

PARDON ME, GOT THE TIME?

BY MICHAEL JAY GEIER

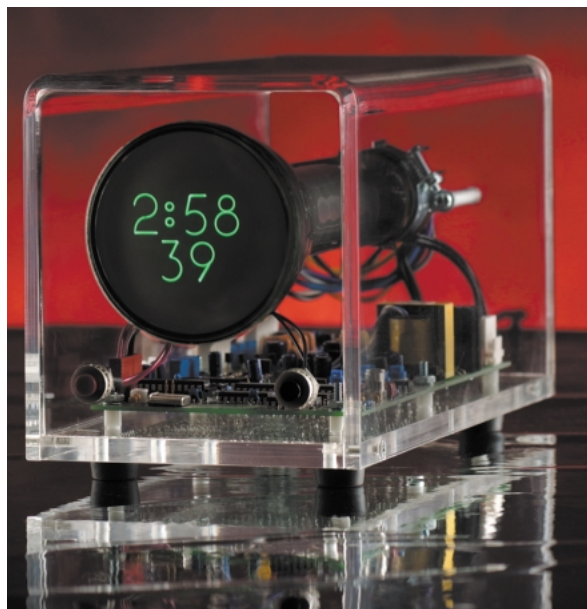
If you're an engineer, your reply just might be, "Sure. You want that in binary?" Let's face it, we tech types love clocks: LED, LCD, nixie, analog, GPS, radio synchronized, even atomic. So *IEEE Spectrum* picked out a few gems for your mantelpiece.

Take the Powers of 2 clock from Realnerds (<http://www.realnerds.com>). This clock will confound your nontechie friends while bringing a smile of recognition to every programmer you know. No numbers here, just six columns of LEDs, one column for each digit marking the hours, minutes, and seconds, in blue (US \$22.98) [see photo, "Bit by Bit"] or red (\$19).

As the seconds tick off, the resulting pattern is enigmatic to anyone not familiar with the code, which is binary-coded decimal. Read upward from the bottom of a column, each LED represents 1, 2, 4, or 8. Time is read by adding (quickly) the values of the lighted bits in each column. For example, the time on the clock in the photo is 02:26:52. (The columns representing the tens of minutes and hours need only reach 5, so 3 bits are sufficient. Likewise, the first column needs 2 bits to represent 0, 1, or 2.)

It sounds baffling but really isn't; my nontechie brother, who didn't even realize the thing was a clock when he first saw it, got the hang of reading it in about 2 minutes and fell in love with it. The constantly changing pattern is mesmerizing, though it can be distracting because of the high brightness of the LEDs. It's a nice effect on a bookshelf in the den, but you probably won't want to put this clock over your TV or anywhere in your bedroom. Still, it's a cool clock.

If you're over 40, you probably remember nixie tubes, the pre-LED vacuum-tube readout in wide use through the 1960s [see "New Life for Nixies," *Spectrum*, June 2002]. With their neon-orange glow and rounded, fully formed digits, nixies have an elegant look. Though the tubes are no longer being made, surplus stocks permit the manufacture of small quantities of nixie products.



TIME SCOPE: Looking like a prop from a 1950s' sci-fi movie, the Scope Clock is available in a clear plastic or wood case and comes either preassembled or in kit form.

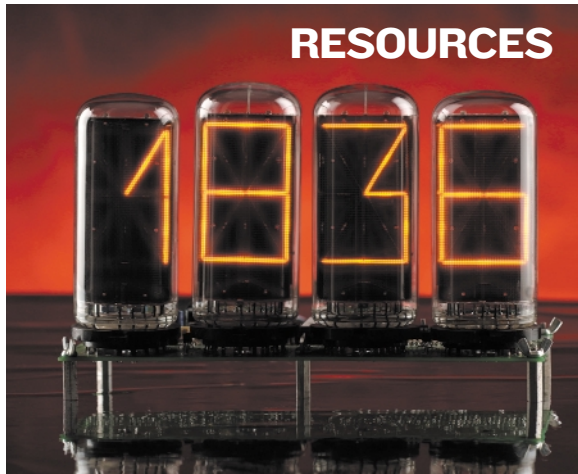
Jeff Thomas at Resonant Instruments LLC, in Mesa, Ariz., blends modern technology with the nixie tube, with his NixiChron clock (\$499; <http://www.amug.org/~jthomas/clockpage.html>) [see photo, "Back to the Future"]. Its anodized metal base and bare tubes are geek-chic, and the tiny Global Positioning System receiver that plugs into the back keeps it accurate anywhere in the world. An included extension cable lets you put the GPS module on your windowsill or even outside, but I had no trouble picking up the satellite signals at my desk.

The clock's menu offers all kinds of options, including a scrolling display of temperature from a built-in thermometer and latitude/longitude coordinates. It's a truly classy timepiece and my favorite of the bunch.

Another, but very different, nixie clock is the GeekKlok from Zetalink Technology (<http://www.zetalink.biz>) [see photo, "Segments of Orange"]. The nixies used in this kit are segmented in 16 straight lines, so various fonts and simple animations can be presented. The effect can be bizarre, with some fonts (including Klingon from "Star Trek"!) unreadable to anything but the trained eye. An internal crystal oscillator provides the time base, with correction once a day from the ac power line's frequency.



BIT BY BIT: [Above] The Powers of 2 clock's LEDs tick off the time in binary-coded decimal. **SEGMENTS OF ORANGE:** [Top right] The GeekKlok can display a number of fonts. **BACK TO THE FUTURE:** [Bottom right] A marriage of today's tech and retro-chic, the NixiChron gets its time from satellites.



RESOURCES

The clock also accepts a 1-pulse-per-second signal from an external timing generator, for time accuracy as good as that of the source. At \$99, the kit is a bargain, though the nixie tubes are extra and come from a different supplier, to which Zetalink refers you.

Still in the retro-look department, the **Scope Clock** from David Forbes at the Cathode Corner Web site (<http://www.cathodecorner.com>) presents the time on the face of an oscilloscope tube. Each number is drawn as a series of arcs on the 7.6-centimeter-diameter screen [see photo, "Time Scope"]. Depending on the type of external case you select—it comes in plastic or hardwood—prices for assembled versions range from \$350 to \$495, with kits available for \$50 less.

My review unit's clear plastic case is very sci-fi and makes me wish I had a spark generator to put next to it, for the full 1950s "movie mad scientist" look. Timing comes from an internal crystal, but an optional input connector allows for an external 1-pps timing source.

Using a 1-pps time source is standard in the world of atomic and GPS-derived clock systems. You don't have your own

atomic clock? Well, they're not completely out of reach. You can get atomic clocks with serious accuracy at surprisingly reasonable prices.

Stanford Research Systems, in Sunnyvale, Calif., sells its **FS725 Rubidium Frequency Standard** for \$2495. With no time display, this isn't a clock by itself, but its 1-pps output can drive any compatible display. With estimated 20-year aging of less than 5 parts per billion, this baby should keep you on time!

A rubidium frequency standard may be darned good, but the best standards use cesium. Agilent Technologies Inc., Palo Alto, Calif., sells its **5071A Primary Frequency Standard** for \$50 390, with long-term stability, the company claims, exceeding 0.01 parts per trillion. Short of exotic clocks such as the Atomic Fountains used to establish official time, that's about as good as it gets, and Agilent throws in a built-in clock display, too.

Don't have quite that much to spend on timekeeping? You can find bargains sometimes on eBay. Rubidium standard clocks, some brand new, have gone for around \$500 to \$1500, and used cesium standard clocks for \$1000 to \$2000. The surplus cesiums, though, generally have worn-out cesium tubes that won't stay frequency locked for long periods, so they aren't useful where ultimate accuracy is required.

Oops, I'm out of time! ■

MICHAEL JAY GEIER has been writing for the technology press for 25 years. Living in Mar Vista, Calif., he contributes regularly to *EE times*, *73 Amateur Radio Today*, and *Envisioneering*.