Centurion Business Computers

MANAGEMENT SUMMARY

Centurion Computer Corporation was incorporated in 1972 under the name Warrex Computer Corporation as the successor to Warrex Computer Services, a company founded in 1971 by John Warren to provide consulting and programming services. That same year, Centurion entered the business of selling and supporting magnetic tape cassette systems. By August 1974, Centurion had designed and manufactured its first minicomputer, combined it with peripherals and software, and delivered it as the initial member of the Centurion family of small business computers. As a result of industry recognition of the Centurion name, the company formally changed its name from Warrex to Centurion Computer Corporation in March 1980.

The MicroPlus, Centurion 200, Centurion III, and Centurion 6000 Series systems are designed to meet the requirements of users who need in-house computer services in environments that may include multiple on-line users, multiple terminal use, high-volume I/O requirements, and real-time access demands. Centurion systems can also serve as time-shared, terminal-operated systems on which many unrelated tasks can be performed simultaneously under a multiprogramming operating system.

The MicroPlus, announced in September 1981, is a diskette-based system that includes the CPU with 64K bytes of MOS memory and two dual-sided, double-density floppy disk drives. Each of these drives has a capacity of 1.2 megabytes. A 75-cps matrix printer and an upper/lower case CRT display/keyboard terminal are standard on the MicroPlus. The basic system can support two additional floppy disk drives and can be expanded to include an 8-megabyte or 24-megabyte Winchester disk drive and more than one CRT and printer.

The Centurion 200 and Centurion III are disk-based systems that include the CPU with 32K bytes of memory ➢

The Centurion family of business computer systems extends from single-user configurations to multi-terminal, multiprogramming systems with remote data entry/output capabilities. Options include seven printer models. Software is provided and can be customized. Dealers provide support, maintenance, and training. Single-user Centurion configurations are priced from $9,863 to $59,593.

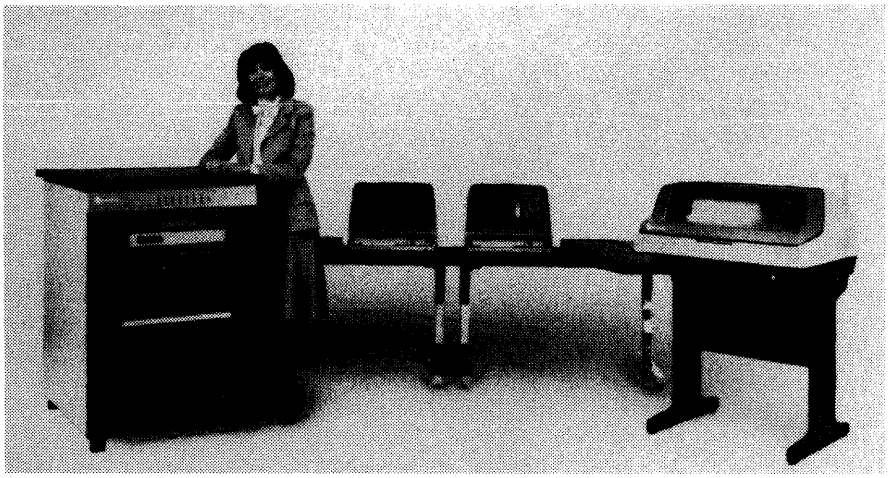
MAIN MEMORY: 32K bytes to 256K bytes.
DISK CAPACITY: 1.2M bytes to 635.2M bytes.
WORKSTATIONS: 1 to 32.
PRINTERS: 45 cps to 600 lpm.
OTHER I/O: None.

CHARACTERISTICS

MANUFACTURER: Centurion Computer Corporation, 1780 Jay Ell Drive, Richardson, Texas 75081. Telephone (214) 699-8400.

Centurion Computer Corporation was incorporated in January 1972 under the name Warrex Computer Corporation as a successor to Warrex Computer Services, a consulting and programming services firm. In 1972, Centurion began selling and supporting cassette tape systems, and two years later designed and began manufacturing the Centurion minicomputer systems. In March 1980, the company formally changed its name from Warrex to Centurion Computer Corporation.

DEALERS: To sell and support Centurion systems, independent dealers have been established in Amarillo, Houston, Austin, Hurst, Mt. Pleasant, Odessa, Richardson, San Antonio, Temple, and Victoria, Texas; Lafayette, and Metairie, Louisiana; Burlingame, Costa Mesa, and Woodland Hills, California; Cherry Hill, New Jersey; Cincinnati, and Rocky River, Ohio; Denver, Colorado; Ellicott City, Maryland; Hauppauge, Smithtown, and New York City, New York; Honolulu, Hawaii; Knoxville, and ➢



The Centurion 6400 shown here features a 64K-byte CPU, a four-port multiplexer, a 79.4-megabyte cartridge module disk, two CRTs, and a 300-lpm band printer. The purchase price of this typical system is $58,349.

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(expandable to 64K bytes), one 10.4-megabyte disk drive, and one upper/lower case CRT terminal. A 150-cps matrix printer is standard. The Centurion 200 can be expanded to include two disk drives, and the Centurion III can include four disk drives. Both systems can support up to four CRTs and multiple printers. The Centurion III has an expanded frame to house a second disk drive.

The Centurion 6000 Series includes four models—the 6200, 6300, 6400, and 6500.

The 6200 is a self-contained disk-based desk model with 64K bytes of memory (expandable to 128K bytes), a fixed/removable disk drive with a 10.4-megabyte or 20.8-megabyte capacity, a 1920-character CRT, and a 150-cps printer. The system will support a second disk drive and up to eight CRTs. The use of fewer CRTs allows memory to be increased to 256K bytes. Line printers rated at 120, 200, 300, and 600 lpm are available.

The 6300 is an upright cabinet model with 64K bytes of memory (expandable to 256K bytes), a fixed/removable 10.4-megabyte or 20.8-megabyte disk drive, a 1920-character CRT, and a 150-cps printer. Up to four disk drives and up to 30 CRTs can be supported. Optional 120-, 200-, 300-, and 600-lpm printers can also be used with the 6300.

The 6400 is an upright cabinet model with 64K bytes of memory (expandable to 256K bytes), a fixed/removable 26.5-megabyte rigid disk drive, a 1920-character CRT, and a 150-cps printer. The system will support up to eight disk drives of 79.4 megabytes each and up to 30 CRTs. Optional 120-, 200-, 300-, and 600-lpm printers can also be used with the 6400.

The 6500 is a self-contained desk model with 64K bytes of memory (expandable to 256K bytes), a fixed/removable 26.5-megabyte rigid disk drive, a 1920-character CRT, and a 150-cps printer. The system will support up to eight disk drives of 79.4 megabytes each and up to 32 CRTs. Optional line printers with speeds of 120, 200, 300, and 600 lpm can also be used with the 6500.

The 6000 Series is built around the CPU-6 central processor; all other Centurion models use the CPU-5. All of the Centurion systems have a remote data entry capability accessed through the video terminal keyboard, with output via the video terminal or printer.

The Centurion systems are hardware/software combinations that include the operating system, a Centurion Programming Language, and a Job Control Language. The Centurion library of applications includes programs for handling payroll, invoicing, general ledger, accounts receivable and payable, financial statements, professional billing, inventory control, depreciation, sales analysis, and word processing.

The MicroPlus Business Management System, designed specifically for the MicroPlus, features the following applications developed for small- to medium-sized businesses: billing, inventory, accounts receivable and

Memphis, Tennessee; Little Rock, Arkansas; Louisville, Kentucky; Milwaukee, Wisconsin; N. Miami, Tampa, and Orlando, Florida; Oklahoma City, and Tulsa, Oklahoma; Pendleton, Indiana; Smyrna, Georgia; and Wichita, Kansas. There are also five dealers in Mexico, four in Canada, one in Bahrain, and one in Venezuela. Centurion dealers provide full support, including sales, programming capabilities, and hardware maintenance. Each dealer owns his own Centurion computer and provides users with demonstrations, programming, and back-up support.

MODELS: MicroPlus, Centurion 200, Centurion III, and Centurion 6000 Series (consisting of the 6200, 6300, 6400 and 6500 systems).

DATE ANNOUNCED: Centurion III, 1975; Centurion 200, February 1979; Centurion 6000 Series, October 1979; and MicroPlus, September 1981.

DATE OF FIRST DELIVERY: Centurion III, 1975; Centurion 200, May 1979; Centurion 6000 Series, October 1979; and MicroPlus, January 1982.

NUMBER INSTALLED TO DATE: Over 1,500 Centurion systems.

DATA FORMATS

BASIC UNIT: 16-bit words and 8-bit bytes (CPU-5, used in the MicroPlus, 200, and III); 8-bit bytes, numeric operands of 1 to 16 bytes, and character strings of 1 to 256 bytes (CPU-6, used in the 6000 Series).

FIXED-POINT OPERANDS: 32-bit and 48-bit, with 64-bit intermediate results (CPU-5); binary numbers of 1 to 16 bytes (CPU-6).

FLOATING-POINT OPERANDS: None (CPU-5); 8-bit exponent and 32-bit mantissa (CPU-6).

INSTRUCTIONS: Seventy-one basic types, one to three bytes long, operating on 8-bit or 16-bit operands (CPU-5); 147 basic types, one to seven or more bytes long, operating on operands from 1 to 256 bytes (CPU-6).

INTERNAL CODE: ASCII and two's complement binary numbers.

MAIN STORAGE

TYPE: Random-access MOS.

CYCLE TIME: 800 nanoseconds per 1-byte access.

CAPACITY: 32K bytes minimum, expandable to 64K bytes maximum (CPU-5); 64K bytes minimum, expandable to 256K bytes maximum (CPU-6).

CHECKING: None (CPU-5); one parity bit per memory byte (CPU-6).

STORAGE PROTECTION: None (CPU-5); each 2K-byte block of memory in a program's address space may independently be unprotected, write-protected, or read-and-write-protected (CPU-6).

RESERVED STORAGE: Upper 4K bytes of memory are used as I/O addresses, and the operating system occupies the lower 12K to 18K bytes (CPU-5); upper 6K bytes are reserved for I/O and protection purposes, and the operating system occupies the 20K to 32K bytes of remaining memory (CPU-6).

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PERIPHERALS/TERMINALS

Model	Description	Manufacturer
PRINTERS		
D-630	Character; 132 positions; 96 ASCII character set, upper/lower case; 45 cps	Diablo
DP-M-120	Serial; 132 positions; 7 x 7 dot matrix; 96 ASCII character set, upper/lower case; compressed print, 6 and 8 lines per inch, switch-selectable; 120 lpm	Control Data Corp.
DP-M-200	Serial; 132 positions; 7 x 7 dot matrix; 96 ASCII character set, upper/lower case; compressed print, 6 and 8 lines per inch, switch-selectable; 200 lpm	Data 100
DP-B-300	Band; 132 positions; 64 ASCII character set, upper case only; 10 characters per inch; 300 lpm	Data 100
DP-B-600	Band; 132 positions; 64 ASCII character set, upper case only; 10 characters per inch; 600 lpm	Control Data Corp.
TI-810	Serial; 132 positions; 9 x 7 dot matrix; 96 ASCII character set, upper/lower case; compressed print, 6 and 8 lines per inch, switch-selectable; 150 cps	Texas Instruments
TI-840	Serial; 132 positions; 9 x 9 dot matrix; 96 ASCII character set, upper/lower case; compressed print, 6 and 8 lines per inch, switch-selectable; 75 cps	Texas Instruments
TERMINALS		
R-40	CRT display/keyboard; 1920 characters, 96 ASCII character set, upper/lower case; 7 x 8 dot matrix	ADDS

payable, payroll, sales tax reporting, and salesman accounting. The Centurion Word Processing package automatically produces typewritten copies of letters, manuals, documents, etc., from a file created and stored for recall on a disk. Significant features include automatic formatting and text blocking. Ease in correcting mistakes is insured through the package's special commands that allow letters, words, or entire lines to be inserted, deleted, centered, or underlined.

Through its dealers, Centurion offers software support, user training, equipment maintenance, and production facilities. Currently, there are over 50 Centurion dealers located in major cities of the U.S., Canada, Mexico, Bahrain, and Venezuela.

USER REACTION

Datapro conducted telephone interviews with six users of Centurion Business Computers randomly selected from a list of current users supplied by the vendor. Of the six respondents, four were CPA firms, one was a retail/wholesale distributor, and one was associated with the health care/medical industry. Each of the users purchased one system, with an average of four CRTs per system. The average length of time that the systems had been installed was approximately 14 months, ranging between three weeks and three years.

Main memory of the purchased systems ranged between 32K bytes and 128K bytes, and the maximum on-line disk storage of 96M bytes was reported by three users. The principal applications utilized by the users on their systems included General Ledger, Payroll, Inventory, Accounts Payable/Receivable, Billing, Check Writing, Monthly Financial Statements, and Quarterly Reports. All six users

CENTRAL PROCESSOR

GENERAL: The CPU-5 processor (used in the MicroPlus, 200, and III) uses approximately 135 bipolar MSI and LSI components. It communicates with memories and I/O devices via an 8-bit data bus, a 16-bit address bus, and various control signals. It is microprogrammed, and executes a single microinstruction in each 200-nanosecond CPU cycle. The execution of both microinstructions and machine-language instructions is overlapped with the fetching of the next instruction to speed up execution.

The CPU contains an 8-bit-wide arithmetic/logic unit (ALU) and data paths. Two 16-bit address counters make it possible to rapidly generate sequential instruction and operand addresses without tying up the ALU. The ALU contains seventeen 8-bit registers that are used for temporary results. Registers accessible to the programmer reside in a high-speed, 256-byte RAM on the CPU card.

The CPU-6 processor (used in the 6000 Series) uses approximately 145 bipolar MSI and LSI components. It communicates with memories and I/O devices via a data bus with eight bits plus parity, an 18-bit address bus, and various control signals. It is microprogrammed, and executes a single microinstruction in each 200-nanosecond CPU cycle. The execution of both microinstructions and machine-language instructions is overlapped with the fetching of the next instruction to speed up execution.

The CPU contains an 8-bit-wide arithmetic/logic unit (ALU) and data paths. Two 16-bit address counters make it possible to rapidly generate sequential instruction and operand addresses without tying up the ALU. The ALU contains seventeen 8-bit registers that are used for temporary results. Registers accessible to the programmer reside in a high-speed, 256-byte RAM on the CPU card.

The CPU-6 incorporates a memory mapping and protection unit that allows 2K-byte blocks of the program's 64K-byte address space to be independently located anywhere in the actual 256K-byte memory space. Each block may also be assigned different protection attributes. Any instruction

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purchased ready-made application programs from Centurion. Only one user has integrated the Centurion systems' word processing capabilities; however, a second user is currently planning to add the word processing function to his system.

The following table illustrates the ratings issued by the interviewed users of the Centurion Business Computers:

	Excellent	Good	Fair	Poor	WA*
Ease of operation	5	1	0	0	3.8
Reliability of mainframe	3	3	0	0	3.5
Reliability of peripherals	3	3	0	0	3.5
Maintenance service:					
Responsiveness	5	1	0	0	3.8
Effectiveness	4	2	0	0	3.7
Technical support:					
Trouble-shooting	4	2	0	0	3.7
Education	1	4	1	0	3.0
Documentation	2	1	2	1	2.7
Manufacturer's software:					
Operating system	3	3	0	0	3.5
Applications programs	2	3	1	0	3.2
Ease of conversion	4	1	0	0	3.8
Overall satisfaction	5	1	0	0	3.8

*Weighted Average on a scale of 4.0 for Excellent.

It is evident that the users were quite pleased with their systems' reliability and ease of use. However, the majority of the contacted users commented on the excellent maintenance service provided by the vendor. The users also noted their systems' excellent response time, flexibility and performance. The table, in turn, also reveals that half of the users were dissatisfied with the documentation provided by the vendor. One user specifically pointed out the lack of documentation for software modifications. But as one user said, "The advantages far outweigh the disadvantages," and this is why all six of the interviewed users said they would and have recommended Centurion Business Computers to potential buyers.□

which violates protection restraints or fetches data with bad parity will be aborted immediately.

The CPU-6 has supervisor and user states that define which instructions may be legally executed. Instructions not permitted in the user state are called privileged and include I/O, mapping control, and interrupt control instructions. User programs which attempt to execute a privileged instruction are aborted immediately.

The CPU-6 also maintains an 8-bit counter which is decremented 60 times a second for use in time-of-day routines. Underflow through zero causes an interrupt.

CONTROL STORAGE: 512 fifty-six-bit words of ROM (CPU-5); 2,048 fifty-six-bit words of ROM (CPU-6).

REGISTERS: Sixteen independent sets of registers, one for each interrupt level. Each set can be addressed as 16 bytes or 8 words.

ADDRESSING MODES: Seventeen modes for load, store, jump, and JSR instructions. These include immediate, direct, indirect, relative, relative indirect, and many indexed modes with auto-increment and auto-decrement modes. Relative addressing for conditional branches. Other instructions operate on register operands (CPU-5).

Seventeen modes for load, store, jump, and JSR instructions. These include immediate, direct, indirect, relative, relative indirect, and many indexed modes. Relative addressing for conditional branches. Most one- and two-operand instructions have immediate, direct, and indexed addressing on one or both operands (CPU-6).

INSTRUCTION REPERTOIRE: Three hundred fifty-four distinct instructions of 71 basic types, including 23 control instructions, 14 conditional branches, 16 one-operand instructions, 14 two-operand instructions, and 4 memory reference instructions (CPU-5).

Eight hundred forty distinct instructions of 147 basic types. Elementary types include 37 control, 16 branch, 4 load/store, and 31 byte and word operations. Complex types include move, arithmetic, editing, and base conversion instructions which can have two memory operands of 1 to 16 bytes, and move, compare, logic, search, and translation instructions which can have two memory operands of 1 to 256 bytes. The complex arithmetic instructions can trigger an interrupt on overflow conditions (CPU-6).

INSTRUCTION TIMINGS: The timings are in micro-seconds.

1) CPU-5; 16-bit operands		
Load Immediate	**3.8**	**(2.8)***
Load Direct	**6.4**	**(5.4)***
Add Two Registers	**3.6**	**(2.8)***
CPU-5; miscellaneous		
Conditional Branch	**2.0-3.2**	
Jump to Subroutine	**10.4**	
2) CPU-6; 16-bit operands		
Load, Memory to Register	**5.0**	
Add Two Registers	**3.0**	
Add Memory to Register	**6.2**	
Multiply Register by Memory	**25.6**	
CPU-6; 32-bit operands, both in memory		
Add	**32.0**	
Move	**28.8**	
Multiply	**150.0**	
Convert ASCII to Binary	**214.0**	
Convert Binary to ASCII and Edit	**140.0**	
CPU-6; miscellaneous		
Move 100 Bytes	**317.0**	
Conditional Branch	**2.0-3.6**	
Supervisor Call	**13.0**	

***(8-bit timings)**

INTERRUPTS: Sixteen-level fully vectored interrupts. Each level has priority over all lower levels (CPU-5).

Sixteen-level fully vectored interrupts. In addition to interrupts by I/O devices, interrupts can be triggered by a number of conditions within the CPU. These include arithmetic overflow, execution of unimplemented or privileged instructions, illegal memory references, parity errors, and time-of-day clock underflow (CPU-6).

PHYSICAL SPECIFICATIONS: The Centurion Micro-Plus minicomputer system is packaged in two separate cabinets which are designed to be placed on a desk top or on a CRT workstation. One of the cabinets can contain two floppy disk drives or one floppy disk drive and one Winchester disk drive. For two additional disk drives, a separate cabinet is needed. The other cabinet contains the basic CPU, memory, a disk controller, and a four-port multiplexer. Four I/O slots are available. The unit is 11 inches high, 21.5 inches wide, 22 inches deep, and weighs 81 pounds. Centurion systems do not require special air-conditioning or physical facilities. Operational temperature is 65 to 75 degrees F., and the relative humidity is 20 to 80 percent, noncondensing. Input voltage is 115 VAC, and the voltage tolerance allows for brownouts.

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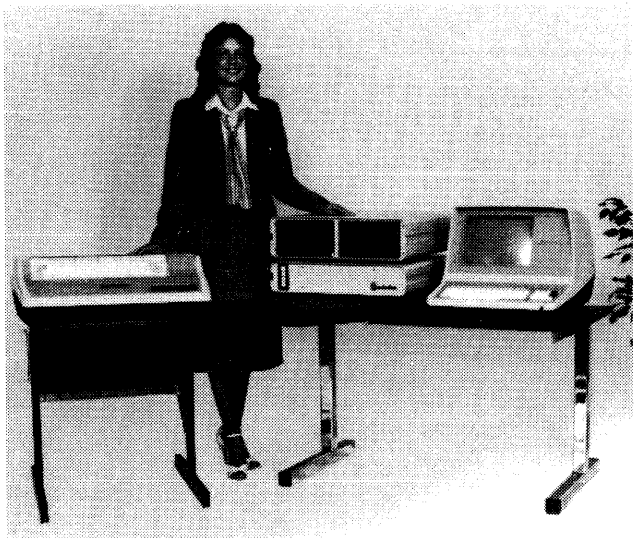

This MicroPlus features a 64K-byte CPU, a four-port multiplexer, two 1.2-megabyte dual-sided, double-density floppy disk drives, one CRT, and a 150-cps printer. The purchase price of the system as shown is $13,133.

The Centurion extended cabinet systems (Centurion III, 6300, 6400) accommodate the basic CPU, memory modules, peripheral controllers, and, in the III and 6300, up to two disk drives in a single cabinet. Fourteen I/O slots are available. The unit is 44 inches high, 32 inches wide, 35 inches deep, weighs 400 pounds, and is mounted on casters. Centurion systems do not require special air-conditioning or physical facilities. Operational temperature is 65 to 85 degrees F., and the relative humidity is 20 to 80 percent, noncondensing. Input voltage is 94.5 to 121 VAC, 59 to 60.5 Hz. The voltage tolerance allows for brownouts.

Centurion desk cabinet systems (Centurion 200, 6200, 6500) accommodate the basic CPU, memory modules, peripheral controllers, up to three floppy disk drives or one cartridge disk unit, and one CRT terminal in the basic cabinet. Seven I/O slots are available. The unit is 28 inches high, 48 inches wide, 33 inches deep, and weighs 300 pounds. Operational environment and electrical requirements are the same as for the Centurion extended cabinet systems.

INPUT/OUTPUT CONTROL

I/O CHANNELS: All of the Centurion systems are equipped with a four-port multiplexer which provides four channels of asynchronous control for the keyboard, printer, CRTs, or remote units. Each I/O device is on its own independent channel and operates independently of all other devices. Low-speed devices transfer data under software control. High-speed devices transfer data under Direct Memory Access control at rates up to 1.2 megabytes/second.

CONFIGURATION RULES

The basic Centurion MicroPlus system includes 64K bytes of memory and two 1.2-megabyte floppy disk drives. Two additional floppy disk drives can be configured to the system. The MicroPlus can also be upgraded to support one floppy disk drive and one 8-megabyte or 24-megabyte Winchester disk drive, up to two CRTs, and multiple printers.

The basic Centurion 200 can be expanded to support 64K bytes of memory, up to two cartridge disk drives (10.4 or 20.8 megabytes each), and up to four CRTs. The system can be configured with multiple printers, which can be addressed simultaneously.

The basic Centurion III can be expanded to support 64K bytes of memory, up to four cartridge disk drives (10.4 or 20.8 megabytes each), and up to four CRTs. The system can be configured with multiple printers, which can be addressed simultaneously.

The basic Centurion 6200 can be expanded to support 128K bytes of memory, up to two cartridge disk drives (10.4 or 20.8 megabytes each), and up to eight CRTs. If fewer CRTs are used, the system can be configured with multiple printers, which can be addressed simultaneously.

The basic Centurion 6300 can be expanded to support 256K bytes of memory, up to four cartridge disk drives (10.4 or 20.8 megabytes each), and up to 32 CRTs. The system can be configured with multiple printers, which can be addressed simultaneously.

The basic Centurion 6400 can be expanded to support 256K bytes of memory, up to eight cartridge disk drives (79.4 megabytes each), and up to 32 CRTs. The system can be configured with multiple printers, which can be addressed simultaneously.

The basic Centurion 6500 can be expanded to support 128K bytes of memory, up to two cartridge disk drives (79.4 megabytes each), and up to eight CRTs. If fewer CRTs are used, the system can be configured with multiple terminals, which can be addressed simultaneously.

The Centurion 200 and III can be field-upgraded to the 6200 and 6300, respectively, without changing the basic cabinet. In all cases, additional disk capacity can be added without obsoleting the basic system; add-on cabinets are provided.

WORKSTATIONS: Varies for each system from up to 2 to up to 32. See above configurations for each system.

DISK STORAGE: Varies for each system. See above configurations.

MAGNETIC TAPE UNITS: None.

PRINTERS: Varies for each system. See above configurations and the PERIPHERALS/TERMINALS chart on M11-128-103.

MASS STORAGE

10.4-MEGABYTE CARTRIDGE DISK DRIVE: Provides four recording surfaces on two disks, one fixed and one removable. The drive has a capacity of 10.4 megabytes with 5.2 megabytes fixed and 5.2 megabytes removable. Each 5.2-megabyte disk contains 812 16-sector tracks with 400 bytes per sector. The average access time is 35 milliseconds, and the data transfer rate is 2.5 megabits per second. The disk controller will support up to four drives for a maximum storage capacity of 41.6 megabytes. The drive is Control Data Corporation's Hawk, and Centurion manufactures the controller.

20.8-MEGABYTE CARTRIDGE DISK DRIVE: Provides eight recording surfaces on four disks, three fixed and one removable. The drive has a capacity of 20.8 megabytes with 5.2 megabytes removable and 15.6 megabytes fixed. Each 5.2-megabyte disk contains 812 16-sector tracks with 400 bytes per sector. The average access time is 40 milliseconds, and the data transfer rate is 2.5 megabits per second. The disk controller will support up to four drives for a maximum storage capacity of 83.2 megabytes. The drive is the Pertec D3000E, and the controller is manufactured by Centurion.

CMD CARTRIDGE DISK DRIVE: Available with 26.5-, 52.9-, and 79.4-megabyte capacities. The 26.5-megabyte version has two recording surfaces on two disks, one fixed and

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one removable. The 52.9-megabyte version has four recording surfaces on three disks, two fixed and one removable. The 79.4-megabyte version has six recording surfaces on four disks, three fixed and one removable. Each recording surface (13.23 megabytes) contains 827 40-sector tracks with 400 bytes per sector. In order to be compatible with all other Centurion disk drives, the 827 physical tracks are handled by the operating system as 2,067.5 logical 16-sector tracks with 400 bytes per sector (i.e., there are 2.5 logical tracks per physical track). The average access time is 20 milliseconds, and the data transfer rate is 9.68 megabits per second. The disk controller will support up to eight drives for a maximum storage capacity of 635.2 megabytes. The CMD is manufactured by Control Data Corporation, and the controller is manufactured by Centurion.

DSDD FLOPPY DISK DRIVE: The dual-sided, double-density (DSDD) floppy disk drive stores up to 1.2 megabytes on 192 16-sector tracks with 400 bytes per sector. The average access time is 96 milliseconds, and the data transfer rate is 62.5K bytes per second. The maximum capacity of the DSDD is four drives or 4.8 megabytes. Qume manufactures the drive, and Centurion manufactures the controller.

COMMUNICATIONS CONTROL

All Centurion systems are equipped with a communications controller that connects the Centurion system with the telephone system, enabling the Centurion to communicate with other data processing equipment or Centurion systems at other locations. A modem translates the language of the telephone lines to the language of the CRT or printer. Data transmission is performed concurrently with local processing. The remote CRT or printer can be used for inquiry and updating, remote job entry, and software updating. The operations can be performed under the control of an operator at the remote CRT without any manual intervention at the Centurion system site or they can be controlled locally.

SOFTWARE

Centurion offers a variety of software products including a basic operating system, programming languages, an assembler, an editor, standard utilities, and a library of business-oriented application software. Centurion provides complete documentation and programming instructions.

OPERATING SYSTEM: *OS* is the operating system used on Centurion systems with the CPU-5. OS provides some device-independent input/output programming and permits the concurrent operation of up to six programs, with each program residing in a different portion of main storage. A round-robin scheduling system determines the partition to which control is given. In a multi-user environment, the programmer using OS is provided with a set of resident routines for accessing data files at both the physical and logical I/O levels.

MAXIMUS is the operating system used on the Centurion 6000 Series (CPU-6). All program I/O is device-independent, using the system logical I/O capabilities. MAXIMUS allows up to 64 independent partitions for program execution. All partitions are dynamic in memory allocation and will grow or shrink so that they are always the size required at any particular time. MAXIMUS is completely protected against accidental modification and is virtually crashproof.

LANGUAGES: Three languages—Centurion Programming Language (CPL), Job Control Language (JCL), and Assembler Language—are available on Centurion CPU-5 systems with OS. Also available is a program/report generator called Application Development and Reporting Tool (ADART).

In addition to all of the above, Basic and Cobol are also available on CPU-6 systems.

The *Centurion Programming Language (CPL)* is a symbolic language designed primarily to implement application software tailored to the in-house needs of users. CPL is oriented to the multiprogramming operating system, which is designed for disk-based random access. The operating system allows users to partition memory into segments which can execute a CPL program, and the CPL program is compiled, assembled, and then linked with external subroutines. The main I/O routines are located in the operating system and are shared by each partition.

The *Job Control Language (JCL)* is implemented to load programs, activate system routines, allocate system resources, manipulate data files to and from peripheral storage devices, and respond to any unusual conditions that may arise during job execution. JCL statements are processed by the Operating System Executive program when it is resident between program executions.

An important concept in the JCL is the use of symbolic parameters. This is a set of variables with assigned values which may be used to represent file names, device names, or any operand values in the JCL statement. Substitution of the real value for the symbolic reference is performed prior to processing the JCL statement.

A two-pass symbolic *assembler* translates source language into absolute binary programs for the Centurion computers. During the first pass, the source program is read and the assembler builds a name table and assigns a value to each symbol. On the second pass, the assembler reads the source program again and generates a binary object record and a program listing. The assembler on the CPU-6 includes over 300 instructions with 71 different memory addressing modes available. Its capabilities include 16-byte (256-bit) math and logical operations, character string manipulation, and numeric editing. Up to 64K bytes of memory can be moved with a single instruction.

Application Development and Reporting Tool (ADART), a sophisticated program and report generator, simplifies software development and facilitates generation of customized management reporting by nonprogrammers.

Centurion BASIC is a Dartmouth standard syntax with enhanced string handling capabilities. All Centurion file structures, including variable spanned indexed (VSI), may be accessed in Centurion BASIC.

UTILITIES: Centurion supplies many general-purpose utilities on both the CPU-5 and CPU-6, plus a library of diagnostic tests for the processor and all peripherals. Standard utilities include Sort/Merge, File/Transmission, Print, File Copy, Disk Copy, File Display, Spool Maintenance, and a Scan utility to review file contents. An on-line Program Trace/Debug is also available with the CPU-6.

A *Text Editor* program permits creation, updating, or correction of disk files. Since information is located by content rather than by relative position within a file, the file is always searched for the specific character string supplied by the operator. During this search, file records can be copied, listed, or by-passed until the specific string is found. When it is found, the entire file record is displayed, and the operator, working through the video keyboard, can modify, delete, or rearrange the file in whole or in part. When all changes have been completed, the updated text is copied back to the original data file.

APPLICATION SOFTWARE: All Centurion programs are interactive.

The *MicroPlus Business Management System*, designed specifically for the MicroPlus, features the following applications developed with small- to medium-sized

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businesses in mind: billing, inventory, accounts receivable/payable, payroll, sales tax reporting, and salesman accounting.

Centurion Word Processing (CWP) automatically produces typewritten copies of letters, manuals, documents, etc., from a file created and stored for recall on a disk. Significant features include automatic formatting and text blocking. Ease in correcting mistakes is insured through CWP's special commands that allow letters, words, or entire lines to be inserted, deleted, centered, or underlined.

Standard Business Applications are programs designed to perform the data processing functions of typical small- to medium-sized businesses. Each package contains detailed operator instructions and the JCL procedures required to execute the programs. Standard application programs may be tailored to meet specialized user requirements. The following systems and programs are included in the Standard Business Series:

Random-Access General Ledger (RAGL) is a comprehensive general ledger and financial reporting system designed specifically to meet the client-accounting needs of accountants in public practice. The system allows for complete flexibility in designing the chart of accounts, branch accounting, and scheduling an unlimited number of accounts in either the balance sheet or income statement. Automatic interfacing with payroll accumulation is available, allowing checks to be entered simultaneously with normal transaction entry. Employee earnings records with 941a's, W-2s, and 1099s are available when required. Calculation routines allow for any computation involving basic arithmetic to be performed during financial report preparation for ratios, gross profit calculations, etc. Reports generated include transaction entry journal, general ledger, trial balance worksheet, financial statements with the accountant's compilation report, statement of changes in financial position, comparative balance sheet and income statement, budgetary comparatives, and subaccount general ledger (for job costing, product sales analysis, etc.).

Centurion Distribution Management System (CDMS) is an interactive real-time accounting and management information reporting system for the manufacturer, wholesaler, and distributor. A single entry automatically updates all applicable files, and virtually any data contained in the system is instantly available. The system includes the following modules: order entry, invoicing, accounts receivable with aging, inventory management reports, sales analysis, sales tax reporting, and statement preparation.

Accounts Payable System provides cash disbursement control, general ledger data, and accounts payable checks. The same entry will post invoices to the vendor file and make distribution to the expense accounts in the General Accounting System. The user has complete flexibility in paying invoices and may elect to pay all vendors, pay any selected invoice for a vendor, pay by date, or indicate that an invoice has been paid manually. The system also provides a series of reports.

Accounts Receivable System is available in open-item and balance-forward versions. The system provides for entry of invoices, credit memos, and adjustments, and the printing of customer statements and accounts receivable balances with aging.

Random-Access Payroll System (RAP) features full-screen displays, prompting messages, and validity checking. Because RAP contains most of the capabilities needed by most small- to medium-sized companies, the user has complete control in establishing his payroll procedures. RAP also provides a number of special features: up to 15 optional deductions above the standard; classification of employees; accrual of vacation and sick leave hours; a 3-digit department code; a 6-digit employee code; and a salary range up to $999,999.99 annually.

Professional Billing System is designed specifically for public accountants but can be used by other firms that bill their clients on the basis of time expended on the client's behalf. The system provides a record of each professional's time, with services performed and for whom; a record of nonbillable time by activity for each professional; expense records by category and client; a record of services performed by client and for the entire firm, showing total hours and dollars for both billable and nonbillable services; a record of work-in-process, what has actually been billed, and the balance of each client's account with aging; and preparation of statements for services rendered.

Depreciation System allows the user to create a file of all fixed assets. The system is completely flexible and allows depreciation schedules to be run as often as needed. The method of depreciation is controlled by the user, allowing him at any time to change his method from declining balance to straight line or any other method.

Amortization Program allows the user to calculate the monthly interest and principal portion of a loan payment. It include the total principal amount, the monthly payment amount, the interest rae, and the beginning month and year. Year-end totals of principal and interest are printed.

Centurion Accounting System for Hospitals (CASH) provides a complete hospital financial accounting system which includes patient accounting, census control, payroll, accounts payable, general ledger, and fixed-asset depreciation. Designed for small- to medium-sized hospitals, the system provides complete patient and third-party billing with complete control of accounts receivable and bad-debt accounts.

Specialized Applications developed by Centurion dealers provide routines to perform the data processing function required by certain selected industries. These include:

- *Fuel Oil Distribution*—a complete system, from printing of delivery schedules to printing service contract renewals and generating customer statements.
- *Country Club Accounting*—membership listing, statements, aged accounts receivable, departmental revenue analysis, and mailing labels.
- *Medical Billing*—patient and third-party billing for doctors' offices and clinics.
- *Utility Billing*—water, sewage, and refuse billing for municipalities.
- *Oil and Gas Accounting*—lease P & L, inventory, rentals, accounts payable and receivable, general ledger and financial statements for independent producers.
- *Insurance Agency Accounting*—claims handling, policy expirations/renewals, invoicing, statements, aged accounts receivable, accounts payable, and producer statements for independent insurance agencies.
- *Publisher's System*—circulation handling, accounts receivable, and commercial printing estimating for newspaper publishers and printers.
- *Bank Accounting*—DDA, CDs, savings, loans, general ledger and financial statements.
- *Contractor's System*—labor distribution, job costing, equipment inventory, accounts payable and receivable, general ledger, and financial statements.

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PRICING

POLICY: Centurion systems are available on a purchase or lease-purchase basis. Individual models are offered as a package, including the processor, required peripherals, and operating system, with separately priced options.

Maintenance is also separately priced and is available through Centurion dealers.

SOFTWARE AND SUPPORT: Dealers are provided with a library of application software from Centurion. In addition, dealers can develop software for individual users and participate in a cooperative software exchange program coordinated by Centurion. Software pricing is set by the dealer, and software prices can be quoted separately or as part of a packaged system. Application software is supported by the dealers.

EQUIPMENT: The components and prices of numerous packaged configurations of the Centurion systems are listed in the EQUIPMENT PRICES section that follows.

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
PACKAGED SYSTEMS			
MicroPlus	Basic system: CPU-5 with 64K bytes of memory, 4-port MUX, R-40 CRT, 2 DSDD floppy disk drives, 75-cps printer	$11,378	$114
	Basic system with 150-cps printer	13,133	131
	Basic system with 45-cps character printer	14,406	144
	Basic system with 75-cps printer, 1 DSDD floppy disk drive, and one 8-megabyte Winchester disk drive	16,613	166
	Basic system with 150-cps printer, 1 DSDD floppy disk drive, and one 8-megabyte Winchester disk drive	18,515	185
	Basic system with 45-cps character printer, 1 DSDD floppy disk drive, and one 8-megabyte Winchester disk drive	19,893	199
	Basic system with 75-cps printer, 1 DSDD floppy disk drive, and one 24-megabyte Winchester disk drive	17,530	175
	Basic system with 150-cps printer, 1 DSDD floppy disk drive, and one 24-megabyte Winchester disk drive	19,431	194
	Basic system with 45-cps character printer, 1 DSDD floppy disk drive, and one 24-megabyte Winchester disk drive	20,810	208
Series 200	Basic system: CPU-5 with 32K bytes of memory, 4-port MUX, R-40 CRT, 10.4-megabyte Hawk disk drive, 150-cps printer	27,668	307
	Basic system with 150-cps printer and 20.8-megabyte Pertec disk drive	32,310	353
	Basic system with 120-lpm printer and Hawk disk drive	28,460	315
	Basic system with 120-lpm printer and Pertec disk drive	33,102	361
	Basic system with 200-lpm printer and Hawk disk drive	29,225	323
	Basic system with 200-lpm printer and Pertec disk drive	33,867	369
	Basic system with 300-lpm printer and Hawk disk drive	33,227	363
	Basic system with 300-lpm printer and Pertec disk drive	37,868	409
	Basic system with 600-lpm printer and Hawk disk drive	36,463	395
	Basic system with 600-lpm printer and Pertec disk drive	41,105	441
Series 6200	Basic system: CPU-6 with 64K bytes of memory, 4-port MUX, R-40 CRT, 10.4-megabyte Hawk disk drive, 150-cps printer	30,237	331
	Basic system with 150-cps printer and 20.8-megabyte Pertec disk drive	34,742	376
	Basic system with 120-lpm printer and Hawk disk drive	31,028	339
	Basic system with 120-lpm printer and Pertec disk drive	35,533	384
	Basic system with 200-lpm printer and Hawk disk drive	31,793	347
	Basic system with 200-lpm printer and Pertec disk drive	36,298	392
	Basic system with 300-lpm printer and Hawk disk drive	35,795	387
	Basic system with 300-lpm printer and Pertec disk drive	40,300	432
	Basic system with 600-lpm printer and Hawk disk drive	39,032	419
	Basic system with 600-lpm printer and Pertec disk drive	43,537	464
Series III	Basic system: CPU-5 with 32K bytes of memory, 4-port MUX, R-40 CRT, 10.4-megabyte Hawk disk drive, 150-cps printer	30,700	307
	Basic system with 150-cps printer and 20.8-megabyte Pertec disk drive	35,342	353
	Basic system with 120-lpm printer and Hawk disk drive	31,492	315
	Basic system with 120-lpm printer and Pertec disk drive	36,133	361
	Basic system with 200-lpm printer and Hawk disk drive	32,257	323
	Basic system with 200-lpm printer and Pertec disk drive	36,898	369
	Basic system with 300-lpm printer and Hawk disk drive	36,258	363
	Basic system with 300-lpm printer and Pertec disk drive	40,900	409
	Basic system with 600-lpm printer and Hawk disk drive	39,495	395
	Basic system with 600-lpm printer and Pertec disk drive	44,137	441
Series 6300	Basic system: CPU-6 with 64K bytes of memory, 4-port MUX, R-40 CRT, 10.4-megabyte Hawk disk drive, 150-cps printer	33,123	331
	Basic system with 150-cps printer and 20.8-megabyte Pertec disk drive	37,628	376
	Basic system with 120-lpm printer and Hawk disk drive	33,915	339
	Basic system with 120-lpm printer and Pertec disk drive	38,420	384
	Basic system with 200-lpm printer and Hawk disk drive	34,680	347
	Basic system with 200-lpm printer and Pertec disk drive	39,185	392
	Basic system with 300-lpm printer and Hawk disk drive	38,682	387
	Basic system with 300-lpm printer and Pertec disk drive	43,187	432
	Basic system with 600-lpm printer and Hawk disk drive	41,918	419
	Basic system with 600-lpm printer and Pertec disk drive	46,423	464

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
PACKAGED SYSTEMS (Continued)			
Series 6400	Basic system: CPU-6 with 64K bytes of memory, 4-port MUX, R-40 CRT, 26.5-megabyte CMD disk drive, 150-cps printer	$41,465	$415
	Basic system with 150-cps printer and 52.9-megabyte CMD disk drive	49,132	491
	Basic system with 150-cps printer and 79.4-megabyte CMD disk drive	50,798	508
	Basic system with 120-lpm printer and 26.5-megabyte CMD disk drive	42,257	423
	Basic system with 120-lpm printer and 52.9-megabyte CMD disk drive	49,923	499
	Basic system with 120-lpm printer and 79.4-megabyte CMD disk drive	51,590	516
	Basic system with 200-lpm printer and 26.5-megabyte CMD disk drive	43,022	430
	Basic system with 200-lpm printer and 52.9-megabyte CMD disk drive	50,688	507
	Basic system with 200-lpm printer and 79.4-megabyte CMD disk drive	52,355	524
	Basic system with 300-lpm printer and 26.5-megabyte CMD disk drive	47,023	470
	Basic system with 300-lpm printer and 52.9-megabyte CMD disk drive	54,690	547
	Basic system with 300-lpm printer and 79.4-megabyte CMD disk drive	56,357	564
	Basic system with 600-lpm printer and 26.5-megabyte CMD disk drive	50,260	503
	Basic system with 600-lpm printer and 52.9-megabyte CMD disk drive	57,927	579
	Basic system with 600-lpm printer and 79.4-megabyte CMD disk drive	59,593	596
Series 6500	Basic system: CPU-6 with 64K bytes of memory, 4-port MUX, R-40 CRT, 26.5-megabyte CMD disk drive, 150-cps printer	37,878	415
	Basic system with 150-cps printer and 52.9-megabyte CMD disk drive	45,545	491
	Basic system with 150-cps printer and 79.4-megabyte CMD disk drive	47,212	508
	Basic system with 120-lpm printer and 26.5-megabyte CMD disk drive	38,670	423
	Basic system with 120-lpm printer and 52.9-megabyte CMD disk drive	46,337	499
	Basic system with 120-lpm printer and 79.4-megabyte CMD disk drive	48,003	516
	Basic system with 200-lpm printer and 26.5-megabyte CMD disk drive	39,435	430
	Basic system with 200-lpm printer and 52.9-megabyte CMD disk drive	47,102	507
	Basic system with 200-lpm printer and 79.4-megabyte CMD disk drive	48,768	524
	Basic system with 300-lpm printer and 26.5-megabyte CMD disk drive	43,437	470
	Basic system with 300-lpm printer and 52.9-megabyte CMD disk drive	51,103	547
	Basic system with 300-lpm printer and 79.4-megabyte CMD disk drive	52,770	564
	Basic system with 600-lpm printer and 26.5-megabyte CMD disk drive	46,673	503
	Basic system with 600-lpm printer and 52.9-megabyte CMD disk drive	54,340	579
	Basic system with 600-lpm printer and 79.4-megabyte CMD disk drive	56,007	596
MEMORY			
11-0107400	32K-byte memory board	2,400	24
11-0107500	64K-byte memory board	4,167	42
11-0106200	128K-byte memory board	7,550	76
MASS STORAGE			
23-9406000	DSDD floppy disk drive	1,683	17
23-9427H00	10.4-megabyte Hawk disk drive with cabinet and controller	12,215	106
	Same with cabinet only	10,548	89
	Same without cabinet or controller	8,882	89
23-D340000	20.8-megabyte Pertec disk drive with cabinet and controller	16,333	147
	Same with cabinet only	14,667	130
	Same without cabinet or controller	13,000	130
CMD-32	26.5-megabyte CMD add-on disk drive	7,600	127
CMD-64	52.9-megabyte CMD add-on disk drive	9,050	154
CMD-96	79.4-megabyte CMD add-on disk drive	9,960	166
PRINTERS			
D-630	45-cps character printer	4,921	49
TI-840	75-cps, 9 x 7 serial matrix	1,641	16
TI-810	150-cps, 9 x 7 serial matrix	3,544	36
DP-M-120	120-lpm, serial matrix printer	4,335	44
DP-M-200	200-lpm, serial matrix printer	5,100	51
DP-B-300	300-lpm, band printer, parallel	8,618	87
DP-B-600	600-lpm, band printer, parallel	11,855	119
TERMINALS			
R-40	CRT terminal; 1920 characters, upper/lower case	1,659	17■