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Standard Time Throughout the World

UNITED STATES DEPARTMENT OF COMMERCE

U.S. NATIONAL BUREAU OF STANDARDS

Charles Sawyer, *Secretary*

TWO PERIODICALS OF THE NATIONAL BUREAU OF STANDARDS

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UNITED STATES DEPARTMENT OF COMMERCE, Charles Sawyer, *Secretary*

NATIONAL BUREAU OF STANDARDS, E. U. Condon, *Director*

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by R. E. Gould

National Bureau of Standards Circular 496

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II. Historical Sketch

From ancient days man has reckoned time by the apparent motion of the heavenly bodies. The rotation of the earth on its axis from west to east causes these bodies to "rise" in the east and "set" in the west. Consequently points to the east of us have sunrise before we do, or, as we say, their time is faster than ours; while points to the west have time that is slower than ours. This rotation of the earth about its axis once in 24 hours gives a time change of 1 hour for every 15° of longitude. Thus, if observations were made on the transit of the sun across the meridian at points separated by 15° of longitude, the time of transit at two such points would differ by 1 hour. If the separation of the points of observation were decreased, the difference in time would be decreased in the same proportion. These times would all be true local times, using the transit of the sun across the meridian as a standard.

Since the distance around the earth is less at points not on the Equator than at the Equator, the distance on the earth's surface corresponding to a time difference is also less in the same proportion. For example, at the Equator 15° corresponds to about 1,040 miles, while at the latitude of New York, 15° corresponds to only about 784 miles. Or, at the Equator, a difference of about 17 miles makes a time difference of 1 minute, while in the latitude of New York a difference of only 13 miles makes a difference of 1 minute in true local time.

The need of a uniform time was felt in the United States about 1870, and the railroads gradually adopted a system specifying important centers or junction points at which changes of 1 hour should be made. As means of communication still further developed, it became apparent that some system of international time must be established.

In 1884 an international congress was called in Washington to consider the subject of a world standard of time. The world was divided into zones, each covering 15° of longitude, the time for each zone being that of the meridian passing through its approximate center and the time in adjacent zones differing by 1 hour. The meridian passing through the observatory at Greenwich, England, was chosen as the zero meridian from which all time should be reckoned. Although there was no definite agreement as to the adoption of this time by the different nations, the plan was gradually accepted.

The adoption of time differing from Greenwich by an odd number of half hours soon made its appearance. This slight departure from the original plan is of advantage in some places, since it more nearly agrees with true local time. In Newfoundland the time is 3½ hours slower than Greenwich time, in Burma 6½ hours faster, and in India it is 5½ hours faster. New Zealand adopted a system of world time in 1868. Sweden and Great Britain also set up a similar system about 1879. After the International Congress in 1884 the International Time Zone System spread rapidly, and today nearly all countries of the world use the system, at least for official purposes.

III. Standard Time in the United States

1. Time Zones

Although the United States has used standard time since 1883, no legislative action for the country as a whole is recorded until March 19, 1918, when Congress directed the Interstate Commerce Commission to establish limits for the various time zones in this country. Changes in these boundaries have been made from time to time, in order that the time changes may occur at such points as to result in a minimum of inconvenience.

The United States is divided into four standard time zones, each approximately 15° of longitude in width. All places in each zone use, instead of their own local time, the time counted from the transit of the "mean sun" across the meridian which passes through the approximate center of that zone. These time zones are designated as Eastern, Central, Mountain, and Pacific, and the time in these zones is reckoned from the 75th, 90th, 105th, and 120th meridians west of Greenwich, respectively. The time in the various zones is slower than Greenwich time by 5, 6, 7, and 8 hours, respectively.

The question of changing from the time of one time zone to that of an adjacent zone arises in practice largely in the operation of railroads. Because of the inconvenience of changing the time by the necessary amount of 1 hour at every point where a railroad crosses one of these boundary lines, the more convenient practice has usually been followed of making the change at some terminal or division point on the road, at some junction point, or at the boundary line between the United States and Canada. The practical result is that the boundaries of the time zones are defined by the lines connecting these points of railroad time change. Because of the location of these railroad junctions or terminals the resulting lines are somewhat irregular. Figure 1 shows the time zones and present boundary lines as defined by the Interstate Commerce Commission. Cities and towns located on these zone boundaries usually take the time of the zone to the East of the line.

2. Time in Territories and Insular Possessions

Standard time is also used in the territories outside of the continental United States. The places and the time used are given below:

Alaska (see table 1)	10 hours slower than Greenwich.
Guam	10 hours faster than Greenwich.
Hawaii	10 hours slower than Greenwich.
Midway	11 hours slower than Greenwich.
Panama Canal Zone	5 hours slower than Greenwich.
Puerto Rico	4 hours slower than Greenwich.
Samoa	11 hours slower than Greenwich.
Virgin Islands	4 hours slower than Greenwich.

PREFACE

The problem of time in different localities is a matter of primary concern in modern travel and communication. It is important, therefore, that there should be available some source of specific information on the subject of standard time. This Circular is intended to present this information in a form that will meet the needs of the general public. The lists, tables, and information given have been compiled from a study of authentic, officially published material. This publication is the fourth edition on the same subject and supersedes C280 (1925), C399 (1932), and C406 (1935), all of which bore the same title. It contains an historical sketch on the development of the standard time system, a time zone map of the United States, a list of radio stations transmitting time signals, a list of the times used in several large cities, a table of the legal time used in the various countries of the world, notes on summer time, and other useful information regarding standard time.

E. U. CONDON, *Director.*

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Standard Time Throughout the World

By R. E. Gould

I. Introduction

The measurement of time is based upon the motion of the earth in relation to certain heavenly bodies. One revolution of the earth in its orbit around the sun is known as a year, and one rotation of the earth on its axis is known as a day. When the day is measured in relation to the stars, we have sidereal time; when it is measured in relation to the sun, we have solar time. Sidereal time is used chiefly by astronomers, while solar time is used for most civil purposes.

The solar day is measured as the time elapsed between two successive passages of the sun through any given meridian. It is well known that the days are not equal throughout the year, for they have a total variation of about 30 minutes during the year. Since the days are not equal, "mean solar time" has been adopted for general use and is defined as the time kept by a "fictitious sun" moving at a uniform speed in the equator at the average speed of rotation of the earth, thus making days of equal length. It is "mean noon" when this "fictitious or mean sun" crosses the meridian. Mean solar time makes it possible to use clocks and watches to divide the day into hours, minutes, and seconds.

There is a definite relation between sidereal time and mean solar time, so that star time observations made by astronomers may be converted to solar time for our daily use. Standard time is mean solar time determined by the time of a definite meridian. The earth is divided into zones, and the time for each zone is the time for the meridian which passes approximately through the middle of the zone.

Determinations of time are made by astronomers at various observatories throughout the world by observing the apparent passages of *relatively constant* stars through a given meridian. The observations are made in sidereal time and converted to mean solar time for general use. In the United States these determinations are made at the U. S. Naval Observatory in Washington, D. C., and are good to approximately 0.01 second.

Until about 1930 high precision clocks were the best means of subdividing the day into equal parts of hours, minutes, or seconds. The highest accuracy obtained from such clocks as the Riefler and the Shortt was about 0.01 second a day or approximately 1 part in 8.5 million.

The vibrations of quartz-crystals, introduced about 1930 as a means of electrical frequency control, introduced a more uniform subdivision, which could be determined to better than 1 part in 100 million, and from which time signals of very high accuracy could be obtained. Today such crystals are used at the National Bureau of Standards and at many observatories for broadcasting standard time signals.

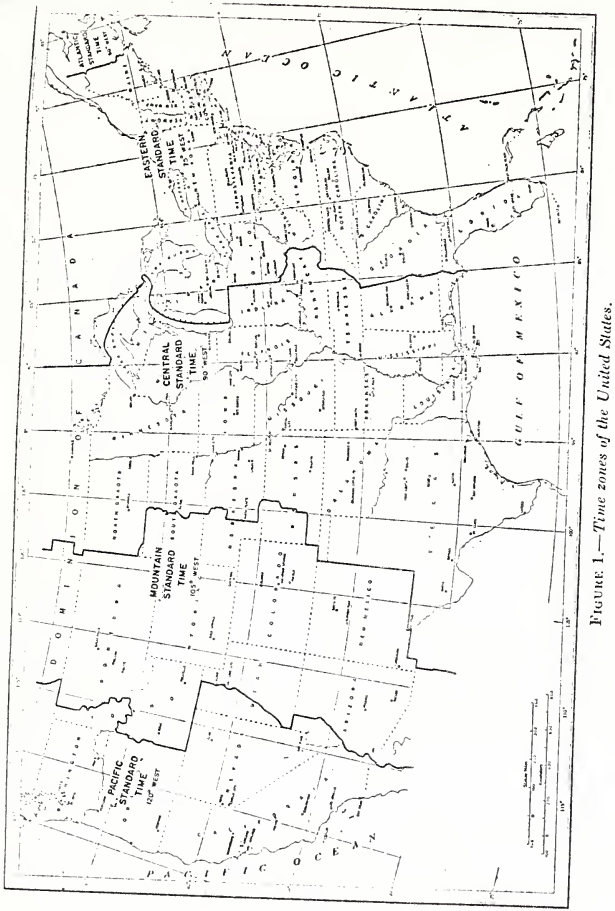

FIGURE 1.—*Time zones of the United States.*

3. Time in Several Large Cities of the United States at 12 Noon, Eastern Standard Time

Atlanta, Ga	12 noon.	Milwaukee, Wis	11 a. m.
Baltimore, Md	12 noon.	Minneapolis, Minn	11 a. m.
Birmingham, Ala	11 a. m.	Newark, N. J	12 noon.
Boston, Mass	12 noon.	New Haven, Conn	12 noon.
Charleston, S. C	12 noon.	New Orleans, La	11 a. m.
Chicago, Ill	11 a. m.	New York, N. Y	12 noon.
Cincinnati, Ohio	12 noon.	Norfolk, Va	12 noon.
Cleveland, Ohio	12 noon.	Omaha, Nebr	11 a. m.
Columbus, Ohio	12 noon.	Philadelphia, Pa	12 noon.
Dallas, Tex	11 a. m.	Pittsburgh, Pa	12 noon.
Denver, Colo	10 a. m.	Portland, Oreg	9 a. m.
Des Moines, Iowa	11 a. m.	Providence, R. I	12 noon.
Detroit, Mich	12 noon.	Richmond, Va	12 noon.
Hartford, Conn	12 noon.	Rochester, N. Y	12 noon.
Houston, Tex	11 a. m.	Salt Lake City, Utah	10 a. m.
Indianapolis, Ind	11 a. m.	San Francisco, Calif	9 a. m.
Kansas City, Mo	11 a. m.	Seattle, Wash	9 a. m.
Los Angeles, Calif	9 a. m.	St. Louis, Mo	11 a. m.
Louisville, Ky	11 a. m.	St. Paul, Minn	11 a. m.
Memphis, Tenn	11 a. m.	Washington, D. C	12 noon.

4. Time Signals in the United States

The standard time for the United States is derived from star observations made at the U. S. Naval Observatory, Washington, D. C. Time signals based on these time determinations are broadcast by the following stations: NSS—U. S. Naval Radio Station, Annapolis, Md.; NPG—U. S. Naval Radio Station, Mare Island, Calif.; NPM—U. S. Naval Radio Station, Pearl Harbor, Hawaii; NBA—U. S. Naval Radio Station, Balboa, Canal Zone; WWV—Standard Frequency Station of the National Bureau of Standards, Beltsville, Md.; WWVH—Standard Frequency Station of the National Bureau of Standards, Maui, Hawaii.

All U. S. Navy time signals are given in a standard manner. The signals begin 5 minutes before the hour and consist of a dash on each second, except on the following seconds: 55 minutes (29, 51, and 56 to 59 seconds); 56 minutes (29, 52, and 56 to 59 seconds); 57 minutes (29, 53, and 56 to 59 seconds); 58 minutes (29, 54, and 56 to 59 seconds); 59 minutes (29, and 51 to 59 seconds).

Beginning exactly on the hour a much longer dash is sent. In all cases the exact second is denoted by the beginning of the dash, the end being without significance. Note that the number of seconds sounded immediately following the single second omission and preceding the long omission at the end of each minute indicates the number of minutes of the signal yet to be sent. For instance, the signal for 56 minutes and 52 seconds is omitted and then 3 seconds are sounded, indicating that 3 minutes of the signal remain to be transmitted.

These time signals, if received directly and automatically, are seldom in error by as much as 0.10 second. The average error is generally less than 0.01 second. The signals broadcast by Naval stations are transmitted on continuous waves, and can be heard only with radio receivers that are suited to such code reception.

The National Bureau of Standards stations, WWV and WWVH, transmit continuously (day and night) standard frequencies and superimposed time signals on several carrier frequencies. These transmissions are modulated waves and may be heard with ordinary radiophone receivers. A pulse 0.005 second in duration is transmitted every second, except the beginning of the last second of each minute. These pulses consist of 5 cycles of a 1,000-cycle audio note and are heard as clicks on the receivers. At precisely 1 minute before each hour and at every 5 minutes thereafter, the audio frequencies are interrupted for exactly 1 minute, to permit time announcements under the International Morse Code, using four digits on the 24-hour system. The first two digits indicate the hours and the last two the minutes. Universal Time (u. t.) is given. In addition to code announcements, a voice announcement of eastern standard time follows the code time on WWV. The time signals beat continuously without interruptions, even during the announcements. (WWVH is an experimental station. The signals are interrupted for approximately 4 minutes immediately after each hour and half hour, and for 30 minutes at 1700 and 1900 u. t.)

These signals of the National Bureau of Standards may be received on the following frequencies (note that 440 cycles per second is musical A above middle C):

WWV		WWVH	
Frequency	Other modulation	Frequency	Other modulation
kc	*c/s*	*kc*	*c/s*
2, 500	440 or 600	5, 000	440 or 600
5, 000	440 or 600	10, 000	440 or 600
10, 000	440 or 600	15, 000	440 or 600
15, 000	440 or 600	------	----------
20, 000	440 or 600	------	----------
25, 000	440 or 600	------	----------
30, 000	None	------	----------
35, 000	None	------	----------

For work of the highest uniformity of time interval markings, transmissions by WWV are to be preferred over those of other stations. The WWV signals are uniform within 0.001 second per day, as broadcast. Deviations from Naval Observatory time have not exceeded 0.05 second. The WWVH signals are synchronized within 0.001 second to those broadcast by Station WWV.

Further information on the standard frequency signals may be obtained from the National Bureau of Standards, Washington 25, D. C. Intercomparisons of the different time signals, including those from WWV, are made at frequent intervals each day and the Naval Observatory publishes correction sheets, which may be obtained from the Observatory without charge.

IV. Time in Foreign Countries

1. Time Zones of the World

Standard time for the world, like longitude, is counted from Greenwich as the prime meridian. As explained in section II, places to the east of Greenwich have faster time than Greenwich, while places to the west have slower time. The world is divided into time zones of approximately 15° for every hour. Since Greenwich is in the 0 zone, the number of any zone, if added algebraically to the time in Greenwich, will give the corresponding time in that particular zone. It must be remembered that not all countries follow the International Time Zone System, but that some use the time of some principal city as a standard and others have no standard of time.

2. International Date Line

The International Meridian Conference in 1884 established as the prime meridian, from which time was to be counted, the meridian passing through Greenwich, England. The meridian 180° from this prime meridian was made the International Date Line, but in order to include islands of the same group in the same day it has been necessary to vary the line from the 180th meridian at some places. The official date line runs from 70° N. to 60° S. in accordance with the following description:

Starting at the 180th meridian at 70° N., thence
southeasterly to 169° W., 65° N., thence
southwesterly to 170° E., 52°30′ N., thence
southeasterly to the 180th meridian at 48° N., thence
southerly on the 180th meridian to 5° S., thence
southeasterly to 172° 30′ W., 15°30′ S., thence
southerly on 172° 30′W. to 45°30′ S., thence
southwesterly to the 180th meridian at 51°30′ S., thence
southerly on the 180th meridian to 60° S.

When crossing this line in a westerly direction (i. e., from west longitude to east longitude), the date must be advanced 1 day, and when crossing in an easterly direction (east longitude to west longitude), the date must be set back 1 day.

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3. Time in Several Important Cities

The following list gives the time in some important cities of the world, outside of continental United States, at 12 noon eastern standard time.

Alexandria, Egypt	7 p. m.
Athens, Greece	7 p. m.
Baghdad, Iraq	8 p. m.
Bangkok, Siam	12 midnight.
Batavia, Java	1 a. m. next day.
Berlin, Germany	6 p. m.
Bombay, India	10:30 p. m.
Brussels, Belgium	5 p. m.
Bucharest, Rumania	7 p. m.
Buenos Aires, Argentina	1 p. m.
Cape Town, South Africa.	7 p. m.
Caracas, Venezuela	12:30 p. m.
Copenhagen, Denmark	6 p. m.
Dawson, Yukon	8 a. m.
Edmonton, Alberta	10 a. m.
Freetown, Sierra Leone	5 p. m.
Geneva, Switzerland	6 p. m.
Halifax, Nova Scotia	1 p. m.
Havana, Cuba	12 noon.
Hong Kong, China	1 a. m. next day.
Honolulu, Hawaii	7 a. m.
Lima, Peru	12 noon.
London, England	5 p. m.
Madrid, Spain	5 p. m.
Manila, Philippine Islands.	1 a. m. next day.
Mexico City, Mexico	11 a. m.
Montevideo, Uruguay	1:30 p. m.
Montreal, Quebec	12 noon.
Paris, France	5 p. m.
Perth, Western Australia	1 a. m. next day.
Rio de Janeiro, Brazil	2 p. m.
Rome, Italy	6 p. m.
Shanghai, China	1 a. m. next day.
Sydney, New South Wales.	3 a. m. next day.
Tokyo, Japan	2 a. m. next day.
Valpariso, Chile	1 p. m.
Vancouver, British Columbia.	9 a. m.
Vienna, Austria	6 p. m.
Wellington, New Zealand.	5 a. m. next day.
Winnepeg, Manitoba	11 a. m.

4. Time Zone Names

Many of the time zones of the world have been given special names in accordance with their locations. The following is a list of some of the better-known zone names.

Time zone name	Standard meridian
Western Europe time—Greenwich time	0°.
Central Europe time	15° E.
Eastern Europe time	30° E.
India time	82½° E.
Burma time	97½° E.
Indo-China time	105° E.
China time—Philippine time	120° E.
Japan time	135° E.
South Australia time	142½° E.
Eastern Australia time—New Guinea time	150° E.
New Zealand time—Fiji time	180° E.
Hawaiian standard time—Alaska standard time	150° W.
Yukon time	135° W.
Pacific standard time	120° W.
Mountain standard time	105° W.
Central standard time	90° W.
Eastern standard time	75° W.
Venezuela time	67½° W.
Atlantic time	60° W.
St. John time	52½° W.

5. Zone Numbers and Letters

The different time zones of the world are numbered east and west of Greenwich. The zone number when added or subtracted, as indicated, from the time of the zone gives the corresponding Greenwich time. Thus, zones to the east have faster time than Greenwich and are indicated as minus (−), while those to the west have slower time and are indicated as plus (+). For convenience in telegraphic and other communications and records, letters have also been assigned to the zones. The system of numbering and lettering is shown in the following table.

Faster than Greenwich			Slower than Greenwich		
Standard meridian east	Zone No.	Zone letter	Standard meridian west	Zone No.	Zone letter
Degrees			*Degrees*		
0	0	Z	0	0	Z
15	−1	A	15	+1	N
30	−2	B	30	+2	O
45	−3	C	45	+3	P
60	−4	D	60	+4	Q
75	−5	E	75	+5	R
90	−6	F	90	+6	S
105	−7	G	105	+7	T
120	−8	H	120	+8	U
135	−9	I	135	+9	V
150	−10	K	150	+10	W
165	−11	L	165	+11	X
180	−12	M	180	+12	Y

6. Time Designations

Certain abbreviations have been adopted as standard in designating time: The time from midnight to noon is indicated by a. m. (ante meridiem); that from noon to midnight by p. m. (post meridiem). Noon is expressed as 12 m (meridies); midnight as 12 p. m.; e. s. t. indicates eastern standard time; c. s. t., central standard time; m. s. t., mountain standard time; P. s. t., Pacific standard time; etc. Greenwich time is expressed as G. c. t. (Greenwich civil time), G. m. t. (Greenwich mean time), or u. t. (universal time). The expression u. t. is preferred.

Before 1925, the astronomical day started at noon, while the civil day started at midnight. This astronomical time was designated as G. m. t. Beginning in January 1925 the astronomical day was changed to start at midnight, thus agreeing with the civil day, and the use of G. c. t. was adopted in most countries. The British Almanac and some others continued to indicate this new time as G. m. t., even though it differed from the former G. m. t. by 12 hours. This led to some confusion, and the use of u. t. (universal time) was gradually adopted to express Greenwich time. This designation may be found in some astronomical tables used jointly with either G. m. t. or

G. c. t. In following old records, it is important to remember that the beginning of the astronomical day was changed from noon to midnight on January 1, 1925.

In some countries the hours of the day are numbered from 0 to 24 beginning at midnight. This is less confusing than the double 12 system used in this country.

The corresponding times in the two systems are:

24-hour system	Double-12 system	24-hour system	Double-12 system
1	1 a. m.	13	1 p. m.
2	2 a. m.	14	2 p. m.
3	3 a. m.	15	3 p. m.
4	4 a. m.	16	4 p. m.
5	5 a. m.	17	5 p. m.
6	6 a. m.	18	6 p. m.
7	7 a. m.	19	7 p. m.
8	8 a. m.	20	8 p. m.
9	9 a. m.	21	9 p. m.
10	10 a. m.	22	10 p. m.
11	11 a. m.	23	11 p. m.
12	12 noon.	0 or 24	12 midnight.

7. Comparison of Time

Figure 2 illustrates clearly the difference in time as one travels from place to place upon the earth. On this chart the outer circle shows the longitude east and west of Greenwich; the middle circle gives the time as compared with noon in Washington, D. C., and the inner circle shows the time difference from Greenwich. This diagram will be found useful in picturing the relative locations of various countries and for computing the comparative time between them.

Example: The standard meridian for Japan is 135° E. and that for Turkey is 30° E. What is the time in each place at noon in Washington and what is the time difference between Japan and Turkey?

Following the radius through 135° E. toward the center, we find that the time in Japan is 9 hours faster than Greenwich and that its time is 2 a. m. next day when it is noon in Washington.

Following the radius through 30° E. toward the center, we find that the time for Turkey is 2 hours faster than Greenwich and that its time is 7 p. m. when it is noon in Washington.

Since Japan is 9 hours faster than Greenwich and Turkey is only 2 hours faster than Greenwich, Japan must be 9 hours minus 2 or 7 hours faster than Turkey.

Where parts of an hour are involved the fraction may be added to the full hour difference shown in the diagram.

Example: Honolulu takes the time of 150° W. What time is it in Honolulu when it is noon in Washington, and what is the time difference between Honolulu and Greenwich?

Following the radius through 150° W. toward the center, we find that Honolulu is 10 hours slower than Greenwich, and that at noon Washington time it is 7 a. m. in Honolulu.

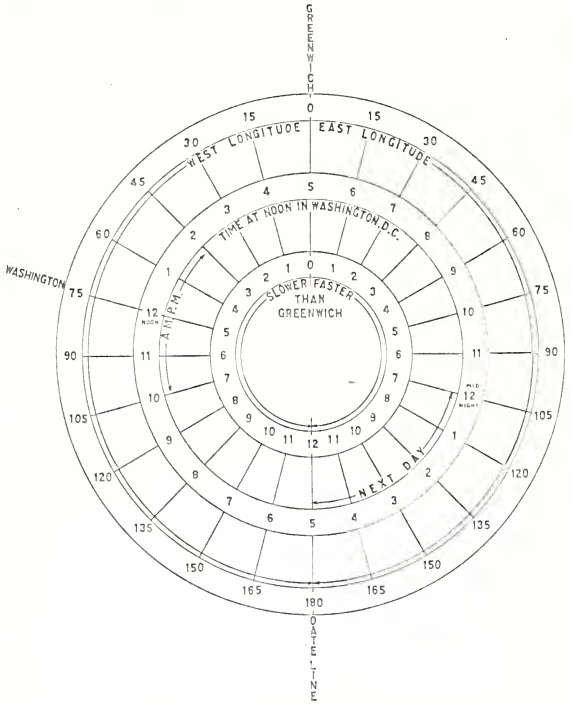

FIGURE 2. *Comparative time chart.*

8. Foreign Time Signals

There are a number of radio stations throughout the world that broadcast time signals. The systems of transmitted signals used by the different stations are not the same. A few stations use a special system of their own, but most stations use one of the systems described below.[1] The signals are preceded by warning or some kind of preliminary signals to indicate the station.

(a) The United States System (previously described).

(b) The International (ONOGO) System.

[1] The descriptions were taken from Radio Navigational Aids, published by the Hydrographic Office, Navy Department.

This system was adopted at the Conférence Internationale de l'Heure, 1912. It is better known as the ONOGO system because of the sequence of the Morse letters used in the time code. The transmission of the actual time signals lasts for three minutes.

As transmitted by the majority of stations, the signals proper are preceded by preparatory signals as shown under the respective stations.

The signal proper lasts 3 minutes and is sent as follows:

Signal	Times				Diagram
	m.	*s.*	*m.*	*s.*	
Series of X's sent every 5 seconds	57	00	to 57	49	— • • • — • • • etc.
Letter O	57	55	to 58	00	55 56 57 58 59 60
Letter N	58	08	to 58	10	08 09 10
Letter N	58	18	to 58	20	18 19 20
Letter N	58	28	to 58	30	28 29 30
Letter N	58	38	to 58	40	38 39 40
Letter N	58	48	to 58	50	48 49 50
Letter O	58	55	to 59	00	55 56 57 58 59 60
Letter G	59	06	to 59	10	06 07 08 09 10
Letter G	59	16	to 59	20	16 17 18 19 20
Letter G	59	26	to 59	30	26 27 28 29 30
Letter G	59	36	to 59	40	36 37 38 39 40
Letter G	59	46	to 59	50	46 47 48 49 50
Letter O	59	55	to 00	00	55 56 57 58 59 60

In the transmission of the signals ONOGO, each dash (—) = 1 second, and each dot (•) = 0.25 second.

The particular signal of this series that is accepted as the time signal varies: in some cases the end of the final dash in the letter O (— — —), representing an even minute, is taken; while another country specifically mentions the dot of the letters N (— •) and G (— — •). As the exactitude of the signals O, N, G, can be depended upon, either method can be safely employed.

c. The New International (modified ONOGO) System

The International Time Commission, July 1925, recommended that the International (Onogo) System of radio time signals be amended, by the substitution of 6 dots (•) sent at the fifty-fifth, fifty-sixth, fifty-seventh, fifty-eighth, fifty-ninth, and sixtieth seconds of each minute, instead of the 3 one-second dashes that commence at the fifty-fifth, fifty-seventh, and fifty-ninth seconds of the last 3 minutes, and which constitute the time signals.

The New International System of radio time signals has now been adopted by France, South Africa, Portuguese East Africa, Brazil, Victoria (Australia), and the Argentine.

The signal proper is as follows:

Signal	Time				Diagram
	m.	*s.*	*m.*	*s.*	
Series of X's sent every 5 seconds	57	00	to 57	50	— • • • — • • • etc.
A dot each second (time signals)	57	55	to 58	00	55 56 57 58 59 60
Letter N (time signal)	58	08	to 58	10	8 9 10
Letter N (time signal)	58	18	to 58	20	18 19 20
Letter N (time signal)	58	28	to 58	30	28 29 30
Letter N (time signal)	58	38	to 58	40	38 39 40
Letter N (time signal)	58	48	to 58	50	48 49 50
A dot each second (time signals)	58	55	to 59	00	55 56 57 58 59 60
Letter G (time signal)	59	06	to 59	10	6 7 8 9 10
Letter G (time signal)	59	16	to 59	20	16 17 18 19 20
Letter G (time signal)	59	26	to 59	30	26 27 28 29 30
Letter G (time signal)	59	36	to 59	40	36 37 38 39 40
Letter G (time signal)	59	46	to 59	50	46 47 48 49 50
A dot each second (time signals)	59	55	to 00	00	55 56 57 58 59 60

d. The Rhythmic (Coincidence) System

The International Time Commission of 1925 adopted the New International System of rhythmic wireless time signals, which is described herein. This system has been adopted by Great Britain, France, U. S. S. R., Germany, French Indo-China, and other countries.

The rhythmic system consists of 306 signals transmitted in the space of 300 seconds or 5 minutes of mean time. The signals falling exactly on the minute are short dashes (—) of 0.4 second duration. Between the dashes 60 dots (•) of 0.1 second each are transmitted. Each minute therefore is divided into 61 intervals. This vernier arrangement permits coincidence to be obtained between the chronometer beat (tick) and the radio signal. Chronometers beating half seconds will afford two coincidences each minute, while those beating only on the second will give one coincidence each minute. Due to the vernier arrangement, these signals permit chronometer comparisons of accuracy approaching 0.01 second

In 1948 there was built at the National Bureau of Standards a means of controlling the frequency of these crystals to an accuracy of approximately 1 part in 20 million. This apparatus, known as the "atomic clock," is still in the development stage, but it gives promise of still higher time precision and control of timing measurements to approximately 1 part in 1 billion.

The following foreign stations broadcast radio time signals. For details as to the times of transmission, the frequencies used, and the type of system of signals, consult the Radio Navigational Aids (latest edition), published by the Hydrographic Office, Navy Department, Washington 25, D. C.

877453—50——3

Europe:
- Denmark:
  - Skamleback.
- France:
  - Paris—Pontoise: FYP and others.
- Germany:
  - Nauen: DFY.
- Great Britain:
  - Rugby: GBR.
  - BBC: GR, GS, GV, and GW series.
- Poland:
  - Warsaw: SPI.
- Portugal:
  - Monsanto: CTB, CTW.
  - Centocella: IMB.
- Spain:
  - Cadiz (San Carlos): EBC.
- Sweden:
  - Stockholm: SBA.
- USSR:
  - Moscow: RAI and others.
  - Leningrad (Detskoe Selo): RET.

Asia:
- China:
  - Hong Kong: ZBW.
  - Shanghai (Frelupt): XSG.
  - Peiping (Peking): XPK.
- India:
  - Calcutta: VWC.
  - Colombo: VPB.
- Indo China:
  - Saigon: FZS3.
  - Kien An: FRK.
- Iraq:
  - Basrah: YIB.
- Japan:
  - Tokyo: JJC and JJY.
  - Choshi: JCS.
- USSR:
  - Theodosia: VEK.
  - Vladivostok: RTH and others.

Africa:
- Eritrea:
  - Massawa: IRG.
- Italian Somaliland:
  - Mogadiscio: ISC.
- Mozambique:
  - Laurenço Marques: CRL.
- Union of South Africa:
  - Capetown: ZSC.

North America:
- Canada:
  - Camperdown: VCS.
  - Halifax: CFH.
  - Ottawa: CHU.
- Mexico:
  - Mexico City: XDA and others.

South America:
- Argentina:
  - Darsena Norte: LOL.
  - Monte Grande: LQC and others.
- Brazil:
  - Rio de Janeiro: PRR.
  - Observatorio Nacional: PPE.
- Chile:
  - Valparaiso—Las Salinas: CCL and others.
- Peru:
  - Callao: OBE.
  - Lima: OAZ.
- Uruguay:
  - Montivedeo: CXG.

Australia and East Indies:
- Australia:
  - Perth: VIP.
  - Sydney: VIS.
  - Melbourne: VIM.
  - Adelaide: VIA.
- Sarawak:
  - Kuching: VQF.
- New Zealand:
  - Wellington: ZMO and others.
  - Christchurch: 3YA.

9. Legal Time Used in the Different Countries

Nearly every country of the world has established a legal time upon which to operate and also a legal time for islands and dependencies under its control. Table 1, page 15, shows the authorized time and compares this time with both Greenwich, England, and Washington, D. C. Where the legal time conforms to the International Standard Time System, the standard-time meridian is indicated.

TABLE 1. *Standard time in the different countries* [a]

Country	General location	Standard meridian		Zone		Time compared to Greenwich (hours to be added to obtain Greenwich time; "f"=faster; "s"=slower)	Time compared to Washington (hours to be added to obtain Washington time; "f"=faster; "s"=slower)
		East	West	Number	Letter		
		Degrees	*Degrees*				
Admiralty Islands	South Pacific	150		−10	K	10f.	15f.
Afghanistan	Asia	65		−4½	D	4f.	9f.
Alaska	North America.						
Juneau, Ketchikan, Sitka			120	+8	U	8s.	3s.
Cordova			135	+9	V	9s.	4s.
Central part			150	+10	W	10s.	5s.
West coast, Aleutian Islands			165	+11	X	11s.	6s.
Albania [b]	Europe	15		−1	A	1f.	6f.
Algeria	Africa	0		0	Z	0	5f.
Amirante Islands	Indian Ocean	60		−4	D	4f.	9f.
Amsterdam Island	do	75		−5	E	5f.	10f.
Ananiba Islands	do	105		−7	G	7f.	12f.
Andaman Islands	do	97½		−6½	F	6½f.	11½f.
Andora [b]	Europe	0		0	Z	0	5f.
Anglo-Egyptian Sudan	Africa	30		−2	B	2f.	7f.
Angola	do	15		−1	A	1f.	6f.
Anguilla Island	West Indies		60	+4	Q	4s.	1f.
Antedon Island	South Atlantic	0		0	Z	0	5f.
Antigua Island	West Indies		60	+4	Q	4s.	1f.
Arabia [c]	Asia (45° E).	45		−3	C	3f.	8f.
Aden [b]			60	+4	Q	4s.	1f.
Argentina [b]	South America	135		−9	I	9f.	14f.
Aru Islands	East Indies	0		0	Z	0	5f.
Ascension Island	South Atlantic						
Auckland Island [c]	South Pacific (165° E).		150	+10	W	10s.	5s.
Austral (Tubuai) Islands	South Pacific						

[a] See footnotes at end of table.

TABLE 1. *Standard time in different countries*—Continued

Country	General location	Standard meridian East	Standard meridian West	Zone Number	Zone Letter	Time compared to Greenwich (hours faster or slower: "f"=faster; "s"=slower)	Time compared to Washington (hours faster or slower: "f"=faster; "s"=slower)
		Degrees	*Degrees*				
Australia [b]	South Pacific						
Western Australia [b]		120		−8	H	8f	13f.
Northern Territory,[b] South Australia.[b]		142½		−9½		9½f	14½f.
New South Wales,[b] Queensland, Victoria.[b]		150		−10	K	10f	15f.
Austria [b]	Europe	15		−1	A	1f	6f.
Azores Islands [b]	North Atlantic	0		0	Z	0	5f.
Bahama Islands	North Atlantic		75	+5	R	5s	0.
Bahrein Islands	Persian Gulf	60		−4	D	4f	9f.
Balearic Islands [b]	Mediterranean Sea	0		0	Z	0	5f.
Bali Island	East Indies	120		−8	H	8f	13f.
Balleny Islands [c]	Antarctic Ocean (162° E).						
Bangka Island	East Indies	105		−7	G	7f	12f.
Barbados Island [b]	West Indies		60	+4	Q	4s	1f.
Bear Island [c]	Arctic Ocean (20° E).						
Bechuanaland	Africa	30		−2	B	2f	7f.
Belgium [b]	Europe	0		0	Z	0	5f.
Bennett Island	Arctic Ocean	150		−10	K	10f	15f.
Bermuda Islands [b]	North Atlantic		60	+4	Q	4s	1f.
Bhutan	Asia	87½		−5½		5½f	10½f.
Billiton Islands	East Indies	105		−7	G	7f	12f.
Bolivia	South America		60	+4	Q	4s	1f.
Borneo [b]	East Indies	120		−8	H	8f	13f.
Brazil	South America.						
Fernando Noronha Island, Isle de Trinidade.			30	+2	O	2s	3f.

Bahia, Ceara, Esperito Santo, Goyaz, Miranhao, Minas-Geraes, Para, Parana, Pernambuco, Piauhy, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Santa Catherina, Sao Paulo.			45	+3	P	3s	2f.
Amazonas, Matto Grosso			60	+4	Q	4s	1f.
Acre Territory			75	+5	R	5s	0.
British Honduras [b]	Central America		90	+6	S	6s	1s.
Bulgaria	Europe	30		−3	C	3f	8f.
Burma	Asia	97½		−6½		6½f	11½f.
Cameroons	Africa	15		−1	A	1f	6f.
Campbell Island [c]	Antarctic Ocean (170° E).						
Canada	North America.						
Belle Isle, Labrador,[b] Newfoundland.[b]			52½	+3½		3½s	1½f.
Anticosti Island, Cape Breton Island, Magdalen Island, New Brunswick,[b] Nova Scotia,[b] Prince Edward Island, Quebec (east of 68° W),[b] Sable Island.			60	+4	Q	4s	1f.
Melville Peninsula (east), Ontario (east of 90° W.),[b] Quebec (west of 68 W.),[b] Southampton Island.			75	+5	R	5s	0.
Manitoba, Ontario (west of 90° W.), Melville Peninsula (west), Northwest Territories (east).			90	+6	S	6s	1s.
Alberta, Saskatchewan, Northwest Territories (middle).			105	+7	T	7s	2
British Columbia, Northwest Territories (west).			120	+8	U	8s	3s.
Yukon			135	+9	V	9s	4s
Arctic Islands [c]	North of Canada.						

See footnotes at end of table.

TABLE I. Standard time in the different countries—Continued

Country	General location	Standard meridian East	Standard meridian West	Zone Number	Zone Letter	Time compared to Greenwich (hours faster or slower; "f"=faster, "s"=slower)	Time compared to Washington (hours faster or slower; "f"=faster, "s"=slower)
		Degrees	*Degrees*				
Canary Islands [b]	North Atlantic		15	+1	N	1s	4f.
Cape Verde Islands	do		30	+2	O	2s	3f.
Caroline Islands	North Pacific	150		−10	K	10f	15f.
Cayman Islands	West Indies		75	+5	R	5s	0.
Celebes Islands	East Indies	120		−8	H	8f	13f.
Ceram Islands	do	135		−9	I	9f	14f.
Ceylon Island [b]	Indian Ocean	82½		−5½		5½f	10½f.
Chad	Africa	15		−1	A	1f	6f.
Chagos Archipelago [b]	Indian Ocean	75		−5	E	5f	10f.
Channel Islands [b]	English Channel	0		0	Z	0	5f.
Chatham Island [b]	South Pacific	180		−12	M	12f	17f.
Chile [b]	South America		60	+4	Q	4s	1f.
China	Asia.						
Western part		75		−5	E	5f	10f.
Mid-Western part		90		−6	F	6f	11f.
Mid-Eastern part, Hainan, Pakekoi, Hongkong, Macao.		105		−7	G	7f	12f.
Eastern part		120		−8	H	8f	13f.
Christmas Island	Indian Ocean	105		−7	G	7f	12f.
Cocos (Keeling) Islands	do	97½		−6½		6½f	11½f.
Colombia	South America		75	+5	R	5s	0f.
Comoro Islands	Indian Ocean	45		−3	C	3f	8f.
Congo	Africa.						
Western part		15		−1	A	1f	6f.
Eastern part		30		−2	B	2f	7f.
Cook Islands	South Pacific (160° W)					10 hr 38 min s	5 hr 38 min s.
Corsica Island [b]	Mediterranean Sea	0		0	Z	0f	5f.
Costa Rica	Central America		90	+6	S	6s	1s.
Crete Island [b]	Mediterranean Sea	30		−2	B	2f	7f.
Cuba [b]	West Indies		75	+5	R	5s	0f.
Curacao Island	Caribbean Sea		67½	+4½		4½s	½f.

Cyprus Island [b]	Mediterranean Sea	30		−2	B	2f	7f
Czechoslovakia	Europe	15		−1	A	1f	6f.
Dahomey	Africa	0		0	Z	0	5f.
Denmark [b]	Europe	15		−1	A	1f	6f.
Dodecanese Islands	Mediterranean Sea	30		−2	B	2f	7f.
Dominica Island	West Indies		60	+4	Q	4s	1f.
Dominican Republic [b]	do		75	+5	R	5s	0.
Ecuador	South America		75	+5	R	5s	0.
Egypt [b]	Africa	30		−2	B	2f	7f.
Eire [b]	British Isles	0		0	Z	0	5f.
Ellice Islands	South Pacific	180		−12	M	12f	17f.
El Salvador	Central America		90	+6	S	6s	1s.
England [b]	British Isles	0		0	Z	0f	5f.
Equatorial Africa, French	Africa	15		−1	A	1f	6f.
Eritrea	do	45		−3	C	3f	8f.
Estonia	Europe (U. S. S. R.)	30		−2	B	2f	7f.
Ethiopia	Africa	45		−3	C	3f	8f.
Falkland Islands [b]	South Atlantic		60	+4	Q	4s	1f.
Fanning Island	North Pacific		165	+11	X	11s	6s.
Faroe Islands	Norwegian Sea	0		0	Z	0	5f.
Fernando Po Island	South Atlantic	0		0	Z	0	5f.
Fiji Islands [b]	South Pacific	180		−12	M	12f	17f.
Finland [b]	Europe	30		−2	B	2f	7f.
Flores Islands	East Indies	120		−8	H	8f	13f.
Formosa (Taiwan) Island	China Sea	135		−9	I	9f	14f.
France [b]	Europe	0		0	Z	0	5f.
Gabon	Africa	15		−1	A	1f	6f.
Galapagos Islands [c]	South Pacific (90° W).						
Gambia	Africa	0		0	Z	0	5f.
Germany [b]	Europe	15		−1	A	1f	6f.
Gibraltar [b]	do	0		0	Z	0	5f.
Gilbert Islands	Pacific Ocean	180		−12	M	12f	17f.
Gold Coast [b]	Africa	0		0	Z	0	5f.
Great Britain [b]	Europe	0		0	Z	0	5f.

See footnotes at end of table.

(Continued)

Country	General location	Standard meridian		Zone		Time compared to Greenwich (hours faster or slower; "f"=faster; "s"=slower)	Time compared to Washington (hours faster or slower; "f"=faster; "s"=slower)
		East	West	Number	Letter		
		Degrees	*Degrees*				
Great Lyakhov Island	Arctic Ocean	135		−9	I	9f	14f.
Greece [b]	Europe	30		−2	B	2f	7f.
Greenland	Arctic Ocean.						
Scoresby Sound			30	+2	O	2s	3f.
Augmagssalik, Disko Island, Western Coast.			45	+3	P	3s	2f.
Interior [c]							
Grenada Island	West Indies		60	+4	Q	4s	1f.
Guadalupe Island [c]	North Pacific (120° W).						
Guadeloupe Island	West Indies		60	+4	Q	4s	1f.
Guam Island	North Pacific	150		−10	K	10f	15f.
Guatemala	Central America		90	+6	S	6s	1s.
Guiana, British, Dutch, French [b]	South America		52½	+3½		3½s	1½f.
Guinea	Africa.						
French, [b] Spanish		0		0	Z	0	5f.
Portuguese			15	+1	N	1s	4f.
Hadramaut (Mukalla)	Arabia	45		−3	C	3f	8f.
Haiti	West Indies		75	+5	R	5s	0.
Halmahera Islands	East Indies	135		−9	I	9f	14f.
Hawaiian Islands	North Pacific		150	+10	W	10s	5s.
Hebrides Islands	British Isles	0		0	Z	0	5f.
Honduras	Central America		90	+6	S	6s	1s.
Hungary [b]	Europe	15		−1	A	1f	6f.
Iceland [b]	North Atlantic		15	+1	N	1s	4f.
India [b]	Asia	82½		−5½		5½f	10½f.
Indo-China [b]	do	120		−8	H	8f	13f.
Iran	do	52½		−3½		3½f	8½f.
Iraq [b]	do	45		−3	C	3f	8f.
Ireland, Northern [b]	British Isles	0		0	Z	0	5f.

Isle of Man	do	0		0	Z	0	5f.
Isle of Pines	West Indies		75	+5	R	5s	0.
Italy [b]	Europe	15		−1	A	1f	6f.
Ivory Coast	Africa	0		0	Z	0	5f.
Jamaica	West Indies		75	+5	R	5s	0.
Jan Mayen Island	Arctic Ocean		15	+1	N	1s	4f.
Japan [b]	Asia	135		−9	I	9f	14f.
Java	East Indies	120		−8	H	8f	13f.
Juan Fernandez Islands	South Pacific		60	+4	Q	4s	1f.
Kamaran Island [b]	Red Sea	45		−3	C	3f	8f.
Kamchatka	Asia	165		−11	L	11f	16f.
Karaginski Island	Bering Sea	165		−11	L	11f	16f.
Kei Islands	East Indies	135		−9	I	9f	14f.
Kenya	Africa	45		−3	C	3f	8f.
Kerguelon Islands [c]	Indian Ocean.						
Kodiak Island	Gulf of Alaska		150	+10	W	10s	5s.
Komandorski Islands	Bering Sea	165		−11	L	11f	16f.
Korea	Asia	135		−9	I	9f	14f.
Kotelni Island	Arctic Ocean	135		−9	I	9f	14f.
Kuril Islands	Asia	135		−9	I	9f	14f.
Labrador	North America		52½	+3½		3½s	1½f.
Laccadive Islands	Indian Ocean	82½		−5½		5½f	10½f.
Latvia *	Europe (U. S. S. R.)	30		−2	B	2f	7f.
Liberia	Africa					0 hr 44 min s	4 hr 16 min f.
Libya *	do	15		−1	A	1f	6f.
Liechtenstein	Europe	15		−1	A	1f	6f.
Lithuania *	Europe (U. S. S. R.)	30		−2	B	2f	7f.
Lombok Island	East Indies	120		−8	H	8f	13f.
Lord Howe Island	South Pacific	157½		−10½		10½f	15½f.
Loyalty Islands	do	165		−11	L	11f	16f.
Luxembourg *	Europe	0		0	Z	0	5f.
Macquarie Islands [c]	Antarctic Ocean (157° E).						
Madagascar Island	Indian Ocean	45		−3	C	3f	8f.
Madeira Islands	North Atlantic	0		0	Z	0	5f.
Malay States, Confederated	Asia	112½		−7½		7½f	12½f.

See footnotes at end of table.

Country	General location	Standard meridian East	Standard meridian West	Zone Number	Zone Letter	Time compared to Greenwich (hours faster or slower; "f"=faster; "s"=slower)	Time compared to Washington (hours faster or slower; "f"=faster; "s"=slower)
		Degrees	*Degrees*				
Maldive Islands	Indian Ocean					4 hr 54 min f	9 hr 54 min f.
Malta Island	Mediterrean Sea	15		−1	A	1f	6f.
Manchuria	Asia	135		−9	I	9f	14f.
Marianas (Ladrone) Islands	South Pacific	150		−10	K	10f	15f.
Marquesas Islands	do		150	+10	W	10s	5s.
Marshall Islands	North Pacific	180		−12	M	12f	17f.
Martinique Island	West Indies		60	+4	Q	4s	1f.
Mauritania [a]	Africa	0		0	Z	0	5f.
Mauritius Island	Indian Ocean		60	+4	Q	4s	1f.
Mexico [a]	North America.						
Aguascalientes, Campeche, Chiapas, Chihuahua, Coahuila, Durango, Guanajuato, Guerrero, Jalisco, Mexico, Michoacan, Morelos, Nuevo Leon, Oaxaca, Puebla, Queretaro, Quintana Roo, San Luis Potosi, Tabasco, Tamaulipas, Tlaxcala, Yucatan.			90	+6	S	6s	1s.
Baja California (south of 28° N.), Nayarit, Sinaloa, Sonora.			105	+7	T	7s	2s.
Baja California (north of 28° N.)			120	+8	U	8s	3s.
Midway Island	North Pacific		165	+11	X	11s	6s.
Miquelon Island [a]	Gulf of St. Lawrence		60	+4	Q	4s	1f.
Moluccas (Spice) Islands	East Indies	120		−8	H	8f	13f.
Monaco [b]	Europe	0		0	Z	0	5f.
Mono Island	East Indies	165		−11	L	11f	16f.
Morocco [b]	Africa	0		0	Z	0	5f.
Mozambique	do	30		−2	B	2f	7f.

Nansei Islands	Japan	135		−9	I	9f	14f.
Natuna Islands	East Indies	105		−7	G	7f	12f.
Nauru Island	South Pacific	172½		−11½		11½f	16½f.
Nepal	Asia	82½		−5½		5½f	10½f.
Netherlands	Europe	0		0	Z	0	5f.
New Britain Island	East Indies	150		−10	K	10f	15f.
New Caledonia Islands	South Pacific	165		−11	L	11f	16f.
Newfoundland [b]	North America		57½	+3½		3½s	1½f.
New Guinea Island	East Indies.						
Western part (Dutch)	East Indies	135		−9	I	9f	14f.
Eastern part (British)		150		−10	K	10f	15f.
New Hebrides Islands	South Pacific	165		−11	L	11f	16f.
New Ireland Island	East Indies	150		−10	K	10f	15f.
New Siberia Island	Arctic Ocean	150		−10	K	10f	15f.
New Zealand [b]	South Pacific	180		−12	M	12f	17f.
Nicaragua	Central America		90	+6	S	6s	1s.
Nicobar Islands	Indian Ocean	97½		−6½		6½f	11½f.
Nigeria	Africa	15		−1	A	1f	6f.
Niger Territory	do						
Western part		0		0	Z	0	5f.
Eastern part		15		−1	A	1f	6f.
Niue (Savage) Island	South Pacific					11 hr 20 min s	6 hr 20 min s.
Norfolk Island	do	172½		−11½		11½f	16½f.
Northern Ireland [b]	British Isles	0		0	Z	0	5f.
Norway [b]	Europe	15		−1	A	1f	6f.
Nova Zembla Island	Arctic Ocean	60		−4	D	4f	9f.
Nunivak Island	Bering Sea		165	+11	X	11s	6s.
Nyasaland	Africa	30		−2	B	2f	7f.
Ocean Island	South Pacific	165		−11	L	11f	16f.
Ogasawara Island	North Pacific	150		−10	K	10f	15f.
Orkney Islands	British Isles	0		0	Z	0	5f.
Pakistan	Asia	87½		−5½		5½f	10f.
Palau Islands	North Pacific	150		−10	K	10f	15½f.
Palestine [b]	Asia	30		−2	B	2f	7f.

See footnotes at end of table.

TABLE 1. *Standard time in the different countries* [a] — Continued

Country	General location	Standard meridian East	Standard meridian West	Zone Number	Zone Letter	Time compared to Greenwich (hours faster or slower: "f"=faster; "s"=slower)	Time compared to Washington (hours faster or slower: "f"=faster; "s"=slower)
		Degrees	*Degrees*				
Palma Island	Mediterranean Sea	0		0	Z	0	5f.
Panama	Central America		75	+5	R	5s	0.
Panama Canal Zone	do		75	+5	R	5s	0.
Paraguay	South America		60	+4	Q	4s	1f.
Perim Island	Arabian Sea	45		−3	C	3f	8f.
Peru [b]	South America		75	+5	R	5s	0.
Pescadores Islands	East Indies	120		−8	H	8f	13f.
Philippine Islands	North Pacific	120		−8	H	8f	13f.
Poland	Europe.						
Western part		15		−1	A	1f	6f.
Eastern part		30		−2	B	2f	7f.
Portugal [b]	Europe	0		0	Z	0	5f.
Pribolof Islands	Bering Sea		165	+11	X	11s	6s.
Principe Island	South Atlantic	0		0	Z	0	5f.
Puerto Rico	West Indies		60	+4	Q	4s	1f.
Queen Charlotte Islands	North Pacific		120	+8	U	8s	3s.
Rapa Island	South Pacific	150		−10	K	10f	15f.
Raratonga Island	do					10 hr 38 min, s	5 hr 38 min s.
Reunion Island	Indian Ocean	60		−4	D	4f	9f.
Rhodes, Isle of	Mediterranean Sea	30		−2	B	2f	7f.
Rhodesia	Africa.						
Northern		30		−2	B	2f	7f.
Southern		30		−2	B	2f	7f.
Rio de Oro	Africa		15	+1	N	1s	4f.
Rio Muni	do	0		0	Z	0	5f.
Rodriquez Island	Indian Ocean	60		−4	D	4f	9f.
Rumania	Europe	30		−2	B	2f	7f.
Russia [b] (see U. S. S. R.)	do.						

Sakhalin Island	Japan	135		−9	I	9f	14f.
Samoa Islands	South Pacific		165	+11	X	11s	6s.
San Marino [b]	Europe	15		−1	A	1f	6f.
Santa Cruz Islands	South Pacific	165		−11	L	11s	16f.
Sao Thome Island [b]	South Atlantic	0		0	Z	0	5f.
Sarawak	Borneo	120		−8	H	8f	13f.
Sardinia Island [b]	Mediterranean Sea	15		−1	A	1f	6f.
Saudi Arabia [c]	Asia.						
Savage (Nine) Islands	South Pacific					11 hr 20 min s	6 hr 20 min s.
Schouten Islands	East Indies	135		−9	I	9f	14f.
Scotland	British Isles	0		0	Z	0	5f.
Senegal [b]	Africa	0		0	Z	0	5f.
Seychelles Islands	Indian Ocean	60		−4	D	4f	9f.
Shetland Islands	British Isles	0		0	Z	0	5f.
Siam	Asia	105		−7	G	7f	12f.
Sicily Island [b]	Mediterranean Sea	15		−1	A	1f	6f.
Sierra Leone	Africa	0		0	Z	0	5f.
Society Islands	South Pacific		150	+10	W	10s	5s.
Sokotra Island	Arabian Sea	45		−3	C	3f	8f.
Solomon Islands	South Pacific	165		−11	L	11f	16f.
Somaliland	Africa.						
British, French, Italian		45		−3	C	3f	8f.
South Georgia Islands	South Atlantic					2 hr 7 min s	2 hr 53 min f.
South Orkney Islands [c]	do						
South Sandwich Islands [c]	do						
South Shetland Islands [c]	do						
Southwest Africa	Africa	30		−2	B	2f	7f.
Soviet Union (See U. S. S. R.)	Europe and Asia.						
Spain [b]	Europe	0		0	Z	0	5f.
Spitzbergen [c]	Arctic Ocean (12°E).						
Staten Island	South Atlantic		60	+4	Q	4s	1f.
St. Croix Island	West Indies		60	+4	Q	4s	1f.
St. Helena Island	South Atlantic	0		0	Z	0	5f.
St. Lawrence Island	Bering Sea		165	+11	X	11s	6s.
St. Lucia Island	West Indies		60	+4	Q	4s	1f.
St. Matthew Island	Bering Sea		165	+11	X	11s	6s.
St. Miguel Island	North Atlantic	0		0	Z	0	5f.
St. Pierre Island [b]	Gulf of St. Lawrence		60	+4	Q	4s	1f.
St. Thomas Island	West Indies		60	+4	Q	4s	1f.
St. Vincent Island	do		60	+4	Q	4s	1f.

See footnotes at end of table.

Continued

Country	General location	Standard meridian		Zone		Time compared to Greenwich (hours faster or slower; "f"=faster, "s"=slower)	Time compared to Washington (hours faster or slower; "f"=faster, "s"=slower)
		East	West	Number	Letter		
Straits Settlements	Asia	Degrees 112½	Degrees	−7½		7½f	12½f.
Sudan (French West Africa)	Africa.						
Eastern part		0		0	Z	0	5f.
Western part			15	+1	N	1s	4f.
Sumatra Island	East Indies	105		−7	G	7f	12f.
Sumba Island	do	120		−8	H	8f	13f.
Sumbawa Island	do	120		−8	H	8f	13f.
Sweden	Europe	15		−1	A	1f	6f.
Switzerland [b]	do	15		−1	A	1f	6f.
Syria [b]	Asia	30		−2	B	2f	7f.
Tanganyika	Africa	45		−3	C	3f	8f.
Tangier	do	0		0	Z	0	5f.
Tanimbar Islands	East Indies	135		−9	I	9f	14f.
Tasmania Island [b]	South Pacific	150		−10	K	10f	15f.
Thaddeus Island	Arctic Ocean	150		−10	K	10f	15f.
Timor Island	East Indies	135		−9	I	9f	14f.
Timor Laut Island	do	135		−9	I	9f	14f.
Tobago Island	West Indies		60	+4	Q	4s	1f.
Togoland	Africa	0		0	Z	0	5f.
Tonga (Friendly) Islands	South Pacific					12 hr. 19 min. f	17 hr. 19 min. f
Transjordan [a]	Asia (38° E).						
Trinidad Island	West Indies		60	+4	Q	4s	1f.
Tuamotu (Low) Archipelago	South Pacific		150	+10	W	10s	5s.
Tunisia	Africa	15		−1	A	1f	6f.
Turkey [b]	Europe and Asia	30		−2	B	2f	7f.
Turks Island	West Indies		75	+5	R	5s	0.
Ubangi Shari	Africa	15		−1	A	1f	6f.
Uganda	do	45		−3	C	3f	8f.
Union of South Africa [b]	do	30		−2	B	2f	7f.
United States of America [b]	North America.						
Eastern			75	+5	R	5s	0
Central			90	+6	S	6s	1s.
Mountain			105	+7	T	7s	2s.
Pacific			120	+8	U	8s	3s.
Alaska			150	+10	W	10s	5s.
Uruguay [b]	South America		60	+3		3s	2f.
U. S. S. R. [b]	Europe and Asia.						
Estonia, Karelo-Finnish, Latvia, Lithuania, Moldavia, Russia, Ukraine, White Russia.		30		−2	B	2f	7f.
Armenia, Azerbaijan, Georgia		45		−3	C	3f	8f.
Kazak, Tadzhik, Turkmen, Uzbek.		60		−4	D	4f	9f.
Kirghiz, W. Siberian Region		75		−5	E	5f	10f.
Approximately 82½° to 97½°		90		−6	F	6f	11f.
Buryat-Mongol, E. Siberian Region.		105		−7	G	7f	12f.
Approximately 112½° to 127½°		120		−8	H	8f	13f.
Kuril Islands, Sakhalin		135		−9	I	9f	14f.
Approximately 142½° to 157½°		150		−10	K	10f	15f.
Approximately 157½° to 172½°		165		−11	L	11f	16f.
Approximately 172½° to coast		180		−12	M	12f	17f.
Vatican City [b]	Europe	15		−1	A	1f	6f.
Venezuela	South America		67½	+4½		4½s	½f.
Virgin Islands	West Indies		60	+4	Q	4s	1f.
Volcano Islands	Sea of Japan	135		−9	I	9f	14f.
Wake Island	North Pacific	180		−12	M	12f	17f.
Wales	British Isles	0		0	Z	0	5f.
Wrangell Island	Arctic Ocean	180		−12	M	12f	17f.
Yap Island	North Pacific	150		−10	K	10f	15f.
Yugoslavia	Europe	15		−1	A	1f	6f.
Zanzibar Island	Indian Ocean	45		−3	C	3f	8f.

[a] See Time Zone Chart of the World No. 5192, published by Hydrographic Office, Navy.
[b] Fast time in use during part of the year. See list under section V.
[c] No definite standard time used.

V. Summer, or Daylight Saving, Time

The use of summer, or daylight saving, time developed largely during the World War I. The plan was to advance the time in a certain area by a definite amount during the summer months to permit greater use of daylight hours. In the United States, Congress in the Act for Saving Daylight, passed in March 1918, advanced the time for all sections of the country 1 hour from the last Sunday in April to the last Sunday in September, the change being made at 2 a. m. when it would cause the least disturbance in schedules. This act was reenacted in October 1919 omitting the daylight saving clause, but some States and communities continued to use daylight saving time by local legislation. The use is by no means general and is entirely a matter of local legislation, having no effect on standard time or time zone boundaries.

Canada took similar action by the adoption of the Daylight Saving Act of 1918. This act lapsed after that year, but, as in the United States, certain sections still continue to use daylight saving time by local legislation. In Europe "summer time" was used by many countries, but the method and time of application varied greatly. Some countries have retained the summer time laws and still use advanced time for certain periods of the year.

The following is a list of countries recorded as making use of fast time during the summer months. Unless otherwise indicated, this "summer time" is usually 1 hour faster than the corresponding standard time, the exact dates being fixed annually.

Aden.
Albania.
Andora.
Argentina.
Australia.
Austria.
Azores Is.
Balleric Is.
Barbados Is.
Belgium.
Bermuda Is.
Borneo (North Borneo) and Sarawak.
British Honduras.
Canada.[a]
Canary Is.
Ceylon.
Chagos Arch.
Channel Is.
Chatham Is.
Chile.
Corsica I.
Crete I.
Cuba.[b]
Cypress I.
Denmark.
Dominican Republic.
Egypt.
Eire.
England.
Falkland Is.[c]
Fiji Is.
Finland.
France.
Germany.
Gibraltar.
Gold Coast.[d]
Great Britain.
Greece.
Guiana, French.[e]
Guinea, French.
Hungary.
Iceland.
India, British and French.
Indo-China.
Iraq.
Ireland, Northern.
Italy.
Japan.
Kamaran Is.
Kamchatka.
Kenya.
Labrador.[f]
Latvia.
Libya.
Lithuania.
Luxembourg.[g]
Malta I.
Mauritania.
Mexico.
Miquelon I.
Monaco.
Morocco.[h]
Netherlands.
Newfoundland.
New Zealand.
Northern Ireland.
Norway.
Pakistan.
Palestine.
Perim I.
Peru.
Portugal.[h]
San Marino.
Sao Thome I.
Sardinia I.
Senegal.
Sicily I.
Spain.[h]
St. Pierre I.
Switzerland.
Syria.
Tasmania.
Turkey.
Uganda.
Union of South Africa.
United States of America.[i]
Uruguay.
USSR.[j]
Vatican City.

[a] Used by local legislation in Nova Scotia, New Brunswick, Quebec, Ontario, and Saskatchewan, mostly large cities.
[b] 1 hour fast from midnight first Saturday in June to first Saturday in September each year.
[c] 1 hour fast last Saturday in September to next to last Saturday in March.
[d] Jan. 1 to Aug. 31 each year, rest of year 00:20 fast.
[e] ½ hour fast, third Sunday in September to third Sunday in March.
[f] 1 hour fast midnight second Sunday in May to first Sunday in October.
[g] 1 hour fast April to October, dates fixed annually.
[h] 1 hour or 2 hours fast, fixed annually.
[i] Local-legislation only, fixed each year.
[j] 1 hour fast the year round.

VI. Selected References

The following list is intended to give the reader sources of general and specific information on standard time. The indexes of the publications named give specific references to the subject. Where no date is given, the reference listed is of frequent, usually annual, issue. The latest issues should be called for in revising information given in this Circular.

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WASHINGTON, December 20, 1949

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