

# New NIST time code to boost reception for radio-controlled clocks

EurekaAlert!

The National Institute of Standards and Technology (NIST) is changing the way it broadcasts time signals that synchronize radio-controlled "atomic" clocks and watches to official U.S. time in ways that will enable new radio-controlled timepieces to be significantly more robust and reliable.

This new time broadcast protocol will not only improve the performance of new radio-controlled clocks and watches, but will encourage the development of new timekeeping products that were not practical with the old broadcast system because of local interference or other limitations. For example, appliances such as refrigerators, microwave ovens and thermostats, as well as traffic light timers and sprinkler systems will be able to take advantage of this new phase modulation broadcast.

Popular radio-controlled timekeepers, which range from wristwatches to wall clocks, are not really atomic clocks—though that's often in their name—but they do set themselves by listening to low-frequency AM time broadcasts from the NIST radio station WWVB in Fort Collins, Colo. Those broadcasts are synchronized to the NIST atomic clock ensemble in nearby Boulder, Colo.

However, sometimes the radio-controlled clocks have difficulty accurately picking up the WWVB time signal because of the clock's location, local radio interference, effects of buildings, and other problems. Moreover, a time broadcast from England on the same frequency also interferes with devices on the east coast of the United States that rely on the NIST broadcast, according to John Lowe, station manager for WWVB.

To solve these problems, Lowe says, NIST has developed, tested and is now beginning to implement the new phase-modulation WWVB signal. Like a traditional AM radio station, time information is encoded in the WWVB broadcast by changes in the strength or amplitude of the radio signal. Phase modulation adds an additional layer of information encoded by shifting the phase of the carrier wave. (The crests of two waves that are "in phase" pass a point at the same time. If one is phase-shifted, the crest will arrive a little before or after the other.)

This change significantly improves signal reception and overall performance of new products that are designed to utilize this new protocol. Legacy clocks and watches will still continue to function as they have because the amplitude modulation remains the same, but they will not benefit from the increased performance of the new phase modulation protocol, Lowe said.

These new products and non-networked systems will be able to take advantage of

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the improved NIST broadcast format thanks to next generation receiver chips that will begin entering the marketplace in 2013.

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