



# ACT Apricot Executive Microcomputer

## ■ PROFILE

**Operating Systems** • MS-DOS 2.0 from Microsoft; CP/M-86 and Concurrent CP/M-86 from Digital Research.

**Data Management** • available through third-party vendors.

**Communications/Networks** • asynchronous communications package.

**Languages** • MS-BASIC, Personal BASIC.

**Models** • Apricot Personal Computer.

**CPU** • 16-bit Intel 8086.

**Memory** • 256K bytes of RAM expandable to 768K bytes.

**Chassis Slots** • 2 open slots.

**Ports** • 1 RS-232C port, 1 Centronics-type parallel printer port.

**Mass Storage** • 315K bytes to 630K bytes of diskette storage on 3.5-inch drives.

**Terminals/Workstations** • single-user system.

**Printers** • none available from the vendor.

**First Delivery** • October 1983 in U.K.; April 1984 in U.S.

**Systems Delivered** • approximately 10,000 in the U.K.

**Comparable Systems** • 16-bit single-user desktop systems in the \$3,000 to \$5,000 price range supporting all standard operating systems.

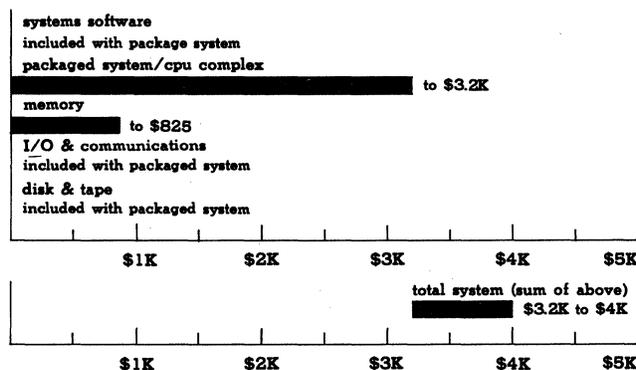
**Vendor** • ACT (North America) Inc; 3375 Scott Boulevard, Suite 366, Santa Clara, CA 95051 • 408-727-8090.

**Canada** • currently no Canadian distributors.

**Distribution** • through computer retailers and OEMs in the U.S.



## PURCHASE PRICE RANGE hardware & software



**APRICOT PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing, and open bars reflecting 5-year service/maintenance fees associated with large system • **SMALL SYSTEM** is based on **Apricot packaged system** (includes CPU, 256K-byte RAM, dual 3.5K-byte disk drives, monitor, keyboard, RS-232C interface, parallel printer port, 2 expansion slots, MS-DOS 2.0 with GSX graphics extension, CP/M-86, Concurrent CP/M, BASIC Interpreter, Personal BASIC, asynchronous communications package, SuperCalc and SuperPlanner) • **LARGE SYSTEM** is based on Apricot packaged system (includes the same package as the small system) and the following options: additional 256K-byte RAM board.

and Canada.

## ■ ANALYSIS

ACT (North America) Inc is the U.S. subsidiary of Applied Computer Techniques (ACT), Great Britain's largest microcomputer company. The North American operation was established to negotiate OEM and distribution contracts in the U.S. and Canada for ACT's new business microcomputer, the Apricot. ACT introduced the system in the U.K. in September 1983 and brought it to North America in April 1984.

In addition to the Apricot, ACT, in Europe, distributes and supports the Sirius 1 microcomputer which is based on the U.S.-made Victor Technologies 9000. While the Victor 9000 has had problems selling in the U.S., in Europe, as the Sirius 1, it is a best seller. ACT also has a software division, Pulsar, which offers over 1,000 in-house and third-party packages for the Apricot, Sirius 1, and other leading 16-bit personal computers in Europe.

ACT bills the Apricot as a fourth-generation system that is easy to use. The Apricot sports the latest technology with its 2-line Microscreen imbedded in the keyboard, with its use of 3.5-inch microfloppy disk drives, with its MS-DOS shell for ease of use, with its transportability, and with its IBM PC ROM emulator for providing IBM software compatibility. It



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is a sleek, well-designed, attractive unit that meets all ergonomic standards.

How much of an impact the Apricot will make in the U.S. marketplace is yet to be determined. Reviews of the system so far have all been very positive—but that doesn't mean the system will sell. That will depend on whether users want a better alternative to the IBM PC.

### □ Strengths

The Apricot was designed with user needs in mind. It is a desktop unit that can be transported with no problem, offers users access to IBM PC software, provides an outstanding keyboard and excellent display capabilities, and uses 3.5-inch microfloppy drives which are more reliable and faster than the 5.25-inch floppies. It provides a shell for MS-DOS, making the system easier to use, and is loaded with Help commands. The Apricot is a better alternative to the IBM PC and, refreshingly, it is not a clone.

### □ Limitations

Every system has some type of shortcoming and the Apricot is no exception. The system presently lacks a hard disk capability and has a shortage of expansion slots (only 2). ACT claims it is addressing both of these issues and will be offering hard disk versions and an external card cage in the near future. Downloading IBM PC software to the Apricot is an inconvenience and can also pose some technical problems. There are technical considerations that could prevent software ported over communications lines from running successfully. For example, programs that have hidden files cannot be downloaded over a modem. ACT isn't too worried about the downloading problem, however, since they are negotiating with major vendors to convert their software to the 3.5-inch format.

Not to criticize ACT on their choice of names, but Apricot is misleading. It makes one think of an Apple-compatible machine rather than the unique product that it is.

## ■ SOFTWARE

### □ Terms & Support

**Terms** • all listed software is bundled with the system except for CP/M-86, Concurrent CP/M, and Personal BASIC; these are free, via a voucher, for those who want them.

**Support** • information not available at this time.

### □ Software Overview

The Apricot runs under MS-DOS 2.0, CP/M-86 and Concurrent CP/M. Other software bundled with the system includes SORCIM's SuperCalc electronic spreadsheet and SuperPlanner executive calendar, Microsoft BASIC, an asynchronous communications facility, and an IBM PC emulator for running IBM PC-compatible software. Personal BASIC from Digital Research is also free for those who want it.

ACT claims over 1,000 software packages, developed by major software vendors and by ACT itself, are currently available for the Apricot. They further claim the Apricot is compatible with the Victor 9000 and can run 95 percent of all IBM PC software using the built-in emulator.

Under MS-DOS, users can interact with the system via the Manager. The Manager is an MS-DOS shell that eliminates the need for users to learn operating system commands. When the Apricot is first turned on, it presents its menus as "Ladders." The

Ladders consist of several options which are displayed in blocks up the left hand side of the screen. A user selects an option by moving the cursor to the desired selection and pressing the RETURN key. This will cause a program to execute or may lead to another Ladder. It is upon this Ladder concept that the Manager is based.

To run IBM PC programs on the Apricot, the program must be downloaded to the Apricot where it is run through the Manager utility which automatically activates the IBM PC emulator. The PC emulator mimics the IBM ROM BIOS and is completely transparent to the IBM software and the user. When the program finishes and the Manager takes over again, the emulator is released and Apricot software runs as normal.

### □ Operating Systems

**MS-DOS 2.00** • single-user, interactive and batch processing operating system with UNIX-like hierarchical directories, piping functions, filters, and hard disk support: equivalent to IBM PC-DOS 2.0 • supports up to 180K bytes in up to 64 different files in single-sided format and up to 360K bytes in up to 112 files double sided, and 5M or 10M bytes with thousands of filenames on hard disk; handles records from 1 to 65,535 bytes long in file transfer, executes external (disk based) commands giving the user ability to expand the DOS vocabulary to limits of disk space • batch processing capabilities with automatic execution on power-up, user commands include: DATE, TIME, COPY, ECHO, PATH, MKDIR, RMDIR, CHDIR, TREE, RECOVER, GRAPHICS, BREAK, and CTTY • additions over DOS 1.25 in performance include hierarchical directories to facilitate hard disk use, numerous performance enhancements, redirection of input/output (I/O), piping of functions (sequentially rather than concurrently as in UNIX), higher sector density per track (9 sectors per track vs 8 in DOS 1.25), and installable device drivers • MS-DOS is divided into four parts: a device independent I/O handler, an I/O processor, reference and jump vectors in low memory, and a command processor; the device independent I/O handler on hidden file MSDOS.SYS is the core of MS-DOS through which I/O must be directed; the I/O processor physically moves data and instructions by means of hidden files IO.SYS as commanded by MSDOS.SYS; the command processor, using the COMMAND.COM program, is responsible for interface between user and MS-DOS, error trapping, batch file processing, interpreting user commands and executing file names • MS-DOS 2.00 will read earlier MS-DOS diskettes; there are several unique system interrupt calls and file descriptors that make programs utilizing these features nontransportable between MS-DOS 2.00 and earlier versions • an editor and other utilities are provided • bundled with the system.

**CP/M-86** • a 16-bit enhanced version of the 8-bit CP/M operating system designed to support the Intel 8086 or 8088 microprocessors; incorporates all the basic elements of the CP/M system but adapts these functions to the larger and faster operating environment • consists of 4 elemental structures: Basic Input/Output System (BIOS), Basic Disk Operating System (BDOS), Command Console Processor (CCP), and a Transient Program Area (TPA) • BIOS is the modifiable portion of the operating system enabling users to tailor CP/M systems to meet specific configurations; allows users to define all hardware-independent elements of the system by defining low-level interface and the peripheral I/O for the system • BDOS provides all the disk management control; supports up to 16 logical drives containing up to 8M bytes each, for a maximum of 128M bytes of online storage; any one file can reach the full drive size • CCP provides the interface between the user's console and the rest of the CP/M system; it reads, interprets, and executes commands entered from the console; commands are both built-in commands and transient commands; transient commands are loaded into the TPA and executed • TPA is the area designated to hold programs that are loaded from disk and then executed • standard utilities provided include: DDT-86 interactive debugger; PIP file transfer utility; SUBMIT batch control utility; ED command-oriented text editor; ASM-86 assembler; STAT system status utility; and GENCMD, which processes Intel "H86" format files • memory requirements depend on number and types of options implemented • supports up to 1M bytes of memory; requires 56K bytes of memory and an ASCII terminal • available at no



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additional charge.

**Concurrent CP/M-86** • a single-user, multitasking operating system that is compatible with CP/M-86 and MP/M-86 operating systems; provides a virtual console environment where each virtual console can be performing its own task; one virtual console is always mapped to the physical consoles and is the foreground console, with all other virtual consoles being background consoles; switching a virtual console to the physical console is accomplished through the use of function keys (typical installations use from 4 to 10 function keys for this process) • supports up to 1M bytes of memory, multiple list devices, and up to 16 logical disk drives, each containing up to 512K bytes of storage for a maximum of 8G bytes of online storage • features include: Real-Time Monitor providing process control and dispatching, as well as queue, flag, and clock management; allows processes to share reentrant code; file management with date and time stamping; and protection of user files and directories through the use of optionally assigned passwords • requires an Intel 8086/8088 microprocessor, 256K bytes of memory (recommended), a console device, disk storage, and a real-time clock • developed by Digital Research, Inc • available at no additional charge.

**Manager** • shell for MS-DOS • based upon the Ladder concept; has up to 5 Ladders displayed on the screen; contains an index which can hold up to 29 programs plus the Tools utilities program, which handles housekeeping chores.

**IBM PC Emulator** • enables IBM PC-compatible programs to run on the Apricot; emulates the IBM ROM BIOS: transparent to the user • 7 interrupts are emulated: interrupt 10—screen control; interrupt 13—direct disk access; interrupt 14—communications handling; interrupt 15—cassette handling; interrupt 16—keyboard handler; interrupt 17—parallel printer handler; interrupt 1A—clock device.

### □ Utilities

A utilities disk is bundled with the Apricot. It includes programs for producing new character sets for the display, for altering characters produced on the keyboard, for creating logos, for controlling the Microscreen and its associated touch-sensitive function keys, and for utilizing the print spooler.

### □ Data Management

ACT does not offer any data management systems for the Apricot. However, third-party software packages such as dBase II are available from outside vendors.

### □ Communications/Networks

**Asynchronous Communications Package** • provides asynchronous TTY emulation; supports ACT's integral modem • bundled with the system.

### □ Program Development/Languages

**Microsoft BASIC-86** • allows calling of machine language subroutines, merging of multiple programs, and transferring control to specific program lines during certain events; IF THEN/ELSE constructs are supported as well as trace/notrace for easier debugging • screen editor implements special function keys and multistatement lines • bundled with the system.

**Personal BASIC** • designed especially for beginning users • features include immediate syntax checking; direct/instant calculation mode; diagnostics messages; error trapping; statement number and variable tracing; user-defined functions; and CP/M-style command keywords • requires CP/M-86 or Concurrent CP/M, and 76K bytes of available memory • developed by Digital Research • bundled with the system.

**GSX Graphics Package** • for displaying diagrams, charts, etc; provides interfaces to graphics peripherals • includes the Graphics Device Operating System (GDOS) and the Graphics Input Output System (GIOS); GDOS is based on the Virtual Device Interface (VDI), the emerging ANSI standard for graphics software; intercepts and services calls from graphics applications programs and loads the device driver (GIOS) modules to support different I/O devices; GIOS modules translate the GDOS interface calls into the unique protocols of graphics devices •

runs under CP/M and MS-DOS • bundled with the system.

### □ Applications Packages

**SuperCalc** • electronic spreadsheet; 63 columns x 254 rows • provides for consolidation, sorting, variable column widths, various formatting options • displays 2 windows, one for results, the other for formulas; both can be scrolled simultaneously • runs under MS-DOS • bundled with the system.

**SuperPlanner** • executive notebook providing facilities for maintaining a daily calendar, appointment book, address book, and activity log; also edits notes and memos • runs under MS-DOS • bundled with the system.

## ■ HARDWARE

### □ Terms, Support & Documentation

**Terms** • available for purchase only • 90-day warranty.

**Support** • at the time this report was written ACT was negotiating with a third-party service organization.

**Documentation** • Owner's Handbook, Configuration Guide, MS-DOS User's Guide, MS-DOS quick-reference card, BASIC quick-reference card, and SuperCalc and SuperPlanner manual included with the basic system.

### □ Physical Specifications (H x W x D; Weight)

**System Unit** • 4x16.5x12.5 inches; 14.4 pounds.

**Display** • 8.5x10.5x10 inches; 9.1 pounds.

**Keyboard** • 2x16x7 inches; 3.3 pounds.

### □ Systems Overview & Configurability

The Apricot is a 16-bit system comprised of a system unit with integral 3.5-inch disk drives, a detached keyboard, and a detached high-resolution monitor. The heart of the system is an Intel 8086 CPU operating with an 8089 I/O processor and 256K bytes of RAM, which is expandable to 786K bytes. Other standard system features include a parallel printer port, an RS-232C interface, a sound generator, 2 expansion slots, and a 48K-byte disk cache which is implemented in RAM by the BIOS.

The disk drives are Sony's 3.5-inch microfloppy units available in a single-sided 315K-byte formatted capacity. A double-sided 720K-byte capacity drive is forthcoming. ACT has introduced 2 hard disk versions in the U.K. and plans to market them in the U.S. sometime this summer. The Apricot's monitor is a high-resolution, monochrome CRT that sits on top of the system unit in a shallow groove. Its pedestal base contains a tilt mechanism enabling various angle adjustments to be made and it can slide across the unit within the oval groove. The monitor's graphics resolution is 800x400 pixels.

The Apricot's keyboard has 96 keys, all of which can be programmed to produce any sequence of ASCII codes. In addition to the standard typewriter layout, function, cursor and editing keys, and numeric keypad found on most other microcomputers, the Apricot's keyboard also incorporates 6 membrane keys, a microscreen, and a mouse connector. The Microscreen is a 2 line by 40 column LCD that serves many purposes. It can display a real-time clock consisting of the time, day, and date; labels for the 6 membrane function keys; a copy of the data as it appears on the CRT display; system prompts; and operands and results during calculator operations.

The Apricot is not only a desktop unit, but is also transportable. The system box and keyboard weigh a total of 17.5 pounds. Just pull out the hidden handle that sits beneath the disk drive opening, slip down the sliding cover that goes over the drives, clip the keyboard to the underside of the unit, and it's ready to go. The CRT, with its indented handle, will have to be carried separately. It weighs only 9 pounds.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**System Maximums** • CPU, 8087 math co-processor, 768K bytes of RAM, monitor, keyboard, 1.4M bytes of disk storage on 2 drives, RS-232C port, Centronics parallel port.



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## Packaged Systems

**Apricot Personal Computer** • includes CPU, 256K bytes of RAM, dual 3.5-inch 315K-byte disk drives, monitor, keyboard, RS-232C interface, Centronics parallel port, 2 expansion slots, MS-DOS 2.0 with GSX Graphics Extension, CP/M-86, Concurrent CP/M-86, BASIC Interpreter, Personal BASIC, asynchronous communications package, SuperCalc, and SuperPlanner:

\$3,190 prch

ACT also offers the Apricot with fewer features.

Apricot Personal Computer • with only 1 drive:

2,790

Apricot Personal Computer • with 1 drive and no monitor:

2,495

Apricot Personal Computer • with 2 drives and no monitor:

2,895

## CPU

The Apricot uses an Intel 8086 microprocessor as its main CPU and an Intel 8089 microprocessor for I/O management. The 8087 math co-processor is optional. The 8086 and 8089 are connected in parallel and share a common bus structure. In the local multiprocessing configuration, only one of them has access to the shared address, control, and data buses at any one time.

**Intel 8086 Processor** • 16-bit data bus interface, 16-bit internal architecture, direct addressing to 1M bytes of memory, 16-bit register set with symmetrical operations, approximately 70 basic instructions with up to 30 addressing modes, 8-bit and 16-bit signed and unsigned arithmetic with binary and decimal operands, extensive string and block move facilities • powerful segmentation facilities allow memory partitioning for multitasking, concurrent, or multiuser capabilities • a pseudo-superset of the Intel 8080 instruction set where translation to 8086 is straightforward • instruction set compatible with 8088 • runs at 5 MHz.

**Intel 8087 Math Co-Processor** • provides extension of Intel 8086/8088 for approximately 100 times faster hardware execution of number-crunching mathematics • 84-bit-wide data paths; 80-bit-wide working registers perform with 18-decimal digit accuracy; 8 data formats and close interfacing to mother CPU result in a powerful numeric data processor (NDP) • to utilize the Intel 8087 processor capabilities it must be supported by the language processor or have specific 8087 assembly subroutines • fits into a socket on the system board:

\$325 prch

## Memory

The system comes with 256K bytes of RAM which is expandable to 768K bytes. Of the 256K bytes, approximately 128K bytes is utilized by the BIOS, the DOS, graphics features, disk cache, character fonts, and keyboard tables; the remaining 128K bytes are user memory.

**128K-Byte Memory Expansion Board** • occupies 1 expansion slot:

\$325 prch

**256K-Byte Memory Expansion Board** • occupies 1 expansion slot:

*PRCH: purchase price. Prices effective as of March 1984.*

slot:

825

## I/O & Communications

The Apricot provides an RS-232C asynchronous/synchronous port, a Centronics-type parallel printer port, keyboard, monitor socket, mouse connector, 2 expansion slots, and a sound generator. An optional on-board modem with auto-dial capabilities will be available in the near future.

**Sound Generator** • can be programmed to produce audio frequency tones, audio noise, or synthesized sounds • contains a TI SN76489 Programmable Sound Generator • included with the system.

**Modem** • integral 300-/1200-bps modem with auto-dial capability; AT&T 103/202-compatible • board occupies 1 expansion slot; minor modification must be made to rear panel of the system unit to accommodate a small connector panel • not available in the U.S.

## Mass Storage

The Apricot uses Sony's 3.5-inch microfloppy disk drive. One or 2 are included with the system depending on the configuration. Additionally, a 48K-byte disk cache is utilized by the BIOS for special fonts and bit-mapped screen RAM. It also serves as a file buffer.

**Sony Microfloppy Drive** • 3.5-inch, 315K-byte, single-sided drives • 70 tracks, soft-sectored using IBM System/34 format in double-density mode, with 512K bytes per sector, 9 sectors per track; 500K bps data transfer rate; 15 millisecond track-to-track access time • spring loaded metal shutters within the drives protect the head window, and open and close within the drives • additional 315K-byte drive:

\$495 prch

## Terminals/Workstations

**Display** • detached CRT tilts, swivels, and moves across the width of a shallow groove in the top of the system unit • 9-inch diagonal screen; green characters on a black background; antiglare optical filter • 80 characters x 25 lines with a character cell of 10x16 dots or 132 characters x 50 lines; graphics resolution of 800x400 pixels • reverse, highlight, underline and strike-through video attributes • monitor included with some packages:

\$295 prch

**Microscreen** • 2 line by 40 character LCD located on the upper right-hand side of the keyboard • on power-up, displays day, date, and time; can be used as a calculator with memory when the CALC key is pressed; labels the 6 touch-sensitive keys with functions unique to the program being run; acts as a window on the screen.

**Keyboard** • detached IBM Selectric-style keyboard with 96 fully programmable keys; includes 8 fixed function keys for Help, Undo, Repeat, Calc, Print, Interrupt, Menu, and Finish; 6 touch-sensitive keys labelled by the microscreen; 9 keys for editing and cursor control; numeric keypad • DB-9 jack on rear of keyboard for attaching a mouse • real-time clock/calendar chip and battery backup stored in the keyboard.

## Printer Graphics

None available from ACT. The system supports a Centronics-type parallel printer interface.

• END



# Convergent Technologies WorkSlate Portable Computer

## ■ PROFILE

**Operating System** • proprietary spreadsheet operating environment.

**Data Management** • not applicable to the system.

**Communications/Networks** • integral terminal emulator and modem support.

**Languages** • not applicable to the system.

**Models** • WorkSlate.

**CPU** • 8-bit Hitachi 6303.

**Memory** • 16K-byte RAM; 64K-byte ROM.

**Chassis Slots** • none.

**I/O** • GP/IO interface standard; optional CommPort with 1 serial port and 1 parallel port.

**Mass Storage** • microcassette tapes.

**Terminals/Workstations** • single-user system.

**Printers** • Microprinter available from Convergent; standard serial or parallel printers are supported via the CommPort.

**First Delivery** • December 1983.

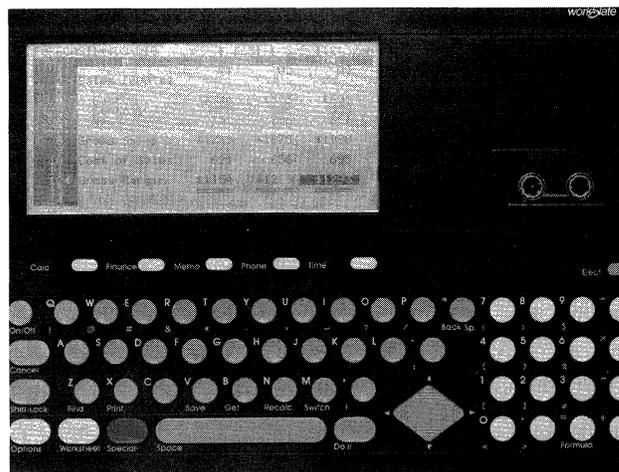
**Systems Delivered** • information not available.

**Comparable Systems** • low end of portable market—Radio Shack Model 100, Epson HX-20, and NEC 8201.

**Vendor** • Convergent Technologies Inc, Advanced Information Products Division; 2441 Mission College Boulevard, Santa Clara, CA 95050 • 408-980-9222.

**Canada** • Distributor: ComputerLand of Red Deer; 146-2325 50th Avenue, Red Deer, AB T41 1M7 • 403-346-8811.

**Distribution** • through major retail chains, by direct mail through



American Express, and by E.F. Hutton in conjunction with its online financial services.

## ■ ANALYSIS

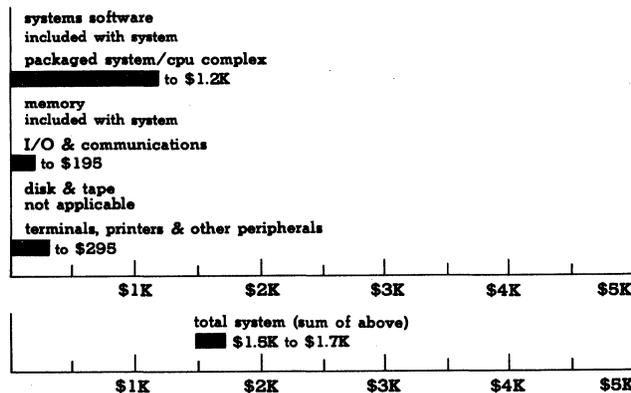
Since its inception in 1979, Convergent Technologies has played an important role in the OEM marketplace, developing such innovative products as its clustered workstations, its powerful Megaframe system, and its soon-to-be-released N-Gen system, products that are all based on 16-bit microprocessor technology. Two of Convergent's most viable customers, Burroughs with its B 20 Series and NCR with its WorkSaver, base their systems on Convergent's clustered workstations. The company's newest system, the N-Gen, will make its debut as the Burroughs B 25 and the Raytheon Signature 8200.

When Convergent introduced its WorkSlate portable computer in August 1983, the company deviated from its traditional OEM stance and brought the system to market under its own label and directly to the end user.

The WorkSlate is one of a new breed of portable notebook computers which are designed to fit in a briefcase. It is similar in overall design to the Radio Shack Model 100, the Epson HX-20, and the NEC 8201. But unlike these products, the WorkSlate is targeted to a specific market—that of the spreadsheet user. Convergent is aiming the WorkSlate at business professionals who are primarily involved with numerical analysis and who have little need for word processing.

With the WorkSlate, users can build integrated electronic spreadsheets for various business and financial reports. Data is presented in a row by column format, which supports the entry of numbers, words, formulas, and special commands. The WorkSlate wears many hats. In

## PURCHASE PRICE RANGE hardware & software



**WORKSLATE PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on WorkSlate packaged system (includes CPU, 64K-byte ROM with operating environment, 16K-byte RAM, LCD, keyboard, integral modem, GP/IO interface, microcassette interface, battery, and phone cable) and the following options: microprinter • **LARGE SYSTEM** is based on WorkSlate packaged system (includes same as small system) and the following options: 1 serial and 1 parallel port and microprinter.



# Convergent Technologies WorkSlate Portable Computer

addition to its spreadsheet capability it can also serve as a tape recorder, calculator, speaker phone, automatic dialing phone, calendar and appointment scheduler, and alarm clock. It can send and receive data from other WorkSlates and can access online databases such as the Dow Jones Reporter. According to Convergent, the WorkSlate is designed to help business people perform everyday business tasks.

### Strengths

The WorkSlate is an ideal product for those who only want to do spreadsheet analysis and are not interested in getting involved with other applications or in learning all of the intricacies of computers. Its light weight and portability are especially attractive for people who are always on the go and need to do a lot of computation. Its integral modem and telephone amplifier capabilities provide additional conveniences. The ability to store information in RAM even when the system is turned off is another system plus.

### Limitations

The WorkSlate's memory limitation will be a problem for users who wish to build large spreadsheets. A 16K-byte RAM is insufficient. The system is also slow. Before Convergent raised its price (from \$895 to \$1,196) the WorkSlate was price competitive. Now the system is priced a little too high. Convergent attributes the price hike to product demand coupled with increased production costs due to a shortage of components.

## SOFTWARE

### Terms & Support

**Terms** • basic system functions including spreadsheet capabilities are contained in system ROM; specialized spreadsheet applications available for a one-time license fee.

**Support** • toll-free hot-line support is available.

### Software Overview

Software for the WorkSlate is built around a spreadsheet concept with all of the system's functions performed against a spreadsheet background. The system does not use an operating system per se, but instead, provides an operating environment for performing various spreadsheet-related tasks. Also it is not programmable in a higher-level language.

The WorkSlate comes with 64K bytes of ROM which contains the operating environment, spreadsheet capabilities, terminal emulation, various time management functions, and a limited word processing capability. A variety of specialized preformatted spreadsheet applications called Taskware are available for specific business environments. The Taskware comes on microcassette tapes.

### Operating System

The WorkSlate provides a proprietary, multitasking operating environment which supports 2 windows and background printing and performs all functions against the background of a spreadsheet. The system's memory manager supports 5 worksheets in memory at one time and concurrent operations during printing, recording, and telephone operations. Inherent in the system are calculator, finance, memo pad, phone, and time management functions including calendar and scheduling capabilities.

**Calculator** • enables a user to perform normal calculator functions while working with a spreadsheet.

**Finance** • allows automatic calculation for amortization, depreciation, interest, and net present value.

**Memo Pad** • gives users the ability to use the microcassette recorder for dictation and voice annotation; also allows text to be entered on a worksheet memo format.

**Phone** • allows the system to function as a telephone answering device, as a speakerphone, and as an automatic dialer.

**Time Management** • allows the system to function as an alarm clock as well as set the correct date and time; contains a calendar feature for scheduling and listing appointments.

### Utilities

None available with this system.

### Data Management

Not applicable to the system.

### Communications/Networks

Asynchronous communications support for interfacing with other WorkSlates and databases is contained in ROM.

**Terminal Functions** • 128 ASCII characters; 7-bit ASCII transmission; 11-line x 46-character display memory window overlay; shows a 4-row worksheet with active cursor control; automatic sign-on and data retrieval functions; answerback memory with worksheet security; transmits and receives entire worksheets.

### Program Development/Languages

Not applicable to the system.

### Application Packages

Convergent provides an integral spreadsheet as well as various Taskware tapes which are predesigned spreadsheet applications laid-out as worksheets. The Taskware worksheets are constructed with built-in formats, titles, and formulas which are tailored to specific business environments.

**Integral Spreadsheet Capabilities** • resides in ROM • handles a maximum of 128 columns x 128 rows with a maximum of 1,000 entries per single worksheet or 1,000 entries spread out over 5 worksheets in memory • provides variable column width; automatic column width setting; automatic commas • performs standard spreadsheet function plus windowing and sorting • most functions are initiated through labelled "softkey" selections.

**Personal Tax** • for tax analysis and preparing IRS forms • worksheets for 1040 Form, all major schedules, Form 2106—Employee Business Expenses, Form 3903—moving expenses, Form 2119—Sale of Principal Residence, monthly/quarterly withholding analysis, income averaging:

\$49 lcms

**Travel** • for arranging and recording personal and business travel details • worksheets for expense reporting, travel expenses, client and entertainment expenses, traveler's check log, itinerary, airline miles log, foreign currency converter, and metric converter:

39

**Sales Reporter** • to assist sales people in managing, reporting, and analyzing their operations • worksheets for account log, commission report, daily contact report, sales expense, inventory availability and pricing, proposal outline, lease vs purchase analysis, lease vs borrow analysis, sales forecasting, 30/60/90 quarter/year, and sales performance graph:

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**Loan Analysis** • to provide assistance with loans or investments • worksheets for monthly/annual amortization schedules, monthly internal rate of return, annual internal rate or return, loan comparisons, personal financial statement, and after-tax loan evaluation:

49

**LCNS: one-time license fee. Prices are rounded (e.g. \$49=\$49.95, \$39=\$39.95, etc). Prices effective April 1984.**



## Convergent Technologies WorkSlate Portable Computer

**Portfolio Analysis** • for analyzing and managing the performance of personal investments • 2 microcassettes • worksheets for stock reporting, annual report analysis, bond analysis, current investment analysis, industry analysis, stock portfolio, summary profit report, unrealized/realized gains and losses, and personal net worth:

59

**Estate/Retirement Planning** • for analyzing and managing personal trust affairs and estate planning options • worksheets for IRA planning and analysis, insurance requirement analysis, life insurance coverage, personal net worth current/projected, college fund planner, and trust account:

49

**Financial Statements** • for professional and personal financial analysis • worksheets for balance sheets, income statements, owners equity statements, ratio analysis, changes in working capital, changes in cash flow, 5-year comparative income statement, and fixed assets:

59

**Cash Management** • for investors, accountants, and financial managers to track and analyze cash flow and cash ratios • worksheets for cash modeling, investment analysis, selected ratio analysis, actual expenses, cash disbursements, cash receipts, currency conversion, planned expenses, and planned vs actual expenses:

39

**Marketing Management** • to assist managers in planning, managing, and analyzing the performance of their products • worksheets for pricing analysis, sales analysis, commissions, sales forecasting, budgets, expenses, sales performance graph, and gross margins:

39

**Business Tax** • to assist sole proprietors and partners in assessing tax implications and preparing IRS forms • worksheets for sole proprietor and partnership taxes—standard forms and standard schedules, personal tax preparation, quarterly tax estimator, tax alternative calculator, investment credit, capital gains/losses, and depreciation:

59

**Real Estate** • for organizing and analyzing residential real estate and income property investments • worksheets for amortization schedules, comparative interest rates and financing, buy vs rent, tenants' record, rental income and expenses, ACRS/non-ACRS depreciation, property income and cash flow analyses, and sell analysis:

59

**Consultant** • to assist independent consultants in planning their time and resources and monitor expenses • worksheets for daily activity log, weekly time sheet travel expense record, accounts receivable, meeting record, project costing, project control, business planning, and business control:

39

**Time & Project Management** • to assist managers in scheduling activities, resources, and responsibilities, generating budgets, and tracking expenses • worksheets for daily activity log, annual plan, delegation list, project schedule, project time line, expense record, project costing, project control, management overview, and project distribution:

49

**Inventory Analysis** • for analyzing inventory ordering methods and inventory costs • worksheets for economic order quantity (EOQ) list, single-item EOQ, savings from optimal order policy, vendor comparison, quantity discounts, profit analysis, demand levels comparison, fixed order sizes comparison, fixed periods comparison, and holding costs comparison:

49

**Electronic Information Services** • for automatic sign-on to electronic databases; includes NewsNet, CompuServe, The Source, ITT Dialcom, Travel Scan, Knowledge Index, Official Airline Guide, and Dow Jones News/Retrieval:

49

**Electronic Mail** • for automatic sign-on to electronic mail services; including MCI Mail, Ethernet, GTE Telenet Telemail, USPS E-Com, Source Mail, CompuServe Mail, Tymshare OnTyme, and Western Union EasyLink:

49

**Auditing** • for use by professional auditors • worksheets for client list, time summary, analytic review, ACRS depreciation, straight line depreciation, lessee accounting, rate implicit on lease, lease amortization, income tax provision, and income tax liability:

49

**Insurance Analyzer** • for organizing insurance records and to assist in making decisions about insurance planning and transactions • worksheets for client contact, life/health/disability insurance, term life insurance rate calculator, whole life insurance rate calculator, whole vs term life insurance, comparative IRA investment, tax-deferred vs tax-exempt investment, estate taxes calculation, investable assets, income, expenses, and life insurance needs analysis:

49

**Job Costing** • designed to help small companies track costs and resources associated with a job and to determine profitability • worksheets for checklist of job charges, job estimate, material ordering schedule, detailed job charges, resource utilization, change order log, budget to actual job status, job cost overview, accounts receivable status, and profit planning:

49

**Accounts Payable** • worksheets for accounts payable ledger, recurring accounts payable, check register, check book reconciliation, A/P invoice aging, cash requirements, notes payable, outstanding balances on loans, petty cash reconciliation, and vendor list:

39

**Accounts Receivable** • worksheets for accounts receivable detail ledger, cash receipts, A/R invoice aging, installment receivables, collection calls, allowance for doubtful accounts, accounts receivable turnover, notes receivable, customer list, and product list:

39

### ■ HARDWARE

#### Terms, Support & Documentation

**Terms** • available for purchase only; 90-day warranty.

**Support** • toll-free hot-line; must ship system back to factory for repair; 48-hour turnaround • 2 audio learning tapes provided with system.

**Documentation** • owner's manual, reference guide, and exercise book included with the system package.

#### Physical Specifications (H x W x D; Weight)

**System Unit** • 1 x 11.25 x 8.5 inches; approximately 3 pounds.

**Display** • integral to System Unit.

**Keyboard** • integral to System Unit

#### Systems Overview & Configurability

The WorkSlate is a notebook-size portable computer that contains an 8-bit microprocessor with 64K bytes of ROM and 16K bytes of RAM. Both the processor and the memory utilize CMOS technology which requires only battery power because of its low power consumption. The system runs off 4 AA alkaline batteries, rechargeable battery-pack, or an AC adapter-recharger.

The WorkSlate's display is an integral 16-line by 46-character LCD that can scroll both vertically and horizontally to provide a window to the worksheet. It can display 2 windows at the same time, but can only address one at a time. The keyboard has a QWERTY layout with a separate numeric pad and is unusual in that it employs button-style keys.

An interesting feature of the keyboard is the 5 oval function keys that are positioned under the LCD. These keys provide access to the built-in calculator, the financial management program, the



## Convergent Technologies WorkSlate Portable Computer

memo pad, telephone operations, and time management capabilities. Once a user selects one of these particular functions, the keys are then reassigned with capabilities related to the selected function. These keys are also used to select the menu options displayed for each of the various worksheet applications.

An integral 300-bps modem, a microcassette tape interface for storage, a telephone amplifier, a built-in clock with a multiple alarm, 2 RJ11 jacks, and a GP/IO interface round out the standard features. The microcassette tape provides 2 tracks—one for recording data and one for audio recording. This enables users to not only store data but also to use the system as a dictating machine, speakerphone, or answering machine. A 2 pound, 40- or 80-column printer is available as a system option as is an interface containing both a serial and parallel port. A user can choose either of these 2 options, but not both, since they both plug into the GP/IO port.

The WorkSlate has enough memory to store 12 pages while each microcassette is capable of storing 60 pages per side. The system contains an independent button-cell battery for storing information in memory when the system is turned-off and also for protecting data for up to a month in case of power loss.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**System Maximums** • same as basic system described under Packaged Systems except adds a parallel printer port.

### Packaged Systems

**WorkSlate** • system unit with 8-bit CPU, 64K-byte ROM, 16K-byte RAM, 16 line x 42 column LCD, keyboard, integral 300-bps modem, GP/IO interface, microcassette interface, rechargeable battery, AC adapter/recharger, 2 button-cell backup batteries, modular phone cable, instruction tapes, and built-in terminal emulation and worksheet capability.

\$1,195 prch

### CPU

**Hitachi 6303** • CMOS version; equivalent of Motorola 6800 • modified with 2 proprietary logic gate arrays for handling the display and microcassette functions • common memory architecture with 16-bit (64K-byte) memory space for instructions, data, and I/O; all data 8-bits wide • instruction set patterned after PDP-11 as closely as possible in shorter word machine with limited CPU registers; has PDP-11 branches and conditional branches; unlimited subroutine nesting via stack pointer addressing LIFO stacks in RAM; does not have vectored interrupt, but can achieve the same function with software.

### Memory

**Standard Memory** • 16K bytes of user memory • 64K bytes of CMOS ROM; includes the operating system, communications

software, and spreadsheets.

### I/O & Communications

The WorkSlate contains an integral modem, a built-in telephone amplifier, 2 jacks for a microphone and earphones, 2 RJ11 jacks for direct connect to a telephone, and a GP/IO port. An optional interface module called CommPort is available for attaching the WorkSlate to other machines and devices such as a high-speed printer and a 1200-bps modem.

**Internal Modem** • 300-bps LSI modem with auto-dial and auto-answer capabilities.

**CommPort** • provides one RS-232C interface and one Centronics-type parallel interface; up to 9600 bps; switch settings for parity, baud rate, and handshakes attaches to GP/IO interface:

\$195 prch

### Mass Storage

The only type of storage utilized by the WorkSlate are microcassette tapes. The middle of the right-hand side of the unit contains a microcassette tape interface. The tape, in addition to data storage, can also be used for voice recording.

**Microcassette Interface** • for recording and playing on 2 tracks, one for audio and one for digital recording; 2400 bps data transfer rate • each microcassette can store up to 5 worksheets per side or 30 minutes of audio recording.

### Terminals/Workstations

The WorkSlate contains an integral LCD and keyboard.

**Display** • 3-inch x 6-inch LCD displays 42 characters x 16 lines of a 128 column x 128 row worksheet; top line is status line; bottom 2 lines show menus • 14 graphics characters available • display scrolls vertically and horizontally providing a window to the worksheet.

**Keyboard** • typewriter-style layout with separate numeric keypad • 60 keys, mostly circular in shape; includes 5 function keys whose assignments change depending on the program and menus being utilized • cursor key is diamond shaped with each point representing a different cursor direction.

### Printers/Graphics Output

Convergent offers The Microprinter for use with the WorkSlate. Standard third-party printers are supported via the CommPort.

**Microprinter** • 4 color printer/plotter; uses 4.5-inch rolled paper; prints 5 characters per second; 40 or 80 columns per line; for longer worksheets, can print at a 90-degree angle printing lengthwise as opposed to sidewise • plugs into GP/IO interface on the rear of the unit; uses 4 batteries for power:

\$295 prch

*PRCH: purchase price. Prices effective April 1984.*

• END



# Alpha Micro Computer Systems

## AM-1000, AM-1000E, AM-1042E, AM-1072, AM-1082 & AM-1092

### ■ PROFILE

**Operating Systems** • AMOS/L, proprietary, multiuser, multitasking, timesharing operating system • CP/M 2.2 on expansion boards.

**Data Management** • available from independent vendors.

**Communications/Networks** • AlphaRJE, IBM 2780/3780 bisynchronous communications package.

**Languages** • AlphaBASIC, AlphaPASCAL, FORTRAN 77, assembler.

**Models** • AM-1000, AM-1000E, AM-1042E, AM-1072, AM-1082, and AM-1092.

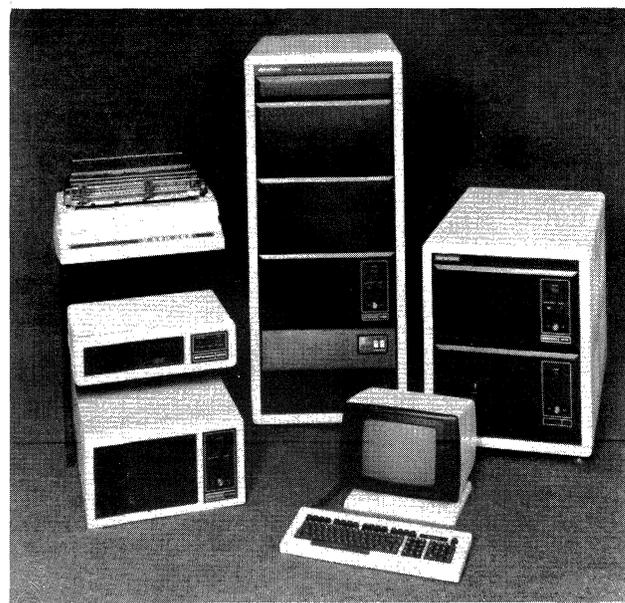
**CPU** • 32-/16-bit Motorola 68000.

**Memory** • 128K to 384K bytes on AM-1000; 256K to 512K bytes on AM-1000E; 512K bytes to 3M bytes on AM-1042E; 512K bytes to 4M bytes on AM-1072, AM-1082, and AM-1092.

**Chassis Slots** • information not available.

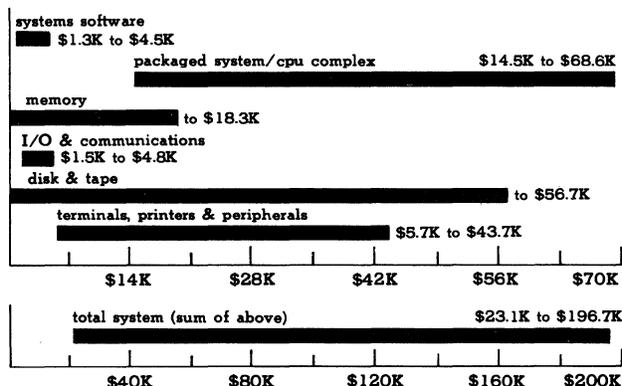
**Ports** • 3 RS-232C ports expandable to 7 RS-232C ports, and 1 parallel port on AM-1000, 1000-E; 2 RS-232C ports expandable to 26 RS-232C ports on other models.

**Mass Storage** • up to 100M bytes on 4 hard disk drives on AM-1000; up to 120M bytes on 4 hard disk drives on AM-1000E; up to 480M bytes on 8 drives on AM-1042E with expansion to 1.44G bytes possible with additional controller boards and drives; up to 560M bytes on 8 drives on AM-1072; up to 1.12G bytes on



### PURCHASE PRICE RANGE

hardware & software



**ALPHA MICRO PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on AM-1000EVW packaged system (includes CPU, 256K-byte RAM, real-time clock, 3 RS-232C ports, VCR interface, 30M-byte Winchester, 800K-byte floppy) and the following options: AMOS/L operating system, CP/M, AlphaBASIC, AlphaMenu, assembler software; serial expansion board; 3 terminals; letter-quality printer • **LARGE SYSTEM** is based on AM-1092M packaged system (includes CPU, 512K-byte RAM, real-time clock, 2 RS-232C ports, 400M-byte Winchester, magnetic tape backup and the following options: AMOS/L operating system, CP/M, AlphaBASIC, AlphaMenu, FORTRAN 77, assembler, AlphaWRITE, AlphaCalc, AlphaRJE software; additional 2.5M-byte RAM; 2 additional 400M-byte drives; data communications controller, 4 expansion boards; 25 terminals; 5 printers.

8 drives on AM-1082; up to 3.2G bytes on 8 drives on AM-1092.

**Terminals/Workstations** • up to 7 can attach to AM-1000 and AM-1000E; up to 26 on AM-1042E; over 40 on AM-1072, AM-1082, and AM-1092.

**Printers** • 40-cps letter-quality printer available from vendor; attaches to either serial or parallel port.

**First Delivery** • June 1982—AM-1000, 1983—AM-1000E, AM-1042E, AM-1072, AM-1082, and AM-1092.

**Systems Delivered** • over 10,000 worldwide.

**Comparable Systems** • Altos 586, CompuPro 68K, Charles River, Wicat, Plexus, Pixel.

**Vendor** • Alpha Microsystems; 17322 Von Karman, P.O. 18347, Irvine, CA 92714 • 714-957-8500.

**Canada** • distributed in major cities throughout Canada.

**Distribution** • worldwide by approximately 300 domestic and 170 overseas distributors, dealers, OEMs and systems houses; also direct sales to OEMs and Fortune 1000 companies.

### ■ ANALYSIS

Alpha Micro was founded in 1977 as a manufacturer of high-end multiuser microcomputer systems. These systems are sold primarily to the business and professional communities, as well as the scientific, medical, engineering and educational markets. They are also sold to OEMs and as components for various companies' private label programs in vertical markets. These component systems offer a high degree of expandability to



## Alpha Micro Computer Systems

### AM-1000, AM-1000E, AM-1042E, AM-1072, AM-1082 & AM-1092

**TABLE 1: MODEL DIFFERENCES**

MODEL	AM-1000	AM-1000E	AM-1042E	AM-1072	AM-1082	AM-1092
<b>CPU</b>	MC68000	MC68000	AM-100L	AM-100L	AM-100L	AM-100L
<b>MEMORY</b>						
Min	128K	256K	512K	512K	512K	512K
Max	384K	512K	3.072M	4.096M	4.096M	4.096M
<b>I/O</b>						
Standard	3 RS-232C ports	3 RS-232C ports	2 RS-232C ports	2 RS-232C ports	2 RS-232C ports	2 RS-232C ports
Optional	4 RS-232C ports 1 parallel port	4 RS-232C ports 1 parallel port	24 RS-232C ports	58 RS-232C ports	58 RS-232C ports	58 RS-232C ports
<b>MASS STORAGE</b>						
Floppy Drive	800KB to 1.6MB	800KB to 1.6MB	—	—	—	—
Winchester-std	10MB	30MB	60MB	70MB	140MB	400MB
Winchester-max	100MB	120MB	1.44GB	560MB	560MB	3.26B
Backup	VCR	VCR	VCR, 20MB tape	VCR, 20MB tape	VCR, 0.5-inch tape	VCR, 0.5-inch tape
<b>MAX USERS</b>	7	7	26	40	40	40

the user. This expansion is available within each system and between systems.

All of the Alpha Micro small-business computers are based on the MC68000 microprocessor, use the same proprietary operating system, and are software compatible. The systems differ primarily in the amount of memory, disk storage capacity, and number of users supported simultaneously. Storage capacities vary from an 800K-byte diskette drive to 400M bytes on a single Winchester drive. The number of simultaneous users can range from one to 7 in the smaller desktop systems—the AM-1000 and AM-1000E—to 40 users in the larger systems—the AM-1042, 1082, and 1092. Data backup can be in the form of video cassette recorders, floppy disk drives, or streamer tapes. In addition to offering standard configurations for each model, Alpha Micro also custom-designs systems to fit an individual's needs.

The latest entries in the Alpha Micro product line are the AM-1000E, an entry-level desktop unit that is an expanded version of the AM-1000, and the AM-60, a custom-designed terminal which can be attached to the systems. According to the latest financial figures released from the company, the AM-1000 products accounted for 30% of Alpha Micro's total sales.

Multiuser systems, such as these Alpha Micro units, are considered to be the powerhouses of the microcomputer industry as opposed to the basic single-user, single-tasking personal and professional workstation. They can be grouped into what is known as the supermicro arena, competing with low-end minicomputers.

The low-end Alpha Micro units—the AM-1000 and AM-1000E are competing with systems such as the Altos 586, the CompuPro 68K, Onyx Sundance, Wicat System 150, and the low-end Charles River Systems. At the other end of the spectrum, Alpha Micro's main competitors are the high-end Wicat and Charles River systems plus minicomputers such as the low-end DEC VAX units.

The middle of the Alpha Micro product lineup is perhaps

the most crowded with competition, for this is where most of the supermicros compete. Here are found systems such as the Altos 68000, CompuPro 68K, Pixel, Plexus, Wicat, and Charles River plus minis such as the Data General 16-bit Eclipse and the DEC PDP-11, all vying for a share of the marketplace.

It would seem, from Alpha Micro's financial profiles, that the company is more than holding its own in the supermicro arena. In its second quarter of fiscal 1984, which ended in August 1983, the company posted its highest sales and earnings in its history, with sales up to 75% from the previous year. Obviously, the company's goal of producing powerful systems with minicomputer performance but at lower prices is paying off.

**□ Strengths**

As pointed out in the Analysis section, the expandability of the Alpha Micro computers is a definite asset for the growing small business. Complete hardware and software compatibility within this family of computers provides for time- and cost-saving conversions.

The choice of the relatively fast MC68000 microprocessor in the basic structure assures rapid processing of tasks for many users. Also, AMOS/L, the company's proprietary operating system, with its multiuser, multitasking, timesharing capabilities can support over 40 users. When combined with the optional CP/M, the benefits to the user increase, as the numerous CP/M application programs become available along with the advantages of AMOS/L.

Regarding the all-important area of maintenance for micros, Alpha Micro has set up a network of AlphaSERV centers and provides dealers with direct service, training, and product support through the International Service and Support Group, a company division.

**□ Limitations**

The major drawback of the Alpha Micro systems is its lack of Unix or a Unix-like operating system. Not that there is anything wrong with AMOS/L, but having some form of



## Alpha Micro Computer Systems

### AM-1000, AM-1000E, AM-1042E, AM-1072, AM-1082 & AM-1092

Unix on the systems would make much more software available to users.

#### ■ SOFTWARE

##### Terms & Support

**Terms** • all Alpha Micro software available under the Master Software License or the End-User Software License agreement • Master Software License (typically sold to dealer or OEM) authorizes holder to use software and resell it • End-User Software License requires end user's signature, authorizes end user to operate software; does not authorize reselling • Master Software License is required before purchasing an End-User License • End-User License must be secured by dealers and OEMs each time they buy software products for resale • pre-requisite for all software products sold or licensed by Alpha Micro is possession of license to use AMOS or AMOS/L operating systems • most Master License packages include 1 year of service and support under Annual Software Support program which consists of patch updates, Comprehensive Software Support, Software Performance Reporting, and Software Bulletins; each is a 1-year subscription service purchased annually.

**Support** • Alpha Micro's Technical Services (AMTS) provides telephone diagnosis, assists in applying temporary correction, or assists in preparing a Software Performance Report • company representative may be sent to location during normal working hours.

##### Software Overview

All Alpha Micro systems use the AMOS/L proprietary operating system. Additionally, CP/M 2.2 is available for use in conjunction with either the AM-1003 serial expansion board or the AM-330 communications controller board. Other products available through Alpha Micro include AlphaBASIC, AlphaPascal, FORTRAN 77, a macro assembler, AlphaRJE for 2780/3780 communication, plus the AlphaWrite word processor and AlphaCalc spreadsheet. Various applications programs are available through Alpha Micro dealers. The vendor will supply users with a catalog of packages.

##### **Packaged Software**

**AMOS/L Package** • AMOS/L operating system, AlphaBASIC, AlphaMenu, and assembler.

\$1,000 lcms

##### Operating Systems

**AMOS/L** • proprietary, multiuser (1 to 40 users), multitasking, timesharing system • design of separate program components called by AMOS/L; allows expansion of system capabilities • includes 3-pass assembler, linkage editor, symbol file generator, symbolic debug routine, support file management, peripheral software drivers • directly addresses 16M bytes of memory • includes set of over 150 utility programs and routines performing general file and system maintenance; sorting, spooling, file handling • English language commands include COPY, SYSTAT, HELP • TASK manager set of programs for background job control, automatic job scheduling functions runs without operator intervention • password security.

**CP/M 2.2** • 8-bit, disk-oriented, single-user operating system • with Alpha Micro implementation, I/O functions handled by AMOS/L • standard CP/M utilities include DDT 8080 interactive debugger, ASM 8080 assembler, PIP file transfer utility, DUMP utility, SUBMIT/XSUB batch control utilities, ED command-oriented text editor, and STAT system status utility • occupies 7K bytes of main memory, 2K bytes of which can be overlaid by application programs • most AMOS/L file backup routines, all AMOS/L-supported disks may be used.

\$370 lcms

##### Data Management

None available from vendor.

##### Communications/Networks

**AlphaRJE** • enables Alpha Micro systems to communicate with most other manufacturer's systems utilizing IBM's bisynchronous

2780/3780 protocols and with other Alpha Micro systems:

\$600 lcms

##### Program Development/Languages

**AlphaBASIC** • Alpha Micro compiled version of BASIC • interactive and compiler modes • memory mapping system • automatic variable-type conversion • substring modifiers • assembly language subroutine calls • interactive debugging features • chaining to system commands, other programs or command files • error trapping • print formatting and terminal-independent screen handling features • random, sequential, and indexed sequential file access.

**AlphaPASCAL** • Alpha Micro version of Pascal • produces structured software for small computers • variety of data structures • assembly language subroutine calls • library of standard routines • user-defined functions and libraries • virtual memory for executing larger programs • random and sequential file access:

NA lcms

**FORTRAN 77** • ANSI standard with extensions for Alpha Micro systems • multiuser, multitasking • single- and double-precision floating-point numbers • screen-oriented symbolic debugger • compiles directly to machine code • runs standard FORTRAN programs with minimal modification • requires 32K bytes for compilation:

1,400

##### Applications Packages

**AlphaWRITE** • multiuser, multitasking word processing system • menu driven • features include insertion and deletion of characters and blocks of text, automatic insertion, global replace, automatic word wrap, spelling checker with a dictionary of more than 80,000 words • arithmetic calculation function:

\$835 lcms

**AlphaCALC** • menu-driven, multiuser, multitasking spreadsheet • provides 255 columns by 255 rows; HELP screen and screen prompts; multiple, linked spreadsheets; precision to 11 digits • handles inserting of AlphaCALC spreadsheets into AlphaWRITE documents:

300

##### Other Facilities

**SSD-Simulator** • provides developer with necessary information to associate a specific program with a specific Software Security Device (integrated circuit) • available to dealers and third-party software developers under license agreement.

#### ■ HARDWARE

##### Terms, Support & Documentation

**Terms** • available for purchase from dealers • prices given are suggested retail prices • 90-day warranty.

**Support** • warranties and maintenance available under the AlphaCare exchange program and through AlphaSERV centers, dealers, and systems houses; under AlphaCare, dealer can return an in-warranty product and receive a replacement unit instead of waiting for the original to be returned • AlphaServ is a network of service organizations that supplement dealer support and service functions • Alpha Micro's Technical Service Group (AMTS), which provides additional technical support to both dealers and AlphaSERV members, includes Service Center, System Support, Spare Parts/Logistics, Customer Service, Customer Relations, and Customer Education departments; also an AMTS journal is published monthly to provide up-to-date technical information • additional support is provided to users and dealers by the International Alpha Micro Dealers Association (IAMDA) and the Alpha Micro Users Society (AMUS).

**Documentation** • AMOS/L documentation library Vol 1 included with system; includes 10 manuals such as Introduction to AMOS, User's Guide, Release notes, etc; Vol 2 and Vol 3 are available for a fee; hardware documentation for different options can also be purchased separately.

*LCMS: license fee. Prices effective as of December 1983.*



## Alpha Micro Computer Systems

### AM-1000, AM-1000E, AM-1042E, AM-1072, AM-1082 & AM-1092

**Physical Specifications (H x W x D); Weight**

**AM-1000, AM-1000E**

**CPU** • 6.5 x 20.25 x 15 inches; 23 to 29 pounds (AM-1000), 25 to 31 pounds (AM-1000E).

**Display** • not applicable.

**Keyboard** • not applicable.

**AM-1042E**

**CPU** • 10.5 x 19 x 30 inches; weight information not available.

**Display** • not applicable.

**Keyboard** • not applicable.

**AM-1072**

**CPU** • 29 x 21.62 x 36 inches; weight information not available.

**Display** • not applicable.

**Keyboard** • not applicable.

**AM-1082, AM-1092**

**CPU** • 50.25 x 21.62 x 36 inches; weight information not available.

**Display** • 12.5 x 15 x 12.5 inches; 35 pounds includes keyboard.

**Keyboard** • 2.6 x 20.5 x 7.1 inches.

**Systems Overview & Configurability**

The Alpha Micro computers are based on the MC68000 processor technology. Models range from a 2- to 7-user system to a 26-user system on the lower end to over a 40-user system on the super micros. All models have I/O and memory expansion capabilities using add-on boards. Mass storage can be expanded with additional drives and data backup is available via the VCR interface for standard video cassette recorders or magnetic tape. All models are software compatible.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**AM-1000 System Maximums** • 384K bytes of RAM, 100M bytes of hard disk storage on 4 drives, 7 terminals, 1 printer.

**AM-1000E System Maximums** • 512K bytes of RAM, 120M bytes of hard disk storage on 4 drives, 7 terminals, 1 printer.

**AM-1042, 1042E System Maximums** • 3M bytes of RAM, 1.44G bytes of hard disk storage; 26 serial ports with addition of I/O boards.

**AM-1072 System Maximums** • 4M bytes of RAM; 560M bytes of hard disk storage on 8 drives; 60 serial ports with addition of I/O boards.

**AM-1082 System Maximums** • 4M bytes of RAM; 560M bytes of hard disk storage on 8 drives; 60 serial ports with addition of I/O boards.

**AM-1092 System Maximums** • 4M bytes of RAM; 3.2G bytes of hard disk storage on 8 drives; 60 serial ports with addition of I/O boards.

**Packaged Systems**

**AM-1000VW** • MC68000 CPU, 128K-byte RAM, real-time clock, 3 RS-232C ports, VCR interface, 10M-byte 5.25-inch Winchester drive.

\$7,583 prch

**AM-1000VWF** • same as AM-1000 VW except includes 800K-byte, 5.25-inch floppy disk drive:

8,750

**AM-1000WF** • same as AM-1000VWF except no VCR interface:

8,258

**AM-1000FF** • same as AM-1000VW except includes 2

800K-byte floppy disk drives in place of Winchester, no VCR interface:

5,850

**AM-1000EVW** • MC68000 CPU, 256K-byte RAM, real-time clock, 3 RS-232C ports, VCR interface, 30M-byte Winchester 5.25-inch drive:

13,333

**AM-1000E VWF** • same as AM-1000E VW except also includes 800K-byte floppy 5.25-inch drive:

14,506

**AM-1042EV** • AM-100/L CPU, 512K bytes of RAM, real-time clock, 2 RS-232C interfaces, VCR interface, 60M-byte, 8-inch Winchester disk drive:

21,666

**AM-1042ES** • same as AM-1042EV except streaming tape backup in place of VCR interface:

25,333

**AM-1072V** • AM-100/L CPU, 512K bytes of RAM, real-time clock, 2 RS-232C ports, VCR interface, 70M-byte, 8-inch Winchester disk drive:

30,500

**AM-1072S** • same as AM-1072V except streaming tape backup in place of VCR interface:

34,167

**AM-1082V** • AM-100/L CPU, 512K bytes of RAM, real-time clock, 2 RS-232C ports, VCR interface, 140M-byte, 8-inch Winchester disk drive:

48,000

**AM-1082M** • same as AM-1082V except magnetic tape backup in place of VCR interface:

60,600

**AM-1082M (Without Backup)** • same as AM-1082V except without VCR interface or magnetic tape backup:

46,600

**AM-1092V** • AM-100/L CPU, 512K bytes of RAM, real-time clock, 2 RS-232C ports, VCR interface, 400M-byte, 10.5-inch Winchester disk drive:

56,000

**AM-1092M** • same as AM-1092V except magnetic tape backup in place of VCR interface:

68,600

**AM-1092M (Without Backup)** • same as AM-1092V except without VCR interface or magnetic tape backup:

54,600

**CPU's**

The AM-1000 and AM-1000E are based on the MC68000 microprocessor; all of the older models have a proprietary CPU, the AM-100/L, which uses the MC68000 chip.

**Motorola MC68000 Processor** • 16-bit data transfer, 24-bit memory addressing and 32-bit wide registers (8 data, 7 address, 2 stack).

**AM-100/L** • based on MC68000 chip • 32-bit internal architecture composed of 17 32-bit bidirectional registers and 32-bit data path • 16-bit data transfer bus • addresses over 16M bytes of memory • operates at 8 MHz • contains over 70 standard instructions which combined with 14 addressing modes form over 1,000 instruction variations • 8 vectored level interrupts • 8-channel DMA capability.

**Memory**

**Standard Memory** • 128K-byte RAM expandable to 384K on AM-1000; 256K-byte RAM expandable to 512K on AM-1000E • 512K-byte RAM expandable to 3M in 128K-byte or 512K-byte

*PRCH: purchase price. Prices effective as of December 1983.*



# Alpha Micro Computer Systems

## AM-1000, AM-1000E, AM-1042E, AM-1072, AM-1082 & AM-1092

increments on AM-1042E; 512K-byte RAM expandable to 4M in 128K-byte or 512K-byte increments on AM-1072 and AM-1092 • byte parity is standard.

**128K-Byte RAM Option** • expands memory capability on AM-1000 and AM-1000E:

\$750 prch

**256K-Byte RAM Option** • expands memory capability on AM-1000 and AM-1000E:

1,575

**128K-Byte RAM Option** • expands memory capability on AM-1042E, AM-1072, and AM-1092:

1,833

**512K-Byte RAM Option** • expands memory on AM-1042E, AM-1072, and AM-1092:

3,666

**I/O & Communications**

**Standard Input/Output** • 3 serial RS-232C ports expandable to 4 additional RS-232C and 1 parallel Centronics printer port with AM-1003 board on AM-1000 and AM-1000E • 2 RS-232C ports expandable to 26 on AM-1042E • 2 RS-232C ports, expandable to 60 on AM-1072 and AM-1092.

**AM-1003 Serial Expansion Board** • optional communications controller and I/O expansion board for the AM-1000 • 4-MHz Z80A microprocessor, 64K bytes of RAM, 4K bytes of EPROM, Centronics parallel interface, 4 serial ports • supports AlphaRJE, Alpha Micro's 2780/3780 bisynchronous communications software • supports CP/M operating system • supports high-speed modem:

\$1,500 prch

**AM-300 Expansion Board** • provides 6 serial ports, cabling • for all models except AM-1000, 1000E:

833

**AM-330 Data Communications Controller** • optional communications controller for the Alpha Micro AM-100/L-based, S-100 bus configurations • includes 4-MHz Z80A microprocessor, 64K bytes of RAM, 4K bytes of EPROM, 2 serial I/O ports, telephone line connector and facilities for supporting low-speed modem and computer dialer • supports AlphaRJE, Alpha Micro's 2780/3780 bisynchronous communications software • supports CP/M operating system • supports high-speed modem through serial port:

1,500

**Mass Storage**

**Diskette Storage**

Floppy disk drives are available for the AM-1000 and AM-1000E only. Packages come with 0, 1, or 2 drives. See Packaged Systems for breakdown.

**Diskette Drive** • 5.25-inch floppy, double-sided, double-density, 800K-byte formatted, 150-millisecond average access time, 250K-bps transfer rate.

**Hard Disk Storage**

Disk size and storage capacity vary according to the model.

**AM-1000/AM-1000E** • 5.25-inch Winchester; 10M bytes/30M bytes formatted; 85-millisecond average access time; 5M-bit-per-second transfer rate • 1 included in certain packages; up to 3 additional subsystems may be connected.

Additional 10M-Byte Drive: \$3,541 prch

Additional 30M-Byte Drive: 6,333

**AM-1042E** • 8-inch Winchester; 60M bytes formatted; 45-millisecond average access time; 8.3-millisecond average latency; 800K-bps transfer rate • 1 included with the system; standard system can support 3 additional drives for a total of 240M bytes; more controller boards and drives can be added for maximum of 1.44G bytes:

10,000

**AM-1072** • 8-inch Winchester; 70M bytes formatted; 20-millisecond average access time; 8.3-millisecond average latency; 1.2M-byte-per-second transfer rate • 1 included with system; standard system can support 3 additional drives for a total of 280M bytes; second controller board and 4 more drives can be added for a maximum of 560M bytes:

13,335

**AM-1082** • dual 8-inch Winchesters; 140M bytes formatted; 20-millisecond average access time; 8.3-millisecond average latency; 1.2M-byte-per-second transfer rate • 2 drives included with system; standard system can support 2 additional drives for a total of 280M bytes; second controller board and 4 more drives can be added for a maximum of 560M bytes:

20,835

**AM-1092** • 10.5-inch Winchester; 400M bytes formatted; 18-millisecond average access time; 7.4-millisecond average latency; 1.86M-byte-per-second transfer rate • 1 included with system; standard system can support 3 additional drives for a total of 1.6G bytes; second controller board and 4 more drives can be added for a maximum of 3.2G bytes:

28,335

**Tape**

Certain models of the AM-1000 & AM-1000E come equipped with a video cassette recorder (VCR) interface permitting file-oriented data backup. The interface uses most commercially available VCRs without modification. One cassette tape can back up 100M bytes of data. AM-1042E and AM-1072 offer either a 20M-byte streamer tape or the VCR interface for data backup. AM-1082 and AM-1092 offer either 0.5-inch magnetic tape or VCR interface.

**Terminals/Workstations**

Alpha Micro offers the AM-60 Video Display Terminal for use with all of their systems. The AM-60 uses a standard EIA RS-232C interface and is ASCII asynchronous, TTY compatible.

**Display** • 12-inch diagonal, tilting, rotating, green phosphor, vertical/horizontal split screen • 80 characters x 24 lines plus 2 status lines • 128-character set including line drawing • 8x10 matrix in 10x11 cell with descenders • blink, underscore, blank, dim, reverse, all combinations.

**Keyboard** • detachable, typewriter-style • low profile • 105 keys, 16 function keys providing 32 possible functions, 8 are programmable • 14-key numeric pad, 5-key cursor control pad; 7 editing keys:

\$1,000 prch

**Printer/Graphics**

Alpha Micro offers a letter-quality printer for use with their systems.

**AM-302 Letter-Quality Printer** • up to 40 cps, 32 cps minimum • ASCII, 128-character set; 1344-character buffer • metalized and plastic printwheels, switch selection • scientific-, financial-, and international-type language fonts • standard ASCII Printer Interface (API); permits either serial or parallel communication:

\$2,750 prch

• END





# Altos 8-bit Systems 580-20 & 580-40

## ■ PROFILE

**Operating Systems** • MP/M-II from Digital Research, Inc., bundled; Oasis from Phase One Systems, Inc

**Data Management** • none available from Altos; file handling capabilities inherent in the operating systems

**Communications/Networks** • asynchronous communications; 2780/3780 bisynchronous communications; 3270/3276 cluster terminal controller/emulator

**Languages** • Altos Business BASIC II; CBASIC; CB-80; BASIC-80 (interpreter and compiler); COBOL-80; R/M COBOL; CIS COBOL; Pascal/MT+; FORTRAN-80

**Models** • 580-20, 580-40

**CPU** • 8-bit Zilog Z80 microprocessor

**Memory** • 192K bytes of RAM

**Chassis Slots** • no expansion slots

**Ports** • 4 serial ports, 1 parallel port standard

**Mass Storage** • 580-20: 1M-byte floppy drive, 19M to 39M bytes of hard disk storage • 580-40: 1M-byte floppy drive, 40M to 59M bytes of hard disk storage • both units 17M-byte tape cartridge

**Terminals/Workstations** • up to 3

**Printers** • none available from Altos

**First Delivery** • 1983

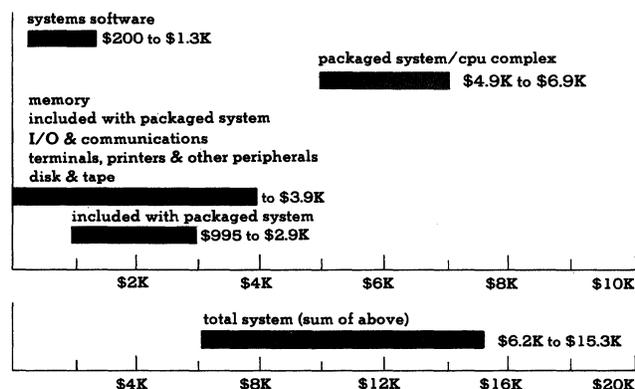
**Systems Delivered** • more than 30,000 8-bit and 16-bit systems

**Comparable Systems** • CompuPro, Cromemco, North Star



## PURCHASE PRICE RANGE

hardware & software ■■■■■



**ALTOS 8-BIT SYSTEMS PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing. • **SMALL SYSTEM** is based on Altos 580-20 packaged system (includes 8-bit CPU, 192K-byte RAM, 20M-byte Winchester, 1M-byte floppy drive, 4 serial ports, 1 parallel port, MP/M-II operating system) and the following options: CBASIC programming language, Altos II terminal • **LARGE SYSTEM** is based on Altos 580-40 packaged system (includes 8-bit CPU, 192K-byte RAM, 40M-byte Winchester, 1M-byte floppy drive, 4 serial ports, 1 parallel port, MP/M-II operating system) and the following options: CBASIC programming language, async and 2780/3780 communications, word processing and spreadsheet software, 20M-byte Winchester disk drive and 3 Altos II terminals.

Horizon, Onyx, Systems Group System 2900; any 8-bit multiuser systems in the \$7,000 to \$15,000 price range

**Vendor** • Altos Computer Systems; 2360 Bering Drive, San Jose, CA 95131 • 408-946-6700

**Canada** • Distributors: Paul Beaugrad; 1 Young Street, Suite 1801, Toronto, ON, M5E 1E5

**Distribution** • more than 1,000 dealers nationwide served through 14 distributors and 5 Altos regional sales offices: 8 primary international distributors; direct sales force selling to OEMs, major system houses, and large end users.

## ■ ANALYSIS

When Altos Computer Systems was formed in 1977, its goal was to design systems for the high-end of the micro marketplace rather than the low-end personal computer area. It was looking to produce systems that could handle business processing and communications functions that didn't need the full power of a mini, but yet weren't suitably handled by the smaller micro machines. Altos has obviously reached its goal, considering that it was shipping at an estimated rate of \$80 million a year in late 1982.

Altos manufacturers only its boards and terminals and acquires the rest of its components from other vendors. It



# Altos 8-bit Systems 580-20 & 580-40

uses standard chips like the Zilog Z80A and industry-standard operating systems to provide users with access to many commercially-available applications programs.

The ACS8000 was the company's first family of products. This line underwent several model changes—from floppy disk-based to hard disk-based, from single-user to multi-user environments. Following the ACS8000, Altos later introduced the 580-10 and the Series 5, systems which incorporated the newer 5.25-inch disk storage format. These were followed by the 580-20 and 580-40 which represent Altos' current 8-bit product line and which are covered in this report. In April 1982, Altos unveiled its 16-bit systems to provide more power to its users. These 16-bit systems are covered in a separate systems report.

### Strengths

Altos computer systems are known for their low-cost per user and their system reliability. Furthermore, they are flexible in their software coverage. Because the systems support 2 generic operating systems and 11 programming languages, they provide their users with capability of accessing a variety of "off-the-shelf" software. Altos has also made efforts to assist its users with its applications packages by offering them an on-screen "tutor".

The systems support a generous amount of disk storage—up to 60M bytes on the 580-40. Disk backup, a problem for many users, is addressed by the availability of a 17M-byte tape cartridge unit which plugs into the back of the system unit.

### Limitations

The systems come with 4 serial ports, 1 parallel port, and no other available slots. If you are a 3-user installation, have a modem attached to the fourth port, and a printer on the parallel port, then you are fully configured and have no room for expansion. If you want to run additional printers you will have to buy a terminal that has a printer port included. In short, the systems, if configured with the maximum users allowed, will not be able to handle future growth.

Having a partitioned memory for each user can be a nice feature because it avoids contention, but the resulting 48K bytes isn't all that much memory to work with. If small programs are being utilized, then there is no problem. But trying to run one of the COBOL or FORTRAN compilers that Altos offers will be a tight squeeze. Also, while these systems handle simultaneous users, 2 or more users cannot run the same program at the same time. The users can simultaneously run only individual applications.

## SOFTWARE

### Terms & Support

**Terms** • basic systems are bundled with MP/M-II • all other software is available for a one-time license fee.

**Support** • software support is handled by the dealers or OEMS • Altos technical support specialists are available via telephone.

### Software Overview

The Altos 8-bit systems run under the MP/M-II operating system and also under Oasis. Eleven programming languages are sup-

ported under MP/M-II as well as 3270 and 2780/3780 communications products, and accounting, word processing, and spreadsheet applications. Software for Oasis is available from third-party vendors only.

### Packaged Software

**Executive Financial Planner & Word Processor** • see individual application listings for descriptions:

\$495 lcms

### Operating Systems

**MP/M II** • bundled with systems • multi-user version of 8-bit CP/M; provides the same features and facilities found in CP/M, including the file management facilities, the basic text editor, the dynamic debugging tools and utilities, and a relocatable standard assembler • contains multiprogramming and multitasking capabilities; supports up to 16 terminals; contains a file-locking facility; priority-driven • developed by Digital Research.

**Oasis** • 8-bit multi-user version supporting up to 16 users in a timesharing, multitasking mode; provides file management support for direct, sequential, keyed and ISAM files; provides file locking and automatic record locking; logon password and privilege level security and dynamic user accounting maintain system-level control • supports program development in BASIC and macro assembler; includes JCL, BASIC interpreter and compiler, relocating macro assembler/debugger/linkage editor, and conversion programs • provides a HELP facility and descriptive error messages; Text Editor and Script Processor, which are line and character oriented • supports a library of over 250 business applications • developed by Phase One Systems, Inc:

\$850 lcms

### Utilities

The following utilities are all included with Macro-80, a relocatable macro assembler bundled with FORTRAN-80: Link-80, a linking loader; CREF-80, a cross-reference utility; and LIB-80, a library manager for building subroutine libraries. Oasis comes bundled with a relocatable macro assembler; a debugger; a linkage editor; and a text editor and script processor.

### Data Management

Altos does not provide any data management systems for its computers. These will have to be purchased from independent vendors. File handling capabilities are inherent in the operating systems.

### Communications/Networks

**ASYNCR** • Altos asynchronous communications package:

\$150 lcms

**SYNCR** • Altos 2780/3780 IBM bisynchronous package:

500

**Altos 3270/3276** • IBM cluster terminal controller/emulator:

750

### Program Development/Languages

**BI-280 Altos Business BASIC II** • BASIC interpreter; compatible with Business BASIC II • for MP/M only • developed by Control C Software, Inc.:

\$495 lcms

**CBASIC** • commercial derivation of the standard BASIC language; compiler/interpreter system • source code file in ASCII is created by the text editor and is compiled into an intermediate file composed of pseudo-code (P-code) instructions, a runtime monitor interprets the P-code instruction and performs the desired operation • CBASIC maintains real numbers in BCD floating-point format, retaining 14 significant digits; decimal arithmetic is fully

LCNS: license fee. NC: No charge. Prices effective December 1983.



## Altos 8-bit Systems 580-20 & 580-40

supported, as is integer arithmetic; other features include extended precision decimal arithmetic, expanded file processing, string processing, and a call-facility to allow for assembly code interface; upward compatible to the CB80 native code version of the language • CBASIC statements are free-form • for MP/M only • developed by Digital Research, Inc:

200

**CB-80** • a native mode, fast version of CBASIC • for MP/M only developed by Digital Research, Inc.:

500

**BASIC** • interpreter • meets requirements for ANSI subset standard • supports integer, string, single precision floating point, and double precision floating point; full PRINT USING for formatted output; trace facilities; error trapping; direct access to CPU I/O ports; read or write any memory location; extensive program editing facilities; automatic line number generation and renumbering; ability to call up 10 assembly language subroutines; matrices with up to 255 dimensions; IF/THEN/ELSE and nested IF/THEN/ELSE; Boolean operators; random and sequential disk files for MP/M only • developed by Microsoft:

350

**BASIC Compiler** • single pass compiler; supports most features of the latest release of Microsoft BASIC, also supports double precision transcendental functions • programs or subroutines written in COBOL-80, Macro-80, and FORTRAN-80 can be loaded and linked together with BASIC; provides formatted listing of the machine code • includes Macro-80, Link-80, BASLIB library, CREF-80, and LIB-80 utilities • for MP/M only • developed by Microsoft:

395

**Oasis Basic** • bundled with Oasis • interpreter/compiler and re-entrant run-time module • handles any valid system CSI level command; direct indexed file I/O; record lockout; ability to access the time and date routines; syntax checking done when data is entered:

NC

**COBOL-80** • exceeds ANSI requirements with a combination of Level 1 and Level 2 features • provides screen handling; program chaining; sequential, line sequential, relative, and indexed sequential file handling; segmentation; trace style debugging • includes Link-80, Macro-80, CREF-80, COBLIB library, LIB-80 utilities • for MP/M only • developed by Microsoft:

750

**R/M COBOL** • a high-level implementation of the ANSI-74 COBOL (X3.23-1974) standard • features include level 2 sequential, relative, and indexed file access methods; full arithmetic capability; standard DISPLAY and COMPUTATIONAL data-type support, extended to include binary as well as packed decimal; extended ACCEPT DISPLAY operations for CRT control; interactive debug at the source statement level; undermarked errors with self-explanatory messages; cross-reference listing; single pass compilation; segmentation at the source language level; and built-in security features for source language library control • developed by Ryan/McFarland:

750

**R/M COBOL Run-time Only:**

275

**CIS COBOL** • system for developing and executing ANSI-74 Standard COBOL programs; upward compatible with Level II COBOL • for MP/M only • developed by Digital Research:

850

**Pascal/MT+** • subset of ISO standard Pascal • native code compiler that generates code in a relocatable format for use with its linker; block structured • contains a linker; run-time support library; disassembler; debugger; and the SpeedProgramming Package including a screen-oriented text editor and interactive syntax checker • for MP/M only • marketed by Digital Research:

475

**FORTRAN-80** • contains full ANSI Standard FORTRAN (X3.9-1966) functions except the Complex data type • optimization features include common expression elimination; peephole optimization; constant folding; branch optimizations /fb includes Macro-80; Link-80; FORLIB library; LIB-80; CREF-80 utilities • for MP/M only • developed by Microsoft:

500

### Applications Packages

**Altos Executive Word Processor** • select word processing system marketed under the Altos label • uses simple mnemonic commands for word processing functions; contains a speller, an on-screen Help mode, and a program for merging a mailing list with text:

295 lcms

**Altos Executive Financial Planner** • Multiplan electronic spreadsheet marketed under the Altos label:

295

**Altos Accountant** • includes 7 modules plus the self-teaching Altos Computer Tutor business software tutorial and BI-280 Business BASIC • modules cover inventory, job costing, payroll, general ledger, accounts payable, accounts receivable, and sales order processing:

2,495

### Other Facilities

None available from Altos.

### ■ HARDWARE

#### Terms, Support & Documentation

**Terms** • hardware is available on a purchase-only basis • 90-day full parts and labor warranty.

**Support** • independent distributors and OEMs service and repair Altos systems and inventory spare parts; many dealers provide for warranty service, system installation and customer training; these services are supported by Altos' customer service and support operations • independent service agreements for installation, on-site service, and contract maintenance are available through the Customer Service Division of TRW.

**Documentation** • information not available from vendor.

#### Physical Specifications (H x W x D); Weight

**CPU** • 19 x 7 x 22 inches; information not available.

**Display** • 13 x 13.5 x 12.5 inches; 20 pounds.

**Keyboard** • 1.2 x 19.5 x 7.5 inches; 4 pounds.

#### Systems Overview & Configurability

The Altos 8-bit micro family is comprised of the 580-20 and the 580-40. The models are sold as "boxes," that is, component systems that include the CPU, memory, and disk storage all housed in one unit. Neither a keyboard nor a video display comes with the systems. Both models have an 800K baud networking port but products from sources other than Altos are needed to implement it.

The 580-20 and 580-40 are comparable units in that they both contain 192K bytes of RAM and 4 serial ports and one parallel port. Additionally, they both support 5.25-inch disk drives and are capable of handling up to 3 users. Their only difference is in the amount of hard disk storage they support. The 580-20 incorporates a 20M-byte Winchester and the 580-40 a 40M-byte Winchester. Both units can daisychain an additional drive of 20M bytes.

The Altos systems offer a partitioned memory to prevent contention and enable each user to run a different application at the same time. Each user is allocated a block of 48K bytes with the final 48K-byte block reserved for utility and operating system programs.

Neither Altos system has any I/O expansion slots or memory extension capabilities. The only expansion is in the disk storage and tape backup areas.



## Altos 8-bit Systems 580-20 & 580-40

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**580-20 System Maximums** • 8-bit CPU with 192K-byte memory; 3 terminals; 40M bytes of hard disk storage on 2 Winchester drives; 1M-byte floppy drive; 17M-byte tape cartridge.

**580-40 System Maximums** • 8-bit CPU with 192K-byte memory; 3 terminals; 60M bytes of hard disk storage on 2 Winchester drives; 1M-byte floppy drive; 17M-byte tape cartridge.

### Packaged Systems

**580-20** • 8-bit Z80A CPU; 192K-byte RAM, 4K-byte PROM; 1 integral 20M-byte Winchester drive; 1 integral 1M-byte floppy drive; 4 serial ports; 1 parallel port; MP/M II operating systems:

\$4,990 prch

**580-40** • same as 580-10 except with a 40M-byte Winchester:  
6,990

### CPUs

Both models utilize a Zilog Z80A 8-bit CPU. Support chips include peripheral interface (PIO), timer (CTC), and direct memory access (DMA) which provides daisy-chained vectored priority interrupt for the CPU.

**Zilog Z80A Processor** • 8-bit LSI microprocessor; 4MHz clock speed • upward-compatible with 8080A software but adds 50 instructions, including advance block-move and block-search macros.

### Memory

Each system comes with 192K bytes of dynamic RAM with parity checking and a 4K-byte PROM for initial loading. Each user has a partitioned block of 48K bytes; the final 48K bytes is reserved for utility and operating system programs.

### I/O & Communications

Both systems are based on a single printed circuit-board design and come with 4 RS-232C ports with programmable baud rates and one parallel port. One serial port can be configured for bisynchronous communications.

### Mass Storage

Both Altos systems are Winchester-based units capable of daisy-

PRCH: purchase price. Prices effective as of December 1983.

chaining one additional 20M-byte drive. They use a 1M-byte floppy to boot the systems and to serve as backup storage. An optional 17M-byte tape cartridge which plugs into the back of the units is also available for backup.

**580-20 Integral Hard Disk** • 5.25-inch Winchester; 19M bytes formatted; 85 milliseconds average access time • included with system.

**580-40 Integral Hard Disk** • 5.25-inch Winchester; 40M bytes formatted; 45 milliseconds average access time • included with system.

**Integral Floppy Drive** • 5.25-inch double-sided, double-density diskette; 1M-byte unformatted data capacity • included with systems.

**580-20 Upgrade Kit** • 5.25-inch Winchester; 19M bytes formatted:

\$3,990 prch

**MTU-6 Magnetic Tape Cartridge Backup Unit** • data capacity of 17M bytes unformatted:

2,995

### Terminals/Workstations

Up to 3 terminals are supported on the 580-20 and 580-40. Altos offers the Altos II Terminal for use with its systems. However, most terminals that connect to an RS-232C port can be attached to the units:

\$995 prch

### **Altos II Terminal**

**Display** • tiltable and rotatable; 14-inch green phosphor screen; horizontal and vertical split-screen capability; 50/60 Hz refresh rate; 128 ASCII character set; 3 graphics character sets; 800 x 325 pixel resolution; 24 lines x 80 columns or 40 lines x 132 columns, plus status line; speeds to 19.2K baud; local, block, half-duplex, full-duplex modes; auxiliary printer port; VT100 emulation.

**Keyboard** • detached; typewriter-style layout; 16 programmable function keys; numeric pad; 6 editing keys, 5 cursor keys.

### Printer/Graphics

None available from Altos. All systems come with a parallel printer port.

• END



# Altos 8086-Based Systems

## 586-20, 586-40 & 986-40

### ■ PROFILE

**Operating Systems** • XENIX from Microsoft; MP/M-86 from Digital Research

**Data Management** • Informix data base management system and C-Isam file manager from Relational Database Systems, Inc.

**Communications/Networks** • 3270/3276 emulation, 3780 bisynchronous communication • Altos WorkNet local area network

**Languages** • Altos Business BASIC III, CBASIC-16, CBASIC-86, MBASIC compiler, MBASIC-86, Microsoft COBOL, R/M COBOL, R/M COBOL run-time, CIS CIBOL, Level II CIS COBOL, Pascal/MT+, Pascal-86, FORTRAN-86, SOFTBOL compiler

**Models** • 586-20, 586-40, 986-40

**CPU** • 16-bit Intel 8086

**Memory** • 586—512K bytes to 1M byte • 986—1M byte

**Chassis Slots** • information not available

**Ports** • 586—6 serial ports expandable to 10 • 986—10 serial ports

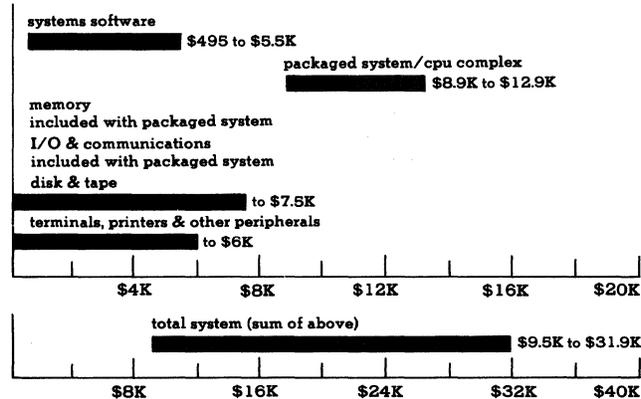
**Mass Storage** • 586-20: 19M bytes to 61M bytes of hard disk storage • 586-40, 986-40: 42M bytes to 84M bytes of hard disk storage • all models: 17M-byte magnetic tape cartridge, 1M-byte floppy disk drive

**Terminals/Workstations** • up to 9 on all models

**Printers** • serial printers supported on all models • none available from Altos



### PURCHASE PRICE RANGE hardware & software



**ALTOS 8086-BASED SYSTEMS PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on **S586-20 packaged system** (includes CPU, 512K-byte memory, 1M-byte diskette drive, 19M-byte Winchester drive, 6 serial I/O ports, Altos II terminal, cable, Xenix run-time operating system) and the following options: Altos Business BASIC • **LARGE SYSTEM** is based on **S986-40 packaged system** (includes CPU, 1M-byte of memory, 1M-byte diskette drive, 42M-byte Winchester drive; 10 serial ports, cable, Altos II terminal, Xenix run-time operating system) and the following options: Altos Business Solutions package, 2780/3780 and 3270 communications, and R/M COBOL run-time software; additional 42M-byte Winchester disk, 17M-byte tape backup; 5 additional Altos II terminals.

**First Delivery** • 1983

**Systems Delivered** • more than 2,500

**Comparable Systems** • Alpha Micro AM-1000, 1000 E, Cromemco, CompuPro, Onyx, Wicot 150

**Vendor** • Altos Computer Systems; 2360 Bering Drive, San Jose, CA 95131 • 408-946-6700

**Canada** • Distributors: Paul Beauregard; 1 Young Street, Suite 1801, Toronto, ONT, M5E 1E5

**Distribution** • more than 1,000 dealers nationwide served through 14 distributors and 5 Altos regional sales offices; 8 primary international distributors; direct sales force selling to OEMs, major system houses, and large end-users

### ■ ANALYSIS

Altos Computer Systems entered the high end of the micro-computer marketplace in 1977 with the intention of designing systems that would bridge the gap between minicomputers and the smaller, less powerful micro machines. Their first system entry was an 8-bit system that utilized the CP/M operating system and 8-inch disks. These systems eventually evolved into Altos' present 8-bit product line—the 580-20 and 580-40—which employ MP/M-II and 5.25-inch drives.



## Altos 8086-Based Systems 586-20, 586-40 & 986-40

**TABLE 1: MODEL DIFFERENCES**

	586-20	586-40	986-40
<b>CPU</b>			
Main CPU	8086	8086	8086
Auxiliary CPUs	Z80, 8089	Z80, 8089	2 Z80s, 8089
<b>MEMORY</b>			
Minimum	512K	512K	1M
Maximum	1M	1M	—
<b>NUMBER OF USERS</b>	5 expandable to 9	5 expandable to 9	up to 9
<b>SERIAL PORTS</b>			
Standard	6	6	10
Optional	4	4	—
<b>HARD DISK CAPACITY</b>			
Standard	19M bytes	42M bytes	42M bytes
Optional	42M bytes	42M bytes	42M bytes

In April 1982, Altos unveiled its 16-bit systems to provide more power to its users. Included in this category are the Intel-based ACS8600 Series which Altos now markets on a limited basis, and their present mainstream products, the 586 and 986 which are covered in this report. Altos also sells a Motorola-based system, the ACS68000. However, because this system is sold only to OEMs, it is not covered in our microcomputer reports.

With the introduction of its 16-bit products, Altos began a process of repositioning its distributors and dealers, estimating that approximately 70 percent of their business for fiscal 1984 will be generated by these systems. The company has also made a Commitment to supporting Xenix, a version of the Unix operating system. Altos feels that Unix will be the operating system in a multi-user environment. To back up this sentiment, Altos is expending considerable effort to make Unix/Xenix software more accessible to and effective for its end-users.

The 586 and 986 systems are positioned on the high end of the scale in the micro marketplace but they are not at the supermicro level as far as power, storage capacity, or memory capacity. They compete primarily in the low end of the 16-bit multi-user arena, with such products as the Fortune 32:16, the Alpha Micro AM-1000, and the Compu-Pro systems to name a few. Also, since they introduced their DIBOL compiler, Altos feels they are in direct competition with several DEC minicomputer systems specifically the PDP-8, PDP-11/23, and PDP-11/44. Altos also stated that applications running under the Pick operating system will run on their 8086-based systems, thereby allowing Altos to compete for market share with Prime, ADDS Mentor, Microdata Reality and the Honeywell Level 6.

Altos competitiveness in the mini market needs to be qualified. These 8086-based systems can compete only with small configurations of the low-end mini lines mentioned (systems that configure around 6 users). For example, they cannot compete with larger PDP-11/44 configurations. These systems can handle more than 25 users, 4M bytes of memory, and 1.2G bytes of disk storage. Keep this in mind if you are shopping for a system.

**Strengths**

Low cost per user and system reliability are common traits of Altos systems. The 586 and 986 are also fast machines. They contain a Z80 processor which is dedicated to I/O tasks and provide DMA (direct memory access) for the hard disks. These features enable the 8086 to process at 10 MHz without getting involved with I/O tasks and disk accesses.

Software flexibility is another system attraction. The systems will run under 4 different operating systems, support 14 different languages, plus a relational DBMS, and 2780/3780 and 3270 communications. The Altos Business Shell is also a nice feature, providing users with a friendlier access to Xenix.

**Limitations**

For systems that are supposed to handle up to 9 users these Altos products do not offer very much memory, unless the users are doing strictly data entry and transaction processing. Trying to spread 1M-byte RAM over 9 users and XENIX will leave approximately 100K bytes per user, maybe even less. With only 3 or 4 users on the systems, however, this shouldn't be a problem. The memory is not partitioned, so users won't be locked into a limited amount. Program development could be a problem though, because a lot of memory is needed, especially for something like a COBOL compiler.

**SOFTWARE**

**Terms & Support**

**Terms** • available for a one-time license fee • warranty on products varies according to the vendor.

**Support** • products supported by Altos include XENIX, XENIX-based languages, and Altos labeled XENIX-based applications; other products available through ASAP (Altos Software Availability Program) are supported by the specific vendors • Altos support consists of telephone support to distributors and dealers.

**Software Overview**

The Altos 586 is primarily a XENIX-based machine, although it will also run under MP/M-86, Oasis-16 and the Pick operating system. A user has a choice of 14 different languages, plus access to a relational DBMS, 2780/3780 and 3270 communications, a local



## Altos 8086-Based Systems

### 586-20, 586-40 & 986-40

area network, a word processor, an electronic spreadsheet, and a complete accounting system, all available and supported by Altos.

In order to ensure that sufficient XENIX-based software is available for its 16-bit systems, Altos provides a software subscription service for its dealers and distributors called ASAP (Altos Software Availability Program). Through ASAP, Altos offers a variety of Altos-evaluated applications. The program also provides assistance to application software developers in the form of technical support and by supplying hardware, programming languages, and XENIX. Additionally, Altos conducts regional training sessions for dealers on the Xenix applications. All software in the ASAP service retains the software manufacturers labels and is warranted and supported by them.

#### Packaged Software

Descriptions of the products presented below can be found in their various categories throughout the Software section.

**Altos Accountant** • includes a 7 module accounting system covering Accounts Payable, Accounts Receivable, General Ledger, Payroll, Order Processing, Job Cost, and Inventory, plus Altos Business BASIC III and Computer Tutor:

\$2,995 lcms

**ABS-86 Altos Business Solutions** • includes Altos Accountant package plus Executive Word Processor and Financial Planner, XENIX extended utilities, and Altos Business Shell:

3,990

**Executive Financial Planner & Word Processor** • includes Multiplan spreadsheet and Horizon word processor:

495

#### Operating Systems

Altos offers its users' a choice of 2 operating systems—MP/M-86 or XENIX.

The XENIX operating system is a version of AT&T's UNIX Operating System enhanced by Altos and Microsoft for commercial use. It contains 6 categories of software grouped together in one integrated package. The operating system portion handles tree structured directory hierarchies, device independent I/O, tree structured process hierarchies, and a user space command language. The system includes a full "C" compiler plus related language utilities such as general purpose macro processor, an LR (1) based computer system (YACC), and a lexical analyzer (LEX). The text processing capabilities provide an interactive content editor, a text processing and typesetting program, a manuscript layout package, and a mathematical formula pre-processor. Various programs that compare, sort merge, scan, and translate files are incorporated into XENIX as well as graphics and formatting capabilities and miscellaneous utilities such as electronic mail and a calendar.

The XENIX software is offered by Altos as a Runtime System or a Development System. The Runtime System is designed to allow the user access to applications programs and basic utilities without having extensive computer knowledge. The Development System contains all runtime system features plus programming development capabilities and additional and extended utilities. The Runtime System can be upgraded to the Development System by adding the Extended Utilities Upgrade package.

**XENIX Runtime** • includes Altos Business Shell for making commonly-used XENIX commands and applications programs easily accessible to non-technical users; Bourne Shell programming using shell scripts; System Administrator capabilities for controlling access to program and data facilities; UNIX mail capabilities; Wall feature for sending messages to all logged in users; Who feature for identifying who is logged into the system; date capability; disable/enable TTY lines; ED-Unix line editor; serial line printer capabilities; support for WorkNet and Ethernet:

\$995 lcms

**XENIX Development System** • includes all XENIX Runtime features plus C compiler programming capability; FORTRAN 77 compiler programming capability; Learn, a tutor for the UNIX operating system; extended System Administrator facilities; development modules such as ADB debugger, full screen editor, and

text formatter; extended Berkeley termcaps; async communications between systems; Berkeley utilities such as WHATIS and WHEREIS; games and quizzes:

1,995

**XENIX Extended Utilities Upgrade** • for upgrading the runtime system to the Development System • includes full development utilities minus runtime features:

1,000

**MP/M-86** • multiuser, multitasking operating system; upward compatible with single-user CP/M-86 system and with the 8-bit CP/M operating environment; provides multiprogramming capabilities with record and file locking capabilities; protection is based on user ID and password construction • features file handling, text editing, and an assembler program; real-time date and time stamping is supported; up to 8 partitions can be structured based on the amount of available memory; the I/O handling module can be tailored to meet individual user environments:

650

#### Utilities

The only utilities available from Altos are those included with the operating systems.

#### Data Management

Data Management software supported by Altos includes the Informix relational database manager and the C-ISAM file manager. Additionally, IDOL DBMS from Science Management Corporation and Unify RDBMS from Unify Corporation are available through Altos' ASAP.

**Informix** • relational database management system • provides menu-driven user interface; Informer non-procedural, interactive query language; Perform custom-screen generator; dynamic database restructuring; audit trail and recovery routines; ACE non-procedural report writer; wild card matching symbols for generic retrievals; optimized B tree access method; security at both field and file level; 9 data types—integer, long, float, double, character, serial, composite, date, money • maximum size of a field and length of any record is 2,048 bytes; maximum of 8 database files may be updated by a single Perform screen • requires maximum memory of 128K bytes; Xenix version 1.0 or higher, either runtime or development system • developed by Relational Database Systems:

\$995 lcms

**C-ISAM** • index file handling utility • requires XENIX version 1.0 or higher • developed by Relational Database Systems, Inc:

450

#### Communications/Networks

Altos offers 3270 and 2780/3780 software communications on its XENIX-based systems plus WorkNet a local area network software written by Altos.

**SYNC** • Altos 2780/3780 IBM bisynchronous package:

\$500 lcms

**Altos 3270/3276** • IBM cluster terminal controller/emulator:

750

**WorkNet** • links up to 30 Altos XENIX-based systems up to a maximum distance of 500 feet using twisted-pair cable • provides both transparent remote file access and remote processor execution • makes all disks on the network appear as a single file system; adheres to all XENIX and application level security • allows Altos computers to act as either multiterminal clusters or as shared network servers without user terminals; servers can be used for storing frequently accessed files or for sharing peripherals; servers may be multi-functional or dedicated • supports up to 38 CPUs; written in "C"; transmits at up to 800K bps • utilizes RS-422 hardware port; requires XENIX Revision 2.3 or above, Comm-1 Cabling Kit:

250

**LCNS: one-time license fee. Prices effective as of December 1983.**



# Altos 8086-Based Systems

## 586-20, 586-40 & 986-40

### □ Program Development/Languages

**Altos Business BASIC III** • SMC Thoroughbred BASIC marketed under the Altos label • enhancement of Dartmouth BASIC to include business-oriented functions • features include numeric array provisions; substring specifications; ability to define new user functions; nonexecuted comment statements; program overlays; B-tree file structure; and file restoration capabilities • requires XENIX runtime version 2.3 or higher:

\_\_\_\_\_ \$495 lincs

**CBASIC-86** • commercial derivative of the standard BASIC language; compiler/interpreter system • compiles source code file created by a text editor or word processor into an intermediate file composed as pseudo-code (p-code) instructions • runtime monitor interprets the p-code directives and performs the operation • features extended precision decimal arithmetic, expanded file processing, comprehensive string processing, assembly code interface, debugging capabilities, and cross-reference lister • runs under MP/M-86:

\_\_\_\_\_ 600

**CBASIC-16** • same as CBASIC-86 except runs under XENIX:

\_\_\_\_\_ 750

**Microsoft BASIC Compiler** • single pass compiler; supports almost all features of the latest release of Microsoft BASIC; also supports double precision transcendental functions • programs or subroutines written in FORTRAN can be loaded and linked together with BASIC; provides formatted listing of the machine code • runs under Xenix:

\_\_\_\_\_ 750

**Microsoft BASIC-86** • allows calling of machine language subroutines, merging of multiple programs, and transferring control to specific program lines during certain events; IF THEN/ELSE constructs are supported as well as trace/notrace for easier debugging • screen editor implements special function keys and multi-statement lines • runs under MP/M-86 and Xenix.

BASIC-86 Running Under MP/M-86:

\_\_\_\_\_ 600

BASIC-86 Running Under XENIX:

\_\_\_\_\_ 500

**Microsoft COBOL** • exceeds ANSI requirements with a combination of Level 1 and Level 2 features • provides screen handling; program chaining; sequential, line sequential, relative, and indexed sequential file handling; segmentation; trace style debugging • includes Link, Macro, CREF, COBLIB library, LIB utilities • runs under Xenix:

\_\_\_\_\_ 750

**R/M COBOL** • a high-level implementation of the ANSI-74 COBOL (X3.23-1974) standard • features include Level 2 sequential relative and indexed file access methods; full arithmetic capability; standard DISPLAY and COMPUTATIONAL data-type support, extended to include binary as well as packed decimal; extended ACCEPT DISPLAY operations for CRT control; interactive debug at the source statement level; undermarked errors with self-explanatory messages; cross-reference listing; single pass compilation; segmentation at the source language level; and built-in security features for source language library control • runs under MP/M-86 and Xenix • developed by Ryan/McFarland:

\_\_\_\_\_ 750

**R/M COBOL Runtime Only** • runs under MP/M-86 and Xenix:

\_\_\_\_\_ 275

**CIS COBOL** • system for developing and executing ANSI-74 Standard COBOL programs; upward compatible with Level II COBOL • runs under MP/M-86 • marketed by Digital Research:

\_\_\_\_\_ 850

**Level II CIS COBOL** • single-pass COBOL compiler and runtime system providing mainframe-to-level II compiling for ANSI 74 COBOL programs • implements ANSI X3.23 1974 COBOL to Federal High Level plus interactive screen handling, line sequential-compressed output; and external file names and pro-

gram names run-time specifications • GSA certification • includes the capability of loading independent segments (overlays) and CALLED subprograms dynamically from disk • developed by Micro Focus:

\_\_\_\_\_ 1,600

**Microsoft FORTRAN-86** • implementation of FORTRAN-77; meets 1977 ANSI standard requirements at the subset level • supports Intel 8087 floating point coprocessor; handles double-precision calculations to 14 digits; uses IEEE standard floating-point arithmetic; provides several precision levels for integers and logicals; supports interactive application programs • permits modules written in 8086 macro assembly language, MS Pascal, and MS FORTRAN to be linked together into one program • runs under MP/M-86 and XENIX:

\_\_\_\_\_ 750

**Pascal/MT+** • subset of ISO standard Pascal • native code compiler that generates code in a relocatable format for use with its linker; block structured • contains a linker; runtime support library; disassembler; debugger; and the SpeedProgramming Package including a screen-oriented text editor and interactive syntax checker • marketed by Digital Research:

\_\_\_\_\_ 600

**Microsoft Pascal-86** • generally conforms to ISO proposed standard (level 0) • generates native machine code; provides low level escapes to the machine level; supports 8087 coprocessor and provides 8087-emulation software if the system does not have an 8087 chip • allows modules written in 8086 macro assembly language, MS-FORTRAN, and MS Pascal to be linked together • offers program development features such as: address types, constants and function of ARRAY and RECORD types, SUPER ARRAYS, control flow features, separately compiled UNITS, variable length strings • runs under MP/M-86 and XENIX:

\_\_\_\_\_ 750

**SOFTBOL Compiler** • DIBOL II compatible language with features of multi-user CTS-300; fully compatible with single-user SOFTBOL II under CP/M, CP/M-86, and MS-DOS • consists of a compiler, runtime system sort package, and various DIBOL-related utilities • allows conditional compilation and nested INCLUDE files; compiler can process up to 7 SOFTBOL programs together, generating an assembly language program • external subroutines can be linked with the main program, with full COMMON areas and parameter passing supported; both overlaid and non-overlaid external subroutines are supported • employs a self-balancing B-tree and features enhanced support of ISAM files, including automatic reorganization of indices; SORT is programmed into the systems language, "C", with some sections in assembler • requires XENIX runtime version 2.3 or higher:

\_\_\_\_\_ 400

### □ Applications Packages

The Altos Accountant includes 7 modules which can be purchased separately. All require the XENIX Runtime system version 1.0 or higher, Altos Business BASIC III, 63K bytes of RAM plus 7K bytes per user, and 132 column printer. Disk storage will vary according to the module.

**Altos Accountant—Accounts Payable** • provides for automated or manual check processing; processes prepaid invoices and installment payments; offers password protection at 4 levels; generates cash flow reports and a vendor analysis • optionally interfaces to Altos Accountant Inventory, General Ledger, and Job Cost modules • requires 250K bytes of disk storage space for programs:

\_\_\_\_\_ \$650 lincs

**Altos Accountant—Accounts Receivable** • provides for open item and balance forward accounts; allows partial or complete payments to specific invoices; offers a cash sales option; provides password protection at 4 levels; maintains tables of variable parameters such as terms and finance charge rates; generates sales journal, miscellaneous credits journal, cash receipts journal, aged trial balance report, cash flow report, customer analysis report, and sales analysis detail report • optionally interfaces to the Altos Accountant Inventory, Job Cost, General Ledger, and Sales



## Altos 8086-Based Systems

### 586-20, 586-40 & 986-40

Order Processing modules • requires 340K bytes of disk storage space for programs:

650

**Altos Accountant—General Ledger** • maintains this year, last year and budget figures for each account; provides both budgetary and historical comparison on statements; provides password protection at 3 levels; generates journal report, general ledger and activity report; trial balance; and balance sheet and income statements • optionally interfaces with the Altos Accountant Accounts Payable, Accounts Receivable, Payroll, and Job Cost Modules • requires 210K bytes of disk storage space for programs:

650

**Altos Accountant—Payroll** • processes regular, overtime and doubletime for hourly employees; salary pay for salaried employees; piecework; tips; sick days and vacation days; 6 standard and 5 miscellaneous deductions; 5 taxable and/or nontaxable other pays; option for forced federal, state, and local withholding; multiple rates and states • generates department report, quarterly unemployment report, quarterly withholding report, sick leave and vacation report, employee list, W-2 form, 941-A report • optionally interfaces to Altos Accountant General Ledger and Job Cost modules • requires 376K bytes of disk storage space for programs:

650

**Altos Accountant—Sales Order Processing** • processes orders automatically from order entry through packing, verification and invoicing; offers a cash sales option; allows for open item and balance forward accounts; provides password protection at 5 levels; generates open order report, sales journal, miscellaneous credits journal, cash receipts journal, open invoices, aged trial balance, cash flow report, customer statements, sales history report, customer analysis, and customer list • optionally interfaces with Altos Accountant Accounts Receivable module • requires 150K bytes of disk storage space for programs:

650

**Altos Accountant—Job Cost** • compares the estimates to the actual costs of a job or job phase; includes variance analysis; provides password protection at 2 levels; generates job listing, cost detail report, job profitability report, billing summary report, overhead allocation report • optionally interfaces to Altos Accountant Accounts Receivable, Payroll, General Ledger, and Accounts Payable modules • requires 160K bytes of disk storage for programs:

650

**Altos Accountant—Inventory** • handles valuation by LIFO, FIFO and average cost methods; provides alternate part numbers for multiple location references; offers multiple pricing structures; maintains on hand, on order, and committed balances; provides password protection at 2 levels; generates status report, alert report, evaluation report, detail list, sales analysis, and price list • optionally interfaces to the Altos Accountant Accounts Receivable, Accounts Payable, and Sales Order Processing modules • requires 140K bytes of disk storage for programs:

650

**Altos Executive Word Processor** • Horizon word processing package marketed under the Altos label • offers global search and replace; cut and paste capabilities; block move and copy; Help mode; imbedded formatting commands; editing of 2 files on-screen at the same time • requires XENIX Runtime version 1.0 or higher, 37K bytes of RAM plus 6K bytes per user, 850K bytes of disk storage:

295

**Altos Executive Financial Planner** • Multiplan electronic spreadsheet marketed under the Altos label • handles 63 columns by 255 rows; allows up to 8 separate windows on the screen at one time • computes arithmetic trigonometric, conditional functions, table functions, financial functions, and statistical functions • requires XENIX Runtime version 1.0 or higher, 60K bytes of RAM plus 1.5K bytes per user, 285K bytes of disk storage for programs:

295

#### Other Facilities

**Computer Tutor** • self-teaching, on-screen business software tutorial for learning how to use the Altos Accountant modules •

included with Altos Accountant.

#### ■ HARDWARE

##### Terms, Support & Documentation

**Terms** • available on a purchase-only basis • 90 day warranty on parts and labor.

**Support** • independent distributors and OEMs service and repair Altos systems and inventory spare parts; many dealers provide for warranty service, system installation and customer training; these services are supported by Altos' customer service and support operations • independent service agreements for installation, on-site service, and contract maintenance are available through the Customer Service Division of TRW.

**Documentation** • Operator's Guide, Diagnostics programs manual, Introduction to XENIX included with system.

##### Physical Specifications (H x W x D); Weight

**CPU** • 6 x 16.8 x 18 inches; 33 pounds

**Display** • 13 x 13.5 x 12.5 inches; 20 pounds

**Keyboard** • 1.2 x 19.5 x 7.5 inches; 4 pounds

##### Systems Overview & Configurability

Both the Altos 586 and the Altos 986 are multiuser systems that employ an Intel 8086 microprocessor as the main CPU. Additionally, they also provide a Z80, an 8089, and a real time clock on the main board. However, the real-time clock does not interface with XENIX, so whenever the system is booted the time and date will have to be entered. The Z80 handles serial I/O functions, floppy disk accesses, and an RS-422 local area network port. The 8089 is used as an intelligent disk and tape controller. Other standard features include a power fail detection capability and a proprietary memory management unit. The 586 also provides a socket for holding an additional 512K-byte memory board.

The 586 consists of 2 models which differ only in the amount of disk storage they can support. The 586-20 comes standard with a 19M-byte Winchester while the 586-40 comes standard with a 42M-byte Winchester.

The 986 is an upscaled version of the 586. It comes standard with double the memory and 10 serial ports, 4 more than the 586. It also provides 2 Z80s for handling I/O; the 586 has only one. Standard disk storage is a 42M-byte Winchester.

All models include an Altos II terminal in the base system price and all models can add an additional 42M-byte drive and a 17M-byte cartridge tape for backup. The Altos WorkNet local area network option will operate under XENIX on all the units.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**S586-20 System Maximums** • 1M-byte RAM; 1M-byte floppy disk drive; 1 19M-byte and 1 42M-byte Winchester drive; 17M-byte tape cartridge unit; 9 Altos II terminals each with its own printer port; 1 open serial port for communications or printer.

**S586-40 System Maximums** • 1M-byte RAM; 1M-byte floppy disk drive; 2 42M-byte Winchester drives; 17M-byte tape cartridge unit; 9 Altos II terminals, each with its own printer port; 1 open serial port for communications or printer.

**S986-40 System Maximums** • 1M-byte floppy disk drive; 2 42M-byte Winchester drives; 17M-byte tape cartridge unit; 9 Altos II terminals, each with its own printer port; 1 open serial port for communications or printer.

##### Packaged Systems

**S586-20** • 16-bit Intel 8086 CPU, 512K bytes of memory, 1M-byte floppy disk drive, 19M-byte Winchester drive, 6 serial I/O ports, Altos II terminal, 10-foot cable, XENIX runtime operating systems:

\$8,990 prch

*PRCH: purchase price. Prices effective as of December 1983.*



# Altos 8086-Based Systems

## 586-20, 586-40 & 986-40

**S586-40** • same as 586-20 except with a 42M-byte Winchester drive:

10,990

**S986-40** • 16-bit Intel 8086 CPU, 1M-byte memory, 1M-byte floppy disk drive, 42M-byte Winchester drive, 10 serial I/O ports, Altos II terminal 10-foot cable, XENIX runtime operating system:

12,990

### CPU

**Intel 8086 Processor** • 16-bit data bus interface, 16-bit internal architecture; direct addressing to 1M-byte memory • 16-bit register set with symmetrical operations, 24 operand addressing modes; 8-bit and 16-bit signed and unsigned arithmetic with binary and decimal operands • software compatible with 8088.

**Memory Management Unit** • built with programmable arrayed logic and RAM circuitry around the CPU • provides for a user mode and a system mode; sets bound registers for user mode • divides memory into 4K-byte blocks; each block can be scattered throughout memory (noncontiguous) • provides write and access protection.

### Memory

**586 Standard Memory** • 512K bytes of parity-checking RAM; expandable to 1M-byte; 375-nanosecond cycle time.

**986 Standard Memory** • 1M-byte of parity-checking RAM; 375-nanosecond cycle time.

**RAM U/K-2** • 512K-byte additional RAM • for 586 only: \$1,990 prch

### I/O & Communications

The 586 comes standard with 6 serial RS-232C ports while the 986 has 10. One port is configurable to RS-422 800K baud for supporting the WorkNet local area network; 2 ports are configurable for bisynchronous communications. All serial ports utilize 380 S10 ships. An expansion capability for adding 4 more serial ports to the 586 is also available.

**RS-232C Interface** • programmable baud rates to 19,200 bps; full-duplex.

**SPE-1 Serial Port Expansion Board** • includes 4 RS-232C ports • for 586 only: \$850 prch

**WorkNet** • for Altos-to-Altos high-speed networking • uses RS422 twisted pair operating at 800K bps; 500 feet on twisted-pair link; links up to 30 XENIX-based Altos computers; CSMA operation; multidrop bus architecture • hardware for establishing this network is included in the Comm-1 Cabling Kit • for more information on the software see Communications Network Software section.

**Comm-1** • includes 50-foot twisted-pair cable; 2 terminators; 2 T-

connectors • required for every 2 computers:

150

### Mass Storage

Both the 586 and 986 are Winchester-based systems that come standard with one hard disk and are capable of daisy chaining one additional. Additionally, they both use a floppy drive to boot the system. Magnetic tape is available to back up the hard disk. It is optional and plugs into a connector on the back of the units.

**Integral Floppy Disk Drive** • 5.25-inch double-sided, double-density diskette; 1M-byte unformatted; 132 milliseconds average access time; 250K bps data transfer rate; 96 tracks per inch.

**586-20 Integral Hard Disk Drive** • 5.25-inch Winchester; 19M bytes unformatted; 85 milliseconds average access time.

**586-40/986-40 Integral Hard Disk Drive** • 5.25-inch Winchester drive; 42M bytes unformatted, 33M bytes formatted; 45 milliseconds average access time; 5M bps data transfer rate.

**U/K-40-86 Add-on Hard Disk** • 5.25-inch Winchester; 42M bytes unformatted: \$4,490 prch

**MTU-4 Magnetic Tape Unit** • data capacity of 17M bytes unformatted: 2,995

### Terminals/Workstations

The Altos 586 is capable of supporting from 5 to 9 users; the Altos 986 can handle up to 9. Altos offers the Altos II Terminal for use with its systems and includes one with each unit. However, most terminals that connect to an RS-232C port can be attached to the units.

#### Altos II Terminal

**Display** • tiltable and rotatable; 14-inch green phosphor screen; horizontal and vertical split-screen capability; 50/60 Hz refresh rate; 128 ASCII character set; 3 graphics character sets; 800 x 325 resolution; 24 lines x 80 columns or 40 lines x 132 columns, 25th status line; speeds to 19.2K baud; local, block, half-duplex, full-duplex modes; auxiliary printer port: \$1,200 prch

**Keyboard** • detached; typewriter-style layout; 16 programmable function keys; numeric pad; 6 editing keys, 5 cursor keys.

### Printer/Graphics

None available from Altos. The systems will support serial printers available from third-party vendors.

• END



# Apple IIe & Apple III Plus Computer Systems

## ■ PROFILE

**Operating Systems** • single-user interactive processing in standalone environments supported by monitors in read-only memory for basic Apple IIe; by Disk Operating System (DOS), Pascal Operating System (POS), or ProDOS for diskette-based Apple IIe; by Sophisticated Operating System (SOS) for Apple III Plus; and by CP/M 2.2 for the Apple III Plus via an optional Z80 Softcard

**Data Management** • Apple IIe and Apple III Plus data management software include the Quick File file management system and Apple File III on the Apple III Plus

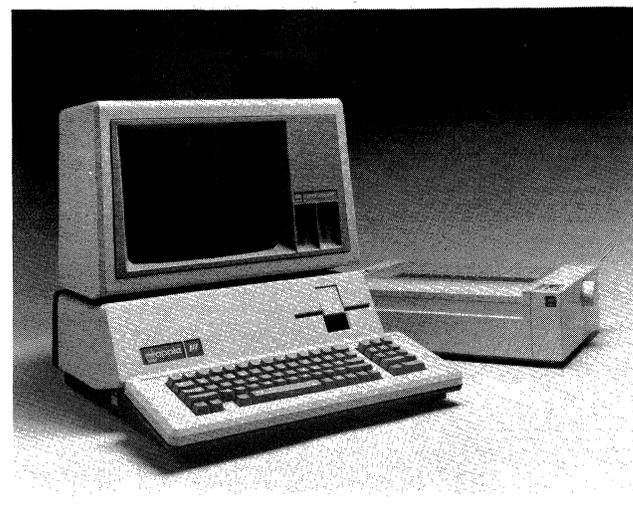
**Communications/Networks** • communications software for the Apple IIe supports access to timesharing systems, networks, and newswires; communications software for the Apple III Plus includes a combination file transfer and terminal emulation utility • IBM 3270 emulation is scheduled for first quarter of 1984

**Languages** • interpreter BASIC standard on all models; Applesoft BASIC with floating point on Apple IIe; • Pascal, FORTRAN, PILOT, and LOGO optional on Apple IIe; Business BASIC, COBOL, and Pascal languages optional on the Apple III Plus

**Models** • Apple IIe 8-bit 6502A-based system and Apple III Plus 8-bit 6502B-based system • high-end Apple III Plus features emulation mode for software compatibility with former Apple II and II Plus

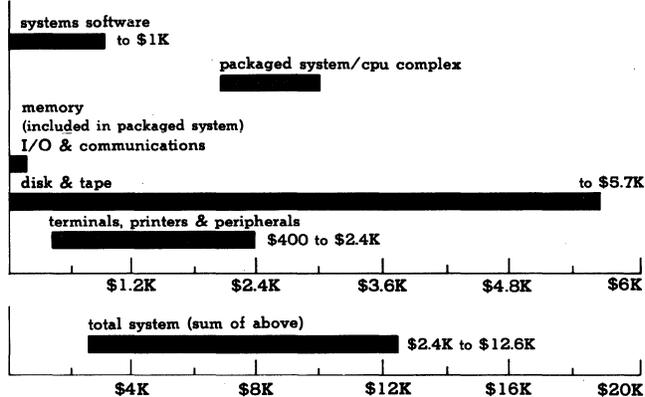
**Chassis Slots** • Apple IIe provides 7 available I/O expansion slots and 1 memory expansion slot • Apple III Plus provides 4 expansion slots available for I/O expansion

**Ports** • the Apple III Plus provides 1 RS-232C port



## PURCHASE PRICE RANGE

hardware & software



**APPLE IIe & APPLE III PLUS PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on Apple IIe Starter System packaged system (includes operating system and language, CPU, 64K-byte RAM, 16K-byte ROM, interfaces, and keyboard) and the following options: 1 diskette drive, 12-inch monitor, and thermal printer • **LARGE SYSTEM** is based on Apple III Plus packaged system (includes operating system and language, CPU, 256K-byte RAM, 4K-byte ROM, clock/calendar, interfaces, integral diskette drive with 4-drive controller, and keyboard) and the following options: Business BASIC and Pascal languages and utilities, Access III Plus communications software, word processing system, VisiCalc, CP/M Softcard, parallel interface card, 2 ProFile 5M-byte hard disks, 3 additional diskette drives, 12-inch monitor, and letter-quality printer • pricing reflects Apple-provided products only.

**Memory** • 64K- to 128K-byte programmable main memory and 16K-byte monitor/language read-only memory on the Apple IIe; 256K-byte programmable main memory and 4K-byte diagnostic/self-test read-only memory on the Apple III Plus

**Mass Storage** • up to 3 2-drive diskette subsystems for a maximum capacity of 840K bytes on the Apple IIe; standard integrated diskette controller and 140K-byte drive on Apple III Plus; up to 3 additional 140K-byte drives available for a maximum capacity of 560K-byte diskette storage; up to 4 optional hard disk systems for a maximum Winchester disk capacity of 20M bytes on the Apple III Plus

**Terminals/Workstations** • single-terminal systems using typewriter-style keyboard and separately available color/B&W display for operator interaction

**Printers** • 1 printer typically on all models; printers available from Apple include matrix thermal, matrix impact, and daisywheel units

**First Delivery** • Apple II and II Plus introduced in 1977; Apple III introduced in 1980; Apple IIe introduced in 1983; Apple III Plus introduced in 1983

**Systems Delivered** • over 1,000,000 Apple II, Apple II Plus, and Apple III Plus systems delivered

**Comparable Systems** • Apple IIe primarily competes with Atari, Basis, Commodore, Franklin, and Radio Shack; Apple III Plus primarily competes with Cromemco, Hewlett-Packard, IBM, Radio Shack, and other business/professional personal computers

**Vendor** • Apple Computer, Inc; 20525 Mariani Avenue, Cupertino, CA 95014 • 408-996-1010

**Canada** • Apple Canada, Inc; 875 Don Mills Road, Don Mills, ONT M3C 1V9 • 416-444-2531

**Distribution** • over 3,300 dealers worldwide; over 1,000 dealers are authorized service centers

## ■ ANALYSIS

In 1977, a small start-up company called Apple Computer



## Apple IIe & Apple III Plus Computer Systems

introduced a new hobbyist/home computer called the Apple II. This small computer turned out to be the beginning of a new technological era—the era of the microcomputer system. Apple's success with the Apple II is quite obvious considering there are more than 1,000,000 systems installed. However, the design and technology of the system was becoming outdated as compared to the fast pace with which the marketplace was changing. Even though the Apple II has undergone 13 revisions since its introduction, it was still time for a change. Enter Apple IIe, successor to the Apple II and II Plus.

How much of a change does the IIe represent over its older family members? Obvious changes include a totally redesigned keyboard similar to the Apple III Plus but without a numeric pad; upper- and lowercase display characters; a full 64K-byte RAM; 16K-byte ROM containing Applesoft BASIC, system software to control the IIe's enhancements, and extended memory management routines; and the capability of adding another 64K bytes of RAM with its own memory management unit. All of these enhancements are included with the IIe which comes with a price tag comparable to the old Apple II Plus system.

Not-so-obvious changes have occurred inside the Apple IIe. A newly designed main logic board uses approximately one fourth as many integrated circuits as the II. The system still contains 8 expansion slots, but slot 0 is gone because the system's language card is now built-in. Slots 1 through 7 still exist plus an auxiliary slot which is located in the center of the motherboard. This auxiliary slot is used only with 1 of 2 optional 80-column text cards.

One of the biggest questions asked about the IIe concerns software compatibility. Will the IIe run all the current Apple II software in the marketplace? Apple says yes except for a few third-party packages. (In the Applications Packages section of this report we cite where the difference(s) occur when running Apple II software on the IIe.)

Primary market areas for the IIe are the same as the II and II Plus—in the office for productivity tasks, in vertical applications areas, in education, in scientific/industrial markets, and in the home consumer market.

The Apple III Plus is a more powerful system than the IIe and contains more standard features. It was introduced to the marketplace in 1980 to cover the more demanding business applications not suitable for the Apple II. Initially available in 2 versions—128K-byte RAM and 256K-byte RAM—the unit now only comes with the latter memory capacity. Apple apparently felt it was more economical to market one version of the system, and in making this announcement, to also drop the price of the unit.

In mid-December 1983 Apple introduced the Apple III Plus, an enhanced version of the Apple III (which it replaces), with new features and updated hardware. Some of the major hardware features of the Apple III Plus are: a redesigned, four-layer main logic board that increases system reliability and reduces radio frequency emissions;

improved peripheral ports on the back panel that use standard DB-25 pin connectors; an upgraded, 55-watt power supply that allows the computer to run cooler; and new casting which provides better heat dissipation which meets standards for Class B computers set by the Federal Communications Commission. In addition, an interlace video mode that effectively doubles screen resolution, a new clock/calendar function which tracks date, day of the week and time, and a new keyboard which is identical to the Apple IIe keyboard, have all been added to the Apple III Plus. The new system is completely compatible with the earlier Apple III.

Apple has also introduced enhancements to the Apple IIe system to both provide more compatibility between the II and III Series, and to increase the disk storage capacity of the IIe Series. ProDOS is a new operating system for the IIe that uses the hierarchical file structure, file-naming conventions, and data formats of Apple's SOS operating system. This provides the ability for Apple II and Apple III data files and data media to be interchangeable. The Apple IIe now also supports Apple's Pro File, which is a 5M-byte Winchester disk, which greatly increases the IIe's storage capacity. Both the new ProDOS operating system and the Apple Pascal Development System will handle the Profile disk on the Apple IIe.

The degree of software compatibility between the Apple II and II Plus and the Apple III and III Plus is provided via an emulation mode on the Apple III and III Plus. With this feature, the IIIs can run most Integer BASIC and Applesoft programs without modification. However, the Apple IIIs cannot emulate software written specifically for the Apple IIe. Apple also offers a CP/M softcard for the IIIs.

Major differences between the new IIe and the III Plus are as follows: larger memory on the III Plus; faster CPU speed on the III Plus; 40-column text standard on the IIe as opposed to 80 columns on the III Plus; higher resolution graphics standard on the III Plus; numeric pad standard on the III Plus, optional on the IIe. The IIe, on the other hand, has 8 expansion slots as compared to 4 on the III Plus. Each unit also comes with different standard interfaces (e.g., cassette interface on the IIe; RS-232C interface on the III Plus). These differences between the 2 systems are cited to show that the 2 products are meant for different target markets.

### □ Strengths

The most desirable feature of the Apple IIe is its flexibility in adapting to a user's particular needs. With 7 available I/O slots and the proliferation of hardware add-ons available from third-party vendors, the computer can easily be transformed into a specialized system. Also, because of Apple's determination to keep the new system as fully compatible as possible with the Apple II and II Plus, users have access to a wealth of software currently on the market. Apple has stated that more than 10,000 packages are available for its Apple II system from independent companies.

Reliability is another positive feature of the Apple IIe. According to Apple, reducing the component count in the system provides both cooler and more reliable operation.



## Apple IIe & Apple III Plus Computer Systems

While the Apple III Plus does not presently enjoy the same level of support as does the Apple IIe, the higher-end system features an emulation mode that provides a fair degree of software compatibility with the Apple II and II Plus. The Apple III Plus user can therefore immediately take advantage of an existing software base and gradually develop or acquire native-mode software that exploits superior processing capabilities. Also, Apple's Softcard III option makes available the vast CP/M library of applications for the systems. According to the vendor, there are more than 400 business programs available for the Apple III Plus.

### □ Limitations

Since our last update, Apple has provided system support enhancements to the Apple IIe which will now support Apple's ProFile hard disk, thus eliminating one of what we viewed as a limitation. This, and the release of the ProDOS operating system, which now provides much greater compatibility between the Apple IIe and the Apple III, have eliminated just about any problems that we had with the systems. The integral keyboard can still be a minor inconvenience to an operator who might get tired of sitting in the exact same spot all day.

With the elimination of the quality-control difficulties that plagued the early Apple IIIs, prospective users should now be a little more comfortable with the Apple III. But with the release of the Apple III Plus, which replaces the Apple III, one has to hope that the earlier problems don't happen again. When running the Apple III with the CP/M softcard and an application such as dBASE II under CP/M, the operational speed of the III (and presumably the III Plus) might not be adequate enough to support the application.

### ■ SOFTWARE

#### □ Terms & Support

**Terms** • basic Apple systems include operating software and BASIC language processor at no additional charge • optional software products are available on a one-time license fee basis.

**Support** • corrective updates provided at no additional charge during initial 90-day warranty period • optional Apple Care Extended Warranty service available; includes corrective updates for systems software purchased during or prior to 12-month coverage period; updates comprising significant product enhancements incur additional fee.

#### □ Software Overview

The Apple IIe systems use a monitor in ROM (read-only memory) to provide fundamental system services. In addition, diskette-based systems can operate under DOS (Disk Operating System), POS (Pascal Operating System), or under the recently announced ProDOS operating system. The Apple III Plus utilizes the diskette-oriented SOS (Sophisticated Operating System). All operating systems are included in basic system prices.

Data management under the Apple IIe is handled with Datatree file management system and Quick File II information management system. Under Apple III Plus, Quick File III provides information management, while the recently announced Apple File III provides data management facilities. Emulation for DEC VT100 and VT52 as well as IBM 3270 are available.

Languages for program/system development that are available include: Applesoft BASIC, Business BASIC, Apple Pascal, Apple FORTRAN, Apple COBOL, and Apple LOGO. Development tools and utilities provided are: Psort as Pascal sort; Script II and III, a

Pascal format utility; Animation tools for Pascal graphics; Co-Pilot, an interactive tutorial; a DOS Toolkit for programmers; and Applegraphics II graphics procedures.

Apple Writer provides word processing capabilities, Apple Speller is a spelling checker, and Mail List Manager provides list management.

There are various third-party-developed applications programs available, over 10,000 for the Apple IIe and more than 400 for the Apple III Plus.

### □ Operating Systems

#### Apple IIe Operating System Software

Basic Apple IIe system uses a monitor in read-only memory (ROM) that provides fundamental system services. Diskette-based Apple IIe systems can run under the Disk Operating System (DOS), under the Pascal Operating System (POS) for UCSD Pascal and Apple FORTRAN programming, or under ProDOS.

**Apple IIe Monitor** • control program in read-only memory (ROM) provides basic system services, including automatic I/O device assignment, cassette tape read/write operations, display/input editing, limited program assembly/disassembly, hexadecimal addition/subtraction, and register examination/modification; start-up in ROM BASIC or start-up with automatic initial program load; protection against accidental system RESET.

**Disk Operating System (DOS) 3.3** • general-purpose disk operating system supports single-user interactive processing; controls system operation and diskette storage allocation • general features include 20-percent increase over DOS 3.2.1 in diskette storage capacity, sequential and random file access, file cataloging, and diskette copying with single- or multiple-drive configurations • DOS 3.3 consists of basic operating system and utilities for file/diskette maintenance; various commands are used to invoke system services • Housekeeping Commands include INIT, CATALOG, MAXFILES, SAVE, LOAD, RUN, RENAME, DELETE, VERIFY, LOCK, and UNLOCK • Access Commands include FP, INT, PR#, IN#, and CHAIN • Sequential Text File Commands include OPEN, CLOSE, READ, WRITE, APPEND, POSITION, and EXEC • Random-Access Text File Commands include OPEN, CLOSE, READ, WRITE, and BYTE • Machine-Language File Commands include BSAVE, BLOAD, and BRUN • Muffin routine for conversion of 13-sector diskette to 16-sector diskette • available as part of A2M0044E Disk II Subsystem (see Hardware—Disk section) • after January 15, 1983, ProDOS will be packaged instead of DOS 3.3.

**Pascal Operating System (POS)** • disk operating system supports single-user UCSD Pascal and Apple FORTRAN program development/execution; manages UCSD Pascal and Apple FORTRAN compilers, macro assembler, linker, file handler, and text editor • supports Apple ProFile hard disks • minimum of 2 diskette drives recommended • included in A2B0006 Apple Language System (see Program Development/Languages section).

**ProDOS** • general-purpose disk operating system supports single-user interactive processing; provides increased compatibility between Apple II and Apple III Plus environments by supporting a hierarchical file structure, file naming conventions, and data formats of the Apple III Plus SOS operating system • enhancements over DOS 3.3 include more efficient memory management, faster user response time, supports larger disk (ProFile hard disk) files, and supports interrupt-driven processing for such applications as networking and data communications • supports programs written in Applesoft BASIC on Apple II Plus or Apple IIe personal computers, and 6502 Assembler programs on Apple II, Apple II Plus, or Apple IIe • includes software development tools such as assembler, editor, debugger, and system utilities • currently available to qualified application developers with retail sale scheduled for first quarter of 1984 • requires a minimum of 64K bytes of memory • as of January 15, 1984, scheduled to be available as part of A2M0044E Disk II Subsystem (see Hardware—Disk section).

#### Apple III Plus Operating System Software

The Apple III Plus runs under the diskette-oriented Sophisticated Operating System (SOS).



# Apple IIe & Apple III Plus Computer Systems

**Sophisticated Operating System (SOS)** • general-purpose disk operating system supports single-user interactive processing; controls system operation and resource allocation; provides standardized file and device interfaces for programming languages • general features include device-independent, hierarchical file system; device- and user-level interrupt capabilities; memory management • SOS consists of a Kernel, System Utilities, and System Configuration Program • kernel subroutines/programs include File Manager, Device Manager, Memory Manager, Interrupt Manager, and Utility Manager • File Manager controls logical storage, transfer, and routing of files; File Management System calls include CREATE, DESTROY, RENAME, SET/GET FILE INFO, SET/GET PREFIX, SET/GET MARK, SET/GET EOF, VOLUME, OPEN, CLOSE, FLUSH, NEW LINE, READ, and WRITE • Device Manager controls physical storage and I/O operations; uses modular device drivers to manage display, keyboard, serial interface, printer interface, and peripheral activities; Device Management System Calls include READ, WRITE, CONTROL, STATUS, INFO, and GET DEVICE NUMBER • Memory Manager controls and allocates memory pages and banks; Memory Management System Calls include REQUEST SEG, FIND SEG, RELEASE SEG, CHANGE SEG, and GET SEG INFO/NUMBER • Interrupt Manager services device and user (keyboard) interrupts • Utility Manager supports program access to clock/calendar and joystick interfaces; Utility Management System Calls include: SET/GET FENCE (priority); SET/GET TIME; JOYSTICK • System Utilities perform high-level system tasks; System Configuration Program supports customization of SOS, including selection of device drivers, for specific user configurations • included in Apple III Plus packaged systems.

**Apple II & II Plus Emulation** • hardware-based emulation facility provides software compatibility with 48K-byte Apple II or II Plus; permits most Apple II and II Plus BASIC programs to run on Apple III Plus without modification (programs that access joystick/game I/O interfaces require modification) • does not work with the Apple IIe software programs.

### Data Management

#### Apple II, II Plus & IIe Data Management Software

**C2S0002 Datatree** • for Apple II Plus and IIe only • file management system • features include organize, search, update, sort, and printing capabilities; menu driven; password protection • requires A2D0024 Apple Pascal • documentation differences and keystroke changes on Apple IIe: \_\_\_\_\_

\$125 lens

**A2D2005 Quick File II** • for Apple IIe only • information management system manages 150 to 250 records • organize, store, search, update, and print capabilities • menu driven • requires 64K-byte memory, 2 diskette drives • Apple Pascal: \_\_\_\_\_

100

#### Apple III Plus Data Management Software

**A3D0020 Quick File III Plus** • information management system • manages 150 to 250 records • organize, store, search, update, and print capabilities • menu driven: \_\_\_\_\_

\$100 lens

**A3D0019 Apple File III** • data management package that provides organization, management, and maintenance of large files • includes facilities to store, arrange, review, and print records in files up to 16M bytes • supports 80 fields per record, 8 keys per file, and 8 fields per key • supports multiuser environment; supports user-defined passwords; and includes an online help facility available at any point in the program • handles printing of reports in rows and columns, summarizing with totals, averages, and counts • requires Apple III Plus with 256K-byte memory and an Apple ProFile hard disk or comparable unit: \_\_\_\_\_

325

### Communications/Networks

#### Apple II, II Plus & IIe Communications/Networks Software

**C2B0013 Comm-Pac** • for Apple II Plus and IIe only •

communications access program • features include access to up to 35 exchanges with auto-dial and auto-logout; off-line communications; dummy logon files for Source, Compuserve, Dow Jones, and Apple Bulletin Board Systems (ABBS) • requires account number and/or password to computerized information sources; D.C. Hayes Micromodem • documentation differences on the Apple IIe: \_\_\_\_\_

\$85 lens

**C2B002 VT100 Emulator:** \_\_\_\_\_

75

#### Apple III Plus Communications/Networks Software

**C3B0003 Apple Access III** • file transfer and terminal emulation utility • features include Digital Equipment Corporation VT100 and VT52 emulation; upload and download files to and from other systems; process downloaded data off-line • package includes 2 versions of basic program, 1 for use with A3D0004 Apple Business BASIC and 1 for use with A3D0005 Apple Pascal: \_\_\_\_\_

\$150 lens

**Apple Access 3270** • allows Apple III Plus to communicate with mainframes • works with the 3270 cluster controller emulator • both the software and the controller emulator is scheduled to be available in early 1984.

### Program Development/Languages

#### Apple IIe Languages

Basic Apple IIe is equipped with Applesoft BASIC in read-only memory (ROM). Optional program development/languages include Pascal and Pascal utilities, FORTRAN, PILOT and PILOT, and LOGO utilities. Program development aids include the DOS Toolkit and Applegraphics II.

**Applesoft BASIC** • interpreter supports implementation of Dartmouth BASIC; suitable for business, scientific, and personal applications; read-only memory (ROM) and diskette-based versions • features include floating-point operands with 9-digit mantissa and exponent ranging from -38 to +38; integer operands ranging from -32,767 to +32,767 in value; string operands; up to 88-dimension, numeric and string arrays; variable names of any length with first 2 characters significant; graphics commands including plotting control; string commands and relational operators; type conversion commands; I/O control and formatting commands; PEEK, POKE, POP, CALL, POP, LOMEM, HIMEM commands; extensive library of mathematical/scientific functions; user-definable error-handling and messages.

**A2D0024 Apple Pascal** • for Apple II Plus and IIe only • UCSD Pascal development system includes Pascal Operating System, hybrid compiler, macro assembler, linker, file handler, and text editor, compiler generates pseudo-code which is interpreted at runtime • Pascal language features include overlays; separate compilation of functions and procedures; EXTERNAL routines; 36-digit integer operands; 32-bit floating-point operands; access to Apple graphics/sound facilities through system library routines; checking for syntax, type, and range errors; compiler directives • macro assembler features include generation of relocatable code; macro parameters; conditional assembly • linker features include support for segmentation at pseudo-code level; processing of both pseudo and machine code • file handler features include manipulation of diskette files and directories; reporting of file locations and available storage • text editor features include full-screen editing; cursor control; global search/replace; output formatting • minimum of 2 diskette drives recommended: \_\_\_\_\_

\$250 lens

**C2B0003 PSORT** • for Apple II and II Plus only • Pascal sort utility • features include up to 10 user-redefinable sort keys with

*LCNS: one-time license fee. Software update service available as part of Extended Warranty at \$90/\$240 per year for Apple IIe and Apple III Plus. NA: not available. Prices effective as of December 1983.*



## Apple IIe & Apple III Plus Computer Systems

mixed ascending/descending sequences; merging up to 10 user-redefinable, pre-sorted files; support of multiple disks for input, output, and work files; supplies parameters through interactive prompting or a control file • requires 64K-byte main memory:

85

C2B0011 Script II • Pascal format utility • features include pagination using headers or footers; designate line spacing, margins, and page breaks; center-, left-, and right-justify text • requires 64K-byte main memory:

100

C2B0001 Pascal Animation Tools • Pascal graphics utility • features include developing fonts of graphic shapes or pictures; print high-resolution shapes at text speed • requires 64K-byte main memory:

75

**A2D0032 Apple FORTRAN** • for Apple II Plus and IIe only • hybrid compiler supports subset implementation of ANSI FORTRAN 1977; generates pseudo-code which is interpreted at runtime in Pascal Operating System environment • features include combinations of FORMATTED/UNFORMATTED and SEQUENTIAL/DIRECT files; subscript expressions with array elements and/or function calls; DO statement limits specified by expressions; I/O units specified by expressions; WRITE I/O lists with expressions; library of 44 intrinsic functions; compiler directives • language restrictions include inability to pass subprogram names as parameters • requires 48K-byte main memory; A2D0024 Apple Pascal; minimum of 2 diskette drives recommended • documentation differences on the Apple IIe:

200

**A2D0028 Apple PILOT** • for Apple II Plus and IIe only • courseware development system includes implementation of PILOT language for computer-aided instruction; based on PILOT 73 and COMMON PILOT • features include operation in Author and Lesson modes; menu-driven Author mode supports creation and storage of lessons incorporating user-defined character sets, text, graphics, and sound effects; Lesson mode supports student interaction with predefined lessons • requires 48K-byte main memory; Lesson mode requires 1 diskette drive; Author mode requires 2 diskette drives:

100

**A2D0051 Apple Super PILOT** • for Apple IIe only • same capabilities and functions as Apple PILOT plus new courseware development capabilities, faster execution, options for color, character size, control of external video devices, and "Turtle graphics" for discovery learning:

200

**A2D0050 Apple Co-PILOT** • interactive tutorial to assist first-time users in creating computer-assisted lessons:

35

**D2D0100 Apple LOGO** • implementation of LOGO language designed to teach computer programming concepts and problem-solving skills to students • features Turtle graphics which allows users to control a cursor and draw lines on the screen • requires 64K-byte IIe, 1 diskette drive, color display:

175

**A2D0029 DOS Toolkit** • for Apple II Plus and IIe only • development package includes Editor/Assembler, Programmer's Assistant utility for Applesoft BASIC, and Hi-Res Character Generator/Animatrix programs for high-resolution graphics • Editor/Assembler consists of integrated 6502 assembler and text editor; features include creation/modification of source-code files in main memory; diskette storage/retrieval of files; generation of relocatable or absolute object-code files on diskette using source-code files on diskette; symbol table generation • Programmer's Assistant utility, written in assembly language, supports Applesoft BASIC programming; features include automatic line numbering/renumbering; program merging; variable cross referencing; remark (comment) deletion; determination of program length • Hi-Res Character Generator, written in assembly language, supports display of a mix of text and high-resolution graphics; features include writing of text over

existing background; text wrap-around within text window; use of multiple, user-defined character sets; automatic lowercase display; figure animation • Animatrix, written in Applesoft BASIC, supports creation/modification of character sets for use with Hi-Res Character Generator • requires A2B0009 Applesoft BASIC Firmware Card, 48K-byte main memory, and diskette drive:

75

**A2D0037 Applegraphics II** • for Apple II Plus and IIe only • development package includes hi-res graphics programs and procedures for Apple Pascal and Apple FORTRAN • features include code files; source files; library file; demonstration programs; core routines; interface to user-defined peripherals; and vector-oriented drawing procedures • requires A2D0024 Apple Pascal; A2D0032 Apple FORTRAN; 48K-byte main memory; diskette drive:

75

### Apple III Plus Languages

Optional program development/languages include Business BASIC, COBOL, and Pascal. Program development aids include Pascal library and format utilities.

**A3D0004 Apple Business BASIC** • interpreter supports implementation of Dartmouth BASIC with extensions; suitable for business, scientific, and personal applications; disk based • features include access to 70K-byte main memory workspace; device-independent file handling through SOS operating system; file references by directory, subdirectory, and file name; 32-bit binary floating-point operands with 6-digit mantissa and exponent ranging from -38 to +38; 16-bit binary integer operands ranging from -32,767 to +32,767 in value; 64-bit binary integer operands ranging from -9.2E18 to +9.2E18 in value; string operands up to 255 characters in (dynamic) length; numeric and string arrays with no dimensional limits; variable names up to 64 characters in length with all characters significant; nested IF-THEN-ELSE control structures; automatic indentation of contents of FOR-NEXT control structures; assembly language program interface with parameter passing; PRINT USING and IMAGE I/O formatting commands; debug commands including line-number trace; display/cursor control commands; extensive library of mathematical/scientific, string, and file functions; user-definable error handling and messages:

\$125 linc

**A3D0005 Apple Pascal** • same as A2D0024 Apple Pascal except requires 128K-byte main memory; Disk III diskette drive; display device, Monitor III recommended:

250

C3S0001 Pascal Utility Library • Pascal library utility • features include General Utilities Modules, File Access Modules, and B-tree Modules; creates CODE files; provides source code:

75

C3B0004 Script III • Pascal format utility • features include pagination using headers or footers; designate line spacing, margins, and page breaks; center-, left-, and right-justify text:

125

**A3D0021 Apple III Plus COBOL** • based on ANSI COBOL (X3.23-1974) • compiler and runtime system • FORMS-2 source code generator • Animator Option for debugging • requires 128K-byte memory, 1 external disk drive (Disk III Plus or ProFile), display device:

495

### Office Automation Software

#### Apple II, II Plus & IIe

**A2D0026 Apple Writer II** • screen-oriented integrated word processing system provides menu-driven editing and print formatting • editing features include global search/replace, text insert/save using external files, and block movement; print formatting features include justification, paging, and margin control • uses Word Processing Language (WPL) for generating form letters and customizing word processing applications •



## Apple IIe & Apple III Plus Computer Systems

package available on 16-sector diskette • requires 48K-byte main memory • documentation differences and keystroke changes on Apple IIe:

\$150 lcms

**C2B2010 Apple Writer IIe** • same as C2B0010 Apple Writer II except designed to use all IIe enhancements including additional memory:

195

### Apple III Plus

**C3B0013 Apple Writer III Plus** • same as C2B0010 Apple Writer II described above except with utilities for transfer of files from Apple II to Apple III Plus • includes built-in interface to Apple Speller III:

\$275 lcms

**Apple Speller III Plus** • spelling checker • uses dictionary lexicon based on Random House Dictionary which can be expanded to include special terms, brand names, project titles, names, and locations • keeps cumulative word count:

175

**Apple Writer III & Apple Speller III** • if purchased together:

395

**A3D0003 Apple III Plus Mail List Manager** • mailing list program • features include entry, editing, sorting, and storage of names, addresses, telephone numbers, and zip codes; user-redefinable format with up to 11 fields; up to 6 lines per label; 105 characters per label; 960 entries per diskette • requires 2 A3M0004 Disk III drives; monitor:

150

### □ Applications Packages

#### Apple II, II Plus & IIe

Applications packages include accounting, financial modeling, stock market, graphics, personal information management, education, and entertainment programs.

**C2B0012 Senior Analyst** • for Apple II Plus and IIe only • corporate planning and financial modeling program • features include creation and display of budget and planning models, profit and loss reports, cash flow projections, and forecasts; links models to share values, calculation rules, or column-and-row definitions; calculations include SUM, MAX, MIN, AVE, and PCT • requires A2D0024 Apple Pascal; 64K-byte main memory:

\$225 lcms

**D2D0002/03/23/36/35 BPI Accounting** • includes accounts receivable, general ledger, inventory control, job costing, and payroll modules (all modules \$395 except job costing, \$595):

175

**A2P2022 Dow Jones Solutions** • includes both a News & Quotes Reporter and a Portfolio Evaluator • provides access to Dow Jones; The Wall Street Journal; Barrons; New York, American, Mid West, and Pacific Stock Exchanges and Over The Counter Market (OTC NASDAQ) electronic databases; access to news by category or company • supports storage, modification, and updating of approximately 100 portfolios of up to 50 stocks each on single diskette • features provided include EDIT module for preformatted screens to assist in entering stock symbol, number of shares, purchase date, and purchase price; FETCH CURRENT QUOTATIONS module to access Dow Jones update quotes; DISPLAY or EVALUATE STOCKS module to obtain or print previously stored data • requires 48K-byte main memory, A2M0004 Apple Disk II, and modem • there are some documentation and screen differences on Apple IIe:

185

**C2S0004 Designer's Toolkit** • for Apple II Plus and IIe only • graphics program; provides graphics for mapping, architecture, and drafting • features include up to 20 pen and brush styles; increase screen image up to 64 times normal size; merge illustrations; 15 fonts in 3 sizes • requires A2M0029 Apple

Graphics Tablet:

225

**Education Packages** • variety of education packages including: C2E0013 Ernie's Quiz (\$50); C2E0016 Instant Zoo (\$50); C2E0015 Mix and Match (\$50); C2E0014 Spotlight (\$50); C2E0010 Math Strategy (\$45); A2D0015 Elementary, My Dear Apple (\$30); A2D0014 The Shell Games (\$30).

### Apple III Plus Applications Packages

Applications packages for the Apple III Plus include a business, a graphics, and a mailing list program.

**A3D0002 VisiCalc III** • management planning program; for managers, financial professionals, scientists, and engineers • applications include budgets, forecasts, pricing strategies, ratios, computations, projections, and study of causes, effects, and tradeoffs • worksheet size of 63 columns by 254 rows; worksheet commands include set global format or option, replicate formula, and split screen • mathematical functions include exponents, natural and base-10 log, sine and arc sine, cosine and arc cosine, and tangent and arc tangent:

\$250 lcms

**C3B0002 Apple III Plus Business Graphics** • graphics programs • features include line, dash, and area-filled graphs; horizontal and vertical bar graphs; pie charts; scattergrams; plots 2 or more graphs on the same set of axes; curve fitting; minimum, maximum, sum, mean, standard deviation, and variance analysis • requires A3D0005 Apple Pascal:

175

**C3B0005 Senior Analyst** • see Apple IIe write-up on package:

350

**BPI Systems Inc Accounting Packages** • provides accounting functions for small business • includes general ledger, and basic features of accounts receivable, accounts payable, and payroll • available for Apple IIe and Apple III Plus with features common to both versions including: provides balancing of transaction entries, complete financial reports and audit trails, prints checks, calculates expense ratios, and provides password security.

**Apple III Version** • takes advantage of hard disk systems storage capacity • requires Apple III Plus with 256K-byte memory, monitor, a hard disk, and printer:

495

**Apple IIe Version** • requires Apple IIe with 64K-byte memory, 2 diskette drives with controller, extended 80-column card, monitor, and printer:

395

### ■ HARDWARE

#### □ Terms & Support

**Terms** • hardware products are available on a purchase or lease basis • leasing is through Apple Leasing, a division of United States Leasing Corporation.

**Support** • carry-in corrective maintenance provided at no additional charge during initial 90-day warranty period • optional Apple Care Carry-In Service is available for \$90 per year for the Apple II, II Plus, and IIe; \$240 per year for the Apple III Plus; and \$276 per year for the ProFile hard disk drive; plans are also available for other Apple-manufactured peripherals • optional on-site maintenance is available through RCA Data Services of Cherry Hill, NJ; annual maintenance contract rates are: \$321 for Apple II, II Plus, and IIe; \$732 for Apple III Plus; and \$734 for the ProFile hard disk drive; on-site maintenance for other peripherals also available.

#### □ Physical Specifications (H x W x D); Weight

##### Apple IIe

**CPU** • 4.5 x 15.13 x 18 inches; 12 pounds.

**Display** • 10.63 x 17.19 x 12.5 inches; 16.5 pounds.

**Keyboard** • integrated with CPU unit.



# Apple IIe & Apple III Plus Computer Systems

## Apple III Plus

- CPU** • 4.8 x 17.5 x 18.2 inches; 26 pounds.  
**Display** • 10.63 x 17.19 x 12.5 inches; 16.5 pounds.  
**Keyboard** • integrated with CPU unit.  
 **Systems Overview & Configurability**

The Apple IIe is an 8-bit system based on a 6502A CPU, while the Apple III Plus is based on a 6502B processor. The Apple IIe comes standard with 64K-byte RAM expandable to 128K bytes, 16K-byte ROM with built-in BASIC, and a full ASCII keyboard which is part of the system housing unit. It provides cassette and joystick interfaces, monitor/TV interface, color graphics and sound capabilities, switching power supply, and an auxiliary video and memory expansion slot plus 7 I/O expansion slots.

The IIe only displays 40 columns of data as a standard system feature. However, inherent in the system is an 80-column display capability which can be activated by inserting an optional 80-column card in the unit's auxiliary slot. The 80-column card is simply 1K bytes of memory which is needed to present 80 columns of data. A variation on this 80-column card is an extended version which, in addition to the 1K-byte memory, also contains 64K-byte RAM for system expansion.

The Apple III Plus system contains a 256K-byte RAM, a 4K-byte ROM, a 4-drive diskette controller and 1 integral floppy, color graphics and sound capabilities, and a clock/calendar. It provides 4 expansion slots, an RS-232C interface, a monitor or TV interface, and 2 DB-9 connectors for joysticks (one can be used for the Apple Silentype printer). Like the IIe, the III Plus also comes with a keyboard that is integral to the system unit. However, the Apple III Plus keyboard also includes a numeric pad.

Both systems can utilize the same Apple printers, monitors, and the ProFile hard disk subsystem. A separately available TV can also be used as a display. Apple also provides diskette drives, a graphics tablet, printers, color plotters, modems, 80-column card, joysticks, and parallel and serial interfaces for its computers.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**Apple IIe System Maximums** • 128K-byte programmable main memory; 16K-byte read-only memory; 840K-byte diskette storage on 6 drives • total of 8 system expansion slots for upgrading basic systems with memory, peripheral/communications interfaces, and other hardware; memory/storage maximums described above require 4 of the 8 available slots.

**Apple III Plus System Maximums** • 256K-byte programmable main memory; 4K-byte read-only memory; 560K-byte diskette storage on 4 drives; 20M-byte Winchester disk storage on 4 drives; RS-232C interface; synchronous serial printer interface • total of 4 system expansion slots for upgrading basic systems with peripheral and communications interfaces; storage maximums described above require all 4 available slots.

### Packaged Systems

#### Apple IIe Packaged Systems

**A2S2064 Apple IIe Basic System** • 8-bit 6502A processor; 64K-byte main memory; 16K-byte ROM which includes built-in Applesoft BASIC language; typewriter-style ASCII keyboard; cassette interface; joystick game I/O interface; 8 expansion slots; color/B&W video receiver (TV) or monitor interface; color graphics and sound capabilities • requires standard video receiver or monitor.  
\$1,295 prch

**A2P2002 Apple IIe Starter System** • same as Basic System plus Disk II floppy disk drive with controller card, 12-inch monitor and stand, Apple 80-column card:  
N/S

**A2P2003 Extended Apple IIe Starter System** • same as A2P2002 Starter System except includes 80-column card with additional 64K-byte main memory:  
N/S

## Apple III Plus Packaged Systems

**A3S0256 256K Basic System** • 8-bit, 1.8-MHz MOS Technology 6502B microprocessor; 4 system expansion slots; 256K-byte main memory; 4K-byte read-only memory containing diagnostic/self-test programs; machine-readable clock/calendar; RS-232C serial interface; synchronous serial interface for A3M0001 Silentype Printer; dual joystick/game I/O interfaces; 4-drive diskette controller; integral 5.25-inch, 140K-byte diskette drive; display interface; typewriter-style ASCII keyboard; 2-inch, audio-output speaker • graphics • SOS operating system • requires standard video receiver (TV) or monitor:  
\$2,995 prch

### CPUs

The Apple IIe is based on the 8-bit 6502A microprocessor, while the Apple III Plus is based on the 8-bit 6502B microprocessor. However, the Apple III Plus operates at a faster speed (1.4-MHz average clock rate, 1.8 MHz with display deactivated) except when in Apple II and II Plus emulation mode; then it runs at 1.0 MHz. The Apple IIe runs at 1.0 MHz.

**Apple SoftCard III System** • for Apple III Plus • hardware/software package • includes add-in Z80A processor card, CP/M 2.2 operating system, and Microsoft BASIC interpreters; permits use of both CP/M 2.2 and standard Apple software • Z80A or standard 6502 operation is selected by booting CP/M or SOS operating system, respectively:  
\$450 prch

### Memory

#### Apple IIe Memory

**Standard Memory** • 64K-byte dynamic RAM for user memory, expandable to 128K bytes via bank switching • all I/O memory mapped • 16K-byte ROM stored in 2 8K chips • programs in ROM include Applesoft interpreter, system monitor routine, 80-column display firmware; self-test routines.

**A2B2023 Extended 80-Column Card** • includes additional 64K-byte RAM:  
\$295 prch

#### Apple III Plus Memory

**Standard Memory** • 256K-byte dynamic RAM • supports program/data storage and serves as refresh buffer for display • 4K-byte ROM contains diagnostic/self-test programs.

### I/O & Communications

#### Apple IIe I/O

Apple IIe packaged system includes cassette tape, joystick/game I/O, and video receiver/monitor interfaces, plus sound capabilities. Seven expansion slots, fully buffered with interrupt and DMA priority structure, are also provided as is an auxiliary slot for multipurpose video and memory expansion. Optional disk and printer controllers/interfaces are described in the Disk and Printer sections, respectively. Other options are described below.

**A2B0015 Apple IEEE-488 Interface Card** • interface module supports connection of up to 14 IEEE-488-compatible devices; permits Apple operation as IEEE-488 listener/talker/controller; complies with all IEEE-488 specifications except capability to pass control to another IEEE-488 controller • on-board firmware handles IEEE-488 bus protocol • includes card-to-instrument cable with IEEE-488 plug • requires system expansion slot:  
\$450 prch

**A2B0001 Hobby/Prototyping Card** • double-sided wire-wrap card for user creation of interface modules; hole pattern with

*PRCH: purchase price. Carry-in maintenance coverage available as part of Extended Warranty at \$90/\$240 per year for Apple IIe and Apple III Plus. N/S: no suggested retail price. NA: not available. Prices effective as of December 1983.*



# Apple IIe & Apple III Plus Computer Systems

100-millimeter centers accepts conventional integrated circuits and passive components • requires system expansion slot:

24

**Hand-Control Interface** • joystick/game I/O interface with 4 analog-to-digital inputs, 3 TTL inputs, and 4 TTL outputs • included in packaged systems.

**A2M2001 Hand Controls** • rotary and push-button control device:

35

**A2M002 Joystick IIe:**

60

## Apple III Plus I/O

Apple III packaged systems include joystick/game I/O and video receiver/monitor interfaces, as well as disk and printer interfaces which are described in their respective sections.

**Audio Output** • facilities include 2-inch speaker and miniature earphone jack, both driven by 6-bit digital-to-analog converter or fixed-frequency beep generator • included in Apple III Plus packaged systems.

**Joystick Interface** • 2 DB-9 connectors for 2 joysticks with pushbuttons • 1 connector can alternately be used to attach the Silentype thermal printer • included in Apple III Plus packaged systems.

**A3B0001 Apple III Plus OEM Prototyping Card** • double-sided wire-wrap card for user creation of interface modules; includes 5.4x3.7-inch circuit development area, input buffering area with 2 8-line RC decoupling networks, 2 connector-interface areas for D-type and ribbon-cable connectors, RF shield, 4 power supply decoupling capacitors • requires system expansion slot:

\$45 prch

## Apple IIe

**A2B0044 Apple II Plus Super Serial Interface Card** • bidirectional, serial RS-232C interface • features include 50 to 19.2K baud; 7 or 8 data bits; 1 start bit; 1 or 2 stop bits; odd, even, or no parity; hardware handshaking control; control from BASIC or Pascal languages; DB-25 connector • replaces A2B0005 Serial Interface Card and A2B0003 Communications Interface Card:

\$195 prch

## Apple III Plus

**Integrated RS-232C Interface** • single-port, half-/full-duplex interface; software selectable duplex mode and baud rate; DB-25 connector • included in Apple III Plus packaged systems.

## Mass Storage

### Apple IIe

Apple IIe systems can optionally include disk storage. A recommended maximum of 3 Apple Disk II subsystems, each consisting of a controller and 2 5.25-inch, 140K-byte diskette drives, can be attached for a total of 840K bytes of storage. With the recently announced ProDOS operating system, the Apple IIe will also support Apple's ProFile 5M-byte hard disk; Pascal Operating System has also been modified to handle the ProFile hard disk (see ProFile write-up below under Apple III Plus).

**A2M0044E Apple Disk II System** • package includes 2-drive controller, 5.25-inch, single-side, single-density diskette drive; DOS 3.3 operating system (until January 15, 1984, then ProDOS operating system will be sent) • 140K bytes per formatted diskette overall; 124K bytes per diskette available for user program/data storage under DOS 3.3 operating system; 137K bytes per diskette available for user program/data storage under Pascal Operating System • 35 tracks per diskette; 16 sectors per track; 462-millisecond average access time; 15.6K-byte-per-second data transfer rate • controller supports 1 A2M0003 Apple Disk II Add-on Drive; recommended maximum of 3 controllers and 6 drives per system • controller requires system expansion slot:

\$545 prch

A2M0003 Apple Disk II Add-On Drive:

395

## Apple III Plus Disk

A basic Apple III Plus system includes an integrated controller and diskette drive. The first add-on drive plugs into the floppy disk connector on the system's back panel; then, in daisy-chain fashion, the second drive plugs into the first, and the third plugs into the second. Up to 4 external ProFile hard disk drives can be attached.

**Integrated Controller** • supports integrated diskette drive and up to 3 A3M0004 Disk III Add-on Drives • included in Apple III Plus packaged system.

**Integrated Diskette Drive** • 5.25-inch, single-side, single-density diskette drive; 140K bytes per formatted diskette • 35 tracks per surface; 16 sectors per track; 125K-bps data transfer rate • included in Apple III Plus packaged system.

**A3M0004 Apple Disk III Add-On Drive** • freestanding version of integrated diskette drive described above; up to 3 units can be attached to integrated controller:

\$435 prch

**A3M0305 ProFile** • 5.25-inch, double-sided, Winchester-type disk drive; 5M bytes per formatted diskette • 153 tracks per surface; 16 sectors per track; 512 bytes per sector; 5M-bps data transfer rate; 95-millisecond average seek time • includes Backup III, a software utility that selectively backs up and restores ProFile's files • requires system expansion slot:

2,195

## Tape

The Apple IIe can be equipped with a standard audio cassette tape drive for program/data storage. A 1500-baud cassette tape interface and cable are included in the packaged system. The Apple III Plus does not support tape equipment.

## Terminals/Workstations

The Apple systems are single-user. Each features a typewriter-style keyboard and separately available display for user/system interaction.

## Apple IIe Display & Keyboard

**Display** • systems use separately available, standard color/B&W video receiver (TV) or monitor; A2M2010 Monitor II or A3M0039 Monitor III described below can be used with the Apple IIe • display modes include text, low-resolution graphics, and high-resolution graphics • text mode supports 24-line x 40-character, upper-/lowercase alphanumeric display format; 5x7 dot-matrix character formation; normal, reverse-video, or flashing characters; cursor control; partial-screen protect; optional 80-column cards provide the additional display memory required for 80-column operation; the actual 80-column display circuitry and firmware are already built into the system • low-resolution graphics mode supports 40x48 dot format or 40x40 dot format with 4 text lines; up to 16 colors • high-resolution graphics mode supports 280x192 bit-mapped pixel array or 280x160 dot format with 4 text lines; up to 6 colors • limited 560x192 pixel resolution can be attained with optional extended 80-column card.

**A2M2010 Monitor II** • 12-inch, P31 green phosphor text and graphics display; anti-reflective, high-contrast screen • 1920 characters at 80 characters x 24 lines • includes video cable • available for Apple IIe:

\$229 prch

**A2B2022 80-Column Card** • extends display capabilities to 80 characters per line • plugs into auxiliary slot:

125

**A2B2023 Extended 80-Column Card** • extends display capabilities to 80 characters per line plus provides additional 64K bytes of memory • plugs into auxiliary slot:

295

**Keyboard** • 63-key, typewriter-style 128 ASCII keyboard built



## Apple IIe & Apple III Plus Computer Systems

into system housing • all keys feature auto-repeat • special keys include CONTROL, SHIFT, Caps LOCK, ESCAPE, cursor control, 2 programmable keys • included in packaged systems.

### A2M2003 Numeric Keypad IIe:

160

### Apple III Plus Display & Keyboard

**Display** • system uses separately available, color/B&W video receiver (TV) or monitor • display modes include 3 text modes, 3 graphics modes, and Apple IIe modes • text modes support software-definable 128-character upper-/lowercase set with normal or reverse-video display; formats include 24-line x 80-character B&W, 24-line x 40-character 16-color foreground/background, and 24-line x 40-character B&W • graphics mode formats include 280x192 dot, 16-color; 140x192 dot, 16-color; 560x192 dot, B&W • display-output facilities include RCA-type (phono) connector and DB-15 connector; RCA-type connector supports NTSC B&W composite video; DB-15 connector supports NTSC color or B&W composite video, 4 TTL outputs for generating RGB color, composite synchronization signal, and +5/-5/+12/-12 volt power supplies; color outputs generate 16-level grey scale on B&W monitors.

**A3M00XX Monitor III** • 12-inch, B&W or green monitor; anti-glare faceplate • recommended for use with Apple IIe and Apple III Plus.

A3M0006 Monitor III • B&W monitor; P4 (white) phosphor:

\$249 prch

A3M0039 Monitor III • green monitor; P39 (green) phosphor:

249

**Keyboard** • 61-key, typewriter-style ASCII keyboard with separate 13-key numeric pad built into system housing; all keys feature auto-repeat • special keys include CONTROL, ESCAPE, SHIFT, ALPHA LOCK, cursor control with 2-speed auto-repeat, 2 programmable function keys • included in Apple III Plus packaged system.

### Printers/Graphics

**A2B0021 Apple IIe Parallel Interface Card** • supports variety of printers with parallel interface; includes 2 sets of firmware • features include user-selectable interface characteristics via 7 card-resident switches; 8-bit input/output ports; provides printing speeds up to 5000 cps; switch-selectable acknowledge and strobe polarity:

\$165 prch

**A2M0036 Apple IIe Silentype Printer** • 40 cps; bidirectional; 5x7 dot matrix thermal; alphanumerics and graphics • alphanumeric printing characteristics include upper-/lowercase characters; 10 cpi; 80 print positions; 6 lpi • graphics printing characteristics include 240-column-per-second print speed; 7 dots per column; 60 dots per inch horizontally and vertically; 480 dots per line • includes 1 roll of heat-sensitive paper • requires system expansion slot:

395

**Apple III Plus Integrated Serial Printer Interface** • synchronous serial interface supports attachment of A3M0001 Apple III Plus Silentype Printer; includes DB-9 connector • included in Apple III Plus packaged systems.

**A3B0002 Apple III Plus Universal Parallel Interface Card** • supports variety of printers and other peripherals with parallel interface; includes 8-bit, parallel port software driver • features include 16 output lines; 8 input lines; control signals with software-selectable priority; programmable pulse-length strobe line; software interrupt capabilities • requires system expansion slot:

225

**A3M0001 Apple III Plus Silentype Printer** • same as A2M0036 Apple IIe Silentype Printer described above except with multiple, software-selectable print styles • requires system expansion slot:

350

**A3M0013 Apple III Plus Silentype Conversion Kit** • allows A2M0036 Apple IIe Silentype Printer to run on Apple III Plus; includes Apple III Plus Silentype driver diskette:

40

**A3M0025 Apple Letter-Quality Printer** • 40 cps; single-sheet or continuous forms up to 15 inches wide; 10, 12, 15 cpi plus proportional spacing; alphanumerics and graphics; requires Super Serial Interface Card on the Apple IIe • includes interface cable, standard printwheel, documentation and tutorial diskette, warranty:

2,195

**A2M0058 Imagewriter** • graphics and text printer • 180 cps (graphics), 120 cps (text) bidirectional; 3- to 10-inch wide paper; single-sheet, fan-fold continuous forms, roll stock and pre-cut labels; up to 4 copies • 7x9 dot matrix; 8 character fonts; up to 175 additional user-defined characters • provides variable resolution from 72 to 160 dots per inch, variable pitch from 10 to 17 cpi, variable line spacing from 1/6 of an inch to 1/144 of an inch, and proportional font and spacing • standard RS-232C serial interface on both Apple IIe and Apple III Plus:

675

**A2M0029 Apple Graphics Tablet** • for Apple IIe • graphics digitizer; maximum digitizing area of 11x11 inches; supports data rates of up to 120 coordinate pairs per second; applications include block and logic diagrams, mechanical and architectural shapes, and schematics • features include VIEWPORT mode for setting user-defined active screen area, CALIBRATE mode for selecting mathematical scales, BKGD COLOR mode for choosing background colors, PEN COLOR mode for selecting drawing colors, FRAME mode for drawing open rectangles, and BOX mode for drawing solid rectangles • Command Functions include CATALOG for displaying file names, SAVE for preserving images, DISTANCE for calculating scale values, and AREA for calculating areas of enclosed figures:

795

• END





# Apple Lisa 2

## Lisa 2, Lisa 2/5 & Lisa 2/10

### ■ PROFILE

**Operating Systems** • Lisa Office System, a proprietary, single-user, multitasking operating system; Macintosh single-user, single-tasking proprietary operating system • Xenix available through Microsoft and UniPlus+ available through UniPress; both provide multiuser Unix-like environments.

**Data Management** • LisaList database application.

**Communications/Networks** • LisaTerminal for emulating VT100, VT52, and TTY terminals; 3270 BSC/SNA emulation.

**Languages** • BASIC-Plus, Pascal, COBOL.

**Models** • Lisa 2, Lisa 2/5, Lisa 2/10.

**CPU** • 32-/16-bit Motorola MC68000 microprocessor.

**Memory** • 512K bytes expandable to 1M bytes.

**Chassis Slots** • 3 open slots.

**Ports** • 2 serial ports; 1 parallel port standard on Lisa 2, Lisa 2/5.

**Mass Storage** • 5M- to 40M-byte hard disk storage; 400K-byte diskette storage.

**Terminals/Workstations** • single-user system; multiuser capabilities available under UniPlus+ and Xenix.

**Printers** • Apple dot-matrix and letter-quality printers.

**First Delivery** • Lisa—June 1983; Lisa 2—January 1984.

**Systems Delivered** • 20,000 as of December 1983.

**Comparable Systems** • Xerox Star, Apple Macintosh.

**Vendor** • Apple Computer, Inc; 20525 Mariani Avenue, Cupertino, CA 95014 • 408-996-1010.



**Canada** • Apple Canada Inc; 875 Don Mills Road, Don Mills, ON M3C 1V9 • 416-444-2531.

**Distribution** • over 3,300 dealers worldwide; national accounts sales force and a select number of dealers (approximately 300) have been established to market Lisa to large corporations.

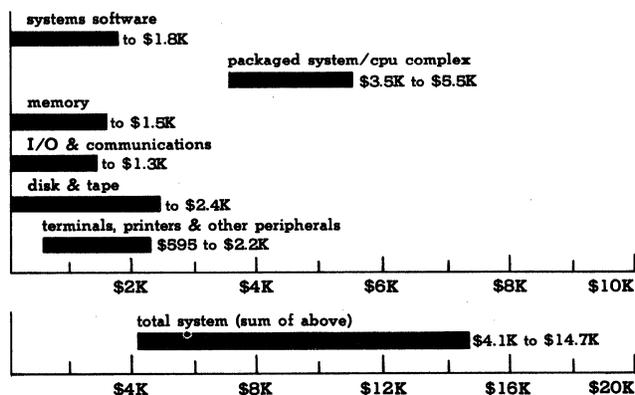
### ■ ANALYSIS

Apple's introduction of Lisa in January 1983 ushered in a new era in computing—one which, according to Apple, would allow people to work in a more natural way without having to adapt to rigid computer conventions or special languages. Lisa was designed to function as a natural extension of its user, following the work habits of the individual. Lisa achieves these objectives by utilizing a pointing device called a mouse in conjunction with graphic images presented on its display screen.

While Lisa is a major achievement technologically, it has not made a significant impact in the marketplace. This is primarily the result of Apple's marketing mistakes. They announced Lisa before it was ready to ship, thereby dimming potential customers' enthusiasm; restricted dealer outlets; bundled too many products with the system which resulted in a high price; and did not have a toolkit available in time for third-party vendors to develop software by Lisa's delivery date.

Obviously, Apple has realized these mistakes. At its annual stockholders meeting in January 1984, in addition to introducing its highly-publicized Macintosh system, Apple also unveiled a new version of Lisa which replaces the initial system. The new Lisa 2, available in 3 configurations, comes bundled with less memory (512K bytes as opposed to the initial 1M-byte memory); a 3.5-inch microdiskette which replaces the system's 5.25-inch drives and makes it disk compatible with Macintosh; an upgraded operating system which is

### PURCHASE PRICE RANGE hardware & software



**LISA 2 PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on Lisa 2 packaged system (includes CPU, 512K-byte RAM, 3.5-inch 400K-byte microdisk drive, CRT, keyboard, mouse, Macintosh operating system, 2 serial ports, 1 parallel port) and the following options: 160-cps dot-matrix printer • **LARGE SYSTEM** is based on Lisa 2/10 packaged system (includes CPU, 512K-byte RAM, 3.5-inch 400K-byte microdisk drive, integral 10M-byte hard disk, CRT, keyboard, mouse, 2 serial ports) and the following options: Lisa operating system, 6 integrated applications, Lisa Terminal software; additional 512K-byte memory; parallel interface card, AppleLine communications device; 2 5M-byte hard disk drives; daisywheel printer.



## Apple Lisa 2

### Lisa 2, Lisa 2/5 & Lisa 2/10

reported to be 2 to 3 times faster than the original system; and the capability of running Macintosh software.

Available software products for Lisa have also increased. Several third-party vendors have announced a total of 80 software packages which are presently available to run on Lisa, and Apple claims approximately 400 other packages will be available for Mac and Lisa by the end of 1984. Two Unix-like systems were also announced, giving Lisa a multiuser capability.

All of this adds up to Lisa's being a much more flexible system. Users can now choose between 512K- and 1M-byte memory, either a 5M-byte or 10M-byte hard disk configuration, and what operating environment they want to utilize. Keep in mind, however, that to run the Lisa software, 1M-byte memory and a hard disk are still needed.

Apple claims that first-time users with no computer experience will be able to operate Lisa in 30 minutes. It is targeting the system to the Fortune 1000 companies and has instituted a direct sales force to penetrate this arena. Apple plans to expand its Lisa dealer network to make more inroads into the small business community.

#### Strengths

Lisa's biggest drawing card is its user interface. The system is designed to do away with "computerphobia" and the need to memorize a set of coded instructions or to master any computer skills to utilize it. The 6 integrated applications all perform most of their tasks in the same way. Because the programs all use the same operating procedures and share a common user environment, there is less for the user to learn. This ease-of-use feature supports Apple's claim of a 30-minute learning period.

Several interesting features are built into Lisa's software. These include overlapping windows, graphic representations of everyday activities, and utilization of mouse technology to name a few. Another is the Undo command which cancels the effects of the last operation. This feature is particularly attractive because it assuages the user's fears of making an irrevocable mistake.

System reliability should prove to be a plus with Lisa. Apple IIs were known for their reliability and Apple probably has that same goal for Lisa.

#### Limitations

Most of the limitations cited in the initial Lisa release (e.g., \$10,000 price tag, bundled software, slow operating system, and no 3270 emulation) have been eliminated. However, with the Lisa 2, Apple has created other shortcomings. For example, the base Lisa 2 comes with one 3.5-inch microdisk drive and no optional second drive. Users must instead go to a hard disk add-on. Another shortcoming is the system's inability to use the Macintosh software with Lisa's Winchester disk. A color display, especially for graphics, would also be nice. The most obvious flaw, however, is Lisa's incompatibility with other Apple systems. Every Apple product has a different operating environment! Fortunately, Mac software will run on the Lisa 2, but a user must have the Mac operating system to do so.

#### SOFTWARE

##### Terms & Support

**Terms** • all Lisa configurations come bundled with an instructional program and a self-test program; the Lisa 2 also comes bundled with the Macintosh operating system; optional software products are available on a one-time license fee basis.

**Support** • first update plus phone allotment time included with initial purchase; future updates will have nominal fees • for a yearly fee, Direct Phone Support will provide software revisions and support.

##### Software Overview

The heart of the Lisa system is its software. When Lisa is turned on, its screen displays what resembles a "desktop." On this desktop are simple graphic pictures called "icons." These icons represent tasks related to objects usually found in an office (e.g., a document, file folders, paper, wastebasket), plus representations of the hard disk and diskettes and 6 applications programs.

The user controls Lisa intuitively by pointing at the symbol which will assist him/her in performing a specific task. Once selected, an icon is used just like its real-life counterpart. A file folder icon, for example, can be "opened" and the contents revealed; documents can be refilled, copied, taken out and changed, put into a new file, or thrown away (put into the wastebasket). Communication with the system is via the mouse, a palm-size device that moves the screen's cursor.

A command bar, which shows the names of different groups of commands relevant to the current application, runs across the top of the screen. Pointing to a particular command and pressing the mouse button will "pull down" a list of available commands for that group. From the list, a user can select which function he/she wishes to execute.

Lisa allows multiple windows on the screen simultaneously. Windows can be overlapped, shrunk, enlarged, or recalled instantly. When overlapping several windows, only the contents of the active file are totally unobstructed (similar to partially overlapping sheets of paper lying on a desk). This overlapping technique enables users to view more than one program at a time in order to move text or data from one program to another. In other words, a user can have a spreadsheet "paper" and a word processing "paper" on the "desk" and switch back and forth between them, incorporating information from one to the other.

When Lisa is turned off (goes into low-power mode) all open files are automatically closed, their status is recorded, and the files are transferred back to their respective diskettes. Then, when Lisa is reactivated, the system automatically returns the files to their former place on the "desktop."

Software for Lisa includes a proprietary operating system, a database manager, an electronic spreadsheet, a word processor, a project management system, a graphics system, a line drawing system, and a terminal emulator. These applications can be integrated with one another, and perform most of their tasks in the same way, using the same commands.

Lisa will also support Macintosh software which presently includes the Macintosh operating system, a graphics package, and a word processor. However, these packages will run only with the 3.5-inch microdisks. They are not supported on Lisa's hard disk drives.

Several third-party products are also available for Lisa. Most noteworthy are 2 Unix-like systems, Microsoft's Xenix and UniPress's UniPlus+ operating systems. These 2 products provide the Lisa 2 with a multiuser capability, enabling the system to serve as a host for other Apple systems or for terminals. In all, 80 software packages have been announced for Lisa, and Apple claims approximately 400 other packages will be available for both Mac and Lisa by the end of 1984.

##### Packaged Software

**Productivity Applications** • include LisaList database manager, LisaWrite word processing system, LisaCalc electronic spreadsheet, LisaProject project management tool, LisaGraph



# Apple Lisa 2

## Lisa 2, Lisa 2/5 & Lisa 2/10

graphics system, and LisaDraw line drawing system; programs also available separately:

\$1,195 lcms

**MacPaint/MacWrite** • graphics/word processor set • runs under the Macintosh operating system:

195

### Operating Systems

Apple provides a proprietary operating system for Lisa. Additionally, Digital Research is in the process of modifying CP/M68K to run on Lisa, while Microsoft is working on a XENIX version for the system. These 2 products will be available from their respective developers, not Apple. Lisa also supports a version of UNIX which is provided by UniPress software.

**Lisa Office System** • single-user, multitasking (up to 6 tasks) • provides graphics menu-oriented user interface; transfers information from one application to another to provide total integration of applications; handles graphic support routines, font management, and data management facilities • contains utility software for window control, disk accessing, intelligent graphic redrawing, and memory management routines • implemented in Pascal; runs several processes concurrently:

\$295 lcms

**Macintosh Proprietary Operating System** • single-user; single-tasking, icon-/graphics-oriented • includes Finder program which is responsible for boot-up, icon directory, desktop handler, and control panel; desktop handler loads 'objects' such as a calculator, alarm clock, control panel, note pad, and scrapbook; control panel regulates system functions such as mouse sensitivity and volume of sound; incorporates real-time battery-driven 24-hour clock and calendar • bundled with Lisa 2 only:

195

**LisaGuide** • online interactive instructional program for first-time users on how to operate Lisa; contains 6 initial lessons plus 4 optional lessons:

NC

### Utilities

Apple provides various system utilities related to its operating systems, printing, and disk data file management. No other major utilities are provided with Lisa.

### Data Management

The LisaList database manager is available from Apple. Third-party packages include both a Unix version and a Lisa Desktop version of dBase II from Ashton-Tate (4th quarter 1984); a Xenix version of Condor's rDBMS; a Xenix version of SMC's Idol DBMS; and a UniPlus+ version of the Unify rDBMS (May 1984).

**LisaList** • database application that searches, sorts, and extracts information; performs automatic checking and formatting of data • 100 maximum fields per record • supports variable-length records with maximum of 990 characters • 8 data types—text, number, data, money, time, social security number, phone number, and zip code:

\$195 lcms

### Communications/Networks

**LisaTerminal** • allows emulation of TTY, DEC VT100, and DEC VT52 terminals • when combined with a plug-in modem, provides access to remote mainframe computers and online information services • when combined with Apple Cluster Controller, emulates an IBM 3278 terminal supporting BSC or SNA/SDLC protocols:

\$295 lcms

**MacTerminal** • emulates DEC VT-100, VT-52, and Teletype terminals; with AppleLine performs IBM 3277 and 3278 terminal emulation; can connect to IBM cluster controllers • requires the Macintosh operating system:

99

### Program Development/Languages

BASIC, COBOL, and Pascal are available from Apple for Lisa. However, because these languages will not be integrated into the system, when utilizing them, Lisa will operate as a standard text and keyboard computer. Third-party products include RM/COBOL and RM/FORTRAN running under both Xenix and UniPlus+.

**BASIC-Plus** • compatible with DEC BASIC-Plus • allows both multiple statements per line and multiple lines per statement • offers 3 types of variables: integers, floating-point/scientific notation, and character string; IEEE standard numerics provide double-precision floating-point accuracy to 15 decimal digits; string arithmetic offers accuracy to 56 digits • common IF... THEN statement has been extended with ELSE clause • file handling may be sequential or random • supports recursive functions, virtual arrays, and matrix operations:

\$295 lcms

**COBOL** • meets and exceeds both ANSI Standard X3.23 COBOL and GSA High Level specifications • provides multikey ISAM facility based on B-tree structure; sort/merge capability; extended versions of ACCEPT and DISPLAY commands to allow input and display positioning at specified points on the Lisa screen; line sequential file handling; runtime specification of external file and program names • editor offers Lisa-style interface:

995

**Pascal** • extension of ISO Pascal; includes a compiler, editor, linker, assembler, debugger, and range of utilities • data typing is strongly enforced • provides nested procedures and function calls; support for modular program development; user-defined data types for specifying English-like values; built-in memory management routines and built-in I/O capabilities, and access to portions of the hardware interface:

595

**Quick Port** • for porting BASIC-Plus, COBOL, and Pascal programs to Lisa • provides a stationary pad and window for a program plus the capability of cutting and pasting information between applications:

NA

**Toolkit/32** • for writing completely integrated applications • provides a stationary pad and window for a program; works with Lisa's visual user-interface functions such as mouse-based editing, pull-down menus, and cut and paste integration:

NA

### Applications Packages

**LisaWrite** • word processing program for creating and revising text documents; contains preview functions; split-screen both vertical and horizontal • LisaCalc models and LisaTerminal information can be integrated into LisaWrite:

\$295 lcms

**LisaCalc** • electronic spreadsheet and financial modeling tool • maximum worksheet size of 255 rows x 255 columns; maximum model size visible is 13 columns (8 characters) x 28 rows • up to 6 vertical or horizontal splits of the window • data and text can be moved into LisaGraph and LisaWrite:

295

**LisaProject** • schedules and monitors project tasks, milestones, and resources; graph charts are available in schedule, task, and resource formats:

395

**LisaGraph** • interacts with spreadsheet data from LisaCalc to create bar, line, mixed bar/line, pie, and scatter graphs; 4 graph sizes:

295

*LCNS: one-time license fee. NC: no charge. NA: not available at this time. Software update service available. Prices effective as of January 1984.*



# Apple Lisa 2

## Lisa 2, Lisa 2/5 & Lisa 2/10

**LisaDraw** • for drawing lines, boxes, circles and ellipses, polygons, and freehand curves; 36 patterns for filling shapes; provides graphics editing, text editing, and alignment aids; used to customize charts and reports from LisaGraph and LisaProject: **395**

**MacPaint** • provides a multitude of artist pseudo-utensils including: paint brush, spray can, ruler, polygon, ellipse, and fill-screen templates; provides facility to "cut" artwork and "paste" directly onto text page of MacWrite file via a "scrapbook" • requires Macintosh operating system; license fee includes MacWrite software: **195**

**MacWrite** • allows flexible mouse manipulation of entered text; can perform right and left justification, margin adjustments, tab-stops, decimal alignment, powerful font and size editing from 9-point print to 24-point headlines, incorporation of graphics "pasted" onto text page, and proportional spacing; print option in fast and slow modes; can process a maximum of approximately 12 single-spaced pages of text • requires Macintosh operating system; license fee includes MacPaint software: **195**

### ■ HARDWARE

#### □ Terms, Support & Documentation

**Terms** • available for purchase or lease; leasing is through Apple Leasing, a division of United States Leasing Corporation.

**Support** • 90-day warranty • optional Apple Carry-In service available; optional on-site maintenance through RCA Data Services of Cherry Hill, NJ; Direct Phone Support available for an annual fee; phone allotment time included with initial purchase • Apple will provide in-house training for large firms who wish to do their own maintenance • diagnostic package, called LisaTest, is packaged with the system; it isolates computer failure to a single board or component • most system components are modular and can be easily removed by users and replaced.

**Documentation** • LisaGuide, an online interactive instructional program included with the system • reference guides for each application.

#### □ Physical Specifications (H x W x D); Weight

**System Unit** • 13.8 x 18.5 x 15.2 inches; 55 pounds.

**Display** • integrated with system unit.

**Keyboard** • 2.5 x 18.5 x 6.5 inches; 4 pounds.

**Mouse** • 1.5 x 2.4 x 3.7 inches; weight not available; mouse requires 4 x 4 inches for optimum movement.

#### □ Systems Overview & Configurability

Lisa is available in 3 models—the Lisa 2, the Lisa 2/5, and the Lisa 2/10. These desktop units all incorporate 3 separate components. The system console houses a 12-inch display, one 3.5-inch diskette drive, and the system electronics plus, on the Lisa 2/10 only, a 10M-byte hard disk drive. The keyboard and mouse/pointer are separate. A fourth component, an external 5M-byte hard disk drive, is packaged with the Lisa 2/5 and plugs into the system's parallel port.

Lisa is built around a Motorola MC68000 32-/16-bit CPU. It utilizes 3 other microprocessors to control I/O function and is equipped with a real-time clock (backed up by a battery) to time stamp all documents.

The system's integral 3.5-inch diskette drive holds 400K bytes of formatted data. This drive is manufactured by Sony and comes with the magnetic surface completely protected by a plastic case. It is the same drive that is used in the Macintosh system. One Apple ProFile 5M-byte hard disk drive comes standard with the Lisa 2/5 and an integral 10M-byte hard disk with the Lisa 2/10. Up to 6 ProFiles or 3 larger capacity hard disk drives can be connected to the systems.

Lisa's major input device is the mouse, a mechanical device used for pointing to and manipulating objects on the screen. Apple has designed its own mouse, which incorporates 1 button for

choosing selections. Pressing the button manipulates the system's cursor, moving it around the screen.

Lisa's high-resolution, bit-mapped display produces graphics and text in 11 different type sizes and styles. Its detached keyboard contains 76 keys divided into a main keyboard and a numeric keypad with cursor control keys. All keys are programmable. When not in use, the keyboard can be stored in a pocket under the system's display.

Two RS-232C ports and a video jack for an external monitor are located on the rear panel of Lisa. A parallel port for connecting the ProFile hard disk is standard with the Lisa 2 and 2/5. On the Lisa 2/10, the parallel port is routed to the built-in hard disk drive. For system expansion, Lisa provides 3 open slots. Parallel interface cards are available for attaching additional hard disks and/or printers. Apple also offers both a dot-matrix and daisywheel printers for use on Lisa.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**Lisa 2 & Lisa 2/5 System Maximums** • 1M-byte RAM • 400K-byte diskette storage and 25M bytes of hard disk storage • 2 serial ports.

**Lisa 2/10 System Maximums** • 1M-byte RAM • 400K-byte diskette storage and 30M bytes of hard disk storage • 2 serial ports.

#### □ Packaged Systems

**Lisa 2** • 32-/16-bit Motorola MC68000 processor and 3 auxiliary processors; real-time clock; 512K bytes of RAM • 3.5-inch 400K-byte diskette drive • integral CRT, detachable keyboard, and mouse • 2 serial ports, 1 parallel port, 3 expansion slots • Macintosh operating system: **\$3,495 prch**

**Lisa 2/5** • same as Lisa 2 except also includes external 5M-byte hard disk plugged into the parallel port • does not include the operating system: **4,495**

**Lisa 2/10** • same as Lisa 2 except also includes integral 10M-byte hard disk and no parallel port or operating system: **5,495**

**Lisa 2/5 Upgrade** • for upgrading the original Lisa to a Lisa 2/5 • no charge until June 1, 1984: **595**

**Lisa 2/10 Upgrade** • for upgrading the original Lisa to a Lisa 2/10: **2,495**

#### □ CPUs

Lisa incorporates a Motorola MC68000 as its main processor. Three other microprocessors control input/output operations to relieve the CPU of certain tasks.

**Motorola 68000 Processor** • 16-bit internal (ALU) architecture, 16-bit data bus interface with 24-bit addressing to .16M bytes; CPU has eight 32-bit data registers and eight 32-bit address registers; two 32-bit stack pointers, a 16-bit status register and a 23-bit program counter • powerful 56 mnemonic instruction set includes 16- and 32-bit data manipulation, signed and unsigned multiply and divide, five basic addressing modes with pre- and post-incrementing, offsetting and indexing, seven levels of priority interrupt with 256 possible interrupt vectors, a trace mode, and sophisticated trap operations for debugging; Motorola "HMOS" technology large-computer geometric architecture.

#### □ Memory

Lisa comes standard with 512K bytes of parity checking RAM expandable to 1M byte; 32K-byte video memory; and 16K-byte ROM.

**PRCH: purchase price; includes 90-day warranty. AppleCare Carry-In Maintenance and on-site maintenance available for a fee. Prices effective as of January 1984.**



# Apple Lisa 2

## Lisa 2, Lisa 2/5 & Lisa 2/10

**512K-byte Add-On Memory Board** • occupies 1 expansion slot: \$1,495 prch

### I/O & Communications

Lisa includes 2 serial ports; 3 expansion board slots; built-in speaker with a software-controllable tone generator; a jack for composite video to an external high-resolution monitor; and a real-time clock. Additionally, the Lisa 2 and 2/5 provide a parallel port for attachment of a hard disk. On the Lisa 2/10, the parallel port is routed to the internal hard disk drive. The expansion slots connect directly to the system bus and have a direct memory access (DMA) capability.

All I/O functions are handled by 3 microprocessors and an interface controller operating on a shared bus. Options include parallel interface boards and a cluster controller for IBM 3270 emulation.

**Parallel Port** • 8-bit bidirectional with handshake control; 6522 interface adapter • used for attachment of the ProFile hard disk system.

**Parallel Interface Board** • provides 2 parallel ports for attaching additional ProFile hard disk systems and/or a parallel printer • requires 1 expansion slot • maximum of 3 per system: \$195 prch

**Serial Ports** • 2 RS-232C programmable ports; up to 244K bps; half- or full-duplex; synchronous/asynchronous; full modem control and ring indicator on 1 channel.

**Apple Cluster Controller** • protocol converter enabling Lisa to emulate an IBM 3278 Model 2 terminal supporting BSC or SNA/SDLC protocols; available with 3 serial ports or 7 serial ports for linking up to 7 systems and/or printers • requires LisaTerminal software.

3-Port Model: 4,500

7-Port Model: 7,000

**AppleLine** • communications unit with 1 serial connection to Lisa and modem connected directly to IBM cluster controller, replaces any IBM 3277 or 3278 compatible terminal with Lisa: 1,295

**AppleBus** • twisted-pair network; 230.4K-bps data transmission speed; maximum length of 1,000 feet; supports up to 32 devices • connects via a transformer which plugs into the serial port and attaches to AppleBus through a standard DIN connector • AppleBus interface built into Lisa • scheduled to be available later in 1984.

### Mass Storage

**Internal Diskette Drive** • 3.5-inch, 400K-byte diskette drive; 80 tracks; variable sectors per track • 500K-bps data transfer rate; track-to-track access time 12 milliseconds, 30-millisecond head seek time; 400 to 600 variable resolutions per minute; diskettes are hardshell with automatic springloaded protective covers • included with all systems.

**ProFile Hard Disk Drive** • 5.25-inch Winchester-type disk drive; 5M bytes formatted per disk • 5M-bps data transfer rate; 95-millisecond average seek time • requires 1 parallel port • 1 drive included in the Lisa 2/5 system package; additional drives available: \$2,195 prch

**Internal Hard Disk Drive** • 5.25-inch Winchester-type disk drive; 10M bytes formatted • 55-millisecond average seek time • included in the Lisa 2/10 packaged system.

### Terminals/Workstations

**Display** • integrated 12-inch monochrome monitor; displays black characters on a white background; up to 40 lines of 132 characters • graphics resolution of 720x364 pixels, bit-mapped • 60-Hz refresh rate; 64 levels of contrast under software control.

**Keyboard** • detached, Selectric-type with N-key rollover • 76 keys total; full ASCII character set; numeric keypad with 4 cursor keys; "Apple" key for fast-path command execution; all keys programmable.

**Mouse/Pointer** • mechanical device about the size of a cigarette pack; rotating ball on the underside for moving on a desktop; 1 button for indicating selections; 2-foot-long wire cord for connecting to Lisa.

### Printer/Graphics

**Apple Daisy Wheel** • 40 cps; single-sheet or continuous forms up to 15 inches wide; 10, 12, 15 cpi plus proportional spacing; alphanumerics and graphics • includes interface cable, standard printwheel, documentation and tutorial diskette, and warranty: \$2,195 prch

**Imagewriter** • serial dot-matrix printer; 160 cps; 160 dot-per-inch resolution; handles paper 4.5 inches to 10 inches wide; characters are formed on a 7x8 pixel matrix, custom characters on a 16x8 pixel matrix; vertical line feed from 1/144 inch to 99/144 inch; prints up to 3 copies; produces a duplicate of Lisa screen representations: 595

• END





# Apple Macintosh 32 SuperMicro

## ■ PROFILE

**Operating Systems** • Macintosh Apple 32 SuperMicro Operating System, single user, including ROM-based Finder and operating utilities in System Folder on diskette.

**Data Management** • none available from vendor; third-party vendor software scheduled for release in third and fourth quarters of 1984 include products from Ashton-Tate, DB Master, and Microrim.

**Communications/Networks** • IBM 3277 and 3278 terminal emulation using AppleLine; also DEC VT-100, VT-52, and TTY Teletype for non-IBM communications using MacTerminal • AppleBus local equipment sharing bus connects Apple 32 SuperMicros to share printers, disk drives, and other peripherals using twisted-pair cable, available second quarter of 1984.

**Languages** • Microsoft BASIC, Macintosh Pascal, Macintosh Assembler/Debugger, Macintosh Logo, and Macintosh BASIC; other languages expected in third and fourth quarters of 1984 from third-party vendors.

**Models** • Macintosh.

**CPU** • Motorola 68000 32/16, 7.8336 MHz, 32-bit internal logic with 16-bit data path.

**Memory** • 128K bytes of RAM, 64K bytes of ROM on single digital board; basic unit upgradeable to 512K bytes of RAM using 256K-bit RAM chip digital board when available.

**Chassis Slots** • none.

**Ports** • two RS-232C/RS-422 serial ports, 230.4K-bps maximum; mouse interface; external disk interface; keyboard interface; polyphonic sound/voice port.



**Mass Storage** • two 3.5-inch, 400K-byte hard cover diskettes, 1 internal drive standard, 1 external drive available; available from third-party vendors include: Winchester hard disks, cartridge hard disks, and tape backup in first, second, and third quarters of 1984.

**Terminals/Workstations** • single terminal system with detached keyboard, mouse, and high clarity gray level monochrome display.

**Printers** • Imagewriter Printer produces hard copy of screen display; multiple font, proportional text, mixed text, and graphics capabilities.

**First Delivery** • January 24, 1984.

**Systems Delivered** • information not available.

**Comparable Systems** • closest comparable systems are Apple Lisa and Xerox Star even though they are priced significantly higher.

**Vendor** • Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014 • 800-538-9696.

**Canada** • Apple Canada, Inc; 875 Don Mills Road, Don Mills, ONT M3C 1V9 • 416-444-2531.

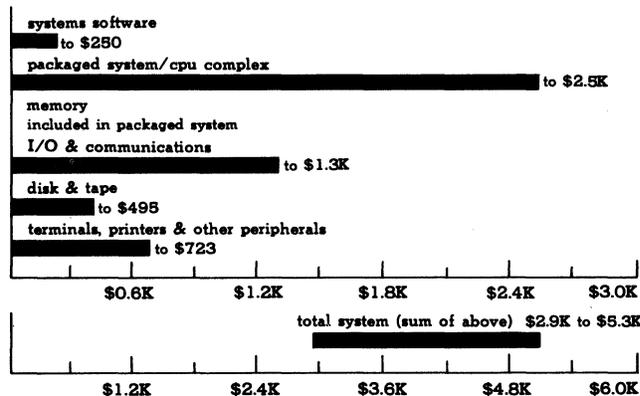
**Distribution** • through approximately 1,500 Apple computer dealers nationwide; 3,000 authorized dealers worldwide; direct high-volume sales to major businesses and universities as part of the Apple University Consortium.

## ■ ANALYSIS

Apple Computer has had difficulty in recent years introducing a product that even comes close to matching the overwhelming success of the Apple II. The executive staff of Apple has made little effort to conceal their disappointment in the Apple III and original Lisa computers. Three years ago Apple created a private internal division staffed by approximately 100 of its best engineers. The Macintosh Apple 32 SuperMicro is the result of this effort. Apple is hoping that its technological advancement and timeliness will make this the "third milestone" in microcomputing; the Apple II being the first

## PURCHASE PRICE RANGE

hardware & software



**APPLE MACINTOSH PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on **MACINTOSH packaged system** (includes 1 integral, 3.5-inch, 400K-byte floppy disk, 128K-byte RAM, 64K-byte ROM, operating system software; MacPaint; MacWrite; mouse, keyboard, and high resolution monitor) and the following options: Imagewriter printer • **LARGE SYSTEM** is based on a **MACINTOSH packaged system** (includes one integral, 3.5-inch floppy disk, 128K-byte RAM, 64K-byte ROM; operating system software, MacPaint, MacWrite, mouse, keyboard, and high resolution monitor) and the following options: Multiplan by Microsoft, MacTerminal, Imagewriter printer, external 400K-byte disk drive, numeric keypad, carry case, and security device.



## Apple Macintosh 32 SuperMicro

and the IBM-PC, the second.

The Macintosh is targeting a largely untapped market of "knowledge workers." Anyone who creates reports, budgets, plans, or memos is a potential owner of a Macintosh. With this targeted market Apple hopes to revolutionize both the human/computer interface standards and utility of personal computers.

Technologically, the Macintosh is truly the epitome of unrestrained engineering. At the cutting edge of technology, however, Apple is already running into various situations beyond its control. A truly maximized Macintosh waits for the arrival of affordable 256K-bit chips, double-sided, 3.5-inch drives, and public recognition of its powers. By means of a \$15 million advertising campaign, Apple Computer seems to be doing all it can to overcome the lattermost hurdle. It can do little to speed the availability of double-sided, 3.5-inch drives or lower the cost of 256K-bit RAMS, save for creating a strong public demand for these products.

Apple has thrust itself back into public view with this product introduction. It will be crucial to the success of the Macintosh and maybe even Apple itself, how well the company responds to public demand for an evolving product. The Macintosh, as it is sold now, is far more sophisticated than any other personal computer. It is also far from reaching its own potential capabilities. This must wait for software, additional technology, and public acceptance.

### □ Strengths

The Macintosh is designed to automate the "knowledge worker" with minimum training and optimum utility. Its superb, very fast graphics and mouse interface provide the basis for an operating environment never before available to the users of personal computers.

Despite the claim of some industry analysts that the mouse is an "interim technology," a single sitting at a Macintosh makes one wonder how personal computers have gone without them for so long.

The potential performance of software using the Macintosh's 32-bit technology and 64K-byte ROM Toolkit is impressive. If the almost 100 software vendors are successful in taking advantage of the features of the Macintosh, a new era in software performance might begin.

### □ Limitations

There is very little software available for the Macintosh. Though very flexible, the bundled word processor can only handle about 12 pages of single-spaced text in memory. The public must wait for the Apple-recruited software developers to complete just about any application they are interested in running. Currently, Microsoft Multiplan is available for spreadsheet analysis, but word processing, database, and graphics programs are still being developed.

The keyboard lacks cursor keys for quick, mouse-less corrections. It has a unique clackety feel that is not much better or worse than the IBM-PC's keyboard.

Memory is limited to 128K bytes of RAM. Apple has not clearly indicated how the anticipated upgrades to 512K bytes of RAM will occur. Internal disk storage is 400K bytes. Though this is more than a single IBM-PC drive, a second drive must be attached externally.

All graphics are represented in black and white with levels of gray. There are no facilities for color or for an external color monitor. This limitation will be somewhat reduced by a soon-to-be-announced color printer from Apple. Currently, a color graphics screen with the necessary resolution to run Macintosh software is prohibitive in price.

### ■ SOFTWARE

#### □ Terms & Support

**Terms** • Macintosh comes bundled with its own proprietary operating system, a tutorial program, and tape; if purchased before May 2, 1984, MacPaint and MacWrite are bundled at no additional cost; optional software is available on a 1-time license fee basis.

**Support** • information is not yet available on extended software support beyond initial 90-day warranty period; a software and hardware hot-line is currently being made available to dealers to assist them in providing support to customers.

#### □ Software Overview

The Apple Macintosh is an entirely new concept in hardware and operating environment sophistication. As such, it is not surprising that there is very little software available immediately. Apple Computer has taken what promises to be effective measures in remedying this situation.

There are currently almost 100 software vendors developing software for the Macintosh. Some developers, notably Microsoft, have had the Macintosh for over a year and are ready to announce completed packages. Software scheduled for availability for this year include titles such as: Multiplan, Microsoft Word, Microsoft Chart and File, MS BASIC, Lotus 1-2-3, PFS series, dBase II, The Home Accountant, and DR Logo. The Apple University Consortium is also destined to increase the amount of public domain software available on the Macintosh.

The Macintosh operating environment is a result of some 200 man-years of effort in the original Lisa project, enhanced, revised, and perfected by approximately 300 additional man-years on the Macintosh project (approximately 100 of Apple's engineers working for three years). The \$2,495 purchase price result is what many industry analysts view as the personal computer buy of the decade.

Designed as a tool for professionals in any knowledge based occupation, the mouse/pull-down menu environment offers extreme flexibility and ease in navigating the electronic desk-top conceptualization. A user is presented with a desk top, note pad, scratch book, calculator, and folders. Using the mouse one can manipulate (open and close) folders, make changes, cut and paste text or graphics, or even push a current worksheet aside with a tiny graphic representation of a hand.

The extent to which these capabilities are maintained and the operating philosophy adhered to in non-Apple software has much to do with the design skills of the individual software developers. Macintosh-specific code must be written in order for third-party software to feature pull-down menus, text and data interchangeability, and mouse interface capabilities.

Apple claims the Macintosh performs spreadsheet functions in Multiplan twice as fast as the IBM-PC. Also, Microsoft's incrementally compiled BASIC outperforms BASICA on the IBM-PC by 10 to 1, according to Apple.

The Macintosh was designed for the world market. The keyboard is software mapped. Ports are labeled in internationally identifiable symbols, and a resource manager in the system toolbox separates program code from data which facilitates



## Apple Macintosh 32 SuperMicro

customization, particularly in foreign language translation.

### Packaged Software

**MacPaint** • bundled at no additional charge during first 100 days of distribution; mouse driven software provides a multitude of artist pseudo-utensils including: paint brush, spray can, ruler, polygon, ellipse, and fill-screen templates; provides facility to "cut" artwork and "paste" directly onto text page of MacWrite file via a "scrapbook."

**MacWrite** • bundled at no additional charge during first 100 days of distribution; mouse and keyboard driven software allow flexible mouse manipulation of entered text; can perform right and left justification, margin adjustments, tab-stops, decimal alignment, powerful font and size editing from 9-point print to 24-point headlines, incorporation of graphics "pasted" onto text page, and proportional spacing; print option in fast and slow modes; can process a maximum of approximately 12 single-spaced pages of text.

**MacPaint/MacWrite** • graphics/word processing set; after 100-day introductory period:

\$195 lcns

### Operating System

**Macintosh Proprietary Operating System** • single user, single tasking, icon/graphics oriented • includes Finder program which is responsible for boot-up, icon directory, desktop handler, and control panel; desktop handler loads "objects" such as a calculator, alarm clock, control panel, note pad, and scrapbook; control panel regulates system functions such as mouse sensitivity and volume of sound; incorporates real-time battery-driven 24-hour clock and calendar.

### Utilities

Apple provides various system utilities related to its operating system, printing, and disk data file management. No other major utilities are provided with the Macintosh.

### Data Management

Apple does not provide data management software, but indicates various third-party developers including Ashton-Tate and Microrim are scheduled to complete such software by the fourth-quarter of 1984.

### Communications/Networks

**MacTerminal** • emulates DEC VT-100, VT-52, and Teletype terminals; with AppleLine performs IBM 3277 and 3278 terminal emulation; can connect to IBM cluster controllers:

\$99 lcns

### Program Development/Languages

Apple has announced the availability of multiple development languages by the fourth quarter of 1984. These languages provide such added features as: multiple window tracing and mouse/graphics support. Among the languages scheduled are: Microsoft BASIC, Macintosh Pascal, Macintosh Logo, and Macintosh Assembler/Debugger.

Included in 64K bytes of ROM is the Macintosh Developer's Toolbox which contains approximately 480 I/O and graphics subroutines that are callable from any language supporting system calls. This ROM also includes the Quickdraw routines which are responsible for almost all screen graphics manipulations.

## ■ HARDWARE

### Terms, Support & Documentation

**Terms** • Macintosh is available for purchase, optionally with an Apple Credit Card; includes operating system software and manuals at no additional cost • additional software products are available on a 1-time license fee basis; optional hardware products available for purchase • Apple Credit Card is not available in Canada.

**Support** • 90-day warranty period • optional Apple Care Extended Warranty available first quarter of 1984; service available at all servicing Apple dealers and more than 300 RCA service centers nationwide.

**Documentation** • user guides provided in spiral bound glossy editions designed to lie flat, with extended back covers folded to facilitate easy identification on a bookshelf.

### Physical Specifications (H x W x D); Weight

**CPU** • 13.5 x 9.7 x 10.9 inches; 16 pounds, 8 ounces.

**Display** • integrated with CPU unit.

**Keyboard** • 2.6 x 13.2 x 5.8 inches; 2 pounds, 8.5 ounces.

**Mouse** • 1.5 x 2.4 x 4.3 inches; 7 ounces.

### Systems Overview & Configurability

The Macintosh system has been called the personal computer industry's most advanced design to date in areas of user interface and processing speed, and Macintosh truly lives up to this acclaim. There are some limitations worthy of criticism, however, in its performance.

Based on an 8-MHz Motorola 68000 microprocessor, coupled with 64K bytes of very elegant 100 percent machine coded ROM, the Macintosh is an extremely fast graphics performer. This power is necessary to support its advanced icon/windows user interface which is presented in black and white with gray levels. The speed and flexibility with which the Macintosh fills screens and moves, rotates, or flips images is unattainable by present day 16-bit personal computer technology, namely the IBM-PC.

Apple selected the mouse as the Macintosh's primary input device. The mouse is rolled on any flat surface and effects a corresponding movement of an arrow-like cursor. A single button is used to select any pointed-to menu option (icon) or to initiate an action (painting). The sensitivity of the mouse to motion is adjustable and normally generates 3.54 pulses every millimeter it rolls.

Other notable features include high-speed serial ports, 512x342 pixel graphics, built-in battery powered clock/calendar, 4-voice sound and speech generator, and an under 20-pound system weight.

Memory is limited to 128K bytes of RAM with 64K bytes of ROM. Though the ROM helps reduce code size of programs running on the Macintosh, it does nothing to increase the amount of raw data 128K bytes can hold. Apple has not yet clearly defined how memory upgrades to 512K bytes of RAM would take place. It is tacitly understood, industry-wide, that since the present 64K-bit RAMs are soldered directly to the digital board, the entire digital board will have to be replaced in order to upgrade to 512K bytes of RAM. Presently, the high price of 256K-bit RAM chips makes the cost of this type of upgrade prohibitive.

Similarly, disk storage technology on the Macintosh is looking toward the advent of double-sided, 800K-byte, 3.5-inch diskettes from Sony. Again, Apple has not indicated if and how upgrades would be performed. The second external diskette drive does not fit inside the much publicized carry case.

There are numerous products scheduled for arrival this year from Apple and third-party vendors. These include: modems, hard disks, floppy disks, tape backups, and networks.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**Macintosh Apple 32 SuperMicro System Maximums** • 128K bytes of RAM, 64K bytes of ROM, 800K-byte, 3.5-inch diskette storage, 2 serial ports, keyboard, mouse, numeric keypad, black on white 512x342 pixel display with gray levels.

### Packaged Systems

**Macintosh Apple 32 SuperMicro** • integral unit with 32-/16-bit processor, 128K bytes of RAM, 64K bytes of ROM, 9-inch

*LCNS: one-time license fee. Prices effective as of January 1984.*



# Apple Macintosh 32 SuperMicro

high-resolution monochrome display with gray levels, 3.5-inch, 400K-byte diskette drive, 6 interfaces and ports, detached keyboard and mouse standard; comes with a system disk, "Guided Tour of Macintosh," diskette and cassette tape, a blank disk; owner's manual; and a programmer's switch:

\$2,495 prch

## □ CPU

**Motorola 68000 Processor** • 32-bit wide CPU registers interconnected by 16-bit wide data paths; 16-bit internal (ALU) architecture, 16-bit data bus interface with 24-bit addressing to 16M bytes; CPU has 8 32-bit data registers and 8 32-bit address registers; 2 32-bit stack pointers, a 16-bit status register, and a 23-bit program counter • powerful 56 mnemonic instruction set includes 4, 8, 16, and 32-bit data manipulation, signed and unsigned multiply and divide, 5 basic addressing modes with pre and post-incrementing, offsetting, and indexing, 7 levels of priority interrupt with 256 possible interrupt vectors, a trace mode and sophisticated trap operations for debugging; Motorola "HMOS" technology large-computer geometric architecture • 7.8336 MHz.

## □ Memory

Macintosh comes with 128K bytes of RAM accompanied by 64K bytes of ROM. Included in the ROM are the Macintosh operating system kernel, Quickdraw screen graphics, and Macintosh Developer's Toolbox containing 480 routines. This accessible ROM effectively reduces the RAM needed for programs using input/output, memory control, or graphics. Also enhancing effective memory use is a Segment Loader, which facilitates division of programs larger than 128K bytes into loadable segments. Memory upgrade to 512K bytes scheduled for late 1984 or early 1985 and will be accomplished via a board swap. For reliability reasons, sockets are not used for memory in the Macintosh. Memory is soldered directly to the digital board.

## □ I/O & Communications

Macintosh comes standard with 2 RS-232C/RS-422 serial ports both capable of 230.4K bps or up to 942K-bps communications clocked internally. Also included are a synchronous serial keyboard bus, mouse interface, and external diskette interface. These facilities emulate DEC VT-100, VT-52, and TTY communications using MacTerminal software. For IBM and IBM cluster controller communications, see AppleLine below.

**AppleLine** • communications unit with 1 serial connection to Apple Macintosh and modem connected directly to IBM cluster controller; replaces any IBM 3277 or 3278 compatible terminal with Macintosh:

\$1,295 prch

## □ Mass Storage

Apple Macintosh comes with a 400K-byte, integral, 3.5-inch

diskette, with an external 400K-byte diskette option.

**Internal Diskette Drive** • 3.5-inch, 400K-byte diskette drive; 80 tracks; variable sectors per track • 500K-bps data transfer rate; track-to-track access time 12 milliseconds, 30 milliseconds head seek time; 400 to 600 variable resolutions per minute; diskettes are hardshell with automatic springloaded protective covers • drive is integral with basic Macintosh system.

**External Disk Drive** • identical to internal drive; attaches to port on rear of Macintosh:

\$495 prch

## □ Terminals/Workstations

**Display** • Macintosh 9-inch monitor is high-resolution, bit-mapped, 512x342 pixel, black on white with gray levels • integral with main system unit.

**Keyboard** • 58-key, 2-key rollover, detached keyboard with wide shift and return keys; full stroke, memory mapped, keyboard connects to front of Macintosh or to optional numeric keypad which in turn attaches to the Macintosh • does not have cursor keys (see Numeric Keypad) • standard with system.

**Numeric Keypad** • 18-key detached numeric keypad with cursor keys • attaches to Macintosh and provides keyboard port:

\$129 prch

**Carry Case** • soft carry case holds Macintosh, keyboard, and cables:

99

**Security Kit** • secures Macintosh to table or desk:

49

## □ Printer/Graphics

**Imagewriter** • serial dot-matrix printer; 160 cps; 160 dot-per-inch resolution; handles paper 4.5 inches to 10 inches wide; characters are formed on a 7x8 pixel matrix, custom characters on a 16x8 pixel matrix; vertical line feed from 1/144-inch to 99/144-inch; prints up to 3 copies; produces a duplicate of Macintosh and Lisa screen representations:

\$595 prch

**Imagewriter** • with purchase of Macintosh:

495

**Apple Letter Quality Printer** • 40 cps; serial interface; 10, 12, or 15 cpi; proportional spacing; paper width to 15 inches; comes with standard print wheel, interface cable, documentation, and warranty:

2,195

**Apple Dot-Matrix Printer** • 120 cps; paper width to 8.5 inches; 10, 12, or 16.5 pitch; standard Centronics parallel interface; includes interface cable, documentation, ribbon, and warranty:

695

• END

*PRCH: purchase price. Prices effective as of January 1984.*



# Burroughs B 20 Series B 21 & B 22 Systems

## ■ PROFILE

**Operating Systems** • Burroughs BTOS real-time, multitasking operating system • Microsoft MS-DOS • Digital Research CP/M-86.

**Data Management** • ISAM under BTOS; multikey ISAM with B 20 Customizer Package.

**Communications/Networks** • CCITT X.25, Asynchronous Terminal Emulator, IBM 2780/3780 RJE Terminal Emulator, IBM BSC and SNA 3270 Terminal Emulators, Burroughs Poll/Select, and Burroughs MT983 Emulator using Burroughs Poll/Select.

**Languages** • BASIC, COBOL, FORTRAN, and Pascal.

**Models** • B 21 with B 21-1T, B 21-2T, B 21-2PC, B 21-3T, B 21-4T, B 21-5T, B 21-5PC, B 21-6T.

**CPU** • 16-bit Intel 8086 for all models except B 21-1 which uses 16-bit Intel 8088.

**Memory** • 128K to 512K bytes on B 21; 256K to 640K bytes on B 22.

**Chassis Slots** • 2 Multibus slots on B 22 only.

**Ports** • B 21-1, 21-1T—1 RS-422 port; other B 21 models—1 RS-422 port, 2 RS-232C ports, 1 Centronics parallel printer port; B 22—2 RS-232C ports or 1 RS-232C port and 1 RS-422 port, 1 Centronics parallel printer port.

**Mass Storage** • none on B 21-1T; 1 630K-byte diskette standard on B 21-2T; 2 630K-byte diskettes standard on B 21-3T; 1 each 5M-byte disk and 630K-byte diskette standard on B 21-4T; 1 each



8.4M-byte disk and 630K-byte diskette standard on B 21-5T; 1 each 12.6M-byte disk and 630K-byte diskette standard on B 21-6T • 8.4M- or 16.8M-byte disk and 0.5M-byte diskette optional on B 22 expandable to 50.4M bytes.

**Terminals/Workstations** • none on B 21-1T, B 21-2T; other B 21 submodels can have up to 3; B 22 can have up to 16.

**Printers** • none on the B 21-1Ts; various dot-matrix and letter-quality printers plus a line printer available for the other models.

**First Delivery** • June 1982.

**Systems Delivered** • approximately 10,200.

**Comparable Systems** • IBM PC/XT, Data General Desktop Generation, Honeywell micro-System 6/10, 6/20.

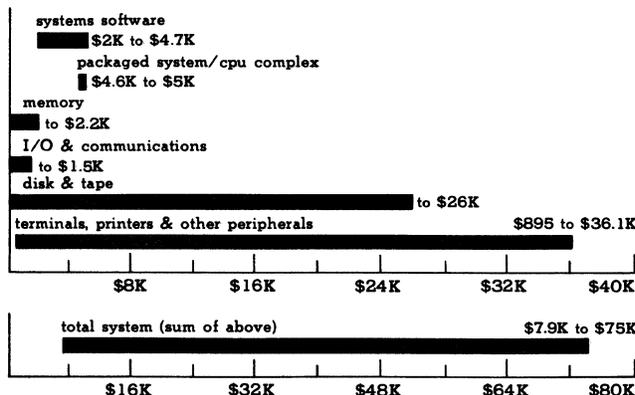
**Vendor** • Burroughs Corporation; Burroughs Place, Detroit, MI 48232 • 313-972-7000.

**Canada** • Burroughs-Canada; 801 York Mills Road, Don Mills, ONT M3B 1X7 • 416-445-4030.

**Distribution** • company-owned stores in the U.S., Canada, and Europe; direct sales worldwide to multisystem customers; independent value-adding dealers and distributors.

## PURCHASE PRICE RANGE

hardware & software



**BURROUGHS B 20 SERIES PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on B 21-3TS packaged system (includes CPU, 128K-byte memory, monochrome display, keyboard, 2 630K-byte diskette drives, RS-422 port, 2 RS-232C ports, Centronics printer port) and the following options: BTOS operating system, BASIC interpreter systems software and 120-cps dot-matrix printer • **LARGE SYSTEM** is based on B 22 packaged system (includes CPU, 256K-byte memory, monochrome display, keyboard, 2 RS-232C ports) and the following options: BTOS and MS-DOS operating systems, BASIC interpreter, COBOL compiler, asynchronous terminal emulator, 3270 SNA emulator, word processor, Multiplan spreadsheet software; additional 384K bytes of memory; communications I/O processor; 33.6M bytes of hard disk storage, streamer tape for backup; 6 B 21-3TS systems as cluster stations, 150-cps dot matrix, 35-cps letter-quality printers.

## ■ ANALYSIS

The B 20 Series is the low-end system in the Burroughs family. Driven by an Intel 8086, the microprocessor-based system was designed using Convergent Technologies hardware and an enhanced version of Convergent Technologies operating system. When Burroughs launched its B 20 program, it pledged unequalled support and service for the system.

Recent enhancements to the B 20 line include the addition of 2 new models—the B 21-2 PC and the B 21-5PC—which are configured with color displays and



## Burroughs B 20 Series B 21 & B 22 Systems

**TABLE 1: BURROUGHS B 20 SYSTEM CHARACTERISTICS**

	<b>B 21-1T</b>	<b>B 21-2T</b>	<b>B 21-2PC</b>	<b>B 21-3T</b>	<b>B 21-4T</b>
Processor	16-bit 8086	16-bit 8086	16-bit 8088	16-bit 8086	16-bit 8086
Speed	8 MHz	8 MHz	8 MHz	8 MHz	8 MHz
Memory					
Min	256K	256K	384K	128K	256K
Max	512K	512K	512K	512K	512K
Display	28x80	28x80	28x80 color & graphics	28x80	28x80
Mass Storage	None	5.25" diskette (630KB formatted)	5.25" diskette (630KB formatted)	5.25" diskette (1.26MB total formatted)	5.25" diskette (630KB formatted) 5.25" Winchester (5.0MB formatted)
Serial Communication	1 RS-422	2 RS-232C 1 RS-422	2 RS-232C 1 RS-422	2 RS-232C 1 RS-422	2 RS-232C 1 RS-422
Parallel Printer Port	None	1 Centronics Interface	1 Centronics Interface	1 Centronics Interface	1 Centronics Interface
Other I/O Slots	None	None	None	None	None
Use	Cluster Station Only	Cluster Station Only	Cluster Station Only	Cluster Station or Standalone System	Cluster, Standalone or Master System

graphics capabilities; the availability of MS-DOS and CP/M-86 on the systems; and the option of utilizing magnetic tape as backup on the B 22. Burroughs has also lowered the prices on the systems, some by as much as 50%.

The B 20 can be utilized in 3 modes: as a cluster station that may require mass storage, printer, or graphics; as a standalone system, since both memory capacity and disk capacity will support most applications; and as a master station serving cluster stations, running an application, or a combination of both.

Burroughs is billing its B 20 Series as a "Distributed Intelligence System" and is therefore not placing a heavy emphasis on capturing the single-user marketplace. According to Burroughs, its distributed intelligence takes distributed processing one step further. Since the B 20 provides the users with processing power, disk storage, printer and data communications capabilities, it offers an alternative solution to the so called "dumb" terminal concept. The B 20 will allow a user to transfer files between B 20s in a clustered environment and transfer files to a remote or local host system. Because each workstation has its own processor and memory set, each workstation can operate individual programs and serve as entry stations to a master unit.

The various models of the B 20 can be targeted for different jobs in the marketplace. The B 22 should be considered when user requirements exceed linking 4 workstations in a network; when disk requirements will exceed 15M bytes and memory requirements will exceed 512K bytes; when Multibus slots will be required; when requirements are such that a workstation would be running applications and sharing its resources with local

network stations; when specialized 34x132-character displays are needed; or when graphic interpretation of statistical data is required.

The B 21-1T can only be used as a cluster station, basically performing data entry. The B 21-2T/PC can be used as low-cost cluster stations when there is a requirement for a local printer and/or data communications and/or minimal local disk storage for running individual applications. The B 21-3T, with its 2M bytes of disk storage, fits the mold of a low-cost standalone system. It can also serve as a cluster station capable of running individual applications.

The B 21-4T, -5T/PC, and -6T can serve as master stations in a small network that requires up to 4 users or as standalone systems where disk requirements are between 2M and 15M bytes. They can also be used as cluster stations if a user feels that each site in the network needs extensive individual storage capacity.

### Strengths

The B 20 systems are based on popular and proven processors and system software. Applications development, a prime concern of value-added dealers, will be greatly simplified by the choice of languages available, and by the Customizer Package and Forms Facility.

Burroughs has added an impressive, wide-ranging array of communications software that should facilitate connecting B 20 systems to various hosts and into various networks. This software feature, coupled with the system's communications processor, makes the B 20 one of the very few micros on the market today that is so richly



## Burroughs B 20 Series

### B 21 & B 22 Systems

**TABLE 1: BURROUGHS B 20 SYSTEM CHARACTERISTICS (CONTD.)**

	B 21-5T	B 21-5PC	B 21-6T	B 22
Processor	16-bit 8086	16-bit 8088	16-bit 8086	16-bit 8086
Speed	8 MHz	8 MHz	8 MHz	5 MHz
Memory				
Min	256K	384K	256K	256K
Max	512K	512K	640K	640K
Display	28x80	28x80 color & graphics	28x80	34x80 or 132
Mass Storage	5.25" diskette (630KB formatted); 5.25" Winchester (8.4MB formatted)	5.25" diskette (630KB formatted); 5.25" Winchester (8.4MB formatted)	5.25" diskette (630KB formatted); 5.25" Winchester (12.6MB formatted)	opt 5.25" diskette (630KB formatted); 5.25" Winchester (8.4MB or 16.8MB formatted up to 50.4MB)
Serial Communication	2 RS-232C 1 RS-422	2 RS-232C 1 RS-422	2 RS-232C 1 RS-422	2 RS-232C or 1 RS-232C, 1 RS-422
Parallel Printer Port	1 Centronics Interface	1 Centronics Interface	1 Centronics Interface	1 Centronics Interface
Other I/O Slots	None	None	None	2 Multibus Slots
Use	Cluster, Standalone or Master System	Cluster, Standalone or Master System	Cluster, Standalone or Master System	Cluster, Standalone or Master System

endowed with sophisticated data communications capabilities.

Because of the various configurations that are offered, the B 20 provides a user with plenty of flexibility in choosing a system to meet his/her needs—from standalone or cluster units; from 630K bytes to 50M bytes of storage capacity; from different size character displays; and from a selection of 7 different printers. Besides its flexibility, another major highlight of the system is its multilanguage capability. The B 20 can presently display and print in 6 languages other than English.

The B 20's external design is another system plus. The unit is an attractive piece of equipment that takes many ergonomic factors into consideration. This is evident when one touches the sculptured keyboard with its palm rest or gazes at the green phosphor 15-inch display with its tilt and swivel base. The lectern on the front of the electronics enclosure adds a nice finishing touch to the unit.

#### □ Limitations

The B 21 models do not offer any provisions for upgrading should a user's disk requirements increase. Whatever the disk capacity a user initially orders, he/she must live with it. Memory expansion on both the B 21 and B 22 is also rather limiting. It would be nice if the systems could go to 1 Meg.

#### ■ SOFTWARE

##### □ Terms & Support

**Terms** • fees are one-time licenses • no service, but 90-day from invoice warranty • all separately priced software available to purchasers of more than 10 systems for 10 times individual price except Customizer Package (maximum \$6,500) and Multiplan

and WRITEone (discounted as hardware).

**Support** • 90-day warranty, extendable to 1 year.

##### □ Software Overview

The Burroughs B 20 runs under its own proprietary operating system, BTOS, as well as under MS-DOS and CP/M-86. Under BTOS, the systems support several communications packages including IBM 2780/3780 and 3270 emulation and the X.25 network. Data management capabilities are incorporated in BTOS. Applications available from Burroughs include a word processor, the Multiplan spreadsheet, business graphics, and various accounting packages.

##### □ Operating System

#### B 20 Operating System (BTOS)

The BTOS operating system is available in 4 versions: B 21 Master or Standalone and B 22 Master or Standalone. The standalone versions include the operating system, system utilities, and ISAM data management facilities. The master versions, which were designed to run in multiuser environments, include a master operating system capable of controlling 3 other cluster workstations; a cluster operating system; a spooler; and a queue manager plus utilities and ISAM functions. Applications which have been written to run on B 20 standalone systems will execute on cluster units without modification.

**BTOS** • real-time, multitasking operating system provides event-driven, priority-based schedules; handles system calls for interprocess communication/synchronization • ISAM supports access to fixed-length data records contained in ISAM data sets; each logical ISAM data set holds one type of data record; each data set is stored as 2 physical files: a data store file and an index file; each index is implemented as a B-tru structure; provides record-level lockout for shared ISAM files • sort facility supports variable length records with fixed-length keys; provides multilevel sorts (up to 15 levels) • system utility functions include initialization, backup, copy files, disk maintenance, list files, and a print spooler (cluster system configurations only) • system-level graphics primitives provide a user with file control over the



## Burroughs B 20 Series B 21 & B 22 Systems

graphics processor (utilized with the B 22 and B 21-2PC, B 21-5PC only):

**\$2,000 lcms**

**MS-DOS 1.25** • single-user, interactive and batch processing disk operating system developed by Microsoft; has its equivalent in IBM PC-DOS 1.2 • supports maximum diskette storage of 160K bytes in up to 64 different files in single-density double-sided format; handles records from 1 to 65,546 bytes long in file transfers; executes external (disk based) commands, giving the user ability to expand the DOS vocabulary to the limits of disk space • includes batch processing capabilities with automatic execution on power up; user commands include DATA, TIME, DISKCOPY, FORMAT, RENAME, ERASE, COMP (compare), CHKDSK (check disk) • innovations include a double File Allocation Table (disk map) with third memory resident copy for efficient disk access, a disk mapping technique which conceptualizes conventional tracks and sectors as a single dimensioned array of logical sectors, and allocation units which subdivide data section into 1, 2, 4, 8, 16, 32, 64, or 128 logical sector groups, eliminating disk external fragmentation typical of conventional track-sector mapping • MS-DOS is divided into four parts: a device independent I/O handler, an I/O command processor, reference and jump vectors in low memory, and a command processor; the device independent I/O handler on hidden file MSDOS.SYS is the core of MS-DOS through which I/O must be directed; the I/O processor physically moves data and instructions by means of hidden file IO.SYS as commanded by MSDOS.SYS; the command processor, using the COMMAND.COM program, is responsible for interface between user and MS-DOS, error trapping, batch file processing, interpreting user commands and executing file names • MS-DOS 1.25 is a predecessor of MS-DOS 2.00:

NA

**CP/M-86** • a 16-bit enhanced version of the 8-bit CP/M operating system designed to support the Intel 8086 or 8088 microprocessors; incorporates all the basic elements of the CP/M system but adapts these functions to the larger and faster operating environment • consists of 4 elemental structures: Basic Input/Output System (BIOS); Basic Disk Operating System (BDOS), Command Console Processor (CCP), and a Transient Program Area (TPA) • BIOS is the modifiable portion of the operating system enabling users to tailor CP/M systems to meet specific configurations; allows users to define all hardware-independent elements of the system by defining low-level interface and the peripheral I/O for the system • BDOS provides all the disk management control; supports up to 16 logical drives containing up to 8M bytes each, for a maximum of 128M bytes of online storage; any one file can reach the full drive size • CCP provides the interface between the user's console and the rest of the CP/M system; it reads, interprets, and executes commands entered from the console; commands are both built-in commands and transient commands; transient commands are loaded into the TPA and executed • TPA is the area designated to hold programs that are loaded from disk and then executed • standard utilities provided include: DDT-86 interactive debugger; PIP file transfer utility; SUBMIT batch control utility; ED command-oriented text editor; ASM-86 assembler; STAT system status utility; and GENCMD that processes Intel "H86" format files • memory requirements depend on number and types of options implemented • supports up to 1M bytes of memory; requires 56K bytes of memory as an ASCII terminal:

NA

### Utilities

Various utilities including a sort inherent in the operating system.

### Data Management

ISAM facilities are inherent in the operating system.

### Communications/Networks

### Emulation Software

**3362-8009 B 20 ATE Asynchronous Terminal Emulator** • lets B 20 emulate an asynchronous character-oriented terminal, displaying or storing data received • also handles binary data •

20 to 19,200 bps • half-/full-duplex • terminal control dynamically on various communication/file parameters • requires 256K bytes for standalone or cluster, 384K bytes for master:

**\$500 lcms**

**3362-8066 B 20 RJE 2780/3780 Remote Job Entry Terminal Emulator** • lets B 20 system emulate an IBM 2780 or 3780 RJE terminal device • operates in background, uses disk instead of cards • files come from editor, word processor, or application program, are queued for transmission • configuration files specify mode (2780/3780) and facility (2- or 4-wire), also sign-on to host • requires 256K bytes for standalone or cluster, 384K bytes for master:

**750**

**3362-8074 B 20 32E 3270 Terminal Emulator** • lets B 20 emulate various BSC IBM controllers: 3271, 3274, 3275, and 3276 • 80/132 columns, up to 31 lines (B 22) • up to 9600 bps, bisynchronous • application program access • 10 function keys with SHIFT/CODE keys provide 30 possible functions • requires 256K bytes for standalone or cluster, 384K bytes for master:

**750**

**3362-8090 B 20 535 SNA 3270 Terminal Emulator** • supports same functional interfaces to IBM hosts as does the IBM 8100 • being developed in 3 major phases; Phase I, Transport Service and SNA 3270 subsystem (available second quarter of 1983); Phase II, SNA RJE workstations; Phase III, Distributed Transaction Processing interface (not yet available) • Transport Service layers include SDLC protocol, path control, transmission control, PU and LU network functions • supports 3270 command and data stream processing • speeds from 2400 to 9600 bps:

**995**

**3362-8017 B 20 POS Burroughs Poll/Select** • supports B 20 emulation of standard Burroughs asynchronous terminals:

**500**

**3362-8694 B 20 MTE** • includes B 20 POS and incorporates emulation of a Burroughs MT983 Input and Display System:

**750**

### Network Software

**3362-8082 B 20 X25 X.25 Communications Manager** • allows B 20 operation on public packet-switching networks • synchronous, via RS-232 modem at up to 9600 bps • packet level for usual X.25 usage; bytestream level for independent I/O and to use B 20 sequential access method without X.25 protocol knowledge by user; terminal emulation level for same on network • requires 256K bytes for standalone or cluster, 384K bytes for master • optional RS-232 serial or parallel Centronics interface printer supported:

**\$500 lcms**

### Program Development/Languages

**3362-7910 B 20 BAI BASIC Interpreter** • ANSI X3.60-1978 plus extensions: ability to call another program from disk and pass parameters; read/write disk files via sequential and random access; write to line printer; read/write to memory and/or I/O ports; extended data types (e.g., double-precision floating point); error condition processing; IF-THEN-ELSE and other structured programming constructs • serial/parallel printer support • requires 256K bytes for standalone/cluster, 384K bytes for master:

**\$750 lcms**

**3362-7928 B 20 COB COBOL Compiler** • ANSI X3.23-1974 Level 2 and GSA high/intermediate • interactive debugger • includes editor • access to ISAM, sort/merge, and Forms Facility • serial/parallel printer support • requires 256K bytes for standalone/cluster, 384K bytes for master:

**750**

*LCNS: one-time license fee. NA: price not available from vendor. Prices effective as of January 1984.*



## Burroughs B 20 Series

### B 21 & B 22 Systems

**3362-7936 B 20 FTN FORTRAN Compiler** • ANSI FORTRAN 77 subset level plus selected full-level features and ANSI FORTRAN 66 compatibility features • includes text editor and linker/librarian • supports serial/parallel printer • requires 256K bytes for standalone/cluster, 384K bytes for master:

750

**3362-7944 B 20 PAS Pascal Compiler** • upward-compatible extension of current ISO draft standard (ISO/TC9/SC5/N509) • complies to native machine code for fast execution • includes text editor and linker/librarian • system programming extensions, such as ability to break/recast type, originate interrupt, initialize values, manipulate strings • runtime error checking • optional compile-time optimization • supports serial/parallel printer • requires 256K bytes for standalone/cluster, 384K bytes for master:

750

#### Program/Application Development Aids

**3362-8686 B 20 DMR Data Manager** • for file functions without resort to programming languages • interactive, with menus and prompts • has screen layout defaults • uses ISAM • users can add to menu • requires BTOS • supports serial/parallel printer:

\$1,200 lens

**3362-7977 B 20 FRM Forms Facility** • interactive display screen graphic design callable from any B 20 language • requires a B 20 language • B 21 version availability with BTOS Level 2:

990

**3362-8025 B 20 CST Customizer Package** • structured set of software components to assist in application program development • includes the operating system, utilities, optional languages, program development tools, data management facilities and generators:

2,500

**3362-8116 B 20 FON Font Designer** • extends graphic display/printer support • for B 22 displays:

500

#### Applications Packages

**3362-7829 B 20 BWP Executive WRITEone System** • single-/multiple-user combined word/data processing • scrolling • split screen • undo/redo keys • 80/132 characters per line "200M" on B 22 • output formatting independent of typist • requires BTOS • supports 64-/96-character serial/parallel direct/spooled printer and letter-quality serial printer direct/spooled • multiple copies discounted with hardware:

\$500 lens

**3362-8033 B 20 BMP Multiplan** • statistical spreadsheet modeling • command driven with math functions • can interface with B 20 Business Graphics package to translate grids into graphic representations • requires BTOS standalone/cluster system • supports serial/parallel printer • multiple copies discounted with hardware:

200

**3361-1740/2011/2003/2029/2037/2045 B 20 Executive Accounting System (EASY)** • 6 modules including order entry/invoicing, accounts receivable, inventory control, accounts payable, payroll, general ledger • price below is per module:

895

**Budgetary Accounting** • comprised of 5 modules; budget control, accounts payable, revenue, general ledger, purchase order purchasing:

NA

**Utility Billing** • performs 5 functions; file maintenance, consumption calculations, management reporting, utility bill preparation, cash posting:

NA

**Government/Education Payroll** • handles security provisions,

recovery techniques, contract pay, flexible payroll cycles, cost center analysis, state reporting, tax sheltered annuities, check reconciliation, hourly/salary payroll, user-defined deductions and earnings, budgetary accounting interfaces, and standard/on-demand reports:

NA

**Construction EASY** • for the construction industry • modules include payroll, accounts payable, purchase orders, job costing, accounts receivable, general ledger:

NA

**Manufacturing EASY** • for manufacturers • modules include payroll, accounts payable, purchase orders, job costing, accounts receivable, and general ledger:

NA

**3545-7662 B 20 BGP Business Graphics Package** • graphically displays and prints data used in release 2.0 or higher of Multiplan • cut and paste functions • changes shading and label font styles • merges, scales, and moves charts and graphs • saves pictures on disk • supports HP 7470A color plotter • requires 384K bytes of memory on standalone/cluster system and 640K bytes on master system:

750

#### Other Facilities

None available from Burroughs.

#### ■ HARDWARE

#### Terms, Support & Documentation

**Terms** • purchase only • quantity discounts by Burroughs to direct-sale multisystem customers • annual maintenance payments.

**Support** • 90-day equipment warranty • 5-day-per-week 8:00 AM to 5:00 PM shift maintenance • hot-line.

**Documentation** • includes B 20 Installation Planning Guide; B 20 Operations (Part I—Hardware, Part II—Systems Software, and Quick Reference Guide); various installation, operation, and maintenance guides on individual pieces of hardware.

#### Physical Specifications (H x W x D); Weight

**CPU** • 13.75 x 30 x 12 inches for B 21 and B 22; 45 pounds for B 21 and 50 pounds for B 22.

**Display** • integrated with CPU unit.

**Keyboard** • 2.4 x 18 x 8.5 inches for B 21 and B 22; 4 pounds for B 21 and B 22.

#### Systems Overview & Configurability

The Burroughs B 20 combines a 16-bit Intel 8086 CPU, memory ranging from 128K bytes to 640K bytes, a 15-inch video display, and a detached keyboard, all integrated in a desktop unit. The system comes in 2 versions, the B 21 which is currently available in 8 models, and the B 22 which consists of 1 model that may be configured with various options.

The 8 models of the B 21 differ with respect to disk storage capacity, number of I/O slots, and whether they can operate standalone or as a master station. All models can serve as cluster units. Additionally, 2 of the models sport color displays with graphics capabilities as opposed to the monochrome displays on the other models. For a breakdown of the B 21 models, refer to the table on page 2.

The B 22 is the high end of the B 20 Series. It is configured with a minimum of 256K bytes of memory, 2 Multibus slots, a parallel printer port, and 2 RS-232C ports, or 1 RS-422 port and 1 RS-232C port. A graphics capability is optionally available. The system can be employed as a standalone unit, as a master station, or as a cluster station.

Storage units on the B 22 are optional. The mass storage base unit is housed in a 7.5-inch floorstanding enclosure. It contains a Winchester controller, a floppy disk controller, a non-removable Winchester disk, and a floppy backup. A floorstanding expansion



## Burroughs B 20 Series B 21 & B 22 Systems

unit is also available. This unit utilizes the controller and the diskette drive in the mass storage base unit.

A B 21 master station can support up to 3 cluster units via its RS-422 channel. With a B 22, 16 workstations can be clustered. When more than 3 cluster units are connected to a B 22 master station, a Communications I/O processor must be employed. Two Communications IOPs can be attached to the system with each one handling up to 4 cluster units.

The internal architecture of the B 21 differs from that of the B 22. However, the 2 systems are compatible and can be mixed in the same network.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**B 21 System Maximums** • varies by submodel • all models include CPU, up to 512K bytes of memory, RS-422 cluster communications port, and keyboard/display.

**B 21-1T System Maximums** • includes basic configuration without disk or diskette storage, printer, or additional data communications ports.

**B 21-2T/-2PC System Maximums** • includes base configuration plus 630K-byte formatted diskette storage; 2 RS-232C ports; parallel printer port; printer.

**B 21-3T System Maximums** • same as B 21-2T except 2 diskette drives.

**B 21-4T System Maximums** • same as B 21-2T plus 5M-byte formatted hard disk; 3 additional B 20 workstations.

**B 21-5T-/5PC System Maximums** • same as B 21-2T plus 8.4M-byte formatted hard disk; 3 additional B 20 workstations.

**B 21-6T System Maximums** • same as B 21-2T plus 12.6M-byte formatted hard disk; 3 additional workstations.

**B 22 System Maximums** • 2 different configurations • both include CPU, 640K bytes of memory, display, keyboard, disk storage, printer, and parallel port • 16-unit Master Station maximum includes base configuration plus 2 RS-232C ports, 2 Communications IOPs, 16 B 20 cluster workstations with 16 printers, 50.4M bytes of formatted disk storage, and 1 500K-byte floppy backup plus 32 630K-byte diskettes (2 per cluster unit) on the workstations • Graphics Master Stations maximum includes base configuration plus 1 RS-232C port, 1 RS-422 port, 1 Communications IOP, 11 B 20 cluster workstations with 11 printers, 50.4M bytes of formatted disk storage, 1 500K-byte floppy backup plus 22 630K-byte diskettes (2 per cluster unit) on the workstations, and graphics processor board.

### □ Packaged Systems

**3545-5666 B 21-1TS Level I Workstation** • 8086 CPU, 256K-byte memory, 28x80 character display, keyboard, 1 RS-422 port

\$2,955 prch    \$296 maint

**3545-9411 B 21-2TS Level I Workstation** • 8086 CPU, 256K-byte memory, 28x80 display, keyboard, 1 5.25-inch 630K-byte diskette, 1 RS-422 channel, 2 RS-232C channels, 1 Centronics printer interface:

4,325            484

**3548-6096 B 21-2PC Level I Workstation** • same as B 21-2TS except with 384K-byte memory, color display, graphics processor:

6,780            830

**3545-5690 B 21-3TS Level I Workstation** • same as B 21-2T except with 128K-byte memory and 2 630K-byte diskettes:

5,040            574

**3545-3257 B 21-4TS Level I Workstation** • same as B 21-2T plus 1 5.25-inch 5M-byte fixed disk:

6,435            998

**3545-5708 B 21-5TS Level I Workstation** • same as B 21-2T plus 1 5.25-inch 8.4M-byte fixed disk:

7,200            1,045

**3548-1712 B 21-5PC Level I Workstation** • same as B

21-5TS except with 384K-byte memory, color display, graphics processor:

10,145            1,391

**3545-5716 B 21-6TS Level I Workstation** • same as B 21-2T plus 1 5.25-inch 16M-byte fixed disk:

8,745            1,089

**3361-9776 B 22 Level II Workstation** • 8086 CPU, 34x80 or 34x132 display, keyboard, 256K-byte memory, 2 Multibus Slots, 1 each RS-232C and RS-422 channel or 2 RS-232C channels, Centronics printer interface:

4,595            930

### □ CPUs

**B 21 CPU** • 16-bit Intel 8086; 8-MHz clock; 4K-byte ROM.

**B 22 CPU** • 16-bit Intel 8086 • 5-MHz clock • 4K-byte ROM • 16-bit programmable maskable interrupt timer with 19.5-KHz clock, 6 priority levels.

### □ Memory

Memory is available via initial order or field add-on, with the latter incurring a \$60 one-time installation charge, and having an exchange credit (given in parentheses after each description). 64K-bit chips are used with byte parity.

#### B 21 Initial Order Memory Options

**3545-5724 B 21-T12 Memory Add-On** • 128K bytes:

\$300 prch    \$86 maint

**3545-5732 B 21-T25 Memory Add-On** • 256K bytes:

600            160

**3545-5740 B 21-T38 Memory Add-On** • 384K bytes:

2,395            280

#### B 21 Field Upgrade Memory Options

**3362-9031 B 21-2EX Memory Upgrade** • to 256K bytes (\$1,400):

\$3,500 prch    \$231 maint

**3362-8959 B 21-3EX Memory Upgrade** • to 384K bytes (\$1,600):

4,000            264

**3362-8967 B 21-5EX Memory Upgrade** • to 512K bytes (\$1,800):

4,500            297

#### B 22 Initial Order Memory Options

**3361-9800 B 22-128 Memory Add-On** • 128K bytes for 384K-byte total memory:

\$750 prch    \$116 maint

**3361-9826 B 22-384 Memory Add-On** • 384K bytes for 640K-byte total memory:

2,195            330

#### B 22 Field Upgrade Memory Options

**3361-9818 B 22-256 Memory Upgrade** • to 384K bytes (\$1,000):

\$3,000 prch    \$230 maint

**3361-9834 B 22-512 Memory Upgrade** • to 640K bytes (\$1,000):

5,000            450

### □ I/O & Communications

No optional I/O features exist for B 20 Series systems. Disks have standard direct memory access (DMA) I/O. B 21 systems have 3

*PRCH: purchase price. MAINT: annual maintenance fee. Prices effective as of January 1984.*



## Burroughs B 20 Series

### B 21 & B 22 Systems

DMA channels (high-speed cluster communications, video refresh, disk), and B 22 systems have a fourth (Multibus slave for Communications IOPs). DMA rate is 3.3M bytes per second.

All B 21 systems come standard with at least 1 communications channel. The B 21-1TS provides an RS-422 cluster communications channel while all other B 21 systems offer 1 RS-422 channel and 2 RS-232C channels as standard features. The RS-422 channels operate at 307K bps up to 410K bps and the RS-232C devices from 110 to 19.2K bps. The RS-422 channel is used in clustering B 20s and the RS-232Cs are used for external data communications and/or serial printers. Data communications on the B 22 consist of either 2 RS-232C interfaces or 1 RS-232C interface and 1 RS-422 interface. On the B 22, the RS-422 channel operates at up to 615K bps. The channels can support such protocols as Burroughs Poll/Select, Bisync, ADCCP, SDLC, and HDLC.

When connecting more than 3 cluster stations to a master B 22, users must add a Communications I/O Processor. The Communications IOP fits into a Multibus slot in the master station and supports up to 8 cluster units. It offloads the B 22 and handles all polling of and acknowledgements to the cluster stations. Up to 2 Communications IOP boards can be inserted into a B 22.

**3362-7662 BC 100 Comm IOP** • communications IOP board for B 22 • provides 2 multidrop 307K-bps RS-422 (channel B) communication channels • includes Intel 8085, 32K-byte RAM, and serial I/O controller • requires 1 Multibus slot • maximum of 2 per system:

\$1,500 prch    \$160 maint

#### □ Mass Storage

##### B 21 Disk Storage

B 21 models are configured with either no disk drives, 1 or 2 diskette drives, or 1 diskette drive and 1 Winchester drive. Formatted diskette capacities are for systems running under BTOS.

**B 21-2TS/-2PC/-3TS Diskette** • integral 5.25-inch double-sided, double-density drive • 630K bytes formatted • average access 158 milliseconds; track/track access 6 milliseconds; 15-millisecond settling time; 83-millisecond average rotational latency; 32K-byte-per-second data transfer rate • 1 drive on 2TS; 2 drives on 3TS.

**B 21-4TS Disk** • integral 5.25-inch Winchester fixed disk; 5M bytes formatted • average access 95 milliseconds; track/track access 3 milliseconds; 624K-byte-per-second data transfer rate.

**B 21-5TS/PC Disk** • same as B 21-4TS disk, except 8.4M bytes formatted and 105-millisecond average access.

**B 21-6TS Disk** • same as B 21-4TS disk except 12.5M-byte formatted and 105-millisecond average access time.

##### B 22 Disk Storage

All B 22 disk storage units are optional and come in 7.5-inch floorstanding enclosures. The master enclosure unit houses the Winchester and floppy disk controllers as well as one hard disk and one floppy drive. An expansion unit is also available for housing 2 additional hard disk drives.

**B 22 Diskette** • included with 8.4- or 16.8M-byte formatted disk in master enclosure unit • 8-inch single-side 0.5M-byte formatted drive • average access 260 milliseconds; track/track access 8 milliseconds; average rotational latency 83 milliseconds; settling time 8 milliseconds; head load time 8 milliseconds; 62.5K-byte-per-second data transfer rate.

**3361-9784 B 22-10M Disk** • 8.4M-byte formatted fixed disk plus 0.5M-byte formatted diskette in freestanding chassis with disk controllers • 70-millisecond average access; 19-millisecond track/track access; 15-millisecond head settling; 543K-byte-per-second data transfer:

\$7,495 prch    \$1,300 maint

**3361-9792 B 22-20M Disk** • same as B 22-10, except disk is 16.8M bytes formatted, and average access is 50 milliseconds:

9,000    1,700

**3362-8934 B 22-20X Add-On Disk** • same as B 22-10, but includes pair of 8.4M-byte formatted disks in expansion unit • controller in B 22-10M/20M:

8,500    1,495

**3362-8942 B 22-40X Add-On Disk** • same as B 22-20X, except both disks are 16.8M bytes formatted • controller in B 22-10M/20M:

11,500    2,275

**B 21 Disk Upgrades** • exchange credits in parenthesis.

3545-6664 B 21-45U • 5M-byte upgrade from a B 21-4TS to a B 21-5TS (\$1,000):

4,800    300

3545-6680 B 21-56U • 5M-byte upgrade from a B 21-5TS to a B 21-6TS (\$2,000):

7,500    300

3545-6672 B 21-46U • 10M-byte upgrade from a B 21-4TS to a B 21-6TS (\$1,000):

7,500    600

#### Tape

**Streamer Tape** • industry-compatible 0.5-inch magnetic tape • for B 22 only:

\$8,500 prch    NA maint

#### □ Terminals/Workstations

Each B 20 system is configured with the CPU, memory, display, and keyboard, all inherent in the workstation unit. Display capabilities for both systems are basically similar. Exceptions on the B 21 are the B 21-2PC and -5PC which have color displays and a graphics board inherent in the units. The B 22 has more characters per screen and a full 256-character programmable font. The keyboard is the same for both systems.

Situated to the left of the B 20 display is the systems workstation electronics housing where the CPU, memory, and I/O ports reside. On the B 21, the disk controllers and drives are also stored in this unit; the B 22 contains 2 Multibus slots in its cabinet. The front of the electronics enclosure serves as a lecturn with clips to hold documents.

**Display** • 15-inch landscape screen; green phosphor except for B 21-2PC, -5PC, which are color; tilt and swivel capability • half-bright, underline, reverse video, blinking character attributes • reverse video, cursor position screen attributes • multiple frames capability • 256 displayable characters on B 22 • 28 lines x 80 characters in a 9x11 matrix on the B 21; 34 lines x 80 or 132 characters in a 10x15 matrix on the B 22.

**Keyboard** • detached, typewriter-style, sculptured surface with a palm rest; connects to display via a 5-foot coiled cable • 14-key numeric pad; 8-key status/control function pad; 6-key cursor control pad; 4-key page control pad; 10 user-definable function keys; all keys programmable; software controllable LED indicators on 8 keys.

**3545-9361 B 22-GRA B 22 Mono Graphics Board** • Multibus graphics board with a dedicated 8-MHz 8086 graphics processor, 128K bytes of display memory, 16K bytes of firmware in ROM • 2 drawing modes, vector and raster; 656x510 pixels • for B 22 only:

\$1,600 prch    \$160 maint

#### □ Printers

System maximum is 1 parallel (Centronics) interface printer and 1 serial printer on an RS-232 channel. Burroughs serial printers are letter quality.

**3362-9023 AP1303 Letter-Quality Printer** • 20 cps • economy model:

\$2,300 prch    \$408 maint

**3362-9015 AP1302 Letter-Quality Printer** • 35 cps • no vertical format features:

3,250    408



## Burroughs B 20 Series B 21 & B 22 Systems

**3544-8976 AP1300-20 Letter-Quality Printer** • 35 cps • vertical format control:

4,568      350

**3361-5915 B 9251-1 Matrix Printer** • parallel interface • 230 cps • 15-inch wide tabletop unit:

3,486      360

**3358-7916 B 9252 Matrix Printer** • parallel interface • 150 cps • 13.5-inch wide tabletop unit:

1,295      300

**3545-9353 B 9253 Matrix Printer** • parallel interface • 120 cps • 9.5-inch wide tabletop unit:

895      135

**3256-7927 B 9249-31 Line Printer** • parallel interface • 370/270 lpm:

9,800      959

• END



# Bytec-Hyperion Hyperion Personal Computer

## ■ PROFILE

**Operating Systems** • MS-DOS 1.25, single user, by Microsoft.

**Data Management** • ADI Aladin Relational Database system.

**Communications/Networks** • IN:TOUCH telephone management and communications package; also available from vendor: BIS 3270, BIS 3780, BIS HASP, SNA 3270, SNA 3770, DEC VT-100 emulators for IN:TOUCH.

**Languages** • BASICA (GW BASIC) by Microsoft.

**Models** • Hyperion, comes in single- or dual-drive models.

**CPU** • Intel 8088 16-bit processor running at 4.77 MHz; socket for additional 8087 math co-processor.

**Memory** • 256K bytes of RAM, expandable to 640K bytes; 8K bytes of I/O and diagnostic ROM.

**Chassis Slots** • none.

**Ports** • one RS-232C/RS-423 serial port with asynchronous and synchronous capabilities; one Centronics-compatible parallel printer port; one I/O connector for Hyperion-ex chassis slot expansion box.

**Mass Storage** • Hyperion comes standard with one or two 320K-byte floppy diskette drives.

**Terminal/Workstation** • the Hyperion is a single-terminal system with detached keyboard, high-contrast 7-inch amber monitor, and



portability features.

**Printers** • can use Centronics-compatible parallel or RS-232C serial printers from third-party vendors; Bytec-Comterm does not provide printers.

**First Delivery** • January 1983.

**Systems Delivered** • not available from vendor.

**Comparable Systems** • the Hyperion competes for market share with MS-DOS machines in the \$3,000 to \$10,000 range; similar systems include IBM-PC compatibles such as Corona, Columbia, and Compaq.

**Vendor** • Hyperion, a division of Bytec-Comterm; 8 Colonnade Road, Ottawa, ON K2E 7M6 • US: 800-323-1717, Illinois: 800-942-8881 extension 246.

**Canada** • Hyperion, a division of Bytec-Comterm; 8 Colonnade Road, Ottawa, ON K2E 7M6 • 800-267-1002 or 613-226-7255.

**Distribution** • through an international network of retailers, value added retailers (VARs), and OEMs.

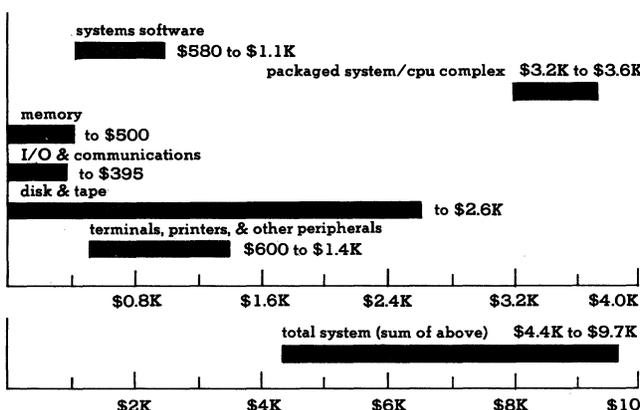
## ■ ANALYSIS

Bytec-Hyperion is a division of a much larger high-technology company, Bytec-Comterm. Its IBM PC-compatible product, called Hyperion, was originally designed by Dynalagic, a floppy disk subsystems and small micro manufacturer. Dynalagic's design was acquired by Bytec-Hyperion, which funded the completion on the project and eventually absorbed Dynalagic.

The Hyperion was designed to be a stylish, portable alternative to the IBM PC. Bytec-Hyperion was largely successful in overcoming many of the technical obstacles necessary to achieve IBM PC compatibility. Unlike many IBM PC-compatible portables, the Hyperion is not an unattractive looking box. The sleek casing is off-white in color and the screen is amber. It is small enough to fit

## PURCHASE PRICE RANGE

hardware & software



**HYPERION PERSONAL COMPUTER PURCHASE PRICING** • bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on single-disk Hyperion packaged system (includes one 320K-byte 5.25-inch floppy disk drive; 256K bytes of RAM, 8K bytes of ROM; MS-DOS 1.25; BASICA BASIC interpreter; Aladin relational database; statistical and calculator packages; 1-year warranty) and the following options: Multiplan spreadsheet and word processing software; dot matrix printer • **LARGE SYSTEM** is based on dual disk Hyperion packaged system (includes two 320K-byte 5.25-inch floppy disk drives; 256K bytes of RAM, 8K bytes of ROM; MS-DOS 1.25; BASICA BASIC interpreter; Aladin relational database package; statistical and calculator packages; 1-year warranty and the following options: word processing and Multiplan spreadsheet software; IN-TOUCH software package with modem; Hyperion-ex expansion chassis with 10M-byte hard disk. 384K bytes of RAM memory on expansion card, letter-quality printer.



## Bytec-Hyperion Hyperion Personal Computer

under an airline seat as carry-on luggage.

The Hyperion runs hundreds of IBM PC-compatible applications. Notably, Bytec-Hyperion distributes Lotus 1-2-3 by Lotus Development and Multiplan by Microsoft. Bytec-Hyperion also publishes a list of Hyperion-tested software which is available from Hyperion dealers. There are a few areas in which the Hyperion does not perform compatibly; these are discussed in appropriate sections of this report.

A unique feature of the Hyperion is availability of an optional, proprietary, phone management system called IN:TOUCH. The program comes with an internal 300-bps modem. Bundled with the system are a text editor, database, development languages, and an operating system.

The Hyperion-ex is scheduled for release in the second quarter of 1984. It is an expansion box with seven IBM PC-compatible chassis slots, and one dedicated interface slot. Many, though not all, IBM PC-compatible cards will function in the Hyperion-ex. Inserting a third-party vendor RAM card permits a Hyperion user to expand system memory to a maximum of 640K bytes. Also, IBM's color graphics adapter allows many color IBM PC programs to use an external color monitor.

Hard disk capacity of 10M bytes can be added internally to the Hyperion-ex expansion box. Though it is not portable, the expansion unit is supplied with rollers, and stands on the floor vertically. The vendor intends for the Hyperion-ex to be used portably within the office, pulled to a meeting room or office on an as-needed basis.

### Strengths

The Hyperion weighs under 20 pounds. This is lighter than some IBM PC-compatible portables which weigh approximately 30 pounds. It is also compact and neatly designed for easy set up and packing.

The Hyperion runs many IBM PC software packages. It also supports the Intel 8087 numeric co-processor. The monitor has a selectable, IBM PC-compatible, 640x200 pixel mode. Bytec-Hyperion provides a list of compatible packages through its dealers.

Optional phone management capabilities and a stylish design make the Hyperion a top contender for the Fortune 1000 executive marketplace. As a personal phone and desktop manager that can be carried home, it offers unique and attractive capabilities in a single package.

Other strengths include: a restyled keyboard with some corrections over the highly criticized IBM PC keyboard, external modular phone jacks which support an optional internal modem, function key specifications on MS-DOS command level screens, shift lock and numeric lock key indicators which are on screen at MS-DOS command level.

### Limitations

Bytec-Hyperion has incurred some limitations in trying to achieve its high compatibility and portability goals. Initially, the most apparent compromise was made in

choosing the small 7-inch monitor. To compensate for the size, Bytec-Hyperion chose a high-clarity amber monitor and elongated the character representation. On an optional, larger, external monitor this elongated shape results in unusually course characters.

As purchased, the Hyperion does not have a single IBM PC-compatible chassis slot. The Hyperion-ex expansion box, scheduled for delivery second quarter 1984, will have to be purchased and connected to the exposed bus on the rear of the microcomputer. This presents a high initial cost to someone interested in a single expansion card. Cards which must connect to the main system unit in addition to the chassis slot interface (Quadlink) can not easily be wired because of the distance between the slots and the machine. Even if a connection was made, it would need to be undone each time the machine was moved.

As compatible as the Hyperion is, it is still not the IBM PC. Software of interest should be tested for compatibility prior to purchase. Bytec-Hyperion does provide results of testing in the form of a compatibility list. It is advisable to refer to this list prior to acquisition of the Hyperion, or additional software.

The diskette drives, manufactured by REMEX for Bytec-Hyperion are noisy during read and write operations. The system itself, however, does not have a noisy fan and is quiet most of the time.

## SOFTWARE

### Terms & Support

**Terms** • basic Hyperion comes standard with operating system software, BASICA interpreter, and ADI Aladin relational database package; additional software is available from Bytec-Hyperion for a one-time license fee; one-year warranty with purchase requires only a properly completed Warranty Registration Card.

**Support** • software support is available via individual retailers carrying the Hyperion.

### Software Overview

The Hyperion runs MS-DOS 1.25. Its operating system is similar but not identical to PC-DOS 1.1, the operating system of the IBM PC. Bytec-Hyperion has modified MS-DOS with some custom on-screen features. These include labels for 10 keyboard softkeys, shift and caps lock indicators, and a clock display. Unfortunately, these attractive features disappear as soon as one leaves the MS-DOS command mode. All system calls routed through the Hyperion's MS-DOS are functionally compatible with PC-DOS 1.1.

IN:SCRIBE text editor and IN:TOUCH communications software were written in the "C" language by Dynalagic for Bytec-Hyperion. Both packages are menu driven and provide immediate utility to the Hyperion. Though IN:SCRIBE is not a full-featured word processor it does facilitate easy editing capabilities for occasional use. IN:TOUCH communications software is optional and comes bundled with a 300-bps modem. An interesting feature of IN:TOUCH is its use of Hyperion's internal speaker to audibly monitor a call until it is answered.

There are hundreds of IBM PC-compatible packages that will run on the Hyperion. The Hyperion switches from 640x250 to IBM PC-compatible 640x200-pixel graphics mode automatically. Lotus 1-2-3, customized for the Hyperion by Lotus Development, produces graphics in the 640x250 mode, resulting in graphics nearer the intended proportions. (The IBM PC produces oval pie charts on the screen using Lotus 1-2-3.)



# Bytec-Hyperion Hyperion Personal Computer

## Packaged Software

All optional software is available individually. See Application Packages section. Bundled with the Hyperion are: MS-DOS, BASICA and ADI Aladin relational database package.

## Operating Systems

**MS-DOS 1.25** • single-user, interactive and batch processing disk operating system developed by Microsoft; has its equivalent in IBM PC-DOS 1.1 • supports maximum diskette storage of 160K bytes in up to 64 different files in single-sided format and up to 320K bytes to 112 files in a double-sided format; handles records from 1 to 65,535 bytes long in file transfers; executes external (disk based) commands, giving the user ability to expand the DOS vocabulary to the limits of disk space • includes batch processing capabilities with automatic execution on power up; user commands include DATA, TIME, DISKCOPY, FORMAT, RENAME, ERASE, COMP (compare), CHKDSK (check disk) • innovations include a double File Allocation Table (disk map) with third memory resident copy for efficient disk access, a disk mapping technique which conceptualizes conventional tracks and sectors as a single-dimensional array of logical sectors, and allocation units which subdivide data section into 1, 2, 4, 8, 16, 32, 64, or 128 logical sector groups, eliminating disk external fragmentation typical of conventional track-sector mapping • MS-DOS is divided into four parts: a device independent I/O handler, and I/O processor, reference and jump vectors in low memory, and a command processor; the device independent I/O handler on hidden file MSDOS.SYS is the core of MS-DOS through which I/O must be directed; the I/O processor physically moves data and instructions by means of hidden file IO.SYS as commanded by MSDOS.SYS; the command processor using the COMMAND.COM program is responsible for interface between user and MS-DOS, error trapping, batch file processing, interpreting user commands and executing file names • Hyperion has modified the MS-DOS 1.25 MODE command and added on-screen function key definitions • included with basic Hyperion.

## Utilities

Various utilities are available under MS-DOS. Hyperion has not included any additional utilities but has modified several MS-DOS commands into a menu-driven format.

## Data Management

**Aladin Relational Database Manager** • menu-driven, modular relational database by ADI • up to 16 unique files with up to 32,000 records per file, maximum of 511 fields per file; uses binary tree structure with data access speeds of no more than 2 seconds • provides search, sort, report generating and batch scriptwriting functions; field designations include Alpha, Numeric, Data, Summation, Dollar, Decimal, Protected, and Comment; provides multiple levels of access for security • bundled with Hyperion at no additional cost.

## Communications/Networks

**3103 IN:TOUCH Telephone Management System** • allows data and voice communication; connects to modular phone jacks between phone and wall socket • up to 40 online telephone numbers with up to 35 dialable characters; disk-based file of up to 2,000 telephone numbers, uses alphabetic search for retrieval • user-definable prefix and suffix codes permit modification of access codes throughout a dialer file; handles both rotary and touch-tone service; comes with internal 300-base modem but can also utilize external modem or access Hyperion RS-232C port directly; optional acoustic cups available for non-modular telephones.

**\$395 lcms**

**3107 VT 100 Terminal Emulator** • emulation package for applications requiring DEC VT100 terminals:

**95**

## Program Development/Languages

**BASICA Interpreter** • implementation of Microsoft BASIC-86

• provides dualmode graphics capabilities in medium and high resolution and drawing statements for creating lines and circles or painting the screen • screen editor implements special function keys and multistatement lines • allows calling of machine language subroutines, merging of multiple programs, and transferring control to specific program lines during certain events; IF THEN/ELSE constructs are supported as well as trace/notrace for easier debugging • comes bundled with the Hyperion.

**Macro Assembler** • Macro-86, MS-LINK, MS-LIB, MS-CREF assembly language package by Microsoft • comes with linker, library, cross-reference facility and macro-assembler; assembled code produced is usable by any language that supports machine language calls or can be run directly from the operating system or monitor • comes bundled with the Hyperion.

## Application Packages

**3100 IN:SCRIBE Executive Text Editor** • menu-driven editor for memos and reports; low-level printer control is provided by imbedding control codes into text; not a full-function word processor:

**\$155 lcms**

**3102 Lotus 1-2-3** • an integrated electronic spreadsheet, database, and graphics package which supports full 8-color presentation • designed to perform spreadsheet analysis including "what if Analysis" to create graphs or charts and manipulate information files • a help key provides over 200 possible screens of information; packaged on multiple diskettes:

**495**

**3101 Multiplan** • second-generation electronic spreadsheet can transfer information between different worksheets; features multiple windows, sort, online reference guide, and format options for printing reports:

**250**

## Other Facilities

**Diagnostics** • included in 8K bytes of ROM are self-test diagnostic and general I/O routines.

## HARDWARE

### Terms, Support & Documentation

**Terms** • available for purchase in the United States and Canada; 1-year warranty on parts and labor.

**Support** • carry-in service through individual dealers or telephone support via the Hyperion hot-line.

**Documentation** • IBM-type loose-leaf manuals include documentation for MS-DOS, BASICA, the Macro Assembler and Systems Programming Tools; also included is a small spiral-bound Set-up Guide and ADI Aladin documentation.

### Physical Specifications (H x W x D); Weight

**CPU & Display** • 8.8 inches X 18.3 inches X 11.3 inches; 18 pounds.

**Keyboard** • 3 X 16.5 X 10; weight not available.

### Systems Overview & Configurability

The Hyperion's main microprocessor is an Intel 8088 running at 4.77 MHz with an adjacent socket for the Intel 8087 numeric co-processor. The system comes with 256K bytes of RAM standard and can not be expanded internally. Memory expansion to 640K bytes can be achieved using the Hyperion-ex expansion chassis, available second quarter 1984, and IBM PC-compatible memory cards.

The system comes with one RS-232C serial port and one Centronics-compatible port on the rear of the machine. An

*LCNS: one-time license fee. Hyperion prices effective as of January 1984.*



# Bytec-Hyperion Hyperion Personal Computer

external monochrome monitor can be attached to a composite video output jack. Also available are standard modular phone jacks for use with the optional internal modem and IN:TOUCH software.

The Hyperion keyboard is microprocessor controlled using an Intel 8049. It includes a built-in 16-character buffer and 10 programmable function keys. The keyboard can be stored inside the Hyperion for transporting. IBM PC-compatible function key templates will not apply to the Hyperion keyboard since, unlike the IBM PC keys, they are arranged across the top row.

The system contains a number of system components that are not those used in the IBM PC. The Hyperion uses an incompatible screen controller making any software directly addressing IBM's video controller inoperable. The system comes standard with one or two REMEX disk drives which are individually shielded and fan cooled. Also, the Hyperion comes with a battery-powered real-time system clock.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**System Maximums** • Hyperion portable with Hyperion-ex option; up to 640K bytes of RAM, 10M bytes of hard disk and 640K bytes of floppy disk storage, real-time clock with battery backup, programmable sound generator, external video monitor, up to 7 IBM PC-compatible cards which can provide to 15 serial or parallel ports (two per card plus Hyperion ports), graphics capabilities or co-processor cards.

### Packaged Systems

**3031 Single Disk Hyperion Business Computer** • IBM PC compatible with 256K bytes of RAM, 8K bytes of ROM, one 320K-byte floppy disk drive, MS-DOS 1.25, BASICA by Microsoft, Aladin Relational Database, Statistical and Calculator Packages, 1-year warranty, 120 VAC, 60 Hz: \$3,195 prch

**3031 Dual Disk Hyperion Business Computer** • IBM PC compatible with 256K bytes of RAM, 8K bytes of ROM, two 320K-byte floppy disk drives, MS-DOS 1.25, BASICA by Microsoft, Aladin Relational Database, Statistical and Calculator Packages, 1-year warranty, 120 VAC, 60Hz: 3,690

### CPU

The Hyperion is based on an Intel 8088 microprocessor. Included with the system is a socket for an Intel 8087 numerical co-processor. In order to utilize the capabilities of the Intel 8087, software which supports the additional instruction set must be used.

**Intel 8088 Processor** • 8-bit data bus interface, 16-bit internal architecture, direct addressing to 1M byte of memory, 16-bit register set with symmetrical operations, approximately 70 basic instructions with up to 30 addressing modes, 8-bit and 16-bit signed and unsigned arithmetic with binary and decimal operands, extensive string and block move facilities • powerful segmentation facilities allow memory partitioning for multitasking, concurrent or multiuser capabilities • a pseudo-superset of the Intel 8080 instruction set where translation to 8088 is straightforward • 4.77 MHz.

### Memory

The Hyperion comes with 256K bytes of user RAM with parity error detection. Also included are 8K bytes of ROM which contain self-test diagnostics and I/O routines. Memory can be expanded by adding a third-party vendor RAM card on the optional Hyperion-ex chassis slot expansion unit.

### I/O & Communications

The Hyperion comes with one RS/232C/RS-423 serial port with baud rate from 110 to 19.2K, programmable parity, stop bits, and data bits. Serial port supports synchronous, bisynchronous, and

bit-oriented protocols. An I/O expansion connector is also available for attachment to Hyperion-ex. A 300-bps internal modem supports IN:TOUCH communications software.

**4202 I/O Card & Cable** • provides interface to Hyperion-ex chassis slot expansion box; cable attaches to I/O expansion connector on Hyperion, card is inserted into one special-purpose Hyperion-ex slot: \$395 prch

**4000 Hyperion-ex** • expansion chassis basic unit; provides 7 IBM PC-compatible slots, one dedicated interface slot, and the capability of adding an optional 10M-byte hard disk drive; future options include a 20M-byte hard disk and streaming tape backup; requires 4202 I/O Card and Cable • available second quarter 1984: 895

**4001 Hyperion-ex With Hard Disk** • same as 4000 Hyperion-ex but with one 10M-byte hard disk and a hard disk controller inserted in one of the chassis slots; requires 4202 I/O Card and Cable: 2,600

### Mass Storage

The Hyperion can be purchased with one or two floppy disk drives. Hard disk and streaming tape storage can be added to the optional Hyperion-ex chassis slot expansion unit. A 20M-byte hard disk and streaming tape are scheduled to be available in the near future. Currently, only 10M-byte hard disk and floppy disk mass storage options are available.

### Diskette Storage

**Floppy Disk** • 5.25-inch IBM PC-compatible drive; 40 tracks; 8 sectors; 300 revolutions per minute; 8-millisecond track-to-track access time; 250K-bps data transfer rate; mounted internally; comes standard with 1- or 2-disk Hyperion.

**3200 Second Floppy Disk** • 5.25-inch IBM PC-compatible drive; 40 tracks; 8 sectors; 300 revolutions per minute; 8-millisecond track-to-track access time; 250K-bps data transfer rate; mounted internally • optional only for single-disk Hyperion, comes with molded front panel for dual drive configuration: \$495 prch

### Hard Disk Storage

**4200 10M-byte Fixed Disk Drive** • 5.25-inch, 12M bytes unformatted, 10M bytes formatted hard disk drive; 306 tracks per side; 4100 bytes per cylinder; 3-millisecond track-to-track access time; 120-millisecond seek time; 5M-bps data transfer rate; average seek time 120-milliseconds; 310-millisecond maximum seek time; 3600 rotations per minute: \$1,705 prch

### Terminals/Workstations

**Display** • integral 7-inch amber CRT; 25 lines of 80 characters; 256 characters including foreign, mathematical, and Greek; characters appear in 6x7 dot-matrix within an 8x10 dot-matrix box with two dot descenders; IBM PC-compatible 640x200 pixel graphics at 70 Hz refresh; 640x250 pixel graphics at 60 Hz refresh; software selectable; supports underline, blink, intensify, reverse, double size, super and subscripting; automatically turns off after prolonged disuse.

**Keyboard** • low-profile European DIN standard keyboard; 84 keys including numeric keypad and 10 function keys; mostly compatible with IBM PC keyboard (function keys are across top); stored inside the main system unit when not in use or when being carried.

*PRCH: purchase price. Hyperion prices effective as of January 1984.*



## Bytec-Hyperion Hyperion Personal Computer

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### **Printer/Graphics**

No printers are supplied by Bytec-Hyperion. Third-party printers and plotters that have RS-232C/RS-423 or Centronics-compatible interfaces can be used on the Hyperion. The Hyperion can accept

most IBM PC-compatible printers and plotters including the IBM PC dot-matrix printer.

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• **END**

