Appendix A: Some Technical Details of Various Personal Computers

Apple

Apple II   The computer used a MOS 6502 microprocessor operating at 1 MHz with 8K bytes of ROM and 4K bytes of dynamic RAM, expandable to 48K. The integral video system could display 24 rows of 40 characters in upper case only. Each character was a 5 by 7 dot matrix. The display also had a graphics mode with high and low resolutions. In low resolution the 40 horizontal by 48 vertical locations could be in one of 15 colors. In high resolution the screen could display a maximum of 280 horizontal by 192 vertical positions in 4 colors. The video system also included a mixed mode in both low and high resolutions, with graphics and four lines of text at the bottom of the screen.

Apple IIc   The computer used a 65C02 microprocessor operating at 1.023 MHz with 16K bytes of ROM and 128K bytes of RAM. The unit had one 5.25-inch 140K byte Alps floppy disk drive. The monitor could display 24 lines of 40 or 80-column text. The video system also had three graphic modes. The low-resolution mode had 40 horizontal by 48 vertical pixels in 16 colors. The high-resolution mode had 280 horizontal by 192 vertical pixels in 6 colors. Then a double-high-resolution mode had 560 horizontal by 192 vertical pixels in 16 colors. The single 5.25-inch Alps half-height floppy disk drive was built-in. The disk controller was the IWM (Integrated Woz Machine) chip as used on the Macintosh computer. The disks were single-sided with 35-tracks and 16-sectors.

Apple IIe   The computer used a MOS 6502A microprocessor operating at 1 MHz with 16K bytes of ROM and 64K bytes of RAM, expandable to 128K. The storage system supported six 140K byte 5.25-inch floppy disk drives. The terminal could display 24 lines of 40-column text in both uppercase and lowercase characters. Each character was a 5 by 7 dot matrix. The computer had two standard graphic modes. A low-resolution mode produced 40 horizontal by 48 vertical pixels with 16 colors. The

standard high-resolution mode produced 280 horizontal by 192 vertical pixels with 6 colors. The video system retained the Apple II mixed mode in both low and high resolutions, with graphics and four lines of text at the bottom of the screen. Seven slots were available for peripheral boards. The unit included an additional 60-pin auxiliary slot on the motherboard that provided for one of two optional cards.

The two optional cards could either display 80 columns of text or both 80 columns of text display and an extension of memory to 128K bytes. The extended memory 80-column option card and suitable software enabled double-density graphics in both low and high-resolution modes.

Apple IIGS The computer used a Western Design Center W65C816 microprocessor operating at 2.8 MHz with 128K bytes of ROM and 256K bytes of RAM, expandable to 8 megabytes. The microprocessor had a 24-bit address bus and an 8-bit data bus. The unit had two operating modes: a native mode of 2.8 MHz and an Apple IIe emulation mode of 1.02 MHz. The storage system included support for both 3.5-inch 800K byte and 5.25-inch 140K byte floppy disk drives. The terminal could display: 24 lines of 40 or 80-column text. Graphic modes varied from low-resolution with 40 horizontal by 48 vertical pixels in 16 colors, to super-high-resolution with 640 horizontal by 200 vertical pixels in 4 colors. An Ensoniq digital synthesizer chip with 64K bytes of dedicated RAM provided new sound capabilities. The unit had a 44-pin memory expansion slot and seven 50-pin slots for peripherals.

Apple III The computer used a Synertek 6502A microprocessor operating at 2 MHz with 96K bytes of memory, expandable to 128K. The unit included one built-in 5.25-inch, 143K byte floppy-disk drive. The terminal could display 24 lines of 80-column text. Graphic modes were 560 horizontal by 192 vertical pixels in monochrome and 280 horizontal by 192 vertical pixels in 16 colors or 16 shades of gray. The computer had four slots for peripheral cards that had certain compatibility with Apple II cards. An aluminum chassis acted as a radio frequency shield and as a heat sink that eliminated the

need for a cooling fan. Three additional disk drives
could be daisy-chained from a rear connector. The Apple
III floppy-disks had a new 16-sector format (compared
with a 13-sector format on the Apple II).

Lisa   The computer used a Motorola MC68000
microprocessor operating at 5 MHz with 1 megabyte of
RAM. The storage system had two Twiggy 5.25-inch 860K
byte floppy disk drives and a separate 5 megabyte
Winchester-type hard disk named ProFile. The display was
a 12-inch monochrome monitor with a resolution of 720 by
364 pixels. The computer used four additional
microprocessors. Two from National Semiconductor
controlled the keyboard and mouse, a 6504 controlled the
two floppy disk drives and the hard disk controller had
a Z-8. The floppy disk drives maintained a constant data
density between the outer and inner tracks.

Macintosh   The computer used a Motorola MC68000
microprocessor operating at 7.83 MHz with 64K bytes of
ROM and 128K bytes of RAM. The storage system had one
integral 3.5-inch 400K byte floppy disk drive from Sony.
The 3.5-inch disks were single-sided with 80 tracks. The
storage system recorded data at a constant rate similar
to the Lisa Twiggy drive. A connector provided for an
optional second external 3.5-inch floppy disk drive. The
display was a 9-inch monochrome monitor with a
resolution of 512 horizontal by 342 vertical square
pixels. There were no expansion slots, but two high-
speed serial ports provided for connection of
peripherals. The separate keyboard had 58 keys (59 in
the international version), but no function or cursor
keys.

Macintosh II   The computer used a Motorola MC68020
microprocessor operating at 16 MHz with a floating-point
coprocessor and one megabyte of RAM, expandable to 8 MB.
The unit had an open NuBus architecture developed at MIT
with six slots for plug-in boards. The 13-inch color or
12-inch monochrome monitor could display 640 by 400
pixels as compared to the 512 by 342 pixel display on
the previous Macintosh computers. The display system
could have either 16 or 256 colors or shades of gray.

Macintosh Portable   The computer used a Motorola CMOS 68000 microprocessor operating at 16 MHz with 1 megabyte of RAM expandable to 2 megabytes. The unit included a built-in 3.5-inch 1.4 megabyte floppy-disk drive. The portable had an Active Matrix Liquid Crystal Display with a screen resolution of 640 by 400 pixels.

The computer was 15.25 inches wide by 14.83 inches deep and the height varied from 2 to 4 inches, front to back. The weight without a hard disk drive was 13.75 pounds. The keyboard had 63 keys with a unique arrangement for locating either a trackball pointing device or an 18-key numeric keypad on the left or right hand side of the keyboard. The computer used lead acid batteries with a power management system controlled by a 6502 microprocessor. This provided 8 to 10 hours of operation on a single battery charge.

Atari

The Atari 400 computer used a MOS 6502 microprocessor operating at 1.8 MHz with 8K bytes of RAM, expandable to 16K. The display had 16 lines of 32 characters and a high-resolution mode of 320 by 192 pixels.

Commodore

PET 2001   The PET 2001 computer used a MOS 6502 microprocessor, had 14K bytes of ROM and 4K bytes of RAM, expandable to 8K. The 9-inch black and white CRT could display 25 lines of 40 characters and the 73-key keyboard included a numeric keypad.

PET 4000   The PET 4000 computer used a MOS 6502 microprocessor, had 18K bytes of ROM and 16K bytes of RAM, expandable to 32K. The configuration included a 12-inch green-phosphor display with a capability of showing 25 lines of 40 characters.

Cromemco

Z-1   The Cromemco Z-1 computer used a Zilog Z-80 microprocessor and had 8K bytes of memory.

Z-2   The Cromemco Z-2 computer used the S-100 Bus with 21 slots for plug-in boards.

CTC Datapoint

The CTC Datapoint 2200 computer terminal used a bit-serial processor in TTL logic with shift register memory. The terminal had a keyboard, 12-line screen display and two cassette tape drives.

Digital Group

The Digital Computer System was available with either an AMD 8080A, MOS 6502, Mostek 6800 or Zilog Z-80 microprocessor. The processor board had 2K bytes of RAM. An input/output board and a video interface board that provided a 16 line by 32 character display were part of the system. An optional 8K static RAM board was available to increase the memory capacity.

EPD

The System One computer kit had 82 integrated circuits, 1K bytes of memory, expandable to 8K and used 57 instructions.

HAL

The HAL-4096, was a home-built 16-bit computer with 16 registers and 4K bytes of magnetic core memory from a surplus IBM 1620.

Heath

H8   The H8 computer used an Intel 8080 microprocessor, had 1K bytes of ROM and memory cards were available in 4K-byte increments to 32K. It had a unique 50-pin bus for expansion cards.

H11   The H11 computer used a DEC LSI-11 microcomputer board and had a 4K by 16-bit word memory that could accommodate up to 20K words.

Heath/Zenith-89   The Heath/Zenith-89 computer used a Zilog Z-80 microprocessor operating at 2.048 MHz and had 16K bytes of RAM, expandable to 48K. The 12-inch screen could display 24 lines of 80 characters. The keyboard subsystem and video display used an additional Z-80 microprocessor.

Accessories The H9 video terminal had a 67-key keyboard and the 12-inch CRT could display 12 lines of 80 characters.

Hewlett-Packard

The HP 9831A desktop computer used a HP BPC microprocessor and had 8K bytes of memory, expandable to 32K. The unit had a 32-character LED display, cassette tape drive and a keyboard.

Hyperion

The Hyperion portable computer had an Intel 8088 microprocessor and 256K bytes of RAM. The storage system had two 5.25-inch 320K byte double-density dual-sided floppy-disk drives. The unit had a 7-inch amber-on-gray monitor that could display 25 lines of 80 characters. The 28 pound portable unit included an integrated display, two floppy-disk drives and a detachable keyboard. The operating system was MS-DOS and the unit was priced at $4,950 (Canadian).

IBM

5100 The 5100 portable computer had a built-in keyboard, monitor and magnetic tape cartridge storage system. The unit used an IBM developed microprocessor and memory consisted of 48K bytes of ROM and 16K bytes of RAM, expandable to 64K. The monitor could display 16 lines of 64 characters.

Scamp The Scamp computer used an IBM Palm microcontroller and had 64K bytes of RAM. The unit had an integrated keyboard and a small CRT that could display 16 rows of 64 columns.

System/3 Model 6 This BASIC computer system used monolithic circuit technology and had 8K bytes of silicon chip memory, expandable to 16K. The design included a keyboard for direct data input, a 14-inch diameter disk storage drive with capacities of 2.5 to 9.8 megabytes and a printer. The CRT could display 15 lines of 64 characters.

IMSAI

The IMSAI 8080 computer used the Intel 8080A microprocessor and included 4K bytes of memory. It also had a heavy duty power supply, commercial-grade paddle switches on the front panel and a six-slot S-100 Bus motherboard, expandable to 22 slots.

Kenbak-1

The Kenbak-1 computer incorporated small and medium-scale integrated circuits with a memory capacity of 256 bytes. It had three programming registers, five addressing modes and very limited input/output capabilities.

Mark-8

The Mark-8 computer used an Intel 8008 microprocessor, had 256 bytes of memory, expandable to 16K bytes by adding memory boards. The unit had provision for six circuit board modules.

MITS

The Altair 8800 computer used an Intel 8080 microprocessor and had 256 bytes of memory. The Altair cabinet had space for eighteen cards. The basic unit had two slots, one for the CPU card and one for the 256 byte memory card.

MOS

The KIM-1 computer used a MOS 6502 microprocessor, had 2K bytes of ROM that contained the system executive, and 1K bytes of RAM. The unit included an audio cassette interface, a 23-key keypad and a six-digit LED display.

North Star

The Horizon-1 computer used a Zilog Z-80 microprocessor and had 16K bytes of RAM. It also included one or two 5.25-inch floppy disk drives and a 12-slot S-100 Bus motherboard.

Noval

The Noval 760 computer used an Intel 8080A microprocessor, had 3K bytes of ROM and 16K bytes of RAM.

NRI

The NRI 832 kit had 52 integrated circuits, 32 bytes of memory, used 15 instructions.

Ohio Scientific

The OSI 400 computer used either a Motorola MC6800, MOS 6501 or 6502 microprocessor. The unit had 512 bytes of ROM and up to 1K bytes of programmable memory was available. The board was designed for use with a 48-line expansion bus system.

PolyMorphic

Poly 88   The Poly-88 computer used an Intel 8080 microprocessor, had 512 bytes of RAM and 1K bytes of ROM. It also used the S-100 Bus with four slots, had a cassette interface

System 8813 The System 8813 computer used an Intel 8080 microprocessor and the video could display 16 lines of 64 characters. The main unit could accommodate from one to three floppy-disk drives with 90K capacity each.

Processor Technology

Sol-10   The Sol-10 Terminal Computer used an Intel 8080A microprocessor and had 1K bytes of PROM, 1K bytes of RAM and 1K bytes of video RAM. The computer could generate a 16-line by 64-character video display. The unit had a built-in 85-key keyboard and one slot for a S-100 Bus board.

Sol-20   The Sol-20 computer used an Intel 8080 microprocessor, had 1K bytes of ROM, 8K bytes of RAM and 1K bytes of video RAM. It also had a heavier-duty power supply and five S-100 Bus expansion slots

REE

The Micral computer used an Intel 8008 microprocessor and included 256 bytes of RAM, expandable to one kilobyte. The system used a 60-bit data bus called Pluribus.

Scelbi

The Scelbi-8H computer used an Intel 8008 microprocessor with up to 4K bytes of memory. The Scelbi-8B business computer had up to 16K bytes of memory.

Sphere

Sphere produced three computer models that used the Motorola MC6800 microprocessor; the Hobbyist, Intelligent and BASIC. The Hobbyist had 4K bytes of memory and a keyboard, the Intelligent had more features and the Basic had 20K bytes of memory and full extended BASIC software.

SwTPC

The SwTPC 6800 Computer System used a Motorola MC6800 microprocessor, had 2K bytes of memory, expandable to 16K. A 1K byte ROM chip contained the mini-operating system. The unit also contained an SS-50 bus for eight interface boards.

Tandy/Radio Shack

TRS-80   The TRS-80 computer used a Zilog Z-80 microprocessor, had 4K bytes of ROM and 4K bytes of RAM, expandable to 62K. The system included a separate cassette tape recorder and a 12-inch black and white monitor that could display 16 lines of 64 characters.

A Disk System Expansion Unit had a disk controller which could support up to four drives. The diskette had a capacity of 83K bytes (formatted) with 35 tracks of 2,500 bytes per track divided into ten sectors.

Texas Instruments

The TI-99/4 computer used a TI TMS9900 microprocessor and had 16K bytes of RAM.

Xerox

Alto The Alto computer system had a processor/disk storage cabinet, graphics display unit, keyboard and a mouse. The processor unit had a 16-bit custom-made processor similar to the Data General Nova 1220. The operating speed was 400,000 instructions per second. Memory incorporated an address space of 64K 16-bit words, expandable to 256K. The processor/disk storage cabinet had two 3-megabyte hard-disk drives. The graphics unit featured an 8 inch horizontal by 10 inch vertical black and white display. It used a bit-mapped raster scan with a resolution of 606 pixels horizontally by 808 pixels vertically that could display 60 lines of 90 characters. The computer used a detachable keyboard supplemented by a mouse incorporating three buttons for program control.