All About Minicomputers

What's available today in the fast-moving minicomputer marketplace? What are the significant features of these machines? How can you tell whether a minicomputer will fit into your own data processing plans? And, if so, which of the many available models represents the best overall choice for you? This report is designed to answer these questions and bring you up to date on the rapidly advancing state of the art in minicomputers.

Dynamism and proliferation continue in the world of the minicomputer. We hear daily of a continual stream of new products entering the marketplace, with hardware and software that take on many names. We hear of minicomputers, superminicomputers, microcomputers, programmable controllers, microprogrammable data entry units, intelligent terminals, accounting machines, large-scale programmable calculators, etc. We also regularly hear of old-line peripheral device and terminal manufacturers announcing their entry into the "minicomputer business" as they add programmable logic and memory to their formerly unintelligent, hard-wired devices.

The net result of all these happenings is, more often than not, confusion—at least when one tries to grasp the meaning or direction of the industry in any overall sense. The confusion may well be compounded when one sets out to satisfy a known in-house need and wonders where to begin looking for a specific minicomputer that will satisfy that need at the best available price.

This report on minicomputers can cut through a lot of this confusion by providing a convenient way to scan quickly a comprehensive list of available minicomputers, together with their primary specifications and prices.

The comparison charts that follow can be effectively used to complete a comprehensive, first-level search of the minicomputer universe in just a few minutes. For example, if you want a minicomputer but know you cannot pay more than $5,000 for the basic CPU and memory, then you can quickly scan across the charts noting the entry "Price of CPU, power supply, front panel, and minimum memory in chassis," and jotting down the name and model number of each minicomputer that applies. Or, your requirements may be for a minicomputer that has a Basic programming language in addition to removable disk pack storage. A similar quick scan across the entries "Disk pack/cartridge drives" and "Compilers" will produce a complete list of those minicomputers that satisfy both requirements.

PLEASE NOTE that a similar presentation of the characteristics of minicomputers with a strong orientation toward business data processing applications is contained in the report called "All About Small Business Computers" (70C-010-30). Thus, to assure that your search will be complete, we suggest that you also scan that report because, as you know, categorical descriptions and definitions in the area of minicomputers can be difficult. What you may consider to be a small business computer, someone else may call a minicomputer, pure and simple. To be sure, therefore, we suggest you quickly scan both sets of charts.

This report presents the salient characteristics of 125 minicomputers from 36 vendors. Prices and capabilities of these machines span a wide range, so prospective users should carefully check the details of this report and the accompanying comparison charts.

A significant aspect of any evaluation and procurement cycle is to gather information about how well the product has worked out for other customers. True, you are not likely to find someone with exactly your processing requirements or company/information set-up, but there will be similar elements. An important first step in gathering this information is presented in Report 70C-010-50, *User Ratings of Computer Systems,* which can be found behind the Feature Reports tab. This summary of the experience of hundreds of users with their minicomputers and small business computers will not replace the need for you to talk with existing users, but it will provide you with important insights about the strengths and weaknesses of the popular systems.

THE COMPARISON CHARTS

The key functional characteristics of 125 commercially available minicomputers from 36 manufacturers are presented in the accompanying comparison charts. Nearly all of the information in the charts was supplied and/or verified by the manufacturers during the months of December 1982 and January 1983; their close cooperation with the Datapro Research staff in the preparation of these charts is greatly appreciated.

The chart entries and their significance to potential minicomputer users are explained in the following paragraphs, together with some useful guidelines for selecting the most suitable minicomputer for your application.

Word Length

Probably the single most important distinguishing characteristic of a minicomputer is its *word length, bits* (i.e., the number of bits (binary digits) that can be stored in or retrieved from main storage during a single cycle). In general, the longer the word length, the greater the efficiency and accuracy of a computer's internal operations—and the higher its price tag.

Most of the minicomputers currently on the market have a 16-bit word length; this size neatly accommodates two 8-bit bytes (characters) and has been shown to yield an attractive balance between economy and performance for many applications. Other widely used models have word lengths of 8, 12, 18, 24, or 32 bits. Systems providing word length architectures of more than 16 bits (generally 32 bits) are featured in the report entitled *All About Superminis* (70C-010-40). This report includes an introduction to "superminicomputers," as well as comparison columns describing the specifications of the superminis currently available.

All About Minicomputers

The 8-bit minicomputers are suitable for many functions where low cost is more important than high precision or sophisticated instruction repertoires—and they can be particularly effective when extensive manipulation of 8-bit bytes must be performed. Entries also indicate parity and error correction bits when applicable.

Number of Workstations Supported

A very important consideration for many users who are considering the acquisition of a minicomputer is the number of workstations it can support. Workstations, in this case, can mean most any type of device which can input and/or receive data from the minicomputer. When the minicomputer is used in a business environment, for instance, the workstation would normally be a data processing device or terminal, but in a manufacturing or distribution environment, the workstation could be a sensor or transmission unit that simply transmits signals back to the minicomputer for processing.

Main Storage

The *storage type* generally falls into one of two basic categories, magnetic core or semiconductor memory. Magnetic core storage has been widely used for more than a decade, and has proved to be fast, flexible, and reliable. Semiconductor memories began to appear in commercially available minicomputers late in 1970, and most minicomputer makers are now using semiconductor memory in their new products. It is clear that the demand for higher performance at lower cost, together with continuing improvements in semiconductor technology, have accelerated the trend toward the use of semiconductor memories.

Two types of semiconductor memories appear in the charts; MOS (metal-oxide semiconductor) and bipolar (bipolar transistor). MOS is decidedly more popular because of its compactness and price. However, bipolar technology, a type of transistor-transistor logic, offers a classic trade-off—higher speed at the expense of more space and greater power consumed, as well as greater cost.

The *cycle time, microseconds* for a storage device is the minimum time interval that must elapse between the starts of two successive accesses to any one storage location. Though cycle time ranks with word length as one of the most significant individual indicators of a computer's performance potential, it is definitely *not* safe to assume that the computer with the fastest cycle time will be the best overall performer in a particular application. Other parameters that have an important effect on a minicomputer's performance include the flexibility and power of its instruction repertoire, the number of storage cycles it requires to execute each instruction, its input/output capabilities, etc.

Access time, microseconds is the actual elapsed time between the CPU's request for data and the time when that data is received (read). In core memory, the access time is usually one-half the cycle time; semiconductor memories do not display a similar relationship.

Our comparison charts show the amount of main storage available for each computer in terms of the *minimum capacity* and *maximum capacity,* expressed in words or bytes (i.e., 32KW or 64KB). In the great majority of cases, storage is available in all the usual binary increments of capacity. Thus, if a computer has minimum and maximum storage capabilities of 32K and 256K bytes, respectively, it is safe to assume that capacities of 64K, 96K, and 128K bytes of memory are also available.

It is important to choose the right storage capacity; for nonmultiprogramming systems, that usually means enough storage to hold your largest program and all associated subroutines and data, but not too much more than that. It is also wise to make sure that your computer's main storage capacity can be expanded if necessary, preferably by simply plugging in an additional storage module.

Parity checking is a standard feature of some minicomputers and an extra-cost option for others. In still other cases, the manufacturers maintain—with some justification—that the reliability of modern magnetic core and semiconductor memories is so high that parity checking is an unnecessary luxury unless absolute accuracy is a must. Parity checking requires the addition of one more bit to each main storage location. This added bit is set to the appropriate value (0 or 1) whenever a word is written into main storage and checked each time the word is read out; the technique permits detection of most, though not all, read and write errors.

Error correction is a rather new feature which is beginning to appear in some of the recent minicomputer offerings. This feature involves appending five or six check bits to each word of memory. The check bits, called a Hamming code, and special algorithms allow a system to detect and correct single-bit errors, and also to detect a fair proportion of the multiple-bit errors that occur.

Storage protection is a feature that prevents unauthorized writing in certain areas of main storage. The protection can be accomplished by hardware means, software means, or a combination of both. Though unnecessary in simple dedicated systems, an effective storage protection scheme is an essential element in multiprogramming and time-sharing environments.

Central Processor

Although there are many variations in their internal architecture, the great majority of currently available minicomputers are parallel, binary processors with single-address instructions and fixed word lengths of 8, 12, 16, 18, 24, or 32 bits.

The *number of directly addressable words* of main storage is an important characteristic that may require some explanation if you are investigating minicomputers for the first time. The problem is that the short word lengths impose serious limitations upon the number of bits that can be assigned to hold the address part of each instruc-

All About Minicomputers

tion. A typical 16-bit minicomputer instruction might consist of three parts: operation code, address mode field, and the address itself. If 6 bits are assigned to hold the operation code (permitting up to 64 distinct operations) and 2 bits are used to designate the addressing mode (permitting specification of indexing and/or indirect addressing), then only 8 bits are left to hold the address field. Since these 8 bits permit direct addressing of only 256 distinct memory locations, it is clear that other means will need to be employed to access most regions of the computer's main storage. The most common solutions to the problem are the use of multi-word instructions, indexing, and/or indirect addressing.

Since indirect addressing is so prominent, it deserves a short explanation. Indirect addressing is an address modification technique in which the address part of an instruction specifies a storage location that contains another address rather than the desired operand itself. This second address may in turn be either the address of the desired operand or another indirect address; the latter case is called multi-level indirect addressing. Indirect addressing permits the use of an entire word to hold an operand address. It can also simplify programming and speed up execution times in some applications by making it possible to change the effective address of numerous instructions by altering the indirect address in a single storage location. Each level of indirect addressing, however, usually requires one additional storage cycle of execution time.

Control storage is an indication of the microprogrammability of the minicomputer. Microprogrammability is a trait that enables the vendor and/or the user to tailor a minicomputer's internal processing capabilities to suit his particular needs. In place of conventional hard-wired logic, a microprogrammed computer uses sequences of microinstructions, usually stored in a special read-only memory (ROM), programmable read-only memory (PROM), or bipolar read-only memory (BROM) unit, to define the effects of each instruction in its repertoire. In some cases, the microprograms can be altered by the user himself, while in others, they are accessible only to the vendor. Microprogrammability can greatly increase the flexibility of a minicomputer, but its presence may involve a trade-off in terms of reduced performance or increased price. Entries here indicate both the type and the size of control storage.

Although it is undeniably dangerous to make inferences about a computer's overall performance capability on the basis of instruction execution times, our charts show the basic *add time, microseconds* to give a first-level indication of fixed-point arithmetic speeds. In general, the indicated add times are the times required to retrieve a one-word operand from main storage and add it to another operand already contained in an accumulator, with no indexing or indirect addressing. Comparisons based on add times can easily be misleading, however, because of differences in word lengths and instruction repertoires.

Hardware multiply/divide facilities are standard in some minicomputers and optional in others. When no hardware facilities are present, multiplication and division must be performed by means of programmed subroutines at a significant reduction in execution speeds. Many minicomputer applications, however, impose little or no need for multiplication or division operations, and in these cases the hardware facilities would be superfluous.

Hardware floating point facilities are not included in the standard instruction repertoires of most of the currently available minicomputers, despite the fact that floating-point arithmetic is highly desirable, if not essential, in many scientific applications. Where available, these facilities can dramatically reduce the execution times for certain programs by eliminating the need for time-consuming floating-point subroutines.

Hardware byte manipulation is the ability to conveniently process information expressed in the 8-bit character codes which are rapidly becoming an industry standard. Obviously, most of the 8-bit minicomputers are effective byte manipulators, and many of the 16-bit machines offer special instructions that permit either half of a word to be addressed and processed as an 8-bit byte.

Battery backup is a feature unique to minicomputers with semiconductor memory, which is volatile and requires refreshing at regular intervals to retain the data that has been written into it. In the event of a power failure, the contents of memory would be lost if the regulator power supply were not backed up by the battery pack.

An interesting solution to this problem with semiconductor memories is furnished by Computer Talk, Inc., whose battery backup feature causes the contents of memory to be recorded on the system disk if a power failure occurs. When power is restored, memory can be recreated by copying from the disk.

A *real-time clock or timer* is another essential element in most "time-conscious" systems. A real-time clock enables the program to determine the time of day, while an interval timer usually indicates the amount of time that has elapsed since the occurrence of some significant event. In many cases, the timer can trigger an interrupt signal when a predetermined interval of time has elapsed.

Input/Output Control

A *direct memory access channel* (DMA) permits direct transfer of I/O data between main storage and a peripheral controller. When a DMA channel is used, the I/O data bypasses the computer's main hardware registers, and the I/O operation proceeds independently of program control once it has been initiated by the program. In minicomputers that lack a DMA channel, I/O data transfers are generally carried out under direct program control, with each word being transferred by way of the processor's registers. Generally speaking, the DMA channel has two significant advantages over program-controlled I/O; it can

All About Minicomputers

accommodate higher I/O data rates, and it causes far less interference with internal processing operations. Regardless of the type of I/O control they employ, most minicomputers can accommodate multiple I/O devices and include appropriate facilities for addressing the desired device.

Maximum I/O rate, words/sec. is a measure of each computer's potential ability to transfer data to and from peripheral devices or other external sources. In machines equipped with a DMA channel, the maximum I/O rate frequently equals the cycling rate of the main storage unit. These maximum I/O rates, however, can be quite deceptive in the case of minicomputers. In general, their storage capacities are limited, their capabilities for simultaneous input/output operations are restricted, and fairly complex programming is associated with I/O operations. For all these reasons, I/O data rates approaching the indicated maximum rates can usually be handled only in short bursts, if at all.

An effective *program interrupt* facility is a requirement for virtually all applications of a real-time nature. An interrupt is a signal that causes temporary suspension of normal program execution so that the particular condition that caused the interrupt can be dealt with. Interrupts fall into two basic categories; internal and external. Internal interrupts are usually triggered by conditions such as a memory parity error, an illegal instruction, or a power failure. External interrupts usually indicate that a particular peripheral device requires attention or has completed an I/O operation. An interrupt usually results in automatic storage of the current contents of the instruction counter, followed by a transfer of control to a software routine that determines the cause of the interrupt and initiates the appropriate action.

The *number of external interrupt levels* provides a reasonable indication of the power of a minicomputer's interrupt system. It shows the number of different external devices whose interrupt signals can be identified by the processor —though it should be noted that this identification process may require a fairly complex and time-consuming sequence of instructions. Many of the minicomputers offer additional external interrupt levels as extra-cost options, and in these cases our charts try to show the available range, from minimum to maximum.

Communications Capabilities

Communications capabilities enable some of the small business computers to function as "intelligent terminals" in data communications networks. An interface equips the small computer to send and receive data over a common-carrier communications link, usually to a larger central computer installation. The small computer's internal processing and storage capabilities enable it to do some data processing locally and to handle a variety of code translation, editing, and control functions in connection with the data communications activities.

Maximum no. of lines indicates how many communications lines can be handled by a particular system. The types of lines are specified in the next two entries.

Synchronous and *asynchronous* have entries of standard, optional, or no, indicating their availability, and also a notation as to the speed of each line in bits per second (bps). Most entries will be of the type "to 9600 bps," indicating one or more transmission speeds up to a maximum of 9600 bps.

Protocols supported indicates the type of communications protocols accommodated by hardware and software for the model. *Network architectures supported* indicates to which communications networks the minicomputer model can be configured. Popular network architectures include IBM's SNA (Systems Network Architecture) and Digital Equipment's DECnet. *RJE terminals emulated* refers to whether there is software available from the vendor for the minicomputer to function as a "look-alike" for remote job entry terminals. The terminals for which support is provided is indicated (i.e., IBM 2780/3780). *IBM 3270 emulation* is listed as a separate entry as a result of an increasing amount of interest from our users concerning the minicomputer model's capability of emulating the IBM 3270 Information Display System.

Peripheral Equipment

The comparison charts summarize the standard peripheral devices that are available for each minicomputer.

Users who are accustomed to larger general-purpose computer systems will find that the term "standard peripheral device" often has a somewhat different meaning when used by a minicomputer manufacturer. Since comparatively few of the minicomputer makers produce their own peripheral equipment, the indicated availability of a given type of device may simply mean that an appropriate interface is available to couple the computer with a peripheral unit supplied by some other manufacturer. In many instances the minicomputer manufacturer buys the peripheral device from the peripheral manufacturer and supplies an appropriate interface for his minicomputer. Datapro has made every effort to include *only* the peripheral devices that are physically supplied by the minicomputer vendors; therefore, prospective buyers should ask these questions about each item of peripheral equipment they will need:

- Has it actually been installed and used with the computer of interest?
- If so, what has the users' experience been?
- What software support is available?
- Who will provide service for the device, and under what conditions?

The inclusion of mass storage devices (magnetic disk units) can greatly increase the data storage and processing

All About Minicomputers

capabilities of a minicomputer system. Disk units enable millions of characters of information to be constantly accessible to the computer. Moreover, any desired record can be retrieved, updated, and re-recorded on the disk, usually within a fraction of a second.

By replacing or augmenting slower, less flexible file storage media such as punched cards, paper tape, or magnetic ledger cards, disk units can enable small computers to handle applications and processing volumes that would otherwise be impossible. The principal disadvantages of disk units are their comparatively high costs and the software complexities that are encountered by users who attempt to harness their full potential. One or both of these considerations will make disk units impractical for many small computer buyers, despite the obvious appeal of disk-oriented data processing.

The diskette, or "floppy disk," is an innovation that can significantly reduce the cost of disk-oriented data processing. The diskette itself consists of a flexible Mylar disk, usually 5.25 or 8 inches in diameter, that is permanently housed in a plastic envelope. It can serve as an input/output and/or random-access storage medium that is considerably smaller in capability and slower in performance than conventional disk units—but also far lower in cost. Introduced by IBM in 1972, diskettes and diskette drive units are now being produced by dozens of vendors and are finding their way into numerous small computer systems, such as the IBM System/34 and Burroughs B 90. Recent enhancements to the floppy disk concept include more concentrated data storage and "flippies" (floppy disks that utilize both sides of the diskette), allowing more data to be stored on-line.

The other, more conventional types of mass storage devices, cartridge and disk pack drives, provide access to far more data and at significantly faster rates. Unfortunately, they also carry price tags several times higher than their floppy counterparts. Most of these units employ cartridges or disk packs that can easily be removed from the drive units and interchanged in much the same manner as magnetic tape reels.

Some cartridge-type units either use nonremovable media or use two cartridges, one fixed and the other removable. Nonremovable disks impose two important limitations. First, the system's file storage capacity is effectively limited to the amount of information that can be stored on-line. Second, disk dumps to create backup files for efficient restart procedures in case of catastrophe are not available to the user.

Interchangeable disks, conversely, provide great flexibility and make it practical to use small computers effectively for both sequential and random data processing applications. In sequential applications, files of virtually unlimited size can be handled through the use of multiple disk packs or cartridges.

Fixed-head (head-per-track) disk and drum units can provide much faster access to on-line data than any other type of mass storage device. The reason is that there is no loss of time due to head positioning because a head is provided for each track. The only delay is rotational delay (latency), or the time required for the desired data to move under the read/write head. But the price of this type of equipment is higher than that of the preceding varieties, and less data can be stored on-line. Fixed-head devices are used when data bases are relatively small and very rapid access to the information is required.

Although currently not represented as a separate entry in the specification charts, Datapro acknowledges the significance of "Winchester" technology in the minicomputer-peripheral market. Winchester disk drives contain the disks, the read/write heads, and the head actuator in a hermetically sealed head disk assembly (HDA), in which the air is continuously circulated and filtered. The fixed-disk media offers some significant advantages over traditional disk drives. The sealed HDA virtually eliminates the problem of head crashes caused by contamination, and no preventive maintenance, such as changing air filters or cleaning and aligning heads, is required. Datapro has tried to distinguish the Winchester drives in the specification columns when the information has been provided by the vendor.

Floppy disk (diskette) drives indicates whether floppies are available for a particular minicomputer, and the minimum and maximum on-line capacities that are offered.

Disk pack/cartridge drives signifies whether one or the other, or both, types of devices can be interfaced to the system, and the minimum and maximum on-line capacities available.

Drum/fixed-head disk storage informs the reader as to the availability of a drum or head-per-track (fixed-head) disk drive, and the minimum and maximum on-line capacities offered.

The indicated maximum storage capacities are shown in thousands (K) or millions (M) of bytes and may be the capacity of a single disk or the total capacity of two or more (typically, four to eight) drives that can be connected to one controller. If an I/O slot is open, theoretically, another controller and its associated drives can be added to most systems.

Magnetic tape cassettes and cartridges offer increased convenience in that they can be transported and stored with little fear of damaging the data that has been recorded. What's more, price tags for cassette and cartridge drives are significantly lower than those of the more conventional reel-to-reel variety, but once again the trade-off of slower transfer rates and reduced on-line storage must be accepted. The charts indicate the availability of *magnetic tape cassettes/cartridges* and *magnetic tape, ½-inch* drives and their associated transfer rates in characters per second (cps) or thousands of bytes per second (KBS).

All About Minicomputers

Serial printers (character-at-a-time) are enjoying increased popularity with the prolific growth of the minicomputer marketplace. The main reason is price; serial printers can provide excellent-quality hard-copy reports for far less money than the line-at-a-time printers used with larger computers. However, for users who require faster printing capabilities, *line printers* are also available for many systems. Serial printers generally range in speed from about 30 to 600 or more characters per second (cps), while line printers operate at speeds of 100 to 2000 or more lines per minute (lpm). The user who needs faster printed output can obviously get it, but he must be willing to pay the higher price tag associated with the line printers.

Data communications interface describes the minicomputer's capabilities, if any, to send and receive data over a common-carrier communications link. Depending on the configuration, a minicomputer can be programmed to function as an intelligent terminal communicating with a larger host computer, or the mini can act as the host computer communicating with other terminals in a network. The chart entry indicates whether an interface is available and gives the range of data rates or the maximum data rate in bits per second (bps).

CRT indicates the availability of a CRT display unit and describes its standard screen size in characters per line and number of lines per screen (e.g., 80 char. x 24 lines).

Other standard peripheral units lists the additional peripheral devices that are available for each system. Typical entries include analog/digital (A/D) converters, paper tape readers, paper tape punches, plotters, etc.

Software

A critically important area to be evaluated is *software*—the programming packages and languages used to program the computer and thereby direct its operations. It is important that you carefully investigate the available software. This investigation should include the operating systems, programming languages, preprogrammed utility packages such as sorts and file maintenance, and application packages such as payroll, inventory control, general ledger, etc. Prospective buyers should carefully note whether the software they will require is included in the cost of the system or offered at extra cost.

Vendors' claims and promises concerning the availability and capability of software should be carefully checked. This is particularly true of software that has been announced but not yet released. Vendors have frequently failed to live up to their marketing publicity.

An *assembler* is a special-purpose program that uses the computer's power to facilitate the preparation of other programs. It enables the programmer to write his own program in a simplified format that uses mnemonic operation codes and symbolic operand addresses. The assembler program then converts these symbolic instructions into their machine-language equivalents, producing computer programs ready for loading and execution. Entries here indicate the availability of an assembler or, in some cases, a macro assembler.

A macro assembler is another software tool to aid the programmer and make his job a little easier. Macro routines can be called by the programmer and copied right into his program. This saves the programmer from having to recode the routine each time it is used and also eliminates the possibility of keying errors when that part of the program is entered. As usual, there is a price to pay; the use of macros usually wastes memory space.

Entries in this section of the charts indicate whether an assembler, a macro assembler, or both are available.

A *compiler* is a software tool designed to shift part of the program preparation task from the user to the computer itself by converting programs written in a simplified, procedure-oriented language into machine-language object programs. Compilers are now used in virtually all large- and medium-scale computer installations because of their demonstrated ability to slash programming costs—and they are becoming increasingly available for minicomputers. This trend is possible because of the more powerful central processors now being used, since compilation is an intricate process that requires more storage space and processing power than the earlier minicomputers provided. Where compilers are offered, however, they frequently limit the programmer to restricted subsets of the standard programming languages and/or require the use of a larger computer to perform the compilation process.

Entries in this section of the charts may include *Cobol* (COmmon Business Oriented Language), *RPG* (Report Program Generator), *Fortran* (FORmula TRANSlator), *Basic* (Beginners All-purpose Symbolic Instruction Code), *Algol* (ALGOrithmic Language), or proprietary languages that are available from a vendor for use on a particular system, and indicate the availability of those compilers for each minicomputer. The key word of warning here is that if you use a language that is unique to a vendor, you will be faced with a big problem if someday you decide to change vendors. Your investment in software will be lost, since the programs will not operate on any other system.

An *operating system* facilitates the operation of a computer by handling functions such as: 1) scheduling, loading, and supervising the execution of programs; 2) allocating storage and I/O devices; 3) initiating and controlling I/O operations; 4) analyzing interrupt signals and dealing with errors; 5) handling communications between the system and its human operator; and 6) controlling multiprogramming or time-sharing operations.

Typical entries describing the available operating systems include "batch," which means that the system processes one or more jobs sequentially and requires all data to be

All About Minicomputers

supplied before initiation (communication between operator and system is not permitted once the job has begun); "interactive," which means that the system allows data, parameters, etc., to be entered as the job is executing; "real-time," which means that the system responds to external demands on a priority basis; or "time-sharing," which means that the system allows multiple users to access the system and share all its resources at the same time.

Language implemented in firmware and *operating system implemented in firmware* tell the reader whether or not the language processor and/or the operating system are contained in microcode. The entries stipulate "fully," "partially," or "no" to indicate the extent of firmware implementation. An advantage to the user is that a language and/or operating system implemented in firmware frees up more memory space for the user's programs and data. Also, the microcode is usually inaccessible to the user (generally contained in read-only memory), eliminating any possible tampering with the language processor or operating system and reducing chances for error. A third advantage derived from firmware implementation is the ability to create more sophisticated and complex system functions at the hardware level. Microcode routines can be substituted for often-used subroutines, thereby increasing system performance.

Pricing and Availability

The comparison charts show the *price of CPU, power supply, front panel, and minimum memory in chassis* along with the memory size in parentheses. *Price of memory increment* stipulates the costs of various sizes (when available) of memory increments, with the actual sizes in parentheses.

If you need two or more minicomputers, it is also worth noting that most of the manufacturers offer sizeable discounts from their list prices on orders for multiple computers. Discounts of up to 40 percent are not unusual on large orders.

Date of first delivery indicates when the first production model of each minicomputer was delivered (or is scheduled to be delivered) to a customer.

Number installed to date shows how many systems of each type had been delivered to customers as of approximately January, 1983. All figures were supplied by the manufacturers themselves.

Comments

This final entry on the comparison charts is used to explain or amplify the preceding entries and to provide other pertinent information about each system's hardware, software, pricing, or applications.

MINICOMPUTER MANUFACTURERS

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the 36 suppliers whose products are listed in the comparison charts that follow.

Applied Systems Corporation, 26401 Harper Avenue, St. Clair Shores, MI 48081. Telephone (313) 779-8700.

ATV Jacquard Systems, 2921 South Daimler, Santa Clara, CA 92711. Telephone (714) 546-3551.

Barrister Information Systems Corporation, One Technology Center, 45 Oak Street, Buffalo, NY 14203. Telephone (716) 845-5010.

Central Data Corporation, P.O. Box 2530, Station A, Champaign, IL 61820. Telephone (217) 359-8010.

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

Century Computer Corporation, 14453 Gillis Road, Dallas, TX 75234. Telephone (214) 233-3238.

Compal Computer Systems, 45617A Ventura Boulevard, Encino, CA 91436. Telephone (213) 907-8003.

Comptek Research Inc. (see Barrister Information Systems Corporation).

Computer Designed Systems, Inc., 8085 Wayzata Boulevard, Minneapolis, MN 55426. Telephone (612) 545-2855.

Computer Hardware, Inc., 4111 North Freeway Boulevard, Sacramento, CA 95834. Telephone (916) 929-2020.

Computer Talk Inc., P.O. Box 148, Morrison, CO 80465. Telephone (303) 697-5485.

Convergent Technologies, 2500 Augustine Drive, Santa Clara, CA 95051. Telephone (408) 727-8830.

Data General Corporation, 4400 Computer Drive, Westboro, MA 01581. Telephone (617) 366-8911.

Dataram Corporation, Princeton Road, Cranbury, NJ 08512. Telephone (609) 799-0071.

Digital Equipment Corporation (DEC), 129 Parker Street, Maynard, MA 01754. Telephone (617) 897-5111.

Digital Scientific Corporation, 2921 South Daimler, Santa Ana, CA 92711. Telephone (714) 453-6050.

Digital Systems Corporation, Walkersville, MD 21793. Telephone (301) 845-4141.

General Automation Inc. 1055 South East Street, Anaheim, CA 92805. Telephone (714) 778-4800.

Hewlett-Packard, Data Systems Division, 11000 Wolfe Road, Cupertino, CA 95014. Telephone (408) 257-7000.

Honeywell Information Systems, Inc., Three Newton Executive Park Drive, Newton Lower Falls, MA 02162. Telephone (617) 552-1000.

Inforex, Inc., 186 Middlesex Turnpike, Burlington, MA 01803. Telephone (617) 272-6470.

Microdata Corporation, P.O. Box 19501, Irvine, CA 92713. Telephone (714) 540-6730.

All About Minicomputers

Microtech Business Systems, 3180 Pullman Street, Costa Mesa, CA 92626. Telephone (714) 557-8640.

Modular Computer Systems, Inc., 1650 West McNab Road, Fort Lauderdale, FL 33310. Telephone (305) 974-1380.

Northern Telecom, Inc., P.O. Box 1222, Minneapolis, MN 55440. Telephone (612) 932-8000.

Olivetti Corporation, 155 White Plains Road, Tarrytown, NY 10591. Telephone (914) 631-8100.

Plexus Computers, Inc., 2230 Martin Avenue, Santa Clara, CA 95050. Telephone (408) 988-1755.

PolyComputers Inc., 18003-L Sky Park South, Irvine, CA 92714. Telephone (714) 850-0540.

MDS/Qantel Corporation, 4142 Point Eden Way, Hayward, CA 94545. Telephone (415) 887-7777.

Rolm Corporation, 4900 Old Ironsides Drive, Santa Clara, CA 95050. Telephone (408) 988-2900.

Second Source Computer, Inc., 14762 Bentley Circle, Tustin, CA 92680. Telephone (714) 832-7724.

Sperry Univac Division, Sperry Rand Corporation, 17900 Von Karman Avenue, P.O. Box C-19504, Irvine, CA 92713. Telephone (714) 754-6900.

Tandem Computers, Inc., 19333 Vallco Parkway, Cupertino, CA 95014. Telephone (408) 725-6000.

Texas Instruments, Inc., Digital Systems Division, P.O. Box 1444, Mail Stop 784, Houston, TX 77001. Telephone (512) 258-5121.

The TRW-Fujitsu Company, 9841 Airport Boulevard, Suite 620, Los Angeles, CA 90045. Telephone (213) 535-3777.

The Ultimate Corporation, 77 Brant Avenue, Clark, NJ 07066. Telephone (201) 388-8800.

Wang Laboratories, Inc., One Industrial Avenue, Lowell, MA 01851. Telephone (617) 459-5000.□

All About Minicomputers

MANUFACTURER AND MODEL	Applied Systems Corporation ASC/88	ATV, Inc. J600	Barrister Information Systems Corporation Barrister 120/121	Barrister Information Systems Corporation Barrister 210	Barrister Information Systems Corporation Barrister 320
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	—	3	8/15	15	15
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	.2/0.5	0.5/0.66	0.4/—	—	—
Min./Max. capacity	16K/1MB	128K	64KB/128K-256KB	128KB	128KB-256KB
Parity checking	Optional	No	No	No	No
Error correction	Optional	No	No	No	No
Storage protection	Optional	No	No	No	No
CENTRAL PROCESSOR					
No. of directly addressable words	128K	64K word (128KB)	32K	32K	32K
Control storage	PROM; 64K (max.)	PROM; 28KB	No	No	No
Add time, microseconds	1.0	3.95	0.4	0.4	0.4
Hardware multiply/divide	Standard	No	No/Opt.	Optional	Optional
Hardware floating point	Optional	No	No/Opt.	Optional	Optional
Hardware byte manipulation	Standard	No	Standard	Standard	Standard
Battery backup	Optional	No	Optional	Optional	Optional
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Optional	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	250K	1.5MB	630K/1MB	1MB	1MB
No. of external interrupt levels	8 (optional)	1	16	16	16
COMMUNICATIONS					
Maximum number of lines	16, 32	2	8	8	8
Synchronous	Opt.; to 150K bps	Std.; to 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
Asynchronous	Opt.; to 19.2K bps	Std.; to 9600 bps	Std.; 9600 bps	Std.; 9600 bps	Std.; 9600 bps
Protocols supported	IBM Bisync, Async, SNA	2780/3780, 3270, TTY, Univac	IBM 6670 BSC	IBM 6670 BSC	IBM 6670 BSC
Network architectures supported	DECnet (RPQ)	None	No	No	No
RJE terminals emulated	Optional	2780/3780, Univac	No	No	No
IBM 3270 emulation	Optional	Yes	No	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	0.24M-2M bytes (4)	(2) 512KB	No	No	No
Disk pack/cartridge drives	Optional	Cartridge, 24-48MB	Std.; 13MB	Std.; 30MB	Std.; (2) 74MB
Drum/fixed-head disk storage	Optional; 10-100MB Winchester	No	No	No	No
Magnetic tape cassettes/cartridges	A/R (optional)	No	No	No	No
Magnetic tape, ½-inch	Opt.; 800/1600 bpi	No	No/Opt. 800/1600 bpi	Opt.; 800/1600 bpi	Opt.; 800/1600 bpi
Serial printer	30-180 cps	45-55 cps	Opt.; 40 cps	Opt.; 40 cps	Opt.; 40 cps
Line printer	A/R (opt.); to 900 lpm	300 lpm, 150 cps	Opt.; 200-1000 lpm	Opt.; 200-1000 lpm	Opt.; 200-1000 lpm
Data communications interface	To 19.2K bps	Up to 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
CRT	Std.; 25 x 80 char.	Std.; 1920 char.	Std.; 1920 char.	Std.; 1920 char.	Std.; 1920 char.
Other supported peripheral units	Plotters, graphic CRT, A/D-D/A I/O	Phototypesetter, OCR	OCR	OCR, IBM 6670 & 6640	OCR, IBM 6670 & 6640
SOFTWARE					
Assembler	Yes; macro assembler (optional)	Yes	No	No	No
Compilers	Basic, Fortran, Pascal, PI/M, Cobol	See Comments	No	No	No
Operating system	Optional (multi-user), UNIX, MP/M	Multi-tasking	Batch, multi-tasking, multi-user, real-time	Batch, real-time, multi-tasking, -user	Batch, real-time, multi-tasking, -user
Language implemented in firmware	Optional	No	No	No	No
Operating system implemented in firmware	Optional	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	2,000 (basic system)	16,900	19,950*/45,400	57,400*	85,400*
Monthly maint. of basic configuration above for on-site contract, $	Options	155	115/355	405	670
Discounts available	Yes	GSA	No	No	No
Price of memory increment, $	490 (64K bytes)	—	6,500 (128KB) (Barrister 121)	6,500 (128KB)	6,500 (128KB)
Date of first delivery	1981	1983	1980	1980	1980
Number installed to date	NA	—	NA	NA	NA
COMMENTS	Modular computer system designed for general applications and special business, communications, and real-time/control operations; high resolution CRT available as an option; color graphics and video options are available; multi-user options for up to 16 terminals	Basic, Data-Rite, Report-Rite	*Includes 64K/128K CPU, (1) 13MB disk, disk controller, five-device controller, operating system and word processing software	*Includes 128KB CPU, (1) 30MB disk, disk controller, eight-device controller, operating system and word processing software	*Includes 128KB CPU, (2) 74MB disks, disk controller, eight-device controller, operating system and word processing software

All About Minicomputers

MANUFACTURER AND MODEL	Barrister Information Systems Corporation Barrister 410	Barrister Information Systems Corporation Barrister 510	Central Data Corp. Roloff System	Centurion MicroPlus	Centurion 5200
WORD LENGTH, BITS	16 + 5	16 + 5	16	8	8
NO. WORKSTATIONS SUPPORTED	15-30	15-30	32	4	12
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.8/0.4	0.8/0.4	0.33	0.8/0.2	0.8/0.2
Min./Max. capacity	256K-2048KB	256K-2048KB	64K/8MW	64K/128K	64K/256K
Parity checking	No	No	Standard	No	Standard
Error correction	Standard	Standard	Optional	No	No
Storage protection	Standard	Standard	Standard	No	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	32K	32K	8M	64K bytes	64K bytes
Control storage	Standard	Standard	PROM; 21KW	PROM; 7, 512 x 8	PROM; 14, 1024 x 8
Add time, microseconds	—	—	1.25	1.6	1.6
Hardware multiply/divide	Standard	Standard	Standard	No	Standard
Hardware floating point	Standard	Standard	Optional	No	No
Hardware byte manipulation	Standard	Standard	Standard	No	Standard
Battery backup	Standard	Standard	No	No	No
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1.25M/5MB	1.25M/5MB	1M	1.25M	1.25M
No. of external interrupt levels	16	16	8	0-16	0-16
COMMUNICATIONS					
Maximum number of lines	8	8	32	1	1
Synchronous	Opt.; 9600 bps	Opt.; 9600 bps	Optional	No	Opt.; 50K bps
Asynchronous	Std.; 9600 bps	Std.; 9600 bps	Standard	Std.; 9600 bps	Std.; 9600 bps
Protocols supported	IBM 6670 BSC	IBM 6670 BSC	—	Async	2780/3780, RS-232-C
Network architectures supported	Barrister/Net	Barrister/Net	—	None	None
RJE terminals emulated	No	No	—	None	Yes
IBM 3270 emulation	No	No	—	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	No	Std.; 2M bytes	Std.; 1.2M bytes	Std.; 1.2M bytes
Disk pack/cartridge drives	Std.; (2) 74MB	Std.; (2) 280MB	Std.; 10M bytes	Std.; 8M-40MB bytes	No Std.; 8-40MB
Drum/fixed-head disk storage	No	No	No	No	
Magnetic tape cassettes/cartridges	No	No	Opt.; 20M bytes	No	No
Magnetic tape, ½-inch	Opt.; 800/1600 bpi	Opt.; 800/1600 bpi	No	No	No
Serial printer	Opt.; 40 cps	Opt.; 40 cps	Opt.; 120 cps	Opt.; 75-150 cps	Std.; 75-150 cps
Line printer	Opt.; 200-1000 lpm	Opt.; 200-1000 lpm	Opt.; 300 lpm	Opt.; 200-600 lpm	Opt.; 200-600 lpm
Data communications interface	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; Async	No	Std.; 1.2-9.6K
CRT	Std.; 1920 char.	Std.; 1920 char.	Opt.; 1920 char.	Std.; 1920 char.	Std.; 1920 char.
Other supported peripheral units	OCR, IBM 6670 & 6640	OCR, IBM 6670 & 6640	—	Any RS-232-C device	Any RS-232-C device
SOFTWARE					
Assembler	No	No	Zilog Z8000	Yes	Yes
Compilers	No	No	Cobol, Basic, C	CPL, JCL, Adart	Cobol, Basic, CPL, Adart
Operating system	Batch, real-time, multi-tasking, -user	Batch, real-time, multi-tasking, -user	Multi-tasking	Multi-tasking	Multi-tasking
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	95,400*	139,200*	5,075	9,500	20,100
Monthly maint. of basic configuration above for on-site contract, $	795	1,030	NA	See dealer	See dealer
Discounts available	No	No	35%, qty. & dealer	See dealer	See dealer
Price of memory increment, $	5,900 (256KB)	5,900 (256KB)	1,775 (64KW)	NA	NA
Date of first delivery	1980	1981	November 1980	January 1982	May 1982
Number installed to date	NA	NA	35	380	NA
COMMENTS	*Includes 128KB CPU, (2) 74MB disks, disk controller, eight-device controller, operating system and word processing software	*Includes 256KB CPU, (2) 280MB disks, disk controller, operating system, and word processing software		Application software available for general business, wholesalers, accountants, medical billing, insurance agencies, service industries, banking, manufacturing	Application software available for general business, wholesalers, accountants, medical billing, insurance, service industries, banking, and manufacturing

All About Minicomputers

MANUFACTURER AND MODEL	Centurion 5300	Centurion 6400	Centurion 6500	Century Computer 400	Century Computer 700
WORD LENGTH, BITS	8	8	8	8, 16	8, 16
NO. WORKSTATIONS SUPPORTED	32	32	12	8	20
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.8/0.2	0.8/0.2	0.8/0.2	0.4/0.2	0.4/0.2
Min./Max. capacity	64K/256K	64K/256KB	64K/256KB	64K/256KB	96K/256KB
Parity checking	Standard	Standard	Standard	No	No
Error correction	No	No	No	Standard	Standard
Storage protection	Standard	Standard	Standard	No	No
CENTRAL PROCESSOR					
No. of directly addressable words	64K bytes	64K bytes	64K bytes	64K bytes	64K bytes
Control storage	PROM; 14, 1024 x 8	PROM; 14, 1024 x 8	PROM; 14, 1024 x 8	4K x 48	4K x 48
Add time, microseconds	1.6	1.6	1.6	1.4 (16 bits)	1.4 (16 bits)
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	No	No	No	Standard	Standard
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	No	No	No	No	No
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1.25M	1.25M	1.25M	1.6M bytes	1.6M bytes
No. of external interrupt levels	0-16	0-16	0-16	15	15
COMMUNICATIONS					
Maximum number of lines	1	1	1	16	20
Synchronous	Opt.; 50K bps	Opt.; 50K bps	Opt.; 50K bps	Opt.; 9600 bps	Opt.; 9600 bps
Asynchronous	Std.; 9600 bps	Std.; 9600 bps	Std.; 9600 bps	Std.; 19,200 bps	Std.; 19,200 bps
Protocols supported	2780/3780, RS-232-C	IBM 2780/3780, RS-232-C	IBM 2780/3780, RS-232-C	Bisync/Async	Bisync/Async
Network architectures supported	None	None	None	—	—
RJE terminals emulated	Yes	Yes	Yes	2780/3780	2780/3780
IBM 3270 emulation	No	No	No	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Std.; 1.2M bytes	No	No	No	No
Disk pack/cartridge drives	No	Std.; 64MB	Std.; 64MB	Both; (10) 320K, 150-300M bytes	Both; (10) 640K, 150-300M bytes
Drum/fixed-head disk storage	Std.; 8-40MB	No	No	No	No
Magnetic tape cassettes/cartridges	No	No	No	No	No
Magnetic tape, ½-inch	No	Std.; 1600 bpi	Std.; 1600 bpi	36 KBS	36 KBS
Serial printer	Std.; 75-150 cps	Std.; 75-150 cps	Std.; 75-150 cps	165 cps	165 cps
Line printer	Opt.; 200-600 lpm	Opt.; 200-600 lpm	Opt.; 200-600 lpm	300 lpm	300-600 lpm
Data communications interface	Std.; 1.2-9.6K	Std.; 1.2-9.6K bps	Std.; 1.2-9.6K bps	9600 bps	9600 bps
CRT	Std.; 1920 char.	Std.; 1920 char.	Std.; 1920 char.	1920 characters	1920 characters
Other supported peripheral units	Any RS-232-C device	Any RS-232-C device	Any RS-232-C device	—	—
SOFTWARE					
Assembler	Yes	Yes	Yes	Assembler and macro assembler	Assembler and macro assembler
Compilers	Cobol, Basic, CPL, Adart	Cobol, Basic, CPL, Adart, JCL	Cobol, Basic, CPL, Adart	Basic, Fortran, Pascal, Forth	Basic, Fortran, Pascal, Forth
Operating system	Multi-tasking	Multi-tasking	Multi-tasking	Real-time, multi-tasking	Real-time, multi-tasking
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	22,300	37,650	35,000	Contact vendor	Contact vendor
Monthly maint. of basic configuration above for on-site contract, $	See dealer	See dealer	See dealer	Contact vendor	Contact vendor
Discounts available	See dealer	See dealer	See dealer	OEM	OEM
Price of memory increment, $	NA	NA	NA	—	—
Date of first delivery	May 1982	—	—	June 1975	June 1975
Number installed to date	NA	—	—	NA	NA
COMMENTS	Application software available for general business, wholesalers, accountants, medical billing, insurance, service industries, banking and manufacturing	Application software available for general business, wholesalers, accountants, medical billing, insurance, service industries, banking and manufacturing	Application software available for general business, wholesalers, accountants, medical billing, insurance, service industries, banking and manufacturing	Additional workstations available; complete turnkey system for gen. business, acctg., fleet mgt., credit unions, inv. control, finance, construction, school district acctg.; package works on all models	See Century Computer 400 Comments

All About Minicomputers

MANUFACTURER AND MODEL	Century Computer 1000	Compal 8200	Compal 8200 PLUS	Computer Designed Systems Adviser IV/700	Computer Designed Systems Adviser IV/800
WORD LENGTH, BITS	8, 16	8	8	16 + 2	16 + 2
NO. WORKSTATIONS SUPPORTED	32	1	1-4	32	64
MAIN STORAGE					
Storage type	MOS	MOS	MOS	Core, MOS	Core, MOS
Cycle/access time, microseconds	0.4/0.2	1.6/0.4	1.6/0.4	0.5, 0.8/0.04	0.5, 0.8/0.04
Min./Max. capacity	160K/1MB	56K/56KB	56K/256K	16K/8000KB	16K/8000KB
Parity checking	No	No	No	Optional	Optional
Error correction	Standard	No	No	Optional	Optional
Storage protection	No	No	No	Optional	Optional
CENTRAL PROCESSOR					
No. of directly addressable words	64K bytes	64K bytes	64K bytes	64K bytes	64K bytes
Control storage	4K x 48	No	No	ROM; 10K x 32 bits	ROM; 10K x 32 bits
Add time, microseconds	1.4 (16 bits)	2.8	2.8	1.05	1.05
Hardware multiply/divide	Standard	No	No	Standard	Standard
Hardware floating point	Standard	No	No	Optional	Optional
Hardware byte manipulation	Standard	Yes	Yes	Standard	Standard
Battery backup	No	No	No	Optional	Optional
Real-time clock or timer	Standard	Optional	Optional	Optional	Optional
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	No	No	Standard	Standard
Maximum I/O rate, words/sec.	1.6M bytes	500K bytes	5M bytes	1.6M	1.6M
No. of external interrupt levels	15	9	9	1-125	1-125
COMMUNICATIONS					
Maximum number of lines	32	3	3	32	32
Synchronous	Opt.; 9600 bps	Std.; 110-9600 bps	Std.; 110-9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
Asynchronous	Std.; 19,200 bps	Std.; 110-9600 bps	Std.; 110-9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
Protocols supported	Bisync/Async	Async, Bisync, TTY, 3270	Async, Bisync	2780, 3780, SNA/SDLC	2780, 3780, SNA/SDLC
Network architectures supported	—	—	—	SNA (opt.)	SNA (opt.)
RJE terminals emulated	2780/3780	2780/3780	2780/3780	2780/3780	2780/3780
IBM 3270 emulation	Yes	Yes	Yes	Optional	Optional
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	Std.; 1.2-2.4MB	Std.; 630K	No	No
Disk pack/cartridge drives	Both; (10) 1200K, 300-500M bytes	—	—	Both; 2400M bytes	Both; 2400M bytes
Drum/fixed-head disk storage	No	Opt.; 10-32MB	Std.; 5M-32MB	No	No
Magnetic tape cassettes/cartridges	No	No	Optional; 14.5MB	No	No
Magnetic tape, ½-inch	36 KBS	Optional	Optional	120 KBS	120 KBS
Serial printer	165 cps	55, 80, 150 cps	55, 80, 150 cps	200 cps	200 cps
Line printer	300-600 lpm	No	No	300-1200 lpm	300-1200 lpm
Data communications interface	9600 bps	110-9600 bps	110-9600 bps	To 9600 bps	To 9600 bps
CRT	1920 characters	1920 characters	1920 characters	80 x 24 char.	80 x 24 char.
Other supported peripheral units	—	—	—	A/D-D/A conv., plotters, graphics	A/D-DA conv., plotters, graphics
SOFTWARE					
Assembler	Assembler and macro assembler	Assembler and macro assembler	Assembler and macro assembler	Macro assembler	Macro assembler
Compilers	Basic, Fortran, Pascal, Forth	Basic, Cobol, Fortran, Pascal	Basic, Cobol, Fortran, Pascal	Pascal, Cobol, Basic, Fortran,	Pascal, Cobol, Basic, Fortran,
Operating system	Real-time, multi-tasking	Real-time	Real-time	Batch, real-time, multi-task, interactive	Batch, real-time, multi-task, interactive
Language implemented in firmware	No	No	No	Partially	Partially
Operating system implemented in firmware	No	Partially	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	Contact vendor	12,500	14,500	59,000 (64KB)	82,000 (64KB)
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	63	73	5,400	5,400
Discounts available	OEM	OEM	OEM	Quantity	Quantity
Price of memory increment, $	—	NA	NA	18,000 (64KB)	18,000 (64KB)
Date of first delivery	June 1975	November 1979	November 1981	October 1977	October 1977
Number installed to date	NA	Over 500	NA	NA	NA
COMMENTS	See Century Computer 400 Comments; also available is an auto parts package, an aircraft parts package, and a word processing package	Price includes turnkey computer systems with a printer, one application software package, training, installation, on-going support	Price includes turnkey computer systems with a printer, one application software package, training, installation, on-going support	Single source responsibility, field upgradable, virtual mem., min. terminal degradation under load, turnkey systems avail., interactive, direct processing system	Single source responsibility, upgradable, virtual degradation, turnkey avail., interactive, direct processing system

All About Minicomputers

MANUFACTURER AND MODEL	Computer Hardware Inc. 3230	Computer Hardware Inc. 4210	Computer Talk Model 400	Computer Talk Model 407	Computer Talk Model 408
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	32	4	256	256	256
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	1.6/0.25	0.47/0.3	0.5, 0.3/0.3, 0.15	0.5, 0.3/0.3, 0.15	0.5, 0.3/0.3, 0.15
Min./Max. capacity	8K/64KW	4K/26KW	16K/512KW	16K/512KW	16K/512KW
Parity checking	Standard	Standard	Standard	Standard	Standard
Error correction	No	No	Standard	Standard	Standard
Storage protection	Standard	Optional	See Comments	See Comments	See Comments
CENTRAL PROCESSOR					
No. of directly addressable words	64K	32K	32K; 512K	32K; 512K	32K; 512K
Control storage	No	No	PROM; 2K words	PROM; 2K words	PROM; 2K words
Add time, microseconds	2.7	4.662	1.0	1.0	1.0
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	Optional	No	Standard	Standard	Standard
Hardware byte manipulation	No	Standard	Standard	Standard	Standard
Battery backup	No	No	Standard	Standard	Standard
Real-time clock or timer	Optional	Optional	Standard with date	Standard with date	Standard with date
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1.25M	—	1M	1M	1M
No. of external interrupt levels	8	8	1-256	1-256	1-256
COMMUNICATIONS					
Maximum number of lines	32	4	256	256	256
Synchronous	Opt.; 50-9600 bps	Opt.; 50-9600 bps	Opt.; 50-9600 bps	Opt.; 50-9600 bps	Opt.; 50-9600 bps
Asynchronous	Opt.; 50-9600 bps	Opt.; 50-9600 bps	Opt.; 50-9600 bps	Opt.; 50-9600 bps	Opt.; 50-9600 bps
Protocols supported	Bisync	Bisync	Async, Bisync, SDLC	Async, Bisync, SDLC	Async, Bisync, SDLC
Network architectures supported	None	None	None	None	None
RJE terminals emulated	IBM 2780/3780	IBM 2780/3780	Most RJE terminals	Most RJE terminals	Most RJE terminals
IBM 3270 emulation	No	No	Yes	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	Yes	110K-10,240K bytes	110K bytes	110K-10240K bytes
Disk pack/cartridge drives	Pack; 1600M bytes	No	Both; 1.2M-1 billion bytes	Both; 1.2M-1 billion bytes	Both; 1.2M-1 billion bytes
Drum/fixed-head disk storage	No	No	Moving-head; 30M bytes	Moving-head; 30M bytes	Moving-head; 30M bytes
Magnetic tape cassettes/cartridges	—	—	30-800 cps; 4 KBS	30-800 cps; 4 KBS	100 cps; 50 KBS
Magnetic tape, ½-inch	Yes	No	35-120 KBS	35-120 KBS	35-120 KBS
Serial printer	No	30-180 cps	10-200 cps	10-200 cps	10-200 cps
Line printer	300, 600 lpm	300 lpm	220-600 lpm	300 lpm	300 lpm
Data communications interface	To 4800 bps; synch.	9600 bps	50-9600; 56K bps	50-9600; 56K bps	50-9600; 56K bps
CRT	80 char. x 24 lines	80 char. x 24 lines	96 char. x 32 lines	96 char. x 32 lines	96 char. x 32 lines
Other supported peripheral units	Card reader, PT, plotter	None	Digitizers, plotters, factory automation equipment	Digitizers, plotters factory automation equipment	Digitizers, plotters factory automation equipment
SOFTWARE					
Assembler	Assembler & macro assembler	Assembler	Assembler and macro assembler	Assembler and macro assembler	Assembler and macro assembler
Compilers	Cobol, Fortran, RPG	Fortran	Basic, Fortran	Basic, Fortran	Basic, Fortran
Operating system	Batch, time-sharing	Real-time	Batch, real-time, time-sharing	Batch, real-time, time-sharing	Batch, real-time, time-sharing
Language implemented in firmware	No	No	Partially	Partially	Partially
Operating system implemented in firmware	No	No	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	15,000 (16K bytes)	13,200	32,144 (16KW MOS)	40,572 (16KW MOS)	41,474 (16KW MOS)
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	Contact vendor	—	—	—
Discounts available	Contact vendor	Contact vendor	Volume	Volume	Volume
Price of memory increment, $	1,500 (16K bytes)	960 (8K bytes)	3,200 (16K words)	3,200 (16K words)	3,200 (16K words)
Date of first delivery	April 1976	October 1977	May 1975	January 1978	January 1978
Number installed to date	NA	NA	NA	NA	NA
COMMENTS		Price includes CPU, two 250K-byte diskettes, a cassette, a 60-cps printer, operating system, and a time system application	Storage protection std. by memory partition and opt. by page; mapping to 512K opt.; 4K PROM opt.; on low power, memory is stored on disk; price includes CRT, light pen, modem, 30M byte disk, arith. & I/O processors, & battery pack operation	Expanded Model 400 with additional features; disk expanded to 30M bytes, 300-lpm x 132 printer and mini-floppy disk for I/O	Expanded Model 400 with additional features; disk expanded to 30M bytes, 300-lpm x 132 printer and mini-floppy disk for I/O

All About Minicomputers

MANUFACTURER AND MODEL	Convergent Technologies AWS Family (210/220/230/240/250/260)	Convergent Technologies IWS Family (110 & 120)	Data General Eclipse C/150	Data General Eclipse C/350	Data General Eclipse M/600
WORD LENGTH, BITS	16	16	16 + 5	16 + 5	16 + 5
NO. WORKSTATIONS SUPPORTED	4	16	16	24	64
MAIN STORAGE					
Storage type	MOS	MOS	MOS	Core, MOS	Core, MOS
Cycle/access time, microseconds	0.1/0.25	0.75/0.2	0.8/0.4	0.8/0.4	0.8/0.4
Min./Max. capacity	128K/512KB	128K/1024KB	256K/1024KB	64K/2048KB	256K/2048KB
Parity checking	Standard	Standard	No	No	No
Error correction	No	No	Standard	Standard	Standard
Storage protection	No	No	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	1024K	1024K	32K	32K	32K
Control storage	4K bytes	4K-160K bytes	ROM; 2K x 56 bits	ROM; 2K x 56 bits	ROM; 2K x 56 bits
Add time, microseconds	0.8	0.6	0.6	0.6	0.6
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	No	Optional	Standard	Standard	Standard
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	No	No	Standard	Optional	Optional
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Std.; 3	Std.; 4	Standard	Standard	Standard
Maximum I/O rate, words/sec.	625K bytes/sec.	2.66M bytes/sec.	1.25M	1.25M/5.0M	1.25M/5.0M
No. of external interrupt levels	9	30	16	16	16
COMMUNICATIONS					
Maximum number of lines	3	22	—	—	—
Synchronous	Std.; to 9600 bps	Std.; to 9600 bps	Opt.; 56,000 bps	Opt.; 56,000 bps	Opt.; 56,000 bps
Asynchronous	Std.; to 19.2K bps	Std.; to 19.2K bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
Protocols supported	X.25, 2780/3780, JES 2 & 3	X.25, 2780/3780, JES 2 & 3	Bisync., X.25, SNA/SDLC	Bisync., X.25, SNA/SDLC	Bisync., X.25, SNA/SDLC
Network architectures supported	SNA	SNA	X.25, SNA, Xodiac	X.25, SNA, Xodiac	X.25, SNA, Xodiac
RJE terminals emulated	2780/3780	2780/3780	2780/3780, HASP	2780/3780, HASP	2780/3780, HASP
IBM 3270 emulation	Yes	Yes	Yes	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Opt.; (2) 1.2MB	Opt.; (3) 500KB	315K-2.5M bytes	315K-2.5M bytes	315K-2.5M bytes
Disk pack/cartridge drives	Opt.; 10/20/40MB Winchester	Opt.; 10/20/40MB Winchester	Pack & cartridge; 10-1520M bytes	Pack & cartridge; 10-1520M bytes	Pack & cartridge 10-6080M bytes
Drum/fixed-head disk storage	—	—	Fixed-head; 1-16M bytes	Fixed-head; 1-16M bytes	Fixed-head; 1-16M bytes
Magnetic tape cassettes/cartridges	—	—	No	No	No
Magnetic tape, ½-inch	—	Optional	10-72 KBS	10-72 KBS	10-72 KBS
Serial printer	Standard	Standard	180 cps	180 cps	180 cps
Line printer	Standard	Standard	300-900 lpm	300-900 lpm	300-900 lpm
Data communications interface	Std.; RS-232, RS499	Std.; RS-232-C, RS499	56,000 bps	56,000 bps (max.)	56,000 bps (max.)
CRT	80 x 28 char.	80/132 x 34 char.	135 char. x 24 lines	135 char. x 24 lines	135 char. x 24 lines
Other supported peripheral units	—	Multibus cards	Modular digital & analog data control & acq. subsys. opt.	Modular digital & analog data control & acq. subsys. opt.	Modular digital & analog data control & acq. subsys. opt.
SOFTWARE					
Assembler	Yes	Yes	Assembler & macro assembler	Assembler & macro assembler	Assembler & macro assembler
Compilers	Cobol, Basic, Fortran, Pascal	Cobol, Basic, Fortran, Pascal	Cobol, Basic, RPG II, Fortran, PL/1, DG/L	Cobol, Basic, RPG II, Fort., PL/1, Algol	Cobol, Basic, RPG II, Fortran, PL/1
Operating system	Real-time, batch, multi-tasking	Real-time, batch, multi-tasking	Batch, real-time, time-shar., multipro.	Batch, real-time, time-sharing	Batch, real-time, time-sharing
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	3,990	6,500	30,220 (256K bytes)	59,000 (128K bytes)	99,300 (256K bytes)
Monthly maint. of basic configuration above for on-site contract, $	—	—	262	347	520
Discounts available	OEM	OEM	Various types	Various types	Various types
Price of memory increment, $	—	—	6,000 (64K bytes)	6,000 (64KB MOS)	6,000 (64KB MOS)
Date of first delivery	1981	1980	March 1979	January 1979	June 1978
Number installed to date	NA	NA	NA	NA	NA
COMMENTS	Optional 64 color bit mapped screen	Optional 656 x 510 bit mapped screen	C/150 AOS compatible with C/350 and M/600 AOS systems	Standard features include extended floating-point functions, and a commercial instruction set; a 10MB/second Burst Multiplexer Channel is optional	Includes I/O processor with 64KB for handling low-speed character-oriented data movement; a 10MB/second Burst Multiplexer channel is optional; supports a variety of data base management systems and the AZ-TEXT WP package

All About Minicomputers

MANUFACTURER AND MODEL	Data General Eclipse S/130	Data General Eclipse S/140	Data General Eclipse S/250	Data General Nova 4C	Data General Nova 4S
WORD LENGTH, BITS	16 + 5	16 + 5	16	16	16
NO. WORKSTATIONS SUPPORTED	16	12	16	4	8
MAIN STORAGE					
Storage type	Core, MOS	MOS	Core, MOS	MOS	MOS
Cycle/access time, microseconds	0.8/0.4	0.4/0.2	0.8/0.4	0.4	—
Min./Max. capacity	32K/1024KB	128K/2MB	64K/2048KB	32K/64KB	32K/64KB
Parity checking	No	No	Standard	No	No
Error correction	Opt. (core), std. (MOS)	Standard	Standard	No	No
Storage protection	Standard	Standard	Standard	No	No
CENTRAL PROCESSOR					
No. of directly addressable words	32K	32K	32K	32K	32K
Control storage	PROM; 2K x 56 bits	ROM; 2K x 56 bits	ROM; 2K x 56 bits	No	No
Add time, microseconds	0.2	0.2	—	0.4	0.4
Hardware multiply/divide	Standard	Standard	Standard	Optional	Optional
Hardware floating point	Optional	Optional	Standard	No	Optional
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	—	Standard	Optional	Optional	Optional
Real-time clock or timer	Optional	Standard	Standard	Optional	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1.25M	5M	1.25M/5M	630K	1M
No. of external interrupt levels	16	16	16	16	16
COMMUNICATIONS					
Maximum number of lines	—	—	—	128	128
Synchronous	Opt.; 56,000 bps	Opt.; 56,000 bps	Opt.; 56,000 bps	Opt.; (32) 56K bps	Opt.; (32) 56K bps
Asynchronous	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.;(128) 19.2K bps	Opt.;(128) 19.2K bps
Protocols supported	Bisync., X.25	Bisync., X.25	Bisync, X.25	Bisync., X.25	Bisync., X.25
Network architectures supported	X.25	X.25	X.25	Xodiac, IBM BSC	Xodiac, IBM BSC
RJE terminals emulated	2780/3780, HASP	2780/3780, HASP	2780/3780, HASP	2780/3780, HASP II	2780/3780, HASP II
IBM 3270 emulation	Yes	Yes	Yes	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	315K-4.8M bytes	315K-4.8M bytes	315K-4.8M bytes	Yes	Yes
Disk pack/cartridge drives	Pack & cartridge; 10-1108M bytes	Pack & cartridge; 10-1108M bytes	Pack & cartridge; 10-1108M bytes	Yes	Yes
Drum/fixed-head disk storage	Fixed-head; 1-16M bytes	Fixed-head; 1-16M bytes	Fixed-head; 1-16M bytes	Yes	Yes
Magnetic tape cassettes/cartridges	No	No	No	Yes	Yes
Magnetic tape, ½-inch	10-72 KBS	10-72K bps	10-72K bps	Yes	Yes
Serial printer	180-340 cps	180-340 cps	180-340 cps	Yes	Yes
Line printer	300-900 lpm	300-900 lpm	300-900 lpm	Yes	Yes
Data communications interface	56,000 bps	56,000 bps	56,000 bps	Yes	Yes
CRT	80 char. x 24 lines	80 char. x 24 lines	80 char. x 24 lines	Yes	Yes
Other supported peripheral units	Modular digital & analog data control & acq. subsys. opt.	Modular digital & analog data control & acq. subsys. opt.	Modular digital & analog data control & acq. subsys. opt.	Digital & analog, data control subsystem	Digital & analog, data control subsystem
SOFTWARE					
Assembler	Assembler & macro assembler	Assembler & macro assembler	Assembler & macro assembler	Yes	Yes
Compilers	Fortran, Basic, Algol, DG/L, Pascal	Cobol, PL/1, Pascal, Basic, Fortran, DG/L	Fortran, Bas., Pas., Algol, DG/L, PL/1	Basic, Fortran, Algol, Pascal	Basic, Fortran, Algol
Operating system	Batch, real-time, time-sharing	Batch, real-time, time-sharing	Real-time, batch, time-sharing	Real-time, multi-tasking	Real-time, multi-tasking
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	14,715 (32KB core)	19,400 (128K bytes)	40,000 (64K bytes)	3,475 (32K bytes)	6,835 (32K bytes)
Monthly maint. of basic configuration above for on-site contract, $	122	125	300	50	63
Discounts available	Various types	Various types	Various types	—	—
Price of memory increment, $	5,000 (128K bytes)	5,250 (128K bytes)	5,000 (128K bytes)	1,700 (32K bytes)	1,700 (32K bytes)
Date of first delivery	July 1977	March 1980	January 1979	1979	1979
Number installed to date	NA	NA	NA	40,000 (all Nova models)	40,000 (all Nova models)
COMMENTS	256 56-bit words of Writable Control Storage (WCS) optionally available; 1K of user control storage, character instruction set, firmware FPU, and hardware FPU are also optionally available	Options include firmware FPU, hardware FPU, character instruction set, and Burst Multiplexer Channel	Options include a high-speed Burst Multiplexer Channel (BMC), an Integral Array Processor, a Character Instruction Set, and a Writable or Fixed User Control Storage		

All About Minicomputers

MANUFACTURER AND MODEL	Data General Nova 4X	Dataram B23 Plus	Dataram M23	Dataram W23	Digital Equipment PDP-11/03
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	16	Software dependent	Software dependent	Software dependent	Up to 127
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	—	0.5/0.3	0.5/0.3	0.5/0.3	1.2
Min./Max. capacity	128K/256KB	256KB/4MB	256KB/4MB	256KB/4MB	32K/64KB
Parity checking	No	Optional	Optional	Optional	No
Error correction	No	No	No	No	No
Storage protection	Yes	No	No	No	No
CENTRAL PROCESSOR					
No. of directly addressable words	32K	2048K words	2048K words	2048K words	32K bytes
Control storage	No	—	—	—	ROM; PROM; 1K
Add time, microseconds	0.4	3.5	3.5	3.5	3.5
Hardware multiply/divide	Optional	Optional	Optional	Optional	Standard
Hardware floating point	Optional	Optional	Optional	Optional	Standard
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	No	No	No	No
Real-time clock or timer	Standard	Optional	Optional	Optional	Optional
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1M	833K	833K	833K	1.67M bytes
No. of external interrupt levels	16	Variable	Variable	Variable	Variable
COMMUNICATIONS					
Maximum number of lines	128	—	—	—	—
Synchronous	Opt.; (32) 56K bps	—	—	—	Up to 1M bps
Asynchronous	Opt.;(128) 19.2K bps	—	—	—	Up to 9600 bps
Protocols supported	Bisync., X.25	—	—	—	DDCMP, DNA
Network architectures supported	Xodiac, IBM BSC	—	—	—	DECnet
RJE terminals emulated	2780/3780, HASP II	—	—	—	Control Data, Univac
IBM 3270 emulation	No	—	—	—	—
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Yes	No	No	No	256K-512K bytes
Disk pack/cartridge drives	Yes	No	No	No	Cartridge; 5.2M-10.4M bytes
Drum/fixed-head disk storage	Yes	No	No	No	No
Magnetic tape cassettes/cartridges	Yes	No	No	No	Cassette; 562 cps
Magnetic tape, ½-inch	Yes	No	No	No	No
Serial printer	Yes	No	No	No	180 cps
Line printer	Yes	No	No	No	300-600 lpm
Data communications interface	Yes	No	No	No	50-56,000 bps
CRT	Yes	No	No	80MB Winchester	—
Other supported peripheral units	Digital & analog, data control subsystem				Serial line and parallel line controllers
SOFTWARE					
Assembler	Yes	Assembler, macro-assembler	Assembler, macro-assembler	Assembler, macro-assembler	Assembler & macro assembler
Compilers	Basic, Fortran, Algol	NA	NA	NA	Basic, Fortran
Operating system	Real-time, multi-tasking	Batch, real-time	Batch, real-time	Batch, real-time	Batch, real-time
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	12,080 (128K bytes)	4,355 (256KB)	9,400 (1MB)	17,750 (1MB)	Contact vendor
Monthly maint. of basic configuration above for on-site contract, $	88	NA	NA	NA	Contact vendor
Discounts available	—	Quantity	Quantity	Quantity	—
Price of memory increment, $	3,800 (128K bytes)	Varies	Varies	Varies	Contact vendor
Date of first delivery	1979	1981	1982	1982	NA
Number installed to date	40,000 (all Nova Models)	—	—	—	Over 15,000
COMMENTS		Incorporates DEC LSI-11/23 processor	Incorporates DEC LSI-11/23 processor and Dataram's Q-MAP™	Incorporates DEC LSI-11/23 processor and Dataram's Q-MAP™ I/O mapping of 18 bit peripherals. Also includes Fuji M2312 and controller.	LSI-11 bus; uses LSI-11 microprocessor

All About Minicomputers

MANUFACTURER AND MODEL	Digital Equipment PDP-11/23	Digital Equipment PDP-11/23-PLUS	Digital Equipment PDP-11/24	Digital Equipment PDP-11/34A	Digital Equipment PDP-11/44
WORD LENGTH, BITS	16 + 2	16	16, 16 + 2, 16 + 6	16 + 2	16 + 2
NO. WORKSTATIONS SUPPORTED	Up to 127	Up to 127	Up to 127	Up to 127	Up to 127
MAIN STORAGE					
Storage type	MOS	MOS	MOS	Core, MOS	MOS/cache
Cycle/access time, microseconds	0.5	—	—	0.98; 0.725/0.51	0.48, 0.96/0.48
Min./Max. capacity	128K/256KB	256K/1MB	128K/1MB	16K/124KB	256K/1MB
Parity checking	No	Standard	Standard	Standard	No
Error correction	No	No	Standard	No	Standard
Storage protection	No	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	64K bytes	1M bytes	Up to 1M bytes	32K	32K
Control storage	—	ROM	—	—	No
Add time, microseconds	1.72	—	—	2.03	0.87
Hardware multiply/divide	Standard	Standard	Standard	Optional	Standard
Hardware floating point	Optional	Optional	Optional	Optional	Optional
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	No	No	Optional	Optional	Optional
Real-time clock or timer	Optional	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	—	—	—	—	1M
No. of external interrupt levels	Variable	Variable	Variable	Variable	4
COMMUNICATIONS					
Maximum number of lines	—	2	—	—	—
Synchronous	Up to 1M bps	Up to 1M bps	Up to 1M bps	Up to 1M bps	Up to 1M bps
Asynchronous	Up to 9600 bps	Up to 9600 bps	Up to 9600 bps	Up to 9600 bps	Up to 9600 bps
Protocols supported	DDCMP, DNA	DDCMP, DNA	DDCMP, DNA	DDCMP, DNA	DDCMP, DNA
Network architectures supported	DECnet	DECnet	DECnet	DECnet	DECnet
RJE terminals emulated	Control Data, Univac	Control Data, Univac	IBM, CDC, Univac	Control Data, Univac	Control Data, Univac
IBM 3270 emulation	—	—	—	—	—
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	256K-512K bytes	256K-512K bytes	256K-512K bytes	256K-512K bytes	256K-512K bytes
Disk pack/cartridge drives	Cart.; 5.2-10.4M bytes	Cart.; 20.8M bytes	Cartridge & pack; 2.5M-1408MB	Cart. & pack; 2.5-1408M bytes	Both; 2.5-1408M bytes
Drum/fixed-head disk storage	No	No	Fixed-head; 512K-8M bytes	Fixed-head; 512K-8M bytes	Fixed-head; 512K-8M bytes
Magnetic tape cassettes/cartridges	Cassette; 562 cps	Cassette; 562 cps	Cassette; 562 cps	Cassette; 562 cps	Cassette; 562 cps
Magnetic tape, ½-inch	No	No	10-72 KBS	10-72 KBS	10-72 KBS
Serial printer	180 cps	180 cps	30-180 cps	30-180 cps	30-180 cps
Line printer	300-600 lpm	300-600 lpm	230-120 lpm	230-1200 lpm	230-1200 lpm
Data communications interface	50-56,000 bps	50-56,000 bps	50-56,000 bps	50-56,000 bps	50-56,000 bps
CRT	—	—	80 char. x 24 lines	—	80 char. x 24 lines
Other supported peripheral units	—	—	Paper tape reader, paper tape punch	Paper tape reader; paper tape punch	Paper tape units
SOFTWARE					
Assembler	Assembler & macro assembler	Assembler & macro assembler	Assembler & macro assembler	Assembler & macro assembler	Assembler & macro assembler
Compilers	Basic, Fortran, Cobol, Coral	Fortran, Cobol, Coral, Basic	Fortran, Basic, Cobol, Coral	Basic, Fortran, Cobol, Coral	Basic, Fortran, Cobol, Coral
Operating system	Batch, real-time, multi-user	Batch, real-time, multi-user, -task.	Multi-tasking, real-time, time-sharing	Batch, real-time, time-sharing	Batch, real-time, time-sharing
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	Contact vendor	Contact vendor	Contact vnedor	Contact vendor	Contact vendor
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Discounts available	—	—	—	—	—
Price of memory increment, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date of first delivery	July 1979	1981	3rd qtr. 1981	March 1976	June 1980
Number installed to date	Over 4000	NA	NA	Over 750	NA
COMMENTS	LSI-11 bus; uses LSI-11/23 microprocessor	The memory management facility enables the processor to extend memory addresses to a full megabyte; utilizes DEC's RSX-11M, RSX-11M-PLUS, RSX-11S, RSTS-E, and CTS-500 op. sys.	Utilizes DEC's RT-11, RSX-11M and RSTS/E operating systems	Uses similar technology to PDP-11/04; includes memory management for greater addressing capability; packaged version called Datasystem 530 is also available	Optional CIS processor & 1M-byte memory increment available; enhanced main-table features and an intelligent console subsystem

All About Minicomputers

MANUFACTURER AND MODEL	Digital Equipment PDP-11/70	Digital Scientific META 4/5000	Digital Scientific META/5030	Digital Systems Galaxy/3	Digital Systems Galaxy/5
WORD LENGTH, BITS	16 + 2	16 + 2	16 + 2	8 and 20	8 and 20
NO. WORKSTATIONS SUPPORTED	Up to 127	32	48+	15	60
MAIN STORAGE					
Storage type	Core	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.98/0.36	0.5	0.35	.50/.50	.50/.50
Min./Max. capacity	64K/1024KB	8K/64KB	128K/16MB	96K/256K bytes	128K/1M byte
Parity checking	Standard	Standard	Standard	Standard	Standard
Error correction	No	No	No	Standard	Standard
Storage protection	Standard	Standard	Standard	Optional	Optional
CENTRAL PROCESSOR					
No. of directly addressable words	32K	64K	64K	192K bytes	1024K bytes
Control storage	—	PROM	PROM	PROM; 512 x 40	PROM; 1024 x 40
Add time, microseconds	0.30-1.20	1.44	1.14	.30	.30
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	Optional	Optional	Optional	No	No
Hardware byte manipulation	Standard	No	No	Standard	Standard
Battery backup	No	No	Optional	Optional	Optional
Real-time clock or timer	Standard	Optional	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	2.9M	1M-2M bytes/sec.	3M bytes/sec.	200K	200K
No. of external interrupt levels	Variable	6	6	15	60
COMMUNICATIONS					
Maximum number of lines	—	96 (adapter)	96 (adapter)	15	120
Synchronous	Up to 1M bps	Opt.; to 9600 bps	Opt.; to 56K bps	Std.; to 15,000 bps	Std.; to 15,000 bps
Asynchronous	Up to 9600 bps	Opt.; to 19,200 bps	Opt.; to 19.2K bps	Std.; to 9,600 bps	Std.; to 9,600 bps
Protocols supported	DDCMP, DNA	Bisync, SDLC, HDLC, X.25	Bisync, SDLC, HDLC, X.25	Programmable	Programmable
Network architectures supported	DECnet	SNA	SNA	None	None
RJE terminals emulated	Control Data, Univac	2780/3780, 3741	2780/3780, 3741	None	None
IBM 3270 emulation	—	Optional	Optional	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	256K-512K bytes	Opt.; (8) 256KB	Opt.; (8) 256KB	No	No
Disk pack/cartridge drives	Cart. & pk.; 2.5-1408M bytes	Opt.; 1-600M bytes (8)	Opt.; (8) 1-600M bytes	Cartridge; 27M bytes/drive	Pack; 80M bytes/drive
Drum/fixed-head disk storage	Fixed-head; 512K-8M bytes	Opt.; (1) 1-2MB	Opt.; (1) 1-2MB	No	No
Magnetic tape cassettes/cartridges	Cassette; 562 cps	—	Opt.; (4) 20-40MB	No	No
Magnetic tape, ½-inch	10-72 KBS	Yes; (8) 20MB+	Yes; (8) 20MB+	1600 bpi	1600 bpi
Serial printer	30-180 cps	Opt.; (1) 180 cps	Opt.; (1) 180 cps	180 cps	180 cps
Line printer	230-1200 lpm	Opt.; (2) 300-1800	Opt.; (2) 300-1800	300, 600, 900 lpm	300, 600, 900 lpm
Data communications interface	50-56,000 bps	Opt.; to 19.2K bps	Opt.; to 19.2K bps	110 to 9600 bps	110 to 9600 bps
CRT	—	Std.; (1) 1920 char.	Std.; (1) 1920 char.	80 char. x 24 lines	80 char. x 24 lines
Other supported peripheral units	Paper tape reader, paper tape punch	Paper tape reader/punch, XY plotter	Paper tape reader/punch, XY plotter	15 port async., multiplexer, 360/370 interface	15 port async., multiplexer, 360/370 interface
SOFTWARE					
Assembler	Assembler & macro assembler	Assembler & macro assembler	Assembler & macro assembler	Yes	Yes
Compilers	Basic, Fortran, Cobol, Coral	Cobol, RPG II, APL, Basic, Fortran	Cobol, RPG II, APL, Basic, Fortran	RPG II, Basic/5, PL/G, Cobol	RPG II, Basic/5, PL/G, Cobol
Operating system	Real-time, inter., time-sharing	Batch, time-sharing	Batch, time-sharing, multiprogramming	Time-sharing	Time-sharing
Language implemented in firmware	No	No	Partially	Partially	Partially
Operating system implemented in firmware	No	No	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	Contact vendor	28,300 (32KB)	58,800 (256KB)	28,500	39,950
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	222	433	228	320
Discounts available	—	Quantity	Quantity	On request	On request
Price of memory increment, $	Contact vendor	2,500 (32KB)	6,000 (128KB)	2,890 (32K bytes)	5,270 (64K bytes)
Date of first delivery	May 1975	NA	June 1980	June 1979	August 1976
Number installed to date	NA	NA	NA	5	30
COMMENTS	Uses same technology as PDP-11/45 and includes 2048 bytes of cache memory for increased performance; disk storage & mag tape periphs. avail. in packaged system called Datasystem 570; includes an LA DECwriter 120	Accommodates up to 32 concurrent users in a mixed conversational and batch mode; expandable to Model 5030	Accommodates 48+ concurrent users in a mixed conversational and batch mode; attached processor available	In-cabinet, on-site upgrades available on all configurations; Galaxy/3 is a multiple microprocessor system; DMA channel and communications interface are both microprocessor-based; integrated WP; 300 MB disk drive, DBMS (available Fall '83)	In-cabinet, on-site upgrades available on all configurations; Galaxy/5 is a multiple microprocessor system; DMA channel and communications interface are both microprocessor-based; integrated WP; 300 MB disk drive, DBMS (available Fall '83)

All About Minicomputers

MANUFACTURER AND MODEL	General Automation Solution Series GA-16/220	General Automation Solution Series GA-16/230	General Automation Solution Series GA-16/240	General Automation Solution Series GA-16/250	General Automation Solution Series GA-16/440
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	16	16	16	16	16
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	Core
Cycle/access time, microseconds	1/0.5	1/0.5	1/0.5	1/0.5	1/0.24
Min./Max. capacity	16K/64KW	16K/64KW	16K/256KW	64K/512KB	32K/1MW
Parity checking	Standard	Standard	Standard	Standard	Optional
Error correction	No	No	Standard	Standard	No
Storage protection	Optional	Optional	Optional	Optional	Optional
CENTRAL PROCESSOR					
No. of directly addressable words	64K	64K	64K	64K	64K
Control storage	4K RAM; 6K EPROM	ROM; 1.2K bytes	ROM; 1.2K bytes	ROM; 1.2K bytes	ROM; 2K bytes
Add time, microseconds	2.1	2.1	2.1	2.1	1.9
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	Optional	Optional	Optional	Optional	Optional
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	Optional	Optional	Optional	No
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1M DMA	800K	800K	800K	1.1M
No. of external interrupt levels	Unlimited, vectored	Unlimited, vectored	Unlimited, vectored	Unlimited, vectored	Unlimited, vectored
COMMUNICATIONS					
Maximum number of lines	See Comments	See Comments	See Comments	See Comments	See Comments
Synchronous	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt., to 9600 bps
Asynchronous	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps
Protocols supported	2780/3780, SDLC, multiplexers	2780/3780, SDLC, multiplexers	2780/3780, SDLC, multiplexers	2780/3780, SDLC, multiplexers	2780/3780, SDLC, multiplexers
Network architectures supported	AUTONET	AUTONET	AUTONET	AUTONET	AUTONET
RJE terminals emulated	2780/3780, HASP	2780/3780, HASP	2780/3780, HASP	2780/3780, HASP	2780/3780, HASP
IBM 3270 emulation	Yes	Yes	Yes	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Opt.; (1-4) 600KB	Opt.; (1-4) 600KB	Opt.; (1-4) 600KB	Opt.; (1-4) 600KB	Opt.; (1-4) 600KB
Disk pack/cartridge drives	Opt.; (1-4) 10M bytes	Opt.; (1-4) 10M bytes	Opt.; (1-4) 10M bytes	Opt.; (1-4) 10M bytes	Opt.; (1-4) 10M bytes
Drum/fixed-head disk storage	Opt.; (1-8) 80MB, opt.; (1-8) 300MB	Opt.; (1-8) 80MB, opt.; (1-8) 300MB	Opt.; (1-8) 80MB, opt., (1-8) 300MB	Opt.; (1-8) 80MB, opt.; (1-8) 300MB	Opt.; (1-8) 80MB, opt.; (1-8) 300MB
Magnetic tape cassettes/cartridges	No	No	No	No	No
Magnetic tape, ½-inch	Yes; (1-4) 72KBS	Yes; (1-4) 72KBS	Yes; (1-4) 72KBS	Yes; (1-4) 72KBS	Yes; (1-4) 72KBS
Serial printer	Opt.; (1-2) 165 cps	Opt.; (1-2) 165 cps	Opt.; (1-2) 165 cps	Opt.; (1-2) 165 cps	Opt.; (1-2) 165 cps
Line printer	Opt.; 300-600 lpm	Opt.; 300-600 lpm	Opt.; 300-600 lpm	Opt.; 300-600 lpm	Opt., 300-600 lpm
Data communications interface	Opt.; 38.4K-2.4M bps	Opt.; 38.4K-2.4M bps	Opt.; 38.4K-2.4M bps	Opt.; 38.4K-2.4M bps	Opt.; 38.4K-2.4M bps
CRT	Opt.; (1-16) 1920 ch.	Opt.; (1-16) 1920 ch.	Opt.; (1-16) 1920 ch.	Opt.; (1-16) 1920 ch.	Opt.; (1-16) 1920 ch.
Other supported peripheral units	Punch card reader	Punch card reader	Punch card reader	Punch card reader	Punch card reader
SOFTWARE					
Assembler	Macro assembler	Macro assembler	Macro assembler	Macro assembler	Macro assembler
Compilers	Cobol, Basic, Fortran	Cobol, Basic, Fortran	Cobol, Basic, Fortran	Cobol, Basic, Fortran	Cobol, Basic, Fortran
Operating system	Batch, real-time, foregrnd./backgrnd.	Batch, real-time, foregrnd./backgrnd.	Batch, real-time, foregrnd./backgrnd.	Batch, real-time, foregrnd./backgrnd.	Batch, real-time, foregrnd./backgrnd.
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	Partially	Partially	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly maint of basic configuration above for on-site contract, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Discounts available	Quantity, 5-40%	Quantity, 5-40%	Quantity, 5-40%	Quantity, 5-40%	Quantity, 5-40%
Price of memory increment, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date of first delivery	January 1976	May 1980	May 1980	1982	June 1975
Number installed to date	11,700	200	200	NA	1800
COMMENTS	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds; features 14 I/O slots	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds

All About Minicomputers

MANUFACTURER AND MODEL	General Automation Solution Series GA-16/460	General Automation Solution Series GA-16/470	General Automation Solution Series GA-16/480	Hewlett-Packard Data Systems Division HP 1000 A600	Hewlett-Packard Data Systems Division HP 1000 A700
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	16	16	16	64	64
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	1/0.24	1/0.24	1/0.24	0.454	0.5
Min./Max. capacity	32K/1MW	64K/64KW	128K/1MW	128KB/4MB	128KB/4MB
Parity checking	Standard	Standard	Standard	Standard	Standard
Error correction	Optional	Standard	Standard	No	Optional
Storage protection	Optional	Optional	Optional	Optional	Optional
CENTRAL PROCESSOR					
No. of directly addressable words	64K	64K	64K	2K	2K
Control storage	ROM; 2K bytes	ROM; 2K bytes	ROM; 2K bytes	—	PROM/RAM; 16K
Add time, microseconds	0.85	0.85	0.85	0.908	1.00
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	Optional	Optional	Optional	No	Optional
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Standard	Standard	Standard	Optional	Optional
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1.1M DMA	1.1M DMA	1.1M DMA	2,130K	2,000K
No. of external interrupt levels	Unlimited, vectored	Unlimited, vectored	Unlimited, vectored	24	24
COMMUNICATIONS					
Maximum number of lines	See Comments	See Comments	See Comments	56	56
Synchronous	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 19.2K bps	Opt.; to 19.2K bps
Asynchronous	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps	Opt.; to 230K bps	Opt.; to 230K bps
Protocols supported	2780/3780, SDLC, multiplexers	2780/3780, SDLC, multiplexers	2780/3780, SDLC, multiplexers	Bisync, async, HDLC, LAP-B	Bisync, async, HDLC, LAP-B
Network architectures supported	AUTONET	AUTONET	AUTONET	DS/1000-3000	DS/1000-3000
RJE terminals emulated	2780/3780, HASP	2780/3780, HASP	2780/3780, HASP	HASP workstation	HASP workstation
IBM 3270 emulation	Yes	Yes	Yes	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Opt., (1-4) 600KB	Opt., (1-4) 600KB	Opt.; (1-4) 600KB	0.286KB-2.36MB	0.286KB-2.36MB
Disk pack/cartridge drives	Opt., (1-4) 10M bytes	Opt., (1-4) 10M bytes	Opt., (1-4) 10M bytes	Fixed disk; 16.1-528M bytes	Fixed disk; 16.1-528M bytes
Drum/fixed-head disk storage	Opt.; (1-8) 80MB, opt., (1-8) 300MB	Opt.; (1-8) 80MB, opt., (1-8) 300MB	Opt., (1-8) 80MB, opt.; (1-8) 300MB	—	—
Magnetic tape cassettes/cartridges	No	No	No	16.7/67.0MB with fixed disk	16.7/67.0MB with fixed disk
Magnetic tape, ½-inch	Yes (1-4) 72KBS	Yes (1-4) 72KBS	Yes; (1-4) 72KBS	Yes;1200ft.x1600bpi	Yes;1200ft.x1600bpi
Serial printer	Opt., (1-2) 165 cps	Opt.; (1-2) 165 cps	Opt., (1-2) 165 cps	Opt.; 180 cps	Opt.; 180 cps
Line printer	Opt.; 300-600 lpm	Opt.; 300-600 lpm	Opt.; 300-600 lpm	Opt.; 400 lpm	Opt.; 400 lpm
Data communications interface	Opt., 38.4K-2.4M bps	Opt.; 38.4K-2.4M bps	Opt.; 38.4K-2.4M bps	To 230K bps	To 230K bps
CRT	Opt., (1-16) 1920 ch.	Opt.; (1-16) 1920 ch.	Opt., (1-16) 1920 ch.	Opt.; 1920 char.	Opt.; 1920 char.
Other supported peripheral units	Paper tape reader & punch card reader	Paper tape reader & punch card reader	Paper tape & punch card reader	Graphic devices, meas. & control proc.	Graphic devices, meas. & control proc.
SOFTWARE					
Assembler	Macro assembler	Macro assembler	Macro assembler	Yes	Yes
Compilers	Cobol, Basic, Fortran	Cobol, Basic, Fortran	Cobol, Basic, Fortran	Fortran 77, Pascal, Basic	Fortran 77, Pascal, Basic
Operating system	Batch, real-time, foregrnd /backgrnd.	Batch, real-time, foregrnd /backgrnd.	Batch, real-time, foregrnd./backgrnd.	Real-time, DBSM	Real-time, DBMS
Language implemented in firmware	No	No	No	Partially	Partially
Operating system implemented in firmware	Partially	Partially	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	Contact vendor	Contact vendor	Contact vendor	7,590 (128K)	9,820 (128K)
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	Contact vendor	Contact vendor	34	41
Discounts available	Quantity, 5-40%	Quantity, 5-40%	Quantity, 5-40%	OEM & end user qty.	OEM & end user qty.
Price of memory increment, $	Contact vendor	Contact vendor	Contact vendor	4,800 (1M byte)	4,800 (1M byte)
Date of first delivery	May 1978	August 1980	August 1980	April 1982	June 1982
Number installed to date	870	180	340	NA	NA
COMMENTS	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds	Up to 256 lines with 1800 bps, and 96 lines with 9600 bps communications speeds	HP 1000 Model 6 microsystem and Model 16 system include A600; DS/1000-IV also supported; available as a 2-board board computer	HP 1000 Model 17 system includes A700; DS/1000-IV and micro-paraphraser microprogramming also supported; optional hardware floating point processor; includes scientific and vector instruction sets for high performance

All About Minicomputers

MANUFACTURER AND MODEL	Hewlett-Packard Data Systems Division HP 1000 A900	Hewlett-Packard Data Systems Division HP 1000 E-Series	Hewlett-Packard Data Systems Division HP 1000 F-Series	Hewlett-Packard Data Systems Division HP 1000 L Series	Honeywell DPS 6/31
WORD LENGTH, BITS	16	16	16	16 + 1	16
NO. WORKSTATIONS SUPPORTED	64	64	64	64	16
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.188 avg. eff.	0.665/0.735 ECC	0.42/0.49 ECC	0.68	0.55/cycle
Min./Max. capacity	768KB/6MB	64KB/2MB	64KB/2MB	64KB/2MB	256K/1024KB
Parity checking	No	Standard	Standard	Standard	Standard
Error correction	Standard	Optional	Optional	No	Standard
Storage protection	Optional	Optional	Optional	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	2K	2K	2K	2K	2M bytes
Control storage	—	PROM/RAM; 16K	PROM/RAM; 16K	—	PROM; 2K x 64 bits
Add time, microseconds	0.267	1.19	0.91	4.5	1.3
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	Standard	No	Optional	No	No
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	Optional	Optional	Standard	Optional
Real-time clock or timer	Standard	Optional	Optional	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Optional	Optional	Standard	Standard
Maximum I/O rate, words/sec.	1,500K	1,140K	1,140K	2.7M bps	6.6M bytes/sec.
No. of external interrupt levels	24	54	50	21	64
COMMUNICATIONS					
Maximum number of lines	56	56	56	56	16
Synchronous	Opt.; to 19.2K bps	Opt.; to 19.2K bps	Opt.; to 19.2K bps	Opt.; to 19.2K bps	Opt.; to 72K bps
Asynchronous	Opt.; to 230K bps	Opt.; to 230K bps	Opt.; to 230K bps	Opt., to 2M bps	Std.; to 19.2K bps
Protocols supported	Bisync, async, HDLC, LAP-B	Bisync, async, HDLC, LAP-B	Bisync, async, HDLC, LAP-B	Async, Bisync, HDLC	TTY, VIP, HASP, HDLC, SDLC, 2780/3780
Network architectures supported	DS/1000-3000	DS/1000-3000	DS/1000-3000	DS/1000-3000	DSA, SNA
RJE terminals emulated	HASP workstation	HASP WS 2780	HASP WS2780	HDLC	HASP, 2780/3780
IBM 3270 emulation	No	No	No	No	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	0.272KB-2.36MB	1.18MB-2.36MB	1.18MB-2.36MB	0.5-2M bytes	Opt., (2) 512-650KB
Disk pack/cartridge drives	Fixed disk; 16.1-528M bytes	Opt.; to 960MB; fixed disk to 528MB	Opt.; to 960MB; fixed disk to 528MB	Both, to 39.2M bytes	Std. (1) 13MB opt.; (2) 26MB
Drum/fixed-head disk storage	—	—	—	132.1M bytes	No
Magnetic tape cassettes/cartridges	16.7/67.0MB with fixed disk	16.7/67.0MB with fixed disk	16.7/67.0MB with fixed disk	—	No
Magnetic tape, ½-inch	Yes; 1200ft x 1600bpi	Yes; 1200ft x 1600bpi	Yes, 1200ft x 1600bpi	Yes; 800/1600 bpi	No
Serial printer	Opt., 180 cps	Opt., 180 cps	Opt., 180 cps	180 cps	Opt., to 160 cps
Line printer	Opt.; 400 lpm	Opt.; 400-1000 lpm	Opt.; 400-1000 lpm	300-1000 lpm	Opt., to 1200 lpm
Data communications interface	To 230K bps	To 230K bps	To 230K bps	To 2M bps	Up to 72K bps
CRT	Opt.; 1920 char.	Opt., 1920 char.	Opt., 1920 char	1920 char.	Opt.; (16) 2000 ch.
Other supported peripheral units	Graphic devices, meas. & control proc.	Graphic devices, meas. & control proc.	Graphic devices, meas. & control proc	Graphic devices, meas. & control devices	Card reader, letter-quality printer
SOFTWARE					
Assembler	Yes	Assembler, Macro assembler	Assembler, Macro assembler	Assembler	Yes
Compilers	Fortran 77, Pascal, Basic	Fortran 77, Pascal, Basic	Fortran 77, Pascal, Basic	Fortran, Basic, Pascal	Cobol, Fortran, RPG, Basic, Pascal
Operating system	Real-time, DBSM	Real-time, DBMS	Real-time, DBMS	Real-time, DBMS	On-line, multi-user
Language implemented in firmware	Partially	Partially	Partially	No	Partially
Operating system implemented in firmware	Partially	Partially	Partially	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	23,900 (768K ECC)	10,075 (64K)	20,075 (128K)	4,730 (64K bytes)	19,500 (13MB disk)
Monthly maint. of basic configuration above for on-site contract, $	79	88	122	29	2,000 (annual)
Discounts available	41	41	OEM & end user qty.	OEM & end-user only	Quantity, volume
Price of memory increment, $	OEM & end user qty. 6,000 (768KB ECC)	OEM & end user qty. 5,000 (512K)	5,000 (512K)	1,500 (128K bytes)	3,000 (256KB)
Date of first delivery	January 1983	November 1976	July 1978	March 1980	1982
Number installed to date	NA	NA	NA	NA	NA
COMMENTS	HP 1000 Model 19 system includes A900; DS/1000-IV also supported; built-in hardware floating point with scientific and vector instruction sets speeds computations	HP 1000 Model 40 & 60 systems include E-Series; DS/1000-IV, DATACAP/1000 II, and PCL/1000-AB also supported; also available as board computer	HP 1000 Model 45 & 65 systems include F-Series; DS/1000-IV, DATACAP/1000-II, PMC/1000, PCL/1000-AB, and HPSPICE also supported; built-in hardware floating point with scientific and vector instruction set speed computations		Includes direct addressing of all memory; segmentation with 4 protection rings & commercial set with decimal arithmetic

All About Minicomputers

MANUFACTURER AND MODEL	Honeywell DPS 6/32	Honeywell DPS 6/34	Honeywell DPS 6/38	Honeywell DPS 6/48	Honeywell DPS 6/54
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	16	16	24	32	40
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.55/cycle	0.55/cycle	0.55/cycle	0.55/cycle	0.55/cycle
Min./Max. capacity	256K/1024KB	256K/1024KB	256K/1024KB	256K/1024KB	256K/2048KB
Parity checking	Standard	Standard	Standard	Standard	Standard
Error correction	Standard	Standard	Standard	Standard	Standard
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	2M bytes	2M bytes	2M bytes	2M bytes	2M bytes
Control storage	PROM; 2K x 64 bits	PROM; 2K x 64 bits	PROM; 2K x 64 bits	PROM	PROM
Add time, microseconds	1.3	1.3	1.3	1.3	1.0
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	No	No	Optional	Optional	Optional
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	Optional	Optional	Optional	Optional
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	6.6M bytes/sec.	6.6M bytes/sec.	6.6M bytes/sec.	6.6M bytes/sec.	6.6M bytes/sec.
No. of external interrupt levels	64	64	64	64	64
COMMUNICATIONS					
Maximum number of lines	8	8	24	32	40
Synchronous	Opt., to 72K bps	Opt., to 72K bps	Opt., to 72K bps	Opt., to 72K bps	Opt., to 72K bps
Asynchronous	Std., to 19.2K bps	Std., to 19.2K bps	Std., to 19.2K bps	Std., to 19.2K bps	Std., to 19.2K bps
Protocols supported	TTY, VIP, HASP, HDLC, SDLC, 2780/3780	TTY, VIP, HASP, HDLC, SDLC, 2780/3780	TTY, VIP, HASP, HDLC SDLC, 2780/3780	TTY, VIP, HASP, HDLC SDLC, 2780/3780	TTY, VIP, HASP, TTY, VIP, HASP, HDLC, SDLC, 2780/3780
Network architectures supported	DSA, SNA	DSA, SNA	DSA, SNA	DSA, SNA	
RJE terminals emulated	HASP, 2780/3780	HASP, 2780/3780	HASP, 2780/3780	HASP, 2780/3780	HASP, 2780/3780
IBM 3270 emulation	Yes	Yes	Yes	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Opt., (2) 512-650KB	Opt., (2) 512-650KB	Opt., (6) 512-650KB	Opt., (6) 512-650KB	Opt., (6) 512-650KB
Disk pack/cartridge drives	Std., (1) 26MB, (2) opt. 26M or 80MB	Std., (1) 80MB; (2) opt. 26M or 80MB	Opt., (4) 256MB	Opt., (4) 256MB	Opt., (4) 256MB
Drum/fixed-head disk storage	No	No	No	No	No
Magnetic tape cassettes/cartridges	No	No	No	No	No
Magnetic tape, ½-inch	No	No	No	Opt., (4) 6250 bpi	Opt., (4) 6250 bpi
Serial printer	Opt., to 160 cps	Opt., to 160 cps	Opt., to 160 cps	Opt., to 160 cps	Opt., to 160 cps
Line printer	Opt., to 1200 lpm	Opt., to 1200 lpm	Opt., to 1200 lpm	Opt., to 1200 lpm	Opt., to 1200 lpm
Data communications interface	Up to 72K bps	Up to 72K bps	Up to 72K bps	Up to 72K bps	Up to 72K bps
CRT	Opt., (8) 2000 char.	Opt., (8) 2000 char.	Opt., (24) 2000 ch.	Opt., (32) 2000 ch.	Opt., (40) 2000 ch.
Other supported peripheral units	Card reader, letter-quality printer	Card reader, letter-quality printer	Card reader, letter-quality printer	Card reader, letter-quality printer, document handler	Card reader, letter-quality printer, document handler
SOFTWARE					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	Cobol, Fortran, RPG, Basic, Pascal	Cobol, Fortran, RPG, Basic, Pascal	Cobol, Fortran, RPG, Basic, Pascal	Cobol, Fortran, RPG, Basic, Pascal	Cobol, Fortran, RPG, Basic, Pascal
Operating system	On-line, multi-user	On-line, multi-user	On-line, multi-user	On-line, time-sharing, batch	On-line, time-sharing, batch
Language implemented in firmware	Partially	Partially	Partially	Partially	Partially
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	26,000 (26MB disk)	30,000 (80MB disk)	24,500	32,500	38,500
Monthly maint. of basic configuration above for on-site contract, $	2,150 (annual)	2,590 (annual)	1,520 (annual)	1,830 (annual)	2,055 (annual)
Discounts available	Quantity, volume	Quantity, volume	Quantity, volume	Quantity, volume	Quantity, volume
Price of memory increment, $	3,000 (256KB)	3,000 (256KB)	3,000 (256KB)	3,000 (256KB)	3,000 (256KB)
Date of first delivery	1981	1981	1981	1981	1981
Number installed to date	NA	NA	NA	NA	NA
COMMENTS	See DPS 6/31 Comments. Field upgradeable to DPS 6/34.	See DPS 6/31 Comments	See DPS 6/31 Comments	Includes all DPS 6/38 features; field-upgradeable through DPS 6 line to a 32-bit system (see Supermini-computer charts)	See DPS 6/48 Comments. Includes separate high-speed processor for decimal arithmetic and byte string operations

All About Minicomputers

MANUFACTURER AND MODEL	Honeywell DPS 6/74	Honeywell DPS 6/76	Inforex 9000	Microdata Reality Series 2000	Microdata Reality Series 4000
WORD LENGTH, BITS	16	16	8-bit byte	8 data bits: 16, 32, 48 instr. bits	8 data bits: 16, 32, 48 instr. bits
NO. WORKSTATIONS SUPPORTED	40	64	24	8	16
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.55/cycle	0.55/cycle	0.6	800 ns.	800 ns.
Min./Max. capacity	512K/2048KB	512K/2048KB	120K/256KB	32K/64KB	64K/128KB
Parity checking	Standard	Standard	Standard	Standard	Standard
Error correction	Standard	Standard	Standard	—	—
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	2M bytes	2M bytes	256K bytes	58K bytes	58K bytes
Control storage	PROM	PROM	ROM; 4K bytes	ROM; 8K	ROM; 8K
Add time, microseconds	0.7	0.7	1.15	—	—
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	Optional	Optional	No	No	No
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	Optional	No	Standard	Standard
Real-time clock or timer	Standard	Standard	No	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	No	Standard	Standard
Maximum I/O rate, words/sec.	6.6M bytes/sec.	6.6M bytes/sec.	125K bytes/sec.	500K bytes/sec.	500K bytes/sec.
No. of external interrupt levels	64	64	—	—	—
COMMUNICATIONS					
Maximum number of lines	40	64	—	8	16
Synchronous	Opt.; to 72K bps	Opt.; to 72K bps	Std.; 9600 bps	Opt.; to 9600 bps	Opt.; to 9600 bps
Asynchronous	Std.; to 19.2K bps	Std.; to 19.2K bps	Optional	Std.; 300-9600 bps	Std.; 300-9600 bps
Protocols supported	TTY, VIP, HASP, HDLC SDLC, 2780/3780	TTY, VIP, HASP, HDLC SDLC, 2780/3780	2780/3780, HASP, Bur., Honey., Univ.	Bisync	Bisync
Network architectures supported	DSA, SNA	DSA, SNA	ULTRANET, ARCNET	—	—
RJE terminals emulated	HASP, 2780/3780	HASP, 2780/3780	See Comments	See Comments	See Comments
IBM 3270 emulation	Yes	Yes	Yes	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Opt.; (6) 512-650KB	Opt.; (6) 512-650KB	No	No	No
Disk pack/cartridge drives	Opt.; (4) 256MB	Opt.; (8) 256MB	20M-180M bytes	Cart.; 10M-20M bytes	Cart.; 24M-40M bytes
Drum/fixed-head disk storage	No	No	No	No	No
Magnetic tape cassettes/cartridges	No	No	Cassettes; (2) 352 cps	No	No
Magnetic tape, ½-inch	Opt.; (4) 6250 bpi	Opt.; (4) 6250 bpi	800/1600 bpi	45 ips; 800/1600 bpi	45 ips; 800/1600 bpi
Serial printer	Opt.; to 160 cps	Opt.; to 160 cps	160 cps	165 cps	165 cps
Line printer	Opt.; to 1200 lpm	Opt.; to 1200 lpm	300, 600 lpm	150, 300, 600 lpm	150, 300, 600 lpm
Data communications interface	Up to 72K bps	Up to 72K bps	Up to 9600 bps	To 9600 bps	To 9600 bps
CRT	Opt.; (40) 2000 ch.	Opt.; (64) 2000 ch.	80 x 24 lines	80 char. x 24 lines	80 char. x 24 lines
Other supported peripheral units	Card reader, letter-quality printer, document handler	Card reader, letter-quality printer, document handler	—	5750 communications terminal	5750 communications terminal
SOFTWARE					
Assembler	Yes	Yes	No	Yes	Yes
Compilers	Cobol, Fortran, RPG, Basic, Pascal	Cobol, Fortran, RPG, Basic, Pascal	Cobol, INFOBUS	English, Data/ Basic, Proc,*	English, Data/ Basic, Proc,*
Operating system	On-line, time-sharing, batch	On-line, time-sharing, batch	Batch, real-time, multi-tasking	Interactive, multi-user	Interactive, multi-user
Language implemented in firmware	Partially	Partially	No	Partially	Partially
Operating system implemented in firmware	No	No	No	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	65,000	75,000	44,630	32,500	38,000
Monthly maint. of basic configuration above for on-site contract, $	4,000 (annual)	4,100 (annual)	800	400	390
Discounts available	Quantity, volume	Quantity, volume	—	—	—
Price of memory increment, $	6,000 (512KB)	6,000 (512KB)	—	2,100 (16K bytes)	—
Date of first delivery	1981	1981	July 1981	December 1977	November 1973
Number installed to date	NA	NA	Contact vendor	6,000 (all mod.)	6,000 (all mod.)
COMMENTS	Includes all DPS 6/54 features, plus 8KB cache memory	See DPS 6/74 Comments	RJE terminals emulated include 2770, 2780, 3770, 3780, RES; System 9000 is a distributed information processing system, specifically addressing distributed data entry and file management solutions for business	Packaged system includes 32KB MOS memory, magnetic tape, 10MB disk drive, 165 cps printer, and 1 CRT; RJE terminals emulated include HASP, 2780/3780, 2770, 3741; *Screenpro	Packaged system includes 64KB MOS memory, magnetic tape, 24MB disk drive, 165 cps printer, and 1 CRT; RJE terminals emulated include HASP, 2780/3780, 2770, 3741; *Screenpro

All About Minicomputers

MANUFACTURER AND MODEL	Microdata Reality Series 6000	Microdata Reality Series 8000	Microtech Business Systems 50 Series	Microtech Business Systems 100/200	Microtech Business Systems 300 Series
WORD LENGTH, BITS	8 data bits: 16, 32, 48 instr. bits	8 data bits: 16, 32, 48 instr. bits	16	16	16
NO. WORKSTATIONS SUPPORTED	32	48	7	37	8 to 56
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	800 ns.	600 ns.	0.6	0.4	0.4
Min./Max. capacity	64K/256KB	256K/512KB	64K/128K	64/1024KB	64K/1024KB
Parity checking	Standard	Standard	No	No	Optional
Error correction	—	—	No	No	No
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	122K bytes	504K bytes	128K bytes	128K bytes	128K bytes
Control storage	No	No	No	No	No
Add time, microseconds	—	—	0.6	0.4	0.4
Hardware multiply/divide	Standard	Standard	No	No	Optional
Hardware floating point	No	No	No	No	Optional
Hardware byte manipulation	Standard	Standard	No	No	No
Battery backup	Standard	Standard	No	No	Standard
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	500K bytes/sec.	500K bytes/sec.	—	—	—
No. of external interrupt levels	—	—	—	—	—
COMMUNICATIONS					
Maximum number of lines	32	48	7	37	56
Synchronous	Opt.; to 9600 bps	Opt.; to 9600 bps	—	—	—
Asynchronous	Std.; 300-9600 bps	Std.; 300-9600 bps	Std.; 30-9600 bps	Std.; 30-9600 bps	Std.; 30-9600 bps
Protocols supported	Bisync	Bisync	Async	Async	Async
Network architectures supported	—	—	None	None	None
RJE terminals emulated	See Comments	See Comments	None	None	None
IBM 3270 emulation	No	No	No	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	No	No	No	No
Disk pack/cartridge drives	Cart.; 48M-514M bytes	Cart.; 128-514M bytes	34-68MB Winch.	34-68MB Winch.	34-272MB Winchester
Drum/fixed-head disk storage	No	No	No	No	No
Magnetic tape cassettes/cartridges	No	No	Cartridge	Cartridge	Cartridge
Magnetic tape, ½-inch	45 ips; 800/1600 bpi	45 ips; 800/160 bpi	—	Opt.; 25 ips	Opt.; 25 ips
Serial printer	165 cps	165 cps	Opt.; 150 cps	Opt.; 150 cps	Opt.; 150 cps
Line printer	150, 300, 600 lpm	150, 300, 600 lpm	Opt.; 150-600 lpm	Opt.; 150-600 lpm	Opt.; 150-600 lpm
Data communications interface	To 9600 bps	To 9600 bps	Opt.; 110-9600 bps	Opt.; 110-9600 bps	Opt.; 110-9600 bps
CRT	80 char. x 24 lines	80 char. x 24 lines	Opt.; 24 x 80 char.	Opt.; 24 x 80 char.	Opt.; 24 x 80 char.
Other supported peripheral units	5750 communications terminal	5750 communications terminal	Paper tape readers	Paper tape readers	Paper tape readers
SOFTWARE					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	English, Data/Basic, Proc,*	English, Data/Basic, Proc,*	Basic	Basic	Basic
Operating system	Interactive, multi-user	Interactive, multi-user	Real-time	Real-time	Real-time
Language implemented in firmware	Partially	Partially	No	No	No
Operating system implemented in firmware	Partially	Partially	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	50,800	89,000	6,450 (64KB)	9,450 (64KB)	11,000 (64KB)
Monthly maint. of basic configuration above for on-site contract, $	450	650	Contact vendor	Contact vendor	Contact vendor
Discounts available	—	—	Contact vendor	Contact vendor	Contact vendor
Price of memory increment, $	2,950 (32K bytes)	4,900 (128K bytes)	NA	NA	3,000 (64KB), 6,300 (512KB)
Date of first delivery	November 1973	October 1979	November 1980	June 1980	October 1979
Number installed to date	6,000 (all mod.)	6,000 (all mod.)	3	40	100
COMMENTS	Packaged system includes 64KB MOS memory, magnetic tape, 48MB disk drive, 150 lpm printer, and 1 CRT; RJE terminals emulated include HASP, 2780/3780, 2770, 3741; *Screenpro	Packaged system includes 256KB MOS memory, magnetic tape, 128MB disk drive, 300 lpm printer, and 2 CRTs; RJE terminals emulated include 2780/3780, 2770, 3741; PEP (Performance Enhanced Processor) provides improved CPU time; *Screenpro	System 50 W34S, for $14,950, includes 34MB Winchester, ¼-in. tape drive in 29-in. enclosure with operating system; 68MB Winchester is optional	System 100 W34S, for $18,250, includes 34MB Winchester, ¼-in. tape drive in 29-in. enclosure with operating system; 68MB Winchester is optional	System 300 W34S, for $23,650, includes 34MB Winchester, ¼-in. tape drive in 29-in. enclosure with operating system; up to four 34MB or 68MB drives can be attached to system; $26,650 for Sys. 300 W68S

All About Minicomputers

MANUFACTURER AND MODEL	Microtech Business Systems 400 Series	Microtech Business Systems M1/10	Microtech Business Systems M1/34	Microtech Business Systems M1/68	Modular Computer Systems Classic II Systems
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	8 to 56	5	5	5	—
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.4	0.4	0.4	0.4	125 ns, 250 ns
Min./Max. capacity	64/1024KB	128KB	128K	128K	128K/4M bytes
Parity checking	Optional	No	No	No	Standard
Error correction	No	No	No	No	Standard
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	128K bytes	128K bytes	128K bytes	128K bytes	256K bytes
Control storage	No	No	No	No	No
Add time, microseconds	0.4	0.4	0.4	0.4	0.3, 0.2
Hardware multiply/divide	Optional	Yes	Yes	Yes	Standard
Hardware floating point	Optional	No	No	No	Optional
Hardware byte manipulation	No	Yes	Yes	Yes	Standard
Battery backup	Standard	No	No	No	Optional
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	—	—	—	—	To 8M bytes
No. of external interrupt levels	—	—	—	—	5
COMMUNICATIONS					
Maximum number of lines	56	37	37	37	256
Synchronous	—	—	—	—	Opt.; to 250K bps
Asynchronous	Std.; 30-9600 bps	Std.; to 19.2K bps	Std.; to 19.2K bps	Std.; to 19.2K bps	Opt.; 75-19.2K bps
Protocols supported	Async	Async	Async	Async	Bisync, SDLC/HDLC
Network architectures supported	None	None	None	None	Maxnet
RJE terminals emulated	None	None	None	None	2780, 3780
IBM 3270 emulation	No	No	No	No	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	No	No	No	Yes
Disk pack/cartridge drives	158-632MB Winchester	10MB Winchester	34MB Winchester	68MB Winchester	Cart.; 8.35MB
Drum/fixed-head disk storage	No	No	No	No	—
Magnetic tape cassettes/cartridges	Cartridge	Std.; 20MB cartridge	Std.; 20MB cartridge	Std.; 20MB cartridge	Yes; 295K-512KB
Magnetic tape, ½-inch	Opt.; 25 ips	No	No	No	Yes
Serial printer	Opt.; 150 cps	Opt.; 180 cps	Opt.; 180 cps	Opt.; 180 cps	Optional
Line printer	Opt.; 150-600 lpm	Opt.; 300-600 lpm	Opt.; 300-600 lpm	Opt.; 300-600 lpm	300-900 lpm
Data communications interface	Opt.; 110-9600 bps	Std.; to 19.2K bps	Std.; to 19.2K bps	Std.; to 19.2K bps	Standard
CRT	Opt.; 24 x 80 char.	Opt.; 24 x 80 char.	Opt.; 24 x 80 char.	Opt.; 24 x 80 char.	24 x 80 char.
Other supported peripheral units	Paper tape readers	None	None	None	Card readers
SOFTWARE					
Assembler	Yes	Yes	Yes	Yes	Assembler, macro-assembler
Compilers	Basic	Basic	Basic	Basic	Fortran, Pascal, Cobol, Coral
Operating system	Real-time	RT multitasking	RT multitasking	RT multitasking	Real-time, multi-programming
Language implemented in firmware	No	No	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	11,000 (64KB)	NA	NA	NA	34,500-101,600
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	175/mo.	180/mo.	185/mo.	Contact vendor
Discounts available	Contact vendor	Distributed	Distributed	Distributed	—
Price of memory increment, $	3,000 (64KB) 6,300 (512KB)	NA	NA	NA	Contact vendor
Date of first delivery	May 1979	December 1982	December 1982	December 1982	May 1982
Number installed to date	NA	4	5	5	NA
COMMENTS	System 400 W158S includes 158MB Winchester, ¼-in. tape drive in 29-in. enclosure with operating system	Desktop-configuration with disk, tape, I/O, and operating system is $12,700	Desktop-configuration with disk, tape, I/O, and operating system is $15,500	Desktop-configuration with disk, tape, I/O, and operating system is $19,210	

All About Minicomputers

MANUFACTURER AND MODEL	Northern Telecom, Inc. 585	Olivetti S6000	Plexus Computers, Inc. P/25	Plexus Computers, Inc. P/35	Plexus Computers, Inc. P/40
WORD LENGTH, BITS	8	16	16	16/32	16
NO. WORKSTATIONS SUPPORTED	16	24	16	16	40
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	7.35	400 nano.	600ns	400ns	600ns
Min./Max. capacity	256K/512K	128K/1024KB	256K/2MB	512K/2MB	512K/4MB
Parity checking	Optional	Standard	No	No	No
Error correction	No	Standard	Standard	Standard	Standard
Storage protection	No	Optional	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	64K	—	64K	64K	64K
Control storage	—	ROM	PROM	PROM	PROM
Add time, microseconds	1.17	—	—	—	—
Hardware multiply/divide	No	Standard	Standard	Standard	Standard
Hardware floating point	No	Standard	Standard	No	Standard
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	—	No	No	No	No
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	—	9.6M bits/sec.	3M bytes	3M bytes	3M bytes
No. of external interrupt levels	16	—	—	—	—
COMMUNICATIONS					
Maximum number of lines	14	24	16	16	40
Synchronous	Std.; 600-9600 bps	Optional	Std.; to 19.2K bps	Std.; to 19.2K bps	Std.; to 19.2K bps
Asynchronous	Opt.; to 9600 bps	Std.; 110-19.2K bps	Std.; to 19.2K bps	Std.; to 19.2K bps	Std.; to 19.2K bps
Protocols supported	Bisync, SDLC, CDC, Burroughs, IBM	Requires intelligent modem	X.25, BSC, SDLC	X.25, BSC, SDLC	X.25, BSC, SDLC
Network architectures supported	No	—	UUCP	UUCP	UUCP
RJE terminals emulated	2780/3780, 2770	Req. prot. in mod.	2780, 3780	2780, 3780	2780, 3780
IBM 3270 emulation	Yes	Req. prot. in mod.	No	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Opt.; 256K	(4) 1.2M bytes	No	No	No
Disk pack/cartridge drives	Opt.; 298MB	Both; (4) 10MB, (4) 90MB	Yes; to 288MB	Yes; to 288MB	Yes; to 580MB
Drum/fixed-head disk storage	22-44MB	8.5, 32MB Winchester	No	No	No
Magnetic tape cassettes/cartridges	Cart. II, 15MB	VCR	Std.; cassette	Std.; cassette	No
Magnetic tape, ½-inch	Yes; 800/1600 bpi	Yes; 800/1600 bpi	No	No	Yes; 9track
Serial printer	Opt.; to 180 cps	Std.; 90-200 cps	Optional	Optional	Optional
Line printer	Opt.; 300-600 lpm	Std.; 300-600 lpm	Optional	Optional	Optional
Data communications interface	Std.; to 9600 bps	Opt.; 110-9600 bps	RS-232-C	RS-232-C	RS-232-C
CRT	1920 char.	Std.; 1920 char.	Optional	Optional	Any ASCII
Other supported peripheral units	Mag. tape drive, cassette/cartridge	—	Multibus	Multibus	Multibus (IEE 796)
SOFTWARE					
Assembler	No	Yes	Z8000	Z8000	Z8000
Compilers	Cobol, Tal 2000	Basic, Pascal, Lisp	C, CBasic-16, Cobol	C, CBasic-16, Cobol	C, CBasic-16, Cobol
Operating system	Multitasking	Multiprogramming	Unix System III; multi-user, interactive	Unix System III; multi-user, interactive	Unix System III; multi-user, interactive
Language implemented in firmware	No	Assembler	No	No	No
Operating system implemented in firmware	No	No	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	19,500 (includes 1 CRT)	21,000	Contact vendor	Contact vendor	Contact vendor
Monthly maint. of basic configuration above for on-site contract, $	292	227.50	Contact vendor	Contact vendor	Contact vendor
Discounts available	Quantity	—	OEM, volume	OEM, volume	OEM, volume
Price of memory increment, $	3,200 (128K)	2,400 (128KB)	end-user	end-user	end-user
Date of first delivery	May 1981	October 1981	June 1982	2nd qtr. 1983	September 1981
Number installed to date	NA	NA	NA	NA	NA
COMMENTS					

All About Minicomputers

MANUFACTURER AND MODEL	Plexus Computers, Inc. P/60	PolyComputer 301A	PolyComputer 1701A	Qantel System 22	Qantel Series 23
WORD LENGTH, BITS	16/32	16	16	8	8
NO. WORKSTATIONS SUPPORTED	40	100 (8 recommended)	100	16	16
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	400ns	0.4/0.2	0.4/0.2	0.95	0.95
Min./Max. capacity	512K/4MB	576KB	4224KB	64K/256KB	64K/256KB
Parity checking	No	No	No	Standard	Standard
Error correction	Standard	No	No	—	—
Storage protection	Standard	Standard	Standard	—	—
CENTRAL PROCESSOR					
No. of directly addressable words	64K	32K	32K	256K bytes	256K bytes
Control storage	PROM	ROM	ROM	ROM	ROM
Add time, microseconds	—	0.8	0.8	—	—
Hardware multiply/divide	Standard	Standard	Standard	—	—
Hardware floating point	No	No	No	No	No
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	No	Optional	Optional	No	No
Real-time clock or timer	Standard	Standard	Standard	Optional	Optional
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	—	—
Maximum I/O rate, words/sec.	3M bytes	Varies	Varies	—	—
No. of external interrupt levels	—	16	16	1	1
COMMUNICATIONS					
Maximum number of lines	40	100	100	2	2
Synchronous	Std.; to 19.2K bps	Optional	Optional	Opt.; to 4800 bps	Opt.; to 4800 bps
Asynchronous	Std.; to 19.2K bps	Std.; 110-9600 bps	Std.; 110-19,200 bps	Opt.; to 19,200 bps	Opt.; to 19,200 bps
Protocols supported	X.25, BSC, SDLC	—	—	Async, Bisync	Async, Bisync
Network architectures supported	UUCP	—	—	BESTNET	BESTNET
RJE terminals emulated	2780, 3780	—	—	2780/3780	2780/3780
IBM 3270 emulation	No	No	No	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	Optional	Optional	Std.; 1.3M bytes	Std.; 1.3M bytes
Disk pack/cartridge drives	Yes; to 580MB	Optional	Optional	No	Std.; 9MB, opt.; 1200MB
Drum/fixed-head disk storage	No	Std.; 1-4; 158MB	Standard	No	No
Magnetic tape cassettes/cartridges	No	Optional	Optional	No	No
Magnetic tape, ½-inch	Yes; 9track	Optional	Optional	No	Opt.; 800/1600 bpi
Serial printer	Optional	Optional	Optional	Std.; 150 cps	Std.; 150 cps
Line printer	Optional	Optional	Optional	—	—
Data communications interface	RS-232-C	Standard	Standard	Std.; to 9600 bps	Std.; to 9600 bps
CRT	Optional	Standard	Standard	Std.; 1728/1920 ch.	Std.; 1728/1920 ch.
Other supported peripheral units	Multibus Optional	—	—	—	—
SOFTWARE					
Assembler	Z8000	ASGOL	ASGOL	REAL Assembler	REAL Assembler
Compilers	C, CBasic-16, Cobol	Cobol, Basic, Fortran, Pascal	Cobol, Basic, Fortran, Pascal	QIC BASIC	QIC BASIC
Operating system	Unix System III; multi-user, interactive	VMOS—batch, time-sharing & real-time	VMOS—batch, time-sharing & real-time	Multi-user	Multi-user
Language implemented in firmware	No	Partially	Partially	Partially	Partially
Operating system implemented in firmware	No	Partially	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	Contact vendor	See Comments	Contact vendor	Contact vendor	Contact vendor
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	—	—	Contact vendor	Contact vendor
Discounts available	OEM, volume	Quantity	Quantity	—	—
Price of memory increment, $	end-user	—	—	Contact vendor	Contact vendor
Date of first delivery	2nd qtr. 1983	June 1981	June 1981	October 1981	October 1981
Number installed to date	NA	20	20	NA	NA
COMMENTS		The 301A is a 3-processor system with all hardware, software and peripherals included for $29,950			

All About Minicomputers

MANUFACTURER AND MODEL	Qantel Series 200	Qantel Series 300	Rolm MSE/14 Micro System	Second Source Computer, Inc. SSCI-1000	Sperry Univac V77-200
WORD LENGTH, BITS	8	8	16	16	16
NO. WORKSTATIONS SUPPORTED	32	64	48	16	16
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	0.95	0.95	0.18	.495	0.66/0.56
Min./Max. capacity	64K/256KB	128K/1024KB	32/1024K	256K/1MB	8K/64KW
Parity checking	Standard	Standard	Standard	No	Optional
Error correction	—	—	No	Standard	No
Storage protection	—	—	Standard	Standard	Optional
CENTRAL PROCESSOR					
No. of directly addressable words	256K bytes	1024K bytes	32K words	32K	32K
Control storage	ROM	ROM	PROM	PROM 4K	ROM; 512 x 24
Add time, microseconds	—	—	0.225	.990	2.31
Hardware multiply/divide	—	—	Standard	Standard	Standard
Hardware floating point	No	No	Standard	Optional	No
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	No	No	Standard	Optional	Optional; 1.5 hrs.
Real-time clock or timer	—	—	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	—	—	Standard	Standard	Standard
Maximum I/O rate, words/sec.	—	—	750K words/sec	2MB	319K
No. of external interrupt levels	16	16	16	64	8-64
COMMUNICATIONS					
Maximum number of lines	2	2	—	64	16
Synchronous	Opt.; to 19,200 bps	Opt.; to 19,200 bps	Opt.; 38.4K	Std.; to 9600 bps	50K bps
Asynchronous	Opt.; to 4800 bps	Opt.; to 4800 bps	Opt.; 19.2K	Std.; to 9600 bps	9600 bps
Protocols supported	Async, Bisync	Async, Bisync	—	SDLC, UDLC, Bisync, ADCCP	UDLC, Bisync
Network architectures supported	BESTNET	BESTNET	None	None	—
RJE terminals emulated	2780/3780	2780/3780	None	Univac, 2780/3780	HASP + 1004
IBM 3270 emulation	Yes	Yes	No	Yes	—
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	No	Opt.; 2.4MB	Opt.; (4) 1MB	Yes
Disk pack/cartridge drives	Cart.; 12M bytes pack; 20-1200MB	Cart.; 12M bytes pack; 20-1200MB	Pack & cartridge 30-1,108MB	Opt.; (4) 10MB	Both; 10M-145MB bytes
Drum/fixed-head disk storage	No	No	Fixed head; 2 x 4M byte	No	No
Magnetic tape cassettes/cartridges	No	No	Cartridge	Opt.; ¼" streaming	No
Magnetic tape, ½-inch	Opt.; 800/1600 bpi	Opt.; 800/1600 bpi	Yes	800/1600 bpi, 75 ips	200KBS
Serial printer	Std.; 150 cps	Std.; 150 cps	60 cps	Opt.; 200 cps	200 cps
Line printer	Opt.; 240-600 lpm	Std.; 300 lpm	600 lpm	Opt.; 1200 lpm	180-640 lpm
Data communications interface	To 9600 bps	To 9600 bps	Yes	Opt.; 20,000 bps	50K bps
CRT	Std.; 1728/1920 ch.	Std.; 1728/1920 ch.	Yes	Opt.; 24 x 80 char.	Yes
Other supported peripheral units	—	—	A/D & D/A, 1553A, 1553B, NTDS	Storage Module Disk (SMD)	IEEE-488 data acquisition
SOFTWARE					
Assembler	REAL Assembler	REAL Assembler	Macro Assembler	Yes	Assembler, macro assembler
Compilers	QIC BASIC	QIC BASIC	Ada, Fortran, Algol PL/1, DGL, Basic	Fortran IV, Cobol	Fortran IV, RPG II
Operating system	Multi-user	Multi-user	Real-time	Multitasking	Batch, real-time, multi-tasking
Language implemented in firmware	Partially	Partially	No	No	No
Operating system implemented in firmware	Partially	Partially	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	Contact vendor	Contact vendor	30,000	7,750 w/256KB	13,945 (16K words)
Monthly maint. of basic configuration above for on-site contract, $	Contact vendor	Contact vendor	—	75	152
Discounts available	—	—	GSA, quantity	Qty. dollar volume	—
Price of memory increment, $	Contact vendor	Contact vendor	23K (96KW)	3,000 (256K)*	1,450 (16K words)
Date of first delivery	May 1980	May 1980	NA	January 1983	NA
Number installed to date	NA	NA	NA	—	NA
COMMENTS			Designed to meet MIL-E-4158, MIL-E-5400 & MIL-E-16400, spec. single board, processor w/32K RAM & console port. 1/2 ATR chassis can house processor, 256KB mem., 5 I/O slots	Includes both DMA word transfer and block mode, CRT interface current loop-switch selectable 110 to 9600 baud; (8) 16-bit registers; virtual console CRT required; *5,500 (512KB) 7,500 (768KB)	

All About Minicomputers

MANUFACTURER AND MODEL	Sperry Univac V77-500	Sperry Univac V77-700	Sperry Univac V77-800	Tandem Computers NonStop (T16/244-3)	Tandem Computers NonStop II
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	32	64	64	No set limit	No set limit
MAIN STORAGE					
Storage type	MOS	MOS	MOS	Dynamic NMOS	NMOS
Cycle/access time, microseconds	0.6	0.5/0.75	0.60	0.5/0.5	400 nano.
Min./Max. capacity	128K/1MW	128K/1MW	128K/1MW	384K/2MB	1M/16MB
Parity checking	No	No	No	Standard	Standard
Error correction	Standard	Standard	Yes	Standard	Standard
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	32K	32K	32K	2M bytes	2000M bytes
Control storage	WCS	WCS	WCS	PROM; 3K x 32 bits	See Comments
Add time, microseconds	1.5	1.2	0.45	0.5	0.5
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	No	Optional	Optional	Optional	Optional
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	Optional	Optional	Standard	Standard
Real-time clock or timer	Standard	Standard	Standard	No	No
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1.66M	1.66M	1.66M	4K bytes/sec.	10M bytes/sec.
No. of external interrupt levels	8-64	8-64	8-64	256	None
COMMUNICATIONS					
Maximum number of lines	32	64	64	4 (synch); 32 (asynch)	252
Synchronous	50K bps	50K bps	50K bps	Opt.; up to 56K bps	Opt.; 56K bps
Asynchronous	9600 bps	9600 bps	9600 bps	Opt.; up to 19.2K bps	Opt.; to 19.2K bps
Protocols supported	UDLC, Bisync	UDLC, Bisync	UDLC, Bisync	—	2780/3780, SDLC, HDLC, UDLC, ADCCP
Network architectures supported	Univac DCA	Univac DCA	Univac DCA	HYPERchannel	HYPERchannel
RJE terminals emulated	HASP + 1004	HASP + 1004	HASP + 1004	—	2780/3780, HASP
IBM 3270 emulation	Bisync	Bisync	Bisync	—	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Yes	Yes	Yes	No	No
Disk pack/cartridge drives	Both; 10M-208MB bytes	Both; 10M-1200MB bytes	Both; 10M-1200MB bytes	Fixed & removable 64MB-no set limit	64M-128M bytes
Drum/fixed-head disk storage	No	No	No	No	No
Magnetic tape cassettes/cartridges	No	No	No	No	No
Magnetic tape, ½-inch	200KBS	200KBS	200KBS	Std.; 800/1600 bpi	800/1600 bpi
Serial printer	200 cps	200 cps	200 cps	200 cps	340 cps
Line printer	180-640 lpm	180-640 lpm	180-640 lpm	600-1350 lpm	600, 900, 1350 lpm
Data communications interface	50K bps	50K bps	50K bps	Std.; to 56K bps	Std.; to 56K bps
CRT	Standard	Standard	Standard	Std.; 2000 char.	Std.; 2000 char.
Other supported peripheral units	IEEE-488 data acquisition	IEEE-488 data acquisition	IEEE-488 data acquisition	Punched card readers	—
SOFTWARE					
Assembler	Assembler, macro assembler	Assembler, macro assembler	Assembler, macro assembler	No	No
Compilers	Fortran IV, Cobol 74	Fortran IV, Cobol 74	Fortran IV, Cobol 74	TAL, Cobol, Fortran, MUMPS	TAL, Cobol, Fortran, MUMPS
Operating system	Batch, real-time, multi-tasking	Batch, real-time, multi-tasking	Batch, real-time, multi-tasking	Multiprocessing, multiprogramming	Multiproc., multi-prog., inter.
Language implemented in firmware	Optional	Optional	Optional	—	Partially
Operating system implemented in firmware	Optional	Optional	Optional	—	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	29,500 (128K words)	29,500 (128K words)	43,000 (128K words)	Contact vendor	Contact vendor
Monthly maint. of basic configuration above for on-site contract, $	322	369	484	Contact vendor	Contact vendor
Discounts available	Yes	Yes	Yes	—	Contact vendor
Price of memory increment, $	9,450 (128K words)	9,450 (128K words)	9,450 (128K words)	Contact vendor	Contact vendor
Date of first delivery	December 1980	December 1980	July 1979	May 1976	April 1981
Number installed to date	NA	NA	NA	NA	NA
COMMENTS	Price includes CRT console terminal; field-upgradeable to a V77-700 and V77-800	Price includes CRT console terminal; field-upgradeable to a V77-800	Prices includes CRT console terminal		Control storage includes PROM (2K x 36 bits) and RAM (16K x 36 bits)

All About Minicomputers

MANUFACTURER AND MODEL	Texas Instruments Business System 600 Series 990/10A	Texas Instruments Business System 800 Series— 990/12LR	Texas Instruments 990/4	Texas Instruments 990/5	Texas Instruments 990/10
WORD LENGTH, BITS	16	16	16 + 1	16 + 1	16 + 6
NO. WORKSTATIONS SUPPORTED	Up to 16	Up to 16	See Comments	See Comments	See Comments
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	350/200 ns	495/445 ns	0.67/0.67	0.50/0.50	0.67/0.67
Min./Max. capacity	256KB/2048KB	512KB/2048KB	4K/28KB	32K/64KB	64K/320KB
Parity checking	Standard	Standard	Standard	Standard	No
Error correction	Standard	Standard	No	No	Standard
Storage protection	No	No	No	No	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	64KB	64KB	32K	32K	32K
Control storage	—	—	No	No	No
Add time, microseconds	2.4	0.55-4.36*	4.7	3.5	3.6
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	No	No	No	No	No
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	Optional	Optional	Optional	Optional
Real-time clock or timer	Standard*	Standard**	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Optional	Optional	No	Standard	Standard
Maximum I/O rate, words/sec.	2.5M bps/3M wds.	2.5M bps/3M wds.	1.5M	1M	3M
No. of external interrupt levels	13	—	—	16	16
COMMUNICATIONS					
Maximum number of lines	Appli. & config. dep.	Appli. & config. dep.	See Comments	See Comments	See Comments
Synchronous	Opt.; 110-9600 bps	Optional	Std.; to 9600 bps	Std.; to 9600 bps	Std.; to 9600 bps
Asynchronous	Standard	Optional	Standard	Standard	Standard
Protocols supported	2780/3780, 3270, SDLC, HDLC	2780/3780, 3270, SDLC, HDLC	Bisync	Bisync	Bisync
Network architectures supported	SNA, X.25	SNA, X.25	—	—	—
RJE terminals emulated	2780/3780	2780/3780	IBM 2780/3780	IBM 2780/3780	IBM 2780/3780
IBM 3270 emulation	Yes	Yes	No	No	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	Opt.; 1.1MB	Opt.; 1.1MB	242K-968K bytes	242K-4M bytes	242K-4M bytes
Disk pack/cartridge drives	Optional	Optional	No	10M-200M bytes	10M-800M bytes
Drum/fixed-head disk storage	No	No	No	No	No
Magnetic tape cassettes/cartridges	Opt.; 19.2MB	Opt.; 19.2MB	No	No	No
Magnetic tape, ½-inch	Opt.; 40MB	Opt.; 40MB	No	30-60 KBS	30-60 KBS
Serial printer	Opt.; 150 cps	Opt.; 150 cps	180 cps	180 cps	180 cps
Line printer	Opt.; 300, 600 lpm	Opt.; 300, 600 lpm	300-600 lpm	300-600 lpm	300-600 lpm
Data communications interface	Opt.; 110-9600 bps	Opt.; 110-9600 bps	75-9600 bps	75-9600 bps	75-9600 bps
CRT	Std.; 1920 char.	Std.; 1920 char.	1920 char.	1920 char.	1920 char.
Other supported peripheral units	5.25", 8" Winchesters (5, 10, 18, 43MB)	5.25", 8" Winchesters (5, 10, 18, 43MB)	PROM programmer, A/D & D/A converters	PROM programmer, A/D & D/A converter	PROM programmer, A/D & D/A converters
SOFTWARE					
Assembler	Yes	Yes	Yes	Yes	Assembler & macro assembler
Compilers	Cobol, Basic, Fortran, Pascal, RPG II	Cobol, Basic, Fortran, Pascal, RPG II	Fortran	Fortran, Basic	Fortran, Basic, Cobol, Pascal, RPG II
Operating system	Batch, multi-tasking	Batch, multi-tasking	Real-time, multi-tasking	Real-time, multi-tasking	Real-time, multi-tasking
Language implemented in firmware	No	Partially; opt.	No	No	No
Operating system implemented in firmware	No	Partially; opt.	No	No	No
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	14,250 (256KB)	34,500 (512KB)	2,685 (8K bytes RAM)	4,200 (32K bytes)	13,860 (64K bytes)
Monthly maint. of basic configuration above for on-site contract, $	71	174	66	64	120
Discounts available	Yes	Yes	—	—	—
Price of memory increment, $	12,000 (512KB)**	3,000 (256KB)	2,000 (64KB)	2,000 (64KB)	6,500 (256KB)
Date of first delivery	September 1982	January 1983	March 1976	April 1979	March 1976
Number installed to date	NA	NA	NA	NA	NA
COMMENTS	*Generator by interrupt from line frequency in power supply **256KB thereafter $3,000, 1MB 10,500	*Uses cache memory and instruction look ahead so exact number cannot be quoted **Generated by interrupt from line frequency in power supply	Based on TI's TMS 9900 microprocessor; num. of workstations & lines are a function of application	Based on TI's TMS 9900 microprocessor; num. of workstations & lines are a function of application & memory sizes	MSI implementation of 990 instruction set; Disk Oper. Sys.; num. of workstations & lines are a function of application & memory sizes

All About Minicomputers

MANUFACTURER AND MODEL	Texas Instruments 990/12	TRW-Fujitsu TFC 8510	TRW-Fujitsu TFC 8520	TRW-Fujitsu TFC 8530	TRW-Fujitsu TFC 8540
WORD LENGTH, BITS	16 + 6	16	16	16	16, 32
NO. WORKSTATIONS SUPPORTED	See Comments	16	16	16	32
MAIN STORAGE					
Storage type	MOS/cache	NMOS	NMOS	NMOS	NMOS
Cycle/access time, microseconds	0.74, 0.15/0.50, 0.15	0.4	0.4	0.4	0.4
Min./Max. capacity	64K/320KB	256K/1280KB	256K/1280KB	256K/1280KB	512K/2048KB
Parity checking	No	Standard	Standard	Standard	Standard
Error correction	Standard	Standard	Standard	Standard	Standard
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	32K	16M bytes	16M bytes	16M bytes	16M bytes
Control storage	No	128K-256KB RAM	128K-256KB RAM	128K-256KB RAM	128K-256KB RAM
Add time, microseconds	0.552	—	—	—	—
Hardware multiply/divide	Standard	—	—	—	—
Hardware floating point	Standard	Standard	Standard	Standard	Standard
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	No	—	—	—	—
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	3M	2M bytes/sec.	2M bytes/sec.	2M bytes/sec.	2M bytes/sec.
No. of external interrupt levels	16	2	2	2	2
COMMUNICATIONS					
Maximum number of lines	See Comments	4	4	4	32
Synchronous	Std.; to 9600 bps	Opt.; 2400-9600 bps	Opt.; 2400-9600 bps	Opt.; 2400-9600 bps	Opt.; 2400-9600 bps
Asynchronous	Standard	Opt.; 200-9600 bps	Opt.; 200-9600 bps	Opt.; 200-9600 bps	Opt.; 200-9600 bps
Protocols supported	Bisync	BSC, HDLC, 2770, 3270	BSC, HDLC 2770, 3270	BSC, HDLC, 2770, 3270	BSC, HDLC, 2770, 3270
Network architectures supported	—	—	—	—	—
RJE terminals emulated	IBM 2780/3780	2770, 3780, MRJE	2770, 3780, MRJE	2770, 3780, MRJE	2770, 3780, MRJE
IBM 3270 emulation	Yes	Yes	Yes	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	242K-4M bytes	Std.; 1MB, opt.; 2MB	Std.; 1MB, opt.; 2MB	Std.; 1MB, opt.; 2MB	Std.; 1MB, opt.; 2MB
Disk pack/cartridge drives	10M-800M bytes	Opt. cart. (4); 20M-40MB	Opt. cart. (4); 20M-40MB	Opt. cart. (4); 20M-40MB	Opt. cart. (7); 20M-40MB
Drum/fixed-head disk storage	No	Std.; 25M-100MB; (25/50/100MB)	Std.; 50M-200MB; (25/50/100MB)	Std.; 100M-400MB; (25/50/100MB)	Std.; 100M-700MB; (25/50/100MB)
Magnetic tape cassettes/cartridges	No	—	—	—	—
Magnetic tape, ½-inch	30-60 KBS	Opt.; 800/1600 bpi	Opt.; 800/1600 bpi	Opt.; 800/1600 bpi	Opt.; 800/1600 bpi
Serial printer	180 cps	Opt.; 120-180 cps	Opt.; 120-180 cps	Opt.; 120-180 cps	Opt.; 120-180 cps
Line printer	300-600 lpm	Opt.; 370-670 lpm	Opt.; 370-670 lpm	Opt.; 370-670 lpm	Opt.; 370-670 lpm
Data communications interface	75-9600 bps	Std.; 200-9600 bps	Std.; 200-9600 bps	Std.; 200-9600 bps	Std.; 200-9600 bps
CRT	1920 char.	Std.; 1920 char.	Std.; 1920 char.	Std.; 1920 char.	Std.; 1920 char.
Other supported peripheral units	Prom programmer, A/D & D/A converters	—	—	—	—
SOFTWARE					
Assembler	Assembler & macro assembler	—	—	—	—
Compilers	Fortran, Basic, Cobol, Pascal, RPG II	Cobol, RPG, Fortran IV	Cobol, RPG, Fortran IV	Cobol, RPG, Fortran IV	Cobol, RPG, Fortran IV
Operating system	Real-time, multi-task	Batch, interactive, multiprogramming	Batch, interactive, multiprogramming	Batch, interactive, multiprogramming	Batch, interactive, multiprogramming
Language implemented in firmware	No	Partially	Partially	Partially	Partially
Operating system implemented in firmware	No	Partially	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	27,750 (64K bytes)	24,840	31,970	41,400	66,130
Monthly maint. of basic configuration above for on-site contract, $	200	125	155	205	270
Discounts available	—	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Price of memory increment, $	6,500 (256KB)	3,200 (128KB)	3,200 (128KB)	6,400 (256KB)	13,825 (768KB)
Date of first delivery	September 1979	May 1981	May 1981	May 1981	May 1981
Number installed to date	NA	NA	NA	NA	NA
COMMENTS	SCHOTTKY implementation of 990 instruction set; num. of workstations & line are a function of application & memory sizes	Field-upgradable to TFC 8540; includes DBMS; price includes CPU, power supply, front panel, minimum memory in chassis, a floppy disk unit, a fixed disk unit, and a console CRT	See TFC 8510 Comments	See TFC 8510 Comments	Includes DBMS; price includes CPU, power supply, front panel, minimum memory in chassis, a floppy disk unit, a fixed disk unit, and a console CRT

All About Minicomputers

MANUFACTURER AND MODEL	Ultimate 750	Ultimate 1000	Ultimate 2000	Ultimate 4303B	Ultimate 4303C
WORD LENGTH, BITS	16	16	16	16	16
NO. WORKSTATIONS SUPPORTED	8	16	32	64	126
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	1	1	1	6	6
Min./Max. capacity	32K/128K words	64K/128K words	64K/128K words	64K/1024K	64K/1024K
Parity checking	Standard	Standard	Standard	Standard	Standard
Error correction	NA	NA	NA	Standard	Standard
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	128K	128K	128K	1024K	1024K
Control storage	PROM; 2K x 64 bits	PROM; 2K x 64 bits	PROM; 2K x 64 bits	WCS; 2K x 64 bits	WCS; 2K x 64 bits
Add time, microseconds	NA	NA	NA	NA	NA
Hardware multiply/divide	Standard	Standard	Standard	Standard	Standard
Hardware floating point	NA	NA	NA	No	No
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	NA	NA	NA	Optional	Optional
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	1MB/sec.	1MB/sec.	1MB/sec.	3M	3M
No. of external interrupt levels	8	8	8	64	64
COMMUNICATIONS					
Maximum number of lines	16	16	16	64	126
Synchronous	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
Asynchronous	Std.; 9600 bps	Std.; 9600 bps	Std.; 9600 bps	Std.; 9600 bps	Std.; 9600 bps
Protocols supported	Bisync; 2780/3780	Bisync; 2780/3780	Bisync; 2780/3780	Bisync; 2780/3780	Bisync; 2780/3780
Network architectures supported	—	—	—	—	—
RJE terminals emulated	2780/3780	2780/3780	2780/3780	2780/3780	2780/3780
IBM 3270 emulation	No	No	No	No	No
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	No	No	No	No
Disk pack/cartridge drives	No	No	No	Std.; 67-268M bytes	Std.; 67-268M bytes
Drum/fixed-head disk storage	No	No	No	No	No
Magnetic tape cassettes/cartridges	Std.; ¼" tape cart.	Std.; cassette	No	No	No
Magnetic tape, ½-inch	No	No	Std.; 1600 bpi	No	No
Serial printer	Opt.; 120 cps	Opt.; 120 cps	Opt.; 120 cps	Opt.; 120 cps	Opt.; 120 cps
Line printer	Opt.; 150-600 lpm	Opt.; 150-600 lpm	Opt.; 150-600 lpm	Opt.; 150-900 lpm	Opt.; 150-900 lpm
Data communications interface	Std.; 9600 bps	Std.; 9600 bps	Std.; 9600 bps	Std.; 9600 bps	9600 bps
CRT	Std.; 80 x 24 char.	Std.; 80 x 24 char.	Std.; 80 x 24 char.	Std.; 80 x 24 char.	Std.; 80 x 24 char.
Other supported peripheral units	—	—	—	—	—
SOFTWARE					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	Extended Basic	Extended Basic	Extended Basic	Extended Basic	Extended Basic
Operating system	Multi-user, time sharing	Multi-user, time sharing	Multi-user, time sharing	Multi-user, time sharing	Multi-user, time sharing
Language implemented in firmware	Partially	Partially	Partially	Partially	Partially
Operating system implemented in firmware	Fully	Fully	Fully	Fully	Fully
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	20,000	27,500	33,500	39,400	60,400
Monthly maint. of basic configuration above for on-site contract, $	NA	325	365	465	595
Discounts available	—	—	—	—	—
Price of memory increment, $	2,500	2,500	2,500	5,000 (64K)	5,000 (64K)
Date of first delivery	1982	June 1982	September 1981	April 1979	April 1979
Number installed to date	—	—	—	700 (all sys.)	700 (all sys.)
COMMENTS	15, 30, 60MB disk drives can be added	8, 30, 60MB disk drives can be added	Disk capacities include 30, 60, 140MB with a 2 drive maximum; memory capacity is 256K words	Price includes OS, 13/67MB disk drive, 4 ports, and 64K bytes of main memory	Price includes OS, 13/67MB disk drive, 4 ports, and 64K bytes of main memory, and an 800-bpi magnetic tape; 2 optional high-performance processors (HPP) available—one doubles CPU performance, the other provides 5X CPU performance

All About Minicomputers

MANUFACTURER AND MODEL	Ultimate 4303D	Ultimate 5303E	Wang VS 25	Wang VS 45	Wang VS 80
WORD LENGTH, BITS	16	16	32	32	32
NO. WORKSTATIONS SUPPORTED	126	126	10	20	32
MAIN STORAGE					
Storage type	MOS	MOS	MOS	MOS	MOS
Cycle/access time, microseconds	6	6	0.48	0.48	0.66
Min./Max. capacity	64K/1024K	64K/1204K	512K/1MB	512K/1MB	128K/512K
Parity checking	Standard	Standard	Standard	Standard	Standard
Error correction	Standard	Optional	Standard	Standard	Standard
Storage protection	Standard	Standard	Standard	Standard	Standard
CENTRAL PROCESSOR					
No. of directly addressable words	1024K	1024K	1MB	1MB	—
Control storage	WCS; 2K x 64 bits	WCS; 2K x 64 bits	—	—	—
Add time, microseconds	NA	NA	—	—	—
Hardware multiply/divide	Standard	Standard	—	—	—
Hardware floating point	No	No	Standard	Standard	Standard
Hardware byte manipulation	Standard	Standard	Standard	Standard	Standard
Battery backup	Optional	Optional	No	No	No
Real-time clock or timer	Standard	Standard	Standard	Standard	Standard
INPUT/OUTPUT CONTROL					
Direct memory access channel	Standard	Standard	Standard	Standard	Standard
Maximum I/O rate, words/sec.	3M	3M	—	—	—
No. of external interrupt levels	64	64	5	5	5
COMMUNICATIONS					
Maximum number of lines	126	126	7	7	6
Synchronous	Opt.; 9600 bps	Opt.; 9600 bps	96	96	96
Asynchronous	Std.; 9600 bps	Std.; 9600 bps	96	96	96
Protocols supported	Bisync, 2780/3780	Bisync, 2780/3780	Async, bisync, SDLC, HDLC	Async, bisync, SDLC, HDLC	Async, bisync, SDLC, HDLC
Network architectures supported	—	—	WangNet	WangNet	WangNet
RJE terminals emulated	2780/3780	2780/3780	2780/3780, 3777	2780/3780, 3777	2780/3780, 3777
IBM 3270 emulation	No	No	Yes	Yes	Yes
PERIPHERAL EQUIPMENT					
Floppy disk (diskette) drives	No	No	Std.; 1.2MB	Std.; 1.2MB	Std.; 300KB
Disk pack/cartridge drives	Std.; 256-1024M bytes	Std.; 256-1024M bytes	Std.; 34 MB; opt. 64MB	Opt.; (4) 640MB	Opt.; (8) 640MB
Drum/fixed-head disk storage	No	No	—	—	—
Magnetic tape cassettes/cartridges	No	No	Opt.; 14MB	Opt.; 14MB	No
Magnetic tape, ½-inch	Standard; 800 bpi	Standard; 800 bpi	Yes	Yes	Yes
Serial printer	Opt.; 120 cps	Opt.; 120 cps	Opt.; to 192 cps	Opt.; to 192 cps	Opt.; to 192 cps
Line printer	Opt.; 150-900 lpm	Opt.; 150-900 lpm	Opt.; to 1200 lpm	Opt.; to 1200 lpm	Opt.; to 1200 lpm
Data communications interface	9600 bps	9600 bps	Optional	Optional	Optional
CRT	Std.; 80 x 24 char.	Std.; 80 x 24 char.	1920 characters	1920 characters	1920 characters
Other supported peripheral units	—	—	—	—	—
SOFTWARE					
Assembler	Yes	Yes	Assembler & macro assembler	Assembler & macro assembler	Assembler & macro assembler
Compilers	Extended Basic	Extended Basic	Cobol, Basic, RPG, Fortran, PL/1	Cobol, Basic, RPG, Fortran, PL/1	Cobol, Basic, RPG, Fortran, PL/1
Operating system	Multi-user, time-sharing	Multi-user, time-sharing	Interactive multi-user	Interactive multi-user	Interactive multi-user
Language implemented in firmware	Partially	Partially	No	No	No
Operating system implemented in firmware	Fully	Fully	Partially	Partially	Partially
PRICING & AVAILABILITY					
Price of CPU, power supply, frt panel, and minimum memory in chassis, $	79,000	98,000	25,000 including 34MB disk	21,000	19,000
Monthly maint. of basic configuration above for on-site contract, $	680	780	225	206	300
Discounts available	—	—	—	—	—
Price of memory increment, $	5,000 (64K)	5,000	3,000 (256K); 5,000 (512K)	3,000 (256K); 5,000 (512K)	6,500 (128K); 10,500 (256K)
Date of first delivery	April 1979	April 1979	September 1982	December 1982	1977
Number installed to date	700 (all sys.)	700 (all sys.)	NA	NA	NA
COMMENTS	Price includes OS, 256M byte disk drive, 4 ports, 64K bytes of main memory, and an 800-bpi magnetic tape drive; 2 optional high performance processors (HPP) available—one doubles CPU performance, the other provides 5X CPU performance	Price includes OS, 256M byte disk drive, 4 ports, 64K bytes of main memory, and an 800-bpi magnetic tape drive; 2 optional high performance processors (HPP) available—one doubles CPU performance, the other provides 5X CPU performance			