



Say, do you have the time?

Every October, we go through the annual ritual of turning our clocks one hour back to switch from daylight-saving time to standard time. Several years ago, in a combined fit of curiosity and paranoia, I made a list of all the clocks I had to change,

and I was surprised to find that there were more than 20 of them; it's not at all hard to have so many. Besides the obvious ones—wrist watches, dashboard clocks, wall clocks, and VCR settings—embedded appliance timers, cell-phone clocks, and many other gadgets have this vital time-telling function.

Some clocks, such as those built into the Windows 98 operating system, automatically do the seasonal switch-over as yet another favor to you. (Secretly, I think it's the OS's way of letting you know that it knows more about your world than you do.) But you need to manually change most clocks—one at a time. I make these changes by setting my wrist watch to the precise time and then going all over the house changing the other clocks using my calibrated

watch to check my corrections.

I was struck by a delicious contrast. The previous week, the local PBS TV station broadcast a documentary *Lost at Sea: The Search for Longitude*, based on the 1995 surprise best-seller (**Reference 1**). The show and book tell the story of how, by 1762, the extraordinary self-taught genius John

prize-winning model H-4 was mounted in a box with gimbals and carefully swaddled in packing material to minimize the effects of vibration. In contrast, we now treat many watches as throwaways.

We have come this far: From crude clocks to a single, handcrafted precision timepiece, to our forest of discrete watches and embedded time functions, we now have relatively inexpensive and available atomic clocks as our standard. Our \$10 watches exceed the accuracy of Harrison's creation. But there's irony here: The same technological advances that enable us to surround ourselves with so much time measurement also contribute to the lack of time in our day (**Reference 2**).

Harrison's watch did more than allow the navy to sail the featureless seas. It made the precise measure-

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Harrison painstakingly hand-built a clock that would at last meet a long-sought goal—an inaccuracy of just a few seconds a month. This clock was precise enough to allow accurate determination of longitude, which the British navy needed for navigation and mastery of the sea. Harrison's chronometer was quite a leap from the timepieces of just a hundred years earlier, which had only an hour hand; a minute hand would imply precision that those timepieces just did not have.

Harrison's winning chronometer was the culmination of 20 years of experimentation, determination, insight, innovation, materials selection, and incredibly clever mechanical error-compensation techniques. His timepieces, some of which still run today, were unique in ways we can't comprehend. His

ment of time convenient and achievable and so triggered science experiments, astronomical observations, and many other activities that previously were impractical or grossly inaccurate (**Reference 3**). We're still seeing the effects of affordable, accurate time measurement in our lives and designs.

References

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3. Andrewes, William JH (editor), "The Quest for Longitude: The Proceedings of the Longitude Symposium," Harvard University (Cambridge, MA), Nov 4 to 6, 1993.

