



**WWV AND YOU**  
by Bruce Portzer

Nearly everyone in the club has at one time or another listened to WWV and its steady drone of time signals. Many of us make frequent use of its services to keep track of time or propagation conditions. Some even tune it in and turn up the volume in an effort to drive neighbors and relatives batty. It's not the most interesting station in the world to listen to: time blips every second, a man and a woman giving the time every minute, and occasional interruptions in the form of obscure announcements.

However, the programming on WWV, monotonous as it may seem, actually contains a wealth of information, much of it very useful to the DXer who knows how to use it. WWV's programming, and that of sister station WWVH, is crammed with information such as time of day, standard audio frequencies, propagation forecasts, weather reports, and other information. Figure 1 shows a typical hour of programming for these two stations, while Figure 2 lists the announcements presented each hour. The following paragraphs describe them in detail and outline some of the uses you can make of them.

**ANNOUNCEMENT SCHEDULE--WWV**

**FORT COLLINS, COLORADO**

0 to 1 Minutes	Station identification and a short summary of the services available from the station.
8 to 9 Minutes	Weather conditions in the Atlantic, Part 1.
10 to 11 Minutes	Weather conditions in the Atlantic, Part 2.
12 to 13 Minutes	Weather conditions in the Eastern Pacific.
18 to 19 Minutes	Geophysical alert and propagation forecasts.
30 to 31 Minutes	Station identification and a short summary of the services available from the station.

**ANNOUNCEMENTS SCHEDULE--WWVH**

**KEKAHA, HAWAII**

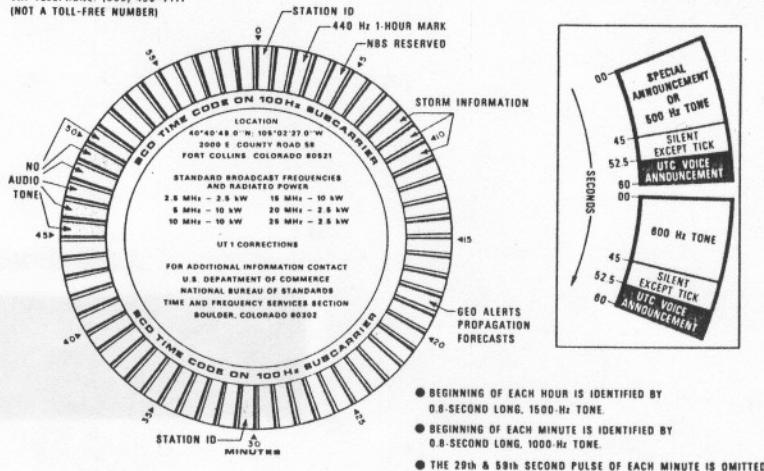
29 to 30 Minutes	Station identification and a short summary of the services available, concluding with "Aloha."
49 to 50 Minutes	Weather conditions for the Pacific area, Part 1.
51 to 52 Minutes	Weather conditions for the Pacific area, Part 2.
59 to 60 Minutes	Station identification and a short summary of the services available, concluding with "Aloha."

Figure 2

**WWV BROADCAST FORMAT**

VIA TELEPHONE (303) 499-7111  
(NOT A TOLL-FREE NUMBER)

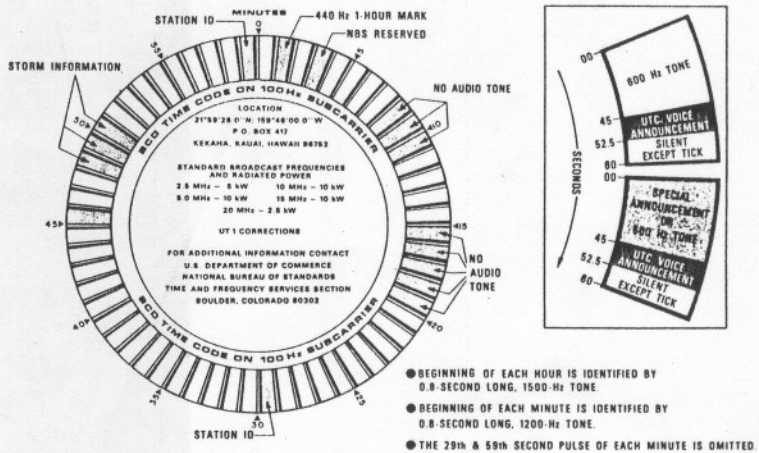
U.S. DEPARTMENT OF COMMERCE  
National Bureau of Standards



- BEGINNING OF EACH HOUR IS IDENTIFIED BY 0.8-SECOND LONG, 1500-Hz TONE.
- BEGINNING OF EACH MINUTE IS IDENTIFIED BY 0.8-SECOND LONG, 1000-Hz TONE.
- THE 29th & 59th SECOND PULSE OF EACH MINUTE IS OMITTED

**WWVH BROADCAST FORMAT**

VIA TELEPHONE: (808) 335-4383 (NOT A TOLL-FREE NUMBER)



- BEGINNING OF EACH HOUR IS IDENTIFIED BY 0.8-SECOND LONG, 1500-Hz TONE.
- BEGINNING OF EACH MINUTE IS IDENTIFIED BY 0.8-SECOND LONG, 1200-Hz TONE.
- THE 29th & 59th SECOND PULSE OF EACH MINUTE IS OMITTED

Figure 1. The hourly broadcast schedules of WWV and WWVH.

FORMAT H, SIGNAL H001, IS COMPOSED OF THE FOLLOWING:

- 1) 1 ppm FRAME REFERENCE MARKER R = (P<sub>1</sub> AND 1.03 SECOND "HOLE")
- 2) BINARY CODED DECIMAL TIME-OF-YEAR CODE WORD (23 DIGITS)
- 3) CONTROL FUNCTIONS (9 DIGITS) USED FOR UT, CORRECTIONS, ETC.
- 4) 6 ppm POSITION IDENTIFIERS (P<sub>1</sub> THROUGH P<sub>6</sub>)
- 5) 1 pps INDEX MARKERS

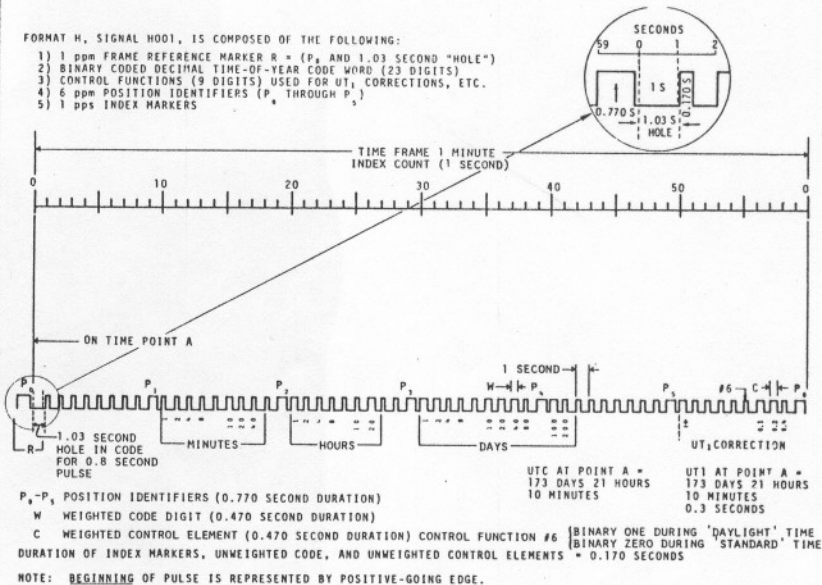


Figure 3 WWV and WWVH time code format.

**STANDARD RADIO FREQUENCIES.** WW and WWH broadcast on 2.5, 5, 10 and 15 Mhz. These frequencies are derived from cesium-controlled oscillators accurate to within 1 part in 10<sup>11</sup>. Due to doppler shift, diurnal shift, and other propagation phenomena, the signal is only accurate to about one part in 10<sup>5</sup> by the time it reaches your receiver. However, unless you like to measure frequencies to the nearest hz, this shouldn't bother you too much.

Because of its accuracy, WW is useful for calibrating receiving equipment. Hams and SWLs use it to calibrate the SW bands on their receivers by tuning to WW and making whatever adjustments are necessary for the dial to read the proper WW frequency. Test equipment, such as frequency meters and crystal calibrators, can also be calibrated by zero-beating their harmonics against WW. First tune in WW. Then turn on/tune in your frequency standard and tweak the trimmer capacitor or whatever until the audible heterodyne (i.e. whistle) and/or rapid variations in your S-meter reading are minimized or disappear. Since accuracy is proportional to frequency, you now have a very precise frequency standard at 3CB frequencies. If you are able to get your standard to within 1hz of WW at 10 Mhz, then at 1 Mhz the calibrator will be accurate to within 0.1 hz plus whatever errors exist in receiving WW.

**TIME OF DAY.** The basic WW format includes a time announcement every minute. Times are Coordinated Universal Time (GMT) and use the 24 hour system. In case you have been wondering, the woman's voice is used on WWH and the man's voice is used on WW. Each second is marked by a time tick, except for the 29th and 59th of each minute, which are omitted. Each hour begins with a 1500 hz tone 0.8 seconds long, followed by 3 seconds of silence and the words "National Bureau of Standards time." The 3 second pause is in case a radio or TV station wishes to use the time tone in their programming without any other announcements or whatever creeping in. Each minute begins with a 1000 hz tone on WW and a 1200 hz tone on WWH. The rest of the time, each second begins with a 5 millisecond pulse of 1000 hz on WW and 1200 hz on WWH.

The second pulses are derived from the same oscillators that control the carrier frequencies and consequently are more than adequate for DXing purposes. The most extensive use I've made of WW is to record it on one channel of a stereo tape recorder while recording DX on the other channel. This gives me a record of exactly when I heard something. In addition, if several weeks or months elapse before I replay the tape, I have a record of the date the tape was recorded, since many of WW's announcements include the date. By checking with my notes I can quickly find if there's anything on the tape worth saving before I erase it.

An added feature of WW is that the day, hour, and minute are transmitted continuously on a 100 hz subcarrier in an IRIG-H format. While most of us don't have much use for this feature, it is useful if, for example, you want to plot a station's signal strength on a strip chart recorder, and record the time along with it. Figure 3 shows the format used. Additional information on this feature can be found in Reference 1.

**STANDARD AUDIO FREQUENCIES.** In addition to the 1000 and 1200 hz time ticks, standard audio tones of 440 hz (A above middle C on the musical scale,) 500 hz, and 600 hz are broadcast, as shown in Figure 1. The 440 hz tone is omitted at 0002 UTC to mark the beginning of a new day. These tones can conceivably be used to tune a musical instrument or to calibrate a filter or oscilloscope or other piece of test equipment.

**PROPAGATION FORECASTS AND GEOPHYSICAL ALERTS.** This material is broadcast at 18 minutes after each hour. The announcement opens with the current K-index value, updated every three hours. This is followed by the current A-index and solar flux values, reports on solar and geomagnetic activity, and a propagation forecast.

This information is very useful to the foreign DXer. The K and A indices are usually good indicators of propagation conditions. If the K-index has been between 0 and 2 for some time, conditions along high latitude paths, such as Europe or Asia, are usually pretty good. If the K-index is around 3, conditions are so-so. A K-index of 4 or more usually corresponds to "auroral" conditions which favor Pan American stations. The A-index is computed on a daily basis and is calculated directly from the K-indices. The approximate relationship between them is as follows:

K	A	K	A	K	A	K	A	K	A
0	0	2	7	4	27	6	80	8	240
1	3	3	15	5	48	7	140	9	400

In addition, the information on solar activity and the state of the geomagnetic field can also prove useful. A quiet field and no significant activity can mean good high-latitude reception, whereas the presence of a "disturbed" or "active" field or major solar activity can produce all sorts of anomalies.

**WEATHER INFORMATION.** WW and WWH broadcast weather information of interest mainly to the ships at sea. A summary of these forecasts is included in Figure 2. These announcements are not very useful to DXers, except possibly to alert them to possible serious storms in a particular area, which could lead to stations in that region operating on emergency schedules.

**SPECIAL ANNOUNCEMENTS.** From time to time, other announcements are made on WW dealing with the stations, its services, or some important scientific event. Sometimes these are worth looking for.

That's a summary of what you can hear. It is worth experimenting to find which frequency provides the best reception for you. My own experience has been that 5 Mhz is best, with 10 Mhz as backup. In some parts of the Northeastern North American continent, WW doesn't always come in too well. If that is the case for you, then CHU, operated by the National Research Council in Ottawa, might be the answer. CHU operates on 3330, 7335, and 14670 khz with 3 kw, 10 kw, and 3 kw respectively. Although propagation forecasts, etc. are not aired, time signals are provided NSP with voice announcements every minute in English and French. Many other stations around the world also serve as time and/or frequency standards. However, since most operate with low power and/or on WW frequencies, their interest in North America is limited mainly to utility DXers.

Such then are WW and WWH. While the programming may not be the most exciting thing in the world, there is a wealth of information available for those who want it. (Revised 3/77)

**REFERENCES:**

1. "NBS Frequency and Time Broadcast Services", National Bureau of Standards Special Publication 432; U.S. Government Printing Office, Washington, DC. January 1976.
2. "Standard Frequency and Time Services of the National Bureau of Standards", Bulletin 373; True Time Instrument Co., Santa Rosa, CA. 1973.
3. World Radio TV Handbook. 1975 Edition. Page 296.
4. Hauser, Glenn. "The K Index", DXWW I, DX Monitor, January 11, 1975. Page 217.
5. Hauser, Glenn. "A and K Index Equivalency", DXWW II, DX Monitor, March 22, 1975. Page 370.

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