Columbia Data Products
Columbia MPC & VP

■ PROFILE

Operating Systems ● MS-DOS 1.25 single user by Microsoft; CP/M-86 by Digital Research, single user; MS-DOS 2.0 by Microsoft and MP/M-86 multiuser by Digital Research also available.

Data Management ● Columbia MPC and VP come with Perfect Filer, a list manager by Perfect Software; MS-DOS and CP/M-86 operating systems provide primitive file copying and handling facilities.

Communications/Networks ● Perfect Link by Perfect Software supports asynchronous communications, terminal emulation, baud rates from 110 to 9,600, supports MODEM and XMODEM Ward Christensen Protocols, and full- and half-duplex transmission modes ● Columbia MPC supports local area networking and has multiuser capabilities.

Languages ● BASICA (GW BASIC) with graphic features by Microsoft; BASICA 2.0 for MS-DOS 2.0 compatibility available.
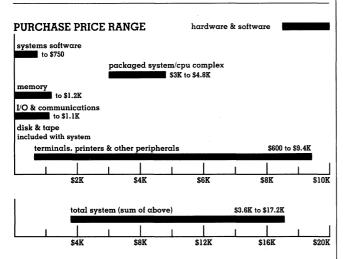
Models ● Columbia 1600-VP; Columbia MPC 1600-1 and 1600-4.

CPU ● Intel 8088 4.77 MHz, 16-bit with 8-bit data path, socket for Intel 8087 numeric co-processor.
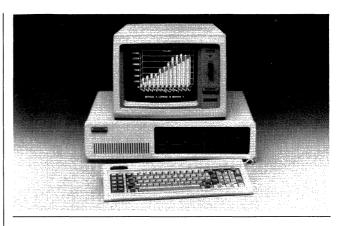
Memory ● 128K bytes standard to 1M bytes on MPC desktop model, 128K- to 256K-byte piggyback printed circuit board (PB), available for Motherboard Expansion on VP Portable.

Chassis Slots ● eight IBM PC-compatible on MPC desktop model, one on VP portable model.

Ports ● one serial RS-232C, one Centronics-compatible parallel.

PURCHASE PRICE RANGE   hardware & software ▮▮▮▮

systems software
▮ to $750

packaged system/cpu complex
▮▮▮ $3K to $4.8K

memory
▮ to $1.2K

I/O & communications
▮ to $1.1K

disk & tape
included with system

terminals, printers & other peripherals $600 to $9.4K
▮▮▮▮▮▮▮▮▮▮▮▮

	$2K	$4K	$6K	$8K	$10K

total system (sum of above) $3.6K to $17.2K
▮▮▮▮▮▮▮▮▮▮▮▮

	$4K	$8K	$12K	$16K	$20K

COLUMBIA COMPUTERS PURCHASING PRICING bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing ● **SMALL SYSTEM** is based on **COLUMBIA 1600-VP packaged system** (includes 16-bit Intel 8088; 128K-byte RAM; two 320K-byte disk drives; non-glare 9-inch green or amber monitor; keyboard; parallel and serial port, an IBM PC-compatible chassis slot, and Super 3000 software pack and the following options: a dot-matrix printer and cable ● **LARGE SYSTEM** is based on a **COLUMBIA 1600-4 packaged system** (includes 128K-byte RAM; one 320K-byte floppy disk drive; one 12M-byte unformatted hard disk drive; keyboard; one parallel and one serial port; eight IBM PC-compatible chassis slots; Super 3000 software pack and the following options: MS-DOS 2.0 MP/M-86; an additional 896K-byte RAM, seven terminals, four communications cards to support terminals, and a letter-quality printer.

Mass Storage ● Columbia MPC and Columbia VP standard configurations include 640K bytes on two 5.25-inch floppy disk; the Columbia MPC can also be ordered with one 5.25-inch 320K floppy disk and one 12M bytes of fixed (hard) disk storage.

Terminal/Workstations ● the MPC and VP are single terminal systems with detachable keyboard, green or amber monitors on the VP and color capabilities on the MPC ● Columbia MPC supports to eight terminals through MP/M by Digital Research and local area networking (LAN) from various third-party vendors only.

Printers ● will take Centronics-compatible parallel or RS-232C serial from third-party vendors only.

First Delivery ● Columbia MPC first delivered August 1982; Columbia VP, May 1983.

Systems Delivered ● total delivered is unavailable; both VP and MPC are currently being shipped at 5,000 units a month.

Comparable Systems ● Columbia computers compete for market share with single-user desktop and portable 16-bit systems supporting MS-DOS or CP/M-86, IBM plug-compatible systems (including the IBM PC), and multiuser systems in the $3,000 to $17,000 range.

Vendor ● Columbia Data Products, Inc; 9150 Rumsey Road, Columbia, MD 21045 ● 301-992-3400.

Canada ● Distributor: Wetaskiwin Computer; 5009 51st Street, Wetaskiwin, ALTA T9A 1L4 ● 403-352-9302.

Distribution ● network of approximately 1,000 dealers nationwide and in Europe, service at 175 Bell & Howell Service Centers nationwide.

■ ANALYSIS

Columbia Data Products is a privately held company founded in 1975 originally as a producer of microprocessor-based communications storage devices. Their two newest products, the Columbia MPC and the Columbia VP, are among the most IBM PC-compatible microcomputers on the market. The company has experienced a consistent 50 to 100% per year growth rate in sales and currently employs over 700 employees with facilities totalling over 175,000 square feet located in Maryland and Puerto Rico.

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The MPC and VP are IBM PC-compatible in hardware and software. Both machines can read and write disks in IBM format and their chassis slots are capable of accepting IBM PC-expansion cards. Their keyboards, manufactured by Keytronic, are in IBM PC-compatible arrangement and include the universal symbols for tab, back space and carriage return. There are over 600 IBM PC- and MS-DOS software packages that run on the MPC and VP. Also available is the vast array of CP/M-86 software.

With eight unused chassis slots and the ability to address to one megabyte of memory, the MPC is easily configured for most any application. For more advanced number crunching an Intel 8087 numeric co-processor can be installed. The MPC has multiuser and multitasking capabilities, graphics resolution identical to that of the IBM PC, and its hard disk and a 64K-byte cache buffer resulting in a significant improvement in performance over the IBM PC hard disk.

The Columbia VP has only one expansion slot. There are multifunction expansion cards originally designed to meet the IBM PC's shortage of slots that prevent this from being a significant disadvantage. The system motherboard has 128K bytes standard and can be expanded to 256K bytes. The system dimensions are 18 inches × 16 inches × 8 inches, and it weighs 32 pounds.

All Columbia personal computer products can be serviced at any one of 175 Bell & Howell service centers nationwide. Perfect Software, the primary supplier of packages bundled with the Columbia, provides a toll-free software support hot line.

☐ Strengths

The MPC and VP offer a significant cost advantage over the IBM PC. In performance the MPC offers greater expandability, and the VP offers portability. The MPC 1600-1, 1600-4, and the 1600-VP are among the most IBM PC-compatible systems available. All systems come with bundled software which allows for immediate utility. The MPC supports all existing major local area networks that run the IBM PC. These include PC-Net, Omninet, Share-Net, and Plan 4000.

☐ Limitations

Though many resource-intensive IBM PC-assembly language programs like video games and operating systems run identically on the MPC and VP, there is no guarantee that the Columbia's will run a user's IBM PC-compatible software. To be sure, the user's software should be tested. At 32 pounds, the Columbia VP is more transportable than portable and cannot comfortably be carried for an extended period of time.

■ SOFTWARE

☐ Terms & Support

Terms ● basic Columbia MPC and Columbia VP come standard with operating system software, BASICA interpreter, word-processor, spelling checker, electronic spreadsheet, database, tutorial, communications package, diagnostics, and software customer support hot line.

Support ● 30-day warranty on software and documentation ● toll-free software support available from Perfect Software, the primary contributor to the Super 3000 Software Pack, comes standard.

☐ Software Overview

The Columbia MPC and VP come with a professional assortment of software called Super 3000 Software Pack. Included in the package are a professional word processor, spreadsheet, graphics generator, file manager, and communications software. In addition, Columbia includes a macroassembler, advanced BASIC, two operating systems, and a personal accounting package.

MS-DOS 1.25 by Microsoft is the primary operating system, with CP/M-86, by Digital Research, included standard. MS-DOS 2.0 and MP/M-86 are available separately.

Multiuser and multitasking facilities for up to 8 users are available under MP/M-86 by Digital Research. Various local area networks are supported on the MPC. These include: ShareNet by Novell, Omninet by Corvus, Plan 4000 by Nestar, and PC-Net by Orchid systems.

☐ Packaged Software

The following packages are bundled with the cost of the system.

Perfect Writer/Perfect Speller ● by Perfect Software, is a professional word processing package that allows versatile editing, storing, retrieval, spelling correction and printing of documents ● it has multiscreen and multifile buffer capabilities, and a virtual memory architecture; it can also automatically create a table of contents, index, footnotes, and in-text referencing.

Perfect Calc ● by Perfect Software, is a spreadsheet package that allows insertion and deletion of formulas, numerical editing, moving, copying, and restoring deletions ● advanced features include multiple spreadsheet manipulation and four personal and home use programs.

Perfect Filer ● by Perfect Software, handles data base entry, manipulation, and reporting ● it supports mail and listing capabilities; can handle individual records of up to 1,024 characters long, form letters, labeling, production templates, and sorting.

The Home Accountant Plus ● by Continental Software, is a personal finance manager ● it has graphing, reporting, check printing, and forecasting abilities.

Fast Graphs ● by Innovative Software, draws graphs in various popular styles from data in Perfect Calc, Multiplan, or DIF file format ● bar charts, pie charts, point-line graphs are all supported, as well as a choice of background; graphs can be either monochrome or color and are printable on most popular dot-matrix printers.

☐ Operating Systems

Both Columbia MPC and VP systems come with 12K-byte automatic booting and self-diagnostic code in ROM. MS-DOS 1.25 by Microsoft and CP/M-86 by Digital Research are bundled with the hardware. MS-DOS 2.0 by Microsoft and MP/M-86 by Digital Research are also available at additional cost.

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 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 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 typ-

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ical of conventional track-sector mapping ● 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 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 predecessor of MS-DOS 2.00.

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 and an ASCII terminal.

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 versus 8 in DOS 1.25), and installable device drivers ● MS-DOS is divided into four parts: adevice-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 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 2.00 will read earlier MS-DOS diskettes, there are several unique system interrupt calls and file descriptors that make programs utilizing these features non-transportable between MS-DOS 2.00 and earlier versions ● editor, debugger, and other utilities are provided ● MS-DOS 2.0 is somewhat enhanced over earlier versions:

	$100 lcns

1682 MP/M-86 ● multiuser operating system by Digital Research

allows up to eight users:

	650

☐ Utilities

Various utilities are available under MS-DOS and CP/M-86. Columbia also includes a diagnostic program for all I/O, memory, and devices.

☐ Data Management

Perfect Filer ● by Perfect Software, is an electronic filer, mailing list, and report generator; it supports individual records up to 1024 characters long, form letter, labeling production templates, and sorting.

☐ Communications/Networks

Columbia MPC can support up to 8 terminals using MP/M by Digital Research. Local area networks supported (LAN) include ShareNet by Novell, Omninet by Corvus, Plan 4000 by Nestar, and PC-NET by Orchid systems.

Perfect Link ● a versatile terminal communication package, by Perfect Software; supports asynchronous communications, terminal emulation, baud rates from 110 to 9,600, supports MODEM and XMODEM Ward Christensen Protocols, and full- and half-duplex transmission modes.

☐ Program Development/Languages

BASICA (GW BASIC), a disk-based interpreter from Microsoft, comes standard. Columbia also includes BASIC which allows compatibility to IBM software written in earlier versions of Microsoft BASIC. BASICA comes with a full complement of features including graphics and IBM compatibility. Because the machines come with dual operating systems, simultaneous development under separate software environments is possible. Macro-86 a macro 8088 assembler is also provided.

BASICA Interpreter ● implementation of Microsoft BASIC ● provides dual-mode 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 ● BASICA 2.0 is provided with MS-DOS 2.0 operating system and takes advantage of 2.0 enhancements.

Assembly Language Package ● Macro-86 macro assembler, MS-LINK linker, MS-LIB library, and MS-CREF cross-reference facilities provide full assembly language development facilities ● assembled code produced is usable by any language that supports machine language calls or can be run directly from the operating system or monitor.

1685 MS-DOS Super Pack ● comes standard with Columbia MPC and VP but can also be purchased separately ● includes: MS-DOS Macro Assembler and BASICA by Microsoft; Asynchronous Communications Support; Perfect Writer, Perfect Speller, Perfect Calc, and Perfect Filer by Perfect Software; Columbia Tutor; Home Account Plus by Continental Software; Diagnostics; a Software Customer Support Hotline:

	NC lcns

☐ Other Facilities

Diagnostics ● included in the 12K ROM is a memory diagnostic; on boot-up the user is prompted for a memory check; if the user selects "no" or five seconds elapse the system automatically proceeds to load the operating system from disk ● MPC diagnostic and VP diagnostic routines for the MPC and VP, respectively, are included with the operating system disks; memory, screen, I/O, keyboard and disk testing is included in single or repeated test format.

LCNS: one-time license fee. NC: no charge. Prices effective as of February 1983.

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ROM Monitor ● in both VP and MPC Columbia includes a ROM monitor which co-exists with the ROM basic input and output system (ROM BIOS); commands available include breakpoint, list and fill memory, echo, trace, step, test memory, disk, keyboard/printer test, interrupt, port, and register.

■ HARDWARE

☐ Terms, Support & Documentation

Terms ● Columbia MPC and VP are available for purchase; 30-day warranty.

Support ● warranty service available from Bell and Howell at 175 service locations nationwide.

Documentation ● provided with the packaged software are paperback manuals for each of the major packages and operating systems, a spiral bound operator's manual, and any addenda or errata ● most documentation includes tutorials, command summary cards, and sample screens.

☐ Physical Specifications (H × W × D); Weight

Columbia MPC

CPU ● 5 × 22.5 × 15 inches; 25 pounds.

Display ● information not available.

Keyboard ● information not available.

Columbia VPC

CPU ● 18 × 14 × 8 inches; 32 pounds includes cover.

Display ● integral to unit; included in CPU specs.

Keyboard ● 1.5 × 17.75 × 7.5 inches; included in CPU specs.

☐ Systems Overview & Configurability

The Columbia Multi-Personal Computers, MPC 1600-1, MPC 1600-4, and the 1600-VP are virtually identical in technical features. They are IBM PC-compatible, 16-bit Intel 8088 based, have a socket for an Intel 8087 numeric co-processor, have 12K EPROM, and run at 4.77 MHz. All come with IBM PC-compatible keyboards, have 640×200 monochrome or 320×200 color graphics resolutions, 80×25 or 40×25 text mode in 16 colors, and have serial and parallel communication ports. (VP has color mode resolution but only in amber or green.)

The MPC has 8 IBM PC-compatible chassis slots, two RS-232C 110 to 19,200 baud serial ports, one Centronics-compatible parallel port, and a memory capacity from 128K bytes standard to 1M-byte 250-nanosecond parity checking RAM. The MPC 1600-1 comes standard with two double-sided double-density 320K-byte disk drives; the MPC 1600-4 is supplied with one 320K-byte disk and a 12M-byte hard disk with 88 sector buffers and 64K-byte cache.

The VP Portable comes with two half-height 320K-byte floppy disk drives, one RS-232C serial port, one Centronics-compatible parallel port, one IBM PC-compatible chassis slot, and a green or amber phosphor 9-inch diagonal non-glare display.

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

Columbia MPC System Maximums ● 1M-byte memory; 12M-byte unformatted fixed disk storage; 640K-byte floppy disk storage; eight users under MP/M-86; 18 serial ports (2 standard, 2 per chassis slot using communication card); or 17 parallel ports (1 standard, 2 per chassis slot using communication card).

Columbia VP System Maximums ● 256K-byte main memory on motherboard, 1M-byte total memory using expansion slot; 640K floppy disk storage; 3 serial ports; 3 parallel ports.

☐ Packaged Systems

Columbia MPC 1600-1 ● 16-bit processor; 128K-byte RAM with parity main memory; two 320K-byte disk drives; RAM-disk support; non-glare monitor; detachable IBM-compatible keyboard;

two RS-232C serial ports; Centronics-compatible parallel port; eight IBM PC-compatible chassis slots; Super 3000 software pack:

$2,995 prch

Columbia MPC 1600-4 ● same as MPC 1600-1 but with 12M-byte Winchester hard disk, 64K cache buffer controller; one 320K disk drive:

4,545

Columbia 1600-IV ● same as 1600-1 but with added CRT controller card and monochrome/color/graphics:

3,170

Columbia 1600-4V ● same as 1600-4 but with added CRT controller card and monochrome/color/graphics:

4,770

Columbia VP ● portable version of Columbia 1600-1; 16-bit 8088 processor; 128K-byte parity checking RAM; two half-height 320K-byte disk drives; RAM disk support; green or amber monitor; detachable IBM-compatible keyboard; an RS-232C serial port; Centronics parallel; one IBM PC-compatible chassis slot; carrying weight 32 pounds; Super 3000 software pack:

2,995

☐ CPUs

Intel 8088 Processor ● 8-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 8088 is straight forward ● 4.77 MHz.

1606 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:

$495 prch

☐ Memory

Columbia MPC 1600-1, 1600-4 Standard Memory ● 128K-byte main memory expandable to 1M bytes; 12K EPROM; approximately 1200K-byte low memory reserved for interrupt vectors, ROM basic input/output system (BIOS) variables, and ROM Monitor variables ● 64K bytes reserved for video I/O ● 16K total reserved for ROM BIOS and Monitor Code.

Columbia VP Standard Memory ● 128K-byte main memory with option for additional 128K-byte piggyback PCB for a maximum of 256K bytes ● identically memory mapped to the MPC (above).

1601 CDP-MPC Expansion Board ● 128K-byte RAM w/parity:

$495 prch

1602 CDP-MPC Expansion Board ● 256K-byte RAM w/parity:

795

1618 CDP-MPC Expansion Board ● 256K-byte RAM w/parity and MP/M-86:

895

☐ I/O & Communications

Columbia MPC and VP come with an RS-232C serial and a Centronics-compatible parallel port, and chassis slots that can be used for communication and networking hardware.

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

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Columbia MPC & VP

Columbia MPC ● two asynchronous RS-232C 110- to 19,200-baud serial ports; Centronics-compatible parallel printer port; eight IBM PC-compatible chassis slots.

Columbia VP ● one asynchronous RS-232C 110- to 19,200-baud serial port; Centronics-compatible parallel printer port; one IBM PC-compatible chassis slot.

1607 Expansion Board ● dual RS-232C (no longer offered), asynchronous or synchronous:

$225 prch

□ **Mass Storage**

Columbia MPC and VP packaged systems come configured with disk drives. No additional expansion is available. For example, in order to configure a hard disk system, the base system would have to be the 1600-4. (See Packaged Systems section.)

5.25-Inch Floppy Disk Drive ● 80 tracks, eight sectors per track, for a 320K-byte capacity; 5-millisecond track-to-track access time with data transfer rates of 250 bps; 300 rpm ● included in purchase price of model MPC 1600-1.

5.25-Inch Fixed Disk ● two double-sided platters, two heads per platter, 178 tracks per head, 17-/512-byte sectors per track for a 12M-byte unformatted, 10M formatted capacity ● included in purchase price of model 1600-4.

□ **Terminal/Workstation**

Display ● MPC has IBM PC-compatible monochrome or color monitor; VP has 9-inch green or amber monochrome; both MPC and VP provide 640 × 200 or 320 × 200 resolution in graphics mode.

1615 Monitor ● 12-inch monochrome monitor by Amdek:

$225 prch

Keyboard ● both MPC and VP have an IBM PC-compatible keyboard manufactured by Keytronics.

□ **Printer/Graphics**

Printers and plotters are available from third-party vendors who cater to the IBM PC-compatible marketplace.

● **END**

Compaq Portable Computers
Compaq & Compaq PLUS

■ PROFILE

Operating System ● Microsoft MS-DOS 1.1 and 2.0

Data Management ● packages available from third-party vendors

Communications/Networks ● available from third-party vendors

Languages ● Microsoft BASIC modified by Compaq

Models ● Compaq, Compaq PLUS

CPU ● 16-bit Intel 8088

Memory ● 128K bytes to 640K bytes (both models)

Chassis Slots ● Compaq: 3 open slots; Compaq PLUS: 2 open slots

Ports ● 1 parallel printer port standard on both models

Mass Storage ● Compaq: 320K bytes to 640K bytes diskette storage; Compaq PLUS: 10M bytes hard disk storage, 360K bytes diskette storage
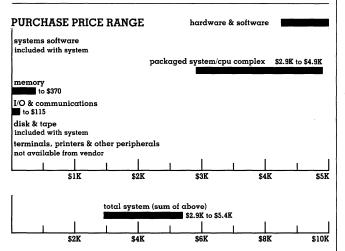
Terminals/Workstations ● single-user systems

Printers ● none available from Compaq

First Delivery ● Compaq: January 1983; Compaq PLUS: October 1983

Systems Delivered ● more than 42,000

Comparable Systems ● IBM PC and PC-compatible systems such as Columbia MPC and VP, Eagle PC and Spirit, Corona Portable and PC, Bytec Hyperion

Vendor ● Compaq Computer Corporation; 20333 FM149, Houston, TX 77070 ● 713-370-7040

PURCHASE PRICE RANGE   hardware & software ■■■■■

systems software
included with system

packaged system/cpu complex $2.9K to $4.9K

memory
■ to $370

I/O & communications
■ to $115

disk & tape
included with system

terminals, printers & other peripherals
not available from vendor

$1K	$2K	$3K	$4K	$5K

total system (sum of above)
■■■■■ $2.9K to $5.4K

$2K	$4K	$6K	$8K	$10K

COMPAQ 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 **Compaq packaged system** (includes 16 bit CPU, 128K-byte RAM, 8K-byte ROM, 16K byte display memory, CRT and keyboard, 320K-byte diskette drive, parallel printer port, MS-DOS and MS-BASIC and the following options: second 320K byte diskette drive ● **LARGE SYSTEM** is based on **Compaq PLUS packaged system** (includes 16-bit CPU, 128K-byte RAM, 8K-byte ROM, 16K-byte display memory, CRT and keyboard, 10M-byte Winchester, 360K byte diskette drive, parallel printer port, MS-DOS 2.0 and MS-BASIC and the following options: additional 128K-byte RAM; asynchronous communications port.

Canada ● Distributor: BSA Computer Analyst Inc; P.O. Box 713, Moncton, NB E1C 8M9 ● 506-854-1283

Distribution ● through more than 800 authorized dealers including Businessland, CompuShop, Computerland, Entre, Sears Business Systems Centers, and other stores and independent dealers

■ ANALYSIS

Compaq Computer Corporation, which was founded in February 1982, is the designer, developer, and manufacturer of what is, so far, the most popular IBM PC-compatible system on the market — the Compaq portable computer. The Compaq is available in 2 versions: the diskette-based Compaq which was introduced in November 1982 and is comparable to the IBM PC; and the newest family member, the hard disk-based Compaq PLUS which was unveiled in October 1983 and is comparable to the IBM PC/XT.

The Compaq units are self-contained, full-function systems that duplicate the IBM PC's internal architecture, keyboard, and disk format, thereby solidifying Compaq's hardware and software "PC" compatibility. The major differences between the IBM systems and the Compaq systems (besides the Compaq's portability) are the location of BASIC—IBM's implementation is in ROM while Compaq's is on its DOS diskette; the number of open expansion slots on comparably configured systems—the diskette-based Compaq has 2 more than the IBM PC; and the display capabilities—on the Compaq units, text and graphics are on the same board while on the IBM units the graphics is optional and requires an additional slot. Additionally, the Compaq systems are priced lower than the IBM units.

Compaq Portable Computers
Compaq & Compaq PLUS

The only other portable systems that achieve the same level of compatibility as the diskette-based Compaq are the Corona and Columbia systems. On a price comparison level, the Compaq is more expensive than its 2 competitors. However, the Corona doesn't have the equivalent PC graphics resolution and the Columbia doesn't have as many expansion slots. Neither has a hard disk-based portable. In fact, Compaq is the only company that presently has a PC/XT compatible being delivered.

Compaq is promoting its systems not as an alternative to the IBM PC, but as an add-on product capable of utilizing the same software and peripherals. The company distributes its systems only through full-service computer retail stores. It claims all of its dealers are capable of delivering professional presales support, post-sales support, and warranty and post-warranty service at the point of purchase. All authorized dealers must complete the mandatory training course in sales and service and must provide training and service in their stores.

Compaq has established a national sales organization to give personal, on-the-spot support and backup to the computer stores. This field organization had regional sales offices in Boston, Chicago, and San Francisco plus 2 other sales locations in Atlanta and Santa Ana, CA.

☐ Strengths

The most attractive feature of the Compaq, and probably the main reason for buying it, is its high-degree of IBM PC-compatibility. More than 98 percent of the software available for the IBM PC will run on it. The Compaq is a well-designed system both aesthetically and architecturally. The vendor seems to have anticipated that users would want to beef-up the system. This is evidenced by the 8087 co-processor socket; the 120 watt power supply which is more than sufficient for handling the system; the availability of 3 expansion slots which is not that common on portables; and the ability of the system to accommodate 128K-bit RAM chips when they become available. Actually, the Compaq is an improvement of the IBM PC.

It's too soon to comment on the Compaq PLUS, but if the shock isolation system for the hard disk lives up to Compaq's expectations, it should perform with the same high-quality as its sister product.

☐ Limitations

There aren't any major limitations of the Compaq. Price might be an area of consideration to some users. As stated earlier in the Analysis, the Compaq costs more than its 2 closest portable competitors when the amount of bundled software provided by each vendor is taken into consideration.

Another area of concern could be the reliability of the hard disk system because of its sensitivity to temperature changes and movement. Other vendors have had their share of problems when trying to incorporate a hard disk into a portable so users might be reluctant to be the first to buy the Compaq PLUS. Compaq feels this is not an issue, however, because unlike the other vendors, they are using

a smaller drive (3.5 inch Winchester) in a specially-designed, super absorbent shock isolation system.

■ SOFTWARE

☐ Terms & Support

Terms ● MS-DOS and MS-BASIC are bundled with the systems.

Support ● dealers will provide support for any MS-DOS and MS-BASIC problems.

☐ Software Overview

The only software available from Compaq is the MS-DOS operating system—versions 1.1 and 2.0 and Microsoft BASIC and BASICA which have been slightly modified by Compaq. Because the systems are IBM PC-compatible, most programs written for the IBM PC and PC/XT will run on the Compaq systems.

Compaq publishes a list of over 600 programs that they have tested and claim will run without any alteration on the Compaq units. Included in this list are programs such as Lotus 1-2-3, Peachtree accounting packages, dBASE II, Condor DBMS, and the various programming languages and other operating systems running on the IBM PC and PC/XT.

☐ Operating Systems

MS-DOS 1.1 ● Compaq's equivalent to MS-DOS 1.25 and PC-DOS 1.1. ● 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 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 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 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, I/O is physically moved by hidden file IO.SYS as commanded by MSDOS.SYS, COMMAND.COM 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 ● single user, interactive and batch processing operating systems 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 file names 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/track vs. 8 in DOS 1.25), and installable device drivers ● will read earlier MS-DOS diskettes, there are several unique system interrupt calls and file descriptors that make programs utilizing these features non-transportable between MS-DOS 2.00 and earlier versions eg: valid MS-DOS 1.25 filenames using "less than," "greater than," "backslash," or "slash"

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characters are not valid in MS-DOS 2.00 ● an editor, debugger and other utilities are provided.

☐ Data Management

Compaq does not offer any data management systems. These will have to be purchased from third-party vendors.

☐ Communications/Networks

Compaq does not offer any communications facilities or networking capabilities for its systems. However, various products are available from third party vendors.

☐ Program Development/Languages

Compaq BASIC is equivalent to Microsoft's BASICA. It has been modified to handle differences in ROM between it and the IBM PC. Modifications are transparent to the user.

BASICA Interpreter ● implementation of Microsoft BASIC-86 ● provides dual-mode 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 ● BASICA 2.0 is provided with MS-DOS 2.0 operating system and takes advantage of 2.0 enhancements.

☐ Applications Packages

The Compaq systems will run 98% of IBM PC-compatible programs. None are available directly from Compaq.

■ HARDWARE

☐ Terms, Support & Documentation

Terms ● the systems are available on a purchase-only basis; they come standard with a 90-day warranty.

Support ● all authorized dealers provide pre-sales support, post-sales support, and warranty and post-warranty service at the point of purchase.

Documentation ● Operator's Guide; MS-DOS manual, and BASIC manual included with system.

☐ Physical Specifications (H × W × D); Weight

CPU ● 8.5 × 20 × 16 inches; 28 pounds for single-diskette Compaq, 31 pounds for Compaq PLUS.

Display ● integrated with CPU unit.

Keyboard ● included in dimension of CPU unit.

☐ Systems Overview & Configurability

The Compaq portable computer is available in 2 models—the diskette-based Compaq and the hard disk-based Compaq PLUS. Both units run under the Intel 8088 microprocessor and include 128K bytes of RAM, a 9-inch integrated CRT and detached keyboard, disk storage, a parallel printer port, a socket for an 8087 co-processor, and interfaces for an RGB monitor, composite video monitor, and RF modulator. The units also contain a tone generator, 120 watt power supply, and a built-in clock which operates only when the systems are on. Circuitry for a light pen is inherent in the systems, but requires an external monitor for operation.

A single diskette-based Compaq unit weighs 28 pounds and the hard disk-based Compaq PLUS, 31 pounds. Both units have the same dimensions—20 inches wide × 16 inches deep × 8.5 inches high—and are identical except for their storage capacity and number of free expansion slots. The diskette-based unit provides 3 open I/O slots while the Compaq PLUS provides 2 open slots. The vendor is offering a fixed disk option for those users who wish to upgrade a diskette-based Compaq to a Compaq PLUS.

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

System Maximums—Compaq ● 640K bytes of RAM, 8K bytes of ROM, 16K bytes of display memory, 640K bytes of formatted diskette storage, parallel printer port, 3 open slots for third-party expansion cards.

System Maximums—Compaq PLUS ● 640K bytes of RAM, 8K bytes of ROM, 16K bytes of display memory, 10M bytes of hard disk storage, 360K bytes of diskette storage, parallel printer port, 2 open slots for third-party expansion cards.

☐ Packaged Systems

Compaq Portable Computer ● includes 128K-byte RAM, 8K-byte ROM, 16K-byte display memory, integrated CRT and detached keyboard, 320K-byte diskette drive, parallel printer port, composite video, RGB monitor, and RF modulator interfaces, MS-DOS 1.1, and MS BASIC (BASICA):

$2,995 prch

Compaq PLUS ● includes 128K-byte RAM, 8K-byte ROM, 16K-byte display memory, integrated CRT and detached keyboard, 10M-byte Winchester drive, 360K-byte diskette drive, parallel printer port, composite video, RGB monitor and RF modulator interfaces, MS-DOS 2.0 and 2.0 BASIC and BASICA:

4,995

☐ CPU

Both the diskette-based Compaq and the Compaq PLUS contain an Intel 8088 as the main CPU and a socket for an Intel 8087 co-processor. However, the co-processor will have to be purchased from third-party vendors.

Intel 8088 Processor ● 8-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 allows memory partitioning for multi-tasking, concurrent or multi-user capabilities ● a pseudo-superset of the Intel 8080 instruction set where translation to 8088 is straight forward ● instruction set compatible with 8086.

☐ Memory

Standard Memory ● 128K bytes of RAM expandable to 256K on the main board and to 640K with add-on memory boards ● 16K bytes of dedicated display memory ● 8K bytes of ROM.

Additional Memory ● 64K-byte memory option; implemented on the main board:

$160 prch

☐ I/O & Communications

The Compaq systems come standard with a parallel printer port, RGB and composite video interfaces, and an RF modulator interface for connection to a TV. The diskette-based Compaq has 3 open IBM PC-compatible slots while the Compaq PLUS has 2. Various PC-compatible boards are available from third-party vendors. The only board available from Compaq is an asynchronous communications card.

Asynchronous Communications Interface ● up to 9600 baud; full- and half-duplex; RS-232C:

$115 prch

☐ Mass Storage

The Compaq PC comes standard with 1 integrated diskette drive; a second integrated drive is optional. The Compaq PLUS is a hard disk-based system with a floppy backup. Tape drives are not supported on these systems.

Integral Diskette Storage ● 5.25-inch double-sided, double-density drive; 320K bytes formatted when used with MS-DOS 1.1; 360K bytes formatted when used with MS-DOS 2.0.

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

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Additional Diskette Drive ● for Compaq PC only ● second integral drive:

$595 prch

Integral Hard Disk Storage ● for Compaq PLUS only ● 3.5-inch Winchester drive; 10M bytes formatted; 100 milliseconds average access time; 5M Hz transfer rate.

Upgrade Kit ● for upgrading a Compaq PC to a Compaq PLUS ● includes 3.5-inch Winchester drive, shock isolation system, controller card, cables:

2,500

☐ **Terminals/Workstations**

Both computers are single-user systems that contain an integrated display and a detached keyboard. The keyboard can be folded over the front of the unit to protect the screen and disk drives when the system is being transported.

Display ● 9-inch diagonal high-resolution screen; green characters on a black background; 15 shades of green; 25 lines by 80 characters; 7×9 dot matrix in a 9×14 cell; IBM PC-compatible graphics (640×200 pixels), bit mapped; 16K bytes dedicated display memory.

Keyboard ● detached with 6-foot coiled cord: IBM PC key layout; 103 keys total includes separate 10-key numeric pad and 10 programmable functions keys.

☐ **Printers**

None available from Compaq. The units support IBM PC-compatible printers.

● **END**

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■ PROFILE

Operating Systems ● MP/M 8-16, proprietary multiuser operating system based on Digital Research's MP/M-86 Version 2.X; allows simultaneous use of 8- and 16-bit programs.

Data Management ● dBase II relational database management system from Ashton-Tate.

Communications/Networks ● ArcNet network interface available as option.

Languages ● BASIC, Pascal, PL/1, COBOL, assembler, Forth.

Models ● single model with choice of storage capacities; multiuser, multiprocessor configuration featuring both 8- and 16-bit operation.

CPU ● 16-bit Intel 8088 with 4 8-bit Zilog Z80B slave processors.

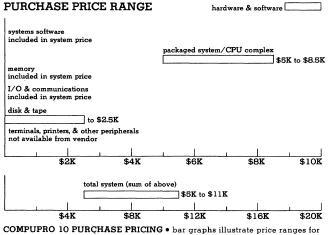**Memory** ● 1M-byte RAM; provides 64K bytes per user plus 768K-byte RAM main memory.

Chassis Slots ● no available chassis slots; expansion options planned into system design.
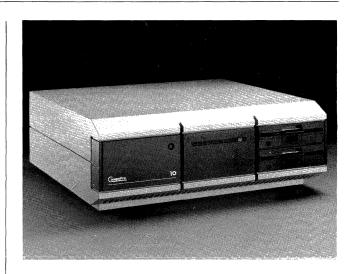
Ports ● 7 serial and 1 parallel port.

Mass Storage ● dual 800K-byte 5.25-inch diskettes; 40M-byte hard disk; 1M- or 4M-byte RAM disk optional; diskette interface supports 2 optional 1.2M-byte 8-inch diskettes; disk interface controls up to 3 additional hard disk drives.

Terminals/Workstations ● multiuser system with support for up to 4 terminals; terminals not provided by CompuPro.

Printers ● supports wide variety of industry standard printers; 1 Centronics printer port and 2 serial printer ports included in packaged system.

PURCHASE PRICE RANGE

hardware & software [_____]

systems software
included in system price

packaged system/CPU complex
[_____] $5K to $8.5K

memory
included in system price

I/O & communications
included in system price

disk & tape
[_____] to $2.5K

terminals, printers, & other peripherals
not available from vendor

| $2K | $4K | $6K | $8K | $10K |

total system (sum of above)
[_____] $5K to $11K

| $4K | $8K | $12K | $16K | $20K |

COMPUPRO 10 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 diskette-based **packaged system** (includes MP/M 8-16, dBase II, WRITE, SuperCalc-86, HyperTyper, Field Companion, one 16-bit main CPU, four 8-bit slave processors, 1M-byte memory, dual 800K 5.25-inch diskettes, two serial printer ports, one parallel printer port, four terminal RS-232-C ports, and one modem RS-232C port. ● **LARGE SYSTEM** is based on hard-disk-based packaged system (includes MP/M 8-16, dBase II, **WRITE**, SuperCalc-86, HyperTyper, Field Companion, one 16-bit main CPU, four 8-bit slave processors, 1M-byte memory, dual 800K 5.25-inch diskettes, single 40M-byte hard disk, two serial printer ports, one parallel printer port, four terminal RS-232-C ports, and one modem RS-232-C port 1M-byte RAM disk option.

First Delivery ● November 1983.

Systems Delivered ● information not currently available.

Comparable Systems ● a number of single-user systems are based on comparable 8- and 16-bit processors; however, the choices are significantly reduced for multiuser systems; the Dynabyte Monarch (Zilog Z80 and Intel 8086) and PolyMorphic Systems Models 8813 and 8810 (Zilog Z80 and Intel 80186) use similar processors but do not provide simultaneous 8- and 16-bit operation; CompuPro feels its architecture and software capabilities move the CompuPro 10 into comparison with the low-end Digital Equipment, Data General, and Wang minicomputers.

Vendor ● CompuPro, a Godbout Company; 3506 Breakwater Court, Hayward, CA 94545 ● 415-786-0909.

Canada ● Distributors: DynaComp Business Computers; 210 W Broadway, Vancouver, BC V54 3W2; 604-872-7737 ● CSC System Center Ltd; 2403 Canoe Avenue, Cognitlan, BC V3K 6A9; 604-941-0622.

Distribution ● worldwide sales through more than 70 Full-Service System Centers; Comcen Technology, Ltd. is exclusive European distributor; Automation Statham PTY, Ltd. is the exclusive Australian distributor; the CompuPro 10 is not currently marketed through Byte Industries and its 1,500 dealers.

■ ANALYSIS

CompuPro is recognized as both a veteran and technical leader in the microcomputer field. September 1983 marked its 10-year anniversary as a manufacturer of high-performance computers.

CompuPro began its corporate existence as CompuKit, a supplier of microcomputer kits. Its parent company, Godbout Electronics, had built a firm reputation as a components supplier. As demand for quality micro-products grew, CompuPro increased the range of available products to include memory boards, CPUs, motherboards, I/O controllers, and peripherals.

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CompuPro was the first company to provide simultaneous 8- and 16-bit operation on the same bus (and then developed the operating software to support it), the first to use direct memory access (DMA) techniques to improve disk access speeds, and the first to develop an electronic disk for high-performance operations. The CompuPro products were based on state-of-the-art hardware featuring some of the fastest processors commercially available as well as an impressive level of reliability. They were widely used in the software development field, and in scientific and industrial applications.

In 1982, CompuPro began to sell complete systems, rather than individual boards. The CompuPro System 816 series was the first product to be configured, supported, and warranted by CompuPro. The System 816 features an S-100 bus (IEEE-696) and a variety of processors, memory types, diskette and disk controllers, as well as compatibility with over 100 suppliers of S-100 products.

The addition of the CompuPro 10, a departure from the earlier S-100-based systems, shows the impact of market awareness on CompuPro's product planning. The CompuPro 10 is aimed at the commercial and business market, a new area for CompuPro. It is software compatible with the 816 Series. The main difference is that the CompuPro 10 is not S-100 based and so is not inherently expandable to the same level as the 816 Series. The CompuPro 10, aimed at the business user, provides a cost-effective entry-level system (less than $1,800 per user including terminals) with the same quality and reliability associated with the CompuPro product line.

☐ Strengths

The CompuPro 10 is one of the very few multiuser systems that doesn't require anything 'extra' to support more than one user. Right out of the box, the system includes enough ports to support 4 users with 2 serial printers, 1 parallel printer, and a modem. Multiuser operating software is included as part of the basic packaged system. There are no surprises and no unexpected costs. In fact, the only real big choices are whether a hard disk is required and whether a RAM disk would speed up the particular application. The ArcNet interface networking option is an extra bonus, but one not essential to basic multiuser operation.

Different approaches to providing multiuser systems are offered by a number of different suppliers. These include shared logic systems, networks with shared resources, and multiprocessor systems. CompuPro has chosen the multiprocessor design as it provides increased performance and reliability. Also, no one user can usurp or crash the system for any reason. When compared to networking a number of single-user systems together to provide multiuser operation through shared resources, the CompuPro 10 is an extremely cost-effective alternative.

Also, it should be noted that the CompuPro 10 was the first microcomputer to include the Xerox AmeriCare service plan as its standard warranty provision. This step is indicative of CompuPro's appreciation for the business community's concern for quality service. The 1-year warranty is a testament to the reliability of the machine in that such a plan could be included at no extra cost to the user.

☐ Limitations

The CompuPro 10 is rather limited when compared to the other CompuPro systems. As it is a departure from the company's S-100 bus-based configurations, the CompuPro 10 is not as expandable or open-ended as the 816 Series models. Of course, a system limited to 5 processors, 1M-byte memory, 8 ports, 1.6M bytes of integral diskette storage, 2.4M-byte add-on diskette storage, 160M bytes of hard disk, 4M bytes of RAM disk, and networking isn't exactly shabby, but it is limited.

The real limitation to the CompuPro 10 is that, in the commercial and business market, CompuPro is not yet recognized as a major contender. As IBM has not yet announced a multiuser system, CompuPro can at least avoid Big Blue comparisons. Also, no one manufacturer has dominated the multiuser market although several are vying for the position. The multiuser market is predicted to grow at an incredible rate as microcomputers provide cost-effective business solutions formerly available only through the sometimes too-expensive minicomputer.

CompuPro is a privately held company, a fact that some perceive as a drawback. Privately held companies are very often overlooked by industry surveyors who research the leaders in the micro field. Publicly held companies are required to supply financial information to the various stock exchanges, information that helps the market surveyors to rank the companies' yearly performance. With a 10-year proven track record of quality products in the scientific and industrial markets, CompuPro is now gaining a significant level of press and industry recognition. This is critical as CompuPro now faces the formidable task of establishing itself as a new entry in the business market.

■ SOFTWARE

☐ Terms & Support

Terms ● the CompuPro 10 packaged system includes the MP/M 8-16 operating system, spreadsheet, database manager, word processor, typing tutor, and executive record keeper; optional software products are available on a one-time license fee basis.

Support ● the Full Service Systems Centers provide the first level of contact for all software support; they are qualified, factory-trained representatives of CompuPro; all inquiries should be directed to the appropriate System Center.

☐ Software Overview

A variety of software items are included with the CompuPro 10 packaged systems. These include the MP/M 8-16 operating system, a database manager, word processing software, an electronic spreadsheet, a typing tutorial, and an executive record keeper. In addition to this bundled software, the CompuPro 10 supports over 3,000 CP/M-based business application programs. CompuPro also provides a wide variety of programming languages for use on its systems.

The MP/M 8-16 operating system provides multiuser, multiprocessor support to run 8- and 16-bit programs simultaneously. MP/M 8-16 is a proprietary version of Digital Research's MP/M-86. Virtually all CP/M and MP/M software written for the Intel 8080, 8086, and 8088 will run on the CompuPro 10.

The software bundled with the CompuPro 10 packaged systems include dBase II data base manager, WRITE word processing package, SuperCalc-86 electronic spreadsheet, HyperTyper typing tutorial, and Field Companion executive record keeper.

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□ **Packaged Software**

Not currently provided by CompuPro.

□ **Operating Systems**

MP/M 8-16 ● multiuser, multitasking, multiprogramming operating system designed to support dual-processor systems using combinations of the Intel 8086 family of 16-bit processor and the Intel and Zilog families of 8-bit processors; a proprietary implementation of MP/M-86, an enhanced upward-compatible version of CP/M supporting up to 1M bytes of user memory; up to 16 users can be supported; ● consists of Supervisor (SUP), Real Time Monitor (RTM), Memory Manager (MM), Character I/O Manager (CIO), Basic Disk Operating System (BDOS), Extended I/O System (XIOS), and Command Interpreter (SHELL) ● BDOS provides the capabilities for managing files and directories; supports up to 16 logical drives, each containing up to 512M bytes, for a maximum of 8G bytes of online storage; supports files up to 32M bytes; CIO supports up to 254 character-type devices (typically terminals and printers) ● RTM is the real-time nucleus of MP/M 8-16 which monitors the execution of processes, arbitrates conflicts for system resources; provides facilities for dispatching, queue, flag, and time management ● XIOS is the portion of the operating system that contains all physical hardware-dependent code, such as Input/Output device handlers; maintains disk definition tables which translate logical drive, directory, and file structure to physical characteristics of a disk ● SHELL provides the interface between users and the system; reads and interprets user's commands and loads programs based on the user command line ● includes all commands (utilities) which are common to CP/M and MP/M-86, as well as additional commands unique to MP/M 8-16; some of the commands include MPMSTAT, which displays run-time system status; ATTACH, which attaches a program to a console; LOGOUT, which terminates a user's session ● requires 256K bytes of memory, an ASCII console, and a real-time clock; CP/M 2.2, CP/M-86, or CP/M 8-16 must also be implemented ● implementation by Gifford Computer Systems, Inc. of MP/M-86 developed by Digital Research, Inc; included in packaged system price.

□ **Utilities**

The CompuPro 10 supports all CP/M-based utilities; available directly from CompuPro is a selection of Digital Research's utilities including Display Manager, Access Manager, MAC macro assembler, SID and ZSID symbolic debugger, and XLT 8- to 16-bit assembly code translator; these utilities are available in 8080- and 8086-based formats.

□ **Data Management**

dBase II ● database management system by Ashton-Tate; uses English-like commands to ADD, DELETE, EDIT, DISPLAY, and PRINT; handles 64K records per file with 1K bytes per record and 32 fields per record; support 7 key fields per file; included in packaged system price.

□ **Communications/Networks**

A total of 8 ports are included as standard in the CompuPro 10 packaged system. The ports are designated as follows: 4 RS-232C terminal ports, 2 serial RS-232C printer ports, 1 Centronics parallel printer port, and 1 RS-232C modem port. An optional ArcNet interface allows the CompuPro 10 to link into local area networks based on the ArcNet standard.

□ **Program Development/Languages**

The CompuPro 10 supports all CP/M-based languages. A number of programming languages and aids are available through CompuPro. These include several different versions of BASIC, Pascal, PL/1, COBOL, assembler, and Forth.

□ **Applications Packages**

WRITE ● word processing system by Proteus Engineering; similar to WordStar; designed for use in creative writing; includes 32 basic commands to allow users to enter, edit, save, copy, format, and print text files; all commands are single keystrokes; included in packaged system price.

SuperCalc-86 ● 16-bit version of standard electronic spreadsheet package by Sorcim; provides basic grid of 63 columns by 254 rows; allows variable-width columns; 16-digit precision provided in calculations; included in packaged system·price.

HyperTyper ● typing tutorial by Summit Software Corp.; designed to teach typing, increase typing skill, or transfer skills from typewriter to computer keyboard; included in packaged system price.

Field Companion ● executive record keeper by Lorand Andahazy; menu-driven system to support the needs of service agents, sales representatives, and other professionals; includes modules to handle time log, expense accounting, customer list, products list, and quotations/invoices; included in packaged system price.

□ **Other Facilities**

The CompuPro 10 supports all CP/M-based facilities.

■ **HARDWARE**

□ **Terms, Support & Documentation**

Terms ● available for purchase only; 1-year warranty standard on boards and enclosure, 6-month warranty on diskette drives.

Support ● CompuPro Full Service System Centers provide complete hardware and software support, system installation, and training; Xerox Americare provides on-site service at no charge within a 100-mile radius of the 82 nationwide Xerox service centers for systems purchased from any authorized Full Service system Centers; for sites beyond 100 miles pick-up and delivery service is available for a fee; walk-in service also available.

Documentation ● each CompuPro 10 system is shipped with a User's Manual as well as instruction manuals for all applicable software packages: MP/M 8-16, dBase II, Write, SuperCalc, HyperTyper, and Field Companion.

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

CPU ● 7 x 22 x 18 inches; 50 pounds.

Display ● not applicable.

Keyboard ● not applicable.

□ **Systems Overview & Configurability**

The CompuPro 10 is a low-cost multiprocessor, multiuser, fully integrated system capable of supporting both 8- and 16-bit simultaneous operation. The system provides more than enough memory to satisfy most applications. A basic 64K is provided for each user with 768K RAM as the system's main memory. Depending on the particular application, up to 512K bytes of the main memory may be used as a software-based disk emulator to significantly increase throughput.

The multiprocessor architecture uses the central 8088 processor to handle overhead tasks, such as disk, printer, and communications support. The individual Z80B processors handle individual user tasks. This approach provides each user with a combination of a dedicated processor and 64K of memory. This then provides a performance level similar to many single-user systems.

Eight ports of various types are included as part of the packaged system. Dual mini-diskettes provide the basic storage choice, with a 40M-byte hard disk optionally available. Other optional storage choices include dual 8-inch diskettes and up to 3 additional hard disks. A hardware-based electronic disk option allows the addition of 1M or 4M bytes of RAM disk. The networking interface option allows the CompuPro 10 to access an ArcNet local area network to provide resource sharing and further increase the system's capabilities.

CompuPro does not supply terminals and printers directly. This allows users, with the help of the System Center or dealer, to configure a system to meet their particular needs. The wide choice of terminals, printers, and add-on peripherals allows a type of customization not available with many other systems.

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

System Maximums ● 1M-byte main memory, 1.6M-byte mini-diskette storage, 2.4M-byte 8-inch diskette storage, 160M-byte hard disk storage, 4M-byte RAM disk storage, 4 RS-232C terminal ports, 2 RS-232C serial printer ports, 1 Centronics parallel printer port, 1 RS-232C modem port, and ArcNet local area network interface.

CompuPro
CompuPro 10

☐ Packaged Systems

Model 10 ● 16-bit Intel 8088 processor, 4 8-bit Zilog Z80B slave processors, 1M-byte RAM, 2 serial RS-232C printer ports, 1 Centronics parallel printer port, 4 terminal RS-232C ports, 1 modem RS-232C port, 2 diskette drives with 1.6M-byte total storage capacity, MP/M 8-16, spreadsheet, database, word processing, typing tutor, and executive record keeper:

$4,995 prch

Model 10 with Hard Disk ● 16-bit Intel 8088 processor, 4 8-bit Zilog Z80B slave processors, 1M-byte RAM, 2 serial RS-232C printer ports, 1 Centronics parallel printer port, 4 terminal RS-232C ports, 1 modem RS-232C port, 1 40M-byte hard disk drive, 2 diskette drives with 1.6M-byte total storage capacity, MP/M 8-16, spreadsheet, database, word processing, typing tutor, and executive record keeper:

8,490

☐ CPUs

The CompuPro 10 includes a master 16-bit Intel 8088 processor plus 4 8-bit Zilog Z80B user processors. A Intel 8087 math co-processor is optionally available. When a user wants to run a 16-bit program, the Z80 acts as a terminal handler and passes the appropriate data to the 8088. This operation is completely transparent to the user.

Intel 8088 Processor ● 8-MHz operation, 8-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 in which translation to 8088 can be automated ● instruction set compatible with Intel 8086; included in packaged systems.

Zilog Z80 Processor ● 6-MHz operation, 8-bit internal architecture, 8-bit data bus interface; direct addressing to 64K bytes of memory; 14 registers include 16-bit program and stack pointers, 2 index registers, and a duplicate set of an 8-bit accumulator and a 7-bit flag register; upwardly compatible with Intel 8080; provides binary-coded decimal (BCD) arithmetic, double-precision operations, multiple indexing with address registers, multiple interrupt, increment, decrement and move capabilities ● in addition to being able to execute all 78 Intel 8080 instructions, 50 enhancements to the instruction set include advanced block move and search macros, relative jump, and 3 types of selectable response interrupts for a total of 128 operations; included in packaged systems.

Intel 8087 Math Co-Processor ● 8-MHz operation, provides extension of Intel 8086/8088 for approximately 100 times faster hardware execution of floating-point 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:

$495 prch

☐ Memory

The CompuPro 10 includes 1M-byte non-expandable RAM memory as part of its packaged system. The standard memory provides parity with 150 nanosecond access time. The 1M-byte memory provides each user with a 64K work space. This leaves 768K bytes for use with the main processor. This will support up to 350 pages of text or a 400- to 500-column by 300- to 400-row spreadsheet.

M-Drive ● 512K bytes of the main memory may be used as a software-based disk emulator to dramatically increase disk throughput; the M-Drive software is loaded into the system and provides the user with a disk volume 'M' for program and data storage; the only concern with such a system is that the user must transfer all programs and data back to a physical disk storage device before powering down the system.

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

☐ I/O & Communications

The CompuPro 10 includes 8 ports as part of the basic packaged system. Seven of these ports are standard RS-232C interfaces. CompuPro has assigned these ports to specific functions to simplify the process of interfacing additional equipment to the CompuPro 10. The 7 RS-232C ports are divided into 4 terminal ports, 2 serial printer ports, and 1 modem port. The terminal ports operate at speeds to 800,000 bps, while the serial printer and modem ports provide transmission speeds to 19,200 bps. The eighth port is a standard Centronics parallel printer port.

The ArcNet local area network interface option allows the CompuPro 10 to link into an ArcNet network. The ArcNet system is based on a token passing protocol with token passes at a rate of nearly 30,000 per second. Coaxial cable provides the basic transmission medium for the ArcNet system. ArcNet permits up to 255 computers and their peripherals to be interconnected.

☐ Mass Storage

Integrated Dual Diskette Drives ● dual, double-sided, double-density 5.25-inch half-height diskettes and controller; 800K bytes per drive, 1.6M bytes of total formatted storage; capable of reading common 5.25-inch formats: IBM, Morrow, Kaypro, Osborne ● 96 tracks per inch, 3-millisecond track-to-track access time, 250K-bps transfer rate, 300 rpm ● included in packaged system.

Integrated Hard Disk ● single 5.25-inch 40M-byte hard disk added to dual diskettes in basic CompuPro 10 system ● 591 tracks per inch, 10-millisecond track-to-track access time, 5M-bps transfer rate, 3529 rpm ● included in packaged system or available as separate purchase:

$3,995 prch

M-Drive RAM Disk ● 512K bytes of standard 1M-byte memory may be used as RAM disk; operation is software selectable to meet user's particular needs; please refer to the memory portion of this report for further information.

M-Drive/H RAM Disk ● 1M or 4M bytes of RAM disk available as option; provides disk operation at RAM speeds, said to increase system performance by 3500%; auto-format feature simplifies use; all CompuPro operating systems support M-Drive/H option.

1M-Byte M-Drive/H:

2,495

4M-Byte M-Drive/H:

15,950

Diskette Subsystem ● dual, double-sided, double-density, 8-inch diskettes and controller; 2.4M bytes of total formatted storage; drives accept single- or double-sided, single- or double-density media ● 48 tracks per inch, 3-millisecond track-to-track access time; includes CP/M-80 and CP/M-86 operating systems, Super-Calc-86 spreadsheet package and dBase II database management system; housed in separate cabinet cable-connected to main system:

3,295

Hard Disk Subsystem ● includes 40M-byte hard disk with single 8-inch diskette for program loading and backup (see Diskette Subsystem for 8-inch diskette information) ● hard disk has 591 tracks per inch, 4096 tracks, 10-millisecond track-to-track access time, 5M-bps transfer rate, 3529 rpm; includes CP/M-80 and CP/M-86 operating systems; housed in separate cabinet cable-connected to main system:

5,495

☐ Terminals/Workstations

Not provided directly by CompuPro, 4 RS-232C terminal ports are provided in packaged systems to provide compatibility with wide range of industry standard terminals and workstations.

☐ Printer/Graphics

Not provided directly by CompuPro, 2 serial RS-232C printer ports and 1 Centronics parallel printer port are included in packaged systems to provide compatibility with wide range of commercially available printers and graphics devices.

● END

CompuPro System 816
Multiuser System

■ PROFILE

Operating Systems ● CP/M 8-16 and MP/M 8-16; proprietary single- and multiuser operating systems, based on Digital Research's standard operating system, allows simultaneous use of 8- and 16-bit programs ● CP/M 2.2, CP/M-68K, CP/M-86, and MP/M-86 also available.

Data Management ● dBase II relational database management system from Ashton-Tate included in some packaged systems.

Communications/Networks ● supports all CP/M- or MP/M-based communications packages available from third-party vendors.

Languages ● mapForth with C, CBASIC-80, CBASIC-86, Pascal MT+ 80, Pascal MT+ 86, CB80, CB86, PL/1-80, PL/1-86, CIS COBOL 80, CIS COBOL 86, Level II COBOL 80, Level II COBOL 86, and MAC 80.
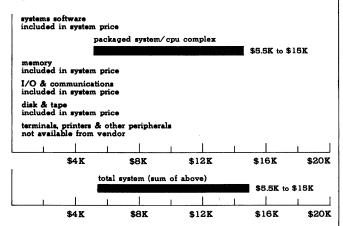
Models ● 7 models: 816/A, 816/B, 816/C, 816/D, 816/E, 816/F, and 816/Z; featuring choice of processors and storage capacities; single- and multiuser configurations available.

CPU ● 8- and 16-bit Intel 8085/8088, 16-bit Intel 8086/8087 and iAPX 286/10, 16-bit Motorola 68000, and 8-bit Zilog Z80B.

Memory ● 816/A: 128K to 1M bytes; 816/B: 256K to 1M bytes; 816/C: 512K to 1M-bytes; 816/D: 512K to 1M bytes; 816/E: 256K to 16M bytes; 816/F: 512K to 1M bytes; 816/Z: 64K bytes ● the S-100 bus provides addressing for up to 16M bytes of memory ● all the processors except the M68000 and Z80B can select and address 1M bytes of memory at a time.

Chassis Slots ● all 816 models use 20-slot desktop enclosure; rackmount version available as option; except model listed is with number of available chassis slots in the packaged configuration:

PURCHASE PRICE RANGE
hardware & software ■

- **systems software** included in system price
- **packaged system/cpu complex** — $5.5K to $15K
- **memory** included in system price
- **I/O & communications** included in system price
- **disk & tape** included in system price
- **terminals, printers & other peripherals** not available from vendor

| $4K | $8K | $12K | $16K | $20K |

total system (sum of above) — $5.5K to $15K

| $4K | $8K | $12K | $16K | $20K |

COMPUPRO SYSTEM 816 PURCHASE PRICING bar graphs illustrate price range for small to large systems, with solid bars reflecting software/hardware purchase pricing ● **SMALL SYSTEM** is based on 816/A packaged system (includes CP/M-816, WRITE, SuperCalc-86, dBase II, Field Companion, HyperTyper, dual processors (8-bit Intel 8085 and 16-bit Intel 8088), 128K-byte memory, dual 1.2M-byte diskettes, 4 series ports, 1 Centronics port, 1 parallel port, and one-year warranty ● **LARGE SYSTEM** is based on 816/F packaged system (includes CP/M-86, MP/M-86, 16-bit Intel NAPX 286 processor, 512K-byte memory, single 1.2M-byte diskette, single 40M-byte hard disk, 12 serial ports, 1 Centronics port, 1 parallel port).

816/A, /B, and /C = 14; 816/D = 10; 816/E = 11; 816/F = 9; 816/Z = 16.

Ports ● Interfacer 3 I/O board provides 8 RS-232C ports ● Interfacer 4 I/O board provides 1 asynchronous port supporting 19.2K bps, 2 asynchronous or synchronous ports supporting higher speeds, 1 Centronics parallel port for printer connection and 1 universal parallel port for custom connections ● the System Support Board provides 1 RS-232C asynchronous serial port for use as a system console ● Interfacer 3 and the System Support Board are standard on the 816/B, /C, /D, and /F models; Interfacer 4 and the System Support Board are standard on the 816/A, /D, /E, /F, and /Z models (except System Support Board not included on 816/Z model) ● the non-standard board optionally available for any model.

Mass Storage ● dual 1.2M-byte 8.0-inch diskette; 40M-byte hard disk; 512K- to 4M-byte RAM disk optional; diskette interface supports 2 optional 1.2M-byte 8-inch diskettes, disk interface controls up to 3 additional hard disk drives; 2 controllers provide maximum of 320M bytes of disk storage.

Terminals/Workstations ● general recommendation of 12 terminals maximum unless configured for increased load; terminals not provided by CompuPro; serial ports provide compatibility with wide variety of commercially available terminals.

Printers ● supports wide variety of industry standard printers; general maximum of 3 printers unless specifically configured otherwise.

First Delivery ● September 1982.

Systems Delivered ● 10,000 installed or on order as of September 1983.

Comparable Systems ● Altos, Molecular, and TeleVideo are comparable to the 816/A, /B, and /C systems; Data General and Digital Equipment low-end minicomputers are comparable to the 816/D, /E, and /F models; the 816/Z is comparable to other Z80 based systems with a 64K memory.

Vendor ● CompuPro, a Godbout Company, 3506 Breakwater Court, Hayward, CA 94545 ● 415-786-0909.

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TABLE 1: COMPUPRO MODEL DIFFERENCES

	816/A	816/B	816/C	816/D	816/E	816/F	816/Z
Processor	8-bit 8085 16-bit 8088	8-bit 8085 16-bit 8088	8-bit 8085 16-bit 8088	16-bit 8086 8087 opt	32-/16-bit MC68000	16-bit iAPX 286	8-bit Z80B
Memory							
Min	128K	256K	512K	512K	256K	512K	64K
Max	1M	1M	1M	1M	16M	1M	—
Standard Ports							
Serial	4	9	9	12	4	12	3
Parallel	2	0	0	2	2	2	2
Open slots	14	14	14	10	11	9	16
RAM Disk	optional	optional	optional	1.5M bytes standard	1.5M bytes standard	1.5M bytes standard	not available
Bundled Software	CP/M 8-16, SuperCalc-86, dBase II, WRITE WP, HyperTyper, Field Companion	CP/M 8-16, MP/M 8-16, SuperCalc-86, dBase II, WRITE WP, HyperTyper, Field Companion	CP/M 8-16, MP/M 8-16, SuperCalc-86, dBase II, WRITE WP, HyperTyper, Field Companion	CP/M-86, MP/M-86, SuperCalc-86, SuperWriter 86	CP/M-68K, mapFORTH w/'C'	CP/M-86, MP/M-86	CP/M 2.2 dBase II, WRITE WP, HyperTyper, Field Companion

Canada ● Distributors: DynaComp Business Computers; 210 W Broadway, Vancouver; BC V5H 3W2; 604-872-7737 ● CSC System Center Ltd; 2403 Canoe Avenue, Cognitlan, BC V3K 6A9, 604-941-0622.

Distribution ● worldwide sales through more than 70 Full Service System Centers; Comcen Technology, Ltd is exclusive European distributor; Automation Statham PTY, Ltd is the exclusive Australian distributor; also marketed through Byte Industries and its associated 1500 dealers.

■ ANALYSIS

CompuPro is recognized as both a veteran and technical leader in the microcomputer field. September 1983 marked its 10-year anniversary as a manufacturer of high-performance computers. CompuPro began its corporate existence as CompuKit, a supplier of microcomputer kits. Its parent company, Godbout Electronics, had built a firm reputation as a components supplier. As demand for quality micro-products grew, CompuPro increased the range of available products to include memory boards, CPUs, motherboards, I/O controllers, and peripherals.

CompuPro was the first company to provide simultaneous 8- and 16-bit operation on the same bus (and then developed the operating software to support it), the first to use DMA techniques to improve disk access speeds, and the first to develop an electronic disk for high-performance operations. These products found a welcome home with the technically oriented user. They were widely used in the software development field, and in scientific and industrial applications.

In 1982, CompuPro began to sell complete systems, in addition to the individual boards. The CompuPro System 816 series was the first product to be configured, supported, and warranted by CompuPro. The System 816 features an S-100 bus (IEEE-696) and a variety of processors, memory types, and diskette and disk controllers, as well as compatibility with over 100 suppliers of S-100 products. As of September 1983,

CompuPro had a base of more than 10,000 System 816s installed or on order.

The System 816 product line is constantly evolving as new processors and products are announced. For sake of simplicity, the 7 models in the series may be divided into 2 subgroups. Three models are based on 1 processor configuration while the other 4 systems each include different processors. The systems are built using CompuPro boards in CompuPro enclosures. The S-100 bus design provides compatibility between the models to allow users to upgrade their systems as needs change.

The 816/A is the entry-level, single-user system with a dual-processor configuration. The next step is the 816/B, considered either a high-performance, single-user, or an entry-level, multiuser system. The 816/B uses the same processors as the 816/A. The 816/C follows this pattern but is configured to be a high-performance multiuser system supporting 3 users with the basic configuration.

The 816/D is the first System 816 model to use a different processor. It is based on the Intel 8086 processor with the companion 8087 math co-processor as an option. It is a multiuser system and includes 1.5M bytes of the M-Drive/H RAM disk to guarantee performance. The 816/E uses the Motorola 68000 processor in conjunction with 1.5M bytes of M-Drive/H RAM disk in the basic system. The 816/F, CompuPro's newest model, is based on the Intel iAPX 286/10 processor. It provides single- or multiuser operation and includes 1.5M bytes of M-Drive/H RAM disk to ensure maximum throughput. The 816/Z is a Z80 based system with 64K bytes of memory. It is a low cost, S-100 system for users who require the reliability level basic to CompuPro systems.

The CompuPro 10 is the first CompuPro system that is not a direct extension of the 816 product line. It is a multiuser system aimed at the business market, a new area for CompuPro. It is software compatible with some of the 816

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Series models. The main difference is that the CompuPro is not S-100 based and so is not inherently expandable to the same level as the 816 Series. This system is covered in a separate report.

☐ Strengths

The CompuPro reputation is built on providing state-of-the-art technology with reliability included as a basic design criterion. The CompuPro System 816 provides a selection of a significant number of the fastest processors on the market. CompuPro has been around longer than most of the other micro manufacturers and has long-term contracts with the chip suppliers, which explains the availability of the newer chips. Basic product reliability is such that a 1-year warranty is standard on all systems and 2-year coverage is available for a slight premium. In addition, 3 systems—the 816/C, /D, and /E—include the Xerox AmeriCare on-site service plan as the standard warranty provision for systems purchased from Full Service System Centers.

The S-100 bus and use of common boards within the 816 product line ensure that the user will not be left behind in the wake of new technology advances. All the systems can swap 1 processor for another, can add memory, storage, or I/O as needed, while retaining compatibility with existing peripherals. New software may need to be added if a user upgrades processors, but in many cases, slave processors may be used to maintain compatibility with earlier software.

☐ Limitations

The major limitation of the System 816 line is that it is not a desktop system meant to be installed by a first-time user. The 816 systems offer a wide range of choices to optimize system performance which means, however, that it is not inherently obvious which system is best for which job. Factory trained CompuPro representatives should be used to assist in sizing the system to the job.

Another significant problem with supplying state-of-the-art hardware is that, for a while, the hardware is developed faster than the supporting software. While this is not a problem for all of the processors used in the CompuPro 816, it is a factor with some of the newest models.

■ SOFTWARE

☐ Terms & Support

Terms ● CompuPro System 816 packaged systems include the appropriate CP/M- or MP/M-based operating system; all models include either all or a subset of the following packages: spreadsheet, database manager, word processor, typing tutor, and executive record keeper; optional software products are available on a one-time license fee basis.

Support ● Full Service Systems Centers provide the first level of contact for software support; they are factory-trained representatives of CompuPro; inquiries should be directed to the appropriate System Center; contact your dealer for follow-up and support.

☐ Software Overview

A variety of software items are included with the CompuPro System 816 packaged systems. These include the appropriate CP/M or MP/M operating systems, as well as some but not necessarily all of the following: a database manager, word processor software, an electronic spreadsheet, a typing tutorial,

and an executive record keeper. In addition to this bundled software, the Compupro System 816 supports over 3,000 CP/M-based business application programs. CompuPro also provides a wide variety of programming languages for use on its systems.

Each system includes the operating systems and available applications bundled into system price that most suit the particular processor in the chosen configuration. The System 816/A includes CP/M 8-16, SuperCalc-86 spreadsheet, dBase II database manager, WRITE word processor, HyperTyper typing tutor, and Field Companion executive record keeper; the Systems 816/B and /C add the MP/M 8-16 operating system to the bundled software listed above; the System 816/D includes CP/M-86 and MP/M-86 as the operating systems plus SuperCalc-86 spreadsheet and SuperWriter-86 word processor; the System 816/E includes CP/M-68K and mapFORTH with C; the System 816/F includes CP/M-86 and MP/M-86 as the basic operating systems, and the System 816/Z includes CP/M 2.2, dBase II database manager, WRITE word processor, HyperTyper typing tutor, and Field Companion executive record keeper.

The CP/M 8-16 and MP/M 8-16 operating systems provide single- or multiuser, multiprocessor support to run 8- and 16-bit programs simultaneously. CP/M 8-16 and MP/M 8/16 are proprietary versions of Digital Research's CP/M-86 and MP/M-86. Virtually all CP/M and MP/M software written for the Intel 8080, 8085, 8086, 8088, 8087, Zilog Z80, and the Motorola 68000 will run on one or more of the CompuPro System 816 models.

☐ Packaged Software

Not currently provided by CompuPro.

☐ Operating Systems

CP/M 8-16 ● single-user, single-tasking operating system designed to support dual processor systems using combinations of the Intel 8086 family of 16-bit processors and the Intel and Zilog families of 8-bit processors; a proprietary implementation of 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.

MP/M 8-16 ● multiuser, multitasking, multiprogramming operating system designed to support dual-processor systems using combinations of the Intel 8086 family of 16-bit processors and the Intel and Zilog families of 8-bit processors; a proprietary implementation of MP/M-86, an enhanced upward-compatible version of CP/M supporting up to 1M bytes of user memory; up to 16 users can be supported ● consists of Supervisor (SUP), Real Time Monitor (RTM), Memory Manager (MM), Character I/O Manager (CIO), Basic Disk Operating System (BDOS), Extended I/O System (XIOS), and Command Interpreter (SHELL) ● BDOS provides the capabilities for managing files and directories; supports up to 16 logical drives, each containing up to 512M bytes, for a maximum of 8G bytes of online storage; supports files up to 32M bytes; CIO supports up to 254 character-type devices (typically terminals and printers) ● RTM is the real-time nucleus of MP/M 8-16, which monitors the execution of processes, arbitrates conflicts for system resources; provides facilities for dispatching, queue, flag, and time management ● XIOS is the portion of the operating system that contains all physical hardware-dependent code, such as Input/Output device handlers; maintains disk definition tables which translate logical drive, directory, and file structure to physical characteristics of a disk ● SHELL provides the interface between users and the system; reads and interprets user's commands and loads programs based on the user command line ● includes all commands (utilities) that are common to CP/M and MP/M-86, as well as additional commands unique to MP/M 8-16; some of the commands include MPMSTAT, which displays runtime system status; ATTACH, which attaches a program to a console; LOGOUT, which terminates a user's session ● requires 256K bytes of memory, an ASCII console, and a real-time clock; CP/M 2.2, CP/M-86, or CP/M 8-16 must also be implemented ● implementation by Gifford Computer Systems, Inc of MP/M-86 developed by Digital Research, Inc.

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CP/M 2.2 ● single-user, single-tasking, general-purpose operating system designed to support the Intel and Zilog families of 8-bit processors; features and facilities of this basic system are all upward compatible and are present in all other versions of CP/M; consists of 4 elemental structures: Basic I/O System (BIOS), Basic Disk Operating System (BDOS), Console Command 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 ● supports up to 16 logical devices, containing up to 512M bytes each; individual files may contain up to 65,536 records, with up to an 8M-byte capacity ● 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 included: DDT interactive debugger; PIP file transfer facility; DUMP utility; SUBMIT/XSUB batch control utilities; ED command-oriented text editor; ASM assembler; and STAT system status utility ● memory requirements depend on number and types of options implemented; basic system requires 20K bytes of memory and an ASCII terminal.

CP/M 68K ● features similar to CP/M 2.2 ● included in purchase price of System 816/E.

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 ● supports up to 16 logical devices, 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 facility; SUBMIT batch control utilities; 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.

MP/M-86 ● a version of MP/M II that can function on the larger 8086/8088-type microprocessor systems; requires the implementation of CP/M-86 to generate the MP/M-86 system; in addition to the 64K bytes of RAM required by the MP/M system, the MP/M-86 also requires 128K-byte RAM for implementation purposes; MP/M-86 incorporates a Supervisor function, which includes the Command Line Interpreter (CLI) and program loader used in the MP/M II system, and also has a program chaining facility; it is upward compatible with CP/M, CP/M-86, and MP/M ● included in purchase price of System 816/D and 816/F.

□ **Utilities**

CompuPro System 816 supports all CP/M-based utilities; available directly from CompuPro is a selection of Digital Research's utilities including Display Manager, Access Manager, MAC macro assembler, SID, and ZSID symbolic debugger, and XLT 8- to 16-bit assembly code translator; these utilities are available in 8080- and 8086-based formats.

□ **Data Management**

dBase II ● database management system by Ashton-Tate; uses English-like commands to ADD, DELETE, EDIT, DISPLAY, and PRINT; handles 64K records per file with up to 1K bytes per record and 32 fields per record; supports 7 key fields per file; included in Systems 816/A, /B, /C, and /Z packaged system prices:

NC lcns

□ **Communications/Networks**

The System 816 models support all CP/M- or MP/M-based communications packages ● available from third-party vendors.

□ **Program Development/Languages**

The CompuPro System 816 supports all CP/M- and MP/M-based languages; a number of programming languages and aids are available through CompuPro; these include:

mapForth ● specific language designed to run with CP/M 68K, includes "C" language compiler; included in System 816/E packaged system price.

CBASIC-80 ● Digital Research standard:

$150 lcns

CBASIC-86 ● Digital Research standard:

325

Pascal MT+ 80 ● Digital Research standard:

350

Pascal MT+ 86 ● Digital Research standard:

600

CB 80 ● Digital Research standard:

500

CB 86 ● Digital Research standard:

600

PL/1-80 ● Digital Research standard:

500

PL/1-86 ● Digital Research standard:

750

CIS COBOL 80 ● Digital Research standard:

850

CIS COBOL 86 ● Digital Research standard:

850

Level II COBOL 80 ● Digital Research standard:

1,600

Level II COBOL 86 ● Digital Research standard:

1,600

MAC 80 ● Digital Research standard:

90

□ **Applications Packages**

WRITE ● word processing system by Proteus Engineering; similar to WordStar; designed for use in creative writing; includes 32 basic commands to allow users to enter, edit, save, copy, format, and print text files; all commands are single keystrokes; included in System 816/A, /B, /C, and /Z packaged system prices.

SuperWriter-86 ● multifunction word processing packages with integrated spelling checker and form letter generator; included in System 816/D packaged system price.

SuperCalc-86 ● 16-bit version of standard electronic spreadsheet package by Sorcim; provides basic grid of 63 columns x 254 rows; allows variable width columns; 16-digit precision provided in calculations; included in System 816/A, /B, /C, and /D packaged system prices.

LCNS: one-time license fee.

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HyperTyper • typing tutorial by Summit Software Corp; designed to teach typing, increase typing skill, or transfer skills from typewriter to computer keyboard; included in System 816/A, /B, /C, and /Z packaged system prices.

Field Companion • executive record keeper by Lorand Andahazy; menu-driven system to support the needs of service agents, sales representatives, and other professionals; includes modules to handle time log, expense accounting, customer list, products list, and quotations/invoices; included in System 816/A, /B, /C, and /Z packaged system prices.

☐ Other Facilities

The CompuPro System 816 supports all CP/M- and MP/M-based facilities available from third-party vendors.

■ HARDWARE

☐ Terms, Support & Documentation

Terms • available for purchase only; 1-year warranty standard on boards and enclosure, 6-month warranty on diskette drives; all System 816 systems support the Certified System Component's high reliability program as an option; this upgrade provides a 2-year warranty on all system boards.

Support • CompuPro Full Service System Centers provide complete hardware and software support, system installation, and training; Xerox Americare provides on-site service at no charge within a 100-mile radius on the 82 nationwide Xerox service centers for 816/C, /D, and /E systems purchased from any authorized Full Service System Center; for sites beyond 100 miles, pick-up and delivery service is available for a fee; walk-in service also available; other warranty provisions are handled by Full Service System Centers.

Documentation • each CompuPro System 816 system is shipped with the applicable User's Manual as well as instruction manuals for individual boards and all bundled software packages.

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

CPU • 7 x 18 x 22 inches; weight information not available.

Display • not provided by CompuPro.

Keyboard • not provided by CompuPro.

☐ Systems Overview & Configurability

The CompuPro System 816 product line includes 7 models incorporating several different processors, each suited to the specific configuration. All 816 systems conform to the IEEE-696 standard for S-100 bus computers and are packaged in a 20-slot chassis.

The 816/A, /B, and /C models are variations of the same configuration. These 3 systems include an 8-bit Intel 8085 and a 16-bit Intel 8088 processor to provide support for all 8- and 16-bit CP/M-based software. The 816/A is an entry-level, single-user system with 128K bytes of memory and CP/M 8-16. The 816/B is termed a high performance single-user system and it includes CP/M 8-16, MP/M 8-16, and 256K bytes of memory. The 816/C is a multiuser system supporting 3 users on the basic system with a recommended maximum of 7 workstations. This basic system includes 512K bytes of memory, CP/M 8-16, and MP/M 8-16. All 3 of these systems will support up to 1M byte of memory, 4.8M bytes of diskette storage, 160M bytes of hard disk storage, and 4M bytes of RAM disk.

The 816/D is a high-performance multiuser system based on the 16-bit Intel 8086 processor and the optional 8087 coprocessor. The basic model can support 5 users. The system includes 1.5M bytes of RAM disk and 2.4M bytes of diskette storage. The system can be expanded to 12 serial ports, 1 parallel port, and 1 Centronics port.

The 816/E is a single-user system with the M68000 processor, 512K bytes of memory, 4 serial ports, 1 parallel port, 1 Centronics port, 1.5M bytes of RAM disk, and 2.4M bytes of diskette storage. The system includes CP/M 68K as well as a C compiler and mapForth with a macroassembler. This system permits programs written in C under UNIX to be ported into a CP/M environment.

The 816/F uses the new 16-bit Intel iAPX 286 chip as its basic processor. The system also includes 512K bytes of memory, a single 1.2M-byte diskette, a single 40M-byte hard disk, 12 serial ports, 1 parallel port, 1 Centronics port, 1.5M bytes of RAM disk, CP/M-86, and MP/M-86. A math processor is available as an option.

The 816/Z is an 8-bit Zilog Z80B-based system with 64K bytes of memory, 3 serial ports, 1 parallel port, and 1 Centronics port. Dual diskettes are included in the basic system to provide 2.4M bytes of online storage. CP/M 2.2 is the operating system provided with the packaged system.

All CompuPro systems except the 816/Z include a number of user convenience features. These include a clock/calendar, interrupt controller, and interval timers. This board also provides battery backup for 2K of RAM as an option. A power fail signal is generated upon power interruption. A socket is included for either the 9511A math processor or the 9512 IEEE floating-point match chip.

CompuPro does not supply terminals and printers directly.

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

System Maximums • due to the variety of systems in the System 816 product line and the extreme range of configurability provided by the S-100 bus, system maximums depend on the required performance specifics. With a 20-slot chassis, all the System 816 models have room for future expansion.

☐ Packaged Systems

816/A with Dual Diskettes • 8-bit Intel 8085 and 16-bit Intel 8088 processors, 128K-byte memory, dual 1.2M-byte 8-inch diskettes, 4 serial ports, 1 Centronics port, 1 parallel port, CP/M 8-16, WRITE, SuperCalc-86, dBase II, Field Companion, HyperTyper; available with 2-year CSC warranty:

$5,495 prch	$6,095 prch w/CSC

816/A with 40M-Byte Hard Disk • 8-bit Intel 8085 and 16-bit Intel 8088 processors, 128K-byte memory, single 1.2M-byte 8-inch diskette, single 40M-byte hard disk, 4 serial ports, 1 Centronics port, 1 parallel port, CP/M 8-16, WRITE, SuperCalc-86, dBase II, Field Companion, HyperTyper; available with 2-year CSC warranty:

8,990	9,590

816/B with Dual Diskettes • 8-bit Intel 8085 and 16-bit Intel 8088 processors, 256K-byte memory, dual 1.2M-byte 8-inch diskettes, 9 serial ports, CP/M 8-16, MP/M 8-16, WRITE, SuperCalc-86, dBase II, Field Companion, HyperTyper; available with 2-year CSC warranty:

6,995	7,795

816/B with 40M-Byte Hard Disk • 8-bit Intel 8085 and 16-bit Intel 8088 processors, 256K-byte memory, single 1.2M-byte 8-inch diskette, 40M-byte hard disk, 9 serial ports, CP/M 8-16, MP/M 8-16, WRITE, SuperCalc-86, dBase II, Field Companion, HyperTyper; available with 2-year CSC warranty:

10,490	11,290

816/C with Dual Diskettes • 8-bit Intel 8085 and 16-bit Intel 8088 processors, 512K-byte memory, dual 1.2M-byte 8-inch diskettes, 9 serial ports, CP/M 8-16, MP/M 8-16, WRITE, SuperCalc-86, dBase II, Field Companion, HyperTyper; available with 2-year CSC warranty:

8,995	9,995

816/C with 40M-Byte Hard Disk • 8-bit Intel 8085 and 16-bit Intel 8088 processors, 512K-byte memory, single 1.2M-byte 8-inch diskette, 40M-byte hard disk, 9 serial ports, CP/M 8-16, MP/M 8-16, WRITE, SuperCalc-86, dBase II, Field Companion, HyperTyper; available with 2-year CSC warranty:

12,490	13,490

PRCH: purchase price. CSC: Certified System Component warranty option. NA: not available.

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816/D with Dual Diskettes ● 16-bit Intel 8086 processor, 512K-byte memory, dual 1.2M-byte 8-inch diskettes, 1.5M-byte RAM disk, 12 serial ports, 1 Centronics port, 1 parallel port, CP/M 86, MP/M 86, SuperWriter-86, SuperCalc-86, available with 2-year CSC warranty:

13,995	15,595

816/D with Dual Diskettes ● 16-bit Intel 8086 processor, 8087 coprocessor, 512K-byte memory, dual 1.2M-byte 8-inch diskettes, 1.5M-byte RAM disk, 12 serial ports, 1 parallel port, CP/M 86, MP/M 86, SuperWriter-86, SuperCalc-86, available with 2-year CSC warranty:

14,295	15,895

816/D with 40M-Byte Hard Disk ● 16-bit Intel 8086 processor, 512K-byte memory, single 1.2M-byte 8-inch diskette, single 40M-byte hard disk, 1.5M-byte RAM disk, 12 serial ports, 1 Centronics port, 1 parallel port, CP/M-86, MP/M-86, SuperWriter-86, SuperCalc-86, available with 2-year CSC warranty:

17,490	19,090

816/D with 40M-Byte Hard Disk ● 16-bit Intel 8086 processor, 8087 coprocessor, 512K-byte memory, single 1.2M-byte 8-inch diskette, single 40M-byte hard disk, 1.5M-byte RAM disk, 12 serial ports, 1 Centronics port, 1 parallel port, CP/M-86, MP/M-86, SuperWriter-86, SuperCalc-86, available with 2-year CSC warranty:

17,790	19,390

816/E with Dual Diskettes ● 16-bit Motorola 68000 processor, 256K-byte memory, dual 1.2M-byte 8-inch diskettes, 1.5M-byte RAM disk, 4 serial ports, 1 Centronics port, 1 parallel port, CP/M 68K with mapForth, assembler, and C language compiler, available with 2-year CSC warranty:

8,995	9,995

816/E with 40M-Byte Hard Disk ● 16-bit Motorola 68000 processor, 256K-byte memory, single 1.2M-byte 8-inch diskette, single 40M-byte hard disk, 1.5M-byte RAM, 4 serial ports, 1 Centronics port, 1 parallel port, CP/M 68K with mapForth, assembler, and C language compiler, available with 2-year CSC warranty:

12,490	13,490

816/F with 40M-Byte Hard Disk ● 16-bit Intel iAPX 286 processor, 512K-byte memory, single 1.2M-byte 8-inch diskette, single 40M-byte hard disk, 1.5M-byte RAM disk, 12 serial ports, 1 Centronics port, 1 parallel port, CP/M-86, MP/M-86:

14,995	NA

816/Z with Dual Diskettes ● 8-bit Zilog Z80B processor, 64K-byte memory, dual 1.2M-byte 8-inch diskettes, 3 serial ports, 1 Centronics port, 1 parallel port, CP/M 2.2, WRITE, SuperCalc, dBase II, HyperTyper, Field Companion; available with 2-year CSC warranty:

4,995	5,395

816/Z with 40M-Byte Hard Disk ● 8-bit Zilog Z80B processor, 64K-byte memory, single 1.2M-byte 8-inch diskette, single 40M-byte hard disk, 3 serial ports, 1 Centronics port, 1 parallel port, CP/M 2.2, WRITE, SuperCalc, dBase II, HyperTyper, Field Companion; available with 2-year CSC warranty:

8,490	8,990

☐ CPUs

Intel 8085 ● 8-bit data bus interface, 16-bit address bus; clock, I/O, and memory interface on the chip; incorporates system fetch and execution logic ● included in 816/A, /B, and /C packaged systems.

Intel 8088 Processor ● 8-MHz operation, 8-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 in which translation to 8088 can be automated ● instruction set compatible with Intel 8086; included in System 816/A, /B, and /C packaged systems.

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 abd 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 8080 is straightforward ● instruction set compatible with 8088 ● included in 816/D packaged system.

Intel iAPX 286 Processor ● 16-bit data bus interface, 16-bit internal architecture, direct addressing to 16M bytes of memory and to 1G-byte virtual addressing per task; 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, extensive string and block move facilities ● powerful segmentation facilities allow memory partitioning up to 16,383 areas between 1K and 64K bytes in length for multitasking, concurrent, multiuser capabilities or virtual memory applications; memory management and attendant protection mechanisms are integrated within the CPU ● a pseudo-superset of the Intel 8080 instruction set where translation to iAPX 286 is straightforward ● a superset of the Intel 8086/8088; instruction set is similar but with more than 10 additional instructions; enhancements include single commands to push or pop all general registers, string input and output using DX register for port, procedure enter and exit (LEAVE) commands, immediate modes add to push, integer multiply and shift/rotate instructions, and check array against boundary command ● in addition to improved execution of original 8086/8088 instructions, more than ten added commands, and an additional interrupt type, the Intel iAPX 286 includes major hardware additions on a single chip; these additions include: a clock generator for internal and external clocks, two external and one internal 16-bit programmable timer/counters, two Direct Memory Access (DMA) channels with 2M-byte-per-second transfer rate, a local bus controller, a data-bus transceiver, programmable memory, and an I/O chip for up to 7 peripherals and 6 totally independent memory blocks, a programmable multilevel interrupt controller, and memory management circuitry ● these improvements upon the Intel 8086/8088 design give the Intel iAPX 286 faster and simpler hardware design ● included in 816/F packaged system.

Motorola 68000 Processor ● 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 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 vectors, a trace mode with sophisticated trap operations for debugging; Motorola "HMOS" technology large-computer geometric architecture; included in System 816/E packaged system.

Zilog Z80B Processor ● 6-MHz operation, 8-bit internal architecture, 8-bit data bus interface; direct addressing to 64K bytes of memory; 14 registers include 16-bit program and stack pointers, 2 index registers, and a duplicate set of an 8-bit accumulator and a 7-bit flag register; upwardly compatible with Intel 8080; provides binary coded decimal (BCD) arithmetic, double-precision operations, multiple indexing with address registers, multiple interrupt, increment, decrement, and move capabilities ● in addition to being able to execute all 78 Intel 8080 instructions, 50 enhancements to the instruction set include advanced block move and search macros, relative jump, and 3 types of selectable response interrupts for a total of 128 operations; included in System 816/Z packaged system.

Intel 8087 Math Co-Processor ● 8-MHz operation, provides extension of Intel 8086/8088 for approximately 100 times faster hardware execution of floating-point mathematics ● 84-bit wide

CompuPro System 816
Multiuser System

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; included in System 816/D packaged system.

☐ Memory

The CompuPro System 816 models offer a range of memory capacities, each suited to the processor and specific configuration ● the 816/A, /B, and /C all have a maximum memory of 1M-byte; standard memory sizes are as follows: 816/A=128K, 816/B=256K, 816/C=512K bytes; the 816/D includes a 512K-byte memory expandable to 1M bytes; the 816/E provides 256K-byte minimum memory, expandable to 16M bytes; the 816/Z includes a 64K-byte memory ● the IEEE S-100 standard provides 24 address bits to support 16M bytes of memory; only the 816/E with M68000 processor can directly address all 16M bytes of memory; the other systems, with the exception of the 816/Z, can select and address 1M bytes of memory at a time.

64K Memory Module ● 8- and 16-bit memory; operates at 10 MHz with 8088 and 8086 type processors, low power static RAM; included in packaged systems or available as add-on module:

$550 prch	$650 prch w/CSC

128K Memory Module ● 8- and 16-bit memory; operates at 12 MHz with 8088 and 8086 type processors; low power static RAM; included in packaged systems or available as add-on module:

995	1,145

256K Memory Module ● 8- and 16-bit memory; operates at 12 MHz with 8088 and 8086 type processors, low power static RAM; included in packaged systems or available as add-on module:

1,750	1,950

☐ I/O & Communications

The CompuPro models include either one or both of 2 I/O boards as the basic communications system; Interfacer 3 is an 8 channel, multiuser serial I/O board; it includes 8 RS-232C ports with 6 providing asynchronous operation at speeds to 19.2K bps; the 2 remaining Interfacer 3 ports provide synchronous or asynchronous operation at higher speeds. The Interfacer 3 is standard in the 816/B, /C, /D, and /F models ● Interfacer 4 is an advanced serial/parallel I/O board; it provides 1 asynchronous port supporting speeds to 19.2K bps, as well as 2 asynchronous or synchronous ports supporting higher transmission speeds; also included are 2 parallel ports—1 Centronics interface for printer connections and 1 universal parallel interface for custom connections; all serial ports are programmable from the CPU for all operating characteristics; Interfacer 4 is included in all 816/A, /D, /E, /F, and /Z system configurations ● the System Support Board, common to all CompuPro systems except the 816/Z, provides an additional RS-232C asynchronous serial channel with programmable characteristics; this allows 1 terminal to operate as a system console.

☐ Mass Storage

Diskette Subsystem ● dual, double-sided, double-density, 8-inch diskettes and controller; 2.4M bytes of total formatted storage; drives accept single- or double-sided, single- or double-density media ● 48 tracks per inch, 3-millisecond track-to-track access time; includes CP/M-80 and CP/M-86 operating systems, SuperCalc-86 spreadsheet package and dBase II database management system; housed in separate cabinet cable-connected to main system; included in packaged system price or available for:

$3,295 prch

Add-On Diskette Drives ● dual, double-sided, double-density, 8-inch diskettes as above, but without controller and software; housed in separate cabinet cable-connected to main system:

2,325

Hard Disk Subsystem ● includes 40M-byte hard disk with single 8-inch diskette for program loading and backup (see Diskette Subsystem for 8-inch diskette information) ● hard disk has 591 tracks per inch, 4096 tracks, 10 millisecond track-to-track access time, 5M-bps transfer rate, 3529 rpm; includes CP/M-80 and CP/M-86 operating systems; housed in separate cabinet cable-connected to main system; included in packaged system price or available for:

5,495

Hard Disk Subsystem with Dual Diskettes ● includes 40M-byte hard disk with dual, half-height, 8-inch diskette for program loading and backup (see Diskette Subsystem for 8-inch diskette information) ● hard disk has 591 tracks per inch, 4096 tracks, 10-millisecond track-to-track access time, 5M-bps transfer rate, 3529 rpm; includes CP/M-80 and CP/M-86 operating systems; housed in separate cabinet cable-connected to main system:

7,395

M-Drive/H RAM Disk ● .5M to 4M bytes of RAM disk available as option; provides disk operation at RAM speeds, said to increase system performance by up to 3500%; auto-format feature simplifies use; all CompuPro operating systems support M-Drive/H option.

M-Drive/H .5M-Byte RAM:

1,475

M-Drive/H .5M-Byte RAM (CSC):

1,675

☐ Terminals/Workstations

Not provided directly by CompuPro; serial ports are provided in packaged systems to provide compatibility with wide range of industry-standard terminals and workstations.

☐ Printer/Graphics

Not provided directly by CompuPro; serial, parallel, and Centronics printer ports are included in packaged systems to provide compatibility with wide range of commercially available printers and graphics devices.

● END

Corona Data Systems
Corona PC & Portable PC

■ PROFILE

Operating Systems ● MS-DOS 1.25 and 2.0 single user by Microsoft; not bundled but also available CP/M-86 single user with GSX-86 graphics extensions by Digital Research, UCSD p-system by NCI.

Data Management ● only MS-DOS file handling capabilities; file and database software available from third-party vendors.

Communications/Networks ● terminal and local area networks (LAN) hardware and software from third-party vendors only.

Languages ● GW BASIC with graphics features by Microsoft.

Models ● Corona PC and Portable PC.

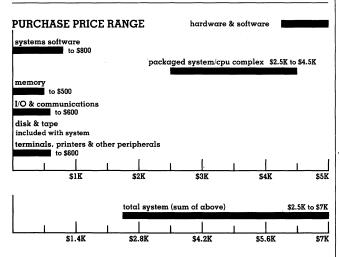**CPU** ● Intel 8088 4.77 MHz, 16-bit with 8-bit data path, socket for Intel 8087 numeric co-processor.

Memory ● 128K bytes standard to 512K bytes of RAM on motherboard.

Chassis Slots ● 4 IBM PC-compatible on desk top model and portable.

Ports ● both systems have a single Centronics-compatible parallel port and RS-232 serial port; both are full-functioning ports.

Mass Storage ● Corona PC and Portable PC can be expanded to 720K-byte floppy disk; only Corona PC to 10M bytes of fixed (hard) disk storage; RAM disk support on both models from operating system can use all or part of extra memory.

Terminal/Workstations ● both models available with single terminal system, detachable keyboard and green or amber display.

PURCHASE PRICE RANGE   hardware & software ▮▮▮▮

systems software
▮▮ to $800

packaged system/cpu complex $2.5K to $4.5K
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memory
▮▮ to $500

I/O & communications
▮▮ to $600

disk & tape
included with system

terminals, printers & other peripherals
▮▮ to $600

$1K	$2K	$3K	$4K	$5K

total system (sum of above) $2.5K to $7K
▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

$1.4K	$2.8K	$4.2K	$5.6K	$7K

CORONA PC & PORTABLE PC 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 **Corona PPC-1 packaged system** (includes a single 5.25-inch floppy disk drive, MS-DOS 1.25 and GW BASIC interpreter by Microsoft, MultiMate word processor by Softword Systems, PC TUTOR by Comprehensive Software Support, integral 9-inch green or amber monitor, and 128K-byte memory) ● **LARGE SYSTEM** is based on **Corona PC-HD packaged system** (includes one 5.25-inch floppy disk and one 5.25-inch 10M-byte hard disk, monitor, MS-DOS 2.0 and GW BASIC by Microsoft, MultiMate word processor by Softword Systems, PC TUTOR by Comprehensive Software Support and 128K-byte memory) and the following options: spreadsheet and database software, additional memory to 512K bytes, modem, and dot matrix printer.

Printers ● will take Centronics-compatible parallel RS-232C serial from third-party vendors only.

First Delivery ● January 1983 for Corona PC; October 1983 for Portable PC.

Systems Delivered ● an undetermined number of units have been shipped.

Comparable Systems ● Corona computers compete for market share with single-user desk top and portable 16-bit systems supporting MS-DOS or CP/M-86 and IBM plug-compatible systems (including the IBM PC) in the $2395 to $6500 range.

Vendor ● Corona Data Systems, Inc; 31324 Via Colinas, Suite 110, Westlake Village, CA 91361 ● 213-706-1505, 800-621-6746.

Canada ● Distributors: Computer Distribution, Inc; 311 West First Street, North Vancouver, BC V7M 1B5; 604-984-0641 ● Scarsdale Technology Corp; 1 Scarsdale Road, Don Mills, ONT M3B 2R2; 416-441-1900.

Distribution ● network of dealers nationwide and Europe, service at local dealerships and 82 Xerox Five Star service locations.

■ ANALYSIS

Corona Data Systems was founded in the summer of 1981 by Dr. Robert S. Harp, who had co-founded Vector Graphics in 1978. The company's first entries into the market were 5M and 10M byte "Starfire" disk drives for the Apple II, first delivered Fall '81 and Summer '82, respectively. A new line of product, "Personal Hard Disk" 5M and 10M drives, was also introduced in the Summer of '82.

By January of '83 Corona Data Systems was shipping its first personal computers with IBM PC plug compatibility. It took Corona nine more months to deliver a portable clone of its desk top model.

The Corona's PC's are very compatible with the IBM PC. Using MS-DOS both Corona models are able to read and write to disks in IBM format. Corona claims compatibility at the hardware (expansion chassis slot boards) level, which allows such further congruencies as the IBM color graphics board.

Corona Data Systems
Corona PC & Portable PC

Some enhancements upon the published IBM PC standard prevent transportability to the IBM PC. In Corona's case this occurs with its enhanced video display. Programs utilizing the improved monitor resolution of 640 × 325 pixels can not be expected to perform as well on the 640 × 200 resolution of the IBM. In fact, the programs may not work on the IBM PC. A solution might be to install any one of a number of IBM plug compatible color/monochrome graphics boards at the sacrifice of the higher resolution of the Corona. Corona has indicated that software is being written to unhook graphics implementation from application software. For example, LOTUS 1-2-3 graphics can now be displayed in 640 × 325 pixel resolution.

Microsoft's MS-DOS 1.25, the operating system of both Corona's, is mapped in memory at a slightly different location from its equivalent IBM PC DOS 1.10. Corona has responded by modifying parts of MS-DOS 1.25 to maintain a compatible communications area in read only memory (ROM). This results in greater IBM PC DOS compatibility than standard MS-DOS 1.25.

☐ Strengths

The Corona PC and Portable PC are both IBM PC-compatible. Corona Data Systems claims they will run "virtually all" IBM PC software with little or no modification. It would be advisable to pre-test the IBM PC software of interest on a Corona for compatibility.

With their enhanced displays and bundled software, MultiMate, both Corona models perform well as general purpose word-processing machines. The displays are truly exceptional in resolution which results in less eye fatigue.

For advanced graphics applications the Corona utilizes graphics pages that are memory mapped. Once the images are loaded or generated in memory the Coronas are capable of rapidly switching from one screen to another. This would be useful in professional demonstrations and animation.

The Portable PC, though it weighs roughly 28 pounds, offers the same computing power as the desk top model. Its construction is durable and has the same expandability as the Corona PC.

The Corona PC and Portable PC retail from $1000 to $3000 less than a comparably equipped IBM PC.

☐ Limitations

IBM PC software that does not adhere to the published IBM PC standard may not run properly on either Corona. Neither Corona is system compatible with the PC, i.e. IBM PC's internal architecture is not duplicated exactly (doing so would be illegal), resulting in possible discrepancies at run time.

Software written on the Corona PC or Portable PC which uses Corona's graphics enhancements may not run correctly or at all on the IBM PC. This should only be a consideration either in a combined IBM PC/Corona environment, or if developing packages for the IBM PC software marketplace. There is no limitation if an IBM PC-compatible color graphics adapter is installed.

Corona Data Systems has chosen not to include a spreadsheet package with its bundled software. Users interested in doing work with electronic spreadsheets will have to buy one separately; and there is a wide range from which to choose.

At 28 pounds the Corona PC may be difficult to carry for any extended period. A better classification of the machine would be "transportable."

As similar as the Corona operating system MS-DOS 1.25 and IBM PC-DOS 1.10 are they are not identical. Present and future compatibility with the IBM PC is a justified concern.

■ SOFTWARE

☐ Terms & Support

Terms ● basic Corona PC and Portable PC come standard with operating system software, BASIC interpreter, word-processing package and PC TUTOR.

Support ● 90 day warranty on all hardware, software and documentation ● technical assistance and repairs are available to purchaser at individual dealers or at any one of 82 XEROX Five Star service locations.

☐ Software Overview

The Corona PC and Portable PC operating systems, MS-DOS and CP/M-86, are currently two of the most supported 16-bit operating systems. Beyond bundled software, which includes a Wang-like word processor, MultiMate, and a tutorial called PC TUTOR, the user has the option to select from thousands of MS-DOS and CP/M-86 packages.

Corona claims both its personal computers are able to run "virtually all" IBM PC software. Please note that some software requires the addition of IBM or IBM compatible expansion boards. (See Analysis section and Hardware Overview for further information on IBM compatibility).

Microsoft's GW BASIC is the only language provided with the systems. There are, however, quite a number of third-party vendor provided interpreters and compilers; these include: COBOL, FORTRAN, Pascal, "C", Assembler, Logo, Forth and Modula-2.

☐ Packaged Software

No major software packages are provided by Corona that are not included with its systems.

☐ Operating Systems

Both Corona PC and Portable PC systems come with automatic booting and self-diagnostic code in ROM. MS-DOS and CP/M-86 with GSX-86 graphics are bundled with the hardware. Corona's version of MS-DOS 1.25 is virtually identical to IBM PC DOS 1.1.

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 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 dimensioned array of logical sectors, and allocation units which subdivide data sections 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

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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 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 predecessor of MS-DOS 2.00, a somewhat enhanced version which clearly indicates Microsoft's intent to develop MS-DOS eventually as a single user XENIX (Unix-like) system.

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/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 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 2.00 will read earlier MS-DOS diskettes, there are several unique system interrupt calls and file descriptors that make programs utilizing these features non-transportable between MS-DOS 2.00 and earlier versions valid MS-DOS 1.25 filenames using certain special characters are not valid in MS-DOS 2.00 ● an editor, debugger, and other utilities are provided. ● MS-DOS 2.0 is somewhat enhanced over earlier versions and is telltale of Microsoft's intent to develop its MS-DOS as a single user XENIX (Unix-like) system.

☐ Utilities

Various disk utilities are available under MS-DOS. Corona also includes a diagnostic with graphic display of motherboard, EQUIP utility which summarizes system configurations, hard disk backup routines for PC-HD models.

☐ Data Management

To date, no database is available from vendor; some flexible file handling capabilities are included in MS-DOS; more powerful data management is available from third-party vendors catering to the IBM PC-compatible marketplace.

☐ Communications/Networks

Available from third-party vendors only. IBM PC chassis slot compatibility allows several hardware local area networks (LAN's) to run on either Corona; Corona has indicated that communications software is to be bundled in first quarter of 1984.

☐ Program Development/Languages

Disk based GW BASIC interpreter from Microsoft with graphics enhancements comes standard. Having two operating systems, MS-DOS by Microsoft and CP/M-86 by Digital Research, encourages simultaneous development.

GW BASIC Interpreter ● implementation of Microsoft BASIC-86 ● provides dual-mode graphics capabilities in medium and high resolution; drawing statements are available for creating lines and circles or painting the screen; screen editor implements special function keys and multi-statement 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.

☐ Application Packages

Multimate ● by Softword Systems; Wang-like word processor offers print queue, utility for insertion of specific elements into form letters, library function for standard file of text, mail merge, thirty one different functions using Corona's 10 function keys, formatting, repagination, "help" messages and tutorials ● written in assembly language and utilizes its own I/O; bypassing the operating system basic input/output system (BIOS) ● comes standard with the system.

☐ Other Facilities

PC TUTOR ● by Comprehensive Software Support; an interactive program originally designed for the IBM PC which instructs users about MS DOS; context includes utilities, how to backup and format diskettes, proper use of equipment ● bundled with system.

Demonstration Programs ● include an adventure and strategy game, a primitive synthesizer and other minor programs.

■ HARDWARE

☐ Terms, Support & Documentation

Terms ● hardware is available for purchase through a network of authorized Corona dealers; 90 day warranty.

Support ● each dealer has support from a full service regional network; upon expiration of warranty owners have an option of using original dealer or one of 82 nationwide Xerox computer centers for walk in, on-site, or pickup/delivery service.

Documentation ● each system comes with manuals for MS-DOS, GW BASIC, Multimate, PC TUTOR and a user guide.

☐ Physical Specifications (H × W × D); Weight

Corona Personal Computer

CPU ● 6.3 × 19.5 × 17 inches; 22.5 pounds.

Display ● 11.25 × 14.25 × — inches; depth and weight not available.

Keyboard ● — × 17.75 × 7.5 inches; height and weight not available.

Corona Portable

CPU ● 9.6 × 18.8 × 19.8 inches with keyboard folded up; 28 pounds.

Display ● integral to unit.

Keyboard ● information not available.

☐ Systems Overview & Configurability

The Corona PC and Portable PC are virtually identical in their capabilities. Both systems come with parallel and serial ports, monochrome, video monitor controller, floppy disk controller and four IBM PC-compatible chassis slots on the motherboard. The keyboard, manufactured for Corona by Key Tronic, features LED indicators and has a much softer touch than its IBM PC counterpart.

The system power supply is 110 watts, a 47 watt improvement over the IBM PC. It can be switched from 110 to 220 volt for international use and has plenty of power to support any added expansion slot hardware.

Corona has one of the highest resolution non-glare screens in the personal computer industry. Each character is presented in 14 × 13 pixels in a 16 × 13 pixel matrix. Graphics and text can exist on the

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screen simultaneously and Corona claims its 640 × 325 pixel resolution is 60 percent better than the IBM PC.

The Portable PC weighs a sturdy 28 pounds and differs from the Corona only slightly. The portable has a smaller 9" monitor (still with 640 × 325 pixels). The Corona hard disk subsystems can not be internally mounted but are usable in an external arrangement.

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

Corona PC System Maximums ● 512K-byte memory; 10M-byte formatted hard disk storage with 320K-byte floppy disk storage or 640K-byte floppy disk storage; nine serial ports (one standard and two per chassis slot using communication card); nine parallel ports using chassis slots in addition to one standard; RAM disk to limits of extra memory; an Intel 8087 numeric co-processor.

Portable PC System Maximums ● 512K-byte memory; 10M-byte formatted externally mounted hard disk storage with 320K-byte floppy disk storage or 640K-byte floppy disk storage; seven serial ports (one standard and two per full size chassis slot using communication card); seven parallel ports using chassis slots in addition to one standard; RAM disk to limits of extra memory; an Intel 8087 numeric co-processor.

☐ Packaged Systems

Corona PC Series Packaged Systems

Model PC-1 ● 16-bit 8088 processor; 128K-byte main memory; one 320K-byte floppy disk drive; user-definable RAM disk; high resolution non-glare green or amber monitor; detachable IBM-compatible keyboard; RS-232C serial port; Centronics-compatible parallel port; four IBM PC-compatible chassis slots:
$2,595 prch

Model PC-2 ● same as PC-1 with two disk drives:
2,995

Model PC-HD ● same as PC-1 with additional 10M-byte hard disk:
4,495

Portable PC Series Packaged Systems

Model PPC-1 ● portable version' of PC-1 with 9-inch black and green high resolution monitor in the system unit (see photograph):
$2,545 prch

Model PPC-2 ● same as PPC-1 with two 320K-byte floppy disk drives:
2,945

☐ CPU

Intel 8088 Processor ● 8-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 allows memory partitioning for multitasking, concurrent

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

or multiuser capabilities ● a pseudo-superset of the Intel 8080 instruction set where translation to 8088 is straightforward.

☐ Memory

Corona PC & Portable PC Standard Memory ● 128K-byte dynamic RAM user memory expandable to 512K bytes in 128K-byte increments on motherboard for all models ● memory mapped graphics storage ● further expansion to 1M byte requires chassis slots.

☐ I/O & Communications

One serial port RS-232C, a parallel Centronics-compatible port, 4 IBM PC-compatible chassis slots on Corona PC and Portable PC.

☐ Mass Storage

Corona PC and Portable PC have direct memory access (DMA) floppy disk controllers on motherboard.

Floppy Disk ● 5.25-inch floppy disk drive, 40 tracks, nine 512-byte sectors per track, for a 360K-byte capacity; average seek time is 84 millisec. with data transfer rates 250K bits per second:
$450 prch

Corona Personal Hard Disk ● 5M 5.25-inch fixed disk, 306 tracks, 32 256-byte sectors per track for a 5M-byte formatted capacity; average seek time is 85 millisec with data transfer rates of 5 megabits per sec ● internally mounted:
1,795

Corona Personal Hard Disk ● 5M 5.25-inch fixed disk, 306 tracks, 32 256-byte sectors per track for a 5M-byte formatted capacity; average seek time is 85 millisec with data transfer rates of 5 megabits per sec ● externally mounted with housing and cable:
2,195

Corona Personal Hard Disk ● 10M 5.25-inch fixed disk, 306 tracks, 32 256-byte sectors per track for a 10M-byte formatted capacity; avg. seek time is 85 millisec with data transfer rates of 5 megabits per sec ● internally mounted:
$2,295

Corona Personal Hard Disk ● equivalent to 10M-byte Corona Personal Hard Disk except externally mounted:
2,695

☐ Terminal/Workstation

Display ● both PC and Portable have high resolution green or amber monitors; text, graphics modes; 80 columns by 25 rows of 16 × 13 pixel characters, reverse video, underline, blinking, high intensity; graphics resolution of 640 × 325 pixels; text can overlay graphics; memory based storage for graphics images.

Keyboard ● detachable cable with 6-foot coiled cord, 83 capacitance keys in IBM PC-compatible arrangement, number and caps lock indicators, attaches to front of system unit.

☐ Printer/Graphics

Systems are compatible with most RS-232C serial or Centronics-compatible parallel printers and plotters from third-party vendors. Corona does not provide printers.

● **END**