Sharp EL-8, an Early Electronic Pocket Calculator (1970)[1]

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Introduction

Around 1970 the calculator world was in full transition. On the one hand, the classic calculating instruments were at their peak of perfection, for example the 4-function electro-mechanical calculators with 10-key input or the all-plastic duplex slide rules with 20 or more scales. But on the other hand electronic tabletop calculators had already been brought to market, although expensive and often built with less reliable binary switching devices such as telephone relays, radio (vacuum) tubes, or *thyratrons* (gas-filled tubes). Another switching component, the *dekatron* (gas-filled decade counting) tube (used in the first full-electronic calculator ANITA MKVII from the Bell Punch Co, UK) still used the more familiar decimal logic. The first integrated circuits (IC's, now commonly called "chips") in 1968 however promised a future of reliability and mass-production, now long since a reality with pocket calculators, which can be cheaper than the batteries powering the electronic circuits. The advances achieved in current pocket calculators become more evident when we consider one of the first Sharp pocket calculators from 1970.

EL-8

Sharp Corporation, Japan, had already in 1966 brought to market an electronic tabletop calculator, built with discrete transistors and the famous Nixie-tubes in the display window: the Compet 20, see Figure 1. In 1969 the smaller QT-8/D appeared, now equipped with four special purpose IC's (by Rockwell Corp.) for the calculating functions.

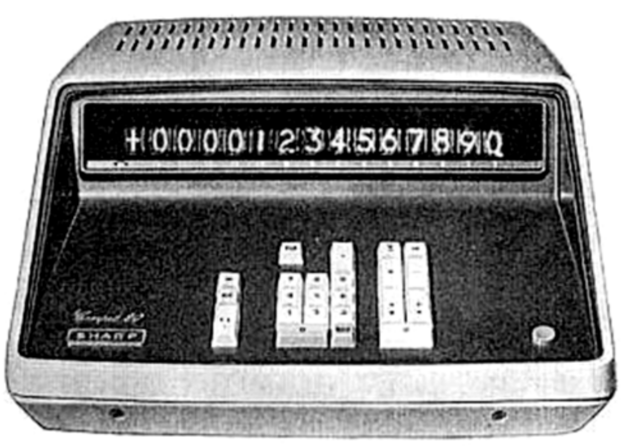

FIGURE 1.
Compet 20, from [6]

In 1970 this machine was improved and further shrunk into the EL-8 (see figure 2) with "pocket" dimensions, although one needed large pockets for it. Not only was the EL-8 bulky (6.5" x 4" x 2.7") and heavy (over 1½ lb.) compared to modern calculators; also, the price was hefty: 345 US dollars in the early space age. The portability and power independency was achieved by incorporating an accumulator pack of six NiCd penlight cells.

FIGURE 2.
EL-8 with power supply and manual

Display

Was the EL-8 user-friendly?

When the machine was switched on the display showed a strange image: jittery and seemingly incomplete digits. The manual indicated that after "power on", one had to press the clear-button (C) twice before calculations could be started. At that point, eight zeroes were visible in the display, however with half the size one would expect. This was caused by the choice of the digit font: eight more or less "flexed" segments that could be illuminated in specific combinations to form any digit. This font design was a step back from the Nixie-tube digits that had a free flowing form, each one in its own plane. Later the even more stylised digits with seven linear segments were adopted for cost reduction reasons.

Figure 3 shows the structure of the EL-8 segments and the full image of the display that used a separate vacuum-fluorescent tube for every digit. The zero has been designed half-size, probably for clear distinction from other digits. Still the image of the zero looks awkward and could easily be misunderstood for a display error.

FIGURE 3.
EL-8 digit segments and all 10-digit shapes

Keyboard

Another characteristic of the EL-8 is its keyboard. Each key depresses smoothly over 3 mm, but without tactile feedback. The switching function is realized by shifting a permanent magnet along a glass-enclosed “reed” contact. Reed contacts were used in the telephone switching exchanges of the 1960s and the 1970s, for example by AT&T and Philips Telecommunications Industry. They were reliable, free of corrosion, explosion-proof, and long-life, but quite expensive.

The high price of the keys may have been a reason to minimize the number of keys: not four keys were used for the four calculating functions (+, −, x, ÷), but only three (see Figure 4). The combination key x÷ was used for both multiplication and division, and the choice between the two was made by requesting the result with the + = key or the − = key respectively.

FIGURE 4.
EL-8 keyboard and display

FIGURE 5.
Solid construction

Other peculiarities

Repeated multiplications required each time the pressing of both the x ÷ key and the + = key; as there was no possibility to memorize a multiplication factor. Suppression of leading zeroes was not provided for: Figure 4 shows the number 5 behind many leading zeroes.

The good news was that after overflow beyond 8 digits, when the machine switched on the "error" light, there was available a *decimal-call-back* function to determine the position of the decimal point in the invisible overflow digits. As the manual describes, one should execute in this error situation a multiplication with 0.000 000 1, so that the decimal point again appears on the display: the real decimal point can in that case imagined to be 7 positions to the right. This is very handy, if one can remember the procedure.

When dissembling the EL-8, one is struck by the differences in physical design with current portable gadgets: separate circuit boards with wide multi-wire connectors and tens of screws in metal frames.

Conclusion

This is how we look back on the EL-8 today, but in 1970, this hi-tech electronic calculator, for the first time in pocket format, must have made quite an impression.

Footnote

1. Adapted and translated into English by the author from the original Dutch article in *MIR44*, April 2007, p. 5

Internet references

1. http://www.datamath.org/Related/Sharp/EL-8
2. http://www.classiccmp.org/calcmuseum/EarlySharp
3. http://home.vicnet.net.au/~wolff/calculators/electronic/Sharp/EL8M/EL8M
4. http://www.oldcalculatormuseum.com/sharpel-8

In Memoriam - Dr. Brian B. Lloyd, CBE, MA, DSc

Werner Rudowski

We met Brian for the first time in 1989 at the Birmingham Museum of Science and Industry, where Richard Knight presented his collection. Besides Brian and Richard, John Knott also attended this "First International Meeting of Slide Rule Collectors" as somebody called it later. The photograph with Brian at a huge logarithmic wage-calculator was taken at this opportunity.

Since then many letters have been exchanged with Brian. In 1990 Brian and his wife Reinhild visited us in Bochum. Besides discussions on slide rules and my collection, we were impressed by Brian's broad knowledge on many other fields. It was very interesting to hear how Reinhild and Brian enjoyed the day in Buckingham Palace when Queen Mum granted Brian with the "Commander of the British Empire" (CBE).

A year later we were invited to the Lloyd's home, a huge manor house, full of paintings, books, books, and slide rules. We enjoyed the garden – more a park. Brian showed us his collection of old masterpieces, stored in the basement. And a surprise, he proudly showed us his well-equipped workshop, where we could admire some self-made pieces of furniture, including a beautiful table.

After his retirement as professor in Oxford, Brian was busy in many fields, not only in collecting slide rules or manufacturing tables. More than full-time he was working on the affairs of his very old friend and colleague Hugh Sinclair, an authority on the polyunsaturated fatty acids in nutrition. He became also – at the age of 70 – Director of the International Nutrition Foundation, a small research charity.