FACTS AND FIGURES ABOUT THE *Bally* PROFESSIONAL ARCADE AND COMPUTER ADD-ON

about our new computer

The big question that just about everybody asks is "Why so cheap? How can a home computer with so much power cost so little while the other units on the market cost so much?"

The answer lies in a phenomenon that is unique to computers and that Bally recognized early. Integrated circuits generally represent only about 10% of the cost of most home computers. The bulk of the other costs are in software—the cost of man hours or man years required to program the computer to make it easy to operate and useful for different applications. In fact, more than 50% of the cost of a computer is the software that went into it and not the hardware, as is the case with most other products.

If half the cost of a home computer is the cost of software, it is usually based on the sale of a few thousand units. If sales are doubled, then software represents 25% of the cost and the rest is reflected in profit. So the more units sold, the less the actual cost of software per unit to the manufacturer. Unlike mass production cost savings, there's always a basic cost of materials to consider no matter how much is produced, but not so with software. Produce twice as much and your costs are halved.

So Bally's strategy was to produce a home computer in three steps, the first step containing practically all the software in the form of a TV game that would appeal to a mass consumer audience that will be expandable into a home computer. Second, with an additional purchase of our Bally Basic Cassette, the calculator keypad is transformed into an alpha-numeric keypad which enables you to write programs up to 1800 characters. We feel this to be the best way to familiarize the public with programming in the BASIC language. The third step will be the purchase of our keyboard add-on which will contain the complementary components to increase the unit's power into a complete home or business computer.

The TV game can be sold in huge quantities to a mass audience and thus the cost of the software per unit is very low. By also designing the TV game for an expansion module, the total cost of the entire package is also very low. The end result is the highest quality TV game on the market with the quality standards and total memory power of a home computer plus the ability to expand the TV game into a home computer with software and hardware supplied by Bally.

This rare combination means that a very extensive software package represents as little as 5% of the total cost of the unit, and the integrated circuits represent over 30% of the cost.

The results provide a unique opportunity to buy a product that is not only the lowest priced system available, but is also the best — and fully expandable through additional inexpensive modules. Your unit will keep step with advancing technology.

In the comparison sheet located in the center of this book, we have listed our personal computer with part of the add-on module. The video display or digital cassette deck is not included in order to make a fair comparison with the other units.

Software

Software is basically two things. First, it is the resident instructions, operating system, and program languages that tell the computer how to function. Second, it includes instructions or programs that are given the computer by its operator.

All units, except the Fairchild, are designed to read and write BASIC programs. Programs written in BASIC are distributed by computer manufacturers, computer magazines, and individuals.

Bally is the only computer manufacturer offering their own programming language in addition to BASIC. This language is a special version of a graphic symbiosis system developed by Dr. Tom Defanti of the University of Illinois.

Dr. Defanti's language was designed specifically for computer graphics and allows people to create and animate pictures easily. This language has been used on large computers in developing computer simulations for education and special effects for *Star Wars* and other films.

Bally engineers have designed Z GRASS, a special version of Dr. Defanti's language, that makes this the only computer easy to use and program.

With Z GRASS the joysticks draw and move pictures on the TV screen. These simple programming steps will expand, and soon you will be able to create your own video games like Pong and Tank with a few hours practice. This self-teaching system supplied with our personal computer gives you the option to create more advanced programs such as stock analysis or music composition.

Hardware

In order of computational power, the microprocessors used in the systems shown on pages 8 and 9 include the LSI-11, Z80, 8080, 6505, 6502, and F8. This is essentially a price/performance trade-off with the Z80 offering more data manipulation capability than any other unit except the Heath H11.

Computer random access memory (RAM) determines the length and complexity of the programs that can be run. Large RAM capacity means flexibility and versatility. Read only memory (ROM) is essentially a fixed list of instructions. The size of the ROM determines how many things a computer can do, and ROM cassettes allow the user to change the programming by plugging in new instructions. Standard audio cassettes are used to store and retrieve programs. The speed in bits per second (BPS) indicates how quickly programs can be changed.

Inputs are the things you use to control your computer. Joysticks move and position images on the screen. Dials enter analog or variable information like a volume control. The calculator keypad lets you select a program or operate your computer as a calculator, and the typewriter keyboard lets you talk directly to the computer and write your own programs.

Video is the output to the TV or monitor. The number of typewriter-like characters that can be shown on the screen indicates the amount of written material the user can see at one time. Graphic resolution determines the amount of detail in the pictures drawn by the computer.

Audio output is usually limited to "beep" sound effects. This is the only computer with a complete sound synthesizer and outputs for any stereophonic music system. The user can program a sonic environment for a game simulation or a musical performance.

Expansion capabilities are not shown in the comparison chart. The SOL, for example, can be expanded to include the same memory capacity (RAM and ROM) and input flexibility (joysticks and dials) as our unit. This expansion hardware alone would cost over $1,000 and would require custom software development. Even with this extension, the SOL does not have color graphics capability.

No other unit in this comparison can be modified to match the input flexibility, computational power and output graphic capability of the Bally personal computer.

Additional Cassettes

○ Speed Math and Bingo Math

○ 280-Zzzap and Dodgem

○ Baseball, Tennis, Handball and Hockey

○ Panzer Attack and Red Baron

○ Sea Wolf and Bombardier

○ Black-Jack, Poker and Acey Ducey

○ Bally Basic

○ Letter Match, Spell N' Score, Crosswords

○ Tic-Tac-Toe and Amazing Maze

○ Star Battle

○ Football

○ Brickyard and Clowns

Hardware Comparison Chart

		Bally	Pet	ECD
MICROPROCESSOR		Z80	6502	6505
MEMORY	RAM(Scratchpad)	8K	8K	4K
	ROM(Resident)	24K	14K	4K
	ROM(Cassette)	24K		
	Std. Cassette Recorder	●	●	●
	BPS	300 to 1200	1200	3200
INPUTS	Typewriter Keyboard	●	●	●
	Calculator Keypad	●	●	
	Dial	4		
	Joystick	4		
VIDEO	Display(Characters)	640	1000	5120
	Text Display(Capacity)	40x16	40x25	128x40
	Graphics Resolution	16,320	128,000	19,200
	Graphics Configuration	160x102	320x400	120x160
	Video Display(B&W)	●	●	●
	(Color)	●		
	No. of Colors Avail.	256		
	Standard TV	●		
AUDIO	Output(Channels)	2		
	Music Synthesizer(Voices)	6		
	Suggested Retail	$800-$900	$795.00	$990
PRICE	Not included in Price	TV		

As a means of comparison, the Bally unit described above includes the add-on module without the digital or audio cassette decks.

Apple II	Heath H11	Heath H8	Sol	Radio Shack	Fairchild
6502	LSI-11	8080	8080	Z80	F8
8K	8K	8K	2K	4K	2K
8K	1K	1K		4K	2K
			4K		2K
●	●	●	●	●	
1500	1200	1200	300 to 1200	500	
●	●	●	●	●	
			●		●
2					
					2
960	960	960	1024	1024	
40x24	80x12	80x12	64x16	64x16	
1920			1024	6144	4096
40x48			64x16	128x48	64x64
●	●	●	●	●	●
●					●
16					16
●					●
1					1
1					1
$1195	$2508	$1472.50	$1295	$600	$149.95
TV			Monitor		

● Indicates capability

Questions and Answers

BASIC UNIT

Q. Is the keypad on the basic unit typewriter style with numbers and letters?

A. No. The keypad consists strictly of numbers and the few controls required to utilize the full array of cartridges.

Q. How does the cartridge system work?

A. Simply slip in a cartridge in the slot at the center of the unit, and program which part of the cartridge you wish to use. Your TV set will then indicate the start of the program.

Q. Do I need a special cartridge to use the electronic calculator with ten memories?

A. No. The unit will operate without any additional cartridge, although for sophisticated scientific or statistical calculations a cassette will be available.

Q. Does the unit use batteries?

A. No. An AC adapter plug is provided free with the unit.

Q. Is the only display used for the basic unit the TV screen?

A. Yes. No other display is necessary.

Q. Can you record programs on a cartridge with the basic unit?

A. No. The basic unit accepts pre-programmed cartridges.

Q. How much computer power is in the basic unit?

A. There are 4K RAM and 8K ROM supplied with the basic unit. The microprocessor used is the Z80.

Q. Is the unit equipped so it will accept future add-on modules?

A. All future add-on modules can be plugged into the basic unit.

Q. What channel does your TV have to be tuned to when you're using your system?

A. Channels 3 or 4.

Q. What is the cost of a system equivalent to the memory in the Bally?

A. The lowest priced unit with as much memory that we have been able to find is the $1295 Apple Computer which also includes a keyboard for programming. A model produced by Radio Shack costs $599 and comes with only 4K ROM and 4K RAM and includes keyboard and display screen. A price comparison sheet is also included with this report.

Q. What is located at the top of the unit?

A. A storage compartment for your library of cassette cartridges is at the top of the unit. It will hold up to 15 cartridges.

Q. Does the unit have built-in games?

A. Yes. The basic unit comes with Gunfight and Checkmate, two arcade games, Scribbling, an intriguing artform feature, and a 5-function, 10 memory, printing calculator.

Q. Will the basic unit accept blank cassettes?

A. No.

ADD-ON MODULE

Q. What will the keyboard be like on the add-on module?

A. It will be an ASCII keyboard—a high quality, full-spaced, 3/4″ key-separated, floating-key keyboard similar to the high quality keyboards found on other computer terminals.

Q. Can you record data with the basic module?

A. Yes. Bally has developed an audio interface and coupled with Bally Basic and an inexpensive audio tape player, you can store your program.

Q. What is the language of the computer?

A. Z-grass Basic.

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BUSINESS APPLICATIONS

Q. Can I use your unit in my business?

A. Yes.   At first only as a calculator, but with the add-on module and various other software packages, one unit will make an excellent business system.

Q. I know very little about computers. Will I be able to use my computer for such things as payroll and bookkeeping without having to learn programming?

A. Yes.   The two factors that you have to be concerned with in any computer are its memory and its software. Your Bally personal computer will be capable of accepting standard business cartridges and additional add-on modules which can handle your requirements.

Q. I need a printer in my business—something to make hard copies. Will Bally be making a printer that can do this?

A. Yes.   Everything from a high-speed printer to a slower speed plain paper matrix printer. These printers will be adaptable to the add-on module by just plugging them in.

Q. What are the specific software packages that will be available for business applications?

A. There will be accounting and payroll, basic inventory control and text editing plus any other application you wish to personally program yourself.

Q. When using my Bally as a telephone dialer, how many numbers can I store and recall?

A. More numbers than you are likely to ever call in five years. The unit can store thousands of numbers.

TECHNICAL QUESTIONS

Q. What is the speed of the cassette tape storage offered?

A. 4,800 baud.

Q. What is the compatability of telephone modems to existing professional equipment?

A. The Bally will use a 300 baud acoustically-coupled modem which will be compatable.

Q. Will the ASCII keyboard have insert and delete functions?

A. Yes. It will also have upper and lower case and a special 8th bit function for text editing higher level languages such as APL. The basic unit's numerical keyboard can also be used.

Q. Is it possible to interface the computer with an IBM typewriter?

A. Yes. And such options will also be available along with a word processing program.

Q. What software is included in the internal library of tasks?

A. All the interfacing subroutine primitives required to drive all graphics functions are included.

Q. Will the basic programming package offer video graphics capability?

A. Yes. A complete video graphics package will be incorporated in the BASIC which includes all image and color handlers. In addition, there will be a complete software sound package to take advantage of the unique sound features of the machine.

Q. What is the baud rate of the magnetic storage?

A. The audio tape decks will have 300-1200 BPS, and the digital tape decks will have 6400.

Q. Will modem operation as an intelligent terminal be feasible?

A. Yes. An acoustical-coupler will be offered for computer link-ups.

Q. How many characters can be displayed on my home TV set?

A. 40 characters per line with 16 lines of text. Each digit or letter is a 7x9 dot matrix with a software redefinable character set.

Q. What is the maximum core size?

A. The total memory capacity is 56K bytes distributed as, 8K of RAM, 24K of resident ROM, and 24K bytes of cartridge ROM.

Q. Can I expand the RAM of the add-on module?

A. Yes. Via RAM insertion you can expand to 16K of RAM.

Q. Is the computer interrupt driven?

A. There are three modes of interrupt described by the fundamental Z80 microprocessor used.

Q. Is programming in machine language possible?

A. Yes. For experimentation by beginners, you can use the basic unit with the numeric keypad and without the add-on module to program the system in machine language. For the more advanced user, a macroassembler used in conjunction with the add-on module gives full assembly level language capability. For high level interpretive language, you can use the self-contained 12K ROM basic.

Q. Is the power supply adequate to handle the peripherals?

A. No. Each peripheral will have its own self-contained power supply.

Q. Can the unit be expanded to accept floppy disk or bubble memory storage accessories?

A. Yes.

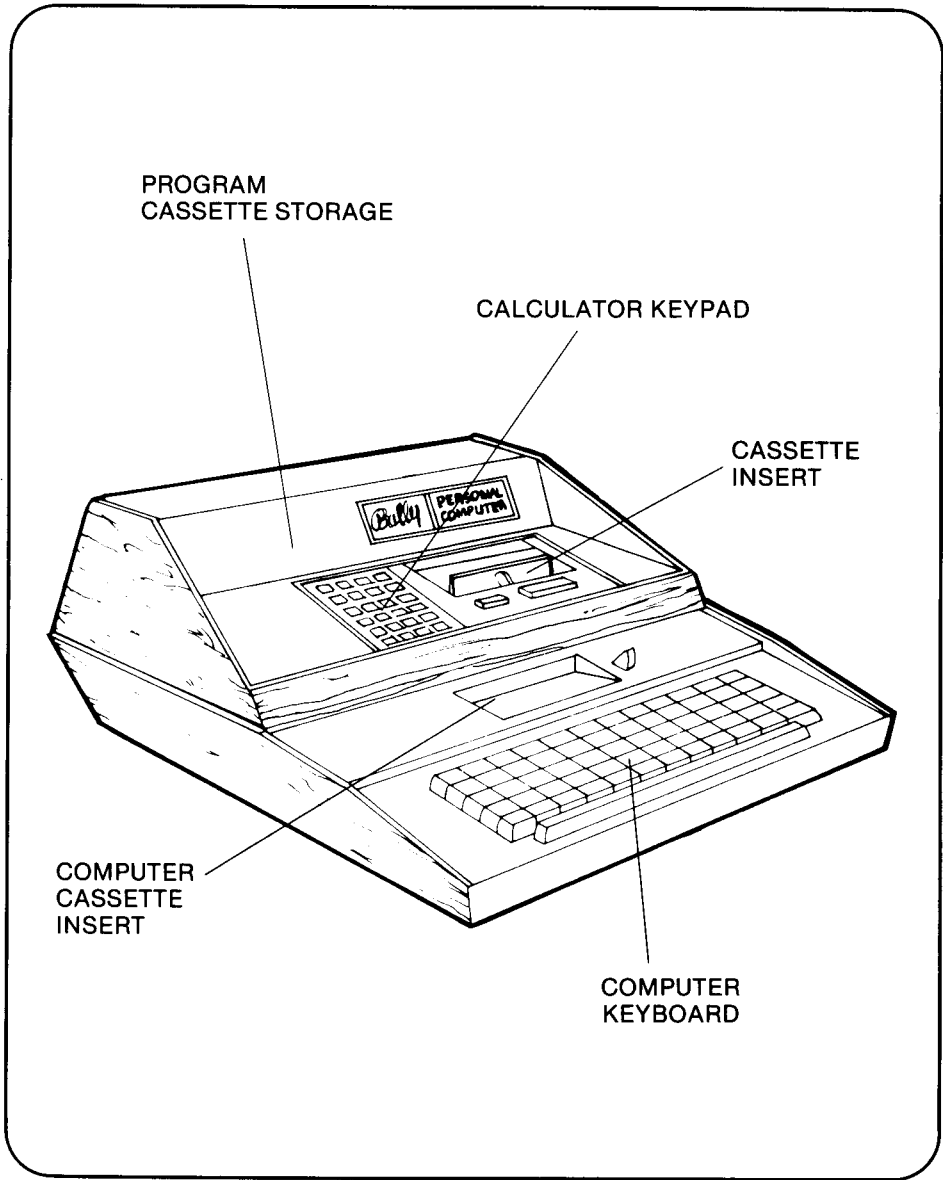Q. What clock rate does the Z80 run at?

A. 1.8 MHz.

Q. What type of interface bus structure is specified?

A. RS232 serial and a custom DNB parallel bus will be specified.

Q. Are there any plans to add a floppy disk later?

A. Yes. Provisions will be on the add-on module to add a floppy disk.

PROGRAM
CASSETTE STORAGE

CALCULATOR KEYPAD

CASSETTE
INSERT

COMPUTER
CASSETTE
INSERT

COMPUTER
KEYBOARD

Shown above is the basic module of the personal computer connected to the add-on module. Not shown is either the digital or audio cassette decks which are separate accessories.