Seiko Quartz LC V.F.A. 06LC

October 1973



Size (dimensions of movement with LCD panel):
(W)26 x (D)29.2 x (H)8.35 mm
Accuracy: ±10 sec/month, avg.
Display: Field-effect liquid crystal
Case material: Titanium

Product Features

The Seiko Quartz LC V.F.A. 06LC was a fully-electronic watch that used the world's first six-digit liquid-crystal display to indicate the time. Capable of continuously displaying the hour, minutes and seconds on a field-effect liquid crystal display that Epson* developed for quartz watches, this groundbreaking digital watch attracted wide attention when it was first marketed, in October 1973.

The most important feature of the 06LC was its driving mechanism. An analog watch indicates the time with hands that are turned by a stepping motor. The stepping motor's movement is controlled by electrical signals that are synchronized with a time standard based on pulses from a crystal resonator. In contrast, the digital quartz 06LC was designed such that the electric signals were sent directly to the liquid crystal panel, where they were converted to digits on the display. The display took advantage of the property of liquid crystal molecules that makes them change alignment under an applied voltage. Molecular alignment changes were translated to the eye as a difference in color or transparency. The internally developed LCD was long-lived (50,000 hours) and had good contrast. A lamp provided enough illumination to make the numbers on the display easy to read, even in the dark. The timepiece boasted some very user-friendly features. Users could, for example, set the time down to the second with pushbuttons, or reset the hour and minute independently.

The 06LC also combined numerous other outstanding features that made it worthy of being called the next-generation quartz. Among them: high accuracy provided by a crystal resonator, high reliability that realizes long life, and the high stability that comes without the need to drive mechanical parts.

Background

In the latter half of the 1960's a desire to display time with numbers instead of hands provided momentum to efforts around the globe to develop a digital watch. Anticipating changes in the market, Epson began pursuing the development of an all-electronic watch in parallel with development of a quartz watch. While such display technologies as light-emitting diodes (LEDs) and dynamic scattering mode (DSM) LCDs existed at the time, Epson researchers needed a lower-power alternative that would provide good visibility. The company thus launched an internal program to develop a field-effect LCD. Numerous technical hurdles had to be cleared. Researchers had to develop a way to synthesize liquid crystal that was suited for use in watches and they had to find a way to inject it into a pair of sandwiched panels. They had to develop an electrode structure and had to meet certain operating temperature range parameters as well as panel display contrast conditions. Moreover, the development effort demanded that Epson marshal together its micro-power electronics technologies—the precision processing technologies the company had developed in the manufacture of mechanical watches and the volume production technologies it used for quartz watches. This program finally culminated, in 1973, in the successful development of the 06LC, an all-electronic watch that displayed the time on a liquid crystal panel instead of by hands on a dial.

Impact

The 06LC digital watch was received even more favorably by the market than had been expected. And, despite initial concerns about the display's reliability, not one watch was returned due to a faulty display panel. Subsequent active efforts to manufacture and introduce digital watches resulted in Epson's LCD system becoming the world's choice for digital watches. Having achieved success with LCDs in digital watches, Epson set it sights on building the LCD business by developing applications for products other than watches.

*Then known as Suwa Seikosha Co., Ltd.