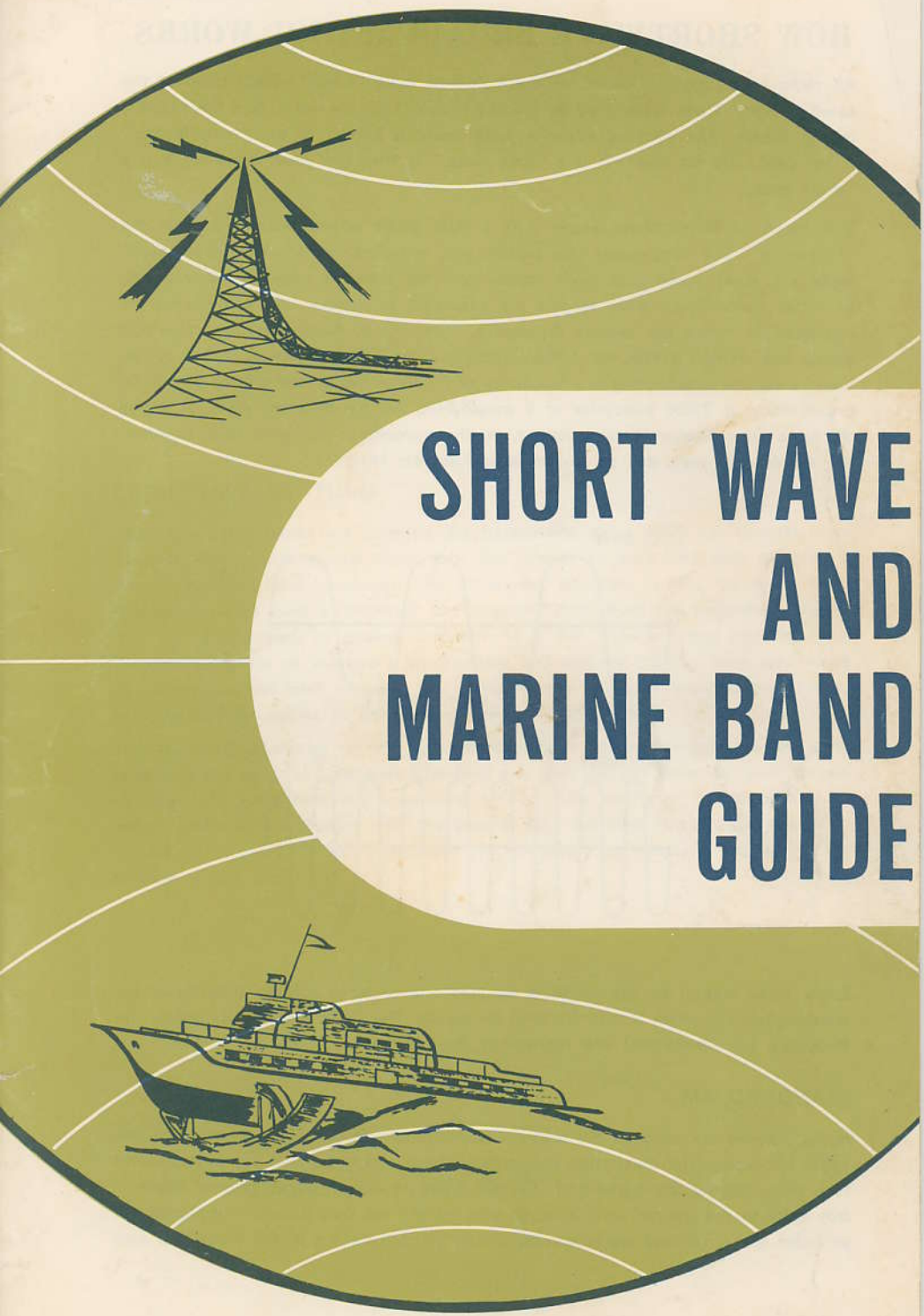
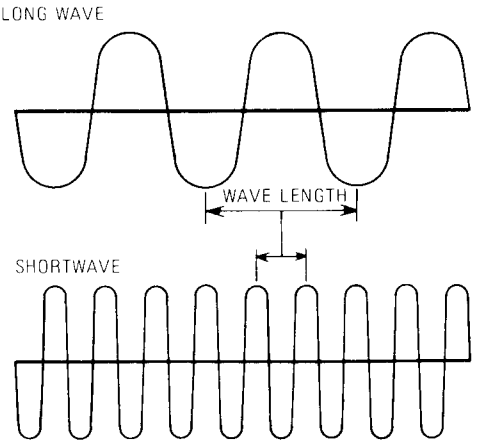


SHORT WAVE AND MARINE BAND GUIDE

HOW SHORTWAVE BROADCASTING WORKS

All radio broadcasting is based on a principle of radio "waves" which travel at the speed of light. These waves may be likened to waves on the water, or a flag blowing in the breeze. The distance between wave peaks is known as the "wave length." If the peaks are far apart, it is a "long wave." If they are close together, it is a "short wave."

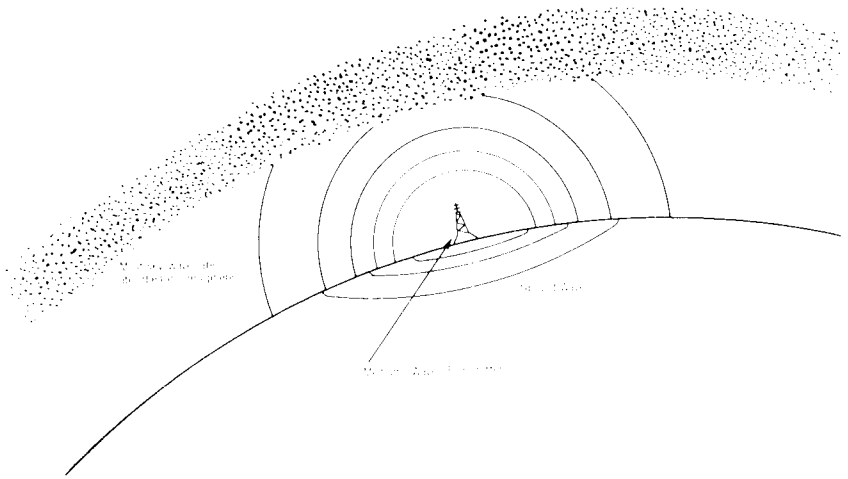
The speed at which these waves pass a given point in one second is called the "frequency." The long waves pass slowly, and therefore, are low-frequency waves; while the short waves pass more rapidly and are therefore high-frequency waves. In radio terminology, wave lengths are expressed in meters, and frequencies are expressed in cycles per second (kilocycles, megacycles). Note that one megacycle equals one million cycles, or 1,000 kilocycles. One kilocycle equals 1,000 cycles. Thus, a station broadcasting at a frequency of 2 million cycles may also be said to be broadcasting at 2,000 kilocycles or 2 megacycles. All are different ways of saying the same thing. Station frequencies are usually expressed in kilocycles (Kc), however, the terminology may also be expressed as kiloherts (KHz).



Every radio station in the world is assigned one or more specific frequencies (or wavelengths) on which it may transmit its signals. The radio RECEIVER selects the frequency (or wavelength) and reproduces the broadcast.

STANDARD AM

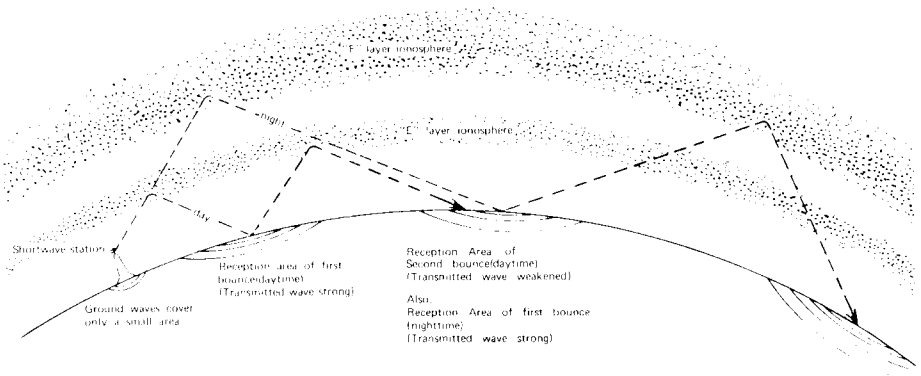
Radio stations are assigned the medium wavelengths—frequencies between 540 and 1,600 kilocycles. The illustration shows the pattern which waves in these frequencies take when leaving the transmitter. Certain types of waves—called ground waves—stay close to the ground, while some go into the sky and pass through the ionosphere to outer space. Ground waves can be picked up by receivers in the immediate area.



SHORTWAVE STATIONS

Throughout the world are assigned the frequencies above 1600 KC (shorter wave lengths). Again, both ground waves and "sky" waves are generated, with the ground waves providing local reception. The difference, however, is that the short, high-frequency waves have a tendency to "bounce" back from the ionosphere (rather than being absorbed, or passing through). It is this "bounce" that provides long-distance reception of shortwave broadcasting and may be heard in each area where the signal bounces back to earth. By selecting their angle of transmission, stations may beam their signals to the part of the world they desire.

The electronic character of the ionosphere (a layer of electronically-charged gases encircling the earth) is constantly changing and thus we can never be quite certain of what shortwave receiving conditions will be. The ability of the ionosphere to reflect radio signals changes with the time of day, the time of year, and even such remote occurrences as the frequency of "sunspots" or magnetic storms on the surface of the sun.



INTERFERENCE AND LIMITATIONS

Shortwave Reception—Interference and unwanted noise are characteristics of shortwave reception. Experienced shortwave listeners, however, accept these conditions and do their best to tune around it. An understanding of the types of interference, and the limitations of shortwave broadcasting will assist greatly in obtaining better reception and knowing what to expect from this receiver.

TIME OF DAY

Shortwave Reception will be very limited during the daytime hours. In late afternoon and evening reception will generally begin to improve. The early morning hours are sometimes good for Australian and South Pacific stations.

SEASON

Fall and Winter are generally the best seasons for shortwave reception, particularly from European and Far Eastern stations. Australian and South Pacific stations are somewhat stronger in the Spring.

SHORT-TERM CHANGES IN THE IONOSPHERE

These are possibly the most frustrating conditions that affect shortwave reception. Conditions in the ionosphere can change rapidly, increasing or decreasing interference, and possibly causing stations to fade completely away.

TYPE OF BUILDING

Reception in buildings of steel construction may be difficult. Better reception may be obtained by taking the receiver outside or at least to a window. An external antenna will greatly improve reception on the SW bands under most conditions.

FLUORESCENT LIGHTS

Considerable interference may be caused by lighted fluorescent lamps, particularly in the higher frequencies. Keep the receiver at least 12 to 25 feet away from fluorescent lights.

TELEVISION RECEIVERS

Operating television sets may interfere greatly with reception. For best reception, all TV sets should be turned off in the immediate area. . .at least within 25 feet of the receiver.

AMATEUR RADIO OPERATORS ("HAMS")

In some cases may sound distorted or garbled because they broadcast on single side band. (As per FCC rules and regulations) instead of standard AM broadcasting.

THE 24 HOUR TIME SYSTEM

In listening to most shortwave broadcasts, you'll hear references to the time of day that may seem puzzling to you. The announcer of a shortwave station in Mozambique, for instance, may say "The next scheduled broadcast to North America on this frequency will be at 1610 hours, GMT".

To the initiated, this will mean that the broadcast will be at 10 minutes past the 16th hour of the day, or 16 hours, 10 minutes. The 16th hour of the day (starting from 12 midnight) would be 4 p.m. If he had said ". . . at 2100 hours . . .", the broadcast would be at 9 p.m. Thus the first two figures give the hour, and the last two figures give the number of minutes past the hour. (Usually illustrated on 24 hour clocks.)

But what about the "GMT"? This refers to Greenwich Mean Time, which means that the time given is not necessarily local time but is the time at the prime meridian (longitude 0). This is because the prime meridian is used as a reference or starting point for the time zones throughout the world.

Thus since we know that Eastern Standard Time is 5 hours behind Greenwich Mean Time, we know that the announced in Mozambique was referring to 1110 EST, or 11:10 a.m.

Greenwich Mean Time (so called because the prime meridian passes through Greenwich, England), is also known as Universal Time (UT) and as GCT.

To convert GMT to Eastern Standard Time, subtract 5 hours (subtract 6, 7, or 8 hours for Central, Mountain or Pacific Standard Time, respectively.) To convert U.S. Standard Time to GMT, simply add the same number of hours to U.S. time. (Refer to front cover inner face for 24 hour time zone Dial-O-Map)

DIAL-O-MAP

To assist in the determination of short wave broadcast times, when the time of broadcast at the point of origin is known, the Dial-O-Map should be used. For example, if a broadcast was to originate in Zone 15 at 3 a.m., what time would the broadcast be received in Zone 7? To determine this, set Zone 15 of the inner dial at 3 a.m., on the outer dial, then read the time on the outer dial which is aligned with Zone 7 of the inner dial. The answer is 7 p.m. This would be true only if the broadcast time was given in LOCAL TIME.

The common practice in radio schedules is to give the broadcast time in Greenwich Mean Time (GMT). To use the example given above again, we assume the broadcast will come from Zone 15, but be broadcast at 12 p.m. GMT. Set Zone 12 (the GMT Zone) of the inner dial at 12 p.m. on the outer dial, then read the time on the outer dial which is aligned with Zone 7 of the inner dial. Once again the answer is 7 p.m. (note that the time of the broadcast in Zone 15 local time is 3 a.m.)

SPECIAL SERVICES

The shortwave bands are used for many governmental, industrial, and commercial services, many of which can be of use also to the general public. For instance, weather forecasts and storm warnings on the Great Lakes and along the Coastal Areas were primarily intended as navigational aids to commercial shipping; but they can also be used by small pleasure craft operators, farmers, and any others in the area to whom this information would be of value. Similar weather information broadcast by the Federal Aviation Authority for use by commercial and government aircraft operators can also be used by private aircraft operators, farmers, pleasure boat operators on inland waters, in fact, even fishermen, hunters, or picnickers.

These services, along with schedules of broadcasts and frequencies, are explained in detail in the pages that follow.

TIME AND FREQUENCY STANDARDS

WWV AND WWVH

The U.S. Department of Commerce, National Bureau of Standards operates two shortwave radio stations which provide an exact standard or reference point for frequency and time. WWV is located at Fort Collins, Colorado, and transmits on 2.5, 5, 10, and 15 MC. WWVH, located on the island of Maui, Hawaii, transmits on 2.5, 5, 10 and 15 MC.

The broadcast on WWV consists of two continuous standard audio tones, 440 cycles per second (cps) and 600 cps. These tones are heard alternately at 5-minute intervals starting with a 600 cps tone on the hour. Thus each even-numbered 5-minute period (0, 10, 20, etc.) will begin with a 600 cps tone, while each odd-numbered 5-minute period (5, 15, 25, etc.) will begin with a 440 cps tone.

The first tone period of each hour lasts for three minutes, followed by a two minute informational period. The tone period in the next and all remaining five minute periods lasts for two minutes, followed by a three minute informational period. Seconds pulses similar to a ticking clock are also heard during the entire five minute period. Intervals of one minute are marked by skipping the last pulse of each minute and beginning the next minute with a double pulse.

The last two minutes of each five minute period are composed of the following information:

1. 0 to 90 seconds—Silence, only the ticking second pulses.
2. 91 to 118 seconds—Station identification in international Morse Code, twice; Universal Time (based on the 0 to 24 hour system) at the prime meridian in Greenwich, England (GMT) in International Morse Code; Radio propagation forecasts also in International Morse Code; Voice Announcement "National Bureau of Standards. WWV—when the tone returns Eastern Standard Time will be 9 hours 20 minutes (24 hour system)." On the hour the minutes are omitted and the deviation or offset from Atomic frequency is given as plus (P) or minus (M) parts in 10^{10} in International Morse Code.
3. During the first half of the 19th minute from WWV and the first half of the 49th minute from WWVH warnings of outstanding events in radio, geophysical, and solar sciences are broadcast in International Code.
4. During the last half of the 19th minute from WWV and the last half of the 49th minute from WWVH, UT2 (astronomical time) corrections are broadcast in International Code.

The 440 cps tone is the standard musical note for A above middle C. This broadcast is used to tune musical instruments.

WWV does not transmit for 4 minutes from 45 to 49 minutes after each hour.

All tone periods on WWVH (Hawaii) last for three minutes. The two-minute informational period consists of the following:

1. 0 to 60 seconds—Silence, only the ticking seconds pulses.
2. 61 to 88 seconds—same as No. 2 above except propagation forecasts are deleted, station is WWVH, and change Eastern to Hawaiian Standard Time.
3. Same as No. 3 and 4 above.

WWVH does not transmit for 4 minutes from 15 to 19 minutes after each hour.

U.S. GREAT LAKES MARINE FORECAST (MAFOR) BULLETINS

Great Lakes weather forecasts are issued every six hours by the United States Weather Bureau Forecast Center, Chicago, Illinois, for broadcast to Great Lakes shipping. These weather forecast bulletins will be issued in the international MAFOR (Marine Forecast) code. The MAFOR code replaces the LAFOT (Lake Forecast) code formerly used for broadcasting Lake weather forecasts to ships.

The MAFOR broadcasts will be made by the stations listed at the end of this section, at the time and frequencies indicated. The U.S. MAFOR broadcasts begin a few minutes after 12 midnight, 6 a.m., 12 noon, and 6 p.m. EST. The forecast period for these broadcasts begins at 1 a.m., 7 a.m., 1 p.m. and 7 p.m. EST respectively. The 24-hour forecast period for Canadian MAFORS issued by the Dominion Public Weather Office at Toronto begins at the time of broadcast.

EXPLANATION OF THE MAFOR CODE

MAFOR (Name of lake or seaway) 1GDFmW1

Great Lakes forecasts broadcast in the International MAFOR Code are coded in 5-figure groups in the form 1GDFmW1, preceded by the name of the lake or seaway covered in the forecast as shown above. Since the weather conditions forecast by the first group are valid only for a limited period, additional groups in the same form are used to describe each change in weather conditions expected during the 24-hour period covered by the forecast.

The first group for each lake mentioned in the broadcast gives the weather conditions forecast for the period beginning on the next hour after the broadcast and is valid for the number of hours indicated by decoding the code figure for the symbol letter "G". The forecast period begins at 1 a.m., 7 a.m. and or 7 p.m.

The next group or groups 1GDFmW1, when included, give the wind and weather forecast for the remainder of the 24-hour forecast period. The forecast conditions in each successive group begin at the end of the period indicated by the code figure for "G" in the preceding group.

The code symbol letters and tables for decoding each symbol code figure are as follows:

MAFOR = Key Word indicating coded marine forecasts in form 1GDFmW1.
1 = Identifying figure and is always 1.
G = Period of time covered by forecast ..... Table I
D = Direction of forecast surface wind ..... Table II
Fm = Force of forecast surface wind .....Table III
W1 = Forecast weather .....Table IV

Examples of MAFOR Bulletins broadcast shortly after midnight EST (Forecast period beginning 1 a.m. EST.)

CODED BULLETIN BROADCAST

MAFOR SUPERIOR 14848 14730 West Half 14128 14848 East Half.
MAFOR ERIE 16900 (1GDFmW1)

Lake Superior: First 12 hours of forecast period, wind, N. 28 to 33 knots, weather, squally; next 12 hours, wind NW, 22 to 27 knots, weather, moderate or good visibility WEST HALF. First 12 hours of forecast period, wind NE, 17 to 21 knots, weather, squally; next 12 hours, wind N. 28 to 33 knots, weather, squally EAST HALF.

(1) **Lake Erie:** (6) 24 hour forecast period, (9) winds—variable, (0) 0 to 10 knots, (0) weather—moderate to good visibility.

TABLE I:
Symbol G—Period of time covered by broadcast

Code Figure	Description
0	Conditions at the time of forecast
1	Forecast valid for 3 hours
2	Forecast valid for 6 hours
3	Forecast valid for 9 hours
4	Forecast valid for 12 hours
5	Forecast valid for 18 hours
6	Forecast valid for 24 hours
7	Forecast valid for 48 hours
8	Forecast valid for 72 hours
9	Occasionally

TABLE II:
Symbol D—Direction of Surface Wind

Code Figure	Direction
0	Calm
1	Northeast
2	East
3	Southeast
4	South
5	Southwest
6	West
7	Northwest
8	North
9	Variable

TABLE III: Symbol F_m —Force of Wind

Code Figure	Force (knots)	Miles Per Hour	Equivalent beaufort Scale	Plain Language Terms
0	0 to 10	0–12	3	Light, gentle
1	11 to 16	13–18	4	Moderate
2	17 to 21	19–24	5	Fresh
3	22 to 27	25–31	6	Strong
4	28 to 33	32–38	7	Strong
5	34 to 40	39–46	8	Gale
6	41 to 47	47–54	9	Gale
7	48 to 55	55–63	10	Whole Gale
8	56 to 63	64–75	11	Whole Gale
9	64 and above	Over 75	12	Hurricane

TABLE IV: Symbol W_1 —Forecast Weather

CODE FIGURE	WEATHER
0	Moderate or good visibility (greater than 3 nautical miles)
1	Risk of accumulation of ice on superstructures (Temp. 23-32°)
2	Strong risk of accumulation of ice on supersturctures (Temp. below 23°)
3	Mist (visibility 5/8 to 3 nautical miles)
4	Fog (visibility less than 5/8 nautical miles)
5	Drizzle
6	Rain
7	Snow or rain with snow
8	Squally weather with or without showers
9	Thunderstorms

NOTES:

1. Each MAFOR Bulletin also contains a brief weather summary giving positions of Lows, Highs, Fronts and other features on the weather map that may affect the Lake Region within the 24-hour forecast period. The synopsis is based on observations taken about 6 hours prior to broadcast.

2. When Small Craft, Gale or Whole Gale warnings have been issued for any lake, the appropriate U.S. MAFORS will also contains a statement indicating the type of display and the area along the Lakes where warning displays are in effect.

U.S. MAFOR Radiotelephone Broadcast Schedules

City	Station	KC	Forecasts	Broadcast Times -- EST
Lorain, Ohio	WMI	2514 (4422.2)	SMHEOL	12:02&6:02 am &pm
Chicago, Ill.	WAY	2514	SMHEOL	12:09&6:09 am&pm
Rogers City, Mich.	WLC	2514 (4422.2)	SMHEOL	12:16&6:16 am&pm
Buffalo, N.Y. (Martinsville)	WBL	2514*	HEOL	12:23&6:23 am&pm. * not used at 12:23& 6:23 am
Duluth, Minn.	WAS	2514 ✢ 4422.2 ‡	SMH	12:27 am & 6:27 am &pm, ✢ at 12:23 pm, ‡ at 12:27 pm
Port Washington, Wis.	WAD	2514	SMH	12:23&6:23 am, 12:27 pm
		WINTER SCHEDULE		
Chicago, Ill. (Lake Bluff)	WAY	2514 (4422.2)	SM	12:02&6:02 am&pm
Port Washington, Wis.	WAD	2514 (4422.2)	SM	12:06&6:06 am&pm
Lorain, Ohio	WMI	2514 (4422.2)	SMHE	12:10&6:10 am&pm

NOTE: S—Lake Superior; M—Lake Michigan; H—Lake Huron; E— Lake Erie; O—Lake Ontario; L — St. Lawrence River

U.S. GREAT LAKES WEATHER BULLETIN (LAWEB) BROADCASTS

Great Lakes Weather Bulletins (LAWEB) are issued by the U.S. Weather Bureau for radio-telephone broadcast every six hours during the navigation season. Schedule of LAWEB broadcasts are as follows:

City	Station	KC	Broadcast Times—EST
Lorain, Ohio	WMI	2514 (4422.2)	2:30 & 8:30 am & pm

EXPLANATION OF GREAT LAKES WEATHER BULLETIN (LAWEB)

Great Lakes Weather Bulletins (LAWEB) are issued by the U.S. Weather Bureau for broadcast every six hours during the navigation season.

The LAWEB contains plain-language reports of wind direction and speed (in knots) and/or barometer reading; also ice data in season, from shore stations in the Lake Region and ships on the Lakes.

Ship reports are from vessels underway on the Lakes when they are more than 3 miles off shore. Ships' positions are given in distance in miles and direction from well-known landmarks; visibility and weather are included in both land and ship reports when visibility is less than 5/8 of a mile. Observations are taken one hour and 30 minutes prior to the time of broadcast. Reports in the Bulletin are sent in the following order.

Lake Michigan

Point Betsie, Mich. (wind only)
Muskegon Harbor, Mich.
St. Joseph, Mich. (wind only)
Chicago, Ill. (barom. only)
Dunne Crio, Ill. (wind only)
Milwaukee Breakwater, Wis. (wind only)
Green Bay, Wis.
Lansing Shoal, Mich. (wind only)
Mackinaw City, Mich. (wind only)
Ship Reports

Lake Superior

Sault Ste. Marie, Mich.
Whitefish Point, Mich. (wind only)
Manitow Island, Mich. (wind only)
Marquette Harbor, Mich. (wind only)
Eagle Harbor, Mich. (wind only)
Hancock, Mich. (wind only)
Houghton, Mich.
Superior Harbor, Wis. (Temp. when below 32^{O})
Rock of Ages Island, Mich. (wind only)
Lakehead, Ont. (wind only)
State Island, Ont. (wind only)
Caribou Island, Ont. (wind only)
Ship Reports

Lake Ontario

Oswego, N.Y.
Rochester (Charlotte), N.Y. (wind only)
Fort Niagara, N.Y. (wind only)
Toronto, Ont. (wind only)
Trenton, Ont.
Main Duck, Ont. (wind only)
Ship Reports

Lake Huron

Port Huron, Mich. (wind only)
Bay City, Mich. (wind only)
Tawas Point, Mich. (wind only)
Alpena, Mich.
Thunder Bay Island, Mich. (wind only)
Gore Bay, Ont. (wind only)
Cove Island, Ont. (wind only)
Wiarton, Ont.
Ship Reports

Lake Erie

Buffalo Light, N.Y.
Erie Light, Pa. (wind only)
Ashtabula Light, Ohio (wind only)
Cleveland Light, Ohio
Point Marblehead, Ohio (wind only)
Toledo Light, Ohio
Southeast Shoal, Ont. (wind only)
London, Ont.
Long Point, Ont. (wind only)
Ship Reports

CANADIAN GREAT LAKES MAFOR AND ST. LAWRENCE LAWEB BULLETINS

MAFOR for Lakes Superior, Huron, Erie and Ontario and Georgian Bay are issued by the Weather Office, Toronto, Canada.

City	Station	Broadcast Time -- EST
Cardinal, Ont.	VDQ	4:50 & 10:50 am & pm
Kingston, Ont.	VBH	4:40 & 10:40 am & pm*
Wiarton, Ont.	VBC	4:00 & 10:00 am & pm
Lakehead, Ont.	VBA	4:30 & 10:30 am & pm
Port Burwell, Ont.	VBF†	3:50 & 9:50 am & pm
Sarnia, Ont.	VBE‡	4:10 & 10:10 am & pm
Sault Ste. Marie, Ont.	VBB	4:20 & 10:20 am & pm
Toronto, Ont.	VBG	3:40 & 9:40 am & pm

All broadcasts are made on 2514 KC/S except as noted.
* Also at 7:10 am, June to August inclusive.
† On 2514 KC/S only. ‡ Also on 4415.8 KC/S.

Urgent reports of dangers to navigation and revision to current weather forecasts are transmitted immediately on receipt by each station shown in the table above. These reports also immediately follow the MAFORS broadcasts.

CANADIAN FORECAST AND LAWEB BULLETINS

For the St. Lawrence River area are broadcast by Radiotelephone Station VCF. Mont Joli, Que. on 2582 KCs, during the navigation season, Forecast Bulletins are transmitted at 7:20 a.m., 12:30 and 7:20 p.m. EST and LAWEBS at 3 and 9 a.m. and p.m. EST. LAWEBS include weather reports from Montreal, Quebec, Mont Joli, Seven Islands, Fox River, Campbelltown, Chatham, Summerside, Grindstone, St. Andrews, Stephensville, Daniels Harbor, Bell Isle, Harrington Harbur Natashquan, Ellis Bay and ships. Reports include visibility when less than ½ mile. Ships' positions are given in latitude and longitude.

These stations also broadcast local area weather reports. The broadcasts also include reports for nearby areas.

Station	Report Includes	Broadcast Times -- EST
VBH	Main Duck Island	1:10 & 7:10 am & pm
VBA	Caribou, Slate Islands & Lakehead	1:40 & 7:40 am & pm
VBB	Caribou & Slate Islands	1:20 & 7:20 am & pm
VBC	Cove Island	1:00 & 7:00 am & pm
VBE	Cove Island	1:30 & 7:30 am & pm
VBF	Southeast Shoal, Long Point & Port Colborne	12:50 & 6:50 am & pm
VBG	Southeast Shoal, Long Point & Port Colborne	1:40 & 7:40 am & pm

U.S. GREAT LAKES GALE AND WHOLE GALE WARNING BROADCASTS

Gale and Whole Gale warnings for the Great Lakes are broadcast by U.S. radiotelephone (voice) stations during the navigation season (about April 1 to December 15). These warnings are broadcast on receipt of the message from the U.S. Weather Bureau. The warning is repeated at 2-hour intervals thereafter for a period of 5 hours from the "Hoist" time given in the message, unless superseded or cancelled. Cancellation of a warning is given once only on the next scheduled warning broadcast following receipt of the cancellation message. Schedules in the table are in minutes past EVEN or ODD hours, EST.

Location	Station Call Letters	Lakest	Broadcast Times—EST
Buffalo, N.Y.	WBL	EOL	On receipt and 55 min. after odd hours
Erie, Pa.	NMD-11	E	On receipt and 55 min. after even hours
Lorain, Ohio	WM1	SMHEOL	On receipt and 35 min. after odd hours
Port Huron, Mich.	NMD-22	H	On receipt and 35 min. after even hours
E. Tawas, Mich.	NMD-24	H	On receipt and 55 min. after odd hours
Rogers City, Mich.	WLC	SMH	On receipt and 45 min. after even hours
Sault Ste. Marie, Mich.	NOG	SMH	On receipt and 45 min. after odd hours
Portage, Mich.	NOG-17	S	On receipt and 35 min. after even hours
Marquette, Mich.	NOG-5	S	On receipt and 55 min. after even hours
Chicago, I..	WAY*	SM	On receipt and 45 min. after odd hours
Port Washington, Wis.	WAD*	M	On receipt and 55 min. after odd hours
Plum Island, Wis.	NAP-15	M	On receipt and 35 min. after even hours
Duluth, Minn.	WAS	S	On receipt and 55 Min. after odd hours

ALL BROADCASTS ARE ON 2182 KC
* Also during winter months.
† Lake covered in warnings: S—Superior; M—Michigan; H—Huron; E—Erie; O— Ontario; L—St. Lawrence River above St. Regis.

COASTAL WEATHER FORECAST AND WARNING INFORMATION FOR BOATMEN

Weather forecasts for coastal and boating areas are issued every six hours by the U.S. Weather Bureau. These forecasts are applicable to coastal waters along the U.S. seacoasts, the Great Lakes, and waters adjacent to Hawaii and Puerto Rico, Each forecast as issued covers a specific coastal water or boating area as indicated in the heading in the forecast. For example, forecasts for coastal waters extending from Eastport, Me. to Block Island, R.I. are headed, "Eastport to Block Island."

New forecasts are available from radio broadcasts commencing around 6 and 12 o'clock a.m. and p.m., local time. When warnings are issued, the forecasts also contain a statement that "Small Craft", "Gale", "Whole Gale" or "Hurricane" warnings, as the case may be, are displayed and also identify the areas covered by the displays. However, warnings of approaching storms may be issued at any time, day or night, for displays, immediate broadcasts, and publication in newspapers.

Information as to locations of coastal warning display stations and all radio stations making broadcasts of U.S. Weather Bureau coastal forecasts and warnings, together with their schedules, are published on a series of Coastal Warning Facilities Chart editions, issued annually, for the following areas:

Eastport, Me. to Montauk Point, N.Y.
Montauk Point, N.Y. to Manasquan, N.J.
Manasquan, N.J. to Hatteras, N.C.
Hatteras, N.C. to Brunswick, Ga.
Eastern Florida
Malachicola, Fla. to Morgan City, La.
Morgan City, La. to Brownsville, Tex.
Point Conception, Calif. to Mexican Border
Eureka, Calif. to Point Conception, Calif.
Canadian Border to Eureka, Calif., and Alaska
Great Lakes: Michigan and Superior
Great Lakes: Erie, Huron, and Ontario
Hawaiian Islands
Puerto Rico and Virgin Islands

Copies of the above charts can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. at 10¢ each.

MARINE WEATHER FORECAST AND WARNING BROADCASTS

The following Marine Radiotelephone (voice) stations make shortwave broadcasts of Weather Bureau forecasts and warnings. Note that there are both regularly scheduled broadcasts and special broadcasts made on receipt of storm and hurricane warnings from the Weather Bureau.

SCHEDULED BROADCASTS—MARINE WEATHER FORECAST AND WARNING

Location	Station Call Sign	Freq. (KC) Marine Band	Broadcast Times—EST
ATLANTIC COAST AREA			
Boston, Mass.	WOU	2450, 2506	Daily, 5:20, 11:20 am & pm, 6:20 am
Boston, Mass.	NMF	2670	Daily, 5:40 am & pm, 11'40 pm
	NMF	2566 daytime only	
New York, N.Y.	WOX	2522, 2590	Daily, 7:15 am & pm
		2482 daytime only	
Cape May, N.J.	NMK	2670	Daily, 6:00 am & pm
Ocean Gate, N.J.	WAQ	2558	Daily, 7:15 am & pm
Ocean Gate, N.J.	WOO	4396.6	Daily, 8 pm only
Wilmington, Del.	WEH	2558	Daily, 7:30 am & pm
Baltimore, Md.	NMX	2670	Daily, 12:30 pm
Norfolk, Va. (Virginia Beach)	WGB	2538	Daily, 12 and 6 am & pm
		2450 daytime only	
Fort Macon, N.C.	NMN37	2670	Daily, 12 noon
Charleston, S.C.	WJO	2566	Daily, 7:15 am & pm
Jacksonville, Fla.	NMV	2670	Daily, 1:20 am & pm
Jacksonville, Fla.	WNJ	2566	Daily, 7 am & pm
Miami, Fla.	WDR	2514, 2490	
GULF OF MEXICO AND CARIBBEAN SEA AREA—CST			
Tampa, Fla.	WFA	2550	Daily, 6 am & pm (not used (Apr. 1 to Dec. 15)
		246	Daily, 6 am & pm
Mobile, Ala.	WLO	2572	Daily, on odd hours
New Orleans, La.	NMG	2670	Daily, 5:50 and 11:50 am & pm
	WAK	2558	
New Orleans, La.	WAK	2598, 2482	Daily, 8 am and 11 pm
Galveston, Tex.	KQP	2530	Daily, midnight and noon
Galveston, Tex.	NOY	2670	Daily, 5:20 and 11:20 am & pm
Swan Island	WSG	2738	Daily, 11:05 am and on request
San Juan, P.R.	NMR	2670	Daily, 11 am & pm (AST)
PACIFIC COAST AREA—PST			
Port Angeles, Wash.	NOW	2670	Daily, 9:45 am & pm
Seattle, Wash.	KOW	2522, 2482	Daily, 9 am & pm (Oct.–May); 8:50 pm (Apr. 1–Sept. 30)
Seattle, Wash.	NMW43	2670	Daily, 9:15 am
Westport, Wash.	NMW	2670	Daily, 9:30 am & pm
Astoria, Oreg.	KFX	2598	Daily, 9:15 am & pm
Portland, Oreg.	KQX	2598	Daily, 9:30 am & pm
Coos Bay, Oreg.	KTJ	2566	Daily, 9:30 am
Eureka, Cal.	KOE	2506, 2450	Daily, 8:45 am & pm; 1:45 pm
San Francisco, Cal.	KLH	2506, 2450	Daily, 8:30 am & pm; 1:30 pm
Long Beach, Cal.	NMQ	2670	Daily, 9 am & pm
San Pedro, Cal.	KOW	2466, 2566	Daily, 8 am & pm

SPECIAL BROADCASTS
STORM AND HURRICANE WARNINGS

Location	Station Call Sign	Freq. (KC) Marine Band	Broadcast Times—EST
ATLANTIC COAST AREA			
Boston, Mass.	NMF	2670*	On recpt. and 11:40 am
Boston, Mass.	WOU	2506, 2450	On recpt. and 20 min. past each odd hr.
New York, N.Y.	NMY	2670*	On recpt. and at 7:20 am and 9:20 pm
New York, N.Y.	WOX	2522, 2590	On recpt. at 15 min. past each odd hr.
		2482 daytime only	
Cape May, N.J.	NMK	2670*	On recpt.
Ocean Gate, N.J.	WAQ	2558	On recpt. and 15 min. past each even hr.
Wilmington, Del.	WEH	2558	On recpt. and 30 min. past each even hr.
Baltimore, Md.	NMX	2670*	On recpt.
Norfolk, Va.	NMN	2670*	On recpt. and at 12:20 am & pm
Norfolk, Va. (Virginia Beach)	WGB	2538	On recpt.
		2450 daytime only	
Fort Macon, N.C.	NMW	2670*	On recpt.
Charleston, S.C.	WJO	2566	On recpt. and on even hrs. thereafter
Charleston, S.C.	NMB	2182	On recpt.
		2670	At 11:20 am and pm
Jacksonville, Fla.	WNJ	2566	On recpt. and on odd hrs. thereafter
Jacksonville, Fla.	NMV	2670*	On recpt.
Miami, Fla.	NMA	2670	On recpt. and at 11:50 am & pm
Miami, Fla.	WDR	2490	On recpt. and on odd hrs. thereafter
		2514	On recpt. and on odd hrs. thereafter (Summer, Daytime only)
GULF OF MEXICO AND CARIBBEAN SEA AREA—CST			
Tampa, Fla.	WFA	2466, 2550	On recpt. and on even hrs. thereafter
St. Petersburg, Fla.	NOF	2670*	At 11:20 am & pm
Mobile, Ala.	WLO	2571	On recpt.
New Orleans, La.	NMG	2670*	On recpt.
New Orleans, La.	WAK	2558, 2598, 2482	On recpt. and on odd hrs. while in effect
Galveston, Tex.	KQP	2530	On recpt. and at 15 min. past odd hr.
Galveston, Tex.	NOY	2670*	On recpt.
San Juan, P.R.	NMR	2670*	At 18 or 48 min. past hr. after receipt of message
PACIFIC COAST AREA—PST			
Port Angeles, Wash.	NOW	2670*	On recpt. and every 3 hrs.
Seattle, Wash.	NMW43	2670*	On recpt. and every 3 hrs. thereafter
Seattle, Wash.	KOW	2482	On recpt. 5 am–9 am, Apr. 1–Sept. 30
Seattle, Wash.	KOW	2522	On recpt. 6 am–11 pm, Oct. 1–Mar. 31
Westport, Wash.	NMW	2670*	On recpt. and every 3 hrs. thereafter
Astoria, Oreg.	KFX	2598	On recpt.
Eureka, Cal.	KOE	2506, 2450	On recpt. and on-odd hrs. for 6-hrs. thereafter
San Francisco, Cal.	KLH	2506, 2450	On recpt. and on odd hrs. while in effect
San Francisco, Cal.	NMC	2182	On recpt.
		2670	At 8:30 am or pm
Long Beach, Cal.	NMQ	2670*	On recpt. and every 3 hrs. thereafter
San Pedro, Cal.	KOU	2566	On recpt. and on odd hrs.

* After announcement on 2182 KC.

AMATEUR RADIO

Amateur radio operators (Hams) are licensed by the governments of most countries to operate radio transmitters and to communicate with one another. These broadcasts and conversations can be heard on the Amateur Radio Bands shown in the Frequency Allocations Chart.

Amateur operators are not assigned specific transmitting frequencies as are international stations. They are permitted to transmit on any frequency they desire, within allocated bands at 1.8–2.0 MC, 3.5–4.0 MC, and 7.0–7.3 MC (160, 75, and 41 meter bands in that order).

Only certain portions of each band may be used for voice communication, while the entire band may be used for code (cw) communication

The 160 and 75-meter bands are generally used for shorter range, or local broadcasts, while the higher-frequency amateur bands are generally used for international amateur communication. Reception will usually be best during the evening and nighttime hours. (Refer to Page 8 for limitations.)

INTERNATIONAL SHORTWAVE BROADCASTING

Many international stations are assigned more than one frequency in different bands. They may broadcast on all frequencies at once, or they may switch from one frequency to another during the day to take advantage of the best shortwave broadcasting conditions.

Inherently, evening and nighttime hours are best for reception of shortwave. Most major European stations are beaming English-language broadcasts to the U.S. during those hours. The most-active bands are 19, 25, and 31 meter, but broadcasts may also be heard on 16, 41, and 49 meter bands during those hours. Some international broadcasting may also be heard on the 60, 75, 90 and 120 meter bands, but these are used principally for short-range or local shortwave broadcasting.

What daytime broadcasting there is will most often be heard on the 16 and 19 meter bands. Some South American stations (generally not English language) may be heard in the afternoon on these bands.

While it is often possible to find a specific station on the dial, most shortwave listeners find greatest satisfaction from "working" the bands, and picking out the strongest stations. Many listeners make a hobby of cataloging the foreign stations received and may be logged in on your personal SW station log. (Most stations will supply, on request, a "QSL" card to confirm a long distance, shortwave reception.)

SHORT WAVE STATIONS BY COUNTRY AND CITY

SHORTWAVE LOCATION TABLES

The following tables show major locations from which short wave broadcasts originate. You will not get them all as there are frequent changes in broadcasts times and frequencies. On the other hand you may get some that are not listed here . . . keep a log of these . . . this is all part of the fun!

****KEY TO READING TABLES:** Times are United States, Eastern Standard Time. Subtract one hour if you are in the Central Zone, 2 hours in the Mountain Zone, 3 hours in the Pacific Zone. Allow if you are on Daylight Savings Time.

The best time for Short Wave listening in your area is between dusk and dawn. Foreign radio stations schedule their broadcasts to be heard during these hours in the countries to which they transmit.

At different hours during the day and during different seasons of the year, you will get varying reception quality and results, depending upon weather conditions and the particular short wave frequency to which you are listening. Stations are continually changing their transmission frequency in order to beam their signals throughout the world most effectively. You will receive a great deal of pleasure and gain a lot of knowledge from experimenting with the different frequencies.

Short wave reception is somewhat sensitive to interference. Fluorescent lighting fixtures and TV sets can create interference, particularly in the higher frequencies. It is best to turn off fluorescent lights or TV sets when operating your radio on one of these bands, or if this is not possible, to keep the radio 12 or 25 feet away from them. In metal frame or reinforced concrete buildings the radio should be placed near a window.

Remember, however, that there are times when almost all stations are blacked out by atmospheric conditions and sun-spot phenomena. Conditions also worsen or improve very quickly and changing to a different frequency will sometimes make a marked difference in reception.

Sometimes, more distant stations of less power are received more strongly than those stations of larger power and less distance, as the Shortwaves are propagated in bouncing skips between earth and ionosphere. (See illustrated figure of page 8.)

Reprinted from Howard Sams Electronic

LOCATION	CALL LETTERS	POWER (kw)	FREQ. (kc)	TRANSMISSION PERIOD (EST)
ADEN				
Steamer Point	—	10	7170	10:00 pm 4:00 pm
AFGHANISTAN				
Kabul	—	50	6000	8:00 pm Midnight
Kabul	—	50	9770	1:00 pm 3:00 pm
Kabul	—	50	15225	1:00 pm 3:00 pm
ALGERIA				
Algiers	—	50	6160	4:00 pm 8:00 pm
Algiers	—	50	11835	1:00 am 8:00 pm
ANGOLA				
Luanda	CR6RF	10	9535	1:00 am 8:00 pm
Luanda	CR6RF	10	7300	1:00 am 6:00 pm
Luanda	CF6RF	10	17706	4:00 pm 6:00 pm
ARGENTINA				
Buenos Aires	LRA	100	6060	6:00 am 11:00 pm
Buenos Aires	LRA	100	6960	7:00 pm 2:00 am
Buenos Aires	LRA	100	11730	2:00 pm 9:00 pm
Buenos Aires	LRU	100	15290	5:00 am 9:00 am
AUSTRALIA				
Melbourne	VIA	100	7190	2:00 am 7:00 am
Melbourne	VLH	50	9600	1:00 pm 4:00 pm
Melbourne	VLH	50	15240	7:00 pm 1:00 am
Melbourne	VLG	100	17840	8:00 pm - 11:00 pm
Sydney	VLI	50	11840	7:00 am 8:00 am
AUSTRIA				
Insbruck	OEI120	5	7245	1:00 pm 3:00 pm
Vienna	OEI	50	6000	11:00 pm 7:00 pm
Vienna	OEI	50	9770	7:00 pm 11:00 pm
				4:00 am Noon
Vienna	OEI	50	15405	1:00 am 4:00 am
BECHUANALAND				
Mafeking		10	7295	6:00 am 7:00 am
BELGIUM				
Brussels	ORU	100	6140	6:00 pm 8:00 pm
Brussels	ORU	100	9710	6:00 pm 8:00 pm
Brussels	ORU	100	11850	11:00 am 4:00 pm
Brussels	ORU	100	17860	7:00 am Noon
BOLIVIA				
La Paz	CP6	10	9555	6:00 am 11:00 pm
La Paz	CP81	10	15300	5:00 pm 11:00 pm
La Paz	CP94	10	17865	2:00 pm 6:00 pm
BORNEO (NORTH) (See Malaysia)				
BRAZIL				
Rio de Janeiro	ZYZ35	100	6115	3:00 am - 10:00 pm
Rio de Janeiro	PRE 8	50	11720	3:00 am 10:00 pm
Rio de Janeiro	ZYZ39	50	15445	3:00 am 10:00 pm
Rio de Janeiro	ZYZ41	10	21490	3:00 am 10:00 pm
BRITISH HONDURAS				
Bellze	—	10	6100	11:00 am 4:00 pm
BRITISH WEST INDIES				
Grenada		10	9595	8:00 pm 10:00 pm
Grenada	—	10	15375	2:00 pm 6:00 pm
BULGARIA				
Sofia		120	6070	10:00 am - 5:00 pm
Sofia	—	120	9700	6:00 pm Midnight
Sofia		50	11850	5:00 pm Midnight
Sofia		50	17800	6:00 am 9:00 am
BRUNEI				
Brunei		10	11965	6:00 pm 11:00 am
BURMA				
Rangoon	XZK	50	6035	8:00 pm 10:00 pm
Rangoon	XZK	50	7120	2:00 am 3:00 am
BURUNDI (KINGDOM OF)				
Bujumbura	—	50	6195	11:00 pm 1:00 am
CAMBODIA				
Phnom Penh		50	11970	3:00 pm 4:00 pm
Phnom penh		50	15255	11:00 pm 3:00 pm
Phnom-Penh		50	17710	7:00 am 11:00 am
CAMEROUN				
Yaounde		30	6040	2:00 am Noon
CANADA				
Montreal	CKN	10	5970	7:00 am 9:00 am
Montreal	CKY	50	9625	2:00 am 4:00 am
Montreal	CHO	50	11720	7:00 am 9:00 am
Montreal	CKC	10	15320	7:00 am 9:00 am
CENTRAL AFRICA				
Bangui	—	30	7220	2:00 am Noon
CEYLON				
Colombo	—	35	11835	7:00 am 9:00 am

LOCATION	CALL LETTERS	POWER (kw)	FREQ. (kc)	TRANSMISSION PERIOD (EST)
Colombo	[illegible]	100	15330	1:00 am 4:00 am
CHAD				
Fort Lamy	[illegible]	30	6165	2:00 am Noon
Fort Lamy	[illegible]	10	9615	2:00 am – Noon
CHILE				
Santiago	CE970	10	9700	6:00 am – 11:00 pm
Santiago	CE1190	10	11900	6:00 am – 11:00 pm
CHINA (TAIWAN)				
Minhsiung	BED26	50	6095	8:00 pm – 11:00 pm
Pan Chiao	BED 26	25	11825	8:00 pm 11:00 pm
Pan Chiao	BEC77	50	15345	8:00 pm – 11:00 pm
Pan Chiao	BED	25	17890	9:00 pm – 11:00 pm
Taipei	BEC24	50	7270	9:00 pm – 10:00 am
Taipei	BEC	50	9745	6:00 am – 7:00 pm
COLUMBIA				
Bogotá	HJZ	10	6075	6:00 am – 9:00 am
Bogotá	HJC	25	6180	7:00 am – Midnight
COMORO ISLANDS				
Dzaoudzi	[illegible]	5	7260	Midnight – 10:00 am
CONGO (EAST)				
Léopoldville	9RCI	100	11865	10:00 am 4:00 pm
Léopoldville	9RCI	50	15245	10:00 am 4:00 pm
Stanleyville	9RST	10	6080	10:00 am – 3:00 pm
CONGO (WEST)				
Brazzaville	[illegible]	50	5970	10:00 am – 5:00 pm
Brazzaville	[illegible]	15	7105	4:00 am 6:00 am
Brazzaville	[illegible]	50	11726	5:00 pm – 9:00 pm
Brazzaville	[illegible]	50	15190	5:00 am – 7:00 am
COSTA RICA				
San José	TIH	10	6006	7:00 am Midnight
San José	TIDCR	3	9615	6:00 am – Midnight
CUBA				
Havana	COCH	100	6015	6:00 am – 2:00 am
Havana	COCH	100	11865	2:00 pm – 5:00 pm
Havana	COCH	100	15285	4:00 pm – 7:00 pm
CYPRUS				
Nicosia	[illegible]	20	15185	6:00 am – 10:00 am
Nicosia	[illegible]	20	17870	6:00 am – 10:00 am
CZECHOSLOVAKIA				
Prague	OLR	100	6005	8:00 pm – 1:00 am
Prague	OLR	100	9505	7:00 am – Noon
Prague	OLR	100	11725	7:00 am 9:00 am
Prague	[illegible]	100	15445	4:00 pm – 5:00 pm
DAHOMEY				
Cotonou	[illegible]	30	7190	3:00 am – 1:00 pm
DENMARK				
Copenhagen	OZF	50	9520	11:00 am – 1:00 pm
Copenhagen	OZF	50	15165	5:00 am – 8:00 am
DOMINICAN REPUBLIC				
Santo Domingo	HI4T	7.5	5970	6:00 am – Midnight
Santo Domingo	HI	50	9505	6:00 am – Midnight
ECUADOR				
Quito	HCJB	30	6050	7:00 pm – Midnight
Quito	HCJB	30	9745	7:00 pm – Midnight
Quito	HCJB	30	11915	7:00 pm Midnight
Quito	HCJB	1	15115	7:00 pm – Noon
Quito	HCJB	30	17890	9:00 am – 10:00 am
EL SALVADOR				
Santa Ana	[illegible]	1	5985	1:00 pm – 3:00 pm
Santa Ana	[illegible]	5	9540	6:00 pm – 11:00 pm
Santa Ana	[illegible]	5	11710	1:00 pm – 11:00 pm
ENGLAND				
London	[illegible]	75	5975	Noon – 3:00 pm
London	[illegible]	75	6050	1:00 am – 3:00 am
London	[illegible]	75	6195	4:00 pm – 6:00 pm
London	[illegible]	75	7150	6:00 am – 9:00 am
London	[illegible]	75	9765	2:00 am – 5:00 am
London	[illegible]	75	11780	8:00 pm – Midnight
London	[illegible]	75	11960	4:00 pm – 7:00 pm
London	[illegible]	75	15140	3:00 pm – 6:00 pm
London	[illegible]	75	21470	3:00 am – 1:00 pm
EGYPT (See United Arab Republic)				
ETHIOPIA				
Addis Ababa	[illegible]	20	11760	10:00 am – 2:00 pm
Addis Ababa	[illegible]	20	15300	3:00 pm – 4:00 pm
FIJI ISLANDS				
Suva	VRH	10	6005	5:00 am – 1:00 pm
FINLAND				
Helsinki	OIX	15	6120	11:00 pm – 5:00 pm

LOCATION	CALL LETTERS	POWER (kw)	FREQ. (kc)	TRANSMISSION PERIOD (EST)	
Helsinki	OIX	15	9555	5:00 am	9:00 am
Helsinki	OIX	10	11805	6:00 am	11:00 am
Helsinki	OIX5	15	15190	11:00 am	2:00 pm
FORMOSA (See China)					
FRANCE					
Paris		100	5955	4:00 pm	6:00 pm
Paris		100	6145	Noon	3:00 pm
Paris		100	7160	Noon	3:00 pm
Paris		100	11845	10:00 pm	2:00 am
Paris		100	15160	Noon	2:00 pm
Paris		100	17850	Noon	2:00 pm
FRENCH GUIANA					
Cayenne		10	6170	5:00 am	9:00 pm
FRENCH POLYNESIA					
Papeete		4	6135	11:00 am	6:00 pm
Papeete		4	11825	2:00 pm	6:00 pm
FRENCH SOMALILAND					
Djibouti		4	6000	Midnight	10:00 am
GABON					
Libreville		25	7270	2:00 am	Noon
GAMBIA					
Bathurst		1	5965	Noon	3:00 pm
GERMANY (EAST)					
Berlin (East)		50	9730	Midnight	1:00 pm
				10:00 am	1:00 pm
Berlin (East)		5	6115	3:00 am	6:00 am
Nauen		50	11765	10:00 am	6:00 pm
Nauen		50	6050	4:00 pm	10:00 pm
GERMANY (WEST)					
Berlin (West)	DMR24	10	6085	11:00 pm	7:00 pm
Berlin (West)	DMB32	100	7265	11:00 pm	7:00 pm
Berlin (West)	DMQ	100	9605	8:00 pm	Midnight
Berlin (West)	DMQ	100	11795	6:00 am	11:00 am
Munich*		10	6015	Noon	6:00 pm
Munich*		20	7190	2:00 am	11:00 am
Munich*		50	9720	3:00 am	4:00 pm
Munich*		20	11815	11:00 pm	5:00 am
Munich*		100	15340	7:00 am	11:00 am
GHANA					
Accra		10	7296	2:00 am	7:00 am
Tema		100	9545	1:00 pm	3:00 pm
Tema		100	15190	9:00 am	10:00 am
GREECE					
Athens		5	6045	5:00 am	6:00 pm
Athens		5	11720	Noon	2:00 pm
				6:00 pm	7:00 pm
Athens		5	15345	Noon	3:00 pm
Athens		75	17745	Noon	3:00 pm
GUATEMALA					
Guatemala City	TGW	10	5990	7:00 am	Midnight
Guatemala City	TGQ	10	11750	7:00 am	1:00 am
GUINEA					
Conakry		50	6155	3:00 am	9:00 am
Conakry		50	9650	11:00 am	7:00 pm
GUYANA					
Sparendam	_FY	10	5980	4:00 am	1:00 pm
HAITI					
Cap-Haitien	4VE	10	9770	7:00 pm	10:00 pm
Cap-Haitien	4VWI	25	11835	5:00 am	7:00 pm
HONDURAS					
Tegucigalpa	HRV	10	5965	9:00 am	Midnight
Tegucigalpa	HRT	10	6165	7:00 am	Midnight
HUNGARY					
Budapest		100	5960	7:00 pm	9:00 pm
Budapest		100	9565	8:00 am	11:00 am
Budapest		100	11910	7:00 pm	9:00 pm
Budapest		100	17720	9:00 am	11:00 am
ICELAND					
Reykjavik	TFU	10	11780	8:00 am	10:00 am
				2:00 pm	4:00 pm
INDIA					
Delhi		100	6085	7:00 am	Noon
Delhi		100	15310	9:00 pm	10:00 pm
Delhi		50	17705	11:00 pm	1:00 am
INDONESIA					
Jakarta	YDE	10	11770	11:00 pm	3:00 am
Jakarta	YDC	10	15150	1:00 pm	8:00 pm
Jakarta	YDC	25	21460	6:00 am	8:00 am

* American-owned Radio Free Europe

LOCATION	CALL LETTERS	POWER (kw)	FREQ. (kc)	TRANSMISSION PERIOD (EST)	
IRAN					
Tehran	EQB	75	6180	9:00 pm	2:00 pm
Tehran	EPB	100	15125	1:00 pm	4:00 pm
IRAQ					
Baghdad	YIH	200	6155	10:00 pm	5:00 pm
Baghdad	YIH	100	15235	5:00 am	7:00 am
IRIAN (WEST)					
Biak		5	9745	6:00 pm	8:00 pm
ISRAEL					
Tel Aviv	4XB	50	9625	Noon	4:00 pm
Tel Aviv	4XB	21	11920	Noon	4:00 pm
ITALY					
Rome		60	5960	Noon	6:00 pm
Rome		25	7175	3:00 am	5:00 pm
Rome		100	9575	Noon	4:00 pm
Rome		60	11905	1:00 am	4:00 am
Rome		60	15400	1:00 pm	6:00 pm
Rome		100	17740	4:00 am	6:00 am
Rome		60	21560	5:00 am	7:00 am
IVORY COAST					
Abidjan		100	6015	1:00 pm	7:00 pm
Abidjan		100	11820	2:00 am	1:00 pm
JAPAN					
Tokyo	JOB6	100	6080	4:00 pm	6:00 pm
Tokyo	JOB	100	9506	Midnight	10:00 am
Tokyo	JOZ	50	9595	24 hours	
Tokyo		100	11750	24 hours	
Tokyo		100	15105	7:00 pm	3:00 am
Tokyo		100	15285	6:00 pm	8:00 pm
JORDAN					
Amman		100	7155	10:00 pm	3:00 am
Amman		50	9560	8:00 pm	11:00 pm
Amman		100	15170	6:00 pm	8:00 pm
KENYA					
Nairobi	ZGW92	10	7240	10:00 pm	10:00 am
Nairobi	ZGW93	10	9665	10:00 pm	10:00 am
KOREA					
Seoul		50	9640	3:00 am	10:00 am
Seoul		50	11925	6:00 pm	Midnight
Seoul		100	15125	9:00 am	11:00 am
				Midnight	1:00 am
KUWAIT					
Kuwait City	9KV	10	6055	9:00 pm	4:00 pm
Kuwait City	9KV29	10	9520	4:00 am	4:00 pm
Kuwait City	9KW244	100	15150	4:00 am	4:00 pm
LAOS					
Vientiane		10	6150	Midnight	1:00 am
Vientiane		10	7145	6:00 pm	8:00 pm
LEBANON					
Beirut		100	9725	8:00 pm	11:00 pm
Beirut		100	11890	4:00 pm	6:00 pm
LIBERIA					
Monrovia	ELWA	50	9590	8:00 pm	11:00 pm
Monrovia	ELWA	50	11970	11:00 pm	9:00 am
Monrovia	ELWA	50	15155	9:00 am	1:00 pm
LIBYA					
Benghazi		100	9565	7:00 am	9:00 am
Benghazi		100	11960	7:00 am	9:00 am
LUXEMBOURG					
Junglinster		50	6090	Midnight	7:00 pm
Junglinster	LXR	50	15350	Midnight	7:00 pm
MALAGASY					
Tananarive		4	7156	Midnight	10:00 am
Tananarive		4	9690	Midnight	10:00 am
MALAWI					
Zomba		10	7285	4:00 am	8:00 am
MALAYA (See Malaysia)					
MALAYSIA					
Jesselton		100	7180	5:00 pm	11:00 am
Kuala Lumpur		100	6100	6:00 pm	7:00 pm
				5:00 am	6:00 am
Kuala Lumpur		10	7110	6:00 pm	9:00 pm
				4:00 am	11:00 am
Kuala Lumpur		50	9750	6:00 pm	9:00 pm
Kuala Lumpur		100	11900	6:00 pm	9:00 pm
				5:00 am	11:00 am
Tebrau		75	6105	6:00 pm	8:00 pm
Tebaru		75	15260	7:00 am	Noon

LOCATION	CALL LETTERS	POWER (kw)	FREQ (kc)	TRANSMISSION PERIOD (EST)
MALI				
Bamako	——	50	7145	1:00 pm – 6:00 pm
Bamako	——	50	15150	5:00 am – 7:00 am
MARTINIQUE				
Fort-de-France	——	8	5995	5:00 am – 11:00 pm
MAURITANIA				
Nouakchott	——	30	6035	7:00 am – 9:00 am
MAURITIUS				
Curepipe	——	10	9710	2:00 am – 8:00 am
MEXICO				
Acapulco	X7BGL	20	6140	9:00 am – 11:00 pm
Mexico City	XEPN	20	6075	7:00 pm – 1:00 am
Mexico City	XEWW	20	9515	8:00 pm – 1:00 am
Mexico City	XEQQ	10	9680	8:00 pm – 3:00 am
Mexico City	XENN	10	11860	8:00 am – 1:00 am
Mexico City	XBD	10	11965	9:00 am – 11:00 pm
Mexico City	XEW	10	15160	Noon – 6:00 pm
MONACO				
Monte Carlo	3AM	30	6035	1:00 am – 6:00 pm
Monte Carlo	3AM4	100	7260	8:00 am – 1:00 pm
Monte Carlo	——	100	11730	11:00 am – Noon
MOROCCO				
Tangier	——	100	6080	9:00 pm – 3:00 am
Tangier	——	35	9615	9:00 pm – 3:00 am
Tangier	——	50	11875	1:00 am – 3:00 am
Tangier	——	100	15290	11:00 am – 5:00 pm
MOZAMBIQUE				
Lourenco Marques	——	7.5	9655	Midnight – 4:00 am
Lourenco Marques	——	7.5	17775	11:00 am – 2:00 pm
NETHERLANDS				
Hilversum	——	100	9715	Midnight – 4:00 am
Hilversum	——	100	9590	3:00 pm – 6:00 pm
Hilversum	——	100	11730	10:00 am – Noon, 4:00 pm – 6:00 pm
Hilversum	——	100	15220	3:00 pm – 7:00 pm
Hilversum	——	100	17810	11:00 am – 4:00 pm
Hilversum	——	80	21480	3:00 am – 6:00 am
Hilversum	——	100	21665	9:00 am – 11:00 am
NETHERLANDS ANTILLES				
Willemstad	——	5	6085	6:00 am – Midnight
NEPAL				
Katmandu	9NB7	5	7105	7:00 am – Noon
Katmandu	9NB7	10	11970	7:00 am – Noon
NEW CALEDONIA				
Nouméa	——	4	7170	1:00 am – 8:00 am
NEW ZEALAND				
Wellington	ZLZ	8	9540	Noon – 6:00 pm
Wellington	ZLZ	8	11780	4:00 am – 10:00 am
NICARAGUA				
Managus	YNWA	5	6140	7:00 am – Midnight
NIGER				
Naimey	——	30	7105	3:00 am – 1:00 pm
NIGERIA				
Enugu	——	10	6090	8:00 am – 5:00 pm
Enugu	——	10	9690	11:00 am – 5:00 pm
Enugu	——	10	11915	11:00 am – 3:00 pm
NORTHERN RHODESIA (See Zambia)				
NORWAY				
Oslo	LKJ	100	6130	11:00 pm – 1:00 am
Oslo	LLG	100	9610	11:00 pm – 1:00 am
Oslo	LLK	10	11850	10:00 am – 1:00 pm
Oslo	LLM	10	15175	5:00 am – 6:00 am
Oslo	LLN	100	17825	6:00 am – 8:00 am
OKINAWA (See Ryukyu Islands)				
PAKISTAN				
Karachi	——	75	5980	8:00 pm – 11:00 pm
Karachi	——	50	9595	7:00 pm – 10:00 pm
Karachi	——	50	11885	7:00 pm – 9:00 pm
Karachi	——	50	15335	9:00 am – 11:00 am
Karachi	——	50	17760	Midnight – 4:00 am
Karachi	——	50	21590	7:00 am – 9:00 am
PANAMA				
Panama City	HOJ	10	5995	7:00 am – 1:00 am
Panama City	HOF	10	9685	7:00 am – 1:00 am
PAPUA				
Port Moresby	VLT	5	6130	1:00 am – 9:00 am
Port Moresby	VLT	5	9520	5:00 pm – 2:00 am
PARAGUAY				
Asunción	ZPA	10	6015	5:00 am – 2:00 pm

LOCATION	CALL LETTERS	POWER (kw)	FREQ. (kc)	TRANSMISSION PERIOD (EST)
Asunción	ZPA	10	9735	6:00 am – Noon
Asunción	ZPA	10	11850	9:00 am – 6:00 pm
Asunción	ZPA	10	15210	7:00 am – Noon
PERU				
Lima	OAX	10	5970	6:00 am – Midnight
Lima	OAX	10	15150	6:00 am – Midnight
PHILIPPINES				
Manila	DZH	30	9730	10:00 am – 1:00 pm
Manila	DZH8	10	11855	2:00 am – 5:00 am
Manila	DZF2	50	11920	11:00 am – Noon
Manila	DZH	10	15300	4:00 am 7:00 am
POLAND				
Warsaw		100	6005	10:00 am – 4:00 pm
Warsaw		15	7125	4:00 pm – 6:00 pm
Warsaw		15	9525	8:00 am 10:00 am
Warsaw		100	11800	11:00 am – 2:00 pm
Warsaw		100	15120	6:00 am – 9:00 am
PORTUGAL				
Lisbon	CSA52	10	6015	1:00 pm – 7:00 pm
Lisbon	CSA10	100	6185	7:00 pm – Midnight
Lisbon	CSA27	100	9740	7:00 pm 11:00 pm
Lisbon	CSA30	100	11875	7:00 pm – Midnight
Lisbon	CSA5	100	17895	8:00 am – 1:00 pm
Lisbon*	CSB	50	5985	11:00 pm – 2:00 am
				1:00 pm 6:00 pm
Lisbon*	CSB	100	7115	1:00 pm – 6:00 pm
Lisbon*	CSB	100	7235	11:00 pm – 3:00 am
Lisbon*	CSB	50	9655	1:00 pm – 6:00 pm
Lisbon*	CSB	50	11725	9:00 am 3:00 pm
Lisbon*	CSB	100	15255	3:00 am 4:00 pm
Lisbon*	CSB	50	17835	11:00 am – 3:00 pm
RUMANIA				
Bucharest		20	5990	8:00 pm – Midnight
Bucharest		20	6190	4:00 pm – 9:00 pm
Bucharest		17	9510	8:00 pm – Midnight
Bucharest		20	11810	11:00 pm – Midnight
Bucharest		20	15380	6:00 am – 8:00 am
RWANDA				
Kigali		5	6050	Midnight – 7:00 am
RYUKYU ISLANDS				
Okinawa		35	6010	3:00 am Noon
Okinawa		100	11960	7:00 pm – 9:00 pm
SARAWAK				
Kuching		10	7160	5:00 pm 6:00 am
SAUDI ARABIA				
Mecca		50	9670	1:00 am 11:00 am
Mecca		10	11950	10:00 pm – 4:00 pm
SENEGAL				
Dakar		25	5975	5:00 am 1:00 pm
Dakar		100	11895	9:00 am 6:00 pm
SIERRA LEONE				
Freetown		5	5980	10:00 am 6:00 pm
SINGAPORE				
Singapore		10	6175	5:00 pm – Noon
Singapore		50	11940	5:00 pm Noon
SOLOMON ISLANDS				
Honiara		5	5960	3:00 am 6:00 am
SOMALI				
Hargeisa		10	7120	10:00 pm – 1:00 am
				5:00 am 3:00 pm
SOUTH AFRICA				
Bloemfontein		20	6150	10:00 pm 5:00 pm
Bloemfontein		20	7270	10:00 pm – 5:00 pm
Bloemfontein		20	9525	1:00 am 10:00 am
Bloemfontein		20	11900	1:00 pm – 5:00 pm
Bloemfontein		20	17885	5:00 am – 11:00 am
SOUTHERN RHODESIA				
Salisbury		20	6020	11:00 pm – 7:00 am
Salisbury		20	7175	5:00 am 10:00 am
Salisbury		20	9505	1:00 am 10:00 am
SPAIN				
Madrid		40	5995	2:00 am – 7:00 pm
Madrid		100	6130	10:00 pm – 3:00 pm
Madrid		100	9565	10:00 am 2:00 am
Madrid		100	11970	3:00 am 8:00 am
Madrid		200	15340	11:00 am 4:00 pm

* American-owned Radio Free Europe.

LOCATION	CALL LETTERS	POWER (kw)	FREQ. (kc)	TRANSMISSION PERIOD (EST)
SUDAN				
Omdurman		20	9505	10:00 pm – 8:00 pm
Omdurman		50	11855	1:00 pm – 5:00 pm
SWEDEN				
Stockholm		100	6065	9:00 pm – 4:00 am
Stockholm		100	9620	4:00 am – 8:00 pm
Stockholm		100	11705	Noon – 4:00 pm
Stockholm		100	15240	11:00 am – 2:00 pm
Stockholm		100	17840	9:00 am – 11:00 am
SWITZERLAND				
Berne	HER	100	6165	1:00 am – 6:00 pm
Berne	HER	100	9665	1:00 pm – 6:00 pm
Berne	HER	100	11865	3:00 pm – 9:00 pm
Berne	HER	100	15315	4:00 am – 10:00 am
SYRIA				
Damascus		50	9640	11:00 pm – 7:00 pm
Damascus		50	11890	7:00 pm – 11:00 pm
Damascus		50	15365	3:00 pm – 9:00 pm
TANGANYIKA (See Tanzania)				
TANZANIA				
Dar es Salaam		20	7165	Midnight – 9:00 am
Dar es Salaam		20	9530	3:00 am – 6:00 am
Marhubi		35	6005	5:00 am – Noon
Marhubi		35	9550	8:00 am – Noon
THAILAND				
Bangkok	HSA	25	7165	4:00 am – 10:00 am
Bangkok	HSK	50	11910	4:00 am – 9:00 am
TOGO				
Lome		25	7266	3:00 am – 1:00 pm
TUNISIA				
Tunis		50	6125	10:00 am – 7:00 pm
Tunis		50	11970	1:00 am – 10:00 am
TURKEY				
Ankara		5	6085	2:00 am – 6:00 pm
Ankara		100	7285	11:00 am – 6:00 pm
Ankara		100	9515	Noon – 6:00 pm
UGANDA				
Kampala		10	7110	1:00 am – 10:00 am
Kampala		10	9690	1:00 am – 10:00 am
UNITED ARAB REPUBLIC (EGYPT)				
Cairo		100	7215	11:00 am – 7:00 pm
Cairo		100	11745	7:00 pm – 11:00 pm
Cairo		100	15350	11:00 am – 7:00 pm
UPPER VOLTA				
Ouagadougou		25	7230	3:00 am – Noon
Ougadougou		25	9515	3:00 am – 1:00 p,
URUGUAY				
Colonia	CXA	10	9640	8:00 pm – 1:00 am
Colonia	CXA14	10	15280	6:00 am – 6:00 pm
Montevideo	CXA15	10	11835	7:00 pm – 10:00 pm
Montevideo	CXA25	10	15385	4:00 pm – 10:00 pm
Montevideo	CXA19	10	17790	8:00 pm – 3:00 am
UNITED STATES OF AMERICA (VOA)				
Cincinnati	WLWO	100	6190	6:00 am – 8:00 am
Cincinnati	WLWO	100	9770	10:00 pm – 3:00 am
Cincinnati	WLWO	100	11890	6:00 am – 10:00 am
Cincinnati	WLWO	100	15190	6:00 am – 9:00 am
Los Angeles	KCBR	100	6040	1:00 am – Noon
Los Angeles	KCBR	200	9570	11:00 am – 1:00 pm
Los Angeles	KCBR	50	11740	5:00 pm – 1:00 am
Los Angeles	KCBR	100	15130	7:00 am – 11:00 am
New York	WDSI	100	9750	5:00 pm – 11:00 pm
New York	WDSI	100	15215	4:00 pm – Midnight
New York	WBOU	50	17780	9:00 am – 6:00 pm
San Francisco	KGEI	50	9590	8:00 pm – Midnight
San Francisco	KGEI	50	15240	5:00 pm – 9:00 pm
U.S.S.R. (Byelorussia)				
Minsk		100	7150	10:00 pm – 10:00 am
Minsk		100	9660	10:00 pm – 4:00 pm
Minsk		100	11955	10:00 pm – Noon
Minsk		100	15150	10:00 pm – 10:00 am
U.S.S.R. (European)				
Leningrad		100	21600	5:00 am – 11:00 am
Moscow		50	5990	3:00 pm – 8:00 pm
Moscow		50	6110	9:00 pm – 6:00 pm
Moscow		50	7210	2:00 pm – 10:00 am
Moscow		100	9765	11:00 am – 5:00 pm
Moscow		100	11860	8:00 am – 2:00 am
Moscow		50	11915	7:00 am – 8:00 am

LOCATION	CALL LETTERS	POWER (kw)	FREQ. (kc)	TRANSMISSION PERIOD (EST)
Moscow	—	50	15395	7:00 pm – 11:00 am
U.S.S.R. (Ukrainian)				
Kharkov	—	15	11970	9:00 pm – 2:00 pm
Kiev	—	100	6165	7:00 pm – 1:00 am
Kiev	—	100	9710	8:00 pm – 3:00 am
Kiev	—	100	15110	11:00 pm – Noon
VATICAN CITY				
Vatican City	—	100	6190	11:00 am – 4:00 pm
Vatican City	—	100	7250	11:00 am – 5:00 pm
Vatican City	—	100	9645	2:00 pm – 6:00 pm
Vatican City	—	100	11740	6:00 pm – 9:00 pm
Vatican City	—	100	15120	8:00 am – Noon
Vatican City	—	100	17840	7:00 am – 1:00 pm
VENEZUELA				
Caracas	—	10	11770	8:00 pm – Midnight
Caracas	—	10	15390	7:00 pm – Midnight
Caracas	—	10	17770	7:00 pm – 10:00 pm
VIETNAM				
Saigon	—	50	7245	10:00 pm – 3:00 am
Saigon	—	50	9620	4:00 am – 10:00 am
Saigon	—	50	11920	8:00 pm – 1:00 am
YUGOSLAVIA				
Belgrade	—	100	6100	9:00 am – 2:00 pm
Belgrade	—	10	7200	1:00 pm – 3:00 pm
Belgrade	—	100	11735	7:00 pm – 10:00 pm
Belgrade	—	100	15240	10:00 am – Noon
ZAMBIA (NORTHERN RHODESIA)				
Lusaka	—	20	7220	11:00 Pm – 2:00 am
Lusaka	—	20	9570	5:00 am – 10:00 am
ZANZIBAR (See Tanzania)				

Printed in Japan