

A SPACE ODYSSEY



The time at the push of a button: to reduce drain on its battery, the Pulsar watch displayed the time only after the user pressed the corresponding button.

Photos by Günther Ramm

Hamilton made headlines around the world in the 1970s with the launch of the Pulsar, a light-emitting-diode quartz wristwatch. But the lifespan of this first digital watch was brief. The Hamilton brand has belonged to the Swatch Group since 1977.
BY LUCIEN F. TRUEB

Since its founding in 1892, the Hamilton company has produced high-quality watches in relatively small numbers. Among many other watches, Hamilton built chronometers for the U.S. Navy during World War Two, which actually outperformed the chronometer models that the navy had been importing from Switzerland. Shortly after the war's end, Hamilton began collaborating with the Epperlein Company in Pforzheim, Germany, to develop a battery-powered, electro-mechanical clockwork with a motorized balance. When the Electric" model debuted in 1957, it was lauded as the first fundamental

innovation in timekeeping technology in 477 years. This claim was slightly exaggerated, however, because Lip in Besançon, France had already launched a similar clockwork in 1952.

The balance was equipped with a flat coil. With each oscillation of the balance, this coil briefly contacted the battery. As a result of its interaction with three stationary magnets, the balance received a mechanical impulse. The formation of sparks however, caused the contacts to burn out after two years or less, requiring costly repairs.

Bulova launched its tuning fork Accutron wristwatch in 1960. Suddenly there was a

timepiece that had abandoned the centuries-old principle of timekeeping on the basis of a rotating oscillating organ composed of a balance and balance-spring. The source of the Accutron's tempo was a high frequency, electronically stimulated vibrating body. As far as its rate was concerned, the Accutron was far more accurate than the Hamilton Electric. Engineers in Hamilton's research laboratory filmed an Accutron in action, viewed the footage in slow motion, then painstakingly disassembled the watch and meticulously analyzed how it worked. They would gladly have imitated this genuinely innovative construction, but Bulova's patent protection was as watertight as an oyster - and Bulova wasn't willing to grant any licenses.

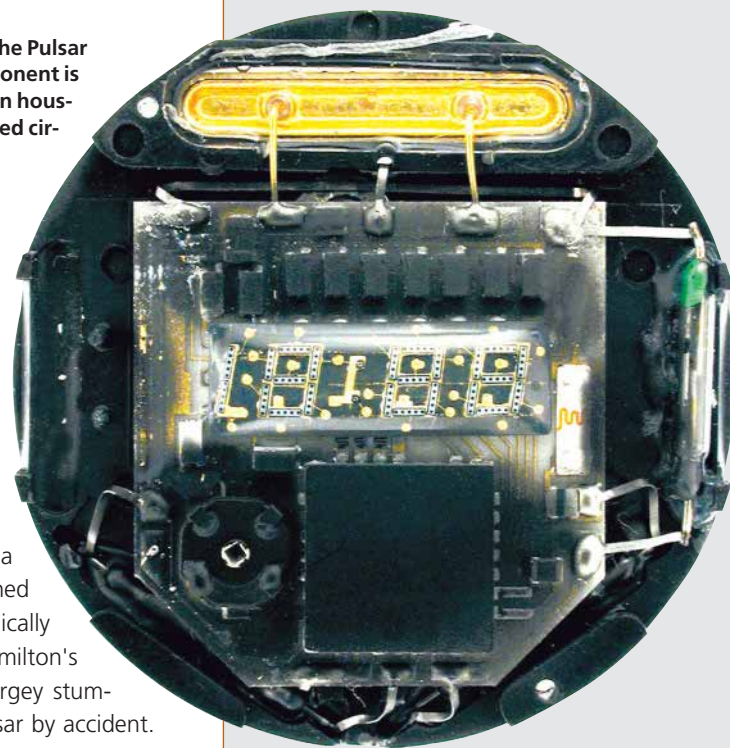
A 1966 visit by science fiction author Arthur C. Clarke and movie director Stanley Kubrick distracted the engineers from any further brooding about this problem. Clarke and Kubrick were working on their film *2001: A Space Odyssey* and wanted to furnish the spaceship *Discovery* with futuristic timepieces. Hamilton Watch agreed to design and build the required timepieces free of charge in exchange for mention of the firm's name in the movie's credits. The table clock that Hamilton designed for the landmark motion picture was encased in a streamlined, elliptically shaped, midnight-black plastic case. The hours, minutes, and seconds were displayed by luminous orange digits that lit up in synchrony with a quartz oscillator which selectively excited seven bar-shaped segments that combined to form a rectangular "8" of the sort that's currently used around the world on computers and digital timepieces with liquid-crystal displays. Each of the eight segments was individually governed and therefore required its own integrated circuit. This was a bulky solution, but miniaturization wasn't a priority in this particular case.

When the results of a chronograph contest were made public at the Neuchâtel Observatory in February 1968, quartz movements were announced as the winners of all 15 first prizes. This news caused genuine consternation at Hamilton. Switzerland and Japan were so far ahead of their competitors that it seemed impossible to catch up. Hamilton needed to develop an original electronic product of its own -

The clockwork module of the Pulsar II: (above) the quartz component is located in the upper, golden housing. The quadratic integrated circuit (below) comprises the "heart" of the wristwatch.

and needed to do so as quickly as possible. Hamilton's executives decided to try to miniaturize the Space Odyssey table clock. If the company's engineers could accomplish the feat, then Hamilton would have something genuinely new to offer: a wristwatch that functioned entirely without mechanically moving components. Hamilton's research director John Bergey stumbled across the name Pulsar by accident. Working late at the office one evening, Bergey noticed an astronomy magazine that had been left lying on an employee's desk. Bergey thumbed through its pages and chanced upon an article about rapidly rotating neutron stars that emit narrowly focused bursts of radiation at regularly timed intervals. Astronomers had coined the neologism "pulsar" to describe these bizarre pulsating stars. "Pulsar," Bergey realized, would also be an ideal name for Hamilton's new wristwatch, so the company immediately registered it as a brand name.

Shortly after the development work had begun on the new wristwatch, Hamilton received a phone call from Electro/Data, a small electronics company based in Garland, Texas. The Texans had built a functional model of a digital clock with a point-matrix light-emitting-diode (LED) display. And they were prepared to miniaturize it down to wristwatch format. Bergey and his colleague Dick Walton flew to Dallas to take a firsthand look at the prototype, which had been constructed by an electrical engineer named Willie Crabtree. The frequency divider and decoder were built using six-volt, CMOS technology. The power source was a homemade battery consisting of three silver oxide and zinc cells. Hamilton signed a contract with Electro/Data under the terms of which Electro/Data agreed to shrink the clock down to wristwatch size within a very short

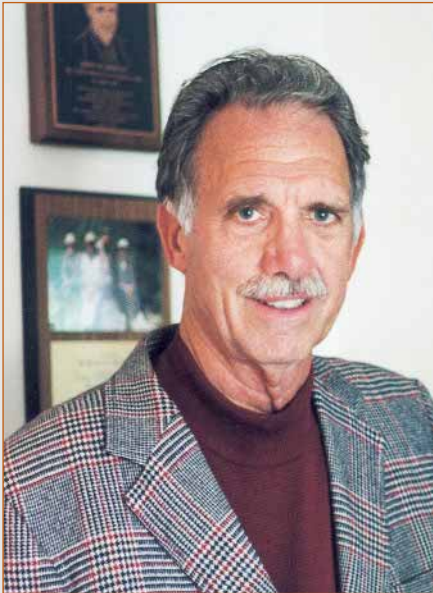


The Pulsar II Date has two push-pieces to trigger the displays of the time and date

THE HAMILTON PULSAR



Willie Crabtree built the prototype of an LED clock and collaborated with Hamilton to further develop the idea into a wrist-watch model that could be mass-produced.



John Bergey, Hamilton's former technical director, chose "Pulsar" as the name for the new watch.

time - in exchange for Hamilton's payment of several hundred thousand dollars.

One of the reasons why Hamilton was in such a hurry to develop the Pulsar was that the company's competitors (Timex, Citizen, and Seiko) were gobbling up ever-greater shares of the market. Hamilton urgently needed an innovation that would put the company back into the headlines. The Pulsar fit the bill to a tee. The prototypes, which first became available in May 1970, were presented to the media at New York's elegant Four Seasons restaurant. Launched as the "Wrist Computer," this version of the watch was equipped with 44 tiny integrated circuits interconnected by more than 4,000 hair-fine wires. This formation was deeply problematic because such a large number of connections virtually guaranteed circuit failure. Also, if the time was displayed continually, the battery was exhausted within a few minutes. Only five prototypes were still functional when the presentation was over. Three of those five gave up their digital ghosts at the cocktail party that followed the media event. When the time came for the Pulsar to be presented on the Johnny Carson show, only one of the prototypes was still in working order. But one was enough to cause a huge furor.

Over the next two years, RCA succeeded in integrating the Pulsar's complicated switching into a single integrated circuit. In addition, the newer versions of the watch relied on three-volt CMOS technology. This voltage was required to govern the displays on the light-emitting diodes. Two button-sized silver oxide batteries sufficed to supply the watch's energy needs. They gave the timepiece a full year's power reserve - assuming that the watch wasn't consulted more than 25 times a day. So much energy was required to illuminate the watch's display that the Pulsar's dial spent most of its life in the dark and only lit up when triggered to do so by a fingertip's pressure one of its control buttons. A commercial 32-kilohertz quartz oscillator was used as the resonator.

For the mass-produced model, the original point-matrix display was replaced by segment-shaped LEDs of the sort that were then in use on pocket calculators. A solar cell automatically adjusted the brightness of the display in four stages (100%, 50%, 25%, and 12.5%) depending on the prevailing ambient lighting

Pulsar at the auctions

Around the clock on any given day watch collectors spanning the globe search online auction sites (such as Ebay) for vintage Pulsar LED timepieces. Once found, they track their prey for up to ten days. Some place an initial bid to "mark their territory" or lie still in the tall grass until the last few seconds of the auction's end. Due to time zone differences, I have known some LED collectors who set their alarm clocks for auctions that end in the wee hours. For the gleeful winners, they have won the horological wonder of the 1970's...the Pulsar, also known as the "Time Computer." Quite often the winner has a stable of each of the Pulsar line of LED watches and just wants to add another. Less frequently, a particular rarity comes along such as the P1 in solid 18-Kt gold. In the month of January such a Pulsar came up for auction and just a few days into the auction it had been bid up to \$17,500. Thanks to online auctions, LED watches and especially the Pulsar are coming back into vogue and are now easier to obtain for a whole new generation of watch enthusiasts.

Nick Gismondi


conditions. The dark red filter through which the luminous digits were visible was originally made from red Plexiglas. This material was later replaced by ruby glass. Electro/Data delivered the first 500 clockworks from Texas before production was transferred to Hamilton's factory in Lancaster, Pennsylvania. It cost \$700 to manufacture each watch at first, but as the years went by this sum was reduced to slightly less than \$50.

The Pulsar triggered a worldwide sensation. The emperor of Abyssinia, the shah of Iran, King Hussein of Jordan, U.S. presidents Nixon and Ford, Soviet head-of-state Leonid Brezhnev, actors Jerry Lewis and Roger Moore, as well as numerous other celebrities had already ordered their Pulsars in 1970 - and were obliged to wait nearly two years before they could accept delivery. The first series of 300 specimens sold out in just three days. This model was equipped with a solid gold case and an integrated wristband and retailed for an extravagantly high \$2,100. Despite the steep price, Hamilton received thousands of orders. A version in a steel case was soon launched, selling for the more moderate price of \$275.

The Pulsar was available at Beyer Jewelers on posh Bahnhof Strasse in Zurich, a fact that elicited much glee from the American press. Newspapers in the United States carried a car-

THE HAMILTON PULSAR

Pulsar®
Time Computer®
Calculator



Sample Calculations

Calculation	Enter	Display
14 - 9 = -23	14 \ominus 9	= - 23
29 - 17 = -12	29 \ominus 17	= - 12
43 x 9 = 387	43 \otimes 9	= 387
14 ÷ 5 = 2.8	14 \oslash 5	= 2.8
47.50 + 6% = 50.35	47.50 \oplus 6 \oslash 100	= 50.35
250 - 12% = 220	250 \ominus 12 \oslash 100	= 220.00

IMPORTANT: Do not leave computer in calculating mode for extended periods - this causes excessive power drain. Return to timekeeping mode by pressing command button once.

Memory
(100 x 56) + (97 x 27) - (500 x 19) = -1281
100 \otimes 56 \oplus 97 \otimes 27 \ominus 500 \otimes 19 \ominus \oslash 1281

Note: To clear memory, press \oslash key twice

Pulsar, Computer, and Time Computer are registered trademarks of Time Computer Inc., Subsidiary of HMW Industries, Lancaster, Pa. 17604. Printed in U.S.A. Part No. 3443-16 1-77

The highlight of the Pulsar collection is the world's first combination of an LED wristwatch and a miniature pocket calculator. The device's electronic brain calculated fractions to 12 digits to the right of the decimal point, but the display showed only the first six digits. The accompanying instruction card explained how to operate the calculator.



toon of the Statue of Liberty wearing a Pulsar on her raised wrist. It looked like good old Yankee ingenuity had just trumped centuries of meticulous Swiss craftsmanship in one battery-aided bound.

As the years went by, the Pulsar's image as a cult object gradually faded. There was hardly a shortage of copycats. Fairchild, for example, first marketed its own LED wristwatches in 1973. Texas Instruments and other license-holders quickly followed suit. Electronics companies like Hughes Aircraft, Fairchild, Micro-ma, National Semiconductors, and Texas Instruments began the mass production of cheap digital watches with permanently illuminated liquid-crystal displays (LCDs). Thirty million watches of this kind had already been sold by 1976, and the number climbed to 42 million a mere twelve months later.

Hamilton was particularly vulnerable because it needed to purchase all of the Pulsar's components from third-party suppliers and occupied itself solely with the task of assembling the parts. Vertically integrated electronics companies thus enjoyed an unbeatable structural advantage. HMW had no choice but to throw in the proverbial towel in 1977. The Pulsar brand and the know-how required to build Pulsar watches were sold to Rhapsody Inc., a jewelry manufacturer in Philadelphia. The brand finally

came under Seiko's ownership. Seiko still uses the name today for its collection of conventional quartz wristwatches. Hamilton was taken over 100% by the Swiss SSIH concern, which was later absorbed by the Swatch Group.

All of Hamilton's employees lost their jobs when the company was sold. One of Hamilton's microelectronics engineers was given the entire Pulsar inventory, worth several million dollars, as a golden parachute. The only strings attached to the gift were that he had to agree

It looked like good old Yankee ingenuity had just trumped centuries of meticulous Swiss craftsmanship in one battery-aided bound.

to handle any situations arising from the watches' guarantee for the next three years. The man had little work to do because the Pulsar had evolved into a top-quality wristwatch.

Nothing could wear out and only seldom did any of its components fail. When the contractually agreed three-year period had elapsed, the lucky engineer still had a huge inventory of Pulsar components which he assembled into complete watches and sold as "factory new" specimens.

Hamilton manufactured a total of approximately 100,000 Pulsar wristwatches, most of which still exist today. From a commercial point of view, LED wristwatches have been pretty much dead for more than two decades, but collectors still appreciate them as significant artifacts embodying an important chapter in the history of 20th-century technology.