

14.8

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25, D. C.Letter Circular
LC1009
(Supersedes
LC974)STANDARD FREQUENCIES AND TIME SIGNALS
WWV AND WWVH

Radio Station WWV (in operation since 1923) and WWVH (since 1949) now broadcast continuously, night and day, giving six widely used services: STANDARD RADIO FREQUENCIES, STANDARD TIME INTERVALS, TIME ANNOUNCEMENTS, STANDARD MUSICAL PITCH, STANDARD AUDIO FREQUENCIES, AND RADIO PROPAGATION NOTICES.

1. Radio Frequencies and Station Locations

Station WWV (N 38° 59' 33", W 76° 50' 52"; near Washington, D. C.) broadcasts continuously, night and day, on standard radio frequencies of 2.5, 5, 10, 15, 20, and 25 Mc.

Station WWVH (N 20° 46' 02", W 156° 27' 42"; Maui, Territory of Hawaii) broadcasts on standard radio frequencies of 5, 10 and 15 Mc. The WWVH broadcast is interrupted for 4 minutes following each hour and half hour and for periods of 34 minutes each day beginning at 1900 UT (Universal Time). Also, during the week including the third Tuesday of each month, the WWVH broadcast is interrupted from 1900 to 2200 UT as follows: 5 Mc on Tuesday; 10 Mc on Wednesday; 15 Mc on Thursday.

2. Time Signals and Standard Time Intervals

The audio frequencies are interrupted for intervals of precisely one minute. They are resumed precisely on the hour and each five minutes thereafter. They are in agreement with the basic time service of the U. S. Naval Observatory so that they mark accurately the hour and the successive 5-minute periods.

Universal Time (Greenwich Civil Time or Greenwich Mean Time) is announced in telegraphic code each five minutes starting with 0000 (midnight). Time announcements are given just prior to and are with reference to return of the audio frequencies.

A voice announcement of Eastern Standard Time is given each five minutes from station WWV; this precedes and follows each telegraphic code announcement.

A pulse on each carrier frequency of 0.005-second duration occurs at intervals of precisely one second. The pulse consists of five cycles, each of 0.001-second duration.

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3. Audio Frequencies and Musical Pitch

Two standard audio frequencies, 440 and 600 cycles per second, are broadcast on all radio carrier frequencies. The audio frequencies are given alternately, starting with 600 cycles on the hour for four minutes, interrupted one minute, followed by 440 cycles for four minutes, and interrupted one minute. Each ten-minute period is the same. The 440-cycle tone is the standard musical pitch A above middle C.

4. Accuracy

Frequencies transmitted from WWV and WWVH are accurate to within 2 parts in 10^8 ; this is with reference to the mean solar second, 100-day interval, as determined by the U. S. Naval Observatory with a precision of better than 3 parts in 10^9 . Time intervals, as transmitted, are accurate within $\pm |2 \text{ parts in } 10^8 + 1 \text{ microsecond}|$.

Frequencies received may be as accurate as those transmitted for several hours per day during total light or total darkness over the transmission path at locations in the service range. During the course of the day errors in the received frequencies may vary approximately between -3 to +3 parts in 10^7 . During ionospheric storms transient conditions in the propagating medium may cause momentary changes as large as 1 part in 10^6 .

Time intervals, as received, are normally accurate within $\pm |2 \text{ parts in } 10^8 + 1 \text{ millisecond}|$. Transient conditions in the ionosphere at times cause received pulses to scatter by several milliseconds.

Corrections for the slight errors in absolute time and frequency as broadcast are available quarterly to organizations having need for corrections.

5. Radio Propagation Disturbance Warning Notice from WWV

An announcement of North Atlantic radio propagation conditions is broadcast in code on each of the standard radio frequencies at 19 1/2 and 49 1/2 minutes past the hour. If a warning of disturbance is in effect, the letter "W" (in International Morse Code) is repeated 10 times (keying tone 800 c/s) prior to the time announcement; if unstable conditions are expected, the letter "U" is repeated 10 times (keying tone 1200 c/s); if there is no warning, the letter "N" is repeated 10 times (keying tone 600 c/s). These announcements are pertinent only to transmission paths in the North Atlantic area.