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, Y=sunrise to sunset.
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.
△	=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 parentheses	Service	Hours	Station controlled by—
Manila, P. I.[1]	KZEG	7980 (37.59)	FX	N	Radio Corporation of the Philippines.
Do.[1]	KZIK	19930 (15.053)	FX	N	Do.
Do.[1]	KZIL		FX	N	Do.
Do.[1]	KZIM	9970 (30.09)	FX	N	Do.
Do.[1]	KZOR	21180 (14.198)	FX	N	Do.
Do.[1]	KZOS		FX	N	Do.
Do.[1]	KZOT	6690 (44.84)	FX	N	Do.
Do.[1]	KZUV		FX	N	Do.
Do.[1]	KZUW		FX	N	Do.
Do.[1]	KZUX		FX	N	Do.
Ponce, P. R.	WJF	5735 (52.31)	FX		Porto Rico Telephone Co.
San Francisco, Calif.[2]	KUP	5585 (53.71), 6335 (47.35), 8350 (35.93), 11170 (26.86), 16700 (17.964).	P	N	Examiner Printing Co.
San Juan, P. R.	WDY	5735 (52.31)	FX		Porto Rico Telephone Co.

[1] Loc. 121°03′ 15″ E., 14° 37′ 15″ N.; type of wave (system) A1. [2] 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—
Cities Service Empire	KMAU	8	PG	X	Cities Service Transportation Co.	
City of Elwood	KDMV	8	PG	X	U. S. S. B.	
Colonel James M. Schoonmaker.[1]	WTBM		PG	X	Shenango Furnace Co.	
Courageous	WVUA	8	PG	X	U. S. S. B.	
Defiance	WTBS	8	PG	X	do	
Gemma	WTBV	8	PG	X	John Chisholm Vessels Co.	
Goliah	WTBP				Cary Davis Tug & Barge Co.	
Harold J. Taggart	WTBR				Philadelphia & Reading Ry. Co.	
Lanai	WTBU				Mrs. Arthur Curtis James	
Naamhok	KDNE	8	PG	X	U. S. S. B.	
New Orleans	KDFB	8	PG	X	do	
Triumph	KEND	8	PG	X	do	
Wacosta	KDLM	8	PG	X	do	
Ward	KDQB	8	PG	X	do	
Wichita	KDMU	8	PG	X	do	
Yale	WTBT	8	PG		Whitman, Ward & Lee Co.	

[1] 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	
KDFB	New Orleans	b	KZOT	Manila, P. I.	c
KDLM	Wacosta	b	KZUV	do	c
KDMU	Wichita	b	KZUW	do	c
KDMV	City of Elwood	b	KZUX	do	c
KDNE	Naamhok	b	WDY	San Juan, P. R.	c
KDQB	Ward	b	WJF	Ponce, P. R.	c
KEND	Triumph	b	WTBM	Colonel James M. Schoonmaker	b
KMAU	Cities Service Empire	b	WTBP	Goliah	b
KUP	San Francisco, Calif.	c	WTBR	Harold J. Taggart	b
KZEG	Manila, P. I.	c	WTBS	Defiance	b
KZIK	do	c	WTBT	Yale	b
KZIL	do	c	WTBU	Lanai	b
KZIM	do	c	WTBV	Gemma	b
KZOR	do	c	WVUA	Courageous	b
KZOS	do	c			

Commercial aircraft stations, alphabetically, by names of stations

[Additions to the List of 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	Wave length	Service	Hours	Station controlled by—
NC 7080 [1]	KHAK	500 (600)	P	X	Radio Engineering Laboratories.
NX 3903	KDZ		P	X	Carl B. Eielson (George H. Wilkins).
X 7439	KDY		P	X	Do.

[1] Type of wave (system) A1–2–3; power, 10 watts.

Commercial aircraft stations, alphabetically, by call signals

Call signal	Name of station	Call signal	Name of station
KDY	X 7439.	KHAK	NC 7080.
KDZ	NX 3903.		

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 parentheses	Power (watts)
Delaware: Wilmington	WTBQ	1210 (247.9)	100
Maryland: Cumberland	WTBO	1420 (211.3)	50
Montana: Butte	KGIR	1360 (220.6)	250
Idaho:			
Idaho Falls	KGIO	1320 (227.3)	250
Twin Falls	KGIQ	1320 (227.3)	250

Broadcasting stations, alphabetically, by call signals

Call signal	Location of station (address)	Owner of station	Frequency in kilocycles, wave length in parentheses	Power (watts)
KGIO	Idaho Falls, Idaho	Jack W. Duckworth, jr., 423 Tamarack Ave., Inglewood, Calif.	1320 (227.3)	250
KGIQ	Twin Falls, Idaho	Stanley M. Soule, care of O. P. Soule, Walker Bank Building, Salt Lake City, Utah.	1320 (227.3)	250
KGIR	Butte, Mont., 200 East Broadway.	Symons Broadcasting Co	1360 (220.6)	250
WTBO	Cumberland, Md., 138 Virginia Ave.	Cumberland Electric Co	1420 (211.3)	50
WTBQ	Wilmington, Del., 2303 Franklin St.	E. Brandt Boylan	1210 (247.9)	100

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 parentheses	Service	Hours	Station controlled by—
Fresno, Calif.[1]	KCU	218 (1,376), *230 (1,304)*, 3,345 (89.6), *3,370 (89)*, 5,920 (50.68), *5,940 (50.51)*.	FX	—	Department of Commerce, Bureau of Lighthouses.
Los Angeles, Calif.[1]	KCT	198 (1,515), *230 (1,304)*, 3,345 (89.6), *3,370 (89)*, 5,920 (50.68), *5,940 (50.51)*.	FX	—	Do.
Do.[2]	WZH	4,030 (74.44), 8,060 (37.22), 12,090 (24.81), 16,120 (18.61), 20,150 (14.88).	FX	Y	U. S. Army.
March Field, Calif.[3]	WTC	200 (1,500)	FX	Y	Do.
Medford, Oreg.[1]	KCX	204 (1,470), *230 (1,304)*, 3,345 (89.6), *3,370 (89)*, 5,920 (50.68), *5,940 (50.51)*.	FX	—	Department of Commerce, Bureau of Lighthouses.
Oakland, Calif.[1]	KCV	207 (1,449), *230 (1,304)*, 3,355 (89.4), *3,370 (89)*, 5,930 (50.59), *5,940 (50.51)*.	FX	—	Do.
Portland, Oreg.[1]	KCY	210 (1,429), *230 (1,304)*, 3,345 (89.6), *3,370 (89)*, 5,920 (50.68), *5,940 (50.51)*.	FX	—	Do.
Redding, Calif.[1]	KCW	224 (1,338), *230 (1,304)*, 3,345 (89.6), *3,370 (89)*, 5,920 (50.68), *5,940 (50.51)*.	FX	—	Do.
Seattle, Wash.[1]	KCZ	*230 (1,304)*, 238 (1,261), 3,345 (89.6), *3,370 (89)*, 5,920 (50.68), *5,940 (50.51)*.	FX	—	Do.
Wheeler Field, Hawaii (Oahu).[4]	WYX	200 (1,500), 185 (1,620)	FX	Y	U. S. Army.

[1] Type of wave (system), A1.
[2] Loc. (approximately) 118° 15′ 00″ W., 34° 03′ 00″ N.; type of wave (system), A1.
[3] Loc. (approximately) 117° 15′ 00″ W., 33° 54′ 00″ N.; type of wave (system), A1–2.
[4] Loc. (approximately) 158° 06′ 00″ W., 21° 30′ 00″ N.; type of wave (system), A1.

NOTE.—The assignment of call signals for the above-named stations of the Bureau of Lighthouses are effective as of Jan. 1, 1929, at which time the stations will probably go in commission.

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	
KCT	Los Angeles, Calif	c	KCY	Portland, Oreg	c
KCU	Fresno, Calif	c	KCZ	Seattle, Wash	c
KCV	Oakland, Calif	c	WTC	March Field, Calif	c
KCW	Redding, Calif	c	WYX	Wheeler Field, Hawaii (Oahu)	c
KCX	Medford, Oreg	c	WZH	Los Angeles, Calif	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: Los Angeles	W6XAM	2,000–2,100 (150–142.9)		Ben S. McGlashan, 2333 21st St.
Aircraft				
Colonial Air Transport Plane No. NC-8000 (Hadley Field, N. J.).	W2XBJ	2,320 (129.3)	10	R. C. A.
Colonial Air Transport Plane No. NC-5650 (Hadley Field, N. J.).	W2XBZ	2,320 (129.3)	10	Do.

Special land stations, grouped by districts

Call signal	District and station	Call signal	District and station
	Second district:		
W2XBJ	Colonial Air Transport Plane No. NC-8000 (Hadley Field, N. J.).	W6XAM	Sixth district: Los Angeles, Calif.
W2XBZ	Colonial Air Transport Plane No. NC-5650 (Hadley Field, N. J.).		

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]

CLEARWATER, CALIF. (LOS ANGELES—KNR).—Fy., 3780 (79.32), 5416 (55.36), 6100 (49.15), 9276 (32.32), 10160 (29.5).
CLEARWATER, CALIF. (LOS ANGELES—KOK).—Type of wave (system) A2 and B. Fy. add 473 (634).
CLEVELAND, OHIO (WTK).—Notice in Radio Service Bulletin for last month should have cited the call as WTK and not WTL.
DULUTH, MINN. (WME).—Notice in Radio Service Bulletin for last month should have cited the call as WME and not WRL.
HILLSBORO, OREG. (PORTLAND—KEK).—Loc. (approximately) 122° 00′ 00″ W., 49° 31′ 00″ N.
LANSING, ILL.—Fy. 285 (1053).
MANILA, P. I. (KZET).—Fy. 10910 (27.5).
NEW YORK, N. Y. (WHD).—Fy. 5570 (53.86), 6365 (47.13), 8250 (35.93), 11140 (26.03), 16500 (17.111).
PALO ALTO, CALIF. (KFS).—Fy. 123 (2439), 131 (2290), 500 (600), 425 (705), 465 (645).
PALO ALTO, CALIF. (KWT).—Fy. strike out 63.36 (4735), add 63.18 (4745).
SUBBASE (WFD).—Type of wave (system) add A1.
SUBBASE (WFE).—Type of wave (system) add A2.
Strike out all particulars of the following-named stations: Hollywood, Calif.; Manila, P. I. (KZEN); Santa Cruz Island, Calif.; Portable (California—KGHV); Portable (California—KGHW); disregard notice of call signals assigned to the two last-named stations, effective January 1, 1929, as published in the Radio Service Bulletin for last month.

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]

ADMIRAL PEOPLES.—W. l., *600*, 705, 800.
AGWIDALE.—W. l., *600*, 660, 705, 730, 800.
AGWIHAVRE.—W. l., *600*, 660, 705, 730, 800.
ALA.—W. l., *600*, 660, 705, 730, 800.
ALEX B. UHRIG.—W. l., *715*, 875.
ALGONQUIN (KGDL).—Type of wave (system), B and A, arc; w. l., *600*, 705, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
ALLEGHANY.—W. l., *600*, 660, 705, 730, 800.
A. M. BYERS.—W. l., *715*, 875.
AMERICA.—Type of wave (system), B and A 1–2; w. l., *600*, 660, 705, 750, 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, 2,290.
AMERICAN LEGION.—W. l., *600*, 705, 800, 1,875, 1,961, 1,987, 2,098, 2,128, 2,190.
AMERICAN MERCHANT.—Call changed to WFDL, effective January 1, 1929.
ANACONDA.—W. l., *600*, 660, 705, 730, 800.
ANDREA F. LUCKENBACH.—W. l., *600*, 705, 800.
ANNISTON CITY.—W. l., *600*, 640, 705, 750, 800, 1,875, 1,961, 2,098, 2,128, 2,190.

ARA.—W. l., *600*, 640, 705, 750, 800, 1,875, 1,887, 1,911, 1,987, 2,098, 2,128, 2,190, 2,290, 2,400.
ARGOSY.—W. l., *600*, 660, 705, 730, 800.
ATLANTIC SUN.—Type of wave (system), A2; w. l., *600*, 640, 660, 705, 730, 750, 800.
BALLCAMP.—W. l., add 1,875.
BLAIR.—Name changed to Exchange.
BLANCHE.—Type of wave (system), B; w. l., 660.
BOSTON COLLEGE.—Owner of vessel, Trawler Boston College (Inc.).
BRAVE COEUR.—Station controlled by R. M. C. A. (U. S. L.).
BROOKINGS.—W. l., *600*, 705, 800.
BYLAYL.—W. l., add 640.
CADDO.—Call changed to WPCO, effective January 1, 1929.
CALMAR.—W. l., *600*, 660, 705, 730, 800.
CAPAC.—W. l., *600*, 705, 800, 1,875, 1,987, 2,098, 2,128.
C. C. WEBBER.—Owner of vessel, Inland Waterways Corporation.
CENTAURUS.—Type of wave (system), A2; w. l., *600*, 640, 705, 750, 800.
CENTRAL WEST.—Name changed to M. J. Barteline; owner of vessel, J. A. Paisley S. S. Co.
CHESTER VALLEY.—Station controlled by R. M. C. A. (U. S. L.)
CITY OF ALBANY.—Call changed to WFCR, effective January 1, 1929.
CITY OF FAIRBURY.—Owner of vessel, American Scantic Line.
CITY OF OMAHA.—Station controlled by R. M. C. A. (U. S. L.).
CITY OF ST. JOSEPH (KFIT).—W. l., *715*, 800, 875.
CITY OF ST. JOSEPH (KOSM).—Name changed to read Extavia.
CLEMENS A. REISS.—W. l., *715*, 875.
COAXET.—Station controlled by R. M. C. A. (U. S. L.).
CODY.—W. l., *600*, 705, 800.
COELLEDA.—W. l., *600*, 660, 705, 730, 800.
COLD HARBOR.—Owner of vessel, U. S. S. B.
COLUMBINE.—Type of wave (system), B; W. l., *600*, 660, 705, 730, 800.
CORMORANT.—Owner of vessel, Ocean Trawling Co.
CORONADO.—Station controlled by R. M. C. A. (U. S. L.).
CORSON.—W. l., *600*, 660, 705, 730, 800.
CUBORE.—Owner of vessel, Calmar S. S. Corporation.
DARDEN.—Owner of vessel, T. P. Gallagher & Co.
DELISLE.—W. l., add 1,911.
DIXIE.—Call changed to WICX, effective January 1, 1929.
DOROTHY ALEXANDER.—Call changed to WGCQ, effective January 1, 1929; w. l., *600*, 705, 800, 1,911, 1,987, 2,098, 2,400.
EDWARD L. DOHENY.—Call changed to WPCP, effective January 1, 1929.
EFFINGHAM.—Station controlled by R. M. C. A. (U. S. L.).
E. R. STERLING.—Call changed to WTBW, effective January 1, 1929.
FLORENCE LUCKENBACH.—Call changed to WLCL, effective January 1, 1929.
GLADYSBE.—Owner of vessel, T. P. Gallagher & Co.
GOLDEN DRAGON.—W. l., *600*, 705, 800, 1,875, 1,987, 2,098, 2,400.
GULF PRIDE.—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.
HARVEY H. BROWN.—Call changed to WEDA, effective January 1, 1929.
HATTERAS.—Station controlled by R. M. C. A. (U. S. L.).
HERBERT G. WYLIE.—Call changed to WTBX, effective January 1, 1929; w. l., add 640.
HERBERT L. PRATT.—Type of wave (system), A1–2; w. l., *600*, 640, 705, 750, 800.
HUMACONNA.—W. l., add 750.
J. L. REISS.—W. l., *715*, 875.
JOHN P. REISS.—W. l., *715*, 875.
KATHERINE.—Type of wave (system), A1–2; w. l., 109, *600*, 705.
KINGFISHER.—Type of wave (system), A2; w. l., *600*, 705, 750, 800.
K. R. KINGSBURY.—W. l., *600*, 640, 660, 705, 750, 800, 1,875, 1,887, 1,911, 1,961, 1,987, 2,098, 2,128, 2,190, 2,400.
LAKINA.—Station controlled by owner.
LYNFORD E. GEER.—W. l., *715*, 875.
MALSAH.—Name changed to Commercial Quaker.
MALVERN.—Type of wave (system), A2; w. l., *600*, 705, 800; service, P. G.; hours, X; rates, 8 cents per word; station controlled by R. M. C. A. (U. S. L.).
MANINI.—W. l., *600*, 705, 800.
MICHIGAN.—Station controlled by owner.

MISSOURI.—Owner of vessel, Inland Waterways Corporation.
MUNARGO.—W. l., add 2,190.
NEMAHA.—W. l., *600*, 705, 800.
NIZINA.—Station controlled by owner.
OTHO.—Owner of vessel, American-West African Line.
PENMAR.—W. l., *600*, 660, 705, 730, 800.
PETER REISS.—W. l., *715*, 875.
POINT BREEZE.—W. l., strike out 660 and 730.
POINT REYES.—Owner of vessel, Gulf Pacific Line.
PRINCETON.—W. l., add 640.
PRUSA.—Station controlled by R. M. C. A. (U. S. L.)
QUEEN.—Call changed to WGCR, effective January 1, 1929.
RESTORER.—Hours, X and N.
RICHARD J. REISS.—W. l., *715*, 875.
ROBADOR.—Name changed to Seaforth.
SACCARAPPA.—Station controlled by R. M. C. A. (U. S. L.)
SAGUACHE.—Owner of vessel, American Scantic Line.
SALINA.—Owner of vessel, Gladstone Transportation Co.
SAMUEL Q. BROWN.—Type of wave (system), A2.
SAN MATEO.—Hours, X and N.
SANTA CECELIA.—Hours, N.
SANTA CECILIA.—W. l., *600*, 640, 705, 750, 800.
SANTA MARIA (WPBW).—Hours, N.
SATURN.—Service, P. G.; hours, X; rates, 8 cents per word; station controlled by R. M. C. A.
SAUCON (WCDK).—Name changed to Exhibitor.
SAWAKLA.—Type of wave (system), B and A, arc.
S. B. HUNT.—Type of wave (system), A2.
SHAWNEE.—Hours, N.
SOCONY.—Type of wave (sytem), A2.
SOUTH AMERICAN.—Hours, N and X.
S. S. THORPE.—Owner of vessel, Inland Waterways Corporation.
STEEL ENGINEER.—W. l., *600*, 705, 800.
STOCKTON.—Owner of vessel. Gladstone Transportation Co.
SUMAR.—Service, P. G.; hours, X; rates, 8 cents per word; station controlled by R. M. C. A.
SUN.—Service, P. G.; hours, X; rates, 8 cents per word; station controlled by R. M. C. A.
SUSPEARCO.—W. l., *600*, 660, 705, 730, 800.
SWIFTEAGLE.—Type of wave (system), A, arc and A2; w. l., add 640.
TEXMAR.—W. l., *600*, 640, 705, 750, 800.
VANDA.—Owner of vessel, Ernest B. Dane.
VERAMAR.—Owner of vessel, Louis Meisel.
VIKING.—Owner of vessel, Meyer-Muzzall & Co.
WALTER A. LUCKENBACH.—Hours, N.
WANDERER.—Service, P. G.; rates, 8 cents per word.
WAPAMA.—Hours, X.
WEST CADDOA.—W. l., add 2,290.
WEST DURFEE.—Station controlled by R. M. C. A. (U. S. L.)
WESTERN STATES.—Type of wave (system), A1–2.
WEST HENSHAW.—Owner of vessel, Oceanic & Oriental Navigation Co.
WEST NOSSKA.—Station controlled by R. M. C. A. (U. S. L.)
WESTWARD HO.—Station controlled by R. M. C. A. (U. S. L.)
WILLAMETTE.—Hours, N and X.
WILLBORO.—W. l., *600*, 660, 705, 730, 800.
WILLETT.—Read Willet.
WILLIAM A. REISS.—W. l., *715*, 875.
WILLIAM K. FIELD.—W. l., *715*, 875.
WILLZIPO.—W. l., add 660.
WILSCOX.—Type of wave (system), B and A, arc; W. l., *600*, 705, 800, 1,875, 1,911, 1,987, 2,098, 2,128, 2,190, 2,400.
WINONA.—Name changed to Exchester.
WINONA County.—Hours, X and N.
WINSTON-SALEM.—Station controlled by R. M. C. A. (U. S. L.)
Strike out all particulars of the following-named vessels: Washtenaw, Waialeale.

COMMERCIAL LAND AND SHIP STATIONS, ALPHABETICALLY, BY CALL SIGNALS

KDKS, *read* Willet; KFZQ, *read* Seaforth; KIGR, *read* Exchange; KOSM, *read* Extavia; KUGM, *read* Commercial Quaker; KUNV, *read* Exchester; WCDK, *read* Exhibitor; WDDV, read M. J. Barteline; the following-cited changes are effective January 1, 1929; WCDA to WTBW; WEDC to WEDA; WFCI to WFCR; WFDF to WFDL; WGCM to WGCQ; WGCP to WGCR; WICC to WICX; WLCI to WLCL; WOCL to WPCO; WPCC to WPCP; WPCH to WTBX; strike out all particulars following the call signals, KGGX, KGGZ, KGHV, KGHW, KZEN, WGDB, WPOO.

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]

KFAU (Boise, Idaho).—Call changed to Kido.
KFPW (Sulphur Springs, Ark.).—Changed to Siloam Springs, Ark.
KGB (San Diego, Calif.).—Power, 250.
KGEN (El Centro, Calif.).—Call changed to KXO.
KMOX (Kirkwood, Mo.–St. Louis).—Add call signal KFQA.
KNX (Los Angeles, Calif.).—Power, 5,000.
KYW (Chicago, Ill.).—Consolidated with KFKX, both calls to be used; power, 2,500 from 6 a. m. to 10 p. m., 5,000 after 10 p. m.
WIBO (Chicago, Ill. near Desplaines).—Owner, Nelson Bros. Bond & Mortgage Co.
WJAM (Waterloo, Iowa).—Call changed to WMT.
WJJD (Mooseheart, Ill.).—Power, 20,000, daytime only.
WRHF (Washington, D. C.).—Call changed to WOL.
WRM (Urbana, Ill.).—Call changed to WILL.
WTAQ (Eau Claire, Wis.).—Owner, Gillette Rubber Co.
WTFF (Mount Vernon Hills, Va.).—Power changed to WJSV.

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]

ABERDEEN PROVING GROUND, MD.—W. l., 1,090, 1,500; service, FX; hours, Y.
AMBROSE CHANNEL LIGHTSHIP, N. Y.—Type of wave (system), A2.
ANNAPOLIS, MD. (NSS).—W. l., 17,045.
ARLINGTON, VA.—Type of wave (system), A1–2–3; w. l., 18.68, 24.9, 37.34, 74.7, 434.5, 2,650.
ASTORIA, OREG.—W. l., *600*, 2,941.
ATLANTA, GA. (WHZ).—W. l., 50.51, 50.63, 89.05, 89.8, 1,261, 1,304.
BALBOA, CANAL ZONE (NBA).—Type of wave (system), A1; w. l., *600*, 6,518.
BAR HARBOR, ME. (NBD).—Type of wave (system), A1.
BELLEFONTE, PA.—Type of wave (system), A1 and A, arc; w. l., 50.51, 50.59, 89, 89.4, 1,287, 1,304.
BETHEL, ALASKA.—W. l., 4.55; service, FX; hours, Y.
BLUE CANYON, CALIF.—W. l., 50.51, 50.54, 89, 89.3, 1,304.
BLUNTS REEF LIGHTSHIP, CALIF.—Type of wave (system), A2.
BOLLING FIELD, D. C. (ANACOSTIA).—W. l., 1,500; service, FA; hours Y.
BOSTON LIGHTSHIP, MASS.—Type of wave (system), A2.
BOSTON, MASS. (NAD).—Type of wave (system), A1; w. l., 2,941.
BOSTON, MASS. (WVO).—W. l., 16.93, 22.57, 33.86, 67.72; 1,345, 1,415; service, FX, hours, Y.
BOWMAN FIELD, KY. (LOUISVILLE).—W. l., 1,500; service FA; hours, Y.
BROWNSVILLE, TEX. (NAY).—Type of wave (system), A2; w. l., 2,885.
BUFFALO LIGHT STATION, N. Y.—Type of wave (system), A2.
BURGESS FIELD, PA. (UNIONTOWN).—W. l., 1,500; service, FA; hours, Y.
BURLEY, IDAHO.—W. l., 50.35, 50.51, 89, 89.6, 1,304.
CALUMET HARBOR LIGHT STATION, ILL.—Type of wave (system), A2.
CAMP CUSTER, MICH. (BATTLE CREEK).—W. l., 1,090; service, FX; hours, Y.
CAMP DEVENS, MASS.—W. l., 1,414; service, FX; hours, Y.
CAMP HARRY J. JONES, ARIZ. (DOUGLAS).—W. l., 34.8, 69.61, 1,090; service FX; hours, Y.
CAMP KNOX, KY.—Service, FX; hours, Y.

CAMP MARFA, TEX.—W. l., 34.84, 90.75, 1,090; service FX; hours, Y.
CAMP MCCLELLAN, ALA. (ANNISTON).—W. l., 670; service FX; hours, Y.
CAMP MEADE, MD.—Name changed to Fort Leonard Wood, Md.; w. l., 1,090; service, FX; hours, Y.
CAMP NICHOLS, P. I. (RIZAL).—W. l., 450; service, FA; hours, Y.
CAMP STEPHEN D. LITTLE, ARIZ.—W. l., 34.8, 69.61, 1,090; service, FX; hours, Y.
CAMP STOTSENBURG, P. I.—W. l., 1,600; service, FX; hours, Y.
CAPE BLANCO LIGHT STATION, OREG.—Type of wave (system), A2.
CAPE HENRY LIGHT STATION, VA.—Type of wave (system), A2.
CAPE LOOKOUT SHOALS LIGHTSHIP, N. C.—Type of wave (system), A2.
CAPE MALA, CANAL ZONE (TRAFFIC STATION).—W. l., *600*.
CAPE SPENCER LIGHT STATION, ALASKA.—Type of wave (system), A2.
CAPE ST. ELIAS LIGHT STATION, ALASKA.—Type of wave (system), A2.
CAVITE, P. I. (NPO).—Type of wave (system), A1–2; w. l., 18.67, 37.34, 2,776, 5,354.
CHANUTE FIELD, ILL. (RANTOUL).—W. l., 1,500; service, FA; hours, Y.
CHARLESTON, S. C. (NAO).—Type of wave (system), A2; w. l., 2,459.
CHEYENNE, WYO.—Type of wave (system), A arc and A1; w. l., 50.51, 50.52, 89, 89.2, 1,271, 1,304.
CHICAGO HARBOR LIGHT STATION, ILL.—Type of wave (system), A2.
CHICAGO, ILL.—W. l., 34.8, 69.61, 1,364; service, FX; hours, N.
CIRCLE, ALASKA.—W. l., 875, 1,740; service, FX; hours, Y.
CLARK FIELD, P. I.—W. l., 450; service, FX; hours, Y.
CLEVELAND, OHIO (WWO).—Type of wave (system), A arc; w. l., 50.51, 50.54, 89, 89.3, 1,250, 1,304.
COLON, PANAMA (NAX).—Type of wave (system), A2.
COLUMBIA RIVER LIGHTSHIP, OREG.—Type of wave (system), A2.
CONCORD, CALIF.—Type of wave (system), A1; w. l., 50.51, 50.59, 89, 89.4, 1,304.
CORDOVA, ALASKA (WTU).—Type of wave (system), A1; w. l., 1,100; service, FX; hours, Y.
COVE POINT LIGHT STATION, MD.—Type of wave (system), A2.
CRAIG, ALASKA.—W. l., 450, 485, 625; service, FX; hours, Y.
CUMBERLAND FIELD, MD. (CUMBERLAND).—W. l., 1,500; service, FA; hours, Y.
DAYTON (FAIRFIELD), OHIO.—W. l., 1,500; service, FA; hours, Y.
DENVER, COLO. (WTS).—W. l., 950; service FX; hours, Y.
DETOUR LIGHT STATION, MICH.—Type of wave (system), A2.
DETROIT RIVER LIGHT STATION, MICH.—Type of wave (system), A2.
DEVILS ISLAND LIGHT STATION, WIS.—Type of wave (system), A2.
DIAMOND SHOALS LIGHTSHIP, N. C.—Type of wave (system), A2.
DILLINGHAM, ALASKA.—W. l., 1,345; service, FX; hours, Y.
DRYDEN, TEX.—W. l., 1,500; service, FA; hours, Y.
DULUTH RANGE FRONT LIGHT STATION, MINN.—Location 92° 05′ 16″ W., 46° 46′ 49″ N.; type of wave (system), A2.
ELKO, NEV.—Type of wave (system), A1 and A arc; w. l., 50.39, 50.51, 88.9, 89, 1,304, 1,442.
EUREKA, CALIF. (TRAFFIC STATION).—Type of wave (system, A2; w. l., add 2,776.
EXECUTION ROCK LIGHT STATION, N. Y.—Type of wave (system), A2.
FAIRBANKS, ALASKA.—W. l., 16.93, 22.57, 33.86, 67.72, 3,700; service, FX; hours, Y.
FIRE ISLAND LIGHTSHIP, N. Y.—Type of wave (system), A2.
FIVE FATHOM BANK LIGHTSHIP, N. J.—Type of wave (system), A2.
FORT ADAMS, R. I.—W. l., 1,415; service, FX; hours, Y.
FORT BARRANCAS, FLA.—W. l., 22.52, 33.78, 67.57, 1,090; service, FX; hours, Y.
FORT BENJAMIN, HARRISON, IND.—W. l., 1,560; service, FX; hours, Y.
FORT BENNING, GA.—W. l., 1,415; service, FX; hours, Y.
FORT BLISS, TEX.—W. l., 34.84, 69.69, 3,480; service, FX; hours, Y.
FORT BRADY, MICH.—W. l., 1,200; service, FX; hours, Y.
FORT BRAGG, N. C.—W. l., 22.52, 33.78, 67.57, 1,370, 1,500; service, FX; hours, Y.
FORT BROWN, TEX.—W. l., 34.84, 69.69, 1,090; service, FX; hours, Y.
FORT CLARK, TEX. (BRACKETTSVILLE).—W. L., 1,090; service, FX; hours, Y.
FORT CROCKETT, TEX.—W. l., 34.84, 69.69, 1,090, 1,500; service, FA; hours, Y.
FORT D. A. RUSSELL, WYO.—W. l., 34.84, 69.69, 1,575; service, FX; hours, Y.
FORT DES MOINES, IOWA.—W. l., 674; service, FX; hours, Y.
FORT DOUGLAS, UTAH.—W. l., 22.52, 33.78, 67.57, 1,560; service, FX; hours, Y.

FORT EGBERT, ALASKA.—W. l., 440; service, FX; hours, Y.
FORT ETHAN ALLEN, VT.—W. l., 1,415; service, FX; hours, Y.
FORT EUSTIS, VA.—W. l., 1,090; service, FX; hours, Y.
FORT FRANK, P. I.—W. l., 480; service, FX; hours, Y.
FORT GIBBON, ALASKA.—W. l., 500, 571; service, FX; hours, Y.
FORT HANCOCK, N. J.—W. l., 1,090; service, FX; hours, Y.
FORT HAYES, OHIO (Columbus).—W. l., 17.16, 22.88, 34.32, 68.65, 1,415; service, FX; hours, N.
FORT H. G. WRIGHT, N. Y.—W. l., 1,415; service, FX; hours, Y.
FORT HOWARD, MD.—W. l., 1,575; service, FX; hours, Y.
FORT HUACHUCA, ARIZONA.—W. l., 34.8, 69.61, 1,090; service, FX; hours, Y.
FORT JOHN HAY, P. I.—W. l., 1,605; service, FX; hours, Y.
FORT KAMEHAMEHA, HAWAII.—W. l., 1,620; service, FX; hours, Y.
FORT LEAVENWORTH, KANSAS.—W. l., 17.14, 22.83, 22.86, 34.25, 34.29, 68.49, 68.52, 1,380, 4,160; service, FX; hours, N.
FORT LEWIS, WASH.—W. l., 1,364; service, FX; hours, Y.
FORT MCARTHUR, CALIF.—W. l., 1,320, 1,730; service, FX; hours, Y.
FORT MCINTOSH, TEX.—W. l., 34.84, 69.69, 1,090; service, FX; hours, Y.
FORT MCPHERSON, GA.—W. l., 34.8, 69.61, 2,860; service, FX; hours, N.
FORT MILLS, P. I.—W. l., 1,100, 1,350, 1,600; service, FX; hours, Y.
FORT MONMOUTH, N. J.—W. l., 1,090, 1,500, 1,620; service, FX; hours, Y.
FORT MONROE, VA.—W. l., 1,090; service, FX; hours, Y.
FORT OGLETHORPE, GA.—W. l., 1,071; service, FX; hours, Y.
FORT OMAHA, NEBR.—W. l., 22.52, 33.78, 67.57, 1,730; service, FX; hours, Y.
FORT PREBLE, ME.—W. l., 1,415; service, FX; hours, Y.
FORT RANDOLPH, CANAL ZONE.—W. l., 270.3, 400; service, FX; hours, Y.
FORT RILEY, KANS.—W. l., 16.93, 22.57, 33,86, 67.72, 1,200, 1,500; service, FX; hours, Y.
FORT RINGGOLD, TEX.—W. l., 34.84, 69.69, 1,090; service, FX; hours, Y.
FORT RODMAN, MASS.—W. l., 1,415; service, FX; hours, Y.
FORT RUGER, HAWAII.—W. l., 1,620; service, FX; hours, Y.
FORT ST. MICHAEL, ALASKA.—W. l., 460; service, FX; hours, Y.
FORT SAM HOUSTON, TEX.—W. l., 36.67, 73.35, 1,090, 5,880; service, FX; hours, Y.
FORT SHAFTER, HAWAII.—W. l., 1,620; service, FX; hours, Y.
FORT SHERMAN, CANAL ZONE.—W. l., 400; service, FX; hours, Y.
FORT SILL, OKLA.—W. l., 34.84, 69.69, 1,090, 1,500; service, FX; hours, Y.
FORT SNELLING, MINN.—W. l., 1,465; service, FX; hours, Y.
FORT STORY, VA.—W. l., 1,090; service, FX; hours, Y.
FORT THOMAS, KY.—W. l., 1,090; service, FX; hours, Y.
FORT TOTTEN, N. Y.—W. l., 1,090; service, FX; hours, Y.
FORTUNA, ALASKA.—*Read* Fortuna Ledge, Alaska., W. l., 530; service, FX; hours, Y.
FORT WINT, P. I.—W. l., 1,100, 1,500; service, FX; hours, Y.
FORT WORTH, TEX. (KKJ).—W. l., 50.34, 50.51, 89, 89.6, 1,304, 1,327.
FORT YUKON, ALASKA.—W. l., 630; service, FX; hours, Y.
FRANCE FIELD, CANAL ZONE.—W. l., 1,500; service, FA; hours, Y.
FRESNO, CALIF. (KCU).—W. l., 50.51, 50.68, 89, 89.6, 1,304, 1,376.
FRYING PAN SHOALS LIGHTSHIP, N. C.—Type of wave (system), A2.
GALVESTON JETTY LIGHT STATION, TEX.—Type of wave (system), A2.
GOVERNORS ISLAND, N. Y.—W. l., 1,090, 1,345, 1,415; service, FX; hours, N.
GRAND HAVEN PIERHEAD RANGE FRONT LIGHT STATION, MICH.—Type of wave (system), A2.
GRAYS HARBOR LIGHT STATION, WASH.—Type of wave (system), A2.
GREAT LAKES, ILL.—Type of wave (system), A2; w. l. 2,459.
GREENSBORO, N. C.—W. l., 50.51, 50.63, 89.05, 89.8, 1,229, 1,304.
GRUNDLER, ALASKA.—W. l., 465; service, FX; hours, Y.
GUAM, MARIANA ISLAND.—Type of wave (system), A2; w. l., *600*.
GUANTANAMO BAY, CUBA.—Type of wave (system), A2; w. l., 2,650.
HADLEY FIELD (NEW BRUNSWICK), N. J.—Type of wave (system), A1; w. l., 50.51, 50.68, 89, 89.6, 1,304, 1,429.
HAINES, ALASKA.—W. l., 1,055; service, FX; hours, Y.
HAMPTON ROADS, VA.—Location changed to Norfolk, Va.
HAT BOX FIELD, OKLA.—W. l., 1,500; service, FA; hours, Y.
HEALD BANK LIGHTSHIP.—Call changed from WSV to WSU, effective Jan. 1, 1929.
HOLY CROSS, ALASKA.—Correct call WXM; w. l., 470; service, FX; hours, Y.

HONOLULU, HAWAII.—Type of wave (system), A1–2; w. l., 2,828, 5,552, 11,490.
HOT SPRINGS, ARK.—W. l., 545; service, FX; hours, Y.
IDITAROD, ALASKA.—W. l., 3,490, 5,555; service, FX; hours, Y.
IOWA CITY, IOWA.—Type of wave (system), A1 and A arc; w. l., 50.51, 50.66, 89, 89.7, 1,265, 1,304.
JEFFERSON BARRACKS, MO.—W. l., 1,350; service, FX; hours, Y.
JUNEAU, ALASKA.—W. l., 2,255; service, FX; hours, Y.
JUPITER, FLA. (TRAFFIC STATION).—Type of wave (system), A2; w. l., 1,621.
JUPITER INLET LIGHT STATION, FLA.—Type of wave (system), A2.
KANSAS CITY, MO.—W. l., 50.34, 50.15, 89, 89.6, 1,304, 1,315.
KELLY FIELD, TEX.—W. l., 1,500; service, FX; hours, Y.
KETCHIKAN, ALASKA.—W. l., 14,888, 18.61, 24.81, 37.22, 74.44, 545, 1,735; service, PG; hours, N.
KEY WEST, FLA. (NAR).—Type of wave (system), A1; w. l., 2,650, 2,828.
KEY WEST, FLA. (WBP).—W. l., 50.51, 50.63, 89, 89.8, 1,304, 1,478.
KINDLEY FIELD, P. I.—W. l., 450, 476; service, FX; hours, Y.
KODIAK, ALASKA.—W. l., *600*.
KOTZEBUE, ALASKA.—W. l., 448; service, FX; hours, Y.
LAKE HURON LIGHTSHIP, MICH.—Location 82° 24′ 50″ W., 43° 02′ 27″ N.; type of wave (system), A2.
LANGLEY FIELD, VA.—W. l., 1,090, 1,500; service, FX; hours, Y.
LANSING SHOAL LIGHTSHIP, MICH.—Location 85° 33′ 40″ W., 45° 54′ 15″; type of wave (system), A2; hours from 5 to 5.30 and 11 to 11.30 a. m. and p. m.
LA PALMA, PANAMA.—W. l., *600*.
LA POINTE LIGHT STATION, WIS.—Type of wave (system), A2.
LITTLE GULL ISLAND LIGHT STATION, N. Y.—Type of wave (system), A2.
LIVENGOOD, ALASKA.—W. l., 480; service, FX; hours, Y.
LORDSBURG, N. MEX.—W. l., 1,500; service, FX; hours, Y.
LOS ANGELES, CALIF.—W. l., 50.51, 50.68, 89, 89.6, 1,304, 1,515.
LOS ANGELES HARBOR LIGHT STATION, CALIF.—Type of wave (system), A2.
LOVE FIELD, TEX. (DALLAS).—W. l., 1,500; service, FX; hours, Y.
LUDINGTON NORTH BREAKWATER LIGHT STATION, MICH.—Type of wave (system), A2.
LUKE FIELD, HAWAII (PEARL HARBOR).—W. l., 1,500; service, FX; hours, Y.
MAKAPUU POINT LIGHT STATION, HAWAII.—Type of wave (system), A2.
MANILA (FORT SANTIAGO-LUZON), P. I. (WTA).—W. l., 34.84, 69.69, 1,605; service, FX; hours, N.
MANITOWOC BREAKWATER LIGHT STATION, WIS.—Location 87° 38′ 29″ W., 44° 05′ 34″ N.; type of wave (system), A2.
MARQUETTE LIGHT STATION, MICH.—Type of wave (system), A2.
MAXWELL FIELD, ALA.—W. l., 1,500; service, FX; hours, Y.
MAYWOOD, ILL.—Type of wave (system), A1 and A arc; w. l., 50.42, 50.51, 88.8, 89, 1,239, 1,304.
MEDFORD, OREG.—W. l., 50.51, 50.68, 89, 89.6, 1,304, 1,470.
METUCHEN, N. J. (RARITAN ARSENAL).—W. l., 1,090, service, FX; hours, Y.
MIDDLETOWN, PA.—W. l., 1,090, 1,500; service, FX; hours, Y.
MILWAUKEE BREAKWATER LIGHT STATION, WIS.—Loc. 87° 52′ 56″ W., 43° 01′ 36″ N.; type of wave (system), A2.
MITCHEL FIELD, N. Y.—W. l., 1,090, 1,500; service, FX; hours, Y.
NANTUCKET SHOALS LIGHTSHIP, MASS.—Type of wave (system), A2.
NEW ORLEANS, LA. (NAT).—W. l., 2,885; type of wave (system), A2.
NEW YORK, N. Y. (NAH).—Type of wave (system), A1; w. l., 2,941.
NOME, ALASKA.—W. l., 22.83, 34.25, 68.49, 660, 1,070, 3,610, 4,000; service, PG; hours, Y; rates, 12 cents per word.
NORFOLK, VA.—Type of wave (system), A2; w. l., *600*, 2,459.
NORTH PLATTE, NEBR.—Type of wave (system), A, arc, and A1; w. l., 50.51, 50.56, 88.1, 89, 1,304, 1,485.
NULATO, ALASKA.—W. l., 638, 1,800, 3,200; service, FX; hours, Y.
OAKLAND, CALIF. (KCV).—W. l., 50.51, 50.59, 89, 89.4, 1,304, 1,449.
OKLAHOMA CITY, OKLA.—W. l., 50.34, 50.51, 89, 89.6, 1,304, 1,339.
OMAHA, NEBR.—Type of wave (system), A1 and A arc; w. l., 50.51, 50.63, 89, 89.5, 1,304, 1,523.
PARRIS ISLAND, S. C.—Type of wave (system), A2.
PASSAGE ISLAND LIGHT STATION, MICH.—Type of wave (system), A2.
PETERSBURG, ALASKA.—W. l., 1,125; service, FX; hours, Y.
PHILADELPHIA, PA.—Type of wave (system), A2; w. l., 2,885.
PLEASANT VALLEY, NEV.—W. l., 50.46, 89, 89.1, 1,304.

POINT ARGUELLO LIGHT STATION, CALIF.—Type of wave (system), A2.
POINT BARROW, ALASKA.—W. l., 37.25, 40.54, 670; service, FX; hours, Y.
POINT BETSIE LIGHT STATION, MICH.—Type of wave (system), A2.
POINT SUR LIGHT STATION, CALIF.—Type of wave (system) A2.
PORT AU PRINCE, HAITI.—W. l., *600;* type of wave (system), A1.
PORTLAND, OREG.—W. l., 50.51, 50.68, 89, 89.6, 1,304, 1,429.
PRESIDIO OF MONTEREY, CALIF.—W. l., 14.81, 18.61, 24.81, 37.22, 70.44, 1,360; service, FX; hours, Y.
PUERTO OBALDIA, PANAMA.—W. l., *600.*
PUGET SOUND, WASH.—Type of wave (system), A1; w. l., 2,941.
REDDING, CALIF.—W. l., 50.51, 50.68, 89, 89.6, 1,304, 1,338.
RELIEF LIGHTSHIP No. 76.—Type of wave (system), A2.
RELIEF LIGHTSHIP No. 78.—Type of wave (system), A2.
RELIEF LIGHTSHIP No. 80.—Type of wave (system), A2.
RELIEF LIGHTSHIP No. 85.—Type of wave (system), A2.
RELIEF LIGHTSHIP No. 90.—Type of wave (system), A2.
RELIEF LIGHTSHIP No. 92.—Type of wave (system), A2.
RENO, NEV.—Type of wave (system), A1 and A arc; w. l., 50.36, 50.51, 88.8, 89, 1,293, 1,304.
RICHMOND, VA.—W. l., 50.51, 50.65, 89.05, 89.8, 1,304, 1,357.
ROCK SPRINGS, WYO.—Type of wave (system), A1 and A, arc; w. l., 50.48, 50.51, 88.8, 89, 1,230, 1,304.
ROCKWELL FIELD, CALIF.—W. l., 1,360, 1,500; service, FX; hours, Y.
RUBY, ALASKA (WXU).—W. l., 400; service, FX; hours, Y.
SACRAMENTO (MATHER FIELD), CALIF.—W. l., 50.51, 50.63, 89, 89.8, 1,304.
SALT LAKE CITY, UTAH.—Type of wave (system), A, arc, and A1; w. l., 50.42, 50.51, 89, 89.3, 1,282, 1,304.
SAN DIEGO, CALIF. (NPL).—Type of wave (system), A1–2; w. l., 2,941, 9,798.
SAN FRANCISCO, CALIF. (NPG).—Type of wave (system), A1–2; w. l., 2,776, 4,543, 7,000, 8,950.
SAN FRANCISCO LIGHTSHIP, CALIF.—Type of wave (system), A2.
SAN FRANCISCO, CALIF. (WVY).—W. l., 17.44, 23.26, 23.28, 34.88, 69.77, 1,730; service, FX; hours, N.
SAN JUAN, P. R.—Type of wave (system), A1–2; w. l., 2,650, 6,246.
SAVANNAH, GA.—Type of wave (system), A2; w. l., *600,* 1,621.
SCHOFIELD BARRACKS, HAWAII.—W. l., 1,620; service, FX; hours, Y.
SCOTT FIELD, ILL.—W. l., 1,500; service, FX; hours, Y.
SEA GIRT STATION, N. J.—Type of wave (system), A2.
SEATTLE, WASH. (KCZ).—W. l., 50.51, 50.68, 89, 89.6, 1,261, 1,304.
SEATTLE, WASH. (WVD).—W. l., 14.70, 18.36, 18.38, 24.48, 24.51, 36.72, 36.76, 73.45, 73.53.
SELFRIDGE FIELD, MICH.—W. l., 1,090, 1,500; service, FX; hours, Y.
SEWARD, ALASKA.—W. l., 17.162, 17.182, 22.88, 22.91, 34.32, 34.36, 68.65, 68.73, 1,090, 1,500, 2,500, 3,000.
SITKA, ALASKA (NPB).—Type of wave (system), A2.
SITKA, ALASKA (WXC).—W. l., *600,* 1,200; service, FX; hours, Y.
SKAGWAY, ALASKA.—Hours, Y.
SOUTH PASS LIGHTSHIP, LA.—Loc., 89° 08′ 22″ W., 28° 59′ 25″ N.; type of wave (system), A2.
SPARTANBURG, S. C.—W. l., 50.51, 50.63, 89.05, 89.8, 1,244, 1,304.
SQUAW HARBOR, ALASKA.—W. l., 68.74, *600;* hours, Y.
ST. AUGUSTINE, FLA.—W. l., *600,* 1,621.
ST. GEORGE, ALASKA.—Type of wave (system), add A2.
ST. JOHNS RIVER LIGHT STATION, FLA.—Type of wave (system), A2.
ST. LOUIS, MO.—W. l., 2,607; service, FX; hours, Y.
ST. PAUL, ALASKA (traffic station).—Type of wave (system), A2; w. l., *600.*
ST. THOMAS, VIRGIN ISLANDS.—W. l., *600.*
STRATFORD SHOAL LIGHT STATION, N. Y.—Type of wave (system), A2.
STREVELL, IDAHO.—W. l., 50.35, 50.51, 89, 89.6, 1,304.
SWIFTSURE BANK LIGHTSHIP, WASH.—Type of wave (system), A2.
TACOTNA, WASH.—W. l., 536, 560; service, FX; hours, Y.
THUNDER BAY ISLAND LIGHT STATION, MICH.—Type of wave (system), A2.
TIENTSIN, CHINA.—W. l., 16.93, 22.57, 33.86, 67.72; service, FX; hours, Y.
TOLEDO, OHIO.—Type of wave (system), A1; w. l., 50.46, 50.51, 89, 89.1, 1,304, 1,456.
TUCSON, ARIZ.—W. l., 1,500; service, FX; hours, Y.
UMATILLA REEF LIGHTSHIP, WASH.—Type of wave (system), A2.

VALDEZ, ALASKA.—W. l., 450; service, PG; hours, Y; rates, 12 cents per word.
VANCOUVER BARRACKS, WASH.—W. l., 1,365; service, FX; hours, Y.
VINEYARD SOUND LIGHTSHIP, MASS.—Type of wave (system), A2.
WASHINGTON, D. C. (WVA).—Call changed to WAR; w. l., 14.90, 18.63, 18.65, 24.84, 24.88, 37.27, 37.31, 74.54, 74.63, 435, 1,330; service FX; hours, N.
WASHINGTON, D. C. (WWX).—Type of wave (system), A1; w. l., 50.51, 88.9, 89, 1,304, 1,470.
WEST POINT, N. Y.—W. l., 1,090; service, FX; hours, Y.
WHITEFISH POINT LIGHT STATION, MICH.—Type of wave (system), A2.
WICHITA, KANS.—W. l., 50.34, 50.51, 89.05, 89.55, 1,276, 1,304.
WINTER QUARTER SHOALS LIGHTSHIP, VA.—Type of wave (system), A2.
WISEMAN, ALASKA.—W. l., 550; service, FX; hours, Y.
WRANGELL, ALASKA.—W. l., 1,160; service, FX; hours, Y.
YUMA, ARIZ.—W. l., 1,500; service, FX; hours, Y.
Strike out all particulars of the following-named stations: Key West, Fla. (WUBV), Relief Lightship No. 79.

GOVERNMENT SHIP 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]

Strike out all particulars of the following-named ships: Bath, CG–188, CG–217, CG–230, CG–238, Curlew, John F. Hylan, Saco, S. C. 159, S. C. 320, S. C. 341, S. C. 419, Vaughan.

GOVERNMENT LAND AND SHIP STATIONS, ALPHABETICALLY, BY CALL SIGNALS

NDE, *read* Norfolk, Va.; WSV changed to WSU, effective January 1, 1929; WUK, *read* Fort Leonard Wood, Md.; WWBB (new call WRZ), *read* Relief Lightship No. 80 (disregard notice in Bulletin No. 138); strike out all particulars of the following call signals: KUSM, NACJ, NATV, NAVV, NAZX, NEDF, NEQJ, NIJB, NITD, NOLK, NOVC, NOXG, NOZR, WUBV, WWAU (new call WRI).

GOVERNMENT AIRCRAFT 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, 1928, and to the International List of Radiotelegraph Stations, published by the Berne Bureau]

J–4.—Call changed to NZNJF.
J–3.—Call changed to NZNJT.
LOS ANGELES.—Call changed to NZRLA.

GOVERNMENT AIRCRAFT STATIONS, BY CALL SIGNALS

NAFB, call changed to NZNJF; NAJC, call changed to NZNJT; NERM, call changed to NZRLA.

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, 192[8

OAKLAND, CALIF. (W6XN).—Fy., 2,052 (146.2), 2,272 (132.04), 4,560 (65.79), 6,425 (46.69), 8,650 (34.68), 12,850 (23.35), 17,300 (17.341), 25,680 (11.682), 27,325 (10.97), 34,240 (8.76), 36,585 (8.52).
OCEAN BEACH, N. J. (W2XJ).—Changed to Deal, N. J.
SAN FRANCISCO, CALIF. (Portable, W6XBB).—Fy., 1,604 (187.03), 1,704 (176.06), 3,208 (93.51), 4,284 (70.02), 2,625 (46.69), 8,650 (34.68), 12,850 (23.35); power 500.
SAN FRANCISCO, CALIF. (Portable, W6XBK).—Owner, M. R. T. Co.
SAYVILLE, N. Y. (W2XBL).—Fy., 35 (8,571).
SOUTH SCHENECTADY, N. Y. (W2XAG).—Fy., 550 to 1,500 (545 to 200); power, 50,000 from noon to midnight, 200,000 midnight to morning.
Strike out all particulars of the following-named stations: Chicago, Ill. (W9XF), Houlton, Me. (W1XA), Houlton, Me. (Portable, W1XR), Providence, R. I. (Portable, W1XAT).

MISCELLANEOUS

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]

Little Gull Light Station, N. Y.—Change to read Little Gull Island Light Station, N. Y., sounding periods changed to transmit every 75 seconds, groups of 1 dot and 3 dashes for 60 seconds, silent 15 seconds, thus:

. — — — . — — — etc.	Silent
60 seconds	15 seconds

Stratford Shoal Light Station, N. Y.—Change to read Stratford Shoal (Middle Ground) Light Station, N. Y., sounding periods changed to transmit every 90 seconds, groups of 1 dot, 1 dash, and 1 dot for 60 seconds, silent 30 seconds, thus:

. — . . — . etc.	Silent
60 seconds	30 seconds

Execution Rocks Light Station, N. Y.—Sounding periods changed to transmit every 75 seconds, groups of 1 dot and 1 dash for 60 seconds, silent 15 seconds, thus:

. — . — . — etc.	Silent
60 seconds	15 seconds

Barnegat Lightship, N. J.—Beacon established. Transmits on 1,034 meters (290 kc.) every 180 seconds, groups of 3 dashes for 60 seconds, silent 120 seconds, thus:

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

Operates continuously during thick or foggy weather and daily in clear weather from 12.30 to 1 and 6.30 to 7 a. m. and p. m., seventy-fifth meridian time. Location 73° 56′ 00″ W., 39° 45′ 45″ N. Call signal WRA.

Aransas Pass Light Station, Tex.—Beacon established. Transmits on 1,000 meters (300 kc.) every 180 seconds, groups of 1 dash, 1 dot, and 1 dash for 60 seconds, silent 120 seconds, thus:

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

Operates continuously during thick or foggy weather and daily in clear weather from 2.30 to 3 and 8.30 to 9 a. m. and p. m., ninetieth meridian time. Location 97° 03′ 23″ W., 27° 51′ 50″ N.

Cape Blanco, Calif.—Correct to read Cape Blanco, Oreg.

GENERAL ORDERS OF THE FEDERAL RADIO COMMISSION

Postponement of effective date limiting duplication (chain programs) on cleared channels (General Order No. 46, October 5, 1928).—In order to determine the actual extent of duplication of chain programs on cleared channels, under the reallocation of broadcasting stations, effective November 11, 1928, and in order that practical experience obtained may indicate the most practical regulatory measures to reduce such duplication, the Federal Radio Commission hereby postpones the effective date of General Order No. 43, limiting duplicated operation on cleared channels to stations more than 300 miles apart, until the end of the next broadcasting license period, January 31, 1929.

Extension of coastal, point-to-point, technical and training, experimental, and ship station licenses until December 31, 1928 (General Order No. 47, October 23, 1928).—It is ordered, that all existing licenses covering coastal, point-to-point, technical and training, experimental, and ship radio transmitting stations, heretofore extended by the commission's General Orders 1, 3, 26, and 39 be, and the same are hereby, further extended for a period of 60 days to terminate at 3 o'clock a. m., eastern standard time, December 31, 1928. This order, however, is subject to the conditions that it shall not be deemed or construed as a finding or decision by the commission, or as any evidence whatsoever, that the continued use or operation of any of said stations serves, or will serve, public interest,

convenience, or necessity, or that public interest, convenience, or necessity would be served by the granting of any pending application for a renewal of any of said licenses; and any licensee subject to this order who continues to use or operate his station during the period covered by this order shall be deemed to have consented to said conditions. This order is only subject to the following exceptions:

1. It shall not apply to any licenses heretofore issued by this commission (as distinguished from licenses issued by the Department of Commerce prior to the establishment of the commission under the radio act of 1927, approved on February 23, 1927), all licenses in such cases to be governed by the terms and conditions of their respective licenses from the commission.

2. It shall also not apply to any existing license for a renewal of which no application shall have been filed prior to November 1, 1928.

Definition of a limited time broadcasting station (General Order No. 48, October 22, 1928).—A limited-time broadcasting station is hereby defined as a station which, under its license from this commission, is permitted to operate during hours allowed daytime broadcasting stations as specified in General Order No. 41, and in addition during certain time temporarily not used by the unrestricted station or stations on the same frequency. An example is the use of late evening hours by a limited-time broadcasting station in the West after the closing of an eastern station on the same frequency.

A limited-time broadcasting station desiring to operate after sunset shall so notify the commission, which will ascertain what hours the use of which is not desired by the unrestricted station or stations on the same frequency, and will thereafter authorize the operation of the limited-time station accordingly, subject, however, to the right of said unrestricted station or stations to reclaim the use of such hours upon reasonable notice to the commission and to the limited-time broadcasting station.

A limited-time broadcasting station will not be permitted to operate at any time when its operation will cause heterodyne interference with other broadcasting stations assigned to the same frequency.

Broadcasting stations ordered to announce character of mechanical reproductions (General Order No. 49, October 26, 1928).—All broadcasting stations shall announce clearly and distinctly the character of all mechanical reproductions broadcast by them, the announcement to precede each such program item. In such announcements each phonograph record used, whatever its character, shall be described as a "phonograph record"; each piano-player selection used shall be described as played by "mechanical piano player"; every other mechanical reproduction shall be similarly described by the term generally used and understood by the public as meaning such mechanical reproduction.

AIRWAYS WEATHER AND COMMUNICATIONS SYSTEM FOR SAFE NIGHT FLYING

Weather is one of the uncontrollable factors that seriously affects the reliability and safety of air transportation and therefore influences the air navigation facilities that must be provided on airways. Candlepower and spacing of lights, as well as location of intermediate landing fields, are determined in conjunction with the study of weather conditions encountered on an airway route. An adequate weather service and communications system, in addition to aids to navigation along the airway, is essential for the full development of a dependable and safe air transportation system. The establishment of safety aids essential for this purpose has been authorized by the air commerce act of 1926. Airway facilities may be classified into two groups: First, the facilities designed to make flying feasible and safe under conditions of poor visibility and thick weather and, second, the safety aids that are required to bring airplanes safely to a well-lighted and equipped landing field when hazardous weather conditions are encountered.

Present weather and communications system.—Under the air commerce act of 1926 the Weather Bureau is the responsible agency for collecting and disseminating weather information. The airways division of the Department of Commerce operates in connection with the Weather Bureau in disseminating weather information along airways. The Weather Bureau maintains personnel at the principal airports to analyze and interpret weather reports. The airways division now maintains 28 radio stations for the exchange of weather information and dispatch of airplanes, this service being supplemented by telephone and teletype communications. The present system of weather information is the expansion of the system initiated by the Post Office Department, which has served for more than 10,000,000 miles of flight, and has established a fine record of performance. Nevertheless, the system can not be considered altogether satisfactory.

The pilot receives the weather information and forecasts before taking-off and concerns himself with weather conditions he may encounter three of four hours hence at points 300 or 400 miles distant, whereas the bulk of his information turns "stale" and unreliable 30 minutes after taking-off, due to rapidly changing weather conditions. The operation of large passenger airplanes makes it imperative that a more comprehensive weather and communications system be established. An adequate weather communications system should convey to the pilot en route the changes in weather and landing conditions, giving him reliable information as of the moment. It is therefore apparent that radio communications to aircraft is the solution of the weather problem.

Radio telephone communications.—Great progress has been made during the past year in the development of radio communications to aircraft. On the Transcontinental Airway two stations have been in operation experimentally under the airways division for several months, and 12 additional radiotelephone transmitters are being installed at Cleveland, Bryan, Chicago, Omaha, North Platte, Cheyenne, Rock Springs, Salt Lake City, Elko, Reno, and Oakland. By the close of 1928 these radio stations will have been completed, and a new system of control of airways operation will be initiated. The radiotelephone transmitters are of 2,000-watt capacity, broadcasting voice on 900 meters, with a reliable range of 125 miles. Apparatus for 15 additional stations is on order for delivery 7 months hence, and the additional stations will be established along other routes on which night flying takes place. In addition to the foregoing, a radiobeacon and communication station is now being established at Key West for the Pan American Air Mail Service.

New system of weather communications.—A new system of weather and communications service has been devised by the Weather Bureau and Department of Commerce to develop the greatest utility from the new radiotelephone facilities now available, and it is proposed to introduce this system on the Transcontinental Airway, using the stations now under construction. This system promises the degree of safety required by air transportation on a basis that permits unlimited traffic. Timely and accurate weather and landing conditions will be made available to any airplane, airport, landing field, or individual that cares to tune in. The information will be broadcast on fixed schedules. Any airplane equipped with a radio receiver will receive weather information at any point within the sector.

The eastern division of the Transcontinental Airway (between New York and Chicago) will be the first to be operated under the new system and will have the control center located at Cleveland, from which point the Weather Bureau, Air Transport Co., and airways division will manage the operation of the service. The American Telephone & Telegraph Co. has arranged to install an automatic telegraph typewriter system under an agreement with the airways division for instantaneous communication between the radio stations, landing fields along the route, the Weather Bureau, and operations manager's office. By this system a message written on a typewriter at any point in the circuit between Newark, N. J., and Cleveland will be transmitted instantaneously and written on a tape at all other points in the circuit. The radio operator at the Department of Commerce radio stations will broadcast the messages by radiotelephone.

The weather service, forming the basis of this new system, is founded on the regular weather reports gathered by the Weather Bureau throughout the United States each morning and evening, supplemented by a secondary net of weather reports gathered at intervals of 3 hours from critical points in the vicinity of the airway route and further supplemented by hourly reports of weather and landing field conditions from intermediate landing fields located 60 miles apart along the airway. The Weather Bureau representative analyzes the weather data and prepares a short-range forecast of weather conditions, predicting the track, movement, and severity of storms, and all other vital information required for the safety of flying. The landing conditions at terminal and intermediate fields, together with the short-range forecasts, are to be broadcast from all radio stations in the sector once each hour on predetermined schedules. These reports will be followed by orders to pilots of airplanes in flight from the operations manager of the transport companies.

Experimental operation of the new weather communications system will be started on November 1, 1928. The radio stations at Hadley Field, Bellefonte, and Cleveland installed by the airways division are now ready for service operation, and the airplanes of the National Air Transport, flying the mail between New York and Chicago, have been equipped with receiving sets for this service. The ex-

perience gained this winter will provide the basis of the service required for the safety of passenger lines which will be started next spring.

Before taking off the pilot refers to previous weather reports and notes especially any orders from the operations manager concerning the scheduled trip. After taking off the pilot receives hourly reports on landing conditions and Weather Bureau forecasts. If landing at the terminal field becomes impossible, reports on intermediate fields along the route and alternate terminal fields permit the pilot to land safely and await more favorable weather. The operations manager follows weather conditions closely and advises the pilot regarding his judgment of conditions and transmits such orders as are found necessary for the proper protection of the interests of the transport company. Arrangements made for motor or rail transportation of passengers and mail, if landing is ordered at a field other than the terminal, can be communicated to the pilot so as to provide for the comfort and safety of the passengers and expediting the mail. Circumstances may require flying at high altitude over ground fog on radio-range signals over the airway, or flying blind by instrument through thick weather, and this may be done with safety as long as the pilot is kept advised that landing conditions are safe at the terminal field or at some other specific landing place. Many trips now lost will be completed with safety as soon as this comprehensive weather communications service is established.

OPENING OF PORTPATRICK (SCOTLAND) STATION FOR RADIO-COMPASS SERVICE

The station at Portpatrick, Scotland, North Channel, located in 5° 07′ 23.8″ W,. 54° 50′ 37.7″ N., is now open for radio-compass service under the following conditions: The wave length employed will be 600 meters; the charge per bearing will be 5 shillings; the reliable range of the station for radio-compass work is 100 miles; up to this range and within the sector 160–295° an accuracy within 2° may be expected.

The accuracy with which the bearings can be taken depends on the conditions outlined below, but, although all necessary precautions are taken in order that the bearings may be determined as accurately as possible, the British administration can not accept any responsibility for the consequences of a bearing being inaccurate. The conditions which should be fulfilled for obtaining a good bearing are to transmit consistently clear, steady signals on a sharply tuned wave.

Bearings at distances exceeding 100 miles will be given if required but will be less reliable; the degree of reliability decreases as the range increases, especially at nighttime. Bearings inside the sectors 140, 159, and 296–010° will be given, but will be definitely stated as "unreliable," because variable errors are experienced inside those sectors. The sector 011–139° has not been calibrated. Bearings at night (more particularly within an hour each way of sunrise or sunset) are subject to variation and should be accepted with caution. If a bearing is not of the highest order, it will be specified as "approximate" by Portpatrick. If a satisfactory bearing can not be obtained, Portpatrick will not transmit one but will inform the ship that conditions are unfavorable and that another call should be made later.—*Notice No. 8, September 18, 1928. Mercantile Marine Department, London.*

CAPE FERRET (FRANCE) RADIOBEACON NOW OPERATING NORMALLY

This beacon is no longer operating experimentally. The particulars are as follows: Location (approximately) longitude 1° 15″ W., latitude 44° 39′ N.; frequency 300 kilocycles (1,000 m.); range 60 miles. The characteristic of the signal is as follows:

• • — • • • — • • • — • 10 seconds	— — — — — — — — etc. 30 seconds
• • — • • • — • • • — • 10 seconds	Silent 10 seconds

The signals will be transmitted commencing at the 10th, 20th, 30th, 40th, 50th, and 60th minutes of each hour during foggy weather.

RADIOBEACON ESTABLISHED AT START POINT LIGHT STATION, ENGLAND

About November 5, 1928, a radiobeacon will be established at Start Point Light Station on the south coast of England. The beacon will transmit during thick weather, every four minutes, the letters "GSM" in Morse code (— — . . . — —) for 48 seconds, followed by a dash for 10 seconds, followed by the letters "GSM" (— — . . . — —) made once in 2 seconds, followed by a silent period of 180 seconds. In clear weather three emissions of the signal as described above will be made consecutively at half-hour intervals, commencing at 23 minutes past the hour. The signal will be transmitted on a wave length of 1,000 meters. Although this signal is to be permanent, it may be found necessary to make some adjustment after establishment, and the station should be considered as under test for a period of three months, during which time the signals may be subject to temporary interruptions. Position (approximately) 3° 38′ W., 50° 13′ N.

PHILIPPINE VESSELS REQUIRED TO BE EQUIPPED WITH RADIO, ACT OF DECEMBER 5, 1927

Act No. 3396, passed and approved by the Philippine Legislature on December 5, 1927, became effective September 1, 1928. It provides that vessels of 300 net tons and upward engaged in interisland shipping shall be equipped with radio equipment for the safety of passengers and crew in case of disaster. Smaller vessels from 200 to 300 net tons making trips of longer than 15 hours duration must also be equipped with radio apparatus. Philippine vessels engaged in foreign trade are exempted from the requirements of the law.

A SYSTEM FOR FREQUENCY MEASUREMENT BASED ON A SINGLE FREQUENCY

An accurate method of rapidly checking the frequencies of piezo oscillators used as the frequency standards for radio stations has been developed at the Bureau of Standards and is in daily use. The method is suitable for calibration of either piezo oscillators or frequency meters in terms of a standard temperature-controlled piezo oscillator. The accuracy obtained is dependent only upon the accuracy of the standard piezo oscillator.

The apparatus required consists of a temperature-controlled piezo oscillator the frequency of which is a multiple of 10 kilocycles, a 10-kilocycle radio-frequency generator, an auxiliary generator covering the range of frequencies desired, a special beat indicator, an audio-frequency generator, and a frequency meter.

The radio-frequency generator is adjusted and maintained at 10 kilocycles in terms of the standard piezo oscillator. The correct adjustment is shown by a special form of beat indicator which gives both visible and audible indication when the radio-frequency generator is so adjusted that a harmonic of its frequency is exactly the same as the frequency of the standard piezo oscillator. A second auxiliary radio-frequency generator is then set approximately by means of a frequency meter to the assigned frequency of the broadcasting station whose piezo oscillator is to be tested and then adjusted to the exact frequency, which is a harmonic of the 10-kilocycle generator, by the special beat indicator.

After these adjustments are made an audible note will, in general, be heard when listening in the telephone receivers of the piezo oscillator under test. This note represents the difference in frequency between the piezo oscillator and that of the auxiliary generator. The beat note heard in the telephone receivers of the piezo oscillator is then matched with a similar note from a calibrated audio-frequency generator. This audio-frequency value is then added to or subtracted from the frequency as given by the harmonic of the 10-kilocycle generator.

The method has the advantages of great accuracy, high precision, adaptability to almost any frequency measurement, and ease of operation.

A paper which has been prepared describing this method will be published shortly. When published it will be announced in the Radio Service Bulletin.

NOTE ON RADIO-FREQUENCY TRANSFORMER THEORY

Radio-frequency transformer theory has for some time been reduced to mathematical treatment. The accepted equations are simple and usually quite effective, but in many cases computations based on these equations are not in entire agreement with careful laboratory measurements. This lack of agreement was

considered in a paper, "Note on radio-frequency transformer theory," by Harry Diamond and E. Z. Stowell, Proceedings Institute of Radio Engineers, September, 1928. It was found to be due chiefly to the existence of a capacitive coupling between the primary and secondary windings which modifies the transformer performance, but the effect of which is usually considered negligible. When this factor is not neglected the resultant equations which are developed in this paper yield a closer agreement with experimental data.

Copies of this paper are not available from the Government. Copies of the Proceedings Institute of Radio Engineers may be obtained from the Institute of Radio Engineers, 33 West Thirty-ninth Street, New York, N. Y.

REFERENCES TO CURRENT RADIO LITERATURE

This is a monthly list of references prepared by the Bureau of Standards and is intended to cover 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 Circular 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.

R100.—*Radio principles*

R112.1 Gratsiatos, J. Uber das Verhalten der radiotelegraphischen Wellen in der Umgebung des Gegenpunktes der Antenne und uber die Analogie zu den Poissonschen Beugungserscheinungen. (On the behavior of radio waves in the vicinity of the image point of the antenna and on the analogy to refraction phenomena due to Poisson.) Annalen der Physik **86**, pp. 1041–1061; August, 1928.

The electric potential at the image point of a transmitting set and in the vicinity is derived based on the theory of Watson. This gives expressions for the electric and magnetic field.

R124 Nestel, W. Untersuchung der Brauchbarkeit von Rahmenantennen fur Sendezwecke. (Investigation of the usefulness of coil antennas as transmitters). Zeitschrift fur Techn. Physik, **9**, pp. 143–145; 1928.

The radiation efficiency of coil antennas is investigated by means of Rudenberg's formulæ. It is shown that for short waves the coil antenna is almost as efficient as ordinary antennas.

R125.6 Wilmotte, R. M. General considerations of the directivity of beam systems. Jour. Inst. of Elec. Engrs. (London), **66**, pp. 955–961; September, 1923.

Definitions are given for directive efficiency and sharpness of directivity in order to treat theoretically the best condition for an effective beam system. An inclined antenna system with a reflector is suggested and an improvement on the Franklin antenna.

R125.6 Wilmotte, R. M., and McPetrie, J. S. A theoretical investigation of the phase relations in beam systems. Jour. Inst. of Elec. Engrs. (London), **66**, pp. 949–54; September, 1928.

The authors derive expressions for the phase relation of beam systems. They assume that the field at all points is due to the radiation field and apply to the amplitude and phase certain factors taking the distance into account. The factors can be read off a graph, and their results are checked against experimental investigations due to Tatarinoff.

R127 Wilmotte, R. M. The nature of the field in the neighborhood of an antenna. Jour. Inst. of Elec. Engrs. (London), **66**, pp. 961–67; September, 1928.

Methods for the calculation of the induced voltage in a receiving antenna in the neighborhood of a transmitting station are given.

R131 Scroggie, M. G. A direct-reading valve tester. Experimental Wireless (London), **5**, pp. 480–84; September, 1928.

An apparatus is described for the direct indication of the mutual conductance and anode resistance of electron tubes.

R132 Beatty, R. T. The stability of a valve amplifier with tuned circuits and internal reaction. Physical Society Proc. (London), **40**, pp. 261–268; August 15, 1928.

Algebraic and graphical treatment of tuned circuit amplifiers.

R133 Wechsung, W. Die Erzeugung sehr kurzer elektrischer Wellen mit Wechselspannung nach der Methode von Barkhausen und Kurz. (The production of very short electric waves with alternating current by the method of Barkhausen and Kurz.) Zeitschrift fur Hochfrequenztechnik, **32**, pp. 58–65; August, 1928.

A continuation of a paper appearing in the Jahrbuch, p. 15, 1928. The author extends his experimental work to Barkhausen oscillations with alternating current excitations.

R134 A new idea for a detector valve. Experimental Wireless (London), **5**, p. 515; September, 1928.

The separation of slower moving electrons from the faster ones by means of a magnetic field and a special grid is suggested. This would give rise to a more sensitive detector tube.

R140 Van der Pol, B., and Van der Mark, J. Le battement du coeur considere comme oscillation de relaxation et un modelé electrique du coeur. (The beating of the heart considered as relaxation oscillation and an electric model of the heart). L'Onde Electrique, **7**, pp. 365–392; September, 1928.

A review of work on relaxation oscillations and a brief description of the system of frequency division; compares the action of the heart beat with that of a neon tube oscillator, showing that the period of the heart beat has more or less a relaxation period.

R150 Sixtus, K. Über den Schwingkristall. (On the oscillating crystal). Zeitschrift für Techn. Physik, **9**, pp. 70–74; 1928.

From the static voltage current characteristic of a contact detector it is concluded that oscillations are produced when working in the falling portion of the characteristic. A theoretical formula based only on heating effects at the point of contact confirms the experiment.

R190 Eccles, W. H., and Leyshon, W. A. Some new methods of linking mechanical and electrical vibrations. Physical Society Proc. (London), **40**, pp. 229–233; August 15, 1928.

Circuits are shown for which contact detector and neon tube oscillations are controlled either by a tuning fork or a quartz plate.

R200.—*Radio measurements and standardization*

R214 Hitchcock, R. C. Piezoelectric frequency control. Electric Journal, **25**, p. 503; October, 1928.

An account of the frequency of the station KDNA during the past half year.

R283 Symonds, A. A. Loop permeability in iron, and the optimum air gap in an iron choke with d. c. excitation. Experimental Wireless (London), **5**, pp. 485–490; September, 1928.

Experimental study of the incremental permeability of iron when d. c. magnetization is superimposed.

R284.3 Meissner, A., and Bechman, R. Untersuchung und Theorie der Pyroelektrizität. (Investigation and theory of pyroelectricity). Zeitschrift für Techn. Physik, **9**, pp. 175–85; 1928.

Experimental and theoretical investigation of the pyroelectric effects of quartz and Turmalin.

R300.—*Radio apparatus and equipment*

R342 von Ardenne, M., and Stoff, W. The harmful effects of interelectrode capacity. Experimental Wireless (London), **5**, pp. 509–514; September, 1928.

Description of the well-known effects of the tube capacity in amplifiers.

R342.2 Barclay, W. A. A graphical construction for resistance amplifiers. Experimental Wireless (London), **5**, pp. 499–500; September, 1928.

A graphical method for determining the best values of anode resistance, grid bias, etc., of an amplifier.

R342.2 Ramelet, E. Über die neue rein elektronische Verstärkung verwendende Zählmethode für Korpuskularstrahlen. (On a new purely electronic amplification for counting corpuscles.) Annalen der Physik, **86**, pp. 871–913; August, 1928.

The pure electronic amplification (not amplification by impact ionization as originally employed by Rutherford-Geiger) due to Greinacher has been worked out in more detail by means of a suitable resistance-capacity coupled amplifier.

R344 Hollman, H. E. Ein Röhrenoszillator für sehr kurze ungedämpfte Wellen. (A tube generator for very short waves). Annalen der Physik, **86**, pp. 1062–1070; August, 1928.

A tube egnerating set is described which works down to 36 cm. In some cases waves down to 13.2 cm were measured.

R374 Ogawa, W.; Nemoto, C.; and Kaneko, S. The effect of chemical composition on the sensitivity of galena as a radiodetector and the cold emission from crystals. Researches of the Electrotechnical Laboratory, Japan, No. 230, June, 1928.

The author explains the action of the crystal detector by means of the difference of electron emissions from the two electrodes forming the contact.

R376 Doucet, V. La distortion dans les ecouteurs telephoniques. (On the distortion in telephone receivers.) QST Français et Radioélectricité Réunis, **9**, pp. 27–29; September, 1928.

Analytical investigation of telephone receivers with regard to distortion.

R376 Bauder, R., and Ebinger, A. Untersuchungen über Monotelephone. (Investigations on the Monotelephone.) Zeitschrift für Techn. Physik, **9**, pp. 65–69; 1928.

Based on the theory of a telephone receiver whose stationary field is large in comparison to the a. c. field. Experiments are carried on with mechanical tuning to resonance. Interesting photographs are shown of the nodal lines developed on the diaphragm.

R376.3 Toulon, P. L'evolution et l'avenir de haut-parleurs, exemples de principes nouveaux: Haut-parleurs electrostatiques. (Evolution and future of loud-speakers, examples of new principles: Electrostatic loud-speakers.) L'Onde Electrique, **7**, pp. 393–409; September, 1928.

Remarks on present day loud-speakers and a description of an electrostatic type.

R376.3 Clark, H. A., and Bligh, N. R. Some output power measurements on a moving coil drive loud-speaker. Experimental Wireless (London), **5**, pp. 491–98; September, 1928.

Experimental method (using the Heaviside equal ratio inductance bridge) for determining the resistance and reactance of a loud-speaker in the audible range.

R384.1 Hull, R. A. The frequency measurement problem. QST, **12**, pp. 9–19; October, 1928.

Description of frequency meter and monitor for 1929 to be used by amateurs in keeping their tansmitting stations on their proper frequency.

R386 Winter-Günther, H. Zür Theorie der Siebketten. (On the theory of filters.) Zeitschrift für Hochfrequenztechnik, **32,** pp. 41–46; August, 1928.

A treatment of filter circuits from the standpoint of coupled circuits. Instead of the method due to H. Riegger and L. Cohen, the method of normal coordinates as used by Routh and Lord Rayleigh for mechanical systems is introduced.

R386 Mallet, E. Chains of resonant circuits. Jour. Inst. of Elec. Engrs. (London), **66,** pp. 968–74; September, 1928.

The coupled circuit filter is solved with the method of differential equations in order to obtain an expression for the current in the last link of the chain. A graphical solution with an example is given.

R500.—*Applications of radio*

R580 Taylor, J., and Taylor, W. Some new applications of short radio waves. Experimental Wireless (London), **5,** pp. 503–508; September, 1928.

Shows experiments in discharge tubes when high frequency voltages are applied. It is possible to produce discharges even at very low pressures.

R800.—*Nonradio subjects*

517 Berg, E. J. Heaviside's operational calculus as applied to engineering and physics. General Electric Review, **31,** pp. 504–509; September, 1928.

The concluding section of a series of papers on above subject. It gives an application to the linear flow of heat and compiles the formulas used in operational calculus.

534 Lindsay, R. B. High frequency sound radiation from a diaphragm. Physical Review, **32,** pp. 515–519; September, 1928.

From the standpoint of hydrodynamics and sound, an expression is derived for the intensity of the high-frequency sound radiating from piston-like oscillator at a distance from the oscillator greater than the diameter of the circular radiator.

534 Brenzinger, M., and Dessauer, F. Eine neue Methode unmittelbarer Steuerung der Luft durch elektrische Schwingungen. (A new method for the direct control of air waves by means of electric oscillations.) Physikalische Zeitschrift, **29,** pp. 654–58.

A glow discharge is used for changing directly superimposed alternating currents into sound waves. The same principle is also used for making a glow-discharge microphone.)

534 Meyer, E., and Just, P. Zur Messung von Nachhalldauer und Schallabsorption. (On the measurement of the reverberation time and sound absorption). Elektrische-Nachrichten Technik, **5,** pp. 293–300; August, 1928.

A method is given for determining the reverberation time. The experimental curves prove the exponential decay of the sound for an echo.

535.3 Koller, L. R., and Breoding, H. A. Characteristics of photo-electric tubes. General Electric Review, **31,** pp. 476–79; September, 1928.

Characteristic curves of light, current, sensitivity, and gas pressure for photo-electric cells.

537.66 Neidl, G. Neuer Versuch zum Johnson-Rahbeck-Effekt. (New experiment with the Johnson-Rahbeck effect). Zeitschrift fur techn. Physik, **9,** p. 22; 1928.

A sphere of mercury is placed on a half conductor, the lower face of which has a metal coating. When an alternating voltage is applied to the mercury and the metal coating, the mercury will vibrate in synchronism with the alternating voltage.)

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