


REMEMBERING THE EARLY DAYS OF MICROCOMPUTERS



PRESENTED BY RON DILLON



TODAY IT IS HARD TO THINK OF LIVING WITHOUT COMPUTERS





Today's tiny computers are possible because they use microprocessors.

Microprocessors are integrated circuits that contains the arithmetic, logic, and control circuitry needed to function as a Central Processing Unit (CPU).





When were microprocessors invented?

In November of 1971 Intel introduced the 4004 microprocessor.

That's almost 43 years ago, but in our lifetimes.

Now let's see how Intel and microprocessors got started.



Intel was started by two men:

Robert Noyce – Earned a PhD in Physics from MIT in 1953

Gordon Moore – Earned a PhD in Chemistry with a minor in Physics from Caltech in 1954

1956

- Both were hired by Shockley Semi-Conductor Laboratories
- William Shockley co-invented the transistor in 1951, for which he received the Nobel Prize in Physics in 1956
- But Shockley was a poor businessman and his team of talented men soon quit

Robert Noyce and Gordon Moore - continued

1957

- Both left Shockley and co-founded Fairchild Semiconductor
- The first successful silicon semiconductor company
- The dominant semiconductor manufacturer in the 1960's

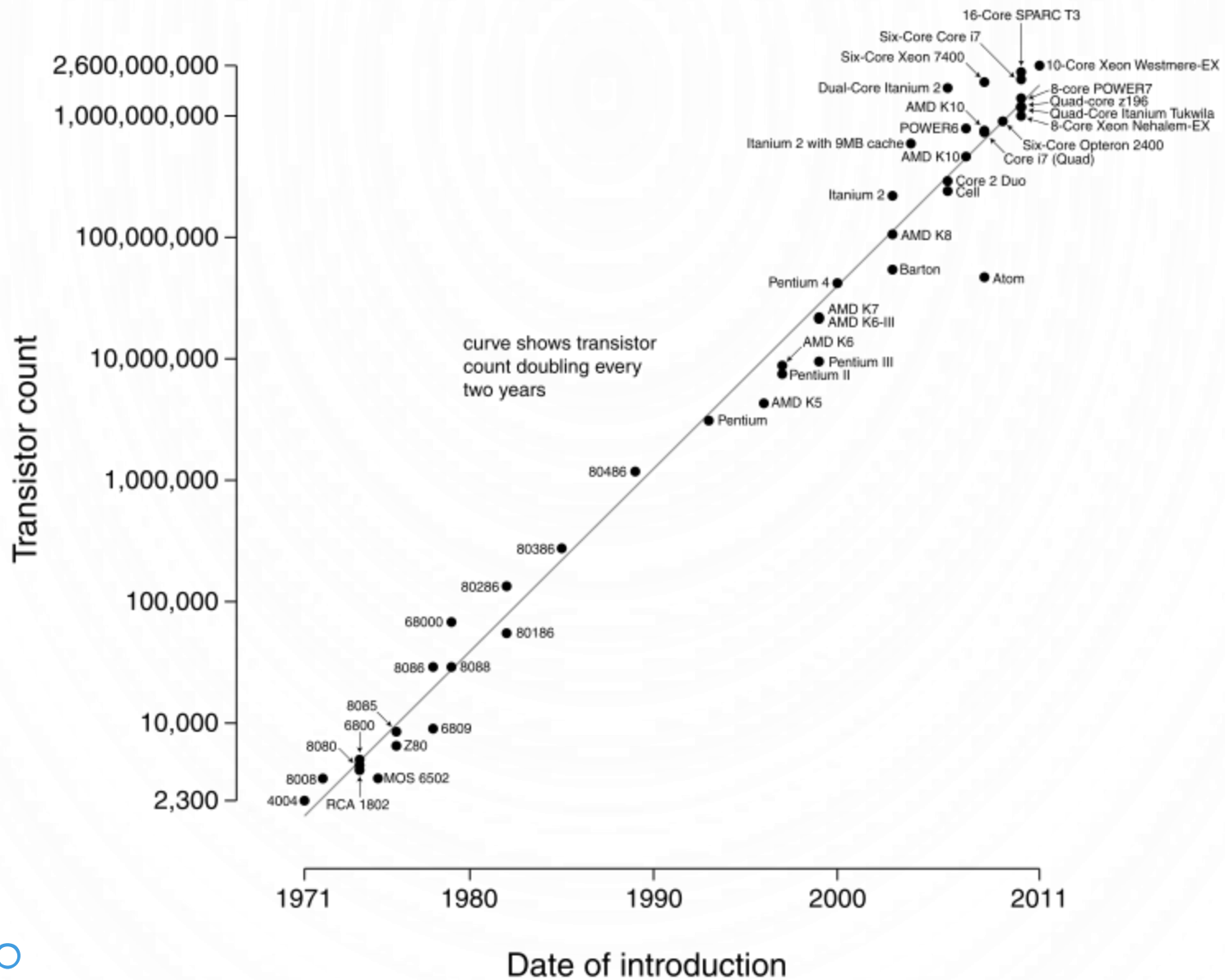
1959

- Robert Noyce was on the team that developed the integrated circuit

1965

- Gordon Moore observed that the number of transistors in dense integrated circuits doubles approximately every two years, now called "Moore's Law"

Microprocessor Transistor Counts 1971-2011 & Moore's Law



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1968

- Both left Fairchild and co-founded N-M Electronics
- They purchased the rights to use the name "Intel" from the hotel chain Intelco
- Manufacturing of memory chips was set up in a 17,000 sq. ft. building in Mountain View, CA, formerly used by Union Carbide Electronics to make MOS transistors

How Microprocessors Began

In 1969, Nippon Calculating Machine Corporation approached Intel to design 12 custom chips for its new printing calculator.

Intel staff proposed a family of four chips for the calculator.

Nippon accepted the proposal.

In 1970 Intel completed the design of the four chips for the calculator and named the set MCS-4.

MCS => Micro Computer System

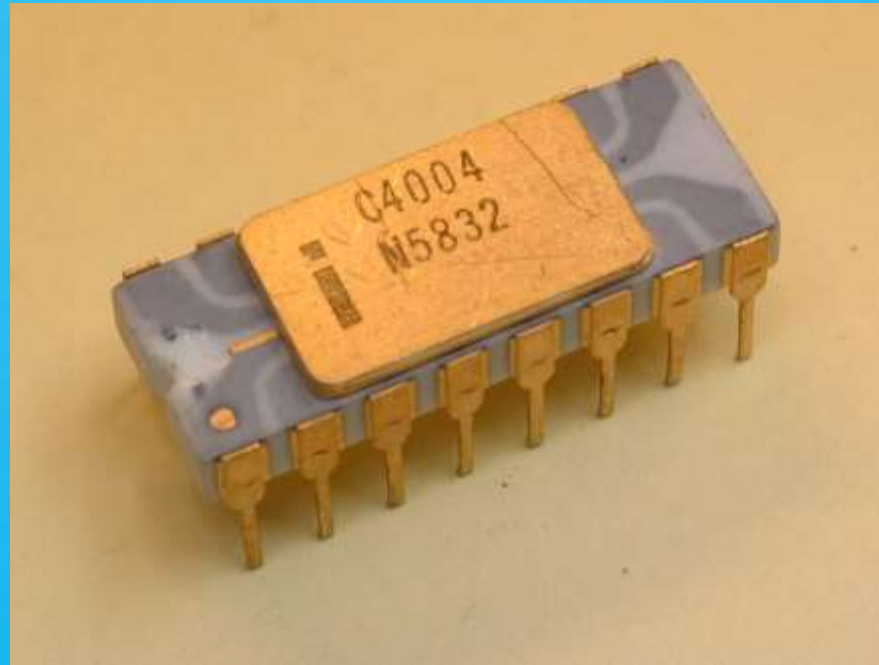
4001 ROM 256 x 8-bits + 4 bits of input/output

4002 RAM 80 x 4-bits + 4 bits of output

4003 Shift Register 10 bits of output

4004 Central Processing Unit (CPU)

Intel purchased the rights to the MCS-4 chipset from Nippon Calculating Machine Corporation and launched the Intel®4004 processor family with an advertisement in the November 15, 1971 issue of Electronic News.



The advertisement said:
“Announcing A New Era In Integrated Electronics.”

History of Intel Microprocessors

Year	Processor	Transistors	Clock	Data Bus	Address Bus
1971	4004	2,300	108KHz	4	12
1972	8008	3,500	800KHz	8	14
1974	8080	4,500	2MHz	8	16
1978	8086	29,000	5MHz	16	20
1979	8088	29,000	5MHz	8	20
1982	286	134,000	6MHz	16	24
1985	386	275,000	16MHz	32	32
1989	486	1,200,000	25Mhz	32	32
1993	Pentium	3,100,000	66MHz	32	32
1995	Pentium Pro	5,500,000	150MHz	64	32
1997	Pentium II	7,500,000	300MHz	64	64
1999	Pentium III	9,500,000	600MHz	64	64
2000	Pentium 4	42,000,000	1.5GHz	64	64
2008	Core 2 Duo	410,000,000	2.4GHz	64	64
2012	3rd Gen Core	1,400,000,000	2.9GHz	64	64

Used in the
first IBM PC
August 1981



What was it like to work with Microcomputers in 1973

Intel 4004 and 8008 microprocessors are available
Intel 1702A EPROM chips available, 256 x 8 bits for
\$100 (\$400,000 per megabyte)

User interface via a Teletype Model 33ASR

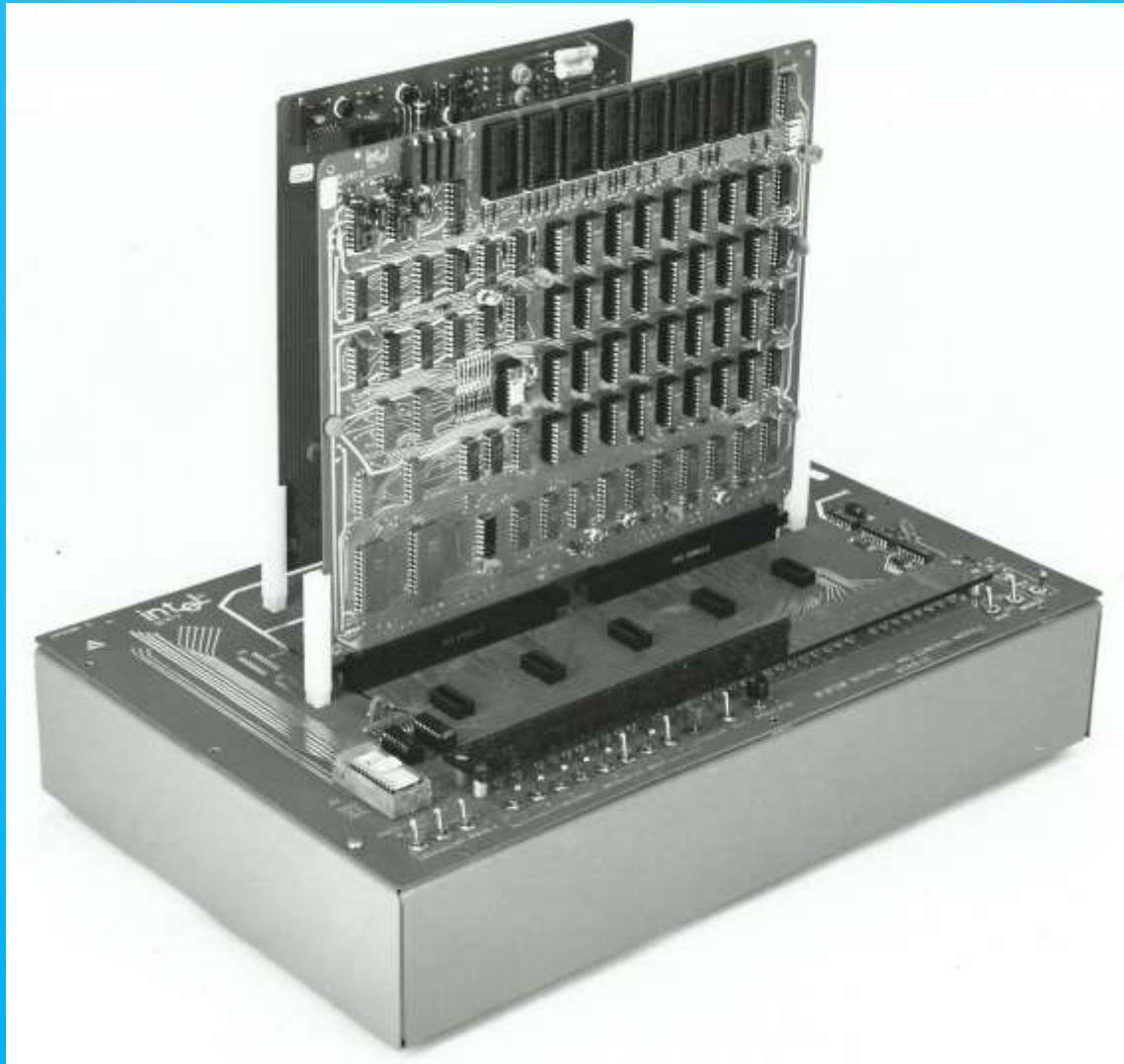
- Keyboard for user input
- Printed on rolled paper for output
- Paper tape punch for program storage
- Paper tape reader for input from storage
- Used the ASCII code for characters

8-inch floppy drives are very new, no interface for
microcomputer systems, not an option

Software development is done on larger computer
systems, such as time-share dial-up services
using the same Teletype machine and a modem.

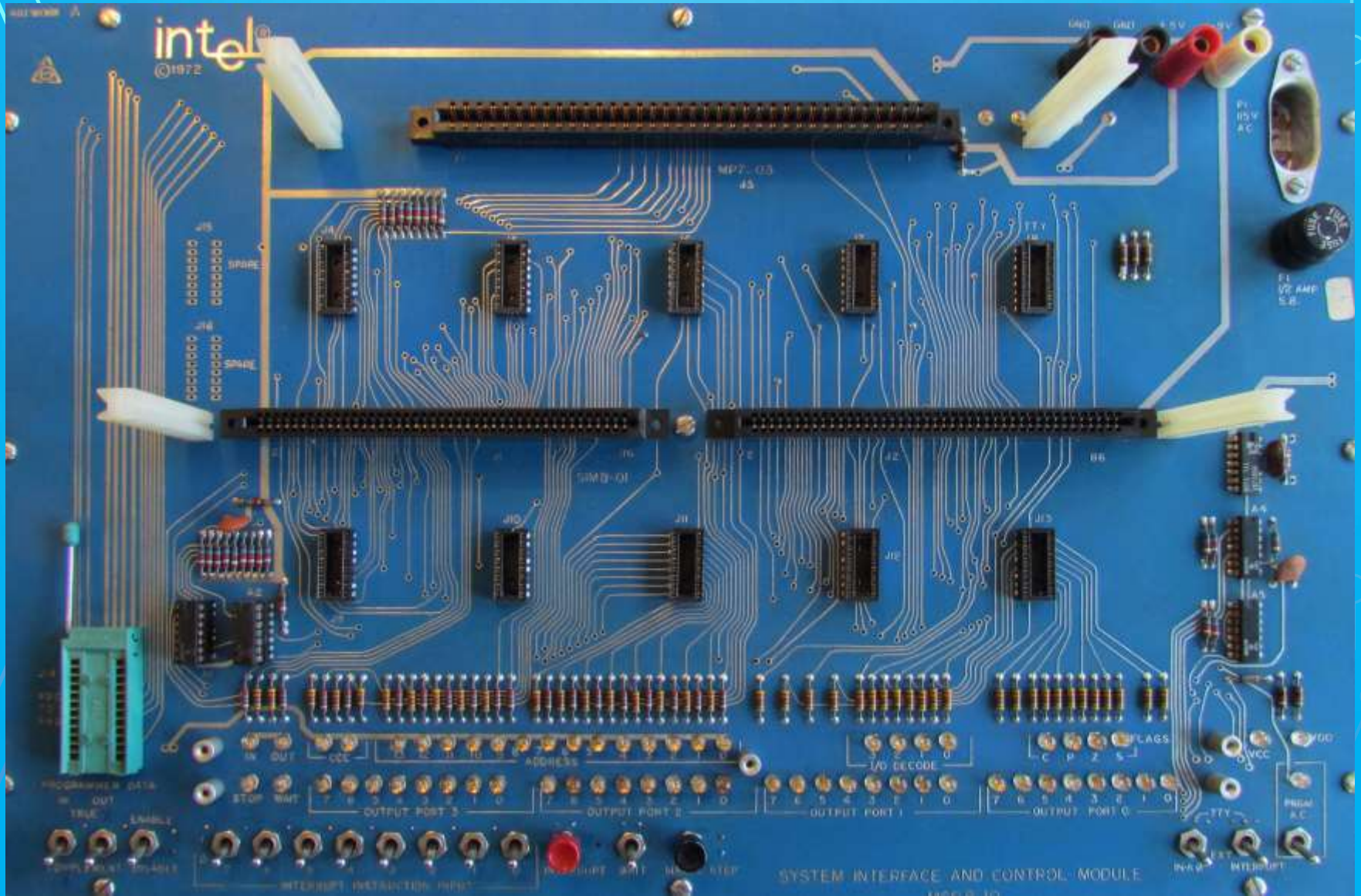
Microcomputers in 1973

My group at the South Charleston (WV) Technical Center of Union Carbide Chemical Co. purchased an Intel MCB 8-10 “System Interconnect and Control Module”



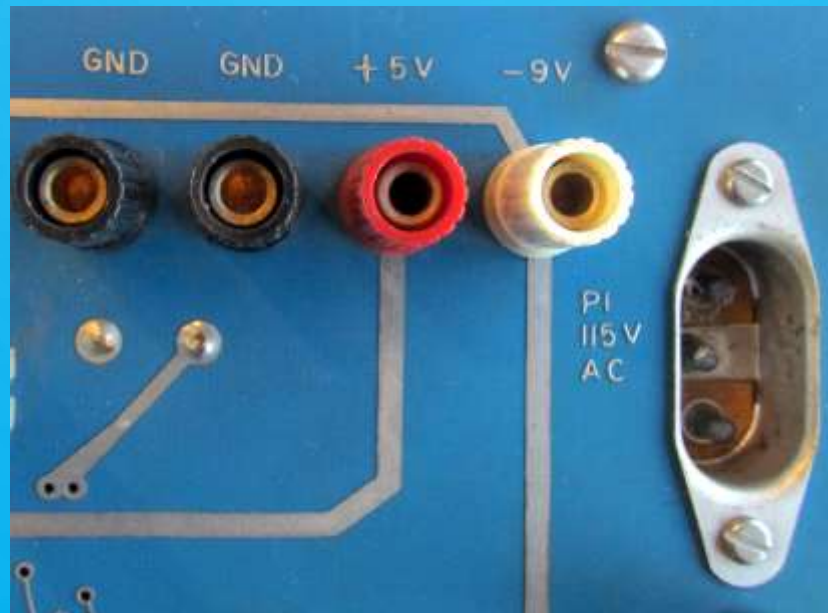
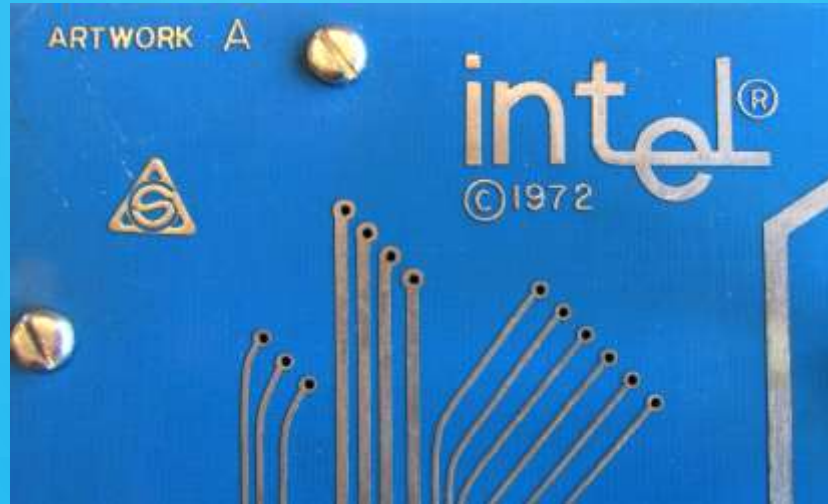
Microcomputers in 1973

The Intel MCB 8-10 “System Interconnect and Control Module”



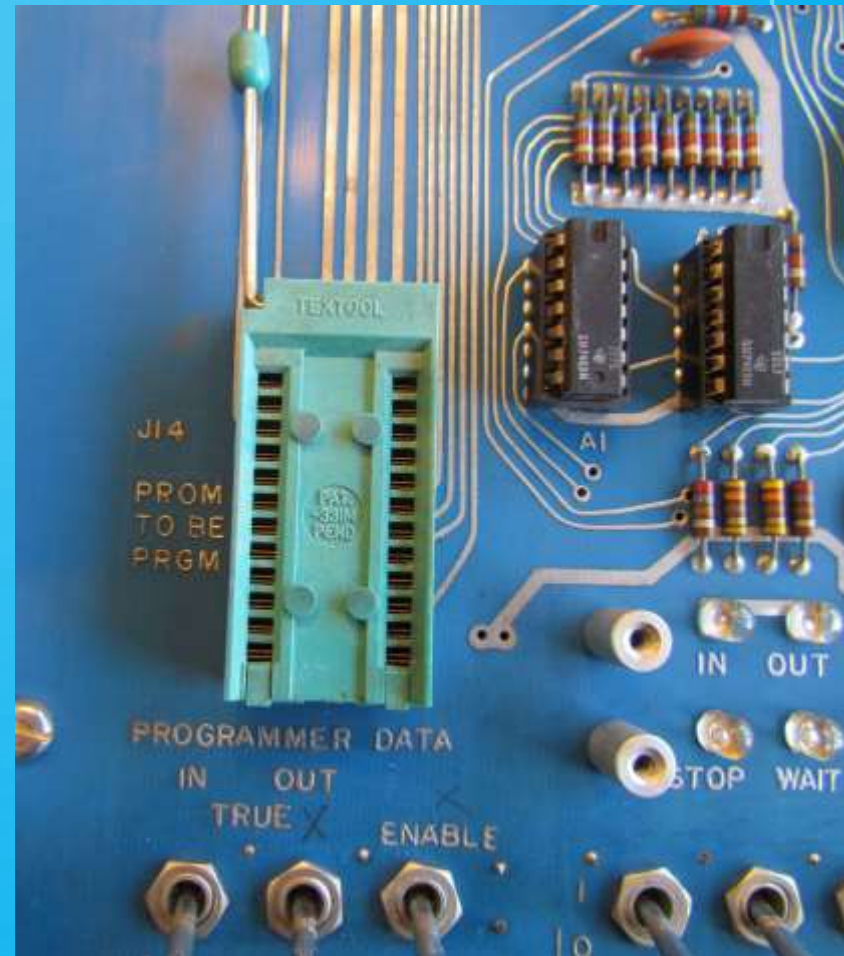
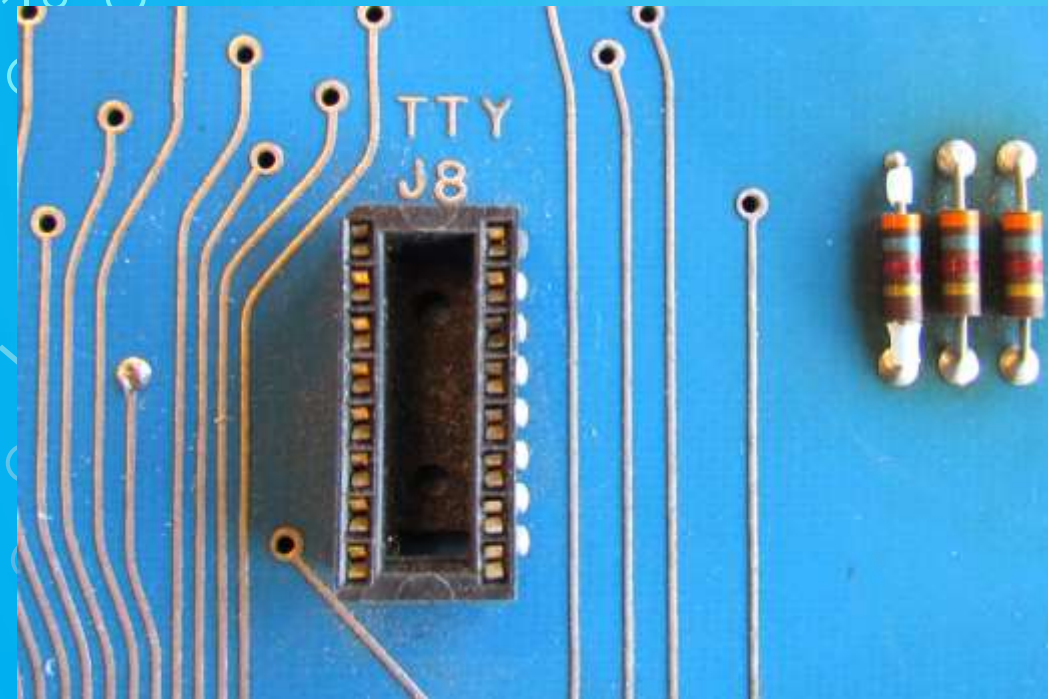
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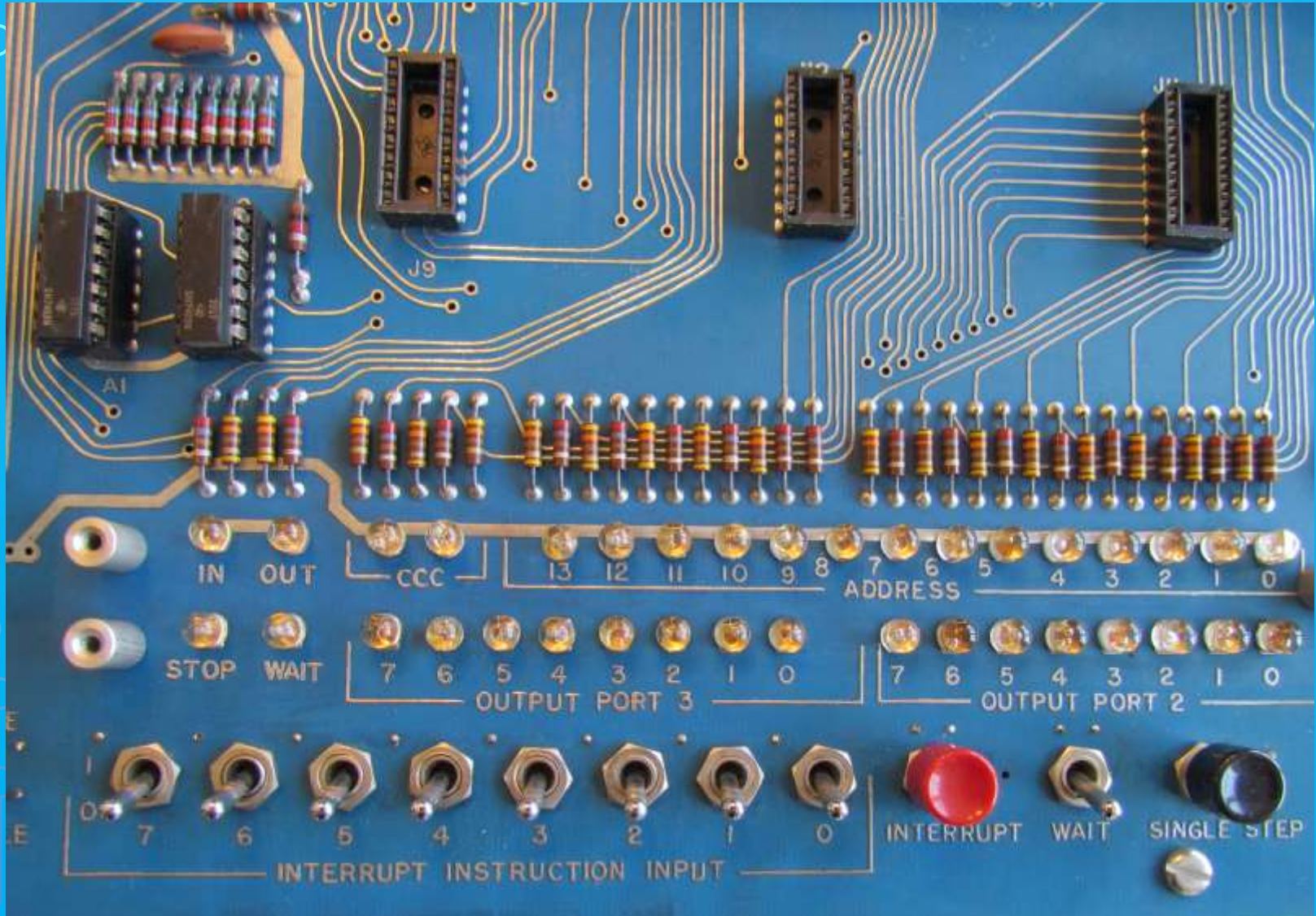
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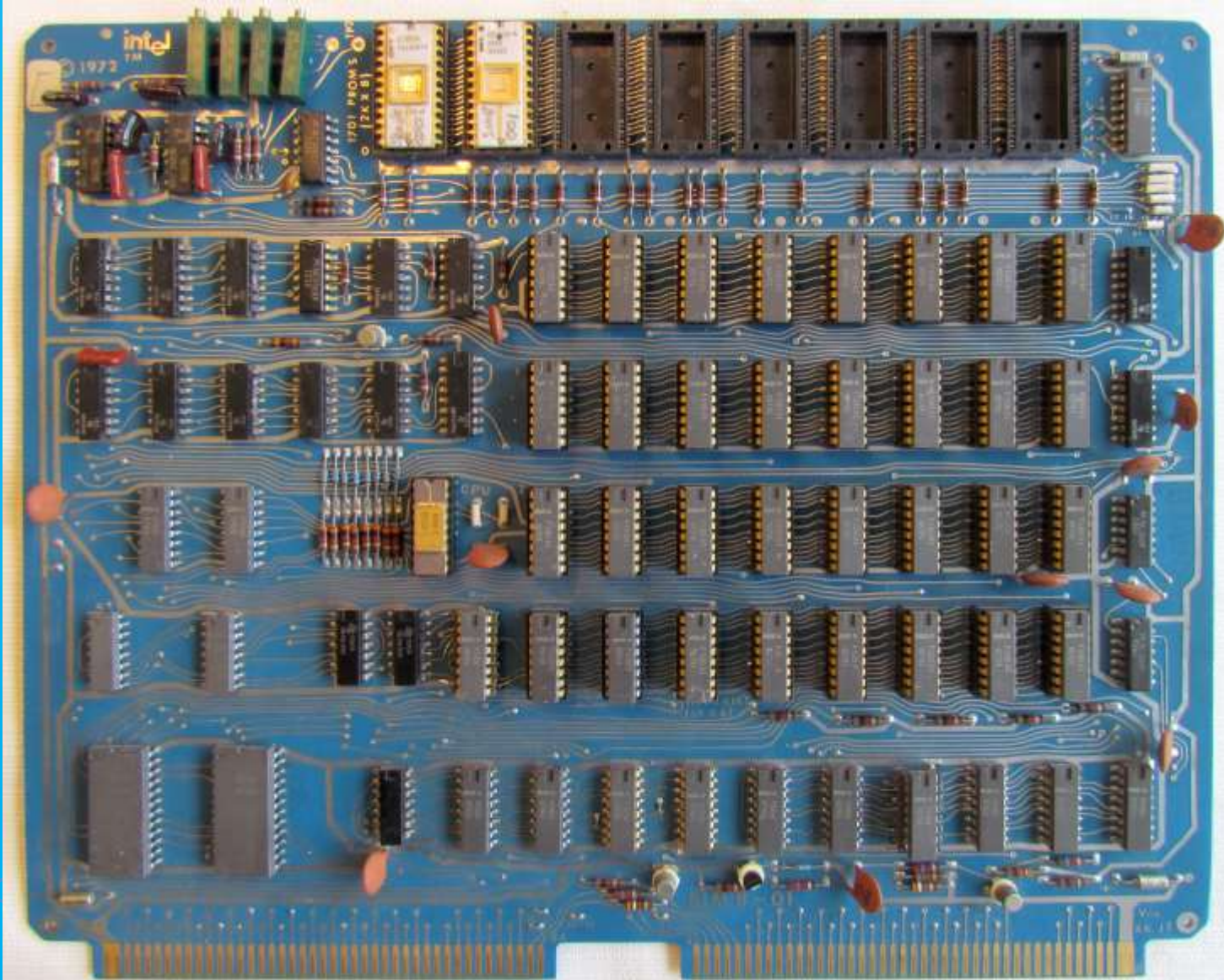
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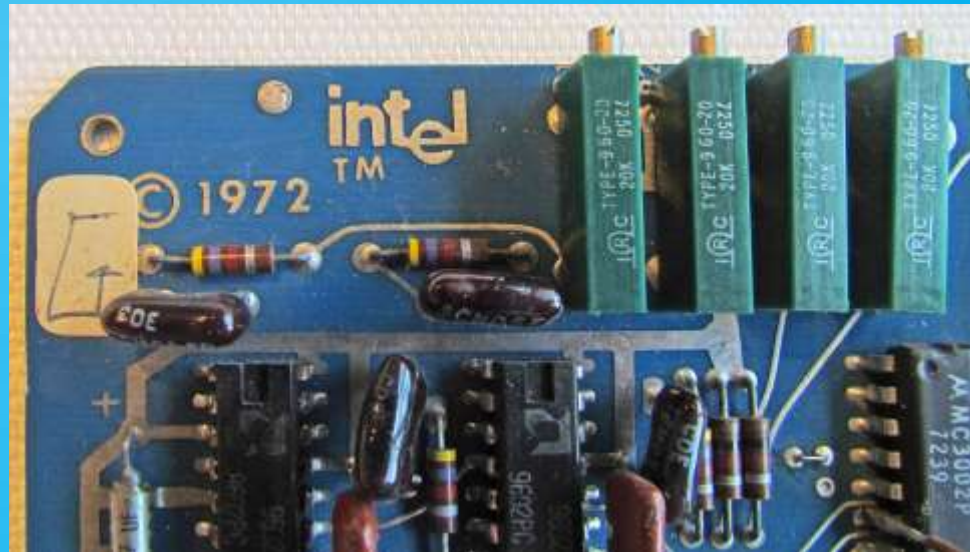
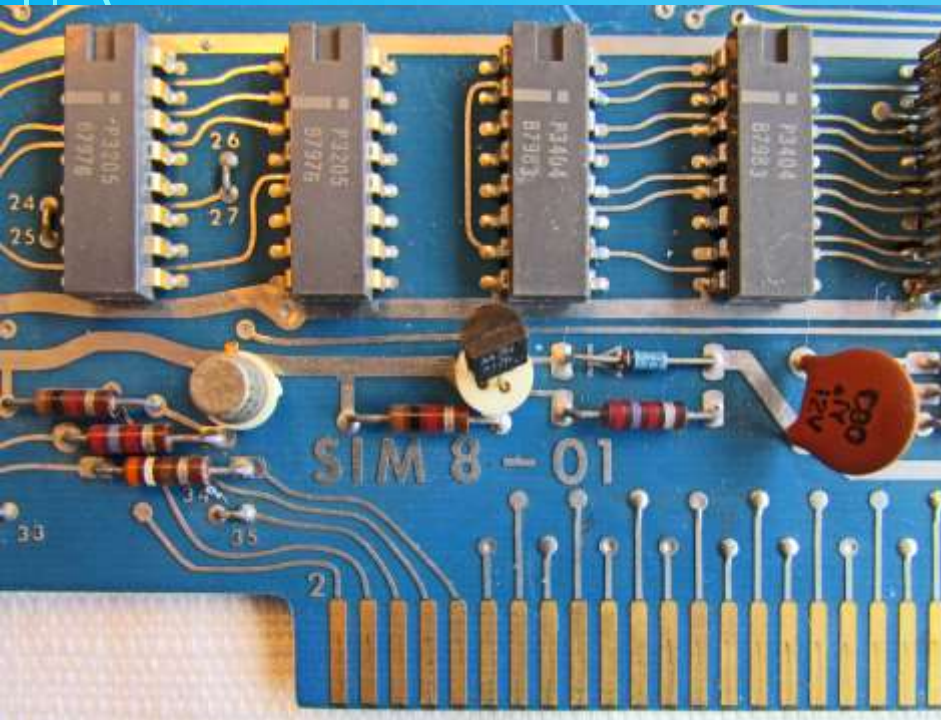
Microcomputers in 1973

The Intel SIM 8 - 01 "Prototyping System"



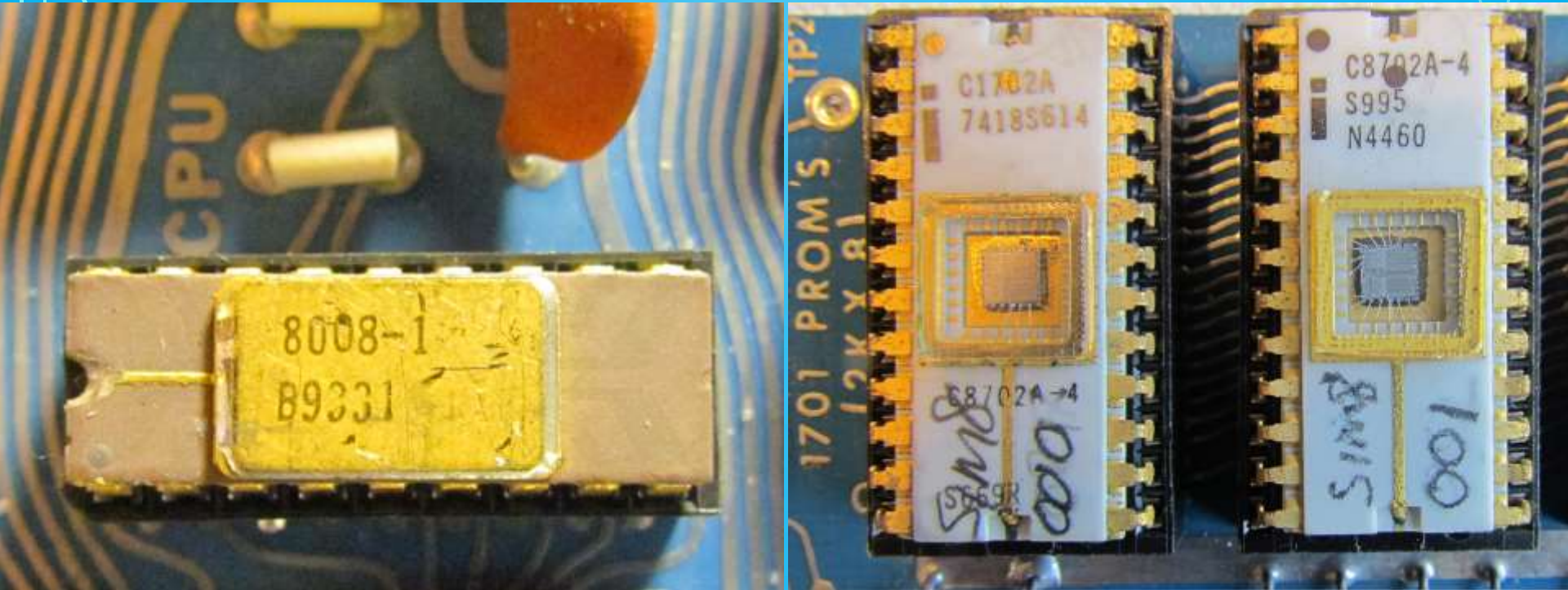
Microcomputers in 1973

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Microcomputers in 1973

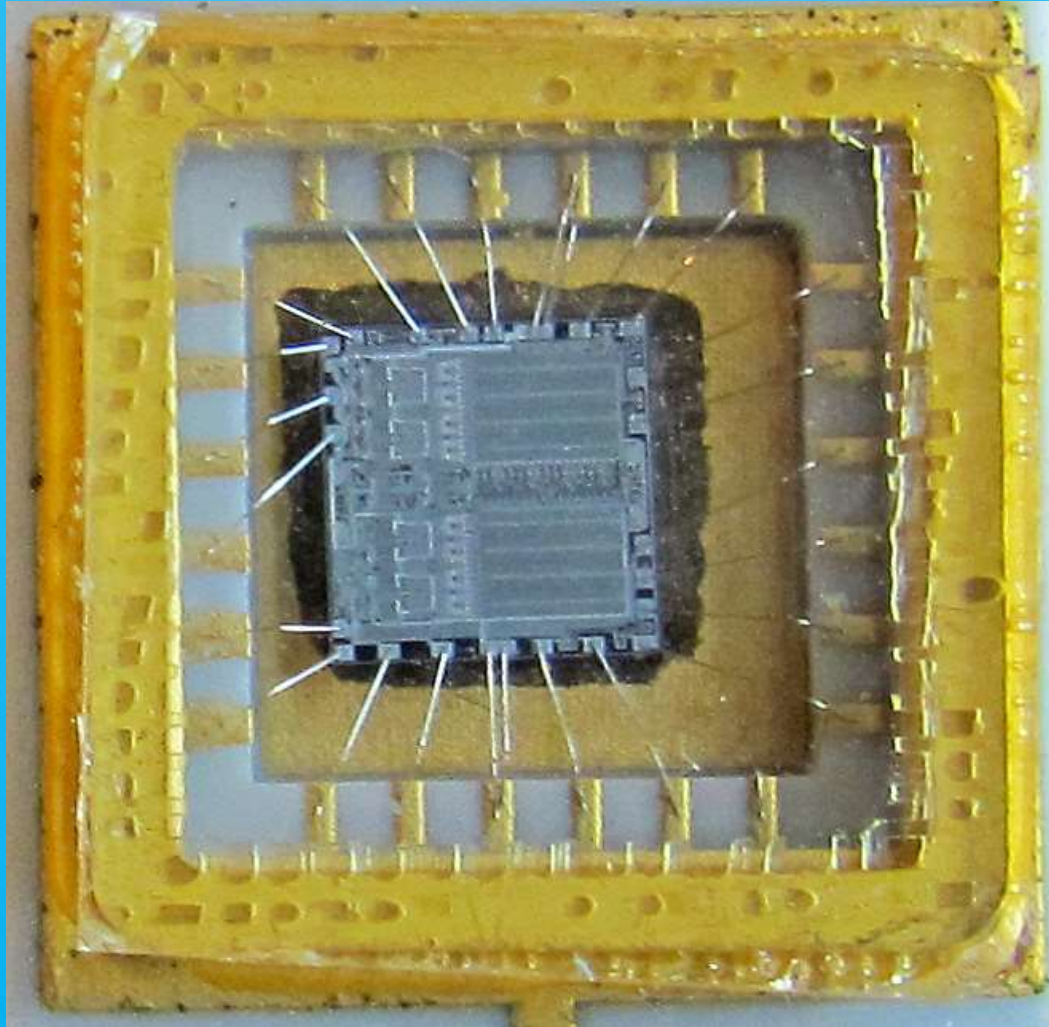
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Microcomputers in 1973

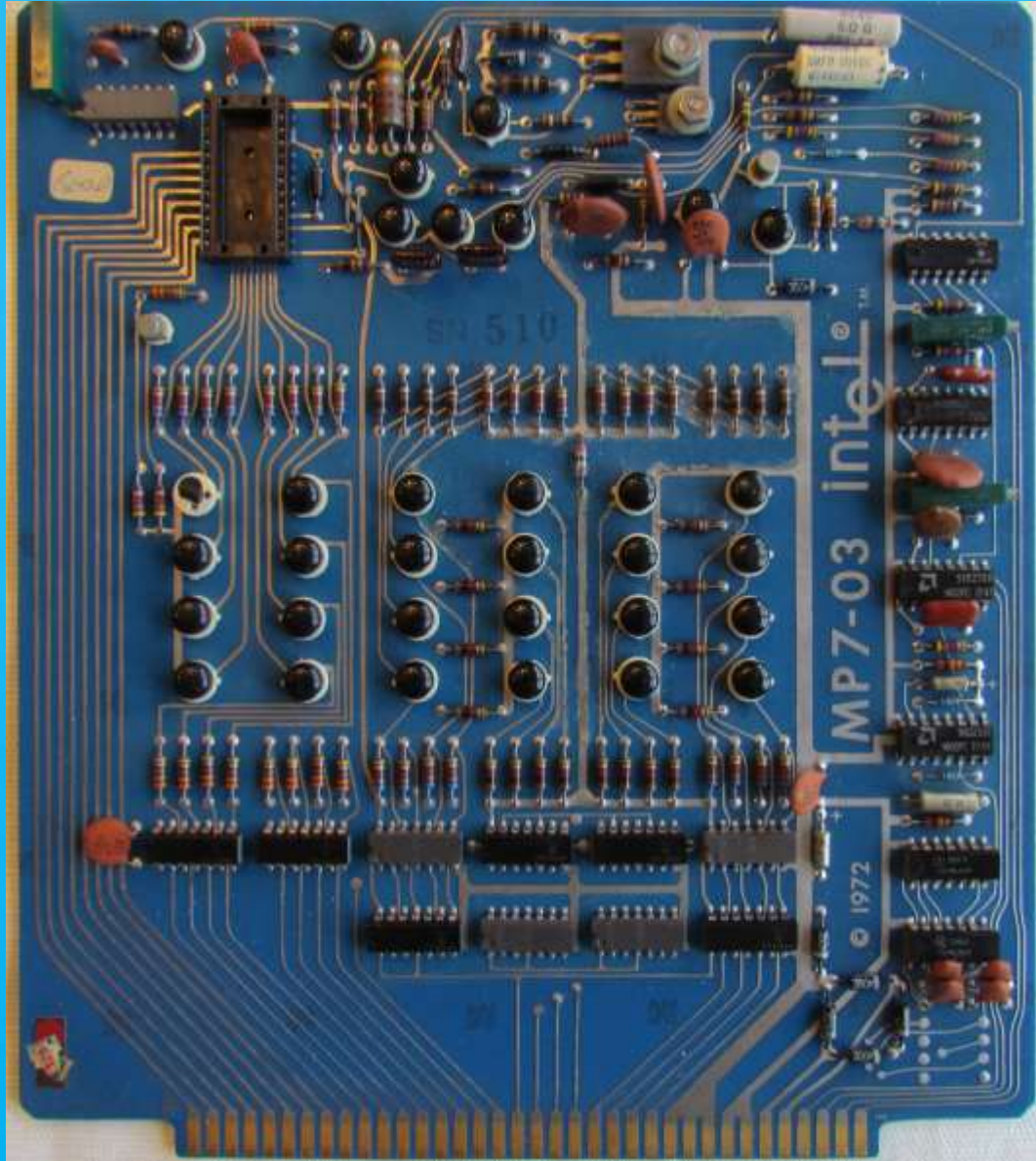
256 x 8 bit EPROM

Erasable Programmable Read Only Memory



Microcomputers in 1973

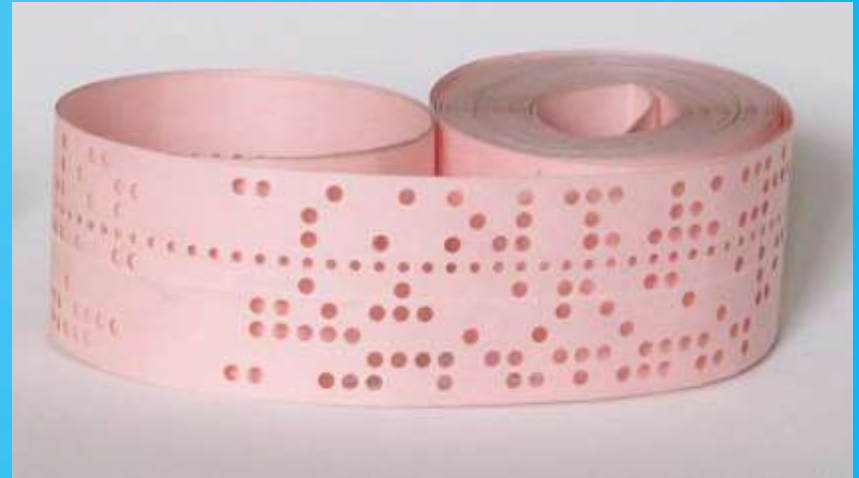
The Intel MP7-03 “PROM Programmer Board”



Microcomputers in 1973

Teletype Model 33 ASR

Punched Paper Tape



Acoustic Modem



1975

Our UCC lab built up a state of the art microcomputer software development system

- 8085 microprocessor
- Maxed-out 64 kilobyte RAM
- CP/M operating system
- Text editor and cross compiler
- Lear Seigler ADM-3A Terminal

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- Modem/phone line for remote access
 - RS-232 serial port (25-pin connector)
- Dot-matrix tractor-feed printer
 - 25-pin parallel port
- EPROM programmer (burner)

1975

Altair 8800 Computer became available

Considered to be the microcomputer that launched the personal computer age

Developed by Ed Roberts of MITS (Micro Instrumentation and Telemetry Systems) in Albuquerque, New Mexico

MITS was founded in 1969 to develop and sell model rocketry light flashers and telemetry transmitters

MIT'S

BUILDING YOUR OWN COMPUTER WON'T BE A PIECE OF CAKE.

(But, we'll make it a rewarding experience.)

Chances are you won't be able to assemble the Altair 8800 Computer in an hour or two. But, that's only because the Altair is a real, full-blown computer. It's not a demonstration kit.

The Altair Computer is fast, powerful, and flexible. Its basic instruction cycle time is 2 microseconds. It can directly address 256 input and 256 output devices and up to 65,000 words of memory.

Thanks to buss orientation and wide selection of interface cards the Altair 8800 requires almost no design changes to connect with most external devices. Up to 15 additional cards can be added inside the main case.

The Altair Computer kit is about as difficult to assemble as a desktop calculator. If you can handle a soldering iron and follow simple instructions, you can build a computer.

You see, at MIT'S, we want your experience with our kits to be rewarding. That's why we take such pains to write an accurate, straight-forward assembly manual. One that you follow step-by-step. (We leave nothing to the imagination.)

Some electronic kit companies are experts at cutting the corners. They promise you the sky and deliver a box full of surplus parts and a few pages of faded instructions run off on their copying machine.

We're experts at not cutting the corners. Our Altair Computer has been designed for both the hobby and the industrial market. It has to be constructed of the finest, quality parts. And it is.

That's why we give you double-sided boards, gold-plated connectors, a 30 Amp power supply (enough to power 15 additional cards), toggle switches and an all aluminum case complete with sub-panel and detachable dress panel.

That's why we give you three manuals (Assembly, Operator's and Trouble-shooting) in a hard-cover, 3 ring binder plus an Assembly Hints manual.

Buy our computer and we'll automatically make you a member of the Altair User's Group. You'll have access to a whole range of custom software designed exclusively for the Altair 8800.

We're quite serious about making computer power available to you at a price you can afford.

BASIC ALTAIR AND OPTIONS

The basic Altair 8800 Computer includes the CPU, front panel control board, front panel lights and switches, power supply and expander board (with room for 3 extra cards) all enclosed in a handsome, aluminum case.

Options now available include 4K dynamic memory cards, 1K static memory cards, parallel I/O cards, three serial I/O cards (FTL, RS232, and RTY), octal to binary computer terminal, 32 character alpha-numeric display terminal, ASCII keyboard, audio tape interface, floppy disc system, and expander cards.



PRICES: Altair Computer Kit with complete assembly

Instructions	\$439.00
Assembled Altair Computer	\$621.00
1,000 word static memory cards	\$176.00 kit & \$209.00 assembled.
4,000 word dynamic memory card	\$264.00 kit & \$338.00 assembled.

NOTE: Altair Computers come with complete documentation and operating instructions. Altair customers receive software and general computer information through free membership to the Altair User's Club. Software now available includes a resident assembler, system monitor, text editor, and basic compiler.

Prices and specifications subject to change without notice. Warranty: 90 days on parts for kits and 90 days on parts and labor for assembled units.

MIT'S/6328 Linn N.E., Albuquerque, N.M., 87108, 505/263-7553

MAIL THIS COUPON TODAY!

- Enclosed is a Check for \$ _____
 or Bank American # _____
 or Master Charge # _____

Credit Card Expiration Date _____

ALTAIR 8800 Kit Assembled

Include \$4.00 for Postage and Handling

Please send free Altair System Catalogue

NAME _____

ADDRESS _____

City _____ State & Zip _____

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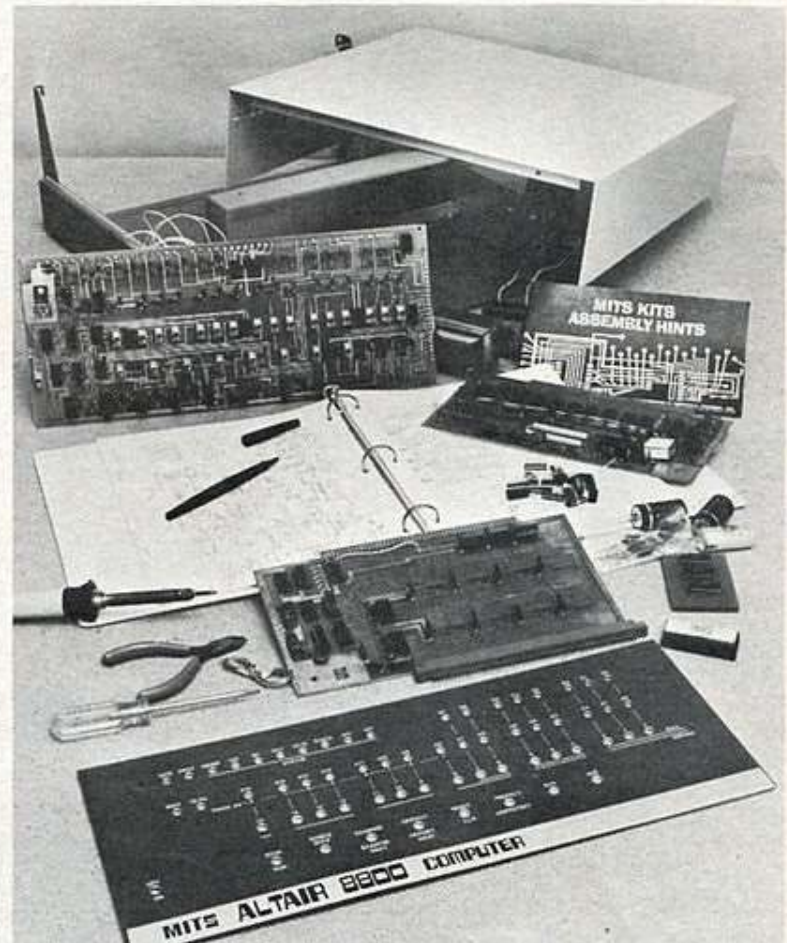
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Credit Card Expiration Date _____

ALTAIR 8800 Kit Assembled

Include \$8.00 for Postage and Handling

Please send free Altair System Catalogue

NAME _____

ADDRESS _____

City _____ State & Zip _____

MITS/6328 Linn, N.E., Albuquerque, New Mexico 87108
 505/265-7553

MAY 1975
 25



1975

Altair 8800 Computer

- Introduced what became known as the S-100 bus that resulted in an industry standard for computer printed circuit boards
- The operating system was CP/M

Microsoft was founded by Bill Gates and Paul Allen April 4, 1975.

- Approached Ed Roberts with a plan to write a Basic language interpreter that would fit on a 4 kilobyte ROM.
- “Altair Basic” went on sale in August 1975, the first Microsoft product.
- Other larger and less limited versions were developed in the following months and years.

1977

Apple II introduced in June 1977

- 4K (\$1298) or optional 64K (\$2638)RAM
- MOS Technology 6502 microprocessor



1978

Tandy / Radio Shack introduced the TRS 80 home computer

- Used the Zilog Z80 microprocessor
- Cost \$399 with 4k RAM








In 1978 I built a hobby computer system based on the S-100 bus.

I designed and built a “terminal” making use of a 4004 microprocessor that displayed 16 lines of 64 characters (1024) on a television.

I built a kit 16k RAM circuit board that cost \$219. (that is \$14,016 per megabyte)
(Today 16k would cost 0.0008 cents)



1979

Introduction of WordStar, an early word processor

- Dominant in the early to mid 1980's
- The first word processor with mail merge and WYSIWYG
- Initially for CP/M and later ported to MS-DOS

Introduction of VisiCalc, an early spread sheet

- Considered the “Killer App” for the Apple II
- Later ported to CP/M and MS-DOS

1980

Commodore VIC-20 released

- Displays 22 lines of 23 characters on a TV
- Used the MOS Technology 6502 microprocessor
- Cost about \$300 with 3.5k RAM
- The first microcomputer to sell one million units



Commodore C-64 released January 1982

- Displays 25 lines of 40 characters on a TV
- Used the MOS Technology 6502 microprocessor
- Cost about \$595 with 38k RAM
- The highest-selling computer model of all times, More than 12 million units were sold



1981

The IBM Personal Computer (PC) in August

- \$1565
- PC DOS 1.0 & IBM Basic in ROM
 - Both from Microsoft
- Intel 8088 microprocessor
- 8-bit data bus
- 16k RAM expandable to 1M
- No disc drives, but you could add 2 5 ¼ floppies
- 5 expansion slots
- Released as Open Architecture
 - IBM published technical information so others could design expansion slot peripheral boards
 - IBM helped 3rd party software developers

1981 The IBM PC



The IBM Personal Computer

The PC August 1981

The XT March 1983

- PC DOS 2.0 & IBM Basic in ROM (Microsoft)
- Intel 8088 & optional 8087 math coprocessor
- 8-bit data bus
- 128k RAM expandable to 1M
- 360kB 5 ¼ floppy drive
- 10MB hard drive
- 8 expansion slots

the AT August 1984

- DOS 3.0
- Intel 80286 & optional 80287 math coprocessor
- 16-bit data bus
- 256k Ram expandable to 16M
- 1.2MB 5 ¼ floppy & 20 MB hard drive
- Battery-backed system clock

The Apple Macintosh

Introduced by Steve Jobs in January 1984

- \$2,495
- Graphical User Interface
- Mouse for moving a pointer
- Motorola 68000 microprocessor
- 16-bit data bus
- 128kB RAM
- 3 ½ inch floppy drive 400kB
- The keyboard was intentionally missing:
 - Arrow keys
 - Numeric keypad
 - Function keys
- Convection cooled
- Had to use Apple's ImageWriter printer

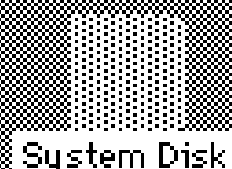


System Disk

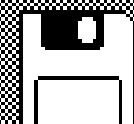
5 items 232K in disk 167K available

Empty Folder System Folder Disk Copy

Font Mover Fonts



System Disk



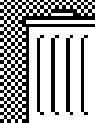
Guided Tour



SysVersion



My Folder



Trash

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Macintosh 512 came September 1984

- 512 kB RAM

Macintosh Plus released January 1986

- 1 MB RAM & SCSI peripheral bus
- 3 ½ inch 800kB floppy drive

Macintosh SE released March 1987

- 20 or 40MB hard disk
- Expansion slot & a cooling fan

Microsoft Windows Releases

Windows 1.0 November 1985

Windows 2.0 December 1987

Windows 3.0 May 1990

Windows 3.1 April 1992

Windows 95 August 1995

Windows 98 May 1998

Windows ME September 2000

Windows XP August 2001

Windows Vista July 2005

Windows 7 October 2009

Windows 8 October 2012

Windows 8.1 October 2013

Other Software Release Dates

WordPerfect 1982

- The dominant word processor in the 1980's

Microsoft Word 1983

Lotus 1-2-3 June 1983

- Considered the “Killer App” for PC's

Microsoft Excel Mac 9-85 Win 11-87

Microsoft Office Mac 1989 Win 1990

The image features a solid blue background with white decorative circuit-like lines in the corners. These lines consist of straight segments and small circles, resembling a stylized PCB or network diagram. The lines are positioned in the top-left, top-right, bottom-left, and bottom-right corners, framing the central text.

The End