; fy., 3,340 (89.8), *3,370* (*89.05*), 5,925 (50.65), *5,940* (*50.8*); hours, N.

ST. GEORGE REEF, CALIF.—Type of wave (system), strike out telegraph; fy., 588 (510); service, FX.

WICHITA, KANS.—Type of wave (system), A1; fy., 3,350 (89.55), *3,370* (*89.05*), *5,940* (*50.8*), 5,960 (50.32); hours, N.

Strike out all particulars of the following-named stations: Duluth Range Rear Light Station, Minn., Superior Entry Light Station, Wis.

GOVERNMENT LAND AND SHIP STATIONS, ALPHABETICALLY, BY CALL SIGNALS

NSD, disregard notice of change to NBN published in Bulletin No. 137, still remains as group call, NBN assigned as individual call for Bethany Beach, Del.; WTI, call changed to WNI; WUAA (new call WUJ), *read* Fort Lewis, Wash.; WWBZ (new call WRZ), *read* Relief Lightship No. 80; strike out all particulars following the call signals WWEB, WWEC.

SPECIAL LAND STATIONS, BY NAMES OF STATIONS

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1928]

CAMBRIDGE, MASS. (WIXM).—Station controlled by Massachusetts Institute of Technology, communication department.

MARION, MASS. (WIXC).—Fy., 500 to 13,000 (600 to 23).

MISCELLANEOUS

[Alterations and corrections to be made to the list of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations, published by the Berne Bureau]

NEW CALL SIGNALS ASSIGNED TO GOVERNMENT LAND AND SHIP STATIONS

Under article 14 of the International Radiotelegraph Convention, Washington, 1927, requiring land and ship stations to use only three and four letter call signals, respectively, the stations named hereunder are assigned the new calls shown in the column headed "To." The calls assigned to United States Army stations are effective midnight November 30, 1928, and those assigned to the Bureau of Lighthouses and the Coast and Geodetic Survey stations are effective January 1, 1929. The June, 1928, edition of this publication contains a list of commercial land and ship stations and other Government land and ship stations the calls of which are changed effective October 1, 1928.

United States Army land stations, alphabetically, by names

Name of station	Call signal From—	Call signal To—	Name of station	Call signal From—	Call signal To—
Bethel, Alaska	WUX	WXI	Fort Story, Va	WUAE	WUT
Camp Custer, Mich	WUAM	WTD	Fort Thomas, Ky	WUAF	WUV
Camp Knox, Ky	WUBC	WTY	Fort Wint, Grande Island, P. I.	WUAK	WTB
Camp Stotsenburg, P. I	WUCA	WZN	Haines, Alaska	WUAZ	WTW
Circle, Alaska	WUM	WXD	Holy Cross, Alaska	WUY	WXN
Cordova, Alaska	WUAY	WTU	Juneau, Alaska	WUJ	WXA
Denver, Colo	WUAX	WTS	Ketchikan, Alaska	WUT	WXH
Fort Brady, Mich	WUAP	WTH	Livengood, Alaska	WUV	WXF
Fort Crockett, Tex	WUAC	WUY	Manila, P. I	WUAJ	WTA
Fort De Lesseps, Canal Zone	WUCG	WZR	Metuchen, N. J	WUBB	WTX
Fort Ethan Allen, Vt	WUAI	WUX	Petersburg, Alaska	WUAV	WTQ
Fort Frank, P. I	WUAD	WUE	Point Barrow, Alaska	WUE	WXB
Fort John Hay, P. I	WUCB	WZQ	Presidio of Monterey, Calif	WUAB	WVM
Fort Lewis, Wash	WUAA	WUJ	Seward, Alaska	WUW	WXR
Fort McArthur, Calif	WUCK	WZW	St. Louis, Mo	WUBF	WZK
Fort Monmouth, N. J	WUBA	WTW	Tientsin, China	WUQ	WVN
Fort Preble, Me	WUAS	WTN	Tucson, Ariz	W DA	WUM
Fort Randolph, Canal Zone	WUCI	WZV	Vancouver Barracks, Wash	WUAQ	WTI
Fort Rodman, Mass	WUAW	WTR	West Point, N. Y	WUAH	WUW
Fort Shafter, Hawaii	WUAR	WTJ	Wrangell, Alaska	WUAO	WTG
Fort Sherman, Canal Zone	WUCH	WZU	Yuma, Ariz	WYDB	WUQ
Fort Sill, Okla	WUBD	WTZ			

United States Army land stations, alphabetically, by call signals

Call signal To—	Call signal From—	Station	Call signal To—	Call signal From—	Station
WTA	WUAJ	Manila, P. I.	WUT	WUAE	Fort Story, Va.
WTB	WUAK	Fort Wint, Grande Island, P. I.	WUV	WUAF	Fort Thomas, Ky.
WTD	WUAM	Camp Custer, Mich.	WUW	WUAH	West Point, N. Y.
WTG	WUAO	Wrangell, Alaska.	WUX	WUAI	Fort Ethan Allen, Vt.
WTH	WUAP	Fort Brady, Mich.	WUY	WUAC	Fort Crockett, Tex.
WTI	WUAQ	Vancouver Barracks, Wash.	WVM	WUAB	Presidio of Monterey, Calif.
WTJ	WUAR	Fort Shafter, Hawaii.	WVN	WUQ	Tientsin, China.
WTN	WUAS	Fort Preble, Me.	WXA	WUJ	Juneau, Alaska.
WTQ	WUAV	Petersburg, Alaska.	WXB	WUE	Point Barrow, Alaska.
WTR	WUAW	Fort Rodman, Mass.	WXD	WUM	Circle, Alaska.
WTS	WUAX	Denver, Colo.	WXF	WUV	Livengood, Alaska.
WTU	WUAY	Cordova, Alaska.	WXH	WUT	Ketchikan, Alaska.
WTV	WUAZ	Haines, Alaska.	WXI	WUX	Bethel, Alaska.
WTW	WUBA	Fort Monmouth, N. J.	WXN	WUY	Holy Cross, Alaska.
WTX	WUBB	Metuchen, N. J.	WXR	WUW	Seward, Alaska.
WTY	WUBC	Camp Knox, Ky.	WZK	WUBF	St. Louis, Mo.
WTZ	WUBD	Fort Sill, Okla.	WZN	WUCA	Camp Stotsenburg, P. I.
WUE	WUAD	Fort Frank, P. I.	WZQ	WUCB	Fort John Hay, P. I.
WUJ	WUAA	Fort Lewis, Wash.	WZR	WUCG	Fort De Lesseps, Canal Zone.
WUM	WYDA	Tucson, Ariz.	WZU	WUCH	Fort Sherman, Canal Zone.
WUQ	WYDB	Yuma, Ariz.	WZV	WUCI	Fort Randolph, Canal Zone.
			WZW	WUCK	Fort McArthur, Calif.

United States Army ship stations, alphabetically, by names

Name of vessel	Call signal From—	Call signal To—	Name of vessel	Call signal From—	Call signal To—
Cambrai	WXA	WUAA	Meigs	WXD	WUAC
Chateau-Thierry	WXF	WUAF	Merritt	WXI	WUAH
Dellwood	WXR	WUAJ	Somme	WXB	WUAB
Grant	WXH	WUAG	St. Mihiel	WXE	WUAD
Kenowis	WYAD	WUAK	Thomas	WXM	WUAI

United States Army ship stations, alphabetically, by call signals

Call signal		Name of vessel	Call signal		Name of vessel
To—	From—		To—	From—	
WUAA	WXA	Cambrai.	WUAG	WXH	Grant.
WUAB	WXB	Somme.	WUAH	WXI	Merritt.
WUAC	WXD	Meigs.	WUAI	WXM	Thomas.
WUAD	WXE	St. Mihiel.	WUAJ	WXR	Dellwood.
WUAF	WXF	Chateau-Thierry.	WUAK	WYAD	Kenowis.

Bureau of Lighthouses land stations, alphabetically, by names

Name of station	Call signal		Name of station	Call signal	
	From—	To—		From—	To—
Ambrose Channel Lightship, N. Y	WWAT	WRG	Makapuu Point Light Station, Hawaii	WWEK	KCP
Blunts Reef Lightship, Calif	WWBU	KCM	Marquette Light Station, Mich	WWEE	WWM
Boston Lightship, Mass	WWAF	WPO	Nantucket Shoals Lightship, Mass	WWAH	WPS
Brunswick Lightship, Ga	WWBG	WSJ	North East End Lightship, N. J	WWAQ	WRD
Cape Charles Lightship, Va	WWAY	WRS	Pollock Rip Slue Lightship, Mass	WWAG	WPQ
Cape Lookout Shoals Lightship, N. C	WWBA	WRY	Relief Lightship No. 76	WWBW	KCO
Cape Sarichef Light Station, Alaska	WWEF	KCA	Relief Lightship No. 78	WWAS	WRF
Cape Spencer Light Station, Alaska	WWEH	KCC	Relief Lightship No. 79	WWAU	WRI
Cape St. Elias Light Station, Alaska	WWEQ	KCD	Relief Lightship No. 80 [2]	WWBB	WRZ
Columbia River Lightship, Oreg	WWBQ	KCK	Relief Lightship No. 85	WWAI	WPT
Cornfield Point Lightship, Conn	WWAM	WPX	Relief Lightship No. 90	WWAJ	WPW
Crescent City Light Station, Calif	WWEJ	KCH	Relief Lightship No. 92	WWBR	KCL
Detroit Lighthouse Depot, Mich	WWET	WWR	Relief Lightship No. 109	WWBH	WSN
Detroit River Lighthouse, Mich	WWES	WWN	San Francisco Lightship, Calif	WWBV	KCN
Diamond Shoals Lightship, N. C	WWAZ	WRV	Scotch Cap Light Station, Alaska	WWEG	KCB
Fenwick Island Shoal Lightship, Del	WWAW	WRN	South Pass Lightship, La	WWBK	WSW
Fire Island Lightship, N. Y	WWAN	WPZ	Stannard Rock Light Station, Mich	WWED	WWH
Five Fathom Bank Lightship, N. J	WWAR	WRE	St. George Reef Light Station, Calif	WWEI	KCG
Frying Pan Shoals Lightship, N. C	WWBE	WSD	Swiftsure Bank Lightship, Wash	WWBO	KCI
Heald Bank Lightship, Tex	WWBJ	WSV	Umatilla Reef Lightship, Wash	WWBP	KCJ
Lansing Shoal Lightship, Mich	(1)	WWZ	Navassa Island Light Station, West Indies	WWEA	WSZ
			Winter Quarter Shoals Lightship, Va	WWAX	WRO

[1] No former call.

[2] Name changed from Relief Lightship No. 72.

Bureau of Lighthouses land stations, alphabetically, by call signals

Call signal		Name of station	Call signal		Name of station
To—	From—		To—	From—	
KCA	WWEF	Cape Sacrichef Light Station, Alaska.	WRE	WWAR	Five Fathom Bank Lightship, N. J.
KCB	WWEG	Scotch Cap Light Station, Alaska.	WRF	WWAS	Relief Lightship No. 78.
KCC	WWEH	Cape Spencer Light Station, Alaska.	WRG	WWAT	Ambrose Channel Lightship, N. Y.
KCD	WWEQ	Cape St. Elias Light Station, Alaska.	WRI	WWAU	Relief Lightship No. 79.
KCG	WWEI	St. George Reef Light Station, Calif.	WRN	WWAW	Fenwick Island Shoal Lightship, Del.
KCH	WWEJ	Crescent City Light Station, Calif.	WRO	WWAX	Winter Quarter Shoals Lightship, Va.
KCI	WWBO	Swiftsure Bank Lightship, Wash.	WRS	WWAY	Cape Charles Lightship, Va.
KCJ	WWBP	Umatilla Reef Lightship, Wash.	WRV	WWAZ	Diamond Shoals Lightship, N. C.
KCK	WWBQ	Columbia River Lightship, Oreg.	WRY	WWBA	Cape Lookout Shoals Lightship, N. C.
KCL	WWBR	Relief Lightship No. 92.	WRZ	WWBB	Relief Lightship No. 80.
KCM	WWBU	Blunts Reef Lightship, Calif.	WSD	WWBE	Frying Pan Shoals Lightship, N. C.
KCN	WWBV	San Francisco Lightship, Calif.	WSJ	WWBG	Brunswick Lightship, Ga.
KCO	WWBW	Relief Lightship No. 76.	WSN	WWBH	Relief Lightship No. 109.
KCP	WWEK	Makapuu Point Light Station, Hawaii.	WSV	WWBJ	Heald Bank Lightship, Tex.
WPO	WWAF	Boston Lightship, Mass.	WSW	WWBK	South Pass Light, La.
WPQ	WWAG	Pollock Rip Slue Lightship, Mass.	WSZ	WWEA	Navassa Island Light Station, West Indies.
WPS	WWAH	Nantucket Shoals Lightship, Mass.	WWH	WWED	Stannard Rock Light Station, Mich.
WPT	WWAI	Relief Lightship No. 85.	WWM	WWEE	Marquette Light Station, Mich.
WPW	WWAJ	Relief Lightship No. 90.	WWN	WWES	Detroit River Lighthouse, Mich.
WPX	WWAM	Cornfield Point Lightship, Conn.	WWR	WWET	Detroit Lighthouse Depot, Mich.
WPZ	WWAN	Fire Island Lightship, N. Y.	WWZ	----------	Lansing Shoal Lightship, Mich.
WRD	WWAQ	North East End Lightship, N. J.			

Coast and Geodetic Survey land stations, alphabetically, by names

Name of station	Call signal		Name of station	Call signal	
	From—	To—		From—	To—
Pacific coast (portable)	KGAJ	KVB	Pacific coast (portable).	KGAM	KVH
Do	KGAK	KVD	Do	KGHM	KVJ
Do	KGAL	KVE	Do	KGHS	KVK

Coast and Geodetic Survey land stations, alphabetically, by call signals

Call signal		Name of station	Call signal		Name of station
To—	From—		To—	From—	
KVB	KGAJ	Pacific coast (portable).	KVH	KGAM	Pacific coast (portable).
KVD	KGAK	Do.	KVJ	KGHM	Do.
KVE	KGAL	Do.	KVK	KGHS	Do.

CHANGES IN RADIOBEACON STATIONS OF THE UNITED STATES

[Additions to the list of Commercial and Government Radio Stations of the United States, edition of June 30, 1928, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Chesapeake Lightship, Va.—Radiobeacon established. Transmits every 180 seconds on 300 kc. (1,000 m.) groups of 1 dot, 2 dashes, and 1 dot for 60 seconds, thus:

•— — • •— — • etc. — Silent

60 seconds — 120 seconds

Beacon will be operated continuously during thick or foggy weather and daily in clear weather from 1 to 1.30 and 7 to 7.30 a. m. and p. m. Radio operator stands watch for the first 15 minutes of each hour from 8 a. m. to 9.15 p. m. in clear weather and from 10 to 10.15 a. m. and from 4 to 4.15 p. m. in thick or foggy weather, at which intervals the beacon is not operated. Call signal WWAY. Location, 75° 42′ 12″ W., 36° 58′ 42″ N.

Dry Tortugas Light Station, Fla.—Operating periods changed. Now operates daily in clear weather from 2 to 2.15, 5 to 5.15, 8 to 8.15, and 11 to 11.15 a. m. and p. m., seventy-fifth meridian time.

Smith Point Light Station, Va.—Radiobeacon established. Transmits every 180 seconds on 305 kc. (985 m.) groups of 1 dash, 2 dots, and 1 dash for 60 seconds, silent 120 seconds, thus:

— • • — — • • — etc.	Silent
60 seconds	120 seconds

Beacon will be operated continuously during thick or foggy weather and daily in clear weather from 4 to 4.30 and 10 to 10.30 a. m. and p. m., seventy-fifth meridian time. Location (approximately), 76° 11′ 00″ W., 37° 53′ 00″ N.

HIGH-FREQUENCY CHANNEL ALLOCATED TO CHICAGO (ILL.) STATION (WCFL)

In reference to the list of high-frequency channels published in Radio Service Bulletin No. 137, August 31, 1928, the frequency of 8,050 kilocycles allocated to the Chicago (Ill.) (WCFL) station owned by the Chicago Federation of Labor was inadvertently omitted.

GENERAL ORDERS OF THE FEDERAL RADIO COMMISSION

Definition of a daytime broadcasting station (General Order No. 41, September 4, 1928).—It is ordered that a daytime broadcasting station is hereby defined as a station which under its license from this commission is permitted to operate only during certain designated hours during the daytime and is not permitted to operate at any time when its operation will cause heterodyne interference with other broadcasting stations assigned to the same frequency.

No daytime station will be permitted to operate after the average time for sunset during any particular month, to be determined from time to time by the chief engineer of the commission. The time of such sunset shall be taken with reference to the location of the transmitter of the daytime broadcasting station unless it is the farthest east of the stations assigned to the same frequency; in this event the time shall be taken with reference to the location of the transmitter of the nearest broadcasting station on the same frequency located to the west of such daytime broadcasting station.

Broadcastings tations not allowed power in excess of 25 kilowatts except for experiments and daytime broadcasting (General Order No. 42, September 7, 1928).—It is ordered (1) That, except as herinafter stated, no broadcasting station assigned to any of the frequencies set forth in subparagraph A of paragraph 4 of General Order No. 40 be authorized to use in excess of 25 kilowatts until further order of the commission. (2) That for the purpose of determining by experiment whether interference will result from the use of a greater amount of power the commission may authorize the use of not more than 50 kilowatts power by any of such broadcasting stations for the next license period beginning after the date of this order. (3) That for experimental purposes the commission may authorize the use of any amount of power in excess of 50 kilowatts, in equal amounts for each zone, by such broadcasting stations at such hours between midnight and morning as may be determined by the commission. (4) That the commission may authorize the use of an amount of power not in excess of twice that above set forth in paragraphs 1 and 2 by the broadcasting stations therein referred to, respectively, for daytime operation only, the exact hours to be determined by the commission. (5) That nothing stated in this order shall be construed as giving any broadcasting station any right or claim to any of the maximum amounts of power herein above set forth, or to any amount of power in excess of the amount which the commission shall from time to time in each case find best calculated to serve public interest, convenience, or necessity.

Chain programs allowed for only one hour unless stations are 300 miles apart or operate on same frequency (General Order No. 43, September 8, 1928).—It is ordered that until further order of the commission no two or more of the broad-

casting stations assigned to the frequencies allocated under subparagraph A of paragraph 4 of General Order No. 40 shall, during the period beginning with November 11, 1928, broadcast simultaneously the same identical program for more than one hour daily during the hours between 7 o'clock p. m. and 12 o'clock midnight, local standard time at the location of the station farthest east, unless (*a*) the transmitters of such stations are separated by a distance in excess of three hundred (300) miles, or (*b*) such stations are operating on the same frequency, or (*c*) such stations receive special permission from the commission. This permission will be granted only in the case of programs of extraordinary national interest or of a nature such that public interest, convenience, or necessity would clearly be served by their duplication to a greater extent than is permitted by the foregoing provisions of this order.

Broadcasting station licenses extended until November 11, 1928 (General Order No. 44, September 8, 1928.)—It is ordered that, with the exception hereinafter set forth, all existing licenses to broadcast, subject to such modifications, conditions, and extensions as may be appended thereto, be, and the same are hereby, further extended for a period of 42 days from October 1, 1928, to terminate at 3 o'clock a. m., eastern standard time, November 11, 1928. This order shall not apply, and no extension of any existing license shall be deemed to be granted, with respect to any broadcasting station listed in General Order No. 32, which was ordered to consolidate with any other station and which shall be notified by the commission prior to October 1, 1928, that its license will not be thus extended.

Broadcasting stations permitted to conduct tests in changing frequency under allocations effective November 11, 1928 (General Order No. 45, September 24, 1928).—For the purpose of permitting broadcasting stations to make such tests as may be necessary to enable them to change to the frequencies assigned to them, respectively under the allocation effective on November 11, 1928, and thereafter to maintain said frequency with the degree of accuracy required by the regulations of the commission. It is ordered that any broadcasting station, the frequency of which has been changed by the new allocation effective on November 11, 1928, be, and it is hereby, permitted until further order of the commission, to make such tests on its new frequency, provided these tests be conducted at hours when interference will not be caused with the broadcasting of other stations. These tests must be limited to the period between 2 and 7 o'clock a. m., eastern standard time, in the case of stations located east of the Mississippi River, and to the period between 1 and 7 o'clock a. m., mountain standard time, in the case of stations located west of the Mississippi River. Such tests will not be permitted to continue in cases where interference develops. On applications in particular cases broadcasting stations may obtain leave to make tests and experiments during the daytime if, in the opinion of the commission, interference will not result.

REVISED UNITED STATES AMATEUR REGULATIONS

[Superseding those dated March 6, 1928]

An amateur station is a station operated by a person interested in radio technique solely with a personal aim and without pecuniary interest. Amateur licenses will not be issued to stations of other classes.

Amateur radio stations are authorized for communication only with similarly licensed stations, except as indicated below, and on wave lengths or frequencies within the following bands and at all times unless interference is caused with other radio services, in which event a silent period must be observed between the hours of 8 p. m. and 10.30 p. m., local time, and on Sundays during local church services.

Kilocycles	Meters	Kilocycles	Meters
401,000 to 400,000	0.7477 to 0.7496	8,000 to 7,000	37.5 to 42.8
64,000 to 56,000	4.69 to 5.35	4,000 to 3,500	75.0 to 85.7
30,000 to 28,000	9.99 to 10.71	2,000 to 1,500	150.0 to 200.0
16,000 to 14,000	18.70 to 21.40		

Amateur radio telephone operation will be permitted only in the following bands:

Kilocycles	Meters
64,000 to 56,000	4.69 to 5.35
3,550 to 3,500	84.50 to 85.70
2,000 to 1,715	150.00 to 175.00

Amateur television and operation of picture transmission apparatus will be permitted only in the following bands:

Kilocycles	Meters
60,000 to 56,000	5.00 to 5.35
2,000 to 1,715	150.00 to 175.00

Spark transmitters will not be authorized for amateur use.

Amateur stations must use circuits loosely coupled to the radiating system or devices that will produce equivalent effects to minimize key impacts, harmonics, and plate supply modulations. Conductive coupling, even though loose, will not be permitted, but this restriction shall not apply against the employment of transmission line feeder systems to Hertzian antennæ.

Amateur stations are not permitted to communicate with commercial or Government stations unless authorized by the licensing authority except in an emergency or for testing purposes. This restriction does not apply to communication with small pleasure craft such as yachts and motor boats holding limited commercial station licenses which may have difficulty in establishing communication with commercial or Government stations.

Amateur stations are not authorized to broadcast news, music, lectures, sermons, or any form of entertainment, or to conduct any form of commercial correspondence.

No person shall operate an amateur station except under and in accordance with an operator's license issued to him by the Secretary of Commerce.

RELATION BETWEEN GREENWICH MEAN TIME AND STANDARD TIMES IN USE IN THE UNITED STATES

The division has published in previous editions of the BULLETIN tables showing the times at which naval and other stations transmit weather and hydrographic reports, time signals, etc. Some of these tables gave Greenwich mean time, and as several requests have been received from readers of the BULLETIN for data showing the difference between Greenwich time and the times used in this country the following is published:

Greenwich mean time is the system of time in which noon occurs at the moment of passage of the mean sun over the meridian of Greenwich, England. Standard time is the time of a certain meridian adopted for local use over a large region in lieu of true local time. The meridian of Greenwich, England, was taken as a prime meridian, and there are 24 standard meridians differing from it by 15° of longitude east and west. These meridians were established in order that the standard times of all countries would agree with Greenwich in minutes and seconds but differ in hours by whole numbers. Clocks at any place within 7° 30′ east or west of a standard meridian are set to agree with the time of that meridian. They may therefore differ by as much as a half hour from local mean time. In the United States the standard times are eastern, 75° west or 5 hours slower than Greenwich mean time; central, 90° west or 6 hours slower than Greenwich; mountain, 105° west or 7 hours slower than Greenwich; and Pacific, 120° west or 8 hours slower than Greenwich.

In Europe, Greenwich time, no degrees is used by Great Britain, Belgium, France, Holland, and Spain; mid-European time, 15° east or 1 hour fast, is used by Austria, Denmark, Germany, Italy, Serbia, Sweden, and Switzerland; East European time, 30° east or 2 hours fast is used by British South Africa, Bulgaria, Egypt, Rumania, and Turkey. The standard time for India follows meridian 82° 30′ east or 5½ hours fast, while Japan takes meridian 135° east or 9 hours fast. In Australia the standard time for western Australia follows meridian 120° east or 8 hours fast; South Australia, meridian 142° 30′ east, or 9½ hours fast; New South Wales, Queensland, Victoria, and Tasmania, 150° east or 10 hours

fast; New Zealand, 172° 30′ east or 11½ hours fast. Longitude 180° practically coincides with the international date line, where, according to direction of passage, the date is set ahead or back one whole day. As the meridian of New York is 74° west, the local time of New York is 4 hours and 56 minutes slower than Greenwich time. The following table shows the local times of various capitals and other important cities of the world when it is noon (local time) in New York:

City	Hour	City	Hour
Amsterdam	5.15 p. m.	London (Greenwich)	4.56 p. m.
Athens	6.31 p. m.	Madras	10.18 p. m.
Auckland	4.36 a. m.	Madrid	4.42 p. m.
Berlin	5.49 p. m.	Manila	1.01 a. m.
Bern	5.26 p. m.	Melbourne	2.36 a. m.
Bombay	9.47 p. m.	Mexico	10.20 a. m.
Brisbane	3.08 a. m.	Ottawa	11.53 a. m.
Buenos Aires	1.04 p. m.	Paris	5.05 p. m.
Brussels	5.14 p. m.	Peking	12.42 a. m.
Cairo	7.00 p. m.	Rio de Janeiro	2.04 p. m.
Calcutta	10.50 p. m.	Rome	5.46 p. m.
Cape Town	6.56 p. m.	San Francisco	8.45 a. m.
Chicago	11.04 a. m.	Petrograd	6.58 p. m.
Christiania	5.40 p. m.	Stockholm	6.08 p. m.
Constantinople	6.52 p. m.	Sydney	3.02 a. m.
Copenhagen	5.46 p. m.	Tokyo	2.16 a. m.
Dublin	4.35 p. m.	Vienna	6.02 p. m.
Edinburgh	4.43 p. m.	Washington	11.48 a. m.
Honolulu	6.25 a. m.	Winnipeg	10.48 a. m.
Lisbon	4.20 p. m.		

INVESTIGATION OF FADING PHENOMENA IN CONNECTION WITH THE BYRD ANTARCTIC EXPEDITION

L. V. Berkner, assistant radio engineer, Bureau of Standards, is now on board the ship *City of New York*, of the Byrd Antarctic Expedition en route to the Antarctic regions. Mr. Berkner, in addition to his duties as a radio officer of the expedition, will make an investigation of fading phenomena, particularly of high-frequency transmissions. The equipment for this work consists of two special high-frequency receiving sets loaned by the Westinghouse Electric & Manufacturing Co., to which fading recorders have been adapted by the bureau. These recorders are similar to those used by the Bureau of Standards in previous fading investigations, and the method used will be the same.

It is expected that this investigation will give information on the effect of the concentration of the earth's magnetic field at the South Magnetic Pole of auroras, temperature, height of the radio reflecting layer, and many other phenomena which affect radio transmission. Mr. Berkner will make observation upon selected stations, and some special transmissions may be arranged.

The expedition will be in the Antarctic regions for sufficient time to give observations throughout both the daylight and dark months of an antarctic year. The Bureau of Standards will keep in touch with the work by means of radio communication.

RADIO SIGNAL TRANSMISSIONS OF STANDARD FREQUENCY, OCTOBER TO MARCH

The Bureau of Standards announces a new schedule of radio signals of standard frequencies, for use by the public in calibrating frequency standards and transmitting and receiving apparatus. This schedule includes many of the border frequencies between services as set forth in the allocation of the International Radio Convention of Washington which goes into effect January 1, 1929. The signals are transmitted from the bureau's station (WWV), Washington, D. C. They can be heard and utilized by stations equipped for continuous-wave reception at distances up to about 500 to 1,000 miles from the transmitting station.

The transmissions are by continuous-wave radio telegraphy. The signals have a slight modulation of high pitch which aids in their identification. A complete frequency transmission includes a "general call" and "standard frequency" signal and "announcements." The "general call" is given at the beginning of the 8-minute period and continues for about 2 minutes. This includes a statement of the frequency. The "standard frequency signal" is a series of very long dashes with the call letter (WWV) intervening. This signal continues for about 4 minutes. The "announcements" are on the same frequency as the "standard

frequency signal" just transmitted and contain a statement of the frequency. An announcement of the next frequency to be transmitted is then given. There is then a 4-minute interval while the transmitting set is adjusted for the next frequency.

Information on how to receive and utilize the signals is given in Bureau of Standards Letter Circular No. 171, which may be obtained by applying to the Bureau of Standards, Washington, D. C. Even though only a few frequency points are received, persons can obtain as complete a frequency meter calibration as desired by the method of generator harmonics, information on which is given in the letter circular. The schedule of standard frequency signals is as follows:

Radio signal transmissions of standard frequency schedule of frequencies in kilocycles

Eastern standard time (p. m.)	Oct. 22 [1]	Nov. 20	Dec. 20	Jan. 21	Feb. 20	Mar. 20
10 to 10.08	550	1,500	4,000	125	550	1,500
10.12 to 10.20	600	1,700	4,200	150	600	1,700
10.24 to 10.32	650	2,250	4,400	200	650	2,250
10.36 to 10.44	800	2,750	4,700	250	800	2,750
10.48 to 10.56	1,000	2,850	5,000	300	1,000	2,850
11 to 11.08	1,200	3,200	5,500	375	1,200	3,200
11.12 to 11.20	1,400	3,500	5,700	450	1,400	3,500
11.24 to 11.32	1,500	4,000	6,000	550	1,500	4,000

[1] This schedule replaces the one previously announced for this date.

INFORMATION CONCERNING TESTING OF PIEZOOSCILLATORS FOR BROADCASTING STATIONS

In connection with the changes in frequencies of broadcasting stations under the new allocation ordered by the Federal Radio Commission the following information is given on the standardization of frequency standards.

Before the Bureau of Standards can undertake any test a written request must be received which contains the following information: (*a*) Licensed frequency of the station, (*b*) type of piezooscillator and quartz plate, (*c*) location and call letters of the station, (*d*) name of the owner of the radio station where the piezooscillator is to be used.

A piezooscillator will not be tested unless the quartz plate is mounted in a suitable holder and operates readily. Tests are limited to complete piezooscillators.

In case a broadcasting station is now using a piezooscillator which has been calibrated by the Bureau of Standards and is required to change its frequency by the action of General Order No. 40, the Bureau of Standards will calibrate a piezooscillator for the new frequency without charge to the station. In many cases the change to a new frequency will necessitate a new quartz plate and changes in the coils of the piezooscillator. The bureau can not do this work. Grinding of quartz plates if they have no other means of adjustment will be done if it comes under 163e of test fee schedule 163. The manufacturer of the piezooscillator should be consulted concerning changes. In requesting a test under this provision state in addition to the information requested above (*e*) test number (taken from certificate) of last test by the bureau.

In case a broadcasting station is using a piezooscillator which has not been calibrated by the Bureau of Standards, it may be submitted for test and a fee will be charged according to test fee schedule 163.

The piezooscillator is the only type of standard which will be calibrated for use as a station standard by the Bureau of Standards. Such a standard will be calibrated for any broadcasting station which requests it. A fee will be charged according to test fee schedule 163. Attention is directed to the explanatory text of this schedule.

In most cases where a quartz plate is used to control the frequency of a broadcasting station directly it is not feasible to calibrate this plate at the Bureau of Standards, since the entire piezooscillator must be submitted. In such cases the station should provide a separate piezooscillator which is used for checking purposes. It may then be submitted for test in accordance with the above.

Tests will, in general, be scheduled in the order in which requests are received. A copy of fee schedule 163 will be sent upon request addressed to Bureau of Standards, Washington, D. C.

REFERENCES TO CURRENT RADIO LITERATURE

This is a monthly list of references prepared by the Bureau of Standards and is intended to covery the more important papers of interest to professional radio engineers which have recently appeared in periodicals, books, etc. The number at the left of each reference classifies the reference by subject, in accordance with the scheme presented in "A Decimal Classification of Radio Subjects—An Extension of the Dewey System," Bureau of Standards Circula No. 138, a copy of which may be obtained for 10 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C. The various articles listed below are not obtainable from the Government. The various periodicals can be secured from their publishers and can be consulted at large public libraries.

R000.—*Radio communication*

R060 Dellinger, J. H. The International Union of Scientific Radio Telegraphy. Proc. I. R. E., **16**, pp. 1107-12; August, 1928.

Organization of U. R. S. I. and report of meeting of October 10 to 28, 1927.

R100.—*Radio principles*

R110 Bramley, Arthur. Kerr effect in water due to high frequency radio waves. Jour. Frank. Inst., **206**, pp. 151-158; August, 1928.

Description of an experiment for finding the absorption lines of radio waves (3 to 300 c. m.) in water. A Kerr tube filled with water and placed between two nicol prisms and a quarter wave plate is used for the work.

R113.4 Jouaust, R. Les phénomènes de propagation des ondes radiotélégraphiques. (The propagation phenomena of radio waves.) Comptes Rendus, **187**, pp. 208-209; July 23, 1928.

Calls attention to the fact that the propagation theory is based on a certain law for which the ionic density in the upper atmosphere is taken as a regular function of the altitude. The electrified particles given off from the sun are, however, a discontinuous emission similar to the Schottky effect in tubes.

R113.7 Kenrick, G. W. Radio transmission formulae. Phil. Mag., **6**, pp. 289-304; August, 1928.

Derives a transmission formula for long wave work taking the upper reflecting layer into account. The results indicate that the inverse square root of the wave length in the damping factor of the Austin-Cohen formula has considerable theoretical justification, but the inverse square root of the distance should be used instead of the inverse first power of the distance. A slight change in the numerical constant is needed.

R116 Frank, N. H. Die Fortplanzung elektrischer Wellen in Kabeln mit zwei Isolationsschichten. (The propagation of electric waves in cables with two insulating layers.) Ann. d. Physik, **86**, pp. 422-34; June, 1928.

The velocity of propagation of electric waves along cables with two insulating layers is computed according to Maxwell's theory. A new method is given for measuring the velocity along wires by means of using Lichtenberg-Figures. This gives a means for also determining the dielectric constant.

R116 Nancarrow, F. E. The behavior of a transmission line at radio-frequencies. Post Office Elec. Engrs. Jour., **21**, pp. 165-69; July, 1928.

Deals with the solution of the propagation of radio-frequency currents along a transmission line. Curves for the surge impedance for different spacings and size of wire are given.

R125.1 Smith-Rose, R. L. Radio direction finder—the theory of the frame aerial avoiding electrostatic pick-up. Wireless World and Radio Review, **23**, p. 186; August 15, 1928.

Discussion of antenna effect and method of screening for its elimination using open loops.

R127 Brunn, H. Eine einfache Methode zur Messung der Eigenwellenlänge von Antennen. (A simple method for the measurement of the natural wave length of an antenna.) Zeits. f. Hochfreq., **32**, p. 25; July, 1928.

A tube wave meter is loosely coupled to an antenna and the grid dip used for the determination of the natural wave length.

R130 Le Boiteux, H. L'influence des émissions secondaires des métaux sur le fonctionnement des lampes à trois électrodes. (Effect of the secondary emission of metals on the behavior of 3-electrode tubes.) Revue Gen. de L'Electricité, **23**, pp. 939-46 and 984-992; June 2, 1928.

This paper gives a theoretical investigation of the working characteristics of circuits using 3-element tubes. The effect of secondary emission is taken into account.

R130 Podlinsky, M. Equilibres instables et régimes statiques parasites dans les circuits électriques associés aux triodes. (Unstable equilibrium and disturbing conditions in triode circuits.) L'Onde Électrique, **7**, pp. 287-306; July, 1928.

Theoretical treatment of the dynatron action in triode circuits.

R130 Ballantine, Stuart. Schrot-Effect in high-frequency circuits. Jour. Frank. Inst., **206**, pp. 159-168; August, 1928.

A further theoretical study of the Schrot effect.

R132.3 Hartshorn, L. Interelectrode capacities and resistance amplification. Experimental Wireless and Wireless Engineer, **59**, pp. 419-430; August, 1928.

A study of resistance capacity coupled amplifiers with respect to distortion and interelectrode capacities and resistance.

R133 Pfetscher, O. Uber die Erregung sehr schneller elektrischen Schwingungen in der Dreielektrodenrohre. (On the production of oscillations of very high frequency by means of electron tubes.) Phys. Zeits., **29**, pp. 449–478; July 15, 1928.

Treats analytically the production of very short waves of tube oscillations and shows like Barkhausen and Kurz that the finite time for the electrons to pass to the respective electrodes produces a phase difference. The Gill-Morell oscillations are treated theoretically. The theory also explains the effect of the grid potential on the frequency even though the external circuit is kept unchanged.

R133 Martyn, D. F. (A reply to K. E. Edgeworth.) Frequency variations of the triode oscillator. Phil. Mag., **6**, pp. 223–228; July, 1928.

Deals with the major effects causing a variation in the frequency of a triode oscillator. States that the most important cause of frequency variation is the flow of grid current, especially when the resistance is kept low and the frequency is not too high. Reference is made to generator with zero grid current which kept the frequency within 1 part in 100,000.)

R134 David P. La détection par lampe. (Detection by means of electron tubes.) L'Onde Electrique, **7**, pp. 313–62; August, 1928.

Theoretical and experimental data for the electron tube as a detector.

R134.4 Van der Pol, B. The effect of regeneration on the received signal strength. Proc. I. R. E., **16**, pp. 1045–52; August, 1928.

Gives the theory and experimental verification of it for the effect of regeneration on signal strength.

R140 Lion, K. Ein Wechselstromkompensator mit grossem Frequenzumfang. (An alternating current compensator with wide frequency range.) Elekt. Nach.-Tech., **5**, pp. 276–283; July, 1928.

A phase shifter for audio and high frequency currents is described.

R142 Mallett, Prof. E. The resonance curves of coupled circuits. Experimental Wireless and Wireless Engineer, **59**, pp. 437–42; August, 1928.

An analytical treatment (vectorial method) of coupled circuit with the frequency varied similar to the one described by the same author in the February, 1927, issue of Experimental Wireless and Wireless Engineer for single circuits.

R154 Watanabe, Yasusi. Über die günstigste Belastung des Hochfrequenz-generators. (On the most favorable load for a high-frequency generator.) Elekt. Nach.-Tech., **5**, pp. 259–267; July, 1928.

A theoretical article for the best load to connect to a high-frequency alternator.

R200.—*Radio measurements and standardization*

R201 Clapp, J. K. A note on methods of rapidly adjusting a radio frequency oscillator in small steps of frequency. Jour. Opt. Soc. of Amer., **17**, pp. 132–37; August, 1928.

Describes rapid methods of adjusting the frequency of a generating set by aural methods using auxiliary generating sets and a tuning fork. Discusses accuracy obtainable.

R201.6 Ferguson, J. G., and Bartlett, B. W. Measurement of capacitance in terms of resistance and frequency. Bell System Tech. Jour., **7**, pp. 420–37; July, 1928.

Describes an adaptation of the Wien Bridge for the determination of capacity.

R214 Wheeler, L. P., and Bower, W. E. A new type of standard frequency piezoelectric oscillator. Proc. I. R. E., **16**, pp. 1035–44; August, 1928.

Gives a new type of piezoelectric oscillator, for which the oscillations are sustained by an acoustic feedback.

R214 Hund, A. Notes on quartz plates, air gap effect, and audio-frequency generations. Proc. I. R. E., **16**, pp. 1072–78; August, 1928.

The effect of supersonic sound waves taking place in a crystal holder is discussed. The energy curve is given with respect to the air gap in the crystal holder. Van der Pol's relaxation oscillations are suggested in the circuit for obtaining very accurate low-frequency current from a high-frequency crystal.

R220 Griffiths, W. H. F. The measurement of small variable capacities at radio frequencies. Experimental Wireless and Wireless Engineer, **59**, 452–59; August, 1928.

A new method is given for calibrating small capacities.

R223 Bryan, A. B., and Sanders, I. C. The dielectric constant of air at radio frequencies. Physical Review, **32**, pp. 302–310; August, 1928.

Value of dielectric constant of dry air free from carbon dioxide determined as 1.0005893 for standard conditions of temperature and pressure. The method is a modification of the usual heterodyne beat arrangement.

R290 Obata, Juichi. The "Ultramicrometer," a new instrument for measuring very small displacement or motion, and its various applications. Journl. Opt. Soc. of Amer., **16**, pp. 419–32; June 1928.

Describes the construction and various examples of applications of the ultramicrometer for measuring a small displacement or motion utilizing a generating electron tube circuit. The displacement or motion to be measured is made to produce either a change in capacity or in the eddy current loss, and in consequence a corresponding change in the plate current of the tube.

R300.—*Radio apparatus and equipment*

R342 Jouaust, R. and Decaut, B. Note sur quelques perfectionnements des amplificateurs a courant continu. (Notes on some perfections on d. c. amplifiers.) L'Onde Electrique, **7**, pp. 306–08; July, 1928.

A straight 2-stage d. c. amplifier is used with the first tube having a large amplification factor. In one case a special tube is employed in the first stage with a narrow mesh grid and a large anode (u=36). In another case a double grid tube is used with the two grids connected together.

R342 Hund, A. Notes on aperiodic amplification and applications to the study of atmospherics. Proc. I. R. E., **16**, pp. 1077–78; August, 1928.

A circuit for aperiodic amplification is given and the main differences between aperiodic amplification and amplification of harmonic voltages are brought out.

R342.7 Reppisch, H. Uber die Spannungsverstärkung mittels Transformatorenkopplung beim Niederfrequenzverstärker. (On voltage amplification by means of transformer coupling for the low-frequency amplifier. Ziets. f. Hochfrequenz., **32**, pp. 22–24; July, 1928.

A derivation of the relations for transformer coupled amplification (audio-frequency).

R342.7 Kirke, H. L. Microphone amplifiers and transformers. Experimental Wireless and Wireless Engineer, **59**, pp. 443–51; August, 1928.

A continuation of the article appearing on page 370 in the July issue. Deals with the effects of coupling between stages of an amplifier. Takes interelectrode capacity into account.

R342.7 Thomson, J. M. Characteristics of output transformers. Proc. I. R. E., **16**, pp. 1053–64; August, 1928.

Discusses analytically and by means of tests, the characteristics of output transformers.

R343.7 Kimmell, W. J. The cause and prevention of hum in receiving tubes employing alternating current direct on the filament. Proc. I. R. E., **16**, pp. 1089–1106; August, 1928.

The effect of the filament which is heated with alternating current on the quality of reception is discussed.

R344 Bell, Eric G. A valve-maintained high-frequency induction furnace and some notes on the performance of induction furnaces. Proc. Phys. Soc. (London), **40**, pp. 193–205; June 15, 1928.

Gives electrical design of an induction fornace and gives a general theory of the behavior of induction furnaces. Experimental results given supporting the theory.

R344 Hund, A. Générateur des courants de fréquence audible et réglable a stabilisation piézo-electrique. (Generator for audio currents of adjustable frequency with piezoelectric stabilization.) QST Francais, **9**, pp. 16–19; August, 1928.

A translation of Bureau of Standards Scientific Paper No. 569, giving a method of producing audio currents of variable frequency and good wave form.

R344.4 Wechsung, H. Röhrengenerator grosser Leistung für sehr kurze elektrische Wellen. (Tube generator of large rating for very short waves.) Zeitz. f. Hochfreq., **31**, pp. 176–183; June, 1928.

A circuit is discussed by means of which 700 watts energy for code modulation and 300 watts energy for speech modulation can be generated. Waves down to 4.2 meters were produced.

R344.4 Hollmann, H. E. Telephonie auf extrem kurzen Wellen. (Telephony with extremely short waves.) Elekt. Nach.-Tech., **5**, pp. 268–75; July, 1928.

The author describes a system for telephony with wave lengths between 30 and 100 cm. It is also shown that the Barkhausen and Gill and Morrell oscillations can occur simultaneously.

R344.6 Lübcke, E. Eine Gross-Verstärkerröhre mit Quecksilberdampf. (A power amplifier tube with mercury vapor.) Zeits. f. Hochfreq., **32**, pp. 1–10; July, 1928.

An amplifier tube using a mercury arc is described. The internal resistance is only 70 ohms, and the tube seems promising for heavy current work.

R374.1 Ogawa, W. Analogy between the crystal detector and a vacuum tube. Phil. Mag., **6**, pp. 175–178; July, 1928.

The author explains the rectification of a crystal detector by means of a difference of electrons emitted from each electrode. According to his views there is no substantial difference between a crystal detector and a vacuum tube rectifier except the metallic conduction at the real contact points in the former.

R374.1 Regler, Fritz. Vorläufige Mitteilung uber die Theorie des Kontaktdetektors. (Preliminary communication on the theory of contact detectors.) Phys. Zeits., **29**, pp. 429–436; July, 1928.

The author divides contact rectifiers into two classes. For the first class rectification is due to electrostriction (piezoelectric effects); and for the other, due to different values of electron affinity for different materials. Many of his conclusions are based on a paper by G. G. Reisshaus, Phys. Zeits., **28**, 223; 1928.

R374.1 Beck, P. Weitere Mitteilungen zum Kristalldetektor problem. (Further communication on contact detectors.) Phys. Zeits., **29**, pp. 436–437; July, 1928.

Describes experimental work with galena-silver, galena-copper and galena-steel contact rectifiers. Microscopic observations of the contact surface have been made in addition, and the results seem to be in agreement in several ways with the ones due to G. G. Reisshaus.

R381 Trogner, A. M. Mica condensers for high frequency. QST, **12**, pp. 47–49; September, 1928.

Gives method of connecting small mica condensers for use in high frequency transmitting sets.

R388 Lee, E. S. Cathode-ray oscillographs and their uses. General Electric Review, **31**, pp. 404–12; August, 1928.

Describes principles of cathode-ray oscillograph and commercial instrument, in which photographic records can be made. Illustrations are given for its use on various problems including radio.

R400.—*Radio communication systems*

R432 Jones, L. J., and Osborn, W. M. Humber radio station. Post Office Elec. Engrs. Jour., **21**, 159–164; July, 1928.

Description of station located at Mablethorpe, Lincolnshire.

R470 Dubois, R. Installation télégraphique à haute fréquence avec appareils "Télétype" réalisée sur une ligne de transmission d'énergie a 60 000 volt de la Société d'Electricité du Tarn. (Telecommunication over the 60,000-volt transmission line of the Société d'Électricité of Tarn.) Revue Gen. de L'Électricité, **28**, pp. 997–1003; June 9, 1928.

Describes the installation of the "Télétype" system for sending messages over a high voltage line. The line is 90 km. long and rated at 60 kv. The system works entirely automatically and gives the messages directly in ordinary writing.

R500.—Applications of radio

R522 Krueger, K., and Plendl, H. Zur Anwendung der kurzen Wellen im Verkehr mit Flugzeugen: Versuche zwichen Berlin und Madrid. (On the application of short waves to aeroplanes: Experiments between Berlin and Madrid.) Zeits. f. Hochfreq., **31**, pp. 169–76; June, 1928.

It was found that **46** m. would work over a distance of 1,400 km. during daytime with 2 watts output, but a distance of 2,000 km. could hardly be covered even if 300 watts were used. The wave length between 27 and 30 m. seemed to work best during day and nighttime for a distance of 2,000 km.; 300 watts energy in the antenna would give a sure communication on ground. For flights, 30 watts gave a fairly dependable service. The band between 16 and 19 m. was nearly as good. It was generally found that 300 watts and 30 m.-wave length was dependable.

R536 Experiments in underground communication through earth strata. U. S. Bureau of Mines Technologic Paper No. 433.

Includes data on radio methods applied to such communication.

R582 Larner, E. T. Practical television (book). Published by Ernest Benn (Ltd.), London.

Reviewed in Nature, **122**, No. 3068, August 18, 1928.

R800.—Nonradio subjects

517 Berg, Ernst J. Heaviside's operational calculus as applied to engineering and physics. General Electric Review, **31**, pp. 444–51, August, 1928.

Reviews Heaviside's operational calculus for the case of the asymptotic solution.

534 Hubbard, J. C., and Loomis, A. L. The velocity of sound in liquids at high frequencies by the sonic interferometer. Phil. Mag., **5**, pp. 1177–1190; June, 1928.

A method is described where the velocity of sound in liquids is determined by means of standing waves generated by a quartz oscillator producing high-frequency vibrations. Thermodynamic coefficients of liquids are computed from the velocities obtained at different temperatures.

534 Hehlgans, F. W. Uber Piezoquarzplatten als Sender und Empfänger hochfrequenter akustischer Schwingungen. (On piezoeoelectric quarts plates as sender and receiver of supersonic sound waves.) Annalen der Physik, No. 12, **86**, pp. 587–627; 1928.

Experimental investigation of vibrating quarts plates for acoustic work.

534 Trendelenburg, F. Zusammenfassender Bericht. Uber neuere akustische und insbesondere elektroakustische Arbeiten. (Summary of electro-acoustic methods.) Zeits. f. Hochfreq., **32**, pp. 27–34; July, 1928.

A compilation of acoustic methods used in a radio laboratory.

5535.3 Wynn-Williams, C. E. The application of a valve amplifier to the measurement of X-ray and photo-electric effects. Phil. Mag., **6**, pp. 324–334; August, 1928.

The author applies a two-electron tube bridge circuit to the measurement of X-ray and photo-electric effects.

546.432 Schindelhauer, F. Radioaktive Niederschläge auf Hochantennen. (Radioactive effects on antennæ.) Phys. Zeits., **29**, pp. 479–87; July 15, 1928.

Uses antennae to study atmospheric potentials. It is shown that the vertical current is mostly due to a radioactive deposit. The current increases with decreasing air pressure and with increasing temperature of the ground.

621.313 Liwschitz, M. Verhalten des selbsterregten Generators bei kapazitiver Belastung. (Control of the speed of direct-current motors by means of electron tubes.) Wissen. Veroff. ausdem Siemens Konzern, **6**, pp. 23–25; 1927.

The voltage which is proportional to the revelotions per minute is applied to a regulator electron tube.
The plate current of the latter affects the field of the motor.

621.385 Küpfmüller, Karl and Mayer, Hans F. Sur les phénomenés transitoires dans les lignes pupinisées et le moyen d'y remédier. Journal Télégraphique, **52**, pp. 93–99 and 113–118; June, 1928. (Propogation of signals along conductors using Pupin coils.)

Deals in detail with phase distortion and suggests filters for overcoming such distortion. Theoretical and experimental data prove their usefulness.

621.385 Affel, H. A.; Demarest, C. S.; Green, C. W. Carrier systems of long-distance telephone lines. Bell System Technical Jour., **7**, pp. 564–629; July, 1928.

This paper is a continuation of the development of carrier systems on long-distance telephone lines.

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