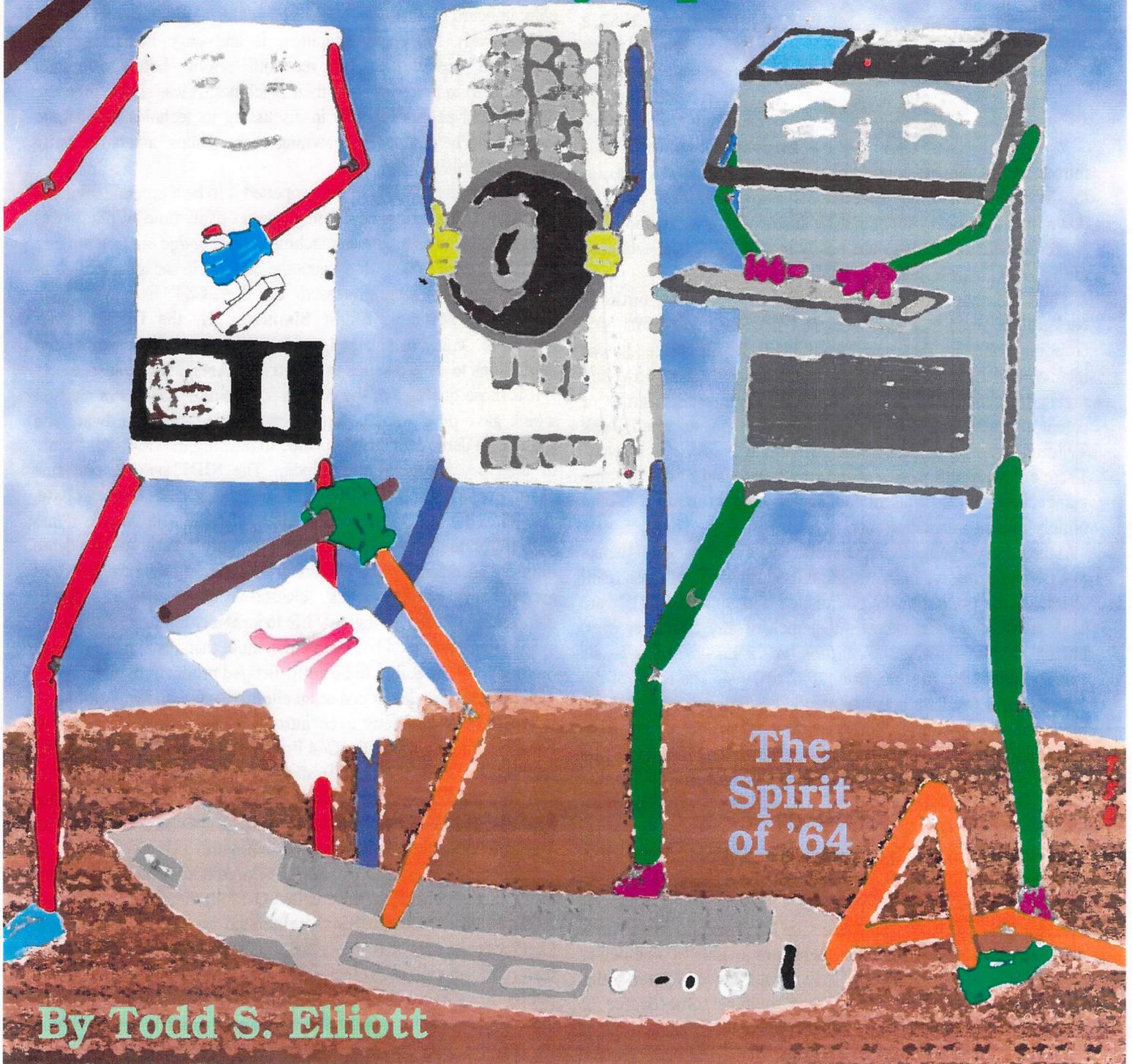


LUCKY REPORT

20th Anniversary Special



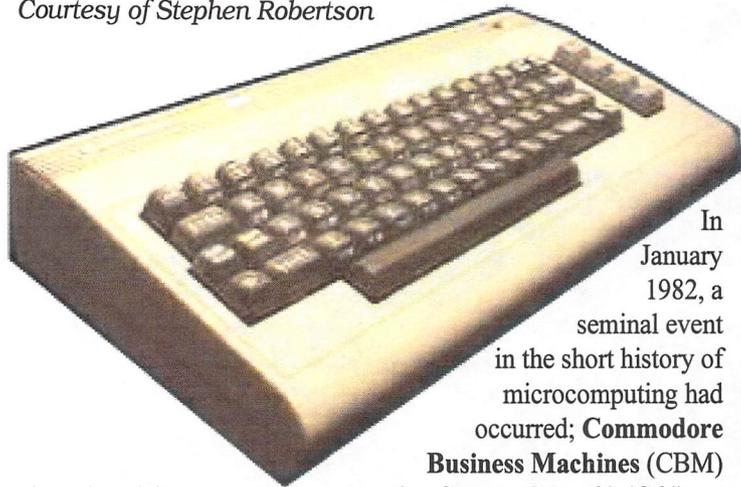
The
Spirit
of '64

By Todd S. Elliott

20th Anniversary of the 64

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The Original Commodore 64
Courtesy of Stephen Robertson



In January 1982, a seminal event in the short history of microcomputing had occurred; **Commodore Business Machines (CBM)**

introduced its newest computer, the **Commodore 64 (C64)**, at the **Winter Consumer Electronics Show**. It will now go down in the annals of computing history as a mere footnote, thanks to revisionist historians busily lending historical cachet to the **IBM PC, Apple, and Microsoft**.

The Commodore 64 had all markings of a corporate birth; its background wasn't 'sexy.' The C64 was a direct result of a corporate machine that was beginning to hit its stride. It was incubated in the suburbs of Philadelphia, Pennsylvania by a young ragtag team of software and hardware engineers, an army of patent attorneys, and overseen by a ruthless businessman, **Jack Tramiel**, who once likened the computing industry to a 'war.' There are no quaint stories of the C64 being hacked out in some garage in a nondescript Silicon Valley neighborhood by some pimply-faced college dropouts.

At the time, the suggested retail price was 595 dollars, but thanks to CBM's aggressive marketing and its shrewd use of mass retail channels, the price quickly plummeted and tons of C64's were sold. It was the most successful launch of any computer ever, having sold in between *17 million to 22 million units* in its extraordinary long lifespan from 1982 to 1994. The reach of the Commodore 64 has been tremendous, indeed; it has been marketed to far-flung corners of the earth, from Japan to Australia/New Zealand to Germany to the United Kingdom. The C64 also enjoyed a strong presence in Canada, and in fact, the parent corporation had its inauspicious beginnings in Toronto as a typewriter repair company.

The Commodore 64 may have propelled CBM to become the *first billion dollar* computing company and threatened the existing computing structure at the time. Back then in 1982, the home computing industry was still in its infancy. Apples and **Ataris** were just making inroads and there was a glut of competing architectures and machines. CBM's own **PET** computer series was making a dent, as it continued to have some degree of success in the small business market. The C64 changed all of

that, seemingly overnight, and proved true to CBM's founder Jack Tramiel's vision, "*computing for the masses!*" Thanks to its fully featured approach coupled with a low price, the C64 was precisely the right kind of computer to infiltrate the home computing market, blindsiding Apple and crippling Atari. In its founder's words, the *Commodore 64 had won the 'home computing wars.'*

Despite its cold corporate origins, the Commodore 64 seemingly had a persona with a host of features; it had a sound synthesizer chip, unheard of during its time. It had colorful graphics and sprites, which made for pretty graphics. It had easy interfacing and expansion possibilities for the still strong hobbyist market accustomed to tinkering with their machines. It was such a machine that brought people together in discussing its technical merits and for seeking help/support, spawning users groups, a relative rarity during these heady times.

It was those qualities, which propelled it to be a preeminent game machine for the home computing market of its time. While it was unfairly labeled as a 'games machine', *it is a badge the Commodore 64 carries with pride!* Many genuine classics in the annals of computing gaming were released for the C64 like **M.U.L.E., Impossible Mission, Flight Simulator II, the Ultima series** and more. Many established software game companies owe their beginnings to the C64 such as **Electronic Arts, Microprose**, etc.

It is those qualities of the custom sounds and graphics in the C64 which gave programmers an 'intimate' feel for the hardware and spawned a demo industry dedicated to pushing the C64 architecture to the very limits of multimedia. The **SIDPlayer** is one fine example of a hobbyist effort to introduce music to the C64 user base. The **Time Crystal** demo was another example of a popular demo with first-rate graphics. Late in the C64's lifespan, it was the demo industry shedding its shady 'piracy' reputation and, at its apex of graphics/music programming, released an unprecedented string of demo masterpieces giving new life to a rapidly maturing market.

The Commodore 64 has been much more than just a mere gaming outlet; it had the ability to be a full-fledged productivity machine as well. **GEOS** was developed as an alternative OS and was embraced by CBM. The company even introduced hardware peripherals to enhance productivity of the C64 line by marketing **REU's, the 1351 mouse and the 1581 (3.5") disk drive**. A lot of productivity software made good use of these hardware features like the **Write Stuff, the Paperback software suite, SuperBase 64/128, the Timeworks software suite, GoDot**, and more.

Telecommunications thrived on the Commodore 64 and gave birth to the media behemoth (once called Q-Link) that is now known as **AOL Time Warner**. **BBS's** proliferated on the scene and gave Commodore users the ability to communicate information about their platform with each other at the speed and ease of email. A lot of public domain and freeware programs were made available to the Commodore public through the **QuantumLink's** vast archives,

BBSes and later, the Internet. **Google Groups**, a Usenet archive, has *archived Commodore messages dating back to 1982 for easy searching and information retrieval today!*

Strangely enough and despite the brilliant success of the Commodore 64, it was none other than Commodore itself that tried to **kill** it. In hindsight, it probably was a strategic decision that indirectly led to Commodore's demise. They acquired a small start-up company holding the **Amiga** prototype and marketed the Amiga as their '*Next Great Thing*' with the usual Commodore marketing spin. At that time, Commodore also lost its guiding founder, Jack Tramiel, as he left the company and purchased Atari from **Warner Communications**.

This is nothing new in the realm of the computing industry in those days. Certain computer companies like Apple, relied on the 8-bit machines as their *cash cow* and used it to fund more R&D toward producing the next generation machines and neglected further development of their bread-winning 8-bit computers. Despite this, Commodore continued to milk the cash cow further by producing the **Commodore 128** and associated hardware peripherals like the 1581 disk drive and made inroads into the home computing arena with even lower prices. Finally, Commodore tried to kill off the C64 by canning the next generation 8-bitter, the **Commodore 65**, in favor of the Amiga and put all energies/monies into a sizeable bet on its future.

Allow me some latitude in conjuring up a *what if* scenario? What if Jack Tramiel had stayed on the stewardship of Commodore and declined purchasing the Amiga prototype? What innovations would have Commodore produced then? It wouldn't have been the **Plus/4** or **Commodore 16** computers. The Commodore 128 may have never been produced because it was birthed into reality by the lessons engendered by the Plus/4 and Commodore 16 computers. Very much more likely, a successor to the C64 would have been produced, with an internal 1581 drive and a **65816** CPU. This would have paralleled Apple's continuing development of their 8-bit line and **Nintendo** with their gaming consoles.

Commodore could conceivably have kept the spirit of the Commodore 64 alive and well into the next millennium due to their economy of scale. They could have easily produced millions of these next generation machines, far more than what Apple or Nintendo could do with their properties. Commodore could have easily spurred hardware innovation and pushed the **Western Design Center** into producing the next generation of the 65816 chipset with higher speeds and computational prowess. Since each generation of the Commodore machines would have retained backwards compatibility, C64 users could have easily kept their migration path towards more powerful machines and kept Commodore alive and well.

But that vision will never be a reality and only exists in the daydreams of the Commodore hobbyist. This isn't to say that Commodore didn't innovate or tinker with their most valuable property, the 64, back in its day. I give you this tribute to the Commodore 64 within these very pages as to the various models and peripherals that CBM itself tried to market, introduce, or innovate for the C64 line throughout its lifespan across the globe. This is presented to you through the courtesy of **Cameron**

Kaiser and his excellent **Secret Weapons of Commodore** website. Please do visit his website as I have only captured a fraction of what's available there for inclusion in this special *20th Anniversary* issue of the **LUCKY REPORT**.

Back to reality; despite CBM's best efforts for corporate survival, their biggest bet, the Amiga computer, never truly caught on in either the home computer realm or the business arena. CBM quietly went out of business on the picturesque shores of the Cayman Islands with some passing news here and there in the **Philadelphia Inquirer**. Quite a humbling end to a billion dollar company, *but in no way marginalizes the Commodore 64's everlasting contribution to computing history*, and its legend is virtually assured for generations to come. The death of the corporate parent has had very little effect on the *esprit de corps* of the Commodore 8-bitters, now being kept alive by users, users groups, programmers, and hardware hackers. The C64 has gone back to its PET roots by turning back to its own user base for self-sufficiency and innovation.

Against a backdrop of massive 'parental neglect' by CBM, a small company honing its success on a simple disk drive accelerator upgrade (JiffyDOS) began to take control and guide the destiny of the Commodore 64 line well into its mature market stronghold. That company, **Creative Micro Designs, Inc.** (CMD) began an unprecedented procession of hardware innovations that not even CBM themselves would even market, such as a hard disk drive, a 65816 accelerator upgrade, a high density version of the 1581 drive, an enhanced ram expansion package, and more.

It is now 2002, and the Commodore 64 itself may experience renewed life and awareness within the hobbyist computing public, and to a lesser extent, the general computing public. I speak of **Jeri Ellsworth's** grand ambitions and ideas for a next generation Commodore 64 and **Maurice Randall's** gatekeeper role and continued stewardship of Commodore 8-bit line's immediate future. If Jeri Ellsworth is successful in creating a next-generation Commodore 64 and uses off-the-shelf computer parts with a new manufacturing imprint, the classic computer may experience renewed life and gain a considerable foothold in the niche hobbyist computer marketplace. It remains to be seen as to what kind of success, if any, Ms. Ellsworth may achieve with her ideas and ambitions. I certainly wish her the best and want her wildest dreams for the **CommodoreOne** to come true.

However, the Commodore 64 has experienced renewed life in the hobbyist classic computer marketplace. It is indisputably the *King of the Hill* of this niche market of the overall computer marketplace. Lately, **eBay** transactions involving the Commodore 8-bit line now number in the thousands per month. The volume of Commodore user participation in the **comp.sys.cbm** newsgroup and other various emailing lists have picked up recently, now numbering in the 80's of messages per day. There are news portals on the Internet reporting Commodore related news on a near daily basis.

A few months ago, CMD passed its torch of Commodore leadership to Maurice Randall. He now controls the immediate direction and future of the Commodore 8-bit line and assumes the role as a gatekeeper. He has been very busy fulfilling CMD orders for related hardware, but it hasn't prevented him from undertaking software innovation in extending the life and vigor of these

high-end CMD peripherals for our Commodores such as creating the latest **CMD HD DOS+** upgrade. He has grand ambitions for the Commodore 8-bit line. Thus, the future for our beloved platform has never been in better hands.

The Commodore 64 is the *Phoenix Computer* of our time. The parent corporation seemingly tried to kill it many times. CMD has also exited the CBM market. Many users have migrated to more mainstream computing platforms only to repurchase their *first love* on eBay or from other second-hand sources. Users, user groups, programmers, and hardware techies have kept it alive beyond any reasonable laws of computer obsolescence.

However, not even the Phoenix can overcome the fundamental laws of atrophy. The Commodore 64's biggest challenge now is to acquire a new generation of users, as much of the current user base is rapidly aging or passing away. As most CBM machines are 20+ years old, the rapidly diminishing base of working Commodore machines will only dwindle more as the years go by, making current efforts to remodernize the Commodore 64 and/or 128 doubly important. Only time will tell if the Commodore 64 will survive as a timeless classic, being enjoyed well into the future.

Here's to the Commodore 64 and may it continue to build on its recent renaissance and see another 20 years of continued excellence! Thanks to the Commodore community's comradery, composed of users, programmers, and hardware hackers, the **Spirit of Commodore** continues to live, *and live well!*

ABOUT THE COVER

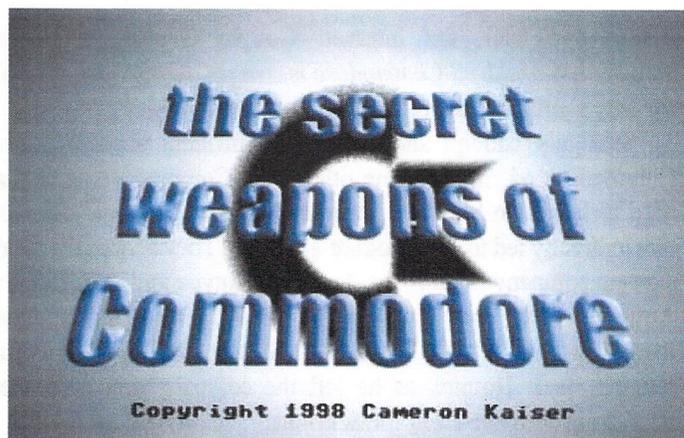
The cover spread depicts four computers. Starting on the left and going clockwise, you see a C64GS computer toting joysticks. Next is a classic C64 spreading the joy via a speaker. The last one of the computer trio is a SX-64 humming a beat, using its own keyboard. Lying on the ground, defeated, is an **Atari 800XL**.



If the cover's style seems familiar, I modeled it after the world-famous "**The Spirit of '76**" painting by **Archibald M. Willard**. Take a look at the painting to the left and compare it with the cover spread. You'll see that I chose this painting as my inspiration. Remember, Jack Tramiel, Commodore's founder, had a warlike approach in his business dealings at Commodore. That theme is reflected in this picture!

One by one, Commodore eventually vanquished Atari, Apple, **Texas Instruments**, **Coleco** and many other manufacturers in winning the Home Computer Wars of the mid-1980's. Fittingly, I think, the cover spread is entitled, "**The Spirit of '64.**"

To create the cover spread, I originally drew this in pencil. Then I used a scanner to scan the pencil sketch into Photoshop on another platform. Using Photoshop again, I colored the drawing and applied a *Dry Brush* filter in giving it a painted look. I also used Photoshop's filters in creating the sky and the earth and as well as the gradient fills in the Commodore and Atari logos on the flags. Next, I saved it as a JPEG and inserted it into a **PostPrint** document for this **LUCKY REPORT**.



With the kind permission of **Cameron Kaiser**, I have excerpted portions (edited for space) of his **Secret Weapons of Commodore** website to show that CBM did produce different flavors of their best-selling flagship product, the Commodore 64. The website is at:

<http://www.floodgap.com/retrobits/ckb/secret/>

Before we get into that, we must traverse thousands of miles across the Pacific Ocean to the land of rising sun, Japan, and examine the immediate predecessor to the C64...



[Picture courtesy of Bo Zimmerman. www.zimmers.net]

The UltiMax
aka **VIC-10**,
"Vickie",
Max Machine

Introduced January 1982

Hardware: 6510 @ 1MHz, 4KB SRAM (2128). Only one CIA (missing the one at \$DD00, hence no user port, serial port or NMI activity). Mini-BASIC on cartridge. The Max had a very horrible rubberish keyboard, reminiscent of MSX machines. No big surprise when you consider its chief market.

Graphics and Sound: SID; 6566 (NOT 6567/6569) video chip (NTSC-M only), but apparently some 6567s did make it into production models. The 6567 is the NTSC VIC-II.

Eventual Fate: Released (MSRP \$150-\$180), apparently only in Japan as the Max Machine. *Fantastic flop*. Curiously released simultaneously in Japan with the Japanese version of the 64.

Comments: The Max Machine's price, plus fierce market competition, doomed it to failure. This isn't the end of the story, however; the spectre of the UltiMax even now haunts the 64 and 128's memory mapping schemes. To allow the 64 to use UltiMax cartridges, if you pull -GAME low and leave -EXROM alone, the 64 pops into UltiMax mode (as described in the Programmer's Reference Guide). In 128 mode, UltiMax mode can be triggered by messing with the MMU (use location \$D505 to control the GAME and EXROM lines).

Surprisingly, UltiMax mode has a very common application: it's a freezer cartridge. Somehow, the freezer needs to gain control of the computer, and the only way to do that is to divert the processor's control to the freezer ROMs. This is easily done in UltiMax mode.

The Japanese Commodore 64

Introduced 1983

Hardware: Somewhat different (and incompatible) Kernal and BASIC to accommodate Japanese katakana characters, 46 total (plus punctuation, diacritics, etc.); many graphic characters replaced in the Char ROM with the new Japanese characters. Breadbox case and original brown keycaps; SHIFT-LOCK replaced with C= LOCK for the purpose of getting at the katakana; modified keycaps to show the new characters with the color keys no longer present and the remaining graphic characters significantly rearranged. Machine started up in English but different color scheme.

Graphics and Sound: Identical to the breadbox 64.

Eventual Fate: Released approximately 1983 at MSRP 99,800yen (approximately US\$400); contemporary of the Max Machine. Lasted barely six months.

Comments: Commodore Japan had an initially bright but ultimately brief and sorrowful history during the early 1980s. The VIC-20 was actually released first in Japan as the VIC-1001.

The VIC's plunge into the Far East computer world was reasonably successful, but the later Japanese 64 and its ill-futured contemporary, the Max Machine, were both victims of the cutthroat Japanese home computer market during the middle of that decade. After the dust had cleared, the 64s were really only available at junk shops; Commodore Japan gave up and started selling off their inventory at fire-sale rates to cut their losses.

Despite this fantastic market failure, the 64 managed to stay present in the Japanese market thanks to a few dedicated users who noticed the success of the 64 back in the States and Europe. Imported software started to trickle in, too little too late to be sure, but a small number of enthusiasts managed to keep the torch burning. [Editor's Note: Truly, a loss occurred here. Had it been more successful, there would be a huge base of NTSC users in Japan producing NTSC compatible games, demos and productivity software contributing towards the overall North American scene.]



[Picture Courtesy of
Moise Sunda.]

Educator 64

aka 4064, PET 64

Introduced: Late 1982

Hardware: Identical to the 64. Some models had an integrated monitor (like the one in the

image) and were in fact 64s packaged in PET casings; others were in the standard case; the 4064 models, however, had slight modifications made to Kernal ROM to make the startup colors black and white, and the familiar "38911 BASIC BYTES FREE" message was for some reason eliminated. However, I have also encountered models that simply look like regular 64s. In fact, Moise reports that his unit is nothing more than an early 64 motherboard with an audio amplifier connected to it and a headphone jack on the front. There is even a reset button next to the amp's volume control.

Graphics and Sound: As mentioned, some of the PET-(en)cased Educators (4064 series) displayed black and white only; sound, colour and sprites were disabled; however, this was a software change, not new or missing chips. The Educators in the standard breadbox case supported the regular colour capabilities and sound, according to **Andrew Davie**, and so did many in the PET casings.

Eventual Fate: Released, but not a strong seller.

Comments: The fact that the 4064 and like-minded machines were not strong sellers didn't matter anyway, since most of them were refurbished 64 boards that had been sent back to Commodore. Commodore fixed them, crammed them into whatever case they had available, and shipped it out to schools at a bargain rate, hence the name. Commodore's line of public domain educational software was apparently targeted at the Educator, and may have even been bundled with it (unconfirmed). According to **Travis Little**, the Educator 64's design was at least in part the idea of the New York (State) Department of Education. School officials were dismayed at how easily the breadbox units could be stolen (in fact, quite a few disappeared from schools, and they fit very neatly in students' knapsacks), so Commodore presented the old PET cases as an inexpensive stopgap solution.

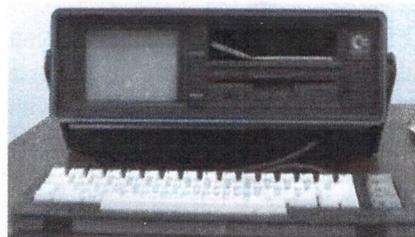
SX-100

Introduced January 1983, with the **DX-64**.

Hardware: Identical to the 64. Upgraded Kernal; missing the cassette port and the RF modulator outputs. Cartridges are accepted through the top, not the back. Integrated 1541 disk drive, supposedly choice of one or two, and a 5-inch black and white composite monitor.

Graphics and Sound: Identical to the 64.

Eventual Fate: Became the SX-64. The two-drive SX-100 (DX-100?) never appeared.



[Photograph Courtesy
of Todd Elliott.]

SX-64, DX-64

aka The name game is interesting. The computer was introduced as the SX-64 and released as the

Executive 64, but everyone calls it the SX anyway. And the case has both names on the front!

Introduced: The DX-64 was announced January 1983 with the SX-100; the SX-64 appeared later that year.

Hardware: Identical to the 64. Upgraded Kernal (new startup colours, cyan on white with cyan border and "COMMODORE SX-64" startup banner; Kernal defaults to device 8 instead of device 1); missing the cassette port and the RF modulator outputs. Cartridges are accepted through the top, not the back. Integrated 1541 disk drive and 5-inch colour composite monitor. The DX-64, the original two-drive version, has two drives (drive 1 on top and drive 0 below, in the same position as the single drive appears on the SX).

Graphics and Sound: Identical to the 64.

Eventual Fate: The DX-64 was first announced, though not by name, in January 1983 with the SX-100; however, it was released in the single-drive form now commonly called the SX-64 as the Executive 64 in May 1983 for MSRP US\$1000. It was not a strong seller due to its weight, price and unfortunate similarities to the Osborne-1, another computer ahead of its time. Nevertheless, the original DX-64 did apparently escape; several working units have been confirmed to exist by **Marc Walters**. There is at least one known of in the U.S., and a few in Germany.

Comments: The SX-100 and the DX-64 were supposed to coexist side by side, and the SX-64 was never even part of Commodore's original rollout. At the Consumer Electronics Show that year (as reported in the March 1983 COMPUTE!), Commodore announced that the SX-100 would sell for \$995, and "a colour TV version with two disk drives for \$1295" (presumably the DX-64). Naturally, this didn't play out in practice, because the most obvious remnant of the ill-fated Executive series is the SX-64, which has only one disk drive and the colour screen.



[Picture Courtesy of Sascha Hoogen.]

Gold 64 & Jubilee 64
aka Jubilee/
"Goldener" 64

Introduced: Multiple dates.
Hardware, Graphics & Sound: See Comments.

Eventual Fate: Released as a commemorative item only.

Comments: The Gold 64s, all commemorative models, are interesting footnotes in Commodore history. **Jim Butterfield** notes that all Commodore commemorative models are dipped, not plated or spray-painted.

The Gold 64 appeared at CES 1984 to commemorate the millionth 64 to be manufactured in the United States. Appearing under a protective Plexiglas case, it shared Commodore's CES booth with the **Silver VIC**, another commemorative model. The Gold 64 had the original NMOS hardware and chipset.

Germany's commemorative model is considerably better known. Also referred to as the Jubilee 64 and also manufactured to celebrate the 1,000,000th model (here in Germany), approximately 150-odd units were claimed to have been made. (this is obviously false, as serial numbers up to 1000348 are known -- there could be as many as a thousand in the total production run.) The serial number for each unit is attached to the front case (and apparently hand-numbered), and the computer itself is attached to an acrylic plate with the imprint of the mainboard circuitry and this inscription: "GOLDENE EDITION aus Anlass des 1.000.000sten C64 in Deutschland 5.Dezember 1986" (*Golden Edition for the occasion of the millionth C64 in Germany, 5 December 1986*); the units were given away as prizes by a figure in a Santa suit at the Commodore booth at CeBIT 1986. The Jubilee 64 is based on the 64C HMOS hardware and chipset, but is packaged in the regular breadbox (so similar to the 64G).

All the Gold 64s are fully functional and operate normally (but geez, if you have one, take care of it -- they really are collector's items!). Unlike the VIC-20, which also came in a silver commemorative edition, there is no known Silver 64.

The Swedish 64
aka **VIC-64, VIC-64S**

Introduced: 1983?

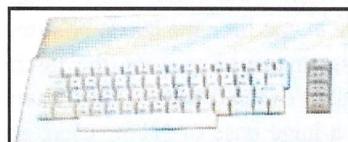
Hardware: Identical to the breadbox 64; modified Kernal and Char ROM for extra characters.

Graphics and Sound: Identical to the breadbox 64.

Eventual Fate: Released in Sweden and Finland. Early on, all Swedish and Finnish models had the modified ROM release; later models were all English (International) models and required the expansion kit.

Comments: The expansion kit for the 64 did the same thing to the 64 as the VIC-20's expansion kit did to the VIC-20, viz., move keycaps and redefine the [, British Pound, and] keys in the Char ROM and Kernal keyboard decode table. As stated above, the first batch or so of Swedish/Finnish 64s all had the modification in place out of the factory, but Commodore cost-cutting nixed the idea, reverting to the English (International) models and requiring the expansion kit in later manufacturing lots.

The 64's kit, according to Peter Karlsson's description, sounds rather chintzy. It involved slapping stickers (!) on the keycaps, swapping Char ROMs, and had the BASIC and Kernal ROMs exchanged with oversized EPROMs. Because the new EPROMs were so large, one of their pins had to be directly connected to the 6510's address bus for proper address decoding.



[Picture Courtesy of Todd Elliott.]

Commodore 64C
aka **C64C**

Introduced: 1987

Hardware: New HMOS-2 chipset with different power requirements and cost-reduced manufacturing. 8500 CPU replaces 6510, with slight differences and other subtle nuances.

Graphics and Sound: 85xx-series VIC-II and SID, with different and controversial sound generation characteristics, and repaired 6581 voltage leak--this repair broke many digital sound routines using \$d418 as a cheap 4-bit DAC. New VIC-II has a nasty *sparkle bug* on rapid changes, particularly to background and border.

Eventual Fate: [Editor's Note: This entry didn't originate in the *Secret Weapons of Commodore* website. I guess this particular model is far too 'common' as to merit mention there.] Released worldwide. Is a bestseller, extending the life of the Commodore 64 well into the 1990's.

Comments: **GEOS** and **QuantumLink** exploded on the Commodore scene, and Commodore was wise to package them with a Commodore 64 with a new marketing spin and in a new aesthetically appealing box. Sold pretty well into early 1990's and is the last of its lineage. Many users have a love/hate relationship with the new SID as it sounded different than the original.

64G

aka C64G, 64 BN/E, C64-III

Introduced: 1989

Hardware: Identical to the later 64C and the 64GS (except the BASIC code), based on the infamous BN/E motherboard version; different case and electronics than the classic breadbox version. Packaged in the classic breadbox case but now in white (with the 64C's off-white keycaps); the BN/E version motherboard caused some slight incompatibility with older programs. Single ROM with both BASIC and Kernal code (23128); PLA and logic chips now on a single GAL (along with the 2114 colour RAM).

Graphics and Sound: Identical to later 64Cs. 8580 (R5?) HMOS SID, 8565 (R2?) HMOS VIC-II.

Eventual Fate: Announced 2/88, released in Europe, but not North America; the earliest model **Nicolas Welte** has is dated 12/88. Some (very!) late models were refurbished 64GS systems sent back to the factory, even though the C64G predated it.

Comments: One promotion involving the 64G was "**Video Supergame 64**" that packaged the system with a game cartridge and joystick, much like the 64GS and 64CGS. It came with a black joystick and a three-game cartridge (**Colossus Chess**, **International Soccer** and **Silicon Syborgs** [sic]), as reported in the August 1988 issue of 64'er. According to **Markus Mehring**, this package was intended for supermarkets and department stores. The more cerebral electronics chains sold the ordinary 64 package.

While the new case mollified some complaints that the 64C did not allow keyboard overlays to fit properly (certainly things like the Music Maker wouldn't fit on it), the board's software kinks made the 64G a real clinker. Commodore, in typical fashion, continued to use the BN/E revision all the way through the remainder of the 64C's lifetime.



[Picture Courtesy of Marc-Jano Knopp.]

"Aldi"

aka The Aldi was christened by 64'er Magazine, not an official title.

Introduced: 1987

Hardware, Graphics & Sound: Identical to BN/E board 64.

Eventual Fate: German release only. Replaced by the 64G.

Comments: Thanks to **Nicolas Welte**. This forerunner to the 64G appeared in Germany only, and was christened Aldi by the German 64'er magazine after a German "nickle-and-dime" store chain (I guess that means 64'er thought they were cheap junk :-). **Oliver Graf** further points out that in fact the Aldis were the only ones to sell the unit. Interestingly, the Aldis were manufactured in the United States. They have the old brown breadbox shell, but 64C-esque white keycaps; internally, they are no different.

64'er's disenchantment with the Aldi was well-known. Their most enduring flaw was the lack of 9V on the userport, which affected hardware attaching there; while some units do indeed have this limitation repaired, many do not. According to Markus Mehring, the entire project just oozes an obvious attempt at making a quick buck.



[Picture Courtesy of Bo Zimmerman.]

The 64GS
aka 64 Game System

64 Game System

Introduced: 1989

Hardware: Identical to the 64; BN/E motherboard, but the case didn't have holes for the keyboard, serial ports, userport or cassette interface. Cartridge port was on the top; however, where this goes internally is debated. **Marc Walters** says that his unit really does have a top-loading cartridge port on the mainboard. Marc's board is also an E version, but the connectors don't have the regular ferrite tips soldered on them, making them unuseable. Other than this, internal components are exactly the same as the Commodore E version mainboard save some Kernal differences; includes unified BASIC/Kernal ROM chip and a "monster GAL" containing the PLA, custom logic, and the 2114 colour RAM space.

Graphics and Sound: Identical to the 64. 8580 (R5) SID, 8565 (R2) VIC-II (PAL, anyway) in Marc's version. Seems very unlikely there is an NTSC 64GS.

Eventual Fate: Released in UK during the 1990 Christmas buying season (introduced at 99.99 UKP) and Denmark during 1991; *massive flop*. 80,000 units were produced; less than 25% of them eventually sold. Most of the remaining units were taken back and disassembled for parts for the 64G.

Comments: One good consequence is that a lot of 64 games came out on cartridge for the 64GS, and 64 owners in Europe were the direct beneficiaries. However, according to **Markus Mehring**, the reason may not have been the 64GS. Rather, Markus theorizes, the 64GS could have been Commodore's attempt to capitalize on the gaming companies' exodus to solid state formats (not much more expensive -- sometimes less expensive! -- to manufacture and much harder to pirate): basically a case of "if you do it we'll do it too". Some software, however, did come out specifically for the 64GS (though it would work fine on a 64, naturally).

Marc Walters notes that the earliest talk of it was during a news item about new 256K cartridge games in the April 1990 **Zzap!64** magazine. The machine was announced officially in the September 1990 issue. Accounting for publishing delay lags, it appears that the 64GS was released in mid-August, although **Patrick Kelly** states it arrived in September.

Marc also adds that there are some internal differences between Kernals. As the screenshots above demonstrate, the 64GS will display an Amiga-esque "Insert Cartridge" animation if turned on without one. It also has windowing routines, but there's no obvious use of them in anything but the startup sequence, and goodness knows what Commodore had in mind putting them in there.

Keyboard-driven games had to be modified for the GS, but GS joysticks had additional circuitry for another firebutton. **Niall Tracey** has analysed the GS stick and found that it behaves identically to any other Atari/Commodore joystick except for the base button, which will drop the POTX register in the SID chip to 0 when the stick is in port 1 and the base button depressed.

Markus notes that the system's price may have been its coffin. It sold for at least as much as a "real" 64, forcing frustrated dealers to sell it off at ridiculously low prices to get it out of their stockrooms (sometimes as low as 30 UK pounds -- at that price it sold rather better. :-) Even more bizarre was a competing package that appeared to have been sold by Commodore itself at the same time. According to Niall Tracey, this package had a 64C, two Annihilator joysticks, a Datasette, and two games (Nightmoves and Mindbenders) for 159.99 UKP. A much better deal by far! Markus adds, however, that Commodore did not learn their lesson in the console arena and promptly tried to introduce the GS to the Danish market in 1991, where it had much the same effect (i.e. none). Commodore Deutschland GmbH was rumoured to be gearing up to try to introduce the GS in Germany, but they denied it from the beginning, and the GS never did appear in that country.

The 64CGS

Introduced: 1990?

Hardware: Identical to the GS, with joystick and cartridge, but with a keyboard, apparently functional port connectors, and a very odd green power light (Commodore almost always used red). Announces itself as BASIC V4 on power up. May contain the windowing routines that existed in the GS ROMs.

Graphics and Sound: Identical to the 64C.

Eventual Fate: Known released in Ireland only, to date. No sales data or figures known.

Comments: According to **Patrick Kelly**, this cream-coloured unit resembles a 64C, but also includes the GS joystick and the GS cartridge, and is very clearly marked C64CGS (C Game System?).



[Picture Courtesy
of Todd Elliott.]

The **Commodore 65**
aka **C64DX**, **C64DX**

Development System

Introduced: Never officially. Prototypes escaped development hell when Commodore was liquidated in 1994.

Hardware: **Fred Bowen**, a Commodore engineer, states that the CPU is a CSG65CE02. However, the actual chip in the models that escaped is a CSG 4510R3 ("Victor" chip), a modified 65CE02 carrying two 6526 CIA's. The clock speed is known for certain to be 3.54MHz. 128K RAM, max 8MB(!), 128K ROM (Commodore 64 ROMs, BASIC V10, a monitor and CBMDOS), integrated 1581, RAM expansion port, cartridge port (weirdly, based on the +4/16's port, not on the 64's), and a useless RF port that doesn't work. 6511-like (not 6551?) UART (up to MIDI data rate), built-in DMA (powered by custom 51-DMAGIC 390957-01), and blitter.

Graphics and Sound: Powered by CSG 4567R5 (VIC-III) ("Bill" chip); standard 64 modes (40x25, 320x200, etc.) plus 80x25 text (with blink, bold, underline); true bitplane graphics; VGA-style 320x200x256 (from a palette of 4096 colours); 640x200x256, 640x400x16, 1280x200x16, 1280x400x4; reportedly can display Amiga OCS IFF. Special facility for address resolution (Display Address Translator [DAT]) of that wacky 64 pixel coordinate system. PAL only, no NTSC (but the RGB output works just fine with the 1084S). Double SID chips for stereo sound (8580R5).

Eventual Fate: Very interesting story -- the project was eventually canned in 1991 by then-chairman **Irving Gould**. Despite this, when Commodore was liquidated in 1994, prototypes escaped, eventually sold by U.S. companies **Grapevine Group** and **Software Hut**. Motherboards also exist. Estimates for the number that eventually made it to the outside world range from as low as 50 (clearly wrong; serial number 000062 has been independently verified) to as high as 2,000, including complete units, motherboards, etc. A working 65 is the Holy Grail of the Commodore 8-bit world these days. :-)

Comments: The 65 is 64 compatible, but not in the sense that the 128 is 64 compatible. The 128 basically carries a 64 inside of it (therefore 99.9999999% compatible except for programs that mess with a few select locations peeking into the 128 hardware) with all attendant ROMs, quirks, etc. The 65, on the other hand, actually emulates the 64 while keeping all its enhanced features active (runs at the lower clock speed; emulates the BASIC [version 2.2?!]). Because of this, the 65 is really only around 75-80% compatible with 64 programs. Demos, copy-protection schemes and cracks depending on NMOS artifact opcodes in the 6510 will die or misbehave; there are probably timing difficulties as well.

The rear ports of the 65 are, from left to right, a disk drive connector, 8-pin standard Commodore video, non-functional channel selector switch and RF output, RGBI (identical to the 128's), stereo outputs, user port (identical to the VIC-20, 64 and 128's), standard serial port and the cartridge port. The last is labeled the *expansion port*, a misnomer because RAM expansion doesn't go there. It connects through a door on the bottom of the unit and plugs into the mainboard separately in the style of the Amiga. The disk drive connector is just a hole, but is undoubtedly where the also-unreleased **1565** disk drive connected. Version 0.9B.910710 of the 65 ROM actually looks for it and reports, invariably, "NO C1565 DRIVE." There are many versions of the 65 ROM, all unfinished.

BASIC 10 has many similarities to BASIC 7.0 on the 128, plus a few other interesting keywords like GENLOCK for video sync; MOUSE/RMOUSE for mouse manipulation; TYPE (which displays a SEQ file to screen -- very handy!); FIND/CHANGE for BASIC find and replace; FRE(0, 1, and 2) for bank 0 (BASIC program text), and bank 1 (variables) free space, as well as number of expansion banks available, respectively; PALETTE for defining colours; and a mysterious DMA command for DMA operations. BASIC 10.0 clearly was unfinished; PAINT, PASTE, CUT, LOCATE, SCALE, WIDTH, QUIT, OFF, SET and VIEWPORT all give ?UNIMPLEMENTED COMMAND ERRORS. Like BASIC 7.0, the function keys are

PET Silver Tribute

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programmable, but the assignments are intriguing. F1 toggles 40/80 columns, F2 erases everything below the cursor, F3 is [DIR], F4 is [DIR " *=PRG"], F5 puts the cursor at the beginning of the prior word, F6 is "KEY 6" (another programming gap unfilled?), F7 moves to the next word, F8 is "MONITOR" and HELP is, naturally, HELP.

The VIC-III apparently has its own MMU. This means, most likely, that the CIAs no longer have their old job of fooling the video chip into seeing different tracts of memory. In fact, in 64 mode, location \$0000 is provided by the VIC-III, not by the 4510. The memory mapping/banking scheme of the 65 is quite complicated because the 4510 is still addressing just 64K.

There are hooks in the \$C000-\$DFFF memory space for an REC (marked as optional in the map), but because the cartridge port is not 64-compatible, you can't just plug in a 1750 and expect its REC to map there. In most cases, though, chips do map to the same locations (like the on-chip CIAs still map to \$D[CD]00, just like on the real 64). The 65 also appears to have two busses, D and E, with 64 kilobytes of RAM on each. The VIC-III can access the D-bus while the CPU accesses the E-bus, and then they can swap around, making the whole 8MB address space effectively both chip RAM and fast RAM. This might also imply that the 65 has no more badlines, which probably spells doom for custom 64-mode hacks like FLI.

Because the 65's DOS is based on the old IEEE 8250 disk drive (PET-era!), the DOS subsystem can only deal with two drives -- and that includes the internal one. Presumably programmer **Dennis Jarvis** did this so that he would have a DOS to work with, and intended to replace it later.

The RAM expansion board, as shown on **Todd Elliott's** unit, sits on a robin's-egg blue PCB and plugs into the bottom through an Amiga-like door. The board reads "COPYRIGHT 1990/COMMODORE ELECTRONICS AWK 313384/C65 RAM EXPANDER ASSY 313381" and the initials of the designers, "PL/BG/JA/VA/HD/NINES." By the way, Todd's is also one of the earliest C65s extant and certainly the earliest unit I've ever seen; his unit is serial number 000008, and several of the chips are EPROMs and hand-labeled to boot.



[Picture courtesy of Paul Stuijt. <http://www.digidome.nl/commodor.htm>] Gone almost unnoticed in the nostalgic celebrations of the **Commodore 64's 20th Anniversary**

gala is the **Silver Anniversary** of the Commodore computer that started it all--The **PET 2001-4** computer with the infamous chiclet "calculator-styled" keyboard, a built-in tape drive, and a built-in monitor all housed in a sturdy steel cabinet casing.

Prior to the PET, **Commodore Business Machines (CBM)** had brought out **MOS Technologies** and marketed their **KIM-I** computer. With engineer **Chuck Peddle** now on Commodore's payroll, the PET "**Personal Electric Transactor**" was designed with an eye of entering the nascent computer market. Unlike the KIM-I computer, the PET was to have a full-featured keyboard, BASIC, 4Kb of RAM, character graphics and a built-in monitor.

The PET was formally introduced to the computing public at the **West Coast Computer Faire** during April 1977 in San Francisco, CA. At the same exposition, the wunderkind duo of **Jobs** and **Wozniak** introduced their signature computer, the **Apple II**. CBM set an initial selling price of \$595 and couldn't make enough computers to meet demand.

The PET has its legacy well assured in the annals of computing history. Not only it was the first CBM computer, it lay out the direction which its eventual descendents would follow.

For example, the **MicroSoft BASIC** introduced in the PET was used in the entire Commodore 8-bit computer line, although CBM's engineers have made substantial revisions. The infamous character graphics that is so omnipresent on all C64 keyboards came from the PET. The standard OS calls as made through the **KERNAL** have found their way into the entire Commodore 8-bit computer line. The character set is named as **PETASCII** and is widely used in the entire Commodore 8-bit computer line. Only **GEOS** was able to *rescue* the Commodore 64/128 computers by using standard ASCII characters. The PET's memory map shares numerous similarities all across the Commodore 8-bit computer line.

The C64 would have never experienced such astounding success if it weren't for its PET ancestry and legacy. The PET paved the way for CBM's engineers, accountants, lawyers and marketers to define the home computing turf upon which such computing business would be waged. True to **Jack Tramiel's** vision of computing for the masses, the PET's pioneering advances led to the C64 winning the *Home Computer Wars* a short five years later. In so honoring the C64's 20th Anniversary, a tribute is being paid to the PET for making the home computer revolution possible.

My sincere thanks to Bo Zimmerman for his "C64 Sticker" graphic as seen in the headline on Page 2. ---T.S.E.---

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Future Shock

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Someone once said, "Imitation is the sincerest form of flattery." The Commodore 64 is no exception. Thanks to its popularity and the intoxicating mists of nostalgia surrounding it, countless programmers and hackers have created hardware and software based emulators trying to recapture the spirit of Commodore. Ironically, such emulation is the C64's future. The real machines are already 20 years old and continue to dwindle in number.



[Picture Courtesy of
Todd S. Elliott.]

Ironically, it was
**Commodore Business
Machines (CBM)**

itself that came out with an emulator for the C64. It was the **Commodore 128** and was a great success. CBM learned many lessons from the failures of the **Plus/4** and **Commodore 16** computers. It was up to **Bil Herd's** team of engineers to come up with a new 8-bit computer and still retain backwards compatibility with the C64. Adopting the *mantra* of C64 compatibility, CBM produced the premier 8-bit computer of its time, the C128. The C128 remains the 8-bit computer of choice for everyday use by the Commodore hobbyist public in the 21st Century.

However, the C128 is a hard computer to categorize. It could be said that it is actually a C64 with some custom chips and a Z80 built-in. After all, the C128 uses the same chips as does the C64, even while in 128 mode running 40 columns. However, the C128 is certainly not a C64 when powered in 128 mode. It uses BASIC v7, has 80 column capability, fast serial disk communications, and a numeric keypad, as well. Whatever semantics may remain, the C128 has a 99% compatibility rate with its older sibling, a feat that modern emulators *may never achieve*.

It wasn't long before a software-based emulator would come along. After all, CBM marketed the '**PET emulator**' for use on a C64, and it was sold on a cassette tape. During the heady times of the C128's introduction and marketing to the computing masses, CBM acquired a tiny start-up company and began to market the **Amiga** line of computers with an entirely different micro-processor and a truly cutting-edge operating system, complete with multitasking.

A64 was the first C64 emulator to come out for the Amiga computers. For the first time, the C64 had been reduced to software based engineering of math and logic concepts. But, the A64 emulator was crude and only had partial emulation. Later C64 emulators like **MagiC64** and **Frodo** came along with better emulation support.

Other than the Amiga's A64 emulator, diehard C64 purists had to be content in using the real machines or the C128. However, CBM undertook a stealth project to produce the next generation C64 computer called the **Commodore 65**, and they fully intended it to be backwards compatible. Unfortunately, CBM canned the project in late 1991. The C65, to date, represents the pinnacle of hardware-based emulation of the C64, incorporating many

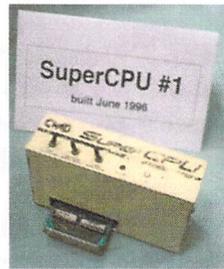
aspects of the VIC-II chip and the 6510's convoluted memory management schemes onto entirely new silicon designs. Outside of some 200-odd number of released prototypes, the C65 remains a computer that C64 purists can only dream about, wondering "*What if CBM had marketed it?*"

In early 1990's, the mainstream computers began to gain in computing power and resources needed for near-perfect C64 emulation at acceptable speeds. The first such emulator to come to the scene was **C64S** and it ran under **MS-DOS** mode. Such pioneering efforts finally led to two near perfect C64 emulators, **CCS64** and **VICE**. Those C64 emulators made a departure. In addition to emulating the C64, it also had to emulate the disk peripherals such as the ordinary 1541 disk drive. Such feats of software engineering is incredible in such a software package where it has to basically emulate **two computers**, the one in the C64 and the one in the disk peripheral! Moreover, **VICE** emulates pretty much everything in the CBM universe, from a **geoCable** interface, an RS232 interface, a **1351 mouse**, to a **17xx REU**.

Last, but not the least, the **Macintosh** isn't left out of the C64 *Emulation Derby*. In addition to the aforementioned Frodo emulator, there exists the **Power64** emulator. The **WinCE** platform once boasted a C64 emulator. Just recently, the **Nintendo GameBoy Advance** has a C64 emulator under development named '**Splam!**'

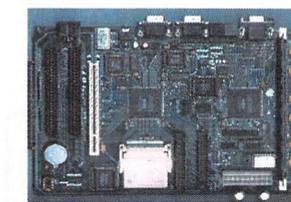
[Picture Courtesy of Dave Ross.]

While all of this brouhaha is going on in more mainstream computing circles, **CMD** themselves were contemplating a C64 successor of sorts. For reasons unknown, CMD did not follow-up on their plans for '**GUS**' (General User's System computer prototype).



This GUS computer concept was to have a C64 compatibility card for near perfect emulation. However, CMD did come up with a C64 emulator of sorts by releasing a **SuperCPU 64**. It is a hardware emulator of sorts because it has to emulate the C64's various memory management schemes. In addition, the SuperCPU 64 has various memory mirroring techniques in order for it to access the C64's host hardware like the VIC-II, CIA and SID chips.

[Picture Courtesy of Jeri Ellsworth.]



Lastly, at near full circle, the C64 emulation may well be coming home to its roots, a full hardware based solution to duplicate the C64! **Jeri Ellsworth** is working on such a solution where full hardware emulation of the C64 is programmed into non-CBM chips. Jeri has made tremendous amount of progress, reducing the C64's various complexities into dedicated silicon circuits and adding in modern components to the mix like VGA, PS/2 mouse, the 65816 microprocessor, etc. into a **CommodoreOne** computer.

In this case through emulation, the Commodore 64 has become the *Lazarus Machine*, rising once again from silicon ashes to enjoy new life. Moving purposefully into the future, the C64 remains well supported by its many believers. And if its popularity improves with age...well...mainstream users might have a *real* "future shock!"

Commodore Price List

February 2002 Commodore Price List

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Since April 2001, I have cataloged statistical data of completed eBay transactions involving Commodore 8-bit items in order to gauge the interest and prices of classic Commodore computer hardware in today's marketplace. I thought it to be apropos to include such data for this *20th Anniversary Special* issue of the *LUCKY REPORT*. The Commodore 64 was introduced in the Winter Computer Electronics Show in January of 1982, but didn't reach store shelves until later. Guessing here, but let's say that CBM marketed the C64 to the masses during February 1982 for \$595. In honor of such a marketing milestone, I present to you the **Commodore Price List** for February 2002, cataloging Commodore sales occurring 20 years later.

For the purposes of statistical reporting, I have scanned completed transactions on eBay that resulted in sales. Sales that failed due to the reserve price or those transactions that have not been completed are not included here. That said, I may have missed or erred on some sales due to incomplete descriptions, oversight, typos, etc. Check out <http://www.geocities.com/eyethian2000/commodorepricelist.html> for the latest pricing information.

By presenting this statistical data, I make **no** warranties, implied or express, with respect to authenticity, merchantability, speculative merits, etc. They are what they are...just a bunch of numbers, and I shall be held harmless and not liable for any damages that may accrue from the usage of these numbers in any fashion. Please do **NOT** base your future auction activity at eBay according to these prices listed below. They are **AVERAGES**, meaning that some items sold for less than average and some items sold for more than average.

The legend is as follows. The first column refers to the Commodore hardware, the second column refers to the # of sales in that period, and the third refers to the mean value of all the prices that have been agreed upon in those sales in that period. The fourth column refers to the change in price trend for that particular item as compared with its auction listing August 2001.

Note that the currency used is the U.S. Dollar, and I only scanned eBay transactions that were accessible through the main eBay U.S. portal. This portal includes U.K., Canada and Australia transactions, as well as several other countries except for eBay in Germany. The 'packages' denotes a Commodore computer unit along with a disk drive, software, monitor, etc.

By compiling these statistics, prices have varied wildly in some items. This is usually due to the location that these items were marketed from, whether they were complete with their original boxes, whether they were in a mint condition, etc. So, the mean prices listed for these items are just about near averages of the prices being sold for these items in eBay in the recent period. Your marketing mileage may vary, of course, when you buy/sell your Commodore items and the resulting sales may not necessarily reflect the prices as shown below.

Without further ado, here's the February 2001 price list! Enjoy.

Commodore 64	44 units	\$21.24	Down
Commodore 64C	16 units	\$24.22	Up
Executive 64			
(SX-64)	19 units	\$94.48	Up
Ultimax	3 units	\$1,737	n/a
Commodore 64GS	2 units	\$154.93	n/a
Commodore 128	6 units	\$34.67	Up
Commodore 128D	12 units	\$93.10	Up
VIC-20	9 units	\$27.80	Down
Plus/4	16 units	\$25.21	Up
Commodore 16	7 units	\$32.57	Up
Commodore 116	1 unit	\$74	Up
Pet 2001	3 units	\$512	Up
PET 4016	1 unit	\$162.50	n/a
PET 4032	3 units	\$119.17	Down
PET 8032	3 units	\$112.05	Up
SuperPet 9000	2 units	\$516.30	n/a
CBM 710	1 unit	\$175	n/a
KIM	1 unit	\$257	n/a
Commodore 64	129		
packages	packages	\$37.64	Down
Commodore 128	19		
packages	packages	\$52.53	Down
VIC-20 packages	29 packages	\$35.22	Up
Commodore 1540	1 unit	\$14.21	n/a
Commodore 1541	45 units	\$16.74	Up
Commodore 1541-II	4 units	\$28.46	Up
Commodore 1570	1 unit	\$5.88	n/a
Commodore 1571	13 units	\$19.67	Up
Commodore 1581	4 units	\$114.76	Up
Datasette (C2N)	28 units	\$8.21	Up
CMD HD	1 unit	\$192.50	Down
CMD FD	1 unit	\$147.51	Down
RAMLink	1 unit	\$100.81	Down
Commodore 2031	1 unit	\$11	n/a
Commodore 4040	2 units	\$38.26	n/a
Commodore 8050	2 units	\$29.50	Up
Commodore 8250	1 unit	\$20	n/a
Excelerator+	1 unit	\$15.99	n/a
FSD-1	2 units	\$19.99	Down
Commodore 1764	5 units	\$42.14	Down
Commodore 1701	1 unit	\$29.14	Up
Commodore 1702	23 units	\$38.46	Down
Commodore 1802	3 units	\$18.26	Down
Commodore 1902	3 units	\$30.66	Down
Commodore 1084	10 units	\$84.16	Up
Commodore 1520	5 units	\$20.17	Down
Commodore 1525	1 unit	\$4.99	Down
Commodore 1526	2 units	\$7.26	n/a
MPS-801	4 units	\$4.38	Down
MPS-803	4 units	\$9.75	Up
MPS-1250	1 unit	\$27	n/a
Commodore 1351	9 units	\$18.95	Up

The LUCKY Report

K. Dale Sidebottom

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My apologies for putting the editorial on the back page. This issue was intended for a November 2001 publication date. I wanted to commemorate the 20th Anniversary of the Commodore 64, and before I knew it, I was guest-editing the *LUCKY REPORT*. At the suggestion of **Dale Sidebottom**, I named this issue the *20th Anniversary Special Issue*. Thanks also goes to **Cameron Kaiser** for offering his **Secret Weapons of Commodore** content to complement the issue.

No doubt, many readers of the *LUCKY REPORT* will have many memories of the Commodore 64 and how it has impacted their lives. We would like to hear from you and get your 'take' on the Commodore 64's latest milestone. Please email them to luckykds@iglou.com or write to the address on the top of this page. Letters and emails are much appreciated and selected comments will be included in a future issue of the *Digest*.

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