BUG BYTES

NEWSLETTER

of

TIBUG

T.I. BRISBANE USER GROUP
P.O. BOX 3051
CLONTARF MDC, QLD, AUST 4019

JANUARY/FEBRUARY 1996

NEXT MEETINGS
19 Jan (& 29 March)

7.30 p.m.
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Contributions to TIBUG are invited from both members and non-members. Articles for inclusion in the succeeding monthly newsletter are required at least two weeks before the monthly meeting and may be included in that newsletter at the discretion of the Editor. If you have a disk system, please supply script on disk with diagrams separately on paper and as clear and black as possible to facilitate photocopying.

Most original articles by members of TIBUG in this newsletter are on disk and are available to other User Groups on request.

Submissions of articles, reviews, comments and letters from mebers is encouraged, however the editor would ask that members keep the following in mind.

Submissions should be about computers, the TI community in particular, or have general interest value.
The preferred media is floppy disk (any format) however cassette tape is most acceptable for those members who do not have expanded systems. Please remember that handwritten submissions have to be retyped into the computer so that they can be reproduced. Typed submissions can also be used directly if the quality of the type is suitable for photocopying.
The newsletter is produced on the weekend preceding the monthly meeting. Any submissions made after the Friday, one week before the meeting will be held over until the following month.
Submissions are best sent directly to the Editor rather than through the PO Box. The address is Col Christensen, 17 Centaur Street, Redcliffe 4020. Contact the editor if you have any difficulties with preparing a submission or have any comments about the newsletter.

CONTENTS

Things As They Might Have Were

Garry Christensen

The home computer became a reality in the late 1970's. There were a few companies that pioneered the home computer and many that followed along.

The first computers were kits that could be built at home. These ranged in sophistication from ones that blinked a few LED's and were programmed in machine code by way of switches, to some primitive machines similar to those of today.

The first on the market with a truly multi-purpose home computer included Tandy, Commodore and Texas Instruments. These companies were visionary. They identified a market that did not exist at that time and were prepared to invest in generating a need. Some of the individuals that were the prime movers in the home computer industry saw that every home could own and use a computer. This was the need they intended to create.

As with everything new, the first customers were the enthusiasts. Many had put together the kits and were moving into the big league. As the popularity of the computers grew, the customer base widened to include more family orientated buyers and later business applications.

Of the big three in the beginning, Tandy with the TRS80, Commodore with the Vic 20 and Texas Instruments with the 99/4, one computer had the potential to dominate the market. That was the Texas Instruments computer. Technically, it was superior, being the only computer to be based on a 16 bit processor and its development had been based on concepts learned in the construction of mainframe computers. It also had the backing of a large company. Finally, Texas Instruments was able to devote a significant effort to the production of software. They had among the most games and had by far the most and best educational software. Their experience in the computer field also provided a large base of application software, ranging from word processors to spreadsheets. While it was the games and educational software that provided the initial success, the application software became more important later.

The competition was fierce among these companies. The first casualty was the TRS80. While it was not completely out of the race in the late 70's and early 80's, its big limitation was availability. Tandy's was and still is an electronics store. The TRS80 was only available in these stores. Both TI and Commodore had engaged major retailers to distribute both the hardware and software.

Both TI and Commodore continued the battle with the release of the 99/4A and Commodore 64 respectively. While the TI99/4A was still the technically best machine, Commodore was able to hold ground. This was because that had realised that the power of a computer in the marketplace was not which was the best but which could do the most. In other words, the one with the most software. They had provided third party software developers all that was needed to write programs for their computer.

TI was quick to take up the challenge with the licensing of software houses to produce TI software, although not without quite an internal struggle. The corporate ethic within TI was one of a closed shop. Texas Instruments should dominate all facets of the market. The decision to allow third party software developers access to the TI had been a hard decision. It was staunchly opposed but those with vision eventually won, arguing that the gain in sales of hardware would compensate for the loss in software sales.

The battle would have continued but for two other companies that had a huge influence on both the market and production or computers. The first was Apple. This computer performed strongly in the market place but is notable in that it was the first to be 'cloned'. Other hardware manufacturers were able to duplicate the computer and sell it at reduced rates.

This had limited success, firstly because of the expensive court action taken by Apple and secondly because the quality was not as high. The clones gained a bad reputation in the marketplace. The court action also tied up much of Apples resources and they tended to be left behind in the computer wars.

The trials of Apple did signify another change in the market place which the people at TI were able to identify. The idea of licensing the production of the TI computer to others was also strongly opposed.

Till then the design had been intentionally convoluted to make the discovery of the 99/4A's secrets as difficult as possible. Those in favour of open architecture argued that these restrictions could be removed. As far as profits were concerned, the pricing wars had ensured that there was not a lot of money to be made in the construction of the computers. Most profits were in the production of IC chips. They also won the day and the first TI clones began to appear.

The other company that influenced the market was IBM. Here at last was a real competitor for TI. IBM also came from the mainframe computer market, had a wealth of experience and had the corporate resources to penetrate a developing market. They teamed up with chip manufacturer Intel to produce a computer squarely aimed at the small business sector.

Till this time TI had focused on the home, believing that the business world would remain loyal to mainframes and minicomputers. Not only did IBM open a new market in which the computer wars could be fought, they stimulated the technology race that results in the high-speed computers of today.

IBM entered the market in 1981 but had little effect till the first 16 bit machines started appearing in 1983. The TI99/8 had just been released and both companies entered into a technology race. The TI99/8 was firstly competing with the 8 bit 8088 based IBM machines and later the 16 bit 80286 computers. The areas of competition included not only processing speed, but also memory and ease that hard drives and peripherals could be added.

This highlighted a fundamental difference in the design of the computer rivals. The IBM computers used an operating system that was loaded from disk at start-up. It had the advantage that it could be easily upgraded but suffered in that each new peripheral required additional software or changes to the operating system. The TI computer maintained an operating system stored permanently in ROM. Any new peripherals provided their own software built in, allowing easy expansion of the computer.

The shift in emphasis at TI from manufacture to design allowed TI focus on improving chips and computer design. In 1886 they released the first of the TI Pinnacle 99 computers. These featured the first 32 bit processor and had provisions for megabytes of memory and operating speeds that saw them take on many of the applications that had previously been dedicated to mini-computers.

The next big development occurred shortly after Apple stole a huge jump on the others with the release of a graphical interface. This provided a more intuitive way to use the

computer and their new computer was called the MacIntosh. TI recognised the advantage of a graphical user interface and launched a take-over of Apple. After an intense legal and financial battle, TI claimed Apple and introduced the graphical interface that we see today on the TI.

This was the first time the two computers were merged. One of the great features of the Motorola chip use in the Apple computer was it's ability to manipulate graphics. Till this time, TI had worked in conjunction with Yamaha in developing dedicated video chips. TI used them in their computers and Yamaha in dedicated video games. TI now used what had been the Apple CPU to exclusively drive the video output while their own CPU ran the programs. The two chips communicated over a high speed bus and backward compatibility was maintained by programming the video CPU to emulate the older Yamaha video chips.

Meanwhile IBM again teamed up with the emerging Microsoft company for their Windows graphical user interface. Microsoft had previously produced the operating system for the IBM computers, as well as many quality applications for both platforms.

The late 1980's and early 1990's saw the development of computers. Of particular note was the falling cost of high speed memory and the increase in hard disk size. The processors from both TI and Intel increased in speed and power with dedicated maths processors and on-board memory being prominent.

The fight for computer supremacy still wages some 17 years since the beginning of the home computer saga. The consumer has certainly been the winner and will continue to win. Of course the recent discussions between TI and IBM about a future development may one day lead to a single platform, however that may well prove irrelevant as the application software is equally available for both and data communication though the world-wide networks does not distinguish between the TI and IBM computers.

The Road Ahead

Garry Christensen

I have been given the most amazing book for Christmas. Its called "The Road Ahead" and it was written by Bill Gates, the mastermind behind Microsoft.

This book is a mixture of Bill's reflections about the early days of Microsoft and importantly about his vision for the future of both computers and the Information Superhighway. This book is a joy to read, particularly for me, because Bill seems to be saying the same things that I have been saying for a number of years now.

Bill indicates that the Information Superhighway does not exist yet. The Internet and Pay TV services and only the precursors and its exact structure is no more known than Henry Ford knew about a 308 Ferrari. The uses for the highway will penetrate into the most mundane parts of life. It particularly impressed me when Bill suggested the same applications that I have suggested in this newsletter in the past.

For anyone who has an interest in the future of computers, I thoroughly recommend this book. It is written essentially for the lay person and Bill's style is easy to follow. If you have an opportunity to read this book, please make an effort because I am sure that you will be well rewarded.

1980's home computer era — Part 3

Atari: Bouncing off from Pong success

By BILL GASKILL
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Last month's article covered Apple Computer and the machines they built during the late 1970s and throughout the 1980s. This month we cover the Atari Computer Corporation. Before getting into the meat of the material, though, you might enjoy knowing that the name Atari comes from the Japanese game of Go, which was a favorite of company founder Nolan Bushnell. Also, I am forever indebted to my good friend Steve Mehr of Thousand Oaks, California, for loaning me his copy of the book *Zap! The Rise and Fall of Atari*. It was a major source of information for this installment, largely on the early days of Atari. The book was published in 1984 and I have not been able to find a copy anywhere, so it is apparently out of print. If any reader has a copy for sale, I'd be interested in hearing from you. Anyway, thanks, Steve!

ATARI:

Atari is still in business today, but I haven't been able to discover what they produce or sell, other than some video games. I certainly haven't found what has sustained them financially over the last 6-8 years? I recently watched a PBS documentary about the Silicon Valley, done by a local historian. In the show this person did a small video byte of Atari headquarters and mentioned that they are still looking for their next "Pong" type hit, but he didn't tell the viewer what is sustaining the company today.

Just before Thanksgiving '94 (which is when I wrote this installment, by the way), I did find out that Atari has released a new 64-bit video game machine called the Jaguar. It is supposed to be the "ultimate" in realism with 3-D video and CD quality sound. This comes from the folks at Toys 'R Us, not Atari, so maybe it's actually true? Problem is, Nintendo is now (November 1994) saying that the video games market is going to be flat this Christmas (December 1994) because there is nothing new to sell. They have announced the impending release of a new video game player called Virtual Boy, due out in February 1995. Virtual Boy will simulate virtual reality (what Jeff Fahey and Pierce Brosnan experienced in the movie Lawnmower Man) by allowing the player to put their head up against a rest on the machine which blocks out all light, making the player more of a captive audience. Anyway, for Atari's economic well-being, I hope that the folks at Nintendo are wrong in their projections for a poor Christmas buying season. Atari is no doubt counting on the Jaguar to be a big seller. The machine I saw in Toys 'R Us was impressive looking, but it also was priced at $249.95, which is more than $100 higher than the best Nintendo or Sega system. The least expensive of the (only) six cartridges available for Jaguar was $49.95, with $59.95 seeming to be the average. Still, if the quality is all that it is hyped to be, maybe it will be a success. Recent sales history does not tell us that however. Witness the failure of the 3DO and Phillips CDI machines to crack the market. The game playing public seems to be more into quantity than quality. Guess we'll have to wait and see.

Atari, as you may already know, started life in 1972 when company founder Nolan Bushnell, a 29-year-old native of Clearfield, Utah, founded the company with the express purpose of inventing the first successful commercial video game. Pong was the outcome, followed four years later by the Atari 2600 VCS (Video Computer System) which is what gave the company the tremendous financial potential it had when Warner Communications bought Bushnell out for $28 million in 1976.

The VCS was conceived by Atari engineer Joe Decuir who designed the chip set and the first prototypes; Harold Lee, who is credited with having pushed Nolan Bushnell in the direction of consumer electronics with Home Pong, and Steve Meyer, who also figured out how to make the VCS cost-effective. Although the VCS was designed by Atari under Bushnell, the company lacked the capital to produce it, which is where Warner entered the picture. They had the money and Atari had the product, so Warner bought Atari for $28 million, with Bushnell receiving $15 million for his own pockets. Part of the sale stipulated that Bushnell refrain from entering a competing business for seven years and that he stay on at Atari to see the VCS development materialize. He honored both contract stipulations and by November 1977 saw Atari produce 400,000 VCS units. He was paid a cool $100,000 a year for what he considered was "doing nothing," but hey, what the heck?

Going into 1977 the video game industry was packed with competitors.

— RCA came out with the Studio 2 video game system,

— Magnavox introduced Odyssey 2,

— National Semiconductor had the Adversary video game system,

— Fairchild Camera and Instruments, now called Fairchild Semiconductor, was releasing a new game a month for their Channel F product, (VAST 99er Ralph Rees has one of these if you've never seen one), and

— Allied Leisure was developing a new video backgammon game which they touted as being the next generation of electronic games.

Unfortunately for the folks at Warner Communications the video game market hit a severe slump in 1977, so Atari ended up sitting on an inventory of VCS units that no one was buying. The slump, however, produced a pretty sizable "shakeout" of the players in the video game industry that only Atari and Coleco would survive. When the market returned again in 1979, bigger than ever, due almost totally to the introduction of a game written in Japan called Space Invaders, Atari was perfectly positioned with a waiting inventory of

(See Page 8)

HOME COMPUTER ERA —

(Continued from Page 7)

new units to sell to a hungry game-playing public.

The resurgence in the video game market and the lucrative returns it yielded also spawned competition for Atari on their own machine. In 1979 former Atari software engineers Alan Miller, David Crane, Bob Whitehead and Larry Kaplan formed Activision and began producing their own game cartridges that would run on the Atari VCS. At the time, two-thirds of the game playing consoles in American homes were Atari systems and the average household was buying five cartridges a year.

No one had the guts to make software that was compatible with someone else's machine until Activision did, but the fact that they sold $65.9 million in software in 1980, only a year after the company was formed, certainly gave credence to the idea.

Impressed by the Activision success, another former Atari employee, marketing VP William Grubb, formed Imagic in 1981. Atari software engineer Rob Fulop jumped ship and joined Imagic in 1982 where he wrote Demon Attack. That one program generated $30 million in sales for Imagic in their first year of business.

In 1980 and 1981 Atari was the darling of the stock market and, of course the video game industry. We've all heard about TV's Emmy Awards, the film industry's Oscar, and Broadway's Tony Award, but did you ever hear of the Arkie? *Video Magazine* created the Arcade Awards in 1980 to honor outstanding achievement in the field of electronic gaming. Known affectionately as the Arkies, by 1982 the annual awards were jointly sponsored by *Video Magazine* and *Electronic Games* magazine. In the first three years that the awards were given, Atari walked away with eight winners in the home video category plus some in the commercial arcade category.

In 1980 Atari won Arkies for Basketball, Video Olympics, and Air-Sea Battle.

In 1981 Atari won Arkies for Adventure and Superman.

In 1982 Atari won Arkies for Asteroids, Missile Command and Warlords.

Some of the reasons or innovations the awards were given for are very interesting in that they show some groundbreaking ideas developed during the infancy of the personal computer, home computer and home video game industry, that we would laugh at today. What was so new and so innovative in 1980 is so taken for granted today that it is not even noticed by the computer/game-using public.

In 1980 the judges praised Basketball's use of a trapezoidal court to simulate depth of field (three-dimensional effect). In 1981 fantasy gaming was successfully translated to the video game screen for the first time with Adventure. In 1982 Missile Command won special praise for allowing a choice of starting levels, so the experienced players could skip over the novice attack waves.

By 1982 VCS sales began to falter, as did sales of Atari-produced video games. Third-party cartridge manufacturers were producing better, more sophisticated software (like Pitfall and Freeway) and both Mattel and Coleco had introduced more powerful machines when they brought out the Intellivision and ColecoVision products. Atari countered with the 5200 that was introduced at the 1982 Summer Consumer Electronics Show, but they made the fatal mistake of introducing a machine that was not compatible with existing 2600 VCS software. An adapter was quickly announced when they realized the mistake, but it didn't ship with the new 5200, so consumers rejected the 5200 en masse. Consequently, the 5200 was never the success Atari hoped it would be, and it was never able to help Atari overcome the loss of market share that had been given up to Mattel and Coleco.

The following are excerpts from an article entitled "Sneak Peeks" that appeared in the September/October 1982 issue of *Atari Age* magazine.

"Samples of the Atari 5200, the new advanced home video game system due in October, were up and running at the Consumer Electronics Show, and the crowds waited patiently to try their hand at superbly detailed versions of Soccer, Galaxians, Missile Command and Space Invaders.

"The biggest news at CES was not the specific games being offered, though, but two surprise additions to the game system itself — a Trak-Ball controller, and an adapter to make current VCS cartridges compatible with the 5200 system.

"We were especially happy to learn about the adapter unit for the Atari 5200, which lets VCS owners play the game cartridges they already own through the new system. While gameplay for VCS cartridges will remain the same when played through the 5200, the adapter lets you enjoy your current cartridge collection and the exciting new games programmed exclusively for the new 5200 without having to switch game consoles. The adapter is due out in 1983."

Also in 1982, sales of Atari's 400 and 800 home computers, which they had introduced in 1979, began to take a battering at the hands of Jack Tramiel and Commodore. Sales of the very popular VIC-20, which had been around since June 1980, and the newly introduced Commodore 64, were taking their toll on Atari's line of home computer. By September 1983 Atari had lost half a billion dollars between VCS software, the VCS, the 5200 and the 400/800 home computers (so TI wasn't the only victim of a Jack Attack). As a result of this financial debacle Warner Communications ousted Raymond Kassar as company CEO in September 1983 and installed James Morgan, a former Philip Morris executive, as Atari CEO.

On top of layoffs that had already taken place, Morgan laid off 250 more Atari employees, canceled the introduction of the powerful 1400XL computer and worked hard to reestablish Atari's vision of who it was, and where it was going. He hired Alan Alda to help sell Atari products just as TI had chosen Bill Cosby, and Commodore had tapped William Shatner to push their goods. But before Morgan could really get started, Jack Tramiel entered the picture in July 1984 and bought Atari right out from under any plans Morgan had for Atari's future.

Columnist John J. Anderson, writing in the October 1984 issue of *Creative Computing* magazine, gives us his thoughts on how Atari went from being the premier game machine company in the world in 1982 to a firm that had lost $538.6 million by 1984.

(See Page 9)

HOME COMPUTER ERA —

(Continued from Page 8)

"...I can't resist getting in a quick 'I told them so.' If only they had made the 5200 game machine 400/800 compatible and offered an optional keyboard peripheral. If only they had killed the 1200 on the drawing board. If only they had brought out the 1450 last fall. If only they had acted early to change their image. If only they had protected the morale and egos of their most creative minds. If only they had realized that the videogame and the low-end home computer were no longer separate markets. If only they had cut costs without cutting quality. If only the XL series had been truly compatible with the old Ataris."

Michael Tomczyk, author of *The Home Computer Wars*, provides us with another view of Atari, in the days immediately following Jack Tramiel moving in. Here are some excerpts from his book.

"A shell-shocked Atari employee told me that on one of those first days in the company, Jack was being shown some new products, and to show what he thought of them he dumped them on the floor."

"In less than a month the world-wide Atari staff was reduced from 5000 to less than 1500."

"Atari was bloated with physical facilities as well as people. On the day Jack (Tramiel) and his team started, Atari occupied over 40 buildings, most of them leased. By the end of the first week the total was down to 7 buildings."

Between 1984 and 1987 some drastic changes took place at Atari, most significantly, of course, the sale of the company to the very person responsible for bringing Atari to its knees. The deal was that Tramiel would buy Atari from Warner Communications for $240 million, but that in essence Warner would loan Jack the money to buy it, and at below market interest rates.

As the new owner of Atari one of Tramiel's first acts was to oust Morgan and place his sons Sam, Gary and Leonard in key positions. Sam became company president, Gary was given the job of collecting Atari's $300 million in accounts receivable and Leonard was placed in charge of software. Once this was accomplished, Tramiel concentrated on the introduction of the Atari ST line of computers. The STs were designed by Atari (Tramiel) to compete directly with the Amiga Lorraine that Commodore International had purchased from Amiga company founders Jay Miner and David Morse in 1984.

Before the introduction of the ST line, media moguls like John J. Anderson were singing the praises of Tramiel:

"Nobody is really sure what Jack will do to and for the Atari product line. It seems likely that the Atari 800XL will continue to be sold, at least through early 1985. As for anything else, all bets are off. It is now highly unlikely that the 1450XL, with built-in parallel bus disk drive and modem, will ever see the light of day. Jack is savvy enough to know that the 1450 is last year's product. He want's to get next year's product out the door as soon as possible, and the 1450XL is not it."

Under Tramiel, Atari's new motto became *Power Without the Price*. Six new computers appeared at the Winter 1985 Consumer Electronics Show, only five months after Tramiel bought the company. Four of the new machines were eight-bit powered computers and two were the new ST line, nicknamed the "Jackintosh" machines, because of their Motorola 68000 CPU and GEM (Apple Macintosh-like) operating environment.

Atari shocked the computer world with pricing never before heard of in computers and peripherals. For example, a 15mb hard disk for the new Atari 130ST/520ST machines retailed for $399! This was an incredible price breakthrough for 1985 when a 10mb hard disk was typically still selling in the $1000 range. You may recall that the Atari 1040ST was also the first computer to offer more than a megabyte of RAM for under $1000.

Apparently none of Atari's pricing strategies worked. While the ST line did become reality, it apparently never even came close to being the savior for Atari that Tramiel had hoped it would become. For reasons I have not yet discovered, like maybe Atari was never able to deliver on all of its fantastic promises, in a matter of three years the ST was in trouble, despite all of Tramiel's efforts to promote it. Following is a comment taken from the September 1988 issue of *Compute! Magazine*, made by contributing editor Arlan Levitan:

"Software development for the Atari ST line is in the dumper, with most software houses blaming poor sales on the current slowdown in ST sales and a higher than normal amount of software piracy in the ST market."

Early 1985 projections had Atari selling hundreds of thousands of STs, but when it came time to make a public offering of the "new" Atari stock, the numbers showed only 150,000 units shipped. Things got worse as the weight of the PC Clone explosion pressed harder and harder on the GEM-based Atari STs until the entire ST line seemed to fade into oblivion by 1990.

In January 1986 Atari introduced a smaller, sleeker and lighter 2600 video game machine (the VCS was dropped from the new machine's name) that hits the streets with a suggested retail price of $49.95. Though the machine was nine years old by that time video games and video game machines were selling well enough so that Atari also introduced the 7800, which was a machine the pre-Tramiel Atari had designed as a replacement for the 5200 back in 1984. The 7800 hits the streets with a suggested retail price of $79.95 and it came with a new version of Pole Position, the popular road racing game.

The 7800 had been sitting around gathering dust when it was brought back to life by the Tramiels. Thanks to a chip named MARIA, the 7800's graphics were superior to even the eight-bit machines of the day and the 7800 accepted 2600 VCS cartridges without having to use an adapter. It competed right along side Nintendo and then later Nintendo and Sega machines in the Toys 'R Us stores around the country for quite a few years. The 7800 finally succumbed to the superior software that was being released for the Nintendo and Sega machines and kids just stopped buying Atari stuff.

Somehow, despite all of its trials and tribulations, Atari remains in business today, with the tiny Atari Portfolio handheld computer being the only new unit it has introduced in more than four years (not counting the new Jaguar). Although I nev-

(See Page 10)

HOME COMPUTER ERA —

(Continued from Page 9)

er owned an Atari home computer, my wife Jacque and I were right in there with the first buyers of the 2600 VCS in the late '70s. In fact, she was the one who discovered video games, not me. We also still have the 2600 VCS machine and some 35 cartridges for it set up today, ready to battle each other in a game of Breakout at the first sign of a rainy day.

Following is a list of Atari's contributions to the "home computer" market of the 1980s. Some, like the 1400XL and 1450XLD were announced and even shown at CES, but were never released.

• **ATARI 65XE** — Basically a repackaged 800XL that retailed for $99 with 64K RAM, built-in BASIC, 256 colors, a four-voice sound chip, 11 graphics modes, five text modes, sprites, what Atari called player/missile graphics, an international character set, a cartridge slot, a serial bus for peripherals, and two joystick ports.

• **ATARI 65XEM** — This was a 65XE with an "Amy," which was an eight-voice sound chip. According to the editorial staff of *Compute!* (page 8, April 1987) it was never actually released, but was set to sell for $150 retail.

• **ATARI 65XEP** — A portable 65XE, Atari's version of the Commodore SX-64, came with a rechargeable battery pack good for three hours and also had a 3.5-inch floppy drive, which was a relatively "new" idea in 1985. It sold for $399.

• **ATARI 130XE** — This computer was basically a 65XE with 128K RAM and a rear parallel connector. It retailed for $150 but was available for $129 on the street.

• **ATARI 400/800** — The 400 and 800 were the original home computers produced by Atari in 1979. The 400 had 8K RAM and was not expandable. The 800 was expandable up to 48K RAM, had a full keyboard, two slots for cartridges, and custom sound and graphics chips designed by Jay Miner, who would later design the Amiga computer.

• **ATARI 600XL, 800XL, 1200XL, 1400XL, and 1450XLD** — These were the flagship line of home computers during the Warner Communications era of ownership. As I stated previously, though, the 1400 and 1450 were never actually released. The 1200XL was considered the top of the Atari computer line, but it was unpopular with consumers so it lasted only a year. The 600XL then became the bottom end of Atari's eight-bit line and the 800XL the top of the eight-bit line. By mid-1987 the 600XL would be gone, but the 800XL was still available for $69.99 on the street.

• **ATARI 130ST, 520ST and 1040ST** — The GEM-Based STs proved to be quite popular in Europe, but not in the U.S. They were all basically the same computer except for RAM. Each sported 192K ROM expandable to 320K with a plug-in cartridge, 512 colors, parallel and serial ports, floppy and hard disk interfaces, MIDI interface two Atari joystick ports, TV or RGB ports, three-voice sound synthesizer, 94-key keyboards with numeric keypads, 10 special function keys, TOS (Tramiel Operating System) and the Graphics Environment Manager (GEM). The 130 sold for $399, the 520 for $599 and the 1040 for $999. The 1040 had an 8mhz clock speed.

Although they were announced at the January 1985 Consumer Electronics Show, a year later they were still not readily available, evidenced by the following comments made by Glenn Hartwig, *Byte*'s technical editor of reviews, in the November 1985 issue, page 253.

"Another relatively new arrival here (at *Byte*) is the Atari 520ST, and since a closer look (eventually a full review) is under development, I'm not going to anticipate the reviewer's comments to any significant degree. The almost total lack of applications software at this point is an obvious drawback, but we'll withhold judgment on that front until and unless Atari and software developers start to show their wares. At the very least, , however, putting almost completely naked hardware out in front of the public would seem to indicate that the company has a fairly high degree of faith in its users' curiosity and enthusiasm."

In the January 1986 *Byte*, you will find an Atari 520ST product description, not a review, which they did for the following reasons.

"Some of the equipment we received such as the hard-disk drive, were prototypes, and at the time of this writing *(which was probably October 1985)*, software is scarce. Atari has not yet completed its BASIC interpreter, and the operating system, TOS, remains unfinished."

• **ATARI MEGA STs** — These were Atari ST machines with 4mb of RAM. They were announced at the January 1987 Consumer Electronics Show.

• **ATARI 1040STE** — Announced at the Winter Consumer Electronics Show in Las Vegas, Nevada, on January 14, 1991. It was designed specifically for MIDI uses by musicians and was touted as being so powerful it would even desktop publish a musical score. I'm not able to verify that any were actually ever produced however.

• **ATARI PCs** — In January 1987 Atari, like everyone else in the computer world, was "Turning Blue," meaning they were jumping on the IBM (Big Blue) PC Compatible bandwagon by producing a computer(s) that would operate in the MS/PC DOS environment. One model sold for $499, and the other for $699. They came with DOS 3.2, GW-BASIC and the GEM operating environment.

"Both of the Atari PCs are aimed at the burgeoning clone market now ruled by Tandy, Leading Edge, Epson and Blue Chip...Both models include 512K RAM (expandable to 640K on the motherboard); and internal 5.25-inch floppy disk drive, RS-232 serial and Centronics-standard parallel ports, a mouse port and mouse controller; composite and PC standard RGBI video outputs; software switchable clock speeds of 4.77 megahertz (the same as the IBM PC) and 8 megahertz (turbo mode); a socket for an 8087 math coprocessor; a PC-style detached keyboard; and a built-in color graphics adapter."

While I don't ever remember seeing any in the stores in my town, they probably were on somebody's shelf somewhere in the U.S.? I clearly remember seeing the Commodore Colt show up at Wal-Mart, but I can't recall ever seeing an Atari PC except in magazine photos. The point being, I can't personally verify whether either computer actually made it beyond being announced at CES in January 1987 and really did find a place on some retailer's shelf.

EMOTICOMS

What do you do if someone sends you a typed massage like this:-

You :-)))) (:-D, if you don't :-$, I'll make sure you get a :-# and a !-(.

Here's a list of emoticons or smileys to help you formulate your reply.

Emotions
:-) Happy
(-: Left handed
:-(Sad
;-) Wink
#-(Oh, what a night!
:-O Shock

Unusual Expressions
:-$ Put your money where your mouth is
:-P Sticking out tongue
:- About to be sick
:-# A smack in the mouth
Wears a brace
(:-) Bald
:-))) Is very fat
:-{} Wears lipstick
$-) Just won the lotto
:-T Tight lipped
:-¦ A split lip
:-Q A smoker
:-X Lips are sealed
:-D Has a big mouth

For those bored silly
(:-) Bicycle helmets
:-)' Tends to drool
=:-) Punk
+-:-) The pope
O:-) An angel
o-:-{{{ Santa
:-% Bank manager
(:1:) Siamese twins
5:-) Elvis Presley
7:-) Fred Flintstone
3:-o A cow
8:-) A little girl
]:-> The devil
:-----} Pinnochio
!-(Black eye
) Cheshire cat
(:-D Blabber mouth
:-.) Madonna
:-) 8 Dolly Parton
C¦:-= Charlie Chaplin
8(:-) Mickey Mouse
/:-) Wearing a beret
d:-) Wearing a baseball cap
%-\ Hungover
%*:-(So hungover my head hurts

TI EMULATOR

Courtesy TIsHUG

USING THE TI-EMULATOR V6.0 AS A VEHICLE FOR GRAPHICS EXPORT

by Alf Ruggeri

I first became aware of the TI-EMULATOR's existence about a year ago, but at the time, with the hustle and bustle of two of my children returning home from overseas business trips, and preparations for a European holiday for my wife and I, there was very little opportunity to even acquire the program.

Motivation to try out the emulator eventually materialized this last September by somewhat of a paradox, my decision to sell my TI system.

THE MOTIVATION

Those members who attended the September TIsHUG meeting may recall that I advertized the sale of my entire TI equipment for reasons given on the day. The portent of this article will of course delay that event by a few months.

On the day following the meeting I attempted to catalogue my TI disks to determine which personal text files, prepared by myself, could be discarded or should be transported across to PC format. Text transportation presented no problem through the use of Mike Dodd's PC TRANSFER program, but I certainly agonized over the inability to transport my collection of high resolution Asgard and TI-ARTIST graphics to the PC.

In an earlier article I had quite firmly established that PC TRANSFER was incapable of importing graphics from a PC. But now faced with the reverse situation, a vague screen prompt seemed to hold some promise. Ben Takach very kindly faxed to me a copy of the original PC TRANSFER documentation, whatever references I had used for my earlier article had vanished into my very organized domestic filing system, probably never to see the light of day again. Ben's documentation revealed that the vague screen prompt was a promise of a future spreadsheet transport feature, but definitely not for graphics.

The most obvious solution would be to scan prints of my graphics as PC images. For this procedure to be effective it would be dependent on a three component task.

A. Preparation of nearly perfect prints of the graphics.

B. Determination of an accurate photocopy reduction ratio, to match the TI's maximum 60 DPI output with the minimum 75 DPI rate of the scanner available to me.

C. Maintenance of accurate scanner performance. No matter how feature packed a scanner, it will inevitably and unpredictably either increase or decrease the number of picture elements it is meant to recognize.

This solution relied more on luck than user skill.

A less harrowing approach would be to have a PC display the TI graphic, in some way or another, and then save the picture via a Screen Capture utility. With the second solution in mind it was time to sound out the possibilities with those in the know.

Amongst several of the TIsHUG members I contacted was Rolf Schreiber. As with GIF-MANIA and the TIPS package, Rolf's reliable acquaintance with the more exotic programs for the TI, produced a solution that definitely seemed to have merit. He was able to point me in the right direction with the TI-EMULATOR. It had been downloaded from the INTERNET either by, or for Rolf. In any case Rolf, many thanks.

GENERAL COMMENTS ON THE TI-EMULATOR

After I installed the program that Rolf gave me, I was able to determine through the documentation, that it was version 6 released as recently as July of this year.

The program, as previous users will know, was produced by Edward Swartz in the USA. It was commenced as a personal project whilst Edward was still at school in 1992. Given the relative age of the TI99/4A and Edward's, one can only imagine that his interest in the TI must have been fostered by either an older friend / family member TI user or an inspirational user group. The result is astounding.

According to Edward, version 6, although much improved, it is quite different from earlier versions as he has had to exclude various ROM and GROM files upon which TEXAS INSTRUMENTS still claim copyright. Therefore with this version there is the implication that a great deal more TI to PC file transfer will be required, before the emulator can work properly. I have not had the opportunity to compare this version with earlier ones.

MINIMUM TI HARDWARE REQUIREMENT

To process the TI to PC file transfer, it is necessary that the user has:

1. A working TI99/4A with 32K of expansion memory and an RS232 card.

2. Extended Basic and Editor Assembler cartridges.

3. A serial communication cable to interconnect the TI and a PC. A description of the serial cable's configuration will be given further on in this text.

If you do not have a working TI system, Edward has a software license from TEXAS INSTRUMENTS to sell all the relevant console GROMS, ROMS, and TI cartridge roms as files in PC format.

INSTALLING THE TI-EMULATOR

The installation program that Rolf gave me were on two 3.5 inch high density disks. One disk has the main program and the other has many demonstration files of TI business and games programs.

I will only describe the installation of the main program. The additional demonstration files can be installed into the main program by individual users. The INSTALL.TXT file on the second disk explains the method.

The main disk has 3 files:

600V9T9.BUG
600V9T9.TXT
600V9T9.ZIP

The first 2 files are general information, it is worthwhile to print them out before installing the program.

1. The 600V9T9.ZIP contains the actual program in an archieved format. Copy this file to temporary directory named EMULATOR on the PC's hard disk. The name of this directory is not important.

2. Dearchieve this file with PKUNZIP.EXE or from XTREE GOLD. The destination path will be the above temporary directory.

3. Five files will be dearchieved:

600V9T9.TXT
INSTALL.EXE
V9T9.DFL

V9T9_6.PKG
VDEM_6.PXG

The 600V9T9.TXT file is the same as on the original disk and if already printed out can be ignored. The other four files constitute the installation package. Run INSTALL.EXE to commence installation from DOS or XTREE GOLD.

4. Follow the on screen menu prompts. The default installation directory will be C:\V9T9\V6.0, I have found that installation to an alternate drive will not be accepted for some reason, therefore if you have less than 2,100,000 byte space on the C drive (this space is required for the minimum installation I propose to describe), I suggest that unecessary files be moved out to floppies or an alternate drive and accept the default installation directory.

5. On the screen following the default directory prompt, answer the 'Choice' prompt with a Y keystroke to accept installation of the V9T9 demonstration files. Accept the demos subdirectory prompt with an ENTER keystroke.

6. The installation process will now commence in earnest. From the V9T9 V6.0 configuration screen choose the processor type and speed of the PC on which the emulator is being installed. This information adjusts the V9T9.CNF file (configuration).

The installation from disk is now complete. Successive ENTER keystrokes will activate a doc file reader/printer. F2 will enable selection of the different topics. ALT + P enables printout. ALT + X will exit the reader/printer.

The temporary EMULATOR directory and the installation files therein can now be deleted as they are no longer required.

THE TI-EMULATOR's DOCUMENTATION

It is always a good practise to print out all the doc files by first time users of a program but in this case it is absolutely essential. Be sure to have plenty of paper and a fresh ribbon or ink cartridge on hand as the total printout is 125 pages.

For a shareware program 125 pages of docs is quite unusual, but when it is considered that the docs describe the life and times of the veteran TI99/4A transported to the world of the PC, it is understandable. Edward was quite concise in the way each aspect of the emulator was documented with its own topic file. Some files e.g. TRANSFER.TXT bring together several related topics in a procedural approach. Notwithstanding this approach, it is not light or casual reading. To establish a firm mental model of the emulator's role, I found it necessary to read the entire docs in depth twice. The second time in a single sitting.

I have included a tree/directory printout of the emulator's directory and subdirectories that is generated by the above installation. This has been done in order to reduce the amount of verbal description that would otherwise be required. It will also simplify my task when referring to a file's location by its subdirectory name only, rather than rattling off the directory-subdirectory-subdirectory's subdirectory-etc-etc names ad naseum.

THE EMULATOR's ROLE AT THIS POINT

At this point the emulator's role is limited to Edward's original production of a FORTH program and 'replaying' of demonstration segments of typical TI programs that Edward has prerecorded.

These demonstration segments have an extension of .DEM and are located in the DEMOS subdirectories. As indicated earlier there are more demonstration segments available on the second disk.

To 'replay' or process these segments it is necessary to include them in an execution statement, for example:

C:\V9T9\V6.0\V979/D C:\V9T9\V6.0\DEMOS\386DX40\PARSEC.DEM or

C:\V9T9\V6.0\V9T9/D C:\V9T9\V6.0\DEMOS\386DX40\MUNCH.DEM

The /D switch instructs V9T9.EXE to 'replay' the demonstration files.

This feature was enough proof of feasability for my graphics export requirement. The V9T9 executable was able to tolerate the presence and successful operation of a screen capture utility. Had it not been so, I would no doubt still be conferring with those in the know for another alternative.

COMPLETING THE INSTALLATION OF THE TI-EMULATOR

As mentioned above, TI-EMULATOR V6 as installed from disk will not completely animate its intended role. It is necessary to transport the TI99/4A operating system files, plug in cartridge files, and the programs that are required to the emulator on the PC.

The way in which this is done is by linking

together the TI and a PC via a serial cable, a modem is not required.

The concept of file transportation between a PC and the TI should not be a novel topic to readers of the TIsHUG newsletter. Geoff Trott and Rolf Schreiber have written several articles on the subject, and I have mentioned details of the same in at least three of my articles since 1992.

SERIAL CABLE CONFIGURATION

The cable that I use links the TI RS232's D25 serial connector to my PC's com port 1's D9 connector. There are seven connections between the PC to the TI and they are:

PC D9 pin 1 to TI D25 pin 8
PC D9 pin 2 to TI D25 pin 3
PC D9 pin 3 to TI D25 pin 2
PC D9 pin 4 to TI D25 pin 20
PC D9 pin 5 to TI D25 pin 7
PC D9 pin 6 to TI D25 pin 6
PC D9 pin 8 to TI D25 pin 5

The cable length that I have found suitable is just over a metre, it is not shielded.

Apart from TI connections pins 2,3,7 i.e. Data Receive, Data Send, Logic or Signal Ground respectively, some of the other connections I have used may be superfluous, as I have read of other users employing only the above three, but by using all seven I have never encountered any extraneous problems.

The above serial cable configuration must not be confused with the standard NULL MODEM cable. The NULL MODEM cable's purpose is to link two PC's or two TI's, and to do so the Data Receive and Data Send lines are reversed from one end of the cable to the other.

The TI's Data Receive and Data Send pins are already reversed in manufacture, in respect to PC's, and therefore further reversal of these two signals via a NULL MODEM cable will not permit communication between the TI and the PC.

PREPARATION OF THE TI99/4A FOR FILE TRANSPORT

To transport the TI's operating system and cartridge contents to the emulator it is first necessary to locate an assembly routine named TRANS on the TI. This routine is located on the emulator's DISK subdirectory.

In order to transport TRANS to the TI, a simple EXTENDED BASIC program named RECEIVER has to be entered on the TI. The program listing of RECEIVER is:

```
80 REM Receiver for TRANS object code from PC
90 REM Legal baud rates: 300, 600, 1200, 2400,
4800, 9600
100 INPUT "Enter the baud rate: ":B
110 OPEN #1:"RS232.BA="&STR$(B)&".DA=8.PA=N",
    UPDATE,VARIABLE81,INTERNAL
120 OPEN #2:"DSK1.TRANS",OUTPUT,DISPLAY,FIXED 80
130 PRINT "Receiving..."
140 INPUT #1:A$
150 IF A$="" THEN 200
160 PRINT #2:A$
170 PRINT ".";
180 PRINT #1:"O"
190 GOTO 140
200 CLOSE #2
210 CLOSE #1
```

Save this program to a blank disk and label the disk ROMS EXPORT.

EXPORT OF TRANS TO THE TI

1. Before the export of TRANS can be commenced it is necessary to edit the FORTH.CNF file in the V6.0 subdirectory. This is done by removing the hash (#) character from the line #RS232/1=1,4 in the [Hardware Options] section. Save the edited file.

2. Run the FORTH.BAT in the V6.0 subdirectory. Insert an ENTER keystroke to select the FORTH kernel in the V9T9 Module Selection Screen. FORTH will now load.

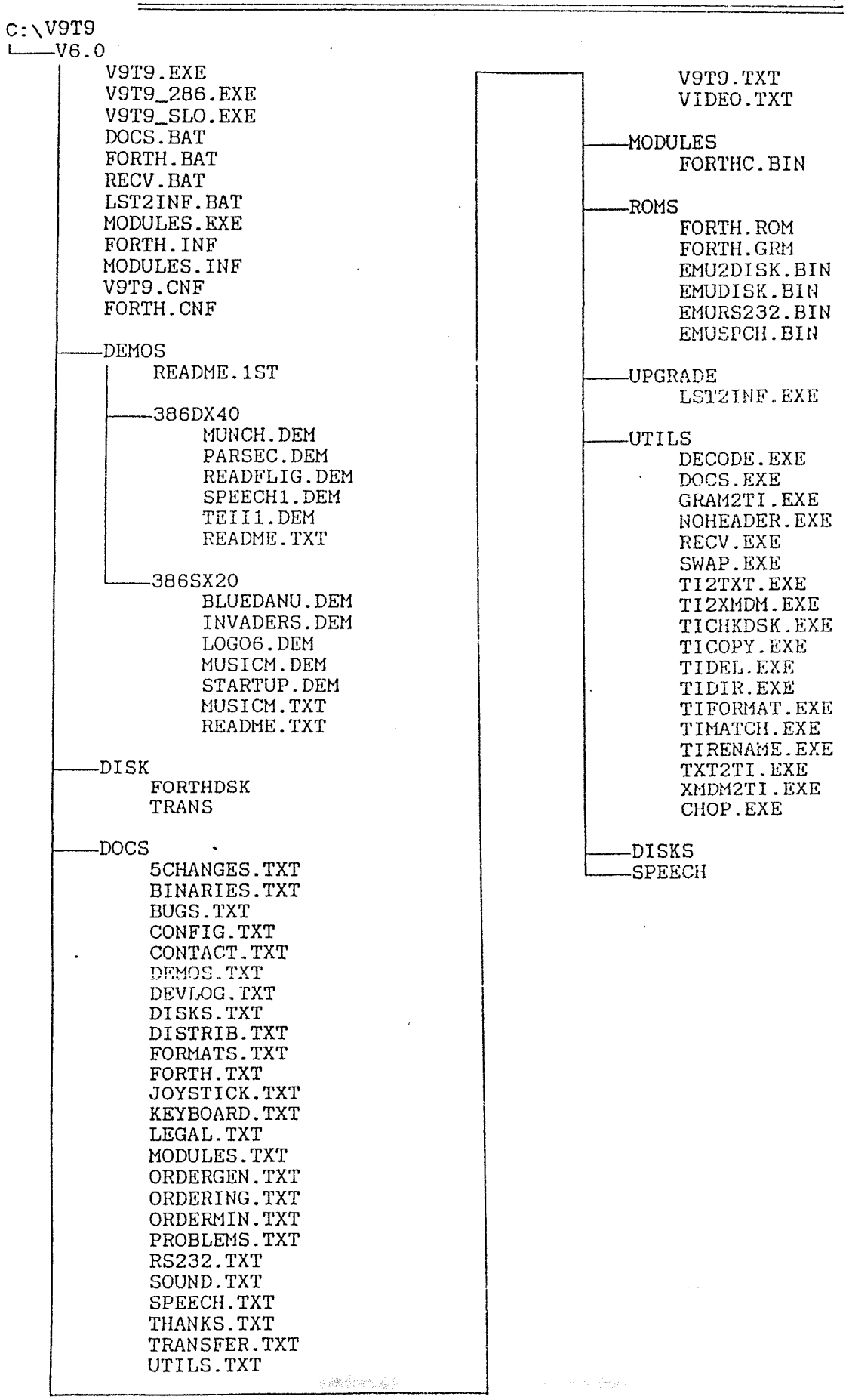
3. When the V9T9 FORTH prompt is displayed followed by a flashing cursor, type in the word TRANSFER. Reply with any keystroke to FORTH's "Press a key to start" prompt.

4. Follow FORTH's instructions to load and run RECEIVER (from the ROMS EXPORT disk) on the TI in EXTENDED BASIC. Input a baud rate of 2400. Leave the disk in drive 1 to accept TRANS's arrival.

5. Press any key on the PC followed by an entry of 4 to select the 2400 baud rate.

Export of TRANS from the PC to the TI will now take place. The event is marked by the appearance of a lengthening horizontal line of dots on the PC and the TI screens. The duration of this process is 2 minutes and 40 seconds. At the end of the export press CTRL + BRK on the PC to terminate the emulator. Check that TRANS has been accepted by the ROMS EXPORT disk.

TI-EMULATOR's TREE / DIRECTORY STRUCTURE AFTER DISK INSTALLATION



EXPORT OF CONSOLE AND EDITOR/ASSEMBLER ROMS TO THE PC

1. Remove the ROMS EXPORT disk from the TI drive 1 and replace the EXTENDED BASIC cartridge with the EDITOR/ASSEMBLER.

2. Reinsert the ROMS EXPORT disk back into drive 1. Select EDITOR/ASSEMBLER's option 3; Load and Run and type in DSK1.TRANS.

3. When TRANS loads up it will ask for RS232 parameters. Type in RS232.BA=2400.DA=8.PA=N.

4. A transfer menu will now be displayed, there are 8 options:

(0) Output device
(1) Console rom (required)
(2) Console grom (required)
(3) Speech rom
(4) Current module
(5) Disk DSR
(6) RS232 DSR
(7) Disk image

Option 0 is used only to reset the RS232 parameters.

As indicated by the menu only options 1 and 2 are required to activate the emulator. Option 4 will also be required unless you only wish to use TI basic on the emulator.

Options 3,5,6,7 are for more adventurous users, there is certainly enough documentation supplied as to their significance and application.

For my application I will use options 1,2,4.

5. The ROMS EXPORT disk can now be removed from the TI. Run the RECV.BAT file from the V6.0 directory.

6. At the Com port prompt enter 1.

7. At the IRQ of Com port 1 enter 4.

8. Type in 2400 for the baud rate and ENTER. The PC is now ready to import roms and grom contents as files.

9. Select option 1 from the transfer menu. The PC on screen message will indicate that it is preparing a location and file name for the intended import.

should the export from the TI not proceed due to some form of error, press any key on the TI to redisplay the transfer menu and try the option selection again. Restart the emulator's RECV.BAT only if an error message such 'unknown code recieved' is displayed on the PC screen. The RECV.BAT is restarted by any PC keystroke. Failure by the TI to export its contents could be due to stray EMF radiation or baud rate. In any case persevere with the transfer menu, you will be rewarded.

When export from the TI occurs, indication of this event will be acknowledged by a lengthening horizontal bar across the bottom of the TI screen. The PC will display the event by the same lengthening line of dots that indicated the export of TRANS.

At the conclusion of a successful TI export select the next option.

10. Proceed with option 2.

11. After option 2 has been successfully processed, select option 4 from the transfer menu; the Current module. In this case EDITOR/ASSEMBLER.

12. A PC prompt will request the entry of a seven character name to be used for the module base name. Type in EDIASSM and an ENTER keystroke.

13. The PC will now prompt for the module name. Type in E/A and an ENTER keystroke.

14. After the cartridge contents are successfully transported to the PC, a further PC prompt will ask for acceptance that E/A be written to the emulator's MODULES.INF file. Reply with a Y keystroke. Press ESC to exit the operation of RECV.BAT.

The imported console rom and grom contents will be lodged by RECV.BAT's operation as 994AROM.BIN and 994AGROM.BIN respectively in the ROMS subdirectory. The imported EDITOR/ASSEMBLER contents will similarly be lodged in the MODULES subdirectory as EDIASSMG.BIN.

15. Run MODULES.EXE from the V6.0 subdirectory. The characters E/A as entered in step 14 will displayed in a white colour on a black background. Press F1 to select E/A, the white foreground colour will turn to yellow, insert an ENTER keystroke to accept. By this step, the EDITOR/ASSEMBLER option will be presented as an alternative to TI BASIC when the emulator is operated.

At this point the TI-EMULATOR is fully equipped to operate as a TI99/4A but it will still require the import of user programs, unless it is intended to operate TI BASIC or EDITOR/ASSEMBLER on their own. My reason in using this program, is as mentioned in the title, that of a vehicle for graphic export.

For my graphics program I have chosen TI-ARTIST PLUS. The essential files that will allow picture display and operate from EDITOR/ASSEMBLY are:

ARTIST1
ARTPT1
ARTPT2
ARTPT3
ARTPT4
EXTDSR
SELECT
and of course a picture HANDS_P

These files will also have to be exported to the emulator, but not by using the TRANS/RECV method.

EXPORT OF USER PROGRAMS TO THE EMULATOR

Program files such as the TIAP are exported via the same serial cable but they are transferred in XMODEM protocol. This is by using TELCO V2 in an XMODEM upload setup on the TI and NETCOMM V3 in download setup on the PC, the baud rate is kept at 2400 bauds as it is fairly reliable. Any PC modem program that supports an XMODEM protocol can be used.

I will not give a detailed explanation of the export procedure using TELCO, as most of the readers who have used bulletin boards, will know the nature of the beast (please refer to the TELCO docs if uncertain) and futhermore not all potential users of the TI-EMULATOR would have or use NETCOMM V3. It is only necessary to say that it is a very simple procedure without any real traumas.

The TIAP or user program files are not to be transported to any of the emulator's established subdirectories, they are not in a format that the emulator will recognize. Instead they are to be stored in a temporary directory named TI-FILES.

Before any imported files can be used by the emulator they have to be processed by an executable named XMDM2TI.EXE in the UTILS subdirectory. The execution statement for an imported file e.g. ARTIST1 is:

C:\V9T9\V6.0\UTILS\XMDM2TI/V C:\TI-FILES\ARTIST1 C:\V9T9\V6.0\DISK

On screen text informs of conversion progress.

The ARTIST1 file will be converted to the emulator's enclave environment and it will be lodged in the emulator's DISK directory. It should come as no surprise that the converted ARTIST1 will not sport the usual DOS extension, after all what would a DOS extension mean to our old friend EDITOR/ASSEMBLER. When all the imported program have been thus converted, the TI-FILES temporary directory and all its contents can be deleted.

OPERATING THE EMULATOR

1. Run the V9T9.EXE in the V6.0 subdirectory.

2. A Module selection screen will display the available modules installed, with a selection number. In this case where only E/A is installed, press ENTER to accept it.

3. The next screen to be displayed will be the 1981 TI99/4A initial screen. Press any key to see that TI BASIC and EDITOR/ASSEMBLER are offered in the same way as on the original TI99/4A.

4. Select EDITOR/ASSEMBLER and choose OPTION 5.

5. Type in DSK1.ARTIST1 and TIAP will load up in the same way it always has.

I will not describe the way TIAP runs in the emulator. All the usual features appear to operate in their normal manner, and yes, my picture is quite unperturbed by its immigration to the PC screen. As I mentioned earlier, the screen capture utility works and therefore mission accomplished. Soon I will have to begin the real work of mustering all the graphics ready for the same trip.

As mentioned several times earlier in the text, to exit any part of the emulator, including TIAP, i.e. key in CTRL + BREAK.

SOME CONCLUDING COMMENTS

A point of interest during the emulator's running of EDITOR/ASSEMBLER and TIAP when the path DSK1 has been entered, is the appearance of a small green horizontal bar in the lower left hand side of the PC screen. You will no doubt notice this when you install the TI-EMULATOR on your own PC. No it is not a glitch. It is Edward's faithful emulation of the drive 1's L.E.D. in operation.

You will probably be wondering as to how the TI's original 256x192 pixel screen will appear on a typical 640x480 pixel PC screen, well, the aspect ratio is still the same i.e. 1.3 but the picture's proportion appears a little unusual. However there is no distortion in the screen captured picture. Graphic Workshop indicates that the screen picture size is 320x200 pixels which yields an aspect ratio of 1.6, and would explain the emulator's rendition of the TI screen. But when the

Continued on Page 18

Disk drives

Random access, yes, but it's not done randomly

By JIM NESS

This is reprinted from the June 1995 issue of VAST News, *newsletter of the Valley of the Sun TI Users Group in Phoenix, Arizona.*

The great thing about disk drives is that they can find files buried randomly within a huge field of data, and they do it pretty fast. Actually, they can do it so fast because it's not at all random.

The mechanical concept is not all that complicated. A small motor spins at 300 rpm (at least in this country, with its 60 hz power supply), and there is a tiny stepping motor attached to a read/write head. A stepping motor is a common item in indexing applications, where you want a motor to move a precise distance and stop on a dime. The read/write head is just a smaller version of what you have on a cassette recorder.

STEPPING MOTOR

The stepping motor "steps" the head from track to track on a diskette. The tracks are concentric circles, not a long spiral as you would have on an album.

All of this is ultimately controlled by the disk software provided with your computer. Usually this is located in ROM within the machine. In most machines, the ROM is only sophisticated enough to load in the official Disk Operating System (DOS) which is located on the disk in the drive when the machine is turned on. The DOS contains all the file handling software, copying software, etc., and, because it is on disk, it can be easily modified and/or updated as time goes by.

Our friends at TI decided to put the whole thing in ROM, which has a few bad side effects. First, it makes it hard to update ond improve the software, which is located in the disk controller card. Second, although the machine is a 64K machine, TI set aside so much memory for special purposes, that only 32K remained to play with. TI set aside 8K for cartridges, 4K for disk drive, 4K for RS232/PIO cards, 4K for the Operating System (can't complain about thot one), and 8K for various interfaces (speech, sound, VDP). Okay, those are a11 good applications to have, but if you don't use them, you still can't use that memory for other things.

Anyway, all of the controlling software for the TI99/4A is located in the ROM card, as I said. This software tells the step motor when to step to the next track, when to return to the beginning, etc.

NO STANDARD FOR KEEPING TRACK OF DATA

There is no standard for how a computer keeps track of data. In the case of TI. there is a directory of existing files, and a map of where they are located, at the beginning of each disk. These files are not necessarily all in complete groups. If you delete a 12-sector file from a disk, there is a 12-sector gap recorded in the map. Then, if you add a 20-sector file, the software will put the first 12 sectors in the gap, and put the rest in the first auailable spot. When you ask for a file that is broken up this way, you can hear the disk head srooting along to read each individual segment.

Because the disk drives themselves are pretty standard, there are a few things that don't change. For instance, there are 48 tracks per inch in most 5.25-inch systems. And most systems only use 35 or 40 of the available 48 tracks. There are either 9 or 18 sectors per track (single- or double-density). Each sector holds 256 bytes of data. And the standard design allows 250,090 bits per second to be written.

Wow, you say, 250K! That is about 25K bytes per second, right? How come I cannot load a 25K program in one second?

Two reasons. First, as I said, the transfer of data is actually controlled by the ROM software in the TI99/4A. And to be as good as it is, it had to be a little bit slow. Not real slow (anyone ever use a Commodore 64 disk drive?), but not as fast as it could be. The second reason also has to do with software, but it is a uniuersal problem associated with single-density storage.

The major difference between single- and double-density storage is the way in which the data is coded. In order for the software to keep track of where the read head is located on a particular track, there are clock or synch bits laid down with the data bits. In the old fashioned single-density format, o synch bit was laid down ahead of each "0" bit, so there were never two 0 bits in a row. That kept the software from getting lost if there were a lot of "0" bits in series. Putting all those synch bits on the disk took up a tremendous amount of space that should be used for data.

ENCODING CLOCK BITS

So, some genius came up with a way of encoding the clock bits in with the data bits, so that no unnecessary space was lost. Voila, double-density storage was born And double density, as used with the CorComp software, is said to increase transfer speed by at least 80 percent, mostly because the number of bits to transfer is cut way down.

So much for the exciting story of double-density versus single-density. How about double-sided versus single- sided? Well, obviously, it requires two read/write heads in the drive. Did you know that when reading a disk, the software reads, first, a track from side one, then the opposing track from side two, and continues back and forth?

The disk head needs something to keep the disk stationary against it. In a single-sided drive, there is a snall arm holding the back side of the disk against the head. In a double-sided drive, that arm would be in the way of the back side read/write head, so the solution was to use the two heads, directly across fron one another, to hold the first available spot. In order to keep them across from one another, they alternate reading or writing, as noted above.

picture is cropped of superfluous surrounding area, the size of my original picture, chosen to be exactly 256x192, is maintained.

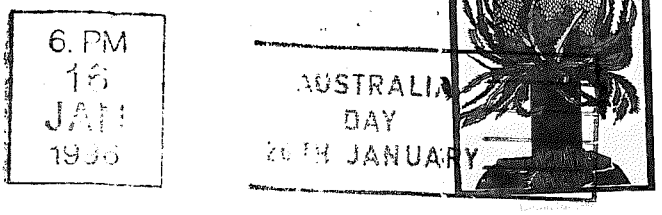
I would not attempt to call this article anything like a comprensive review of the TI-EMULATOR V6. There is simply too much to cover in one single article. Instead my approach has been a very linear one, and that was for graphics transportation. To say that the program is packed with a wealth of features is definitely an understatement which I hope other users in our community will venture to explore. Try it out for yourself.

It is a valuable learning experience not only in TI to PC file transfer process but also in understanding a little of what console and cartridge files animate the TI99/4A.

Remember this emulator is a shareware program and Edward Swartz should be rewarded for his effort if you use the program. His address is in the disk documentation.

Best regards
Alf Ruggeri

END OF ARTICLE



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