

Commodore enters in the play

"Business is war, I don't believe in compromising, I believe in winning" - Jack Tramiel



Commodore_International Logo

Commodore International was an American home computer and electronics manufacturer founded by Jack Tramiel. Commodore International (CI), along with its subsidiary Commodore Business Machines (CBM), participated in the development of the home personal computer industry in the 1970s and 1980s.

CBM developed and marketed the world's best-selling desktop computer, the Commodore 64 (1982), and released its Amiga computer line in July 1985. With quarterly sales ending 1983 of \$49 million (equivalent to \$106 million in 2018), Commodore was one of the world's largest personal computer manufacturers.

Commodore: the beginnings

The company that would become Commodore Business Machines, Inc. was founded in 1954 in Toronto as the Commodore Portable Typewriter Company by Polish-Jewish immigrant and Auschwitz survivor Jack Tramiel. By the late 1950s a wave of Japanese machines forced most North American typewriter companies to cease business, but Tramiel instead turned to adding machines.

In 1955, the company was formally incorporated as Commodore Business Machines, Inc. (CBM) in Canada. In 1962 Commodore went public on the New York Stock Exchange (NYSE), under the name of Commodore International Limited.

Commodore soon had a profitable calculator line and was one of the more popular brands in the early 1970s, producing both consumer as well as scientific/programmable calculators. However, in 1975, Texas Instruments, the main supplier of calculator parts, entered the market directly and put out a line of machines priced at less than Commodore's cost for the parts. Commodore obtained an infusion of cash from Gould, which Tramiel used beginning in 1976 to purchase several second-source chip suppliers, including MOS Technology, Inc., in order to assure his supply. He agreed to buy MOS, which was having troubles of its own, only on the condition that its chip designer Chuck Peddle join Commodore directly as head of engineering.

Through the 1970s Commodore also produced numerous peripherals and consumer electronic products such as the Chessmate, a chess computer based around a MOS 6504 chip, released in 1978.

In December 2007, when Tramiel was visiting the Computer History Museum in Mountain View, California, for the 25th anniversary of the Commodore 64, he was asked why he called

his company Commodore. He said: "I wanted to call my company General, but there's so many Generals in the U.S.: General Electric, General Motors. Then I went to Admiral, but that was taken. So I wind up in Berlin, Germany, with my wife, and we were in a cab, and the cab made a short stop, and in front of us was an Opel Commodore." Tramiel gave this account in many interviews, but Opel's Commodore didn't debut until 1967, years after the company had been named.

Once Chuck Peddle had taken over engineering at Commodore, he convinced Jack Tramiel that calculators were already a dead end, and that they should turn their attention to home computers. Peddle packaged his single-board computer design in a metal case, initially with a keyboard using calculator keys, later with a full-travel QWERTY keyboard, monochrome monitor, and tape recorder for program and data storage, to produce the Commodore PET (Personal Electronic Transactor). From PET's 1977 debut, Commodore would be a computer company.

By 1980, Commodore was one of the three largest microcomputer companies, and the largest in the Common Market. The company had lost its early domestic-market sales leadership, however; by mid-1981 its US market share was less than 5%, and US computer magazines rarely discussed Commodore products. BYTE stated of the business computer market that "the lack of a marketing strategy by Commodore, as well as its past nonchalant attitude toward the encouragement and development of good software, has hurt its credibility, especially in comparison to the other systems on the market". The author of Programming the PET/CBM (1982) stated in its introduction that "CBM's product manuals are widely recognized to be unhelpful; this is one of the reasons for the existence of this book".

In the 1981 Commodore reemphasized the US market with the VIC-20, which was introduced at a cost of US\$299 and sold in retail stores. Commodore bought aggressive advertisements featuring William Shatner asking consumers "Why buy just a video game?" The strategy worked and the VIC-20 became the first computer to ship more than one million units. A total of 2.5 million units were sold over the machine's lifetime and helped Commodore's sales to Canadian schools.

History of Commodore Computers

History of Commodore Computers³

- **1953: Jack Tramiel opens a typewriter repair shop in the Bronx, New York.**
 - **1954: Tramiel founds Commodore.**
 - **1955: Tramiel relocates to Toronto and becomes the biggest manufacturer of low cost office furniture in Canada**
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³ Edited from <http://oldcomputers.net/c64.html> and [Chronology of Events in the History of Microcomputers](#)

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- **1977: Commodore manufactures calculators and digital watches, but gets killed by Texas Instruments.**
 - **1976: Commodore purchases MOS Technologies, an American maker of IC chips. MOS' senior engineer, Chuck Peddle was working on the 6502 micro processor. A popular 8 bit processor that soon would be used in machines like the Apple II, the Atari 800, the Commodore PET and 64.**
 - **1977: January - Commodore first shows a prototype PET computer at the Winter Consumer Electronics Show.**
 - **1977: June - Commodore shows its first production PET computers at the Summer Consumer Electronics Show.**
 - **1980: May - Commodore Business Machines introduces the CBM 8032 microcomputer, with 32KB RAM and an 80-column monochrome display.**
 - **1980: May - Commodore Business Machines introduces the CBM 8050 dual 5 1/4-inch floppy disk drive unit.**
 - **1980: Commodore Japan introduces the VIC-1001 (later called the VIC-20 in the USA).**
 - **1981: January - Commodore announces the VIC-20, for US\$299. During its life, production peaks at 9,000 units per day.**
 - **1982: January - Commodore announces the Commodore 64 microcomputer, showing a prototype at the Winter CES, for US\$600) for US\$595.**
 - **1982: January - Commodore introduces the 16K SuperVIC.**
 - **1982: April - Commodore announces the B (700) and P (500) series of microcomputers, for US\$1700-3000.**
 - **1982: September - Commodore Business Machines begins shipping the Commodore 64. Suggested retail price is US\$595.**
 - **1982: Commodore releases the 1540 Single-Drive Floppy for the VIC-20.**
 - **1983: January - Commodore Business Machines begins selling the Commodore 64 through mass merchants, which drops the retail price to US\$400.**
 - **1983: January - At the Winter CES, Commodore debuts the Commodore SX-100, a portable version of the Commodore 64, with bundled B/W screen, for US\$995. Price with color screen and two drives is US\$1295.**
 - **1983: January - At the Winter CES, Commodore demonstrates the HHC-4 (Hand-Held Computer). It features 24-character LCD screen with 4 KB RAM expandable to 16 KB. This was one of Commodore's pre-PET business products. Price is US\$199.**
 - **1983: January - Commodore's sales of VIC-20s reaches 1,000,000.**
 - **1983: January - Commodore introduces the SX-64, the first color portable computer. Weight is 10.5 kg. It incorporates a 5-inch color monitor and one or two 5.25 inch floppy drive. Price is US\$1600.**
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- **1983: April - Commodore drops dealer prices on the VIC-20, which allows it to drop below US\$100 retail, the first color computer to hit that mark.**
 - **1983: April - Commodore offers a US\$100 rebate on the purchase of a Commodore 64 on receipt of any computer or videogame unit.**
 - **1983: May - Commodore ships the Commodore Executive 64. It features 64KB RAM, detachable keyboard, 5-inch color monitor, 170KB floppy drive, for US\$1000.**
 - **1983: June - Commodore drops the dealer price of the Commodore 64 to US\$200, allowing the retail price to drop to US\$200-230.**
 - **1983: June - At the Summer CES, Commodore shows the B128/256-80, formerly called P128. It has a monochrome monitor with 80-column display. They also show the Executive 64, formerly the Commodore SX-100. It has a 6-inch color monitor and is priced at US\$995.**
 - **1983: Commodore debuts the Exactron Stringy Floppy, a high-speed cassette-based data storage device.**
 - **1984: January - Jack Tramiel, President of Commodore International, has a disagreement with the major share holder, Irvin Gould. Tramiel leaves the company and a few months later buys Atari.**
 - **1984: January - At the Winter CES, Commodore shows the SX-64, formerly called Executive 64. It now includes a 5-inch monitor, and one 170KB 5 1/4 disk drive, for US\$995.**
 - **1984: January - Commodore announces that during 1983, Commodore sold US\$1 billion worth of computers, the first personal computer company to do so.**
 - **1984: June - Commodore announces the Commodore 16. Former name was TED-16 and is expected to sell for around US\$100, and marketed as "The Learning Machine".**
 - **1984: June - Commodore announces the Commodore Plus/4, formerly called the Commodore 264. It will now feature four built-in programs, not just one. Price should be around US\$300.**
 - **1984: August - Commodore purchases Amiga Corporation.**
 - **1984: Commodore stops manufacturing the VIC-20.**
 - **1985: January - Commodore unveils the Commodore 128 Personal Computer. It functions as three computers in one: a complete Commodore 64, a CP/M mode, and a new 128KB mode.**
 - **1985: January - Commodore announces the 1571 Disk Drive, for the Commodore 128.**
 - **1985: July - Commodore unveils the new Amiga 1000 in New York, for US\$1300.**
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- **1985: Commodore stops production of the Commodore 64 several times during the year, restarting each time based on public demand.**
 - **1986: Commodore releases Transformer software for the Amiga, which, along with the Commodore 1020 5 1/4-inch disk drive, provides limited MS-DOS compatibility.**
 - **1987: January - Commodore announces the Amiga 500 and the Amiga 2000.**
 - **1987: January - Commodore debuts the Commodore 128D in the North American market.**
 - **1988: December - Commodore announces the A2286D Bridgeboard for the Amiga 2000. The A2286D contains an 8-MHz Intel 80286 and a 1.2MB 5 1/4-inch disk drive.**
 - **1988: Commodore introduces the Amiga 2000HD and the Amiga 2500.**
 - **1989: January - Commodore announces that 1 million Amiga computers have been sold.**
 - **1989: November - Commodore announces the Amiga 2500/30. It is essentially an Amiga 2000 with a 2630 Accelerator Board (25-MHz 68030 and 68882 math coprocessor).**
 - **1990: April - Commodore offers Amiga 1000 owners US\$1000 to trade in their Amiga on a new Amiga 2000.**
 - **1990: June - Commodore ships the Amiga A3000 computer.**
 - **1990: September - NewTek ships the Video Toaster, a hardware/software video effects tool for the Commodore Amiga 2000, for US\$1600.**
 - **1990: Commodore announces the Amiga 3000. Prices start at US\$4100 with a monitor.**
 - **1991: January - Commodore releases the CDTV package. It features a CD-ROM player integrated with a 7.16-MHz 68000-based Amiga 500. List price is US\$1000.**
 - **1992: Commodore introduces the Amiga 600 for a base price of \$500.**
 - **1992: September - Commodore introduces the Amiga 4000.**
 - **1992: December - Commodore introduces the Amiga 1200.**
 - **1994: Commodore International and Commodore Electronics (two of the many international components of Commodore Business Machines) file for voluntary liquidation.**
 - **1995: April - At an auction in New York, ESCOM buys all rights, properties, and technologies of Commodore.**
 - **1997: Gateway buys bankrupt Amiga.**
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Commodore VIC-20: Why buy just a video game? (1980)



Commodore_VIC-20

The VIC-20 is an 8-bit home computer that was sold by Commodore Business Machines. The VIC-20 was announced in 1980, roughly three years after Commodore's first personal computer, the PET.

The VIC-20 was the first computer of any description to sell one million units.

The VIC-20 has been described as "one of the first anti-spectatorial, non-esoteric computers by design...no longer relegated to hobbyist/enthusiasts or those with money, the computer Commodore developed was the computer of the future."

The VIC-20 was intended to be more economical than the PET computer. It was equipped with 5KB of static RAM and used the same MOS 6502 CPU as the PET. The VIC-20's video chip, the MOS Technology VIC, was a general-purpose color video chip designed by Al Charpentier in 1977 and intended for use in inexpensive display terminals and game consoles, but Commodore could not find a market for the chip.

As the Apple II gained momentum with the advent of VisiCalc in 1979, Jack Tramiel wanted a product that would compete in the same segment, to be presented at the January 1980 CES. For this reason Chuck Peddle and Bill Seiler started to design a computer named TOI (The Other Intellect). The TOI computer failed to materialize, mostly because it required an 80-column character display which in turn required the MOS Technology 6564 chip. However, the chip could not be used in the TOI since it required very expensive static RAM to operate fast enough.

In the meantime, freshman engineer Robert Yannes at MOS Technology (then a part of Commodore) had designed a computer in his home dubbed the MicroPET and finished a prototype with some help from Al Charpentier and Charles Winterble. With the TOI unfinished, when Jack Tramiel was shown the MicroPET prototype, he immediately said he wanted it to be finished and ordered it to be mass-produced following a limited demonstration at the CES.

As the new decade began, the price of computer hardware was dropping and Tramiel saw an emerging market for low-price computers that could be sold at retail stores to relative novices rather than professionals or people with an electronics or programming background. The personal computer market up to this point had sold primarily through mail order or

authorized dealers, the sole exception being Radio Shack, who had their own stores as a distribution network.

The prototype produced by Yannes had very few of the features required for a real computer, so Robert Russell at Commodore headquarters had to coordinate and finish large parts of the design under the codename Vixen. The parts contributed by Russell included a port of the operating system (kernel and BASIC interpreter) taken from John Feagans design for the Commodore PET, a character set with the characteristic PETSCII, an Atari 2600-compatible joystick interface, and a ROM cartridge port. The serial IEEE-488-derivative CBM-488 interface was designed by Glen Stark. It served several purposes, including costing substantially less than the IEE-488 interface on the PET, using smaller cables and connectors that allowed for a more compact case design, and also complying with newly-imposed FCC regulations on RFI emissions by home electronics (the PET was certified as Class B office equipment which had less stringent RFI requirements).

Some features, like the memory add-in board, were designed by Bill Seiler. Altogether, the VIC 20 development team consisted of five people, who referred to themselves as the VIC Commandos. According to one of the development team, Neil Harris, "[W]e couldn't get any cooperation from the rest of the company who thought we were jokers because we were working late, about an hour after everyone else had left the building. We'd swipe whatever equipment we needed to get our jobs done. There was no other way to get the work done! [...] they'd discover it was missing and they would just order more stuff from the warehouse, so everybody had what they needed to do their work." At the time, Commodore had a surplus of 1 kbit¹4 SRAM chips, so Tramiel decided that these should be used in the new computer. The end result was arguably closer to the PET or TOI computers than to Yannes' prototype, albeit with a 22-column VIC chip instead of the custom chips designed for the more ambitious computers.

The amount of memory on the VIC-20's system board was very small even for 1981 standards

This is evident if you think how the Super Expander cartage (below) was minded. It not only added new BASIC commands but also enough RAM to use a "bitmap" mode.

The Super Expander cartridge added BASIC commands supporting such a graphics mode using a resolution of 160¹160 pixels. It was also possible to fill a larger area of the screen with addressable graphics using a more dynamic allocation scheme, if the contents were sparse or repetitive enough. This was used, for instance, by the game Omega Race. The VIC chip did not support sprites.

While newer PETs had the upgraded BASIC 4.0, which had disk commands and improved garbage collection, the VIC-20 reverted to the 8KB BASIC 2.0 used on earlier PETs as part of another of the design team's goals, which was limiting the system ROMs to only 20KB. Since Commodore's BASIC had been designed for the PET which had only limited audiovisual capabilities, there were no dedicated sound or graphics features, thus VIC-20 programmers had to use large numbers of POKE and PEEK statements for this. This was in contrast to the computer's main competitors, the Atari 400 and TRS-80 Color Computer, both of which had full-featured BASICs with support for the machines' sound and graphics hardware. Supplying a more limited BASIC in the VIC-20 would keep the price low and the user could purchase a BASIC extender separately if he desired sound or graphics commands.

While the TRS-80 Color Computer and Atari 400 had only RF video output, the VIC-20 instead had composite output, which provided a sharper, cleaner picture if a dedicated monitor was used. An external RF modulator was necessary to use the computer with a TV set, and had not been included internally so as to comply with FCC regulations (Commodore lobbied for and succeeded in getting them relaxed slightly by 1982, so the C64 had an RF modulator built in).

VIC-20s went through several variations in their three and a half years of production.

The Japan's VIC-1001

In April 1980, at a meeting of general managers outside London, Jack Tramiel declared that he wanted a low-cost color computer. When most of the GMs argued against it, he said: "The Japanese are coming, so we will become the Japanese." This was in keeping with Tramiel's philosophy which was to make "computers for the masses, not the classes". The concept was championed at the meeting by Michael Tomczyk, newly hired marketing strategist and assistant to the president, Tony Tokai, General Manager of Commodore-Japan, and Kit Spencer, the UK's top marketing executive. Then, the project was given to Commodore Japan; an engineering team led by Yash Terakura created the VIC-1001 for the Japanese market. The VIC-20 was marketed in Japan as VIC-1001 before VIC-20 was introduced to the US.

When they returned to California from that meeting, Tomczyk wrote a 30-page memo detailing recommendations for the new computer, and presented it to Tramiel. Recommendations included programmable function keys (inspired by competing Japanese computers), full-size typewriter-style keys, and built-in RS-232. Tomczyk insisted on "user-friendliness" as the prime directive for the new computer, to engineer Yash Terakura (who was also a friend), and proposed a retail price of US\$299.95. He recruited a marketing team and a small group of computer enthusiasts, and worked closely with colleagues in the UK and Japan to create colorful packaging, user manuals, and the first wave of software programs (mostly games and home applications).

Scott Adams⁴ was contracted to provide a series of text adventure games. With help from a Commodore engineer who came to Longwood, Florida to assist in the effort, five of Adams's Adventure International game series were ported to the VIC. They got around the limited memory of VIC-20 by having the 16 KB games reside in a ROM cartridge instead of being loaded into main memory via.

While the PET was sold through authorized dealers, the VIC-20 primarily sold at retail, especially discount and toy stores, where it could compete more directly with game consoles. It was the first computer to be sold in K-Mart.

As we will see, this marketing idea will be a game changer. It helped to popularize 8-bit computers, even if these computers will be most of the time "game console" disguised as computers.

Commodore took out advertisements featuring actor William Shatner (of Star Trek fame) as its spokesman, asking: "Why buy just a video game?" and describing it as "The Wonder Computer of the 1980s". Television personality Henry Morgan (best known as a panelist on

⁴ Scott Adams was a game designer. For more information take a look at [https://en.wikipedia.org/wiki/Scott_Adams_\(game_designer\)](https://en.wikipedia.org/wiki/Scott_Adams_(game_designer))

the TV game show I've Got a Secret) became the commentator in a series of Commodore product ads.

The VIC-20 had 5KB of RAM, of which only 3.5KB remained available on startup (exactly 3583 bytes). This is roughly equivalent to the words and spaces on one sheet of typing paper, meeting a design goal of the machine. The computer was expandable up to 40KB with an add-on memory cartridge (a maximum of 27.5KB was usable for BASIC).

The "20" in the computer's name was widely assumed to refer to the text width of the screen (although in fact the VIC-20 has 22-column text, not 20) or that it referred to the combined size of the system ROMs (8áKB BASIC+8áKB KERNAL+4áKB character ROM).

Bob Yannes claimed that "20" meant nothing in particular and "We simply picked '20' because it seemed like a friendly number and the computer's marketing slogan was 'The Friendly Computer'. I felt it balanced things out a bit since 'Vic' sounded like the name of a truck driver."

In 1981, Tomczyk contracted with an outside engineering group to develop a direct-connect modem-on-a-cartridge (the VICModem), which at US\$99 became the first modem priced under US\$100. The VICModem was also the first modem to sell over 1 million units. VICModem was packaged with US\$197.50 worth of free telecomputing services from The Source, CompuServe and Dow Jones. Tomczyk also created a SIG called the Commodore Information Network to enable users to exchange information and take some of the pressure off of Customer Support inquiries, which were straining Commodore's lean organization.

The VIC-20 was the best-selling computer of 1982, with 800,000 machines sold.

One million units had been sold by the end of the first full year of production; at one point, 9,000 units a day were being produced.

With the introduction of Commodore 64 in the 1982, VIC-20 destiny was signed.

Sales of the C64 were slow at first due to reliability problems and lack of software. But by the middle of 1983, sales of the C64 took off resulting in plunging sales for the VIC-20. In order to try and staunch the sales decline, by mid-1983 the computer had become widely available for under \$90. As sales of the computer continued to decline, the VIC-20 was quietly discontinued in January 1985. Perhaps the last new commercially available VIC-20 peripheral was the VIC-Talker, a speech synthesizer

Applications

The VIC-20's BASIC is compatible with the PET's, and the Datasette format is the same. Before the computer's release, a Commodore executive promised that it would have "enough additional documentation to enable an experienced programmer/hobbyist to get inside and let his imagination work". Compute! favorably contrasted the company's encouragement of "cottage industry software developers" to Texas Instruments discouraging third-party software.

Because of its small memory and low-resolution display compared to some other computers of the time, the VIC-20 was primarily used for educational software and games. However, productivity applications such as home finance programs, spreadsheets, and communication terminal programs were also made for the machine.

The VIC had a sizable library of public domain and freeware software. This software was distributed via online services such as CompuServe, BBSs, as well as offline by mail order and by user groups. Several computer magazines sold on newsstands, such as Compute!, Family Computing, RUN, Ahoy!, and the CBM-produced Commodore Power Play, offered programming tips and type-in programs for the VIC-20.

An estimated 300 commercial titles were available on cartridge and another 500+ were available on tape. Games on cartridge include Gorf, Radar Rat Race, Sargon II Chess, and Jupiter Lander. A handful of disk applications were released.

The VIC's low cost led to it being used by the Fort Pierce, Florida Utilities Authority to measure the input and output of two of their generators and display the results on monitors throughout the plant. *The utility was able to purchase multiple VIC and C64 systems for the cost of one IBM PC compatible.*

Vic20 Specification

The VIC-20 had card edge connectors for program/expansion cartridges and a tape drive (PET-standard Datasette). It came with 5 KB RAM, but 1.5 KB of this was used by the system for various things, like the video display (which had a rather unusual 22x23 char/line screen layout), and other dynamic aspects of the ROM-resident BASIC interpreter and KERNAL (a low-level operating system). Thus, only 3583 bytes of BASIC program memory for code and variables was actually available to the user of an unexpanded machine.

A funny story is about the "KERNAL" world. The name should be KERNAL but apparently was misspelled.

According to early Commodore myth, and reported by writer/programmer Jim Butterfield among others, the "word" KERNAL is an acronym standing for **Key**board **Entry** **R**ead, **N**etwork, **A**nd **L**ink, which in fact makes good sense considering its role.⁵

The computer also had a single DE-9 Atari joystick port, compatible with the digital joysticks and paddles used with Atari 2600 videogame consoles (the use of a standard port ensured ample supply of Atari-manufactured and other third-party joysticks; Commodore itself offered an Atari-protocol joystick under the Commodore brand); a serial CBM-488 bus (a serial version of the PET's IEEE-488 bus) for daisy chaining disk drives and printers; a TTL-level "user port" with both RS-232 and Centronics signals (most frequently used as RS-232, for connecting a modem).

Importantly, like most video game consoles and many computers at the time the VIC had a ROM cartridge port to allow for plug-in cartridges with games and other software as well as for adding memory to the machine. Port expander boxes were available from Commodore and other vendors to allow more than one cartridge to be attached at a time. Cartridge software ranged from 4 to 16 KB in size, although the latter was uncommon due to its cost and only larger software houses produced 16 KB cartridges.

⁵ See also <https://en.wikipedia.org/wiki/KERNAL>

The graphics capabilities of the VIC chip (6560/6561) were limited but flexible. At startup the screen showed 176x184 pixels, with a fixed-color border to the edges of the screen. Since a PAL or NTSC screen has a 4:3 width-to-height ratio, each VIC pixel was much wider than it was high. The screen normally showed 22 columns and 23 rows of 8-by-8-pixel characters; it was possible to increase these dimensions up to 27 columns, but the characters would soon run out the sides of the monitor at about 25 columns. Just as on the PET, two different 256 character sets were included, the uppercase/graphics character set and the upper/lowercase set, and reverse video versions of both. Normally, the VIC-20 was operated in high-resolution mode whereby each character was 8x8 pixels in size and used one color. A lower-resolution multicolor mode could also be used with 4x8 characters and three colors each, but it was not used as often due to its extreme blockiness.

Bitmap mode “trick”

The VIC chip did not support a true bitmap mode, but programmers could define their own custom character set. It was possible to get a fully addressable screen, although slightly smaller than normal, by filling the screen with a sequence of different double-height characters, then turning on the pixels selectively inside the RAM-based character definitions. The Super Expander cartridge added BASIC commands supporting such a graphics mode using a resolution of 160x160 pixels. It was also possible to fill a larger area of the screen with addressable graphics using a more dynamic allocation scheme, if the contents were sparse or repetitive enough. This was used, for instance, by the game Omega Race. The VIC chip did not support sprites.

The VIC chip had readable scan-line counters but could not generate interrupts based on the scan position (as the VIC-II chip could). However, the two VIA timer chips could be tricked into generating interrupts at specific screen locations. This could be accomplished by setting up the timers after a position had been established by repetitive reading of the scan-line counter, and letting them run the exact number of cycles that pass by during one full screen update. Thus it was possible but difficult to mix graphics with text above or below it, or to have two different background and border colors, or to use more than 200 characters for the pseudo-high-resolution mode. The VIC chip could also process a light pen signal (a light pen input was provided on the DE-9 joystick connector) but few of those ever appeared on the market.

The VIC chip output composite video; Commodore did not include an RF modulator inside the computer's case because of FCC regulations. It could either be attached to a dedicated monitor or a TV set using the external modulator included with the computer.

The VIC chip had three pulse wave sound generators. Each had a range of three octaves, and the generators were located on the scale about an octave apart, giving a total range of about five octaves. In addition, there was a white noise generator. There was only one volume control, and the output was in mono.

Because the VIC had only 5K RAM, the VIC-20's RAM was expandable through the cartridge port via a Super Expander Cartridge (or simply, RAM Expander). RAM cartridges were available in several sizes: 3 KB (with or without an included BASIC extension ROM), 8 KB, 16

KB, 32 KB and 64 KB, the latter two only from third-party vendors. *The internal memory map was dramatically reorganized with the addition of each size cartridge, leading to a situation where some programs would only work if the right amount of memory was present* (to cater to this, the 32 KB cartridges had switches, and the 64KB cartridges had software setups, allowing the RAM to be enabled in user-selectable memory blocks).

Since the VIC-20 was designed to use SRAM rather than DRAM, the system board had no provisions for RAM refresh. Memory expansion cartridges may in practice use either type; however, DRAM-based expanders had to contain their own circuitry to refresh the RAM and multiplex the data/address bus, and one possible reason for the oversized VIC-20 cartridge PCBs may have been to provide room for DRAM infrastructure.

Commodore's official RAM expansion cartridges were only available up to a maximum of 16KB worth of additional memory, but third party cartridges could provide up to 64KB and sometimes included DIP switches to map the additional RAM to user-selectable address space.

Describing it as "an astounding machine for the price", *Compute!* in 1981 expected that the VIC-20 would be popular in classrooms and homes with small children, with "excellent graphic and sound capabilities". While predicting that the 22-column screen was "too small to support any but the most rudimentary business applications" the magazine observed that "at a price of \$299, that is hardly the point", stating that "the VIC will provide very stiff competition to the TRS-80 Color Computer" and "is a much more valuable computer literacy tool than" other products like the TRS-80 Pocket Computer. *Compute!* concluded that "VIC will create its own market, and it will be a big one". While also noting the small screen size and RAM, *BYTE* stated that the VIC 20 was "unexcelled as low-cost, consumer-oriented computer. Even with some of its limitations ... it makes an impressive showing against ... the Apple II, the Radio Shack TRS-80, and the Atari 800". The magazine praised the price ("Looking at a picture ... might cause you to think \$600 would be a fair price ... But it does not cost \$600 the VIC 20 retails for \$299.95"), keyboard ("the equal of any personal-computer keyboard in both appearance and performance. This is a remarkable achievement, almost unbelievable considering the price of the entire unit"), graphics, documentation, and ease of software development with the KERNAL.

The VIC-20 could be hooked into external electronic circuitry via joystick port, the so-called "user port," or the memory expansion cartridge port, which exposed various analog to digital, memory bus, and other internal I/O circuits to the experimenter. The BASIC language could then be used (using the PEEK and POKE commands) to perform data acquisition from temperature sensors, control robotic stepper motors, etc.

The VIC-20 did not originally have a disk drive, but an extremely reliable digital tape storage system (using audio cassette tapes); the VIC-1540 disk drive was released in 1981.

Recent software releases such as clones of *Frogger* (2007 release) and *Berzerk* (2010 release) have gameplay, graphics, and sound (including voice synthesis in *Berzerk*) that are comparable to the original arcade machines. A port of *Doom*, a 1993 game popularized on much more powerful platforms, became available for the VIC-20 in 2013.

The VIC-20 was called VC-20 in Germany because the pronunciation of VIC with a German accent as well as its codename Vixen both sound like German curse words. The term VC was marketed as though it was an abbreviation of VolksComputer ("people's computer", similar to Volkswagen, Volksempfänger, etc.)

BYTE in 1983 published a series of technical articles about the VIC-20.

In 1982, Commodore introduced the Commodore 64 as the successor to the VIC-20.

VIC20 Legacy

VIC 20 has tiny memory, but a full featured keyboard and a huge software library, mostly of games.

The Super Expander should be developed and packed with the computer, because would have balanced it lack of power (mostly memory and graphic).

Normally Commodore will have a 2-years cycle, so in the 1982 the company was ready for a new product.

From the Vic-20 Commodore take the VIC-I chip and stated developing two different evolution:

- One will be the VIC-II graphic chip, featuring sprites object
- One will be the Sound Interface Device (SID), created by Bob (Robert) Yannes.

Of the two, the SID is a bit more more innovative in our humble opinion, but together with a pack of RAM the resulting computer will be very impressive, as we shall see.

The Commodore 64, also known as the C64 or the CBM 64, is an 8-bit home computer introduced in January 1982 by Commodore International (first shown at the Consumer Electronics Show, in Las Vegas, January 7-10, 1982). It has been listed in the Guinness World Records as the highest-selling single computer model of all time, with independent estimates placing the number sold between 10 and 17 million units.

Commodore 64 (1982)



Commodore_64

C/64 enters in to play: introducing the best selling computer ever

It is very difficult to talk about the C/64 because everything has been already said.

The machine was ahead of time for its custom chips, and the amount of RAM.