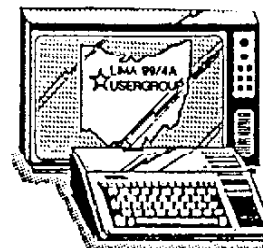# BITS,BYTES&PIXELS

## LIMA 99/4A USERS GROUP

### FINAL REPORT: THE MAY 1994 LIMA TI MULTI USER GROUP CONFERENCE
by Charles Good

Well, its over. From an organizational view things went very smoothly with no major screw ups. All the video and computer equipment in the seminar rooms worked properly. The seminar speakers kept to their time limitations. The on site food service kept everyone awake with morning coffee and later had nice subs for lunch. All the user groups and dealers were able to set up and afterword disassemble their displays with a minimum of difficulty. Everybody had fun and filled up on good food at the after-the-show pizza buffet we arranged. The only time I messed up was during cleanup time when I put away Bud Mills' cart... in a locked basement room of another building along with all the University's carts everybody used to move supplies into and out of the exhibit area. Poor Bud was standing around scratching his head saying, "Where's my cart?"

140 people signed our attendance record. I know personally that two of our speakers did not sign in, so it is probably reasonable to assume a total attendance of 150.

We have good quality video tapes with over 14 hours of useful video and sound, except for a few minutes when one speaker strayed out of the field of view of our unmanned camera. These videos are available to any user group, any TI dealer, and any paid member of the Lima User Group. To get your set send $15 to Charles Good, P.O. Box 647, Venedocia OH 45895. You will receive three 6 hour name brand (probably Memorex) VHS tapes by 4th class US mail. Tapes to Canada will be sent first class mail and cost $20. Listed below are the contents of these video tapes:

TI MULTI USER GROUP CONFERENCE
Lima Ohio---------May 14 1994
TAPE #1
----------------------------------
TAPE COUNTER/SPEAKER/TITLE
----------------------------------
100/BRUCE HARRISON/His compiler, reformatter, and other recent public domain releases.

1680/MS EXPRESS--Mickey Cendrowski and Norman Rokke/ Software Data Base- Genealogy+ and other software by MS Exp

2740/NOTUNG SOFTWARE--Ken Gilliland/Disk of Medieval Time and other software from Notung

3180/USER GROUP OFFICERS' CONFERENCE

4020/BUD MILLS/SCSI update and other BMS products

TI MULTI USER GROUP CONFERENCE
Lima Ohio----------May 14 1994
TAPE #2
----------------------------------
TAPE COUNTER/SPEAKER/TOPIC
----------------------------------
100/DON WALDEN with TIM TESCH and JAMES SCHROEDER of CECURE ELECTRONICS/Geneve and Myarc products and services available from Cecure

2120/JIM KRYCH of ASGARD PERIPHERALS/The history of and software for the AMS memory expansion system

3140/CHARLES GOOD/Demo of the new Funnelweb v5.01 40 and 80 column editors, and a peek at the under development v5.02 editor

3890/MIKE WRIGHT of CADD ELECTRONICS/Demo of PC99 release 2A; a 99/4A emulator running on an IBM compatible

4610/BERRY MILLER/Discussion with audience of Geneve related topics including MDOS status.

TI MULT USER GROUP CONFERENCE
Lima Ohio---------May 14 1994
TAPE #3
----------------------------------
TAPE COUNTER/SPEAKER/TITLE
----------------------------------
40/CHRIS BODENMILLER and RON MARKUS of RAMCHARGED COMPUTERS/ Creating game graphics using TI ARTIST and the PROSTICK joystick

1620/BARRY TRAVER/Programming from the 99/4A to a PC

2700/JIM KRYCH/The Virtual 4A

**⁑DONE⁑**

## LETTER from AUSTRALIA - No. 7  Apr / 94

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Well, it does seem a long time since I last put fingers (2 of them anyway) to keyboard to bash out a Letter. Actually I did start one in January, about on schedule but events conspired against it. Just after New Year I tried to install a 80-track drive on the Hawks Nest machine, so I could spend evenings of a lazy summer vacation doing some TI programming. Disaster struck however and in process of hooking up the drive to a PC power supply, I managed to reverse the power leads to the Mechatronics 80-Z unit. It was downhill with Murphy all the way from there. Although the PE-Box turned out to be undamaged, the first spare normal console did not work - a dud power supply and of course it was one with a mid-lead connector. Any other I could rustle u p had on-board snap-on connector. So out with the CC-40 and Memo-Writer. Time to do a Charlie Good and compose a Letter on that and download it later to the Kotara machine. No luck there -- after several attempts, new batteries, every time the Memo-Writer would lose its conte nts when it was put aside for later work. Either something is faulty in the CC-40 or the M-W cartridge does not really handle 18 Kb expanded machines properly. Eventually I gave up in frustration.

After that came a vacation trip to New Zealand. The air tickets were William's Xmas present to ancient parents - that was the least of the expenses, but I could not convince him to pick up the damage to the Master Blaster. According to our Kiwi friends February is the best time to visit NZ, unless you are specifically after a skiing holiday. With only 2 weeks or so we chose to restrict our visit to the South Island, and scarcely had enough time for that. As it turned out the weather was well-nigh perfect, sunny and clear all the way down the west coast of the South Island, a very rare event indeed in summer. This followed on a period of extreme rainfall and flooding in the South Island. Some of the mountain roads such as Haast Pass had only just reopened so tourist numbers were down temporarily.

Many things about NZ were more or less as expected, but some that I should have been prepared for came as a surprize. Mostly this was to do with driving around the country. Our experiences have been of Australia and the USA, both rather large countries. You can drive from east to west coasts in NZ in just a few hours if you don't stop to look at the scenery along the way! That is obvious enough from a map but still a surprize. Mountain driving is not what we expected at all. We were used to the western US of A where mountain driving starts at 5 or 6000 feet and goes up from there, and were thinking of high altitudes and cold at night - there are glaciers after all. That's not how it is - most of the driving is at or near sea level, and even the passes are only 3000 feet or so, even though the mountains rise to 12,000 ft. That is not to say it is trivial. The mountains of NZ are

very young in geological terms and always eroding do wn in great landslides, and it is only about 6 million years since tectonic plate collisions caused the uplift. The recent ice ages ground out deep glacial valleys all over the place. The narrow west coast plain has formed from all the eroded material being washed back up. I could have spent days and days just picking up the beach pebbles and driftwood at Hokitika and Gillespies.

The relationships between NZ and Australia show quite a few parallels to those between Canada and the USA. Small country reacts to much bigger neighbour. NZ does share with Australia the characteristic attitude expressed in the phrase "She'll be right mate!" common to both countries. In NZ however they have a corollary to that which runs "Geez, how did thet heppen" with a slight attempt there to convey the NZ pronunciation. Mainly this differs from Australian pronunciation in the vowel sounds, and to Australian ears the accent is quite distinctive. Unlike the U S where there are distinctive regional accents, the Australian and NZ internal variations are more between "educated" and "broad". Regional variations tend to be more in items of vocabulary than accent. I still use terms that date from my Queensland childhood which are foreign to NSW where I now live. I sometimes think all those Kiwis come to Australia looking for their lost vowel sounds. One thing that is good in NZ is "fush and chups" - the only place we have had it as good in Australia was at Apollo Bay on the Great Western Road in Victoria. I guess that shares an exposure to the Antartic. Much of the South Island of NZ is south of Tasmania, but it amazing how easily you can get sunburnt in the Otago region. In NZ they are very conscious of ozone depletion problems.

Driving a car in the South Island is an interesting experience. NZ used to be a rolling museum of old British cars, but now these have been largely displaced by imports of second hand Japanese cars. Like Australia, Japan, and the UK the cars are right hand drive, so we had no adjustment problems there, apart from dodging the occasional US or German tourists who had forgotten what side of the road they were supposed to be on. We have scared some American drivers in our time in the US too while adjusting - once you have changed over a couple of times the switch becomes just another driving skill. NZ is the last refuge of the one-lane bridge even on main highways, and in one place on the west coast a long one-lane bridge is shared by the railroad track. Very unnerving when you are out in the middle. Kiwis treat speed limits very casually. You can usually tell you are in a town area with 50 km/hr speed limit by noticing the traffic is all moving at 70 km/hr, and 20 km/hr over the limit is the basic norm. I gather speed cameras were introduced last December and made such a haul that the protests are still reverberating and there was no sign of them while we were there.

I had better stop talking about NZ before this becomes the the equivalent of forcing you to look at the slides from our holiday. Magic moments included walking to the terminus of the Fox Glacier just near sea-level rain-forest, a helicopter trip to the top of the glacier, and the glow-worm cave on Lake Te Anau, known from Maori legend but lost for centuries and only rediscovered relatively recently. All in all I can thoroughly recommend NZ as a place to visit.

Nature is said to abhor a vacuum. In this case it fills it with possums. The word must have gone out and some new ones moved in. Also the Animal Welfare lady brought back the baby possum whose mother had been savaged, a tough little survivor that one. So now we have a full complement that come down outside the kitchen door for food. You do get a different slant on them in NZ however. Australia has its own set of disasters with introduced animals — rabbits, foxes, cane toads, starlings, mynahs, and domestic ones gone feral such as cats, pigs, and goats, just to list a few of them. In NZ also they have a hugE list of introduced disasters, not the least of which is the common Australian brush-tail possum. These have gone crazy in NZ and are destroying much of the native forest. In Australia the level of toxins in the tree leaves that they eat keeps a reasonable balance, but in NZ they munch up almost everything and are in plague proportions. On the west coast of NZ approaching Hokitika we went along one section of road where there were squashed possums every meter or so.

Most programming work around here has been on Editors in various versions. Ever since the coming of the AVPC, developments in this area have been driven by the 80-column versions, with the 40-col following along as best it can. Most recent releases have been the Vn 5.01 80-column version with large 64 Kb buffer in 9938 VDP extension VRAM. To put this in user terms, I have combined all the 80-col documentation into a single file 310 sectors long on disk which still leaves more than 10% of the text buffer free. I am currently working on a symmetrical "editring" version which replaces the large DiskReview type of View buffer with a second text buffer with exactly the same properties as the first one. It can still be used as a View buffer if desired, but with exactly the same capacity and edit and search functions as the first buffer. I think I finally slew all the RS bugs in the 40-col ED/AEH version last night and e-mailed off the corrected version in TIFD form to Charlie this afternoon. By the time you read this you will have seen it at the Lima MUG or have received it in the Lima UG distribution.

Now if you have 80-col capability you will have found that it works as well as the earlier regular size buffer versions despite the greatly increased capacity. A preliminary test is sue of this was set up for programmers' editor function only because buffer handling speed was such that word-wrap mode would not have been realistic. So what has changed? The test version used VDP RAM as just a larger buffer for text data, but separated this from the line table which was kept in CPU RAM. The large size combined with the inherent inefficiencies of reading and writing to VDP memory slowed down buffer manipulation functions to a degree unacceptable in a general purpose editor. The next step was clear as I was also looking to the future of using CPU RAM expansions, which of necessity page in numerous smaller blocks of RAM, and only one of these can be addressed at a time at a given address. VDP memory is different in that though there is a 16 Kb bank size built in, reads or writes can auto-increment over the whole range which is what was done in the test P/E-only issue.

So what we are facing is the design of a buffer manager that can handle a banked or segmented buffer structure. There are gains to be made here, because if only a one or two segmen ts have to be attended to at a time, even if there is overhead in deciding just which segments, we may well come out way ahead on the amount of buffer shuffling that has to be done. I have talked about how TI-Writer type editors handle buffer management in previous writings, but I will give a brief summary here. The design concept is to keep the buffer manager as a separate layer with a small set of defined interface routines called by the edit code. This has been extended in the segmented model by another layer which is called by the previously defined buffer functions, and the edit code remains blissfully unaware of the details of the text buffer. The exception to this statement was the buffer initialization called by Purge which acted directly on the buffer pointers.

The original TI-Writer defined a set of line oriented services, and was not particularly tightly written and even very inefficient for block functions. The general structure of the one piece text buffer is a downwards growing table of line pointers to an upwardly growing pile of compacted ("squished") lines. No gaps are left in this pile. It is shuffled down when a line is deleted, and new lines are added to the top. Text buffer full occurs when the two collide. These services are 8 LWP calls to
    INSTLN -- adds a new line to the buffer and inserts a new entr y in the line table.
    DELTLN -- deletes a line by removing it from the text pile, an d adjusts all line pointer references as necessary.
    UPDTLN -- replaces the modified line with the new one, deletin g the old and inserting a new line if necessary.
    GETLN -- fetches and unsquishes an existing line from the text bufer.

These have a small cast of supporting BL routines, to generate line numbers, locate lines in the buffer, check for possible overflow, adjust the line table, and to do mass moves of the text buffer. Later versions of the Funnelweb editors added some block oriented BLWP services to improve handling blocks o f lines for Copy and Delete which was handled with appalling slowness by the original TI written

code. Another BL service, MVLINS was added to optimize line table block shuffles as need ed for the Move lines function, which now occur rapidly with no risk of overflow (TI's terrible original code first copied the bloc k line by line and then deleted the original also line by line).

DLBLOC -- deletes blocks of lines by contiguous blocks in the text buffer, and is very much faster for a well ordered buffer, and usually much faster than doing it line by line. In the worst case it is no better than the original, but in practice the text buffer is rarely so disordered.

CPBLOC -- copies a block of lines by making tentative additions of the copied lines and their pointers beyond the existing contents. If buffer overflow would occur the attempt is abandoned with no changes, and if successful only a single reshuffle of the pointer table is necessary.

Now in the new segmented buffer model, the edit code sees exactly this same interface. The new buffer manager introduces a layer of services below this, the segment manager. A variation that had already been made in the P/E-only large buffer test issue was that the line table occupied its own area of CPU RAM in high-mem, and line table overflow became a separate issue from text overflow. The capacity was made large enough to cover most normal usage of a 64 Kb text buffer. It was found desirable to introduce seven new BLWP services for the segment manager.

INISEG -- sets up the data tables and pointers for the segment ed buffer structure. This is called by the Purge routine in the main code, and isolates all details of the buffer from the caller.

FNDSEG -- locates and returns segment data for the segment containing the particular line requested by line number.

GETSEG -- returns the data for the first segment it can find w ith enough room for the line to be stored.

TMPSEG -- sets up a temporary segment data table for use by the block copy function.

MAXSEG -- locates the temporary segment with the most room left to see what size of contiguous block can be stored in one hit.

UPDSEG -- updates the permanent segment table for a successful block copy that does not cause overflow.

FRESEG -- returns data for the SU display showing text buffer and line table free.

As you can see it is the Copy Block function alone that is responsible for 3 out of 7 of these. Deeper below these still are the routines for setting up bank switching and VDP addressing. These are of no concern at all to the edit code, and would change drastically if a different form of banked memory were used. The manager currently assumes a 64 Kb fully byte addressed buffer as its model, segmented into from 2 to 32 segments of uniform size in binary sequence. This allows for a 2 Kb minimum size which would be appropriate for the banked memory in Horizon family RAMdisks. The Vn 5.01 editor as issued uses 4 Kb segments, a size chosen deliberately not to match the 16 Kb banks of VDP. The

segment size can be altered by a single dat a word in the program, but I have not yet had the time to experiment to find the optimal segment size.

The next stage of development beyond the 2 file edit-ring using VDP is to extend the edit ring approach to banked RAM devices of one sort or another. With this it would also be possible to extend the large buffer model to the 40-col version. Whether that effort is worth it or not, I am still not sure. Immediate plans are to use a 192 Kb HRD for this purpose, as I have one of these spare for use as a memory expansion. The Quest RD would make a good candidate as it has a simpler CRU banking structure, but I am short of RAMdisk space and cannot spare it . The AMS looks too small at 128 Kb to be of more than limited interest now that the edit-ring idea is up and running, as it would support only a single full 64 Kb buffer in this size. Talking of that device, I know it only from description, but the opinions expressed in the last Letter were carefully considered. The article from Jim K in the Feb/94 BB&P missed the point in its highly polemical defense of the design decision (flawed in my view) not to have a DSR ROM. The comments I made on this in no way implied that a DSR was necessary for memory access via DSRlink search and DSR routine execution though Jim K seems to be stuck on this model as a straw man to tear apart. What a DSR could and should provide at the very least is test functions, and as a report I have seen from Germany on the AMS card indicates, initialization function for warm restarts as well. It does not really matter, as the path of memory expansion for general purpose use around here will of necessity be the surplus small HRD.

If you are curious when and where this is being written, I am at home on my TI-99/AVPC, with the radio playing Lester Flatt tunes on the ABC's Sunday night country music program - which much to my liking tends to play a lot of bluegrass, the C&W stuff itself not being of much interest. I did start to write it on the PC as it will be e-mailed via my office PC to Ohio when do ne, but I find I like using the FW Editor much better than any PC editor I have, so I will put up with the extra step of transferring it to PC disk.

Tony McGovern
Funnelweb Farm
May / 01 / 94
e-mail -- phpam@cc.newcastle.edu.au
Delphi -- GLOBAL01
**\*\*DONE\*\***

## TI STILL CARES ON THE INTERNET

The consumer relations people at TI, the people who run the 800-TI-CARES phone line, can also be reached on the internet. Use ti-cares@lobby.ti.com to send them email.

**\*\*DONE\*\***

## THE TORTOISE AND THE HARE.
### by Mike Wright, PC99 development team.

There are now at least three PC emulators for the TI-99/4A. Of the three:

PC99 is a commercial product. It sells for $147. On a PC with a 486 66MHz processor, PC99 runs about 1.6 times slower than a 4A.

TIEMUL is fairware. It sells for $40. On a PC with a 486 66MHz processor, TIEMUL runs about 3 times faster than a 4A.

TIEMUL is both cheaper and faster than PC99. Put them together on a shelf in a supermarket and almost any consumer would choose TIEMUL. Why have a tortoise, when you can have a hare?

The answer is that there is more to an emulator than just raw performance. The purpose of this document is to try and establish a list of desirable emulator features. Using this list, you should be able to make an informed comparison. Remember that each emulated TI feature requires extra PC code to be executed. The net result is: more features, more code, less speed.

Since this document is written by one of the PC99 developers, a description of each feature will be given from a PC99 point of view. No attempt is made to compare emulators. We leave this to you. However, we believe that once you have considered all the evidence, you will find that the tortoise may yet again upset the hare.

### ARCHITECTURE

PC99: The ultimate goal is to develop a Basic compiler on the PC. The compiler will take any TI Basic or Xbasic program and convert it to TMS9900 assembly code. The compiler will handle any Basic statement, including DEFs and sub- programs. No TI developer has been able to do this on a 4A. The most common reason given is that there is not enough memory on a 4A. The PC99 compiler overcomes this since it can use the full resources of the PC.

A compiler user will test the Basic program in PC99. The program is then exported to DOS, compiled, and returned to PC99 as relocatable object code which can be loaded by the Editor/Assembler. It will not be required to convert the Basic program to another format, such as LIST or MERGE.

Since PC99 can directly exchange disks with a 4A, the compiled program may be distributed to other users.

A large portion of this architecture has been completed. Development is proceeding, as time allows.

### TMS9900 16-BIT PROCESSOR
PC99: Fully emulated. All 69 instructions and all corresponding addressing modes are implemented.

### TMS9918A VIDEO DISPLAY PROCESSOR
Memory-- PC99: Fully emulated. Up to 16K VDP memory can be addressed.

Write-only registers-- PC99: Fully emulated. All eight registers can be addressed.

Display modes-- PC99: Fully emulated. All four modes (graphics, bitmap, text and multicolor) are available.

Colors-- PC99: Fully emulated in PC VGA mode with PC color monitor. Any pixels that are on in a group of 8 may be one of 16 colors. Any pixels that are off in the same group can be one of 16 colors.

Sprites-- PC99: Fully emulated. Up to 32 sprites can be defined.

Interrupt processing-- PC99: Fully emulated.

### TMS9901 PROGRAMMABLE SYSTEMS INTERFACE
PC99: All of the features used on the 99/4A are fully emulated.

### TMS9919 SOUND PROCESSOR
PC99: Partially emulated. On the 99/4A this chip has three sound channels (1, 2 and 3) and one noise channel. In PC99 only sound channel 1 is emulated. This is a PC limitation.

### TI CONSOLE JOYSTICK PORT
PC99: Fully emulated, if the PC has a game port. The PC joysticks emulate the actions of TI joysticks. If a game port is not available, the PC ALT function keys can be used.

### TI CONSOLE CASSETTE PORT-- PC99: Not emulated.

### TI CONSOLE COMMAND MODULE PORT
PC99: A TI "command module" consists of one or more DOS files. These are loaded into PC memory. You "change a command module" by running the PC99 configuration utility (CFG.EXE). Almost all TI-manufactured command modules are fully emulated under PC99. The same applies to third party command modules. No "lockups" due to bad contacts can occur.

The module files are identical to those used by TI GRAM devices, such as the Gramulator. If you transfer them to a 4A, they can be used without modification.

### TI CONSOLE KEYBOARD
PC99: Almost every key and shift mode (SHIFT, CTRL, FCTN) on the 99/4A keyboard can be keyed on the PC keyboard. PC99 does not support TI multiple shift modes (for example, FCTN SHIFT B). You can use PC function keys (F1-F10) as TI FCTN keys (FCTN 1 - FCTN 0).

## TI MEMORY
PC99: Fully emulates the TI memory map:
>0000->1fff 8K console ROM
>2000->3fff 8K low memory expansion
>4000->5fff 8K peripheral ROMs
>6000->7fff 8K ROMs in command modules
>8000->9fff 8K memory-mapped
>a000->ffff 24K high memory

## TI COMMAND MODULE BANK SWITCHING
PC99: Both TI and MBX bank switching schemes are fully emulated. Some command modules, such as Extended Basic, use this feature. The MBX command modules which do not require the MBX console are fully emulated in PC99.

## TI GROMs
PC99: Fully emulates the TI GROM memory map and auto-incrementing actions of a GROM. Up to 8 8K GROMs can be loaded. A development version of PC99 has been tested with up to 16 banks of GROM memory and using the REVIEW MODULE LIBRARY feature in the console.

## TI DISK CONTROLLER
PC99: Fully emulated. The TI disk controller supports up to three drives. Each diskette can contain 720 256-byte sectors. In PC99 a TI "diskette" is a DOS file.
PC99 comes configured as a three-drive TI system.
A PC99 "diskette" is a mirror image of a TI disk, including the inter-sector information. This makes it easy to transfer diskettes between a 4A and PC99, and vice-versa. PC99 includes utilities to transfer diskettes by serial port, or by using PC Transfer.

## TI-RS232
PC99: Fully emulated, if the PC has up to two COM ports and one parallel port. PC99 can exchange data over the PC COM ports, and can drive a TI compatible printer connected to the PC LPT port.

## DEBUGGER
PC99: Built in. Press ESC at any time to halt any TI program, even during disk accesses. Examine or change any TI memory. Set breakpoints and watchpoints. No debugger running on a 4A has, or can have, all these capabilities.

## SOURCE CODE
PC99: Written in C, a high-level language, with a few lines of assembly code for keyboard handling. The code is compiled with the Symantec 6.1 C compiler and the Microsoft 5.1 Macro Assembler.
High-level languages are "portable". This means the source code can generally be compiled on another platform with little change. In fact, the pilot PC99 code was developed on a Unix platform running X-windows. It would not be an onerous task to make PC99 run in native mode on a Macintosh, since Symantec also makes a C compiler for the Mac.

Having portable code ensures that PC99 will not become obsolete if PC architecture undergoes a fundamental change. Although Intel has promised to ensure backward compatibility with older processors, this is becoming more and more difficult to do. There is a also a strong hint that IBM and Motorola may introduce a line of PCs based on the PowerPC chip. This chip is already used in the Macintosh.
A disadvantage of high-level languages is that they can never be as efficient as native assembly code. A program written in assembly code will generally out perform its equivalent in a high-level language. However, most professional developers feel that the long-term benefits of portability outweigh the short-term gain of performance.

## DOCUMENTATION
PC99: Includes a comprehensive 75-page manual, with table of contents. The manual covers quick start, installation, the configuration utility, the emulator and the utilities supplied with PC99.
The PC99 manual is supplied in two formats: as a WordPerfect 5.1 file, and as a raw Ascii file. WordPerfect is the top-selling PC word processor, and the 5.1 file format can be read by any version: 5.1+ for DOS, 5.1 for Windows, 5.2 for Windows, 6.0 for DOS, 6.0 for Windows, and 6.0a for DOS. In addition, other PC word processors, such as Microsoft Word for Windows, can read native WordPerfect files.
By supplying the documentation on disk, you can refer to it "on-line". This allows you to search for topics and even insert your own notes. You can also print the documentation in your choice of fonts and styles.
If you do not have a compatible word processor, the equivalent Ascii file can be edited using EDIT supplied with DOS (5.0 and higher).

## COPYRIGHTED MATERIAL
The executable code contained in the TI console ROM and GROMs, TI peripherals (such as the RS-232 and disk controller), and TI command modules is copyrighted and owned by Texas Instruments.
Under penalty of law, it is illegal to distribute this code in any manner withou without express permission from TI. This includes placing the code on a or Internet node.
PC99: CaDD Electronics has negotiated a contract with Texas Instruments which permits it to sell TI's copyrighted code. For each "console" or "command module" sold, CaDD has to pay a royalty to TI. This agreement covers every command module sold by TI with a PHM number. It does not cover third party modules, such as those made by Atari, Funware, and others.

## SOFTWARE
PC99: The following programs have shown up bugs or design flaws in emulating the 4A. All have been fixed in PC99 Stage 2a.
Return to Pirate's Isle (bug in program)-- Writes to

addresses in the console ROM. This code was used for debugging and accidentally left in, according to author Scott Adams. PC99 ignores writes into ROM.

Telco (technical bug in program)-- Sends illegal instructions to the TMS9918, which attempt to determine if a 9938 VDP & as used on a Geneve & is available. PC99 masks these to allowable 9918 values.

Rapid Copy (bug in program)-- Sends illegal values to the WD1771 chip in the TI disk controller. PC99 masks these to correct values.

Turbo Copy (bug in program)-- Too few bytes are sent to pad a track. PC99 emulates the WD1771 chip in the TI disk controller by timing out and recovering.

Astro Fighter (technical bug in program)-- Uses the color transparent as black. This caused portions of the ship to be blanked out. PC99 allows the background color to show behind transparent.

RXB (design flaw in PC99)-- Has an instruction or data in the last address of a GROM. When this address is accessed on a 4A, the hardware "wraps" and fetches the next instruction from the base address of the GROM. PC99 used to always fetch from the next sequential address.

The following programs have been explicitly tested under PC99:

All TI command modules (includes Editor and Assembler from Editor/Assembler, Logo II, TI-Writer, Multiplan, and Plato); all Atari command modules; Inscebot's TI Artist, and TI-Base; William Warren's PRBase; MG Explorer, DiskAssembler, and Super Extended Basic; Genial Computerware's Identifile; M&T Utilityware's Disk+Aid; Paul Charlton's Fast-Term; all Infocom adventure games; Ken Gilliland Casino Games; Harry Wilhelm's The Missing Link.

Many other programs have been run under PC99, including those written in Basic or Extended Basic. One example is the classic Giant and Dwarfs, written by Barry Traver.

UTILITY PROGRAMS

Most PC packages come with a base program and a series of utilities. For example, in WordPerfect 6.0 for DOS WP60.EXE is the base program, while WPFI.EXE (font installer), CV.EXE (file converter), and WPINFO.EXE (equipment and environment checker) are utilities.

Utilities reflect the software architecture of a product. For example, if your emulator does not store TI files as a mirror image of a TI disk, there would be no need for DSKOUT.EXE, a PC99 utility that extracts a TI file from a TI "disk" and makes it a DOS file. Conversely, if you do not store TI files as a mirror image of a TI disk, you would need a utility to "join" these files and create a TI disk header before transferring the "disk" to a real 4A system.

PC99: includes the following TI utilities:

RSECTOR and WSECTOR: These are used to transfer TI diskettes between a 4A system and PC99, and vice versa. A PC99 "disk" is a DOS file that is a mirror image of a TI disk.

PC99: includes the following DOS utilities:

--CF6.EXE: Configures PC99. You can change a command module, change "disks", even change the 99/4A into a 99/4. This powerful utility makes it easy to configure PC99 to match your PC hardware.

--DUMP.EXE: Dumps a DOS file in hex and Ascii.

--DUMPROM.EXE: Dumps a TI ROM in hex to an Ascii file.

--GREAD.EXE: Strips unwanted trailers off files.

--GSTRIP.EXE: Strips unwanted headers off files.

--PATCH.EXE: Patches ROM or GROM files (or any other DOS file).

PC99 includes the following DOS disk utilities:

--DSKDIR.EXE: Catalogs a TI "disk" from DOS.

--DSKCHECK.EXE: Checks the integrity of a TI "disk".

--DSKMERGE.EXE: Merges files transferred from a 99/4A system using PC Transfer into a TI "disk".

--DSKOUT.EXE: Exports a file from a TI "disk" and store it as a standalone DOS file.

--DSKIN.EXE: Imports a DOS file to a TI "disk".

The following DOS utilities are used on files extracted by DSKOUT.EXE:

--BAS2ASC.EXE: Converts TI Basic or Extended Basic program files into DOS Ascii. The converted file can be loaded into PC Basic.

--DIS.EXE: Disassembles single E/A5 files and E/A5 files that have been "joined" by EA5JOIN.EXE.

--DVB02ASC.EXE: Converts TI D/V 80 files into DOS Ascii. The converted file can be loaded into a PC word processor, such as WordPerfect.

--EA5JOIN.EXE: Loads successive E/A5 files into an equivalent TI memory space and saves as a single file. The output file can be used by the PC99 disassembler, DIS.EXE.

--EAC2ASC.EXE: Converts E/A3 compressed format files to Ascii. Shows all tags by name, the load offset, and contents in hex and Ascii.

--IV2ASC.EXE: Converts TI Extended Basic INT/VAR 254 program files into DOS Ascii. The converted file can be loaded into PC Basic. [Not all TI Extended Basic statements are valid in PC Basic.]

MRG2ASC.EXE: Converts TI Basic or Extended Basic files saved in INT/VAR 163 (MERGE) format into DOS Ascii. The converted file can be loaded into PC Basic. [Not all TI Basic statements are valid in PC Basic.]

The following DOS utility is used with DSKIN.EXE:

ASC2DV80.EXE: Takes a DOS Ascii file and converts it to TI-Writer format. This file can be stored in a TI "diskette" using DSKIN.EXE.

PERFORMANCE

PC99: Emulation speed depends on the PC hardware. It is recommended that the minimum hardware for PC99 should be a 386 running at 33MHz. If possible you should have a 486 running at 33MHz. Many mail order suppliers have machines of this caliber for between $1,000 and $1,200.

Only two years ago, similar machines cost twice as much. The new crop of 486 DX/4 100MHz cost around $2,400, while Pentium 90MHz and 100MHz machines cost around $3,200. The point of quoting prices and performance is not to establish an absolute value, but to show that PC hardware performance continues to rise while prices continue to fall.

PC99 uses the clock in MG Super Extended Basic as a measure of performance. On a 4A this clock is close to real time. On a 486 DX/2 PC running at 66MHz, PC99 takes 16 seconds to display 10 seconds.

### PRICING

PC99: The current release, Stage 2a, costs $147. PC99 was developed and released in "stages" to help fund development and spread the cost to the user over time. Development costs for PC99 have included: three PCs (486 33Mhz, 486 50Mhz, and 486 66Mhz); DOS 5.0, 6.0, and 6.2; Microsoft C6, Borland 3.1 C++, and Symantec 6.1 C compilers; Microsoft MASM 5.10; Solution Systems Brief editor; FastGraph C compilers; Microsoft MASM 5.10; Solution Systems Brief editor; FastGraph graphics library; Blaise Asynch Manager; VMDATA Extended Memory Manager; MKS Systems lex and yacc; Creative Labs Sound Blaster SDK; Nu-Mega Bounds Checker for DOS; and WordPerfect; along with advertising, mailing and other costs. We have yet to amortize these costs. At this stage PC99 is truly a labor of love love. For comparison, the SoftPC emulator for a Macintosh has a list price of about $550. IBM charges $2,500 for a PC emulator running under AIX.

### SUPPORT

Availability:

CaDD Electronics offers telephone support for PC99 each evening and weekends (EST). If the support line is unattended, the call is recorded & will be returned, usually within 24 hours. You can also write to CaDD at its Consumer Service Facility and be assured of a reply.

Quality:

The owners of CaDD Electronics are among the developers of PC99. They have an intimate knowledge of all aspects of the product. CaDD also qualifies as expert on the 4A, having developed the Gramulator, the most advanced GRAM device yet made.

Longevity:

All of the PC99 developers own full 99/4A systems, including a Gramulator. Two of the developers have been TI owners and users since 1983. CaDD Electronics has been making products for the TI-99/4A since 1985.

### FUTURE DEVELOPMENT

PC99: There is no promise of any future upgrade to the current product. No apology is made for this approach, even though it has cost us sales. Yet, as one PC99 reviewer put it, we continue to "quietly develop quality products for the 99/4A". Our answer to critics is simple. We do not wish to become the Myarc or Press of the emulator world.

Given the above, future development for PC99 calls for:

Sound Blaster:-- The configuration program, CFG.EXE, is already linked with the Creative Labs SDK. CFG.EXE can test for the presence of a Sound Blaster and play Creative Labs CMF music files. For PC99, the plan is to optionally allow 3-channel sound through a Sound Blaster.

Basic compiler:-- The MKS lex and yacc programs will be used to develop the PC99 compiler.

Sound Blaster:-- An attempt will be made to emulate the TMS5200 in the TI Speech Synthesizer through the Sound Blaster.

Improved Performance:-- An attempt will be made to increase the execution speed of the product so that it runs at 4A speed on a 486 33MHz PC.

Optional peripherals:-- An attempt will be made to emulate the Myarc floppy disk controller and TI p-Code card.

(BB&P editor's note: PC99 is available to new purchasers for $147 from CaDD Electronics, 81 Prescott Rd., Raymond NH 03077. TIEMUL is available for a fairware donation of $40 from Edward Swartz, 1401 E. 18th St., Georgetown TX 78626.)

**DONE**

**Gary Fitzgerald
9 Merwin Avenue
Apartment #2
Milford, CT
06460-7903**

Dear Charlie,

Thanks for the great time out there in the wild west. I'm enclosing an article I wrote for a few newsletters. As you can tell, I throughly enjoyed myself at the MUG conference. I hope my reference to your physical presence did not offend you. I wish I could have talked to you more but I was buzzing around like a four - winged hairy insect of the genus *Apis*. All conditions being somewhat equal, I hope to see you again, same time next year. I fear I'll have to be somewhat more thrifty as Gail is asking," Who's gonna pay the bills this month!??!!" Don't suppose the telephone company would take a P-GRAM+ as payment, do you? Till next time.

Sincerely,

Gary Fitzgerald

P.S. Don't forget to say "HI" to Gail on the next tape. I'd send you the fifteen bucks for the MUG tapes but my little excursion to Lima and more current disability status (AGAIN!!!) at work has left the well dry. Say "THANKS" to the rest of the Lima gang.

LIMA MUG Conference of May, 1994

By Gary Fitzgerald
Nutmeg 99ers
Lima UG
Long Island 99ers
Ottawa UG


After driving through thursday afternoon thunderstorms in New Jersey, crisscrossing the East-West divider on Route 80, riding single file for miles and miles in the Red Devil - a 1993 Ford Festiva with a huge 1300 cc engine - I crossed the Pennsylvania-Ohio border. This was the farthest West I had ever been. Where were all the buffalo? Didn't matter 'cause it was dark and I wouldn't have heard all the thundering hoofs above the din of all those eighteen wheelers. I was pretty beat by this point but I sensed the alure all those TMS 9900 series microprocessors, so onward I went. Toledo and down? Columbus and over? Nah, not for this intrepid explorer. Me and my Teddy Bear (Wanna make somethin' of it?) ventured the Blue Highways except they weren't blue on my map. 1:30 am friday morning and I was in the Land of Oz. Real exciting. Slept till 1:30 pm friday afternoon. I regrouped and found my way to OSU Lima Campus. After getting directions from what must have a math professor - *There are four buildings and the driveway your on is tangential to the polygon....* - I found Reed Hall. I walked in and found Dr. Charles Good directing traffic. Seizing the opportunity to be quite witty, I announced myself as the Connecticut Division of the Lima UG, chest foward, feet together, three fingered salute. Well he looked at me as though I was a Commadore in TI clothing. So much for being cute!!! He recognized my name when I sheepishly offered it and was magnanimous in his greeting. He was thinner and taller than I expected. Must be due to the camera angles and such as viewed on my monthly Lima tapes. That hunkered down aspect of his physical appearance I always attributed to the necessity of poking his face into the camera to introduce himself. That's his natural stance, kind of like a coyote on the prowl. *Oh yeh, like I'm an expert on coyotes after my sojourn way out west.* I immediately picked up a tape dispenser and some preprinted signs to mark off who got how many tables where. I finally felt like a for real member of the Lima UG. I met many TIers that I had only spoken to. I started spending money and the MUG conference had not officially opened. That night I met some of the really big players in the TI community. The "Gang of Four" from Tennesee including Beery Miller and Gary Cox, Don Walden from Cecure, Tim Tesch of S and T Software. That night I was sitting in Beery's room as he further refined MDOS Version 2.0, had Don Walden and James Schroeder demonstrate and explain to me the upgrades available for the Geneve - 384K Expanded Memory for a total of 917K, Programmable Flash Memory, and PFM+. I saw this stuff in action and it was pretty impressive. If you want to operate in 80 columns, have the ability to reprogram your operating systems, have a choice of which files to boot up, and other options I'm too illiterate too explain, get thee to a Geneve and fill 'er up with all the goodies you can. You still have your trusty 99/4A to play with and, should you have jumped to IBM compatability, a choice of two TI emulators to save your first love in computers from extinction.

The following day's events are like a blurr, some cosmicly shared experience in another dimension of space and time. My first observation is you can't tell TIers by looking at them or reading their resume. All shapes, sizes, and backgrounds were represented. Most vendors are avid TIers as well as business people. If you expect to get a good deal on a cartridge you never managed to get aound to buying, you're idea of a bargain and the dealers idea of a bargain are probably not in the same ballpark. Oh, there are deals to be had. These transpire in a number of scenarios. TIers who are trying to get rid of some stuff because their families are about to through them out of the house will deal. If you have a lot of money and can make bulk purchases you can deal. There were a few people with full systems to sell and would not break them up. You can find someone who wants the parts of the system you don't want and go in for the kill. Keep Micheal Milliken, junk bonds, corporate takeovers, and the whirlwind '80s in the back of you mind and you'll know how to approach your target. Keep some of your stash until the end of the day and watch the prices plummet. Call Joseph Cohen and he'll trade for something you don't want anymore. If you find something you want, try the old dollar down and a dollar a week approach. It worked for me. What was purely amazing to me was the gadgets that are still available such as the CorComp Micro Expansion System, a neat little package especially if your pressed for space. I saw a Craig Miller Original GRAM Kracker. The individual, not a vendor, wanted $100.00, maybe $125.00 for it. I don't know what it actually went for. There were Super Sketches and Mice and Joysticks and Diskettes all resonably priced. If you collect word processors, there were 6 or 7 different variations available. There were cartidges by Romox, Milton Bradley, Funware, Spinnaker, Imagic, just about all the original manufacturers were represented. There were direct parallel printer interfaces that didn't require the RS232 cards or PEB's. Plenty of original TI Program Recorders. Many books relating to TIng and computing in general. My advice is to make up a wish list for next year, start saving, and come to Lima next year. Plenty of motels to stay at. Plenty of people to shuttle you back and forth.

And don't forget the seminars. Plenty of knowledgable TIers to answer all those questions you were afraid to ask. Just to meet Barry Traver and chat for a bit was worth the ride. He approaches the TI with a perspective that is subtlely unique and throroughly modern. If you think your TI is behind the times, talk to Barry for a while. If a computer were built today that was user friendly and desirably unique, it would have many of the qualities of the 99/4A and would by named the Barry Traver Very Special Edition. The seminars overlap by a half an hour, so you'l never see and hear all that is going on. But you can get Tapes of the MUG from Charlie for fifteen dollars or cheaper if you supply you're own tapes. Send to LIMA UG, PO Box 647, Venedocia, OH 45894. Be forewarned that these are not broadcast quality tapes. There is likely to be a lot of background noise. After last year's experiment with remote microphones, it was decided to go back to the mikes at the cameras as much sound was lost on the '93 tapes. Too many buttons to push and switches to switch. 1 have received these tapes for the past three years and there is always many hours of instruction, explanation, and demonstration.

Now let's turn to what was NOT at the Conference. I must preface the following with a short editorial. That anyone even attempts to manufacture hardware or write software for

our ten year old orphans is beyond my expectations. If some products are delayed or some goals never achieved, it was not for lack of trying and the community should respect those who have tried. Bud Mills and WHT don't have all the bugs out of their SCSI project. Bud has certainly not made a lot of money on TI related stuff and has generously helped those who own a product of his, even if it was not bought from him. Sometimes he has taken what some would consider a long time to return a product for repair. I once waited three months for my return. I was glad when I got it. If I had the money I would send Bud a deposit on a SCSI device. He has apologized for the lack of a working model and offered to return his customers' money. Don't sound so shabby to me. Anytime I want to get angry I can call the manufacturer of my 486SX33 and get the runaround for weeks on end. Having said that, there seem to be some people to avoid when making a TI purchase. There is a gentleman in Canada who builds an 80 column device for the TI. I have heard him receive fire and brimstone for the way he conducts his business. I have also heard support and praise for his attempts at his projects. Bottom line is I wouldn't buy anything from him because he can't get his stuff together. I'm sorry for this failure and for those outside North America who are way past due a refund or a product. I don't care who's fault it is. It is now intolerable. If you want 80 columns, get a used AVPC, a Geneve, a used TIM, or wait and see what WHT comes up with. I would also appreciate straight talk from those involved in Asgard Peripherals. If you have left the TI market, just say it. I appreciate you having made the AMS design and schematics available to the public domain. 20 were made. There will be no more unless someone starts making them or the individual hobbyists builds one himself. If I have this wrong, let me know. Good-bye Asgard Peripherals.

It is hard on me mentally and physically. Many of the TIers at the Conference made it worth the effort. It was a pleasure to meet all these wonderful people. To meet them is as much a reason to go as to get my hands on all those little goodies. One of the "Gang of Four" helped me make copies of the Lima library disks. Thank You...If only I could remember your name. Harry Hoffman and his wife made my stay at the Motel 6 quite relaxing and very homey. Everyone there seemed to enjoy themselves and... I'm running on too much. I held back this article to see if there were any comments on Delphi. There were none. You'd think that LIMA MUG never happened. It did and I hope there is another MUG next year. You ought to go. You'll never know what your missing.