BITS, BYTES&PIXELS

LIMA 99/4A USERS GROUP



FEBRUARY 1771 SPECIAL ANCIENT

Volume 7, #2 History issue

THE 99/4 NOME COMPATER description of an antique by Charles Good Lina Dhio Weer Group

A SHORT HISTORY OF THE TI HOME COMPUTER

TI began shipping the 99/4 (copyright 1979 on the color bar title screen) in October 1979. It cost \$1150 bundled with a 13 inch color monitor (FORTUNE, December 3, 1979, p.54). Initially you had to take the monitor and could not purchase the 99/4 separately, and east purchasers had to saw close to full price. Bundling was necessary because the 19/4 console passed but TIs TV modulator initially failed to page FCC lab tests for noninterference with radio and TV breadcast reception. The modulator emitted too much RF radiation (DUSINESS WEEK, March 19, 1979, p.37). However, at that time the FCC did not regulate RF radiation from computing devices not hooked directly to TVs. So TI got around the PCC regulations by offering to the public a "complete package". It wasn't until January 1, 1981 that the FCC began tention MLL computers likely to be used in a home environment for TV/radio broadcast interference (PDPULAR COMPUTING, November 1981, p.6). Il eventually came up with a TV mudulator that maild pass FCC tests and on November 28. 1980 began selling the console and monitor separately. The console's list price was \$650 (BUSINESS WEEK, December 8, 1980, p.28). This was in one respect was actually a price increase, because the separate prices of the console and monitor were \$250 more than their previous bundled price.

II never published any sales data for the 99/4, but an independent market research firm estimated that II would well 23000 between its introduction and the end of 1980 (FORTUME, June 16, 1980, p.139). During the summer of 1981 II quietly introduced the 99/4A with a list price of \$525. By the time production of the 99/4A ceased in late 1983 or early 1984 the store price for a brand new 99/4A was \$50, and ever 1 million, perhaps several million 99/4As had been sold.

SUMMARY OF DIFFERENCES BETWEEN THE 99/4 AND 99/4A.

The most obvious differences are the keyboard, the lack of lower case letters on the "4", and the "4"s EQUATION CALCULATOR. Nost "4"s have an earphone jack on the front for private listening, but mine doesn't. I will discuss most of these obvious differences in detail. Other differences are listed in an accompanying article by Mike Wright. The 4A gets its "A" from the fact that it has a 9918A video processor, whereas the 99/4 has a 9918 video processor. The 9918A has bit map mode, which is not found on the 9918 processor. This means that any software that uses bit map mode will not run on the 99/4. Other differences between the 99/4 and 99/4A (such as the "4"s lack of an XOP assembly directive) are referenced in the index of the

Editor/Assumbler senual (p.456) under the heading "Computer differences".

In general, all software written for the "4" will run on the 4A. Some complicated routines on the 4A were required to achieve this compatibility. The "4" has 256 bytes more from memory in TI BASIC than the 4A, so some BASIC software written on a "4" may not work on an unexpanded 4A. Lots of assembly or GPL software written for the 4A will NOT work on the "4", and there is no easy way to upgrade a "4" to a 🖦. The Mini Memory module and its line by line assembler, and the E/A module and its editor and assembler work DK on the *4*. A partial list of "won't work on the 99/4" software includes TI-Writer, Multiplan, Funnelweb v4.x, the LIMES program that comes with the Mini Memory module, all the 脚iton Bradley game modules that were created to accompany the MBX system, Mord Invasion, Parsec, Story Machine, Alginer, Dragon Mix, and Word Radar. Most of these medales and the LINES program are probably incompatible because they use bit map mode. There are probably other reasons for the imcompatibility of Multiplan, TI-Writer, and Funnelweb. Even the non-editor parts of Funnelweb won't work on the "4". When you boot Funnelweb into the "4" using the extended basic codule, the title screen shows blanks where there should be lower case letters. You can then go to Funnelweb's extended basic user list, but here the "4" locks up. You can't boot any software from the XB user list.

THE KLUDGY 99/4 KEYBOARD

After playing around with my "4" for a couple of months, I am forced to agree with the statement made in an accompanying FORTUNE magazine article. The 99/4 is a real dog, mainly because of its keyboard.

There are 41 "chicklet" style keys, each slightly contoured and shaped like a narrow rectangle. The 😘 keyboard has 48 keys. Although each 99/4 key depresses separately, the keys are not what experienced users would call "full travel" There is no tactile response, no click. before the keys suddenly bottom out at the end of their downward travel. Non-alphanumeric keys include one (and only one) SHIFT, an ENTER, a SPACE bar, and a SPACE key immediately to the left of the "A" key. Alpha keys always produce upper case letters, so the SHIFT key is not used as often as it is on the 99/4A. There is are no ALPHA LOCK, FCTM. or CTRL keys on the "4". The "4"s SPACE key and bar do exactly the same thing, leave a blank space. I can see we reason at all for this space KEY, in addition to the normally positioned space bar. There are ASCII characters built into the 99/4 console that are not implemented on its limitedkeyboard, yet there is this stupid extra space key.

NEXT PASE

Touch typing on the 99/4 is difficult. The keys are spread apart the same distance as on the familiar 99/44 keyboard, so it is possible to get all your fingers at once onto the keys. But the small vertical size of the keys and their lack of tactile feel makes touch typing difficult. The small size and minimal contour of the "4"s keys makes it difficult for a touch typist to find by feel and seat his er her fingers in the center of the desired keys as the fingers move blindly around the keyboard. The fully contoured such larger keys of the 4A (larger because there is less space between keys) makes touch typing much easier. A special problem to experienced touch typists is the lack of any key to the right of the "L". This means there is no "home" key for the little finger of the right hand to touch, and this will drive most touch typists crazy. Frequently, when I try to type on my "4" I end up accidently moving my fingers over one key to the left on the home key row so that all ten fingers have something to touch. My left hand pinky finger is then on the useless SPACE key instead of on the "A" where it should be. Then I type rtow fevfw. II recognized this problem. The only application software written for the 79/A that is likely to require touch typing, the Terminal Emulator II, has a keyboard overlay with a raised area creating a fake key for the right hand's little finger.

TI provided a series of overlays specifically for war with the 99/4 and not usable with the 4A. Some overlave were mackaged with the "4" and others were available with specific command modules. Because of the narrow vertical size of each key there is enough room between rows of keys on the "4" to display a text prompt immediately above ANY key, not just above the numeric keys as is the case with the 4A. The overlays have text prompts for special keypresses, and cover the emtire "4" keyboard, with the keys sticking up through holes in the overlay. Special keypress usually involve using the SNIFT key in combination with a letter key. One overlay packaged with the "4" shows the editing keys used in DASIC. SMIFT/@=quit. SHIFT/W=begin. SHIFT/ESDX= SMIFT/R=redo. SHIFT/T=erase. SHIFT/A=aid. SHIFT/F=delete. SMIFT/G=insert. SHIFT/Z=back. SHIFT/C=clear. SMIFT/V=proceed. There is nothing intuitive about some of these keypresses (why not SHIFT/B instead of /I for back), so the overlay is really needed. Another overlay packaged with the "4" shows the split keyboard keys that can be used with some games to simulate the 8 positions of joysticks #1 and In addition to the overlays packaged with the computer. I have seen overlays designed for use with the following command modules: Terminal emulator I, Terminal emulator II, Video graphs (PHM3005), and Video Chess. There may be other overlavs I havn't seen.

One of the reasons I give the 99/4 my "read dog" rating is the uncontrollable multiple repeat of the keys on my "4"s keyboard. This makes it almost impossible to do any uneful typing, touch or hunt and peck, on my "4". Autorepeat of all keys at rate of 12 characters per second after a 1 second delay is listed as a NEW feature of the 79/46 (79ER MAGAZINE,

Vol 1 82, July/August 1981, p.48). Autoropeat is MET described in TI literature as a feature of the "4". On my "4" any of the keys are likely to repeat INSTANTLY. When you degress a "4" key, the keypress registers in the memory of the computer at a point about 1/2 way down the travel of the key. There is no tactile response that this has occured. The only thing your finger feels during a keypress is the sudden stop when the key bottoms out. If the key hovers in this "1/2 way down" region you get mamultiliplie displays of there keeey on the scrrreenon. Try as I might, I can't seem to avoid this. By "4"s keyboard is very sensitive. Other experienced 4A users who have tried my "4" all have the same Having to use backspace (SHIFT/S) and delete (SMIFT/F) after every 6-10 keystrokes gets old really fast. It has been suggested to me that this problem may be related to the ageing of my "4". The condition may not have existed when my "4" was built. One collector of TI computer products told me, "I had a 99/4 that did that. I got rid of it and replaced it with a 99/4 that still works fine."

ONLY UPPER CASE LETTERS

No keypress on the "4" keyboard will give ASCII codes 97-122, the lower case letters. Everything you type is in moper case, and this means you only use the SHIFT key in routine typing to shift the numeric keys and display 100% by 100% by

THE EDUATION CALCULATOR

When you PRESS ANY KEY TO CONTINUE from the color bar powerup screen of the "4", you get a menu with three choices. Press 1 for TI BASIC, 2 for EQUATION CALCULATOR, 3 for TITLE OF COMMAND MODULE.

The EQUATION CALCULATOR is a way of using the "4" in mathematical calculations without having to write a BASIC program to do the calculations. You can do simple arithmetic, and you can also use exponential numbers, PI, SGR, exponents, SIN, CDS, TAN, and ATN in your calculations. Everything that can be done using EQUIATION CALCULATOR can also be done using a II BASIC program, or directly from BASIC command mode.

The EQUATION CALCULATOR screen is divided into three sections. The bottom section is where you do your calculating. You can, for example, type in a simple calculation such as 1567+56.98-145+(12/98), press (enter), and display the answer. To do the same thing in DASIC command mode, you would have to type PRINT before you typed the numbers of the calculation. A single calculation is limited to 28 characters (one line of text).

You can define variables such as LENGTH=60, press the up NEXT FARME

personnelly displayed in the upper third of the EQUATION CALCULATOR screen. You can display up to 6 variable names and their current values on screen in this way and not have to worry about the display scrolling off the top of the screen. You can do the same thing in BASIC command mode by pressing (enter) after typing LENSTH=60. The value of LENSTH would be stored in the computer's memory, but it would enly remain on screen until it scrolled off the top due to subsequent entrys.

You can also define an equation such as PERIMETER=2*LEN6TH+2*MIDTH and store this equation in the middle part of the EDUATION CALCULATOR screen. You can then define the values of the variables LEN6TH and MIDTH, use the down arrow to bring the equation into the bottom work area of the EDUATION CALCULATOR screen, press (enter) and display the current value of PERIMETER. You can then redefine LENGTH and/or MIDTH, and reuse the equation to calculate the new value of PERIMETER. You can also store equations for repeated use in a BASIC program, although you cannot store such an equation in memory in BASIC command mode. In command mode you would have to retype the equation each time.

I don't think EQUATION CALCULATOR is very useful. Apparently II didn't either, because they dropped it when the 4A was released. From BASIC (a program or from command mode) you can do all the same things, and more. limitation of EQUATION CALCULATOR is the 28 character size of a formula or chain calculation. The most common routine calculating I do on my 99/4A is to balance my checkbook. I enter BASIC command mode and type PRINT, followed by my imitial bank balance, followed by all my sub**sequent** withdrawals (as minus numbers) and deposits (as positive mumbers). Before I press (enter) to display my balance I cam check the screen to see that all the numbers in the calculation are typed correctly and use INSERT or DELETE to correct mistakes. Such a long chain calculation requires several lines on the screen to display all the digits before pressing (enter). II BASIC command mode gives as 4 lines. EXTEMBED BASIC command mode gives me 5 lines. EQUATION CALCULATOR allows me only one line of digits.

CONCLUDING REMARKS

then it was released in 1979 the 99/4 was the only commoner device that could really be called a "Mome Computer". It was the first to utilize cartridge seftmere. Its speech synthesis was, and still is, unequaled. It was many to use, easy to program in BASIC, and it was powerful. Its high price was probably the major reason for its initially limited sales. Its rotten keyboard didn't help wither. I'm sure glad we now have the 99/4A. The 4A is much superior to the "4".

##DONE##

Wike Wright 45 Conterville Brive, Sales, New Managehire 03079, December 21, 1990.

Dear Charles,

The 99/4 proved to be more elusive than I had thought. For example, 99'er only put out one issue before the 4A was announced. II chose not to mention the release of the 4A in its own newsletter. The resultant material is thus a bit of a composite picture, but there is a lot of information there. I found the end piece on the 99/2 compatibility surprising, to say the least.

The end of the 97/4 was signalled by TI at the Communer Electronics Show. The following was extracted from the *99/4 Home Computer Users-Group Newsletter*, Vol 1 No. 6, August 18, 1981:

"On June 30th Texas Instruments Consumer Products Div. ammounced at the Consumer Electronics Show a revised 99/4 computer console labeled the 99/4A. Also T.I. announced another price reduction in the suggested retail price of their console at \$525.00." (Note that 99'er Magazine gives the dates of the show as May 31 through June 3, 1981)

The differences between the 99/4 and 99/4A were described in 99'er Magazine, Vol 1 No. 2, p48:

*Enter the 99/4A personal computer -- a new console that retains the same profile, speech capability, color graphics and software compatibility of its predecessor, but replaces the old 40-key calculator-style keyboard with a standard-configuration, 48-key typewriter keyboard. This, im itself, would be quite a welcome improvement; but take a closer look at the new keyboard's specifications and you'll soon discover that it really is a new keyboard and not just the recipient of some superficial cosmetic changes. Witness its impressive array of features: such niceties as both waper and lowercase; an ALPHA LOCK key (for conveniently keeping the keyboard in uppercase mode); auto repeat (with a two second time delay) on all keys; function (FCT'N) and control (CTRL) [sic] keys (for secondary functions telecommunications use); and finally, a Basic that will accept both upper and lowercase characters but displays all reserved words, variable names, and subprogram names in capitals for easy identification. How's that for versatility.

The keyboard action has an excellent "feel". Although it is still the same small size as it predecessor, touch typing on this new keyboard gives you the illusion of typing on a big office machine. It seemed quite capable of keeping up with my occasional blinding bursts of speed — something the old keyboard (and quite a few other microcomputer keyboards as well) is incapable of doing. Incidentally, I have been informed by Texas Instruments that since the circuit board has been re-designed, there's no practical way of retrofitting existing TI-97/4s with the new keyboard.

NEXT PAGE

In addition to the features I've continued above, there have been some other changes ... Ben't expect the familiar heyboard everlay to fit this new machine. Instead, it uses a two-level strip overlay mounted above the top row of beys (similar to supermarket shelf pricing strips and holders). Also, due to some ROM/GROM swaps on the new circuit board, the console now has a built-in "trap" circuit (that has to be installed in the old console through a separate factory modification) for TMS9900 assembly language debugging on the UCSB Pascal Development System...; in the process, however, the console lost its Equation Calculator mode."

The indifference of TI to the introduction of the 4A is reflected in its own newsletter "Texas Instruments Personal Computer User's Newsletter". The June 1981 issue only contains references to the 99/4 computer. Then in August 1981, on page 4, the newsletter casually refers to the "growing list of applications programs available for the TI-99/4 and TI-99/4A computers".

There is no official mention of the end of 99/4 preduction. My guess is that TI did not want to upset existing purchasers, since the 99/4 could not be upgraded to a 99/40.

The following material is taken from "TI-99/4 and TI-99/4A Personal Computer System Software, Comprehensive Specification", dated February 25, 1983. It illustrates some of the problems TI had with the original 99/4 console, and how they were fixed or affected the 99/4A:

"Section 4. TI-99/4A Keyboard Scan Routine.

4.1 Introduction.

The II-99/4A has a 48-key typewriter style keyboard. In order to support this new device and maintain compatibility with existing software, a rather complex keyboard scan routine was written. The following sections explain the various aspects of this routine.

4.2 State of the Keyboard.

The TI-99/4A keyboard has three possible states. They are:

- 1. TI-99/4 Emulator keyboard.
- 2. Pascal keyboard.
- 3. Basic keyboard.

Also, to maintain compatibility with existing software, the scan routine supports a split keyboard configuration.

The console software maintains an internal flag which determines the state of the keyboard. This flag can be controlled by any application by means of the keyboard number parameter in the GPL status block. The keyboard number parameter is in CPU RAM location 28374. The value 0 is used to scan the keyboard in whatever state it happens to be. The values 3, 4, and 5 are used to change keyboard states. The following paragraphs describe each state of the keyboard and the use of the keyboard number parameter to select that state.

4.2.1 TI-99/4 Esulator Keyboard.

The TI-TY/40 powers up with the keyboard in this state. The keyboard number is set to zero. If an application needs to return to this state from some other state, the keyboard is scanned with keyboard number set to 3. Scanning keyboard number three sets the internal state flag to "99/4 Emulator", resets the keyboard number parameter to zero, and perferos a keyboard scan in that state. Thereafter, the keyboard may be scanned with keyboard number set to 0.

In this state only 99/4 keyboard values are returned. There are three exceptions: [, \, and]. These characters were built into the 99/4 console but were not implemented on the keyboard. All other key codes are ignored and a no key condition is returned. For example, "CONTROL i", unich returns the value >B1, is not a legal 99/4 key. Therefore, the scan would return "No Key" for "CONTROL i". Another result is that in this state the keyboard is "alpha-locked" regardless of the state of the ALPHA LOCK key."

"Section 6. TI-99/4A Basic.

6.1 Functional Changes.

The following is a list of the functional differences between 99/4 Basic and 99/4A Basic:

- 1. 99/4A Basic uses the "Basic" version of the keyboard cas be described in section 4.2.3. The state of the keyboard cas be changed by CALL KEY. However, the state reverts to "Basic" whenever Basic returns to the command level, e.g. at program termination or on a breakpoint.
- 2. Both upper and lower case character definitions are initialized. Since Basic uses dynamic allocation for the "graphics" characters, this means that 99/4A Basic powers up with 256 fewer bytes of free memory than 99/4 Basic does.
- 3. Input in the edit mode or in response to a program IMPUT statement now includes an auto-repeat feature. A key which is held down for a second will begin to repeat at a rate of 12 characters per second.
 - 4. The "Equation Calculator" was removed.
- 5. Failure of an OLD command no longer necessarily destroys the program previously in memory. Since the current program may or may not be partially overwritten before the "OLD" failure, a warning message is displayed.
 - 6. The cursor was changed to a solid rectangular bax.

6.2 Bug Fixes

The following is a list of bugs in 99/4 Basic which were fixed in 99/4A Basic:

- Line numbers listed to a peripheral device are printed properly at a record boundary.
- The POS function will now find substrings beyond position 127.
 - 3. 255 byte records are now properly blank-filled.
- 4. String expressions in CALL SOUND do not crash the system.
- 5. User-defined numeric functions with string parameters will return values near zero.

NEXT PASS

- 5. Programs with breakpoints may be safely edited.
- 7. Editing a program followed by performing an imperative command will not destroy the program:
- Multi-line insertions and deletions do not garbage the margins.
 - 9. Dimension wrap-around at 65536 has been fixed.
- 6arbage collection lockup when using files has been fixed.
- Illegal long constants in INPUT, READ, etc.
 generate error messages rather than crashing system.
- 111egal uses of UDFs cause error eescages rather than destroying the program.

Section 7. 6PL Interpreter Modifications. Three known bugs in the 6PL interpreter were fixed. The bugs and the fixes are described below.

7.1 CRU IN

The CKU IN portion of the GPL I/D instruction has never worked. The interpreter uses the information provided by the GPL instruction to create the appropriate 9900 CRN instruction. The 9900 instruction is then executed in a register. Because an increment-by-two instruction was wood in place of an increment instruction, the original code was not creating a legal CRU IN instruction. Changing the increment-by-two to an increment fixed this bug.

7.2 CASE

The GPL CASE instruction has caused problems in more application programs. The problem is one of timing. The wriginal code repeatedly performs two successive GROW reads with no time delay between them. Therefore, some bROWS which pass virtually every other test may fail to execute a particular CASE statement because of this timing problem. To fix this problem, a NOP was added between the GROW reads.

7.3 FETCH

The original GPL FETCH instruction would not fetch data into VDP RAM. The source of this problem was a register conflict. A register containing certain flags was being used to save another value during execution of the FETCH instruction. This bug was fixed by using a free register to save the necessary value during FETCH execution."

"Section 7. Other Modifications.

7.1 BREAK Key Routine.

One of the major problems in converting from the 99/4 keyboard to the 99/4A keyboard was the location of the Besic "BREAK" key. On the 99/4 "Shift-C" was used both as the Besic "BREAK" key and the RS232 "ABORT" key. Unfortunately the Besic interpreter, Extended Besic interpreter, and RE232 directly scan the keyboard lines to check for this key. The problem arises from the fact that "Function-4", instead of "Shift-C", is the "BREAK" key on the 99/4A. Therefore, some rearranging had to be done on the 99/4A keyboard to insure that "Function-4" was located in the keyboard matrix at the same position as "Shift-C" on the 99/4 keyboard.

Fo avoid this problem in the future, a "Check for BMEAK key" routine was added to the console software. This routine is executed via a BL 0>20 instruction. This routine only modifies the value of register 12. If the BREAK key is down, it returns to the caller with the equal bit set. Otherwise it returns with the equal bit reset. All future software which needs to check for this key must use this routine rather than testing keyboard lines directly.

9.2 ROM-Only Applications.

For the 99/4 every SSS command module application had to have at least one 6ROM. The system power up code only searched the 6ROMs for applications programs. The II-99/4A ham the additional capability of executing ROM-only applications. The power up code now checks CPU memory location >6000 (usually referred to as ROM-in-6ROM) for a valid ROM/6ROM header. It then searches the linked list of user programs (if any) indicated by that header. These user programs are added to the applications selection list. Some 79/4As have this capability; others do not.

9.3 New Character Definitions.

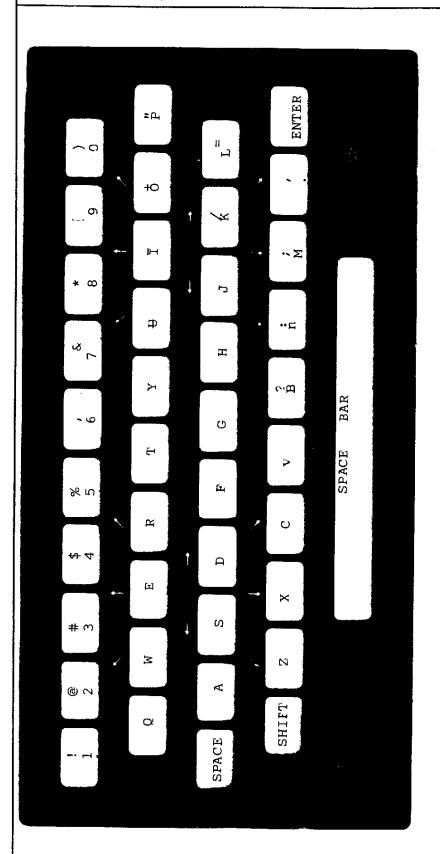
The 99/4A keyboard has the capability of generating the full Ascii character from 0 to >7F. To further enhance this capability, definitions for the complete Ascii printable character set were added to the console. The previous 5x6 uppercase character set was increased in size to 5x7 and lowercase definitions were added. Due to software compatibility issues the console will still power up with the 6x8 uppercase character set and the character loading routines are as follows:

- 1. Console routine >16 loads the 6x8 character set which includes characters >20 through >5F.
- 2. Console routine >18 loads the 5x7 uppercase character set which includes characters >20 through >5F.
- Console routine >4A loads the 5x7 lowercase character set which includes characters >60 through >7E.

These routines are executed by storing the starting VBP RAM address in CPU RAM location >834A and performing a BPL CALL instruction to the appropriate routine."

"Appendix B. Compatibility.

In general there will be no designated compatibility between the TI-99/4 and any previous computers. There is no compatibility with products of Texas Instruments calculator line. The Basic language is very similar to other microcomputer Basics, however, nost programs will need some changes to run on the 99/4. Any programs which use the graphics capabilities of other computers will need to be totally rewritten to run on the 99/4. The memory format of a Basic program is unique as are most personal computers. The image which is recorded to mass-storage in SAVE command is this memory image which limits the capability of transporting



Basic programs to other computers even if they could read our mass storage media.

Peripheral devices for the 99/4 including the Mini-floppy Disk and RS-232 Interface will not work on any other personal computer. Peripherals from other computers will not work on the 99/4 except for those with RS-232 interfaces which can be attached to our RS-232 peripheral. The media or other mass storage peripheral (audio tape or disk) will not be transferable to the 99/4.

The TI-99/2 Basic program cassette tapes are compatible with the 99/4, but the 99/2 is not compatible with 99/4A Solid-State Software, or vice-versa."

DONE

THE 99/4 KEYBOARB

To the left is a natural size xerox copy of the 99/4 split key keyboard The arrows indicate the keypresses that can be used with some pames to simulate the action of joystick #1 and joystick #2. The 99/4's keys would stick up through the holes in the overlay, and the alphanumeric designation of the keys is indicated in the illustration. The keys are actually somewhat smaller than would appear from the holes in this illustration because the keys have to be inside the holes. Mote the SPACE key to the left of the A. and the lack of any key to the L. The ENTER and SHIFT keys are colored red. All other keys are colored black.

DONE

SELLING THE 99/4 AND THE 99/7

Ever hear of the TI-99/7? Probably not. It is discussed in the following article by Bro Uttal, originally published in the June 16 1980 issue of FURTUNE magazine. The article's discussion of TI's marketing strategy for the 99/4 could very well have been written 3 1/2 years later as a discussion of TI's marketing blunders with the 99/4A.

John V Roach. executive vice president of Radio Shack, the leading producer of personal computers, says he doesn't like to knock the competition. But at a recent brokerage house seminar on electronic technologies, the genial Texan Just couldn't restrain himself. Having stepped to the podium, Roach pointed to a demonstration model of Texas Instruments' new home computer, the 99/4. "I'm sure glad somebody brought a TI computer here today," he deadpanned. "it's only the second one I've seen — and the first was when they launched it at the consumer electronics show last June." Roach's wisecrack brought down the house.

The butt of the gibe is TI's first entry into a market that could become the consumer electronics bonanza of the Eighties. Less than five years old, the personal computer business should rack up world wide sales of over \$650 million this year. By 1984 it could top \$3.5 billion, more than the combined value of all the digital watches, stereos, and video recorders sold in the U.S. in 1979. Scores of companies have launched personal computers to stake their claims on this new Golconda.

A BUNGLED OPPORTUNITY:

But the innovative giant of consumer electronics was slow to move, and when it finally did, it chose a wrong-headed marketing strategy and a product that relatively few people seem to want. "Basically, the 99/4 is a dog," says a disgruntled distributor, "and II has no concept of how to sell it. When I asked a TI exec why anyone should buy it, he couldn't say." The company has dropped about \$20 million trying to crack the market, says a former executive, and it has bungled a major opportunity for growth.

II refuses to talk about the 99/4, but the problems are obvious. It started shipping last October (of 1979) and by the end of this year had expected to sell at least 50000, worth roughly \$35 million at wholesale. But Dataquest, a market-research firm, now estimates that TI will ship less than half that number. New England Electronics Ce., one of the top ten personal computer distributors in the country, has quit carrying the machine; it is trying to help its dealers by shifting 99/4's from the many stores where they are gathering dust to the few that have found a way to move them.

Although some of TI's troubles can be laid to start up problems, the debacte raises fundamental questions about the company's strategy. Unlike most of its rivals, TI is concentrating on selling to the ordinary consumer, who would ultimately produce a much bigger market than computer hobbyists, engineers, small businessmen, and professionals.

To appeal to Mr. end Mrs. America, the company designed the 99/4 to be the least threatening of computers, with a full color TV screen, programs that simply snap into the keyboard comsole, and a speech-synthesis chip that enables it to "talk." this friendly machine is supposed to help its owner play games, educate children, and manage household finances.

HOW APPLE GOT BITTEN

Almost everybody else in the industry feels that the consumer market is coming - but will take four or five years to develop. The leading companies - Radin Shack, Apple Computer, and Commodore - have turned instead toward the businessman and professional. "TI is making the same mistake we made three years ago," says Steve Jobs, the 25 year old vice chairman of Apple. "The market now is for machines that can solve serious problems, and to do that, you need alot more than the 99/4 offers." John Antonchick, who follows the industry for Creative Strategies International, a market research firm, estimates that the home market is only one-eighth the size of the business professional hombyist segment and will grow less than half as fast for the next few years.

II figured that consumers would be willing to pay a premium for the TI name, but the price of the 99/4 - now \$1400 - seems much too high. Those few competitors who are trying to penetrate the home market have kept prices well below \$1000. Their machines are less versatile than TI's but they feel the consumer simply will not pay for the extra functions TI is offering. Roach of Radio shack observes, "When the computer does become a mass market appliance item, it is very unlikely that it will sell for more than \$500."

In its single minded quest for the consumer, TI has managed to exclude itself from the business and professional market. It designed the system in a way that makes it difficult for small, independent companies to write programs or make peripheral gear that can be used with the 99/4. These creative suppliers have helped others in the industry grow by providing software and peripheral equipment needed to serve specialized markets such as dentists' offices. Conrad Jutson, who left TI's personal-computer group to help Atari get into both home and professional markets, notes: "What the leading edge consumer needs is a lot of software; without it, the computer is just so much old iron." when Atari introduces its new software this year, he says, most of it will come from third party suppliers.

So, it seems, TI has produced a machine too costly for the mass market and too limited for the sophisticated user. It has ended up, as a distributor says, "offering less product for more money — the opposite of TI's usual strategy." This outcome can be traced to the way the machine was developed. From the start, the product lacked focus. It began as a video game, changed into a primitive home computer, and, after surviving the ministrations of three successive program managers, emerged as a hybrid.

HEROES CAN BE EXPENSIVE

TI's top managers loved to dabble with the library of

programs being developed for the new machine. "some of them saw in the 97/4 their private electronic fantasies," recalls an engineer who worked on the project. Another veteran links the hazy focus to TI's famed management system, which sets aside special funds for engineers to develop their own ideas. "An engineer comes along with a bright idea," he says, "and before anybody on the operating side knows what's happening, he's been finded, he's off and charging, and he's a hero. It works half the time. But half the time, you end up pouring an awful lot of money down the drain before somebody says, 'Whoa! There's no marketplace.'"

Ironically, II killed two other computers that bid fair to do better than the 99/4. The first, a "professional" model aimed at scientists and engineers, would have gone head to head with the HP83, one of Hewlett-Packard's nottest new products. But since II's operating executives are required to meet tight development budgets, the consumer products group bled funds from the professional model to speed up introduction of the 99/4 when it had fallen behind scheldule.

The high end of the line was supposed to have been the 99/7. According to managers who worked on that system, its specifications, software, and price — about \$5000 — would have made it a strong contender in the business and professional market. Moore Business Forms Inc., the leader of its industry, apparently agreed: it created a Texas division to sell the 99/7. Distributors of personal computers were so impressed with the 99/7 that some of them took on the 99/4 against their better judgement just to get the more sophisticated machine.

LEFT WITH THE LIMP OF COAL

Internal competition ultimately put the kibosh on the 99/7. II's digital systems group, which is based in Austin and sells minicomputers to small businesses, argued that it should control development of the 99/7 because the machine was designed for small businesses. Besides, the 99/7 was so powerful and inexpensive that it would have cannibalized the low end of the minicomputer line. The squabble went all the way up to top management, which decided at the last minute to cancel the 99/7 introduction and transfer the project to Austin. There, the "not invented here" syndrome took over. Austin engineers started questioning the new product's technical and economic feasibility, and within six months, most of the project staff had left for other iobs in TI. Looking back on all this, an allumnus concludes, "They threw away the two pieces of gold and kept the lump of coal."

Nobody doubts that someday, in some way, II will be a major factor in the personal computer market. The questions are when and how. Siven the disappointing results to date and the slow evolution of the mass market, II might well decide to ease off on the business for several years. That would leave competitors laughing and dealers growning - but it would give II time to develop a coherent strategy.

FORTUNE, June 16, 1980, pages 139-140

DONE

************************** × BITS, BYTES & PIXELS * Published by Lima OH 99/4A User Group Material contained herein may be copied by any user group as long as credit DV80 files of # is given. most articles in BB&P can * be obtained by sending a disk and return postage. ADDRESS-P.O. Box 647 Venedocia Ohio 45894 Published monthly except July and August GROUP OFFICERS President-Joann Szippl 419-228-7109 Vice Pres-Susan Cummings 419-738-3770 * Treasurer-Leonard Cummings* 419-738-3770 Newsletter editor and Librarian-Charles Good 419-667-3131 * ******************

OPPS HE SOUFED

On page 1 of the January 1991 BB&P we published the source code of an assembly routine written by Bruce Harrison. The II-Writer formatter caused the "E" (the "at" character) to be DELETED FROM THE BEGINNING OF THE OPERAND FIELD in some of the lines of code. You can identify the incorrect lines of code in the published listing by noting that the operand of each incorrect line is printed in double strike (extra dark) and the comment is moved one space to the left, compared to the rest of the comments. We hope this error has not caused anyone any problems.

DGNC