The Olivetti M20 and the history of a website

by Davide Bucci

1 - Introduction

The Olivetti M20 was a remarkable computer, developed at a time when it was not yet clear that Intel processors and MS-DOS would play a big role in the years to come. Ultimately, it would not have direct successors and did not create an ecosystem large enough to survive more than a few years. Nonetheless it found a small niche, notably in Europe and contributed to the daily work of many small businesses.

This article presents the M20, as well as the operating system that Olivetti developed for it, the PCOS. I have been and still am the webmaster of a website, dedicated to this machine, which went online in 2005, so the second part of this article is more of a personal nature and describes the history of my computer as well as that of the website I dedicated to it.

Figure 1 - The M20 case, designed by Ettore Sottsass

2 - The beat of a different drum, the Z8001

Development of the M20 (internally called PC1000) started in 1979 in the Olivetti Advanced Technology Centre (ATC) in Cupertino, California, not far from the Apple headquarters. Olivetti presented the computer to the public on March 31, 1982, in the magnificent castle of Agliè, not too far from Ivrea in Italy [1]. They had already used the M20 name for a older model of typewriter in 1920 and hoped to repeat the success for the then blossoming personal computer market. The newborn was based on the Zilog Z8001 processor, like all machines of the 'LINEA 1' (L1) family, completed by the M30, M40 and M60 minicomputers. The M20 ran a proprietary operating system developed specifically for it, the Professional Computer Operating system or PCOS-8000. One colourful detail is that several Italian ministers and political representatives were invited to the Agliè meeting. Presenting a new computer in Italy in this way was not only a minor technological event, but more a political and (why not?) a cultural event, however the computer was actually distributed worldwide [2-4] and attracted a certain level of interest. The title of this paragraph paraphrases the subtitle of an American review [3].

Olivetti was well known for their industrial design and the M20 was no exception. A modern-looking plastic case was designed by Ettore Sottsass (1917-2007) and was praised at the time. The designer had a long history of collaboration with Olivetti, notably, he was in charge of the industrial design of the Elea 9003 in 1959, one of the first fully transistorised computers in the world. In 1969, he also drew the stylish Valentine typewriter, attractively adorned in a garish red colour. The M20 hosted a respectably sized motherboard, a well equipped keyboard (not detachable) as well as two 5.25" floppy disk drives or one floppy disk drive and one hard disk. A separate 12" monitor could be put on top of the case and oriented. The result can be seen in figure 1 and still retains a certain retro-futuristic appeal to the modern eye.

3 - The hardware

The motherboard, shown in figure 2, occupied practically all the base of the computer, hence the choice of an integrated keyboard was dictated by technical constraints. The motherboard contained a 4 MHz Z8001 processor,

using a real 16 bit bus, 128 KB of RAM, a printer interface and an RS232 serial interface with a maximum speed of 9600 baud. The RAM could be expanded up to a maximum of 512 KB by using up to three expansion cards. Two slots were available for expansions such as an IEEE interface card, hard disk controller and so on. The build quality was excellent and the system was modular. Assembly and disassembly was a matter of a few screws and some clever latches.

The keyboard was slightly noisy, but fast and excellent for touch typing. Italian readers may notice in figure 3 that it conserved the classic QZERTY layout for typewriters, as the modern Italian QWERTY layout plus the accented letters was yet to come, introduced by the same Olivetti with the M24. Olivetti clearly wanted people to type as comfortably as possible and aimed to people used to typewriters. Contemporary reviews [3] tend to explicitly mention the absence of separate function keys, however, special key functions were accessible via two coloured keys named Command and CTRL, these were pressed and held down before pressing another key. A detachable legend could be inserted in a slot on top of the keyboard, to indicate the function of each key. Two additional keys, called S1 and S2, could be assigned various functions. The most evident omission is the backspace key, normally obtained with CTRL+H (tab is obtained with CTRL+I). The S2 key is exactly at the place where one would expect a backspace key, but is configured by default as a Carriage-Return. Any key could be reprogrammed, for example, if you thought you could not live without a backspace key, you could type 'CK &C3, 8' to assign the S2 key (scan code C3 in hexadecimal) to that function (ASCII code 8 = CTRL+H). You can even make this permanent, with the PSAVE command. A small beeper mounted on the keyboard PCB was the only sound device available.

Olivetti was very attentive to international markets and many tailored versions of the M20 were made available. This caused some issues as the character sets differ, also some characters must be adapted if you type a BASIC source from a manual in English (a notable example is # of the English set that becomes £ in French or Italian). The issue was noticed at the time. It was mentioned in a French review [4] that a nationalised machine came with English manuals as the French ones were not yet ready. This is still true today as many of the manuals available are only in English [5].

Most machines came with a double 5.25" floppy disk drive unit whose 320 KB nominal disk capacity became 272 KB when a disk was formatted (called a "volume" in the PCOS jargon). Noticeable is the different formatting of the head 0/track 0 (MF, 128 bytes/sector) with respect
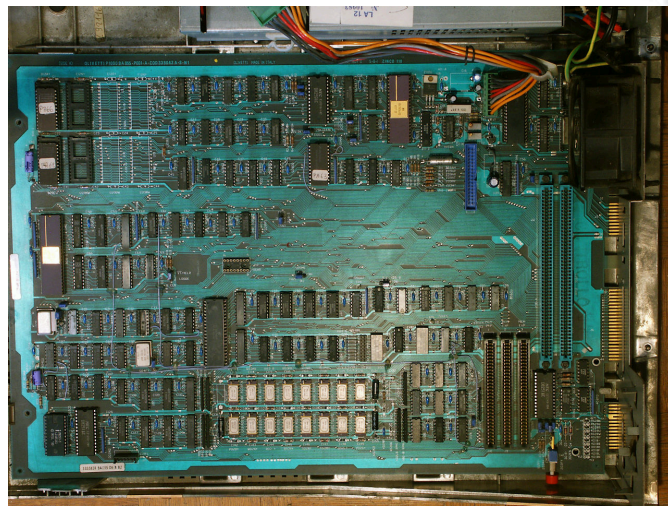
Figure 2 - The wide M20 motherboard

to the other tracks (MFM, 256 bytes/sector). Different configurations exist, an 11.5 MB Winchester drive (similar to the MFM ST251) was available to replace one of the floppy drives and 160 KB and 640 KB disk drives were also available. Unusually, in the standard hardware configuration, the M20 identifies the two floppy drives as 1: on the left and 0: on the right.

A range of printers was available from Olivetti. The PR1450S, PR1450G (G stands for "graphic"), PR1471, dot matrix and the PR2400 thermal. The M20 sports a standard Centronics parallel interface but, as for the RS232 interface and the screen, it employs a proprietary edge connector. An output mains plug from the computer allowed it to automatically power up the printer when the computer was switched on.

The M20 does not make a distinction between graphic modes and text modes, everything is drawn in a graphic screen with a 512x256 pixel resolution. This offered a great flexibility at the expense of a slight delay in some operations, such as text scrolling. The operating system uses either a 64x16 character grid or a more conventional 80x25 arrangement. The basic model came with a black and white display but an expensive (and therefore quite rare) option was a colour monitor that required special RAM expansion boards equipped with parallel to serial converters. These acted as a sort of a simple DMA circuitry able to direct the R G and B bit planes directly to the screen output.

The screen is powered by the computer with a 12V line and uses a single cable for the power supply and the video signals. It is nonstandard, signals are R, G, B, B/W, plus V and H sync (all TTL levels). The vertical sync operates at 68.2 Hz the horizontal at 18.7573 kHz. Those nonstandard frequencies make it difficult to find a compatible monitor if the original one is malfunctioning or is absent.

4 - The operating system

The PCOS operating system seems peculiar and obscure to the modern eye, but was not underpowered with respect to the DOS 1.0 that equipped the first IBM PC 5150 (presented to the press only 7 months earlier than the M20). It did not feature directories and subdirectories, but you could control file access with a password, even if the protection was not considered very strong. You could use abbreviations for commands such as 'VF' for 'VFORMAT' to format a new disk. It is worth mentioning that this command could fail to format a floppy disk that had already been formatted for MS-DOS. A radical but effective solution was to destroy all previous data with a strong magnet. The operating system was highly configurable, allowing you to decide which commands to keep resident, depending on the memory configuration and your convenience. Alternative operating systems were made available by Olivetti. In October 1982, Olivetti proposed an expansion board called Alternate Processor Board (APB), containing an Intel 8086 that allowed the M20 to run MS-DOS. Worthy of note was CP/M-86, an extension of the well-known CP/M for the Intel processor.

The Olivetti M20 uses standard DS-DD floppy disks and access was reasonably fast, a full disk format on a 320 KB unit takes 1 min and 18 s and a complete disk copy ('VCOPY' command) is done in 1 min 24 s. Booting PCOS 4.1a takes 27 s on my 512 KB machine. In general, the M20 was widely acknowledged to be a relatively powerful machine, the Z8001 was a decent processor for the time and was the computer was sold by Olivetti at an attractive price. A version of the Microsoft BASIC was shipped with the machine and execution speed of programs on the M20 was competitive with the original IBM 5150.

The successor to the M20 was called M24, it came out in 1983, but was based on the 8086 processor and MS-DOS. It was an incredibly successful and effective machine. Olivetti offered an "Alternate Processor Board", with a Z8001 for it, which allowed the M24 to run PCOS. A few years later, it became clear nonetheless that the death knell was definitely sounding for that operating system. Version 4.1a, developed in 1984, is the last version of
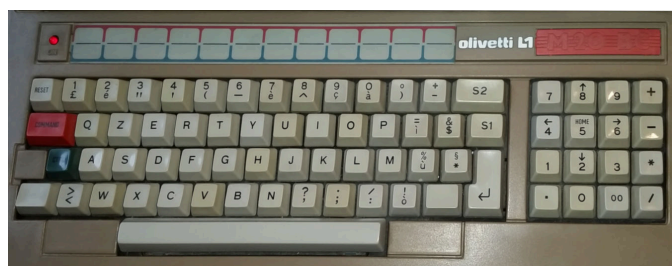
Figure 3 - Italian keyboard with the QZERTY layout

the PCOS I am aware of.

5 - My M20 and the birth of a website

The spring of 1993 was a sunny one in my small town, near Turin, in Italy. During one of the seemingly interminable afternoons that a teenager has on their hands, I went to visit a friend after school. Will was a very intelligent guy and an incredibly skilled guitarist for a boy who only just turned 14. Most of the time he played and I tried to learn something from him. That day he greeted me with a smile and said "Dave, I've got a computer that may interest you." showing me a brown and beige square shaped thing that was lying inert in his room. "My father got it from the car part shop nearby, they wanted to trash it as it's old. We can't use it: if you want, take it." Needless to say, I accepted.

"What is this... thing?" My father certainly wasn't enthusiast when he came that evening to pick me up with his car and saw me with that strange computer. We already had a 286 PC, but I saw some pictures on the twelve years old computer magazines I used to read at the time. That was, however, the first time I saw an Olivetti M20 in real life and I already liked much its strangely angular yet sleek shape.

I soon discovered my "new" computer was, indeed, useless without an appropriate operating system. It powered up, but it only had two disk drives and no hard disk. Once the self test terminated it remained utterly inert, waiting. After a few weeks, I asked Ugo, one of our neighbours at the time, for help. He used to live in the house next door to where I lived with my parents and he taught me basically everything I knew about computers. I had already received from him those old computer magazines I used to read with such delight. Ugo came to my rescue with his usual patience and kindness, offering me some old floppy disks for this strange machine. It turned out he had worked on a similar one ten years earlier.

I then learned that the M20 used a strange operating system called PCOS and I could play a little with the Microsoft Basic that came with it. I already knew this dialect, so I spent some hours playing and drawing some lines and circles on the screen. I also got some simple games (such as the one in figure 4) that were tiny yet charming.

That was fun, but without any manual and detailed information, there was not much I could do at the time. I kept my M20 in good shape, but not frequently used, until 2004. By then I was already living in France and, as I was a regular Internet user, I thought it would be
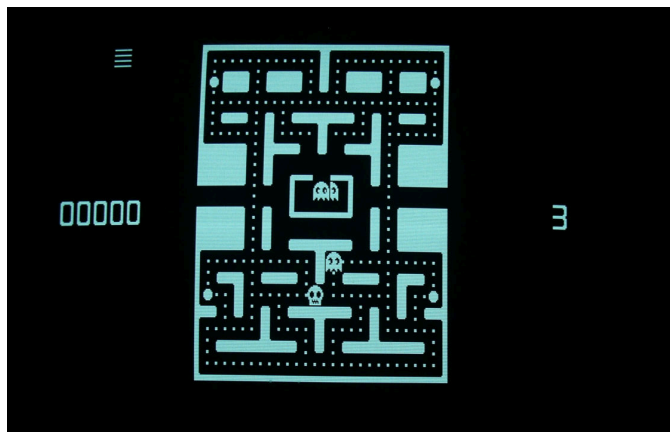
Figure 4 - A clone of Pac-Man

interesting to search for information about my old and strange computer. I discovered, with delight, that scans of some manuals were already available, but that information was scattered in different websites and was fragmented.

I decided to do something and I choose a solution that was obvious in an epoch of the Internet where social networks were yet to become widespread. I put together a web site, writing all the HTML and a bit of PHP myself. It went online in 2005 and still exists today [6], with the same old-fashioned look I chose back then. By the way, I would like to thank in particular Roberto Bazzano, who has hosted the site on his servers since 2007. Thanks to the website, I came in touch with many interesting and incredibly skilled people. The Olivetti M20 has a small, yet devoted, international community.

Around 2006, having become an electronics engineer, I tried improving my machine. It needed some repairs. The original power supply was not up to the task anymore and, after more than 20 years, the disk drives needed to be aligned. I managed to get a former Olivetti technician on the phone, who explained me the factory procedure to bring them back to life. I also studied the schematics of memory expansions and built one with two salvaged SIMM modules, bringing my machine to a whopping 512KB of RAM. Olivetti must have used a primitive CAD system at the time, their schematics were incredibly hard to read and literally full of errors. I suspect those used for the production were not the ones that appear in the hardware manual.

In all those years, I tried helping other people, trying to learn new things and documenting what I did with the machine, however the website hosts contributions from many other people, kind enough to send me a description of their experiences. This paper would not have been possible without the help I received from them via the website.

6 - Conclusion

In this article, I described a rather peculiar computer, the Olivetti M20. Very competitive with respect to the 5150 IBM PC, it was ultimately penalised by lack of software and perhaps general recognition. I described the hardware as well as the operating system, PCOS-8000. In the last part, I told the story of my machine (depicted in the figures) and how I decided to build a website dedicated to it. That allowed me to get in touch with many people from different countries who are passionate about the Olivetti M20.

One last note: I wrote the first version of this paper on my Olivetti M20 running Oliword 1.2, transferring the files with a RS232 link and using a simple Bash script to strip the control codes. Final editing was done on a modern MacBook Pro.

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[5] See for example: http://www.z80ne.com/m20/index.php?argument=sections/manuals/manuals.inc
[6] http://www.z80ne.com/m20