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All About Small Accounting Computers

In the price and performance range between conventional accounting machines and full-fledged computer systems, there is a class of data processing equipment that is currently filling the needs of thousands of businesses of all types and sizes. Though these machines employ a wide variety of programming and storage techniques, they are typically characterized by purchase prices in the \$5,000 to \$75,000 range, modest internal processing capabilities, and a strong emphasis upon direct keyboard input and low-speed printed output.

These low-cost business data processing systems are known by numerous names: Electronic Accounting Machines, Office Computers, Electronic Billing Computers, Magnetic Record Computers, etc. To simplify matters, we have chosen to use the generic term "small accounting computers" throughout this report.

WHO MAKES THEM

The leading U.S. suppliers of small accounting computers have long been Burroughs Corporation and the National Cash Register Company. It is no coincidence that Burroughs and NCR are also the leading suppliers of conventional adding and accounting machines. Both companies have huge marketing and service organizations and have done an outstanding job of trading their customers up to progressively more powerful equipment as their data processing requirements expand in volume and complexity. During 1972, both companies announced new models — the Burroughs L 8000 Series and the NCR 399 — that significantly enhance the attractiveness of their product lines. No official statistics are available as to the size or distribution of the small accounting computer market, but it is estimated that Burroughs and NCR together command roughly two-thirds of a \$1 billion worldwide market for accounting machines and small accounting computers.

IBM, the dominant supplier of both larger computer systems and punched-card tabulating equipment, has only begun to achieve proportionate success in the small accounting computer market. The principal vehicle for IBM's recent penetration is the System/3 Model 6 — a strong entry at the upper end of this market segment, with its disc storage, fast printer, and optional CRT display output.

Other major suppliers of American-made small accounting computers include the Automated Business Systems Division of Litton Industries, the Business Machines Division of the Singer Company, and Digital Equipment Corporation. About a dozen smaller companies, including Basic Four, Cascade, Custom Computer, Eldorado Electrodata, Quantel, and Ultimacc, offer small business data processing systems based upon minicomputers with comparatively powerful internal processing capabilities.

This comprehensive survey summarizes the characteristics of 88 small accounting computers from 33 suppliers. These keyboard-oriented business data processing systems, priced in the \$5,000 to \$75,000 range, come in a wide range of configurations and capabilities. Designed mainly for small companies, they are being productively employed in many large organizations as well.

European-made equipment is making a much greater impact upon the small accounting computer market than in any other segment of the U.S. computer market. Honeywell, Olivetti, Philips, and Nixdorf are marketing equipment which they manufacture in France, Italy, the Netherlands, and Germany, respectively. (Late in 1972 Nixdorf acquired Victor Comptometer's small accounting computer marketing interests, which had been dedicated to marketing the German-made Nixdorf systems.)

WHO NEEDS THEM

The small accounting computers are, of course, designed primarily to serve the business data processing needs of ➤



The NCR 399 is the greatly improved heir-apparent to NCR's earlier and widely used line of accounting computers, including the 395, 400 and 500. Based upon a minicomputer manufactured by NCR, the 399 offers a wide range of optional peripherals and up to 16K bytes of core storage. Among other noteworthy features of this system are status control lights and "lead-through" programming to aid in operator training.

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The Litton ABS/1281 has a 4096-word magnetic drum memory that stores both instructions and data. The 35-char/second wheel-type printer features three independent form feeds. Single or dual magnetic ledger card handlers are standard, with a capacity of up to 1199 digits per card.



▷ small companies. The principal sales targets are the more than 200,000 U.S. business and government organizations with between 20 and 500 employees. Smaller companies will usually find it difficult to justify the price tags on these machines, while larger organizations will usually need more powerful computers.

For many of these small companies, a computer—when properly selected, installed, programmed, and operated—can lead to far smoother operations and higher profits. In addition to processing routine transactions, a computer can produce reports that give management the information it needs to achieve improved customer service, reduced inventories, tighter cost control, and increased production efficiency. But in far too many cases, especially in smaller companies, computers are poorly chosen, misused, and misunderstood, so that they actually become liabilities rather than assets. The best way to guard against this type of disaster is through a thorough management training program in the principles of EDP. But, since few small-company executives have the time or inclination for such training, the next best approach is to seek competent outside advice to provide guidance in the selection and installation of an appropriate computer system. The best starting point for obtaining effective outside help is likely to be your own industry, trade, or professional association.

Though the low-cost small accounting computers are designed mainly for use in small companies, they are also being productively used in some of the nation's largest corporations in a variety of specialized applications such as these:

- Local processing of some or all of the data generated in branch offices, divisions, and/or small subsidiaries.

- Individual, “dedicated” applications that involve extensive keyboard input and printed output, such as the preparation of accounts payable checks, insurance claim checks, and stock transfer certificates.
- “Intelligent terminal” applications, in which the small computers perform both local data processing functions and communications control functions in company-wide data communications networks.

APPLICATIONS

In their basic configurations, most of the small accounting computers consist of a processing unit, a keyboard for data entry, and a serial (typewriter-style) printer or low-cost line printer for data output. All variable data for each transaction is entered by the operator through the on-line keyboard. The “master file” or ledger data required to process each transaction may also have to be entered through the keyboard. In systems equipped with appropriate input/output capabilities, however, the master file data can be read directly into the processor from magnetic ledger cards, punched cards, paper tape, magnetic tape, or magnetic disc, leading to greatly increased processing speeds and flexibility.

For most small accounting computers in most applications, the overall processing speed will be governed by the speed at which the operator can key in the data for each transaction. Wherever on-line keyboard entries are involved, the overall throughput of a system will rarely exceed a few transactions per minute.

Many of the systems can optionally be equipped with sufficient input/output capabilities to handle conventional batch-mode data processing, in which the variable ▷

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Digital Equipment Corporation's long-awaited entry into the small accounting computer market has finally been realized with the DECdata-systems. A Series 300 system is shown here, built on a PDP-8 minicomputer with up to 32K 16-bit words of core storage, two DECpack discs, a card reader, an I/O console, and an output printer.

▷ transaction data is recorded on cards or tape so that it can be read into the computer at higher speeds. This mode of operation is particularly suitable for the recently developed systems that are built around a minicomputer. Earlier designs precluded this work-flow pattern because of the limited internal processing and storage capabilities of those machines. Even at the present time, one leading supplier of small accounting computers states that less than 20 percent of the systems it installs are equipped with any input/output devices beyond the basic keyboard, printer, and (in some models) magnetic ledger card capabilities.

As their name implies, the small accounting computers are designed and used predominantly for applications of the accounting type. A much smaller (albeit growing) number of systems are also suitable for applications in the scientific, engineering, management sciences, or information storage and retrieval categories.

In fact, in recent years it has become steadily less clear where the dividing line should be placed between the minicomputer-based small accounting computers with general-purpose operating systems and the truly general-purpose small computing systems with full-scale batch processing (i.e. job stream) capabilities. Into this latter category must fall systems such as the IBM System/3 Model 10, the Burroughs 1700, the NCR Century 50, etc. The differentiating criteria used for purposes of this report include not only the system's hardware characteristics and the generality of its operating systems design, but also the stress placed upon standard business applications software, the vendor's market strategy, etc.

General-purpose small computing systems are individually covered in the Computer section of DATAPRO 70.

On the other side of the spectrum, applications software and/or the facilities provided to aid in developing such software play a key role in distinguishing between a minicomputer and a small accounting computer system. While the former is often packaged and marketed as hardware only, the latter have extensive applications-oriented facilities and tend to be available on a "turnkey" basis for end-user installation.

Within the accounting realm, billing is by far the most common application for the small accounting computer systems. The order entry, invoicing, and accounts receivable functions constitute the lifeblood of many small businesses, as well as the functions that require the most clerical effort to process manually. As a result, the billing application alone frequently justifies the installation of a computer. Indeed, several of the systems included in our survey are officially designated as "Billing Computers," although they are suitable for other applications as well.

Payroll is probably the next most important application for the small accounting computers, with general ledger accounting, accounts receivable, accounts payable, inventory management, and sales analysis also ranking high on the list. In addition to these broad general classes of applications, the small accounting computers are capable of effectively handling many of the specialized data processing needs of manufacturing, wholesaling, retailing, financial, educational, government, and service organizations. ▷

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USERS' RATINGS OF SMALL ACCOUNTING COMPUTERS

System	Number of User Responses	Total Number of Machines	Overall Performance				System Reliability				Maintenance Service				Software and Technical Support			
			E	G	F	U	E	G	F	U	E	G	F	U	E	G	F	U
Burroughs L 2000	7	22	1	6			1	6			1	6				4	2	1
Burroughs L 3000	2	2	2				2				2				1	1		
Burroughs L 5000	1	1		1					1			1						
Burroughs E 6000	1	2			1				1				1					1
Burroughs E 8000	1	1	1				1				1					1		
Honeywell Model 58	1	1	1					1			1					1		
IBM 6430	1	1			1				1									1
IBM System/3 Model 6	10	23	4	4	2		6	4	1		4	4	1	1		5	2	3
Litton ABS 1231/1241	2	2	2				1	1			2				1	1		
NCR 400	1	1				1							1					1
NCR 500	1	1				1								1				1
Nixdorf 820 Series	3	36	2	1			1	1	1		1	1	1		1	1	1	1
Olivetti P203	1	1			1				1				1					1
Philips P-359	1	1		1				1				1						1
Singer 5800	1	6			1				1							1		

LEGEND: E—Excellent, G—Good, F—Fair, U—Unsatisfactory.

➤ USER EXPERIENCE

To assess the current level of user satisfaction with small accounting computers, and to determine what business applications are being successfully implemented with them, Datapro Research Corporation conducted a survey of users of such systems in December 1972. A Small Accounting Computer Reader Survey Form was included in the December supplement to DATAPRO 70 and mailed to all subscribers. By January 15, usable responses had been received from 34 users of small accounting computers with a total of 102 installed systems. In virtually every case where more than one system was installed, all of the systems were from the same vendor. This approach is readily understandable, since it spreads the program development and training costs over as wide a base of compatible systems as possible.

Four questions were asked in the survey to assess the level of user satisfaction: "How would you rate the overall performance of the system?", "How would you rate the system's reliability?", "How would you rate the maintenance service provided for the equipment?", and "How would you rate the manufacturer's software and technical support?". The responses to these questions from users of 15 different systems are shown in the table. Prospective buyers should carefully note that the very small sample sizes for many of these machines make it unwise to attach undue significance to the indicated ratings; some of the unsatisfactory experiences reported by individual users may represent isolated instances of poor local support.

Totaling the responses to all four of Datapro's questions for all systems, the results were as follows:

<u>Rating</u>	<u>No. of Responses</u>	<u>% of Total</u>
Excellent	40	29
Good	56	41
Fair	26	19
Unsatisfactory	14	11

Thus, the survey indicates a fairly high level of satisfaction among users of small accounting computers, with 70 percent rating their systems generally good or excellent. It is clear, however, that users are considerably less happy with the software and technical support for these systems than with their overall performance, reliability, and maintenance.

Among the specific strengths and weaknesses noted by two or more users were the following: Burroughs L Series — ease of use and relatively low cost (3 mentions each), awkwardness of having to use larger Burroughs systems to compile programs for the small accounting computers (4 mentions); IBM System/3 Model 6 — relatively low cost (3 mentions), ease of operation and convenience of RPG (2 mentions each), inefficient or poor systems software (4 mentions), and incompatibility with other systems (2 mentions). In general, most users stressed ease of use of their systems, while users of the more powerful minicomputer-based systems frequently revealed their transitory status as upward-migrating installations by grumbling about system throughput limitations and lack of system flexibility. ➤

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➤ The applications for which small accounting computers are being used fall within the general business category, with several special purpose packages sprinkled among them:

<u>Application</u>	<u>No. of Users</u>	<u>% of Total</u>
Invoicing/billing	14	41
Accounts receivable	9	26
Payroll	6	18
General ledger	6	18
Inventory management	5	15
General financial administration, including cash receipts journal, accounts payable	10	29
Special industry applications, including securities/banking, distribution, medical/dental, sales analysis	10	29
Miscellaneous (order entry, remote job entry)	4	12

BUYING ADVICE

As with all categories of data processing equipment, the watchword in selecting a small accounting computer is "Buyer beware." These machines come in a wide range of types, sizes, and capabilities—with price tags to match—and there's a great deal to be gained through systematic selection of the most appropriate system for your particular needs.

But all too often, the buyers of this class of equipment have little or no understanding of data processing principles and are likely to buy the wares of the salesman who arrives first or sells hardest.

No company should *ever* buy a computer from the first salesman who knocks on its door. It's always far wiser to check out the offerings of at least a few of the other major suppliers, and you shouldn't hesitate to play one vendor against another in an effort to get the most for your money. Just remember that all promises of extra software, technical support, or other concessions should be specifically included in the contract you sign.

Companies that make a sincere effort to select the most appropriate equipment for their needs are likely to encounter a number of frustrations. Many of the small accounting computers are very poorly documented. The sales brochures and even the technical manuals often seem to be artfully contrived to conceal more than they reveal about the equipment's true characteristics and capabilities. The salesmen aren't likely to be much more helpful; typically, they've been trained to sell "instant solutions" to your data processing problems rather than specific hardware or software. Clearly, the assumption is that the buyers of these machines are unsophisticated souls who have no reason to know or care what the basic product specifications are.

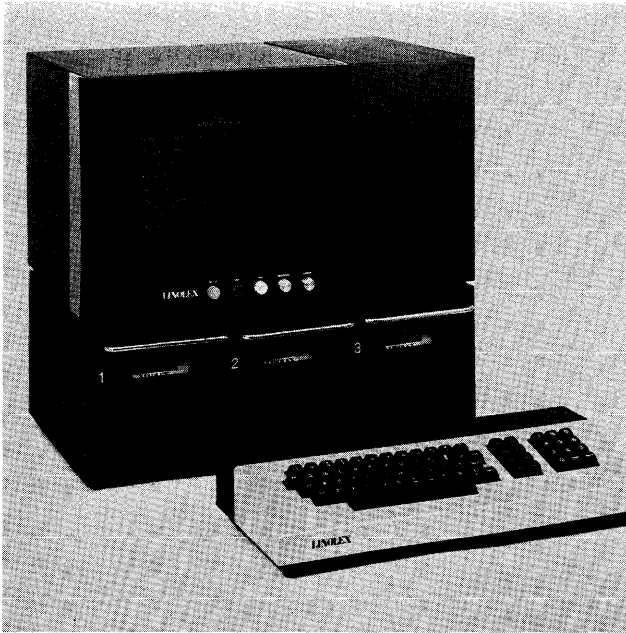
Before seriously considering the acquisition of any small accounting computer, you should demand:

- Detailed specifications of all the pertinent hardware and software.
- A full-scale demonstration of the equipment on at least one of your own principal applications—or, if that's not practical, on a demonstration program whose functions are similar enough to your own needs so that you can draw realistic conclusions about the system's processing speed and ease of programming and operation.
- A detailed proposal that spells out exactly what equipment, software, and technical support will be ➤



The Burroughs L 3000 Window Accounting Computer, like other models of Burroughs' popular L Series accounting computers (and their communications-oriented TC Series counterparts), features a magnetic disc memory that holds data, the user's programs, and "firmware" (microprogramming) that controls the system's arithmetic and logic operations. The L 3000 can accommodate passbooks for local operations as well as an interface to a central computer for on-line applications. With communications, the L 3000 is called a TC 700 Data Communications Terminal.

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The Linolex Model A system shown above is a complete business computing system with up to 32K bytes of semiconductor memory, a data entry keyboard, magnetic tape cassettes for program and data storage, and an information screen for operator communications. Optional I/O devices include an 18-million-byte disc, punched card input, and 1/2-inch industry-compatible magnetic tape.

- supplied, estimated processing times for each of your applications, all responsibilities of both the vendor and buyer, and the total purchase price or monthly rental price.
- A list of users in your geographical area who are employing the system for applications similar to yours. Talk to several of these users and find out as much as you can about their experiences. While they may not be able to give you much help in developing a sophisticated comparison to other alternative systems, they *can* give you a good idea of what pitfalls to watch out for in installing and using that particular system.

If all this sounds like too much trouble, or just plain incomprehensible, your company (like hundreds of others) could be heading for serious losses of time and money through installation of an unsuitable computer system. In that case, you should seek help from responsible user associations with problems similar to your own and/or from a qualified independent consulting firm. DATAPRO 70 Feature Report 70F-050-01 provides useful guidelines for selecting and employing consulting services effectively.

You'll find a great deal of additional useful advice in DATAPRO 70 Feature Report 70F-100-01, "How to Plan and Implement a New Computer Installation," and in the following explanations of the comparison chart entries.

THE COMPARISON CHARTS

The characteristics of 88 small accounting computers from 33 different manufacturers are presented in the accompanying comparison charts. All of these systems are currently being commercially marketed in the United States. The information in the charts was supplied and/or verified by the manufacturers or U.S. suppliers during December 1972 and January 1973; their close cooperation with the Datapro Research staff in the preparation of these charts is greatly appreciated.

The comparison chart entries and their significance to potential users of small accounting computers are explained in the following paragraphs, together with some useful guidelines for selecting the equipment that will most effectively meet your needs.

Data Formats

This section of the comparison charts describes the formats used to store and process data within each system.

Word length is the number of bits (binary digits) of data that can be stored in or retrieved from the internal storage unit during a single cycle. Some small accounting computers have a "fixed word length," meaning that each machine word or operand always has the same number of bits, digits, or characters. Others have a "variable word length," meaning that their operands may consist of a variable number of bits, digits, or characters. In the latter case, the "word length" entry shows the number of data bits used to represent each byte or character within the variable-length operands.

Digits per word is the number of decimal digits that can be represented within each machine word. At least four binary bits are required to represent each decimal digit, and in some systems six or eight bits are used.

Characters per word is the number of alphanumeric characters that can be represented within each machine word. Most systems use either six or eight bits to represent each character. Some small accounting computers are incapable of processing or storing alphanumeric information, in which case this entry is blank.

Operand length is the length of each unit of data upon which the basic internal processing operations, such as addition and subtraction, are performed. Fixed word-length computers usually have an operand length of one word. For variable word-length computers, the ranges of permissible operand lengths for addition and subtraction are shown.

Instruction length is the number of words (or bits) used to specify each operation to be performed by the system. This entry is relevant only for systems with internally stored programs. In general, each instruction indicates the ➤

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▷ specific operation to be executed (add, multiply, move, print, etc.) and the storage locations of one or more of the operands involved. Since some small accounting computers store their data and their programs in separate storage units, the instruction length may be unrelated to the data word length.

Internal Storage

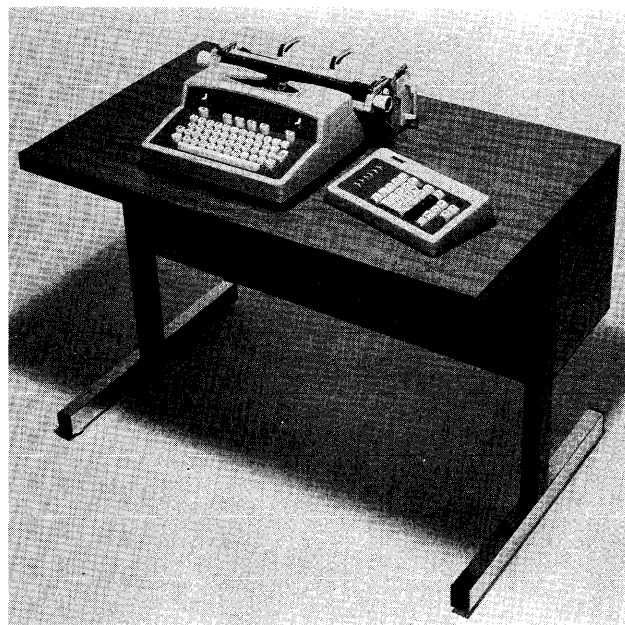
One of the principal characteristics that distinguishes computers from adding machines and conventional accounting machines is the provision of an internal storage unit capable of holding and selectively retrieving a significant quantity of data and/or instructions. This section of the comparison charts describes each system's internal storage facilities.

Type of storage. As in large computers, magnetic cores are the most commonly used internal storage medium. Magnetic core storage has been widely used for more than a decade, and has proved to be fast, flexible, and reliable. Unfortunately, core storage is also rather expensive, so the designers of some small accounting computers have elected to use other storage media, including rotating magnetic discs and drums, delay lines, and magnetic tape cartridges. All of these alternative media are inherently slower and less reliable than magnetic cores, yet their lower cost gives them considerable appeal to both manufacturers and buyers of small accounting computers. Semiconductor storage, which is expected to gradually supersede core storage as the principal storage medium for larger computers, has yet to make its appearance on the small accounting computer scene.

Storage capacity. The amount of internal storage is one of the most significant characteristics in appraising the power of any computer. The amount of productive processing that a computer can perform during any one run is largely determined by the number of instructions and/or operands it can hold. Computers that store their programs externally (on plugboards, punched tape, etc.) can get by with correspondingly less internal storage, since only the data needs to be stored internally—but the externally programmed computers are inherently limited in processing power and flexibility.

The charts indicate the number of words of internal storage available for each computer. Where a range of storage capacities is offered, the minimum and maximum capacities are shown. Some of the small accounting computers have two or more distinct internal storage units, and in these cases the situation is further explained in the "Comments" entry at the bottom of the comparison charts.

Cycle time. This is the minimum time interval that must elapse between the starts of two successive accesses to any one storage location. The storage cycle time normally ranks with word length as one of the most signif-



One of the least expensive small accounting computers available, Paillard's Hermes F-4 Billing Computer is designed mainly for billing and source data recording applications. Mini-cassette output, as well as punched tape and card output, are also available. About 600 of these systems have been installed since the end of 1969.

icant individual indicators of a computer's performance potential. However, the throughput of the equipment covered in this report is usually determined by the operator's keying speed rather than by the machine's internal performance. Therefore, the storage cycle time is of considerably less importance—as long as the machine is fast enough so that the operator seldom has to wait for it to finish processing one transaction before she can key in the data for the next transaction. Several manufacturers actually refused to specify the storage cycle times of their machines—and DATAPRO 70 believes every prospective buyer has a right to know all the basic specifications of every computer, even in cases where the data's relevance may ultimately prove to be of minor significance for a specific application environment.

Storage usable for data/programs. These two chart entries tell whether each computer's internal storage can be used to store data and/or programs. Data can be stored internally for rapid retrieval in all of the computers covered in our survey, but a number of the systems use external media to hold their programs.

Processing

This section of the comparison charts describes each computer's capabilities for internal processing of the data that is presented to it. "Processing" is a general term for the various arithmetic and logical operations that must be performed to solve a particular problem or achieve a ▷

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The Philips P-350 Series Office Computers feature 400 to 1200 15-digit words of core storage for both programs and data. The larger models can accommodate as many as 16 peripheral devices, up to 4 of which can operate simultaneously. Several thousand P-350 systems have already been sold in Europe.

➤ desired result. Virtually all of the computers covered in this survey are equipped, through either machine instructions or standard software, to perform all the basic arithmetic and logical operations upon decimal operands; the usual complement of operations includes add, subtract, multiply, divide, compare, test, branch, print, etc.

Programming technique. A computer program is a set of instructions that cause a computer to perform a particular sequence of operations. Most current computers use *internally stored* programs, meaning that their instructions can be stored, retrieved, and altered as if they were data. This capability to modify their own programs gives stored-program computers great flexibility and enables them to respond to changing problem conditions.

Some small accounting computers, however, are *externally programmed*. The instructions which comprise their programs may be stored on punched tape loops or magnetic tape cartridges, or wired into plugboards. Plugboards, usually called "control panels" by the equipment manufacturers, are perforated boards whose holes (called "hubs") are manually interconnected by means of wires terminating in plugs (called "patchcords"). The specific interconnections determine the sequence of operations which the machine will perform. Control bars or rods on the printers constitute another external programming technique that is sometimes used to control the format of printed output.

Although externally programmed computers are inherently less flexible and powerful than their stored-program

counterparts, their use can frequently be justified on the basis of lower equipment costs, lower programming costs, and/or less retraining for employees who are familiar with conventional accounting machines or tabulating equipment. But the trend is clearly toward ever-increasing use of stored-program computers for all types and volumes of applications, and it is likely that most of the externally programmed models will disappear from the market within the next few years.

Operational registers. A register is a device that stores a small quantity of data (usually one word) and serves some special purpose. Most computers have one or more accumulators (in which arithmetic operations are performed), an instruction register, and a sequence counter. Multiple registers can facilitate programming and increase program execution speeds. In many small computers, reserved locations in internal storage, rather than special hardware elements, serve as registers in order to keep the cost down. The comparison charts show the number of operational registers and their capacities in all cases where the manufacturers have released this information.

Add time. The time required to develop the arithmetic sum of two operands is another widely used measure of computer performance—and another figure that turns out to be of comparatively little importance in the selection of a small accounting computer. Once again, the reason is that the overall speed of these systems in most applications is largely determined by the operator's keying speed. Add times for the systems covered in our survey span the range from a few microseconds to more than half a second—yet the key question is still whether the operator can "beat the machine." If not, the machine is probably as fast as it needs to be for these keyboard-oriented accounting applications. (It should be noted that for larger equipment configurations, in applications where the transaction data is prerecorded on cards or tape, add times—and internal speeds in general—become highly significant considerations.)

Keyboard Input

The principal source of input to most small accounting computers is data keyed in by a human operator. Therefore, the keyboard facilities for on-line data entry deserve careful consideration.

Alphanumeric (typewriter) keyboard. Virtually all of the systems covered in our survey include a keyboard, arranged in the conventional typewriter format, that permits direct entry of both alphabetic and numeric information.

10-key numeric keyboard. A 10-key adding-machine-style keyboard, standard in many of the systems and optional in others, permits all-numeric data to be entered at considerably higher speeds than via a typewriter-style keyboard. The numeric keys are usually accompanied by control keys which activate various machine functions. ➤

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▷ **Full accounting keyboard.** Most “classic” accounting machines have multiple columns of keys, with each column consisting of the digits 0 (or 1) through 9. Though used in only a few of the current small computers, these full keyboards have the advantage of being familiar to most accounting machine operators.

Printed Output

Printed documents and reports represent the principal form—and frequently the only form—of output from most small accounting computers. Therefore, printing and document-handling capabilities receive strong emphasis in the comparison charts.

Printing speed. The computers in this class generally use typewriter-style printing elements that print one character at a time. Thus, their printing speeds are usually in the range of 7 to 40 characters per second. A few systems offer line printers with considerably higher speeds. Rated printing speed is of little significance if most of the data to be printed is keyed in by the operator. But if a high proportion of the printing is done from the computer’s memory, under program control, then higher printing speeds can yield major improvements in throughput.

Carriage width. The width of the printer’s carriage naturally determines the maximum width of the forms it can handle. Carriage widths of 15 to 26 inches are common in this class of equipment, permitting two or more separate forms to be inserted and printed upon in side-by-side fashion.

Split platen. This useful feature, standard in some printers and optional in others, permits two (or occasionally three) separate forms to be inserted and advanced independently of one another. Thus, in payroll applications, suitably equipped machines can produce a journal, earnings ledger, and payroll checks with earnings statements in a single operation. Machines that lack the split platen capability will frequently require two or more runs (or multiple on-line printers) to produce the printed outputs that can be prepared in a single run by a split platen printer.

Pin-feed forms handling. For efficient feeding of continuous, fanfold printer forms, pin-feed forms-handling facilities are a virtual necessity. Drive sprockets or “tractors” on the printer engage holes punched into the margins of the forms, permitting positive feeding with little chance of misalignment or jamming.

Friction-feed forms handling. When printing on individual documents, such as ledger cards, a conventional friction feed mechanism (as on a typewriter) is preferable because the documents can be inserted more easily than into a pin-feed mechanism. Therefore, most of the small accounting computers can (and should) be equipped with both pin-feed and friction-feed facilities. An additional useful feature of some machines is the ability to insert and align individual friction-fed documents, such as ledger

cards, from the front by simply dropping them into a “chute.”

Journal roll handling. Some machines can be equipped to handle continuous rolls of paper tape of the type used on adding machines. This facility can be useful for maintaining a journal record of each transaction.

Magnetic Ledger Cards

Magnetic ledger cards are among the most popular input/output media for small accounting computers. Their principal attraction is that they enable small businesses to retain the individual, hard-copy ledger records they have long been accustomed to using. In addition, machine-readable data can be recorded on the cards, usually on one or more vertical magnetic “stripes.” Identity and status information about each account can be recorded on the appropriate card in both printed and magnetically encoded form, and the encoded data can be re-read and updated whenever necessary.

Thus, magnetic ledger cards combine many of the advantages of both traditional visible records and machine-readable media such as punched cards or magnetic tape. Their principal disadvantage is that the low speed of most of the available card-handling equipment precludes the use of magnetic ledger cards in high-volume data processing applications.

Data capacity. This entry specifies the maximum number of digits of information that can be recorded on each magnetic ledger card. ▷



The Nixdorf 820/03 Terminal Computer is one of numerous models in the Series 800. Manufactured in West Germany, the Series 800 machines feature both core and “rod cell” storage, plus microprogrammed logic.

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▷ *Automatic card alignment.* Processing speed is considerably enhanced if the magnetic ledger cards can simply be inserted into a chute by the operator and automatically advanced to the first blank line on the card, ready for posting. This entry states whether the automatic alignment facility is standard, optional, or not available.

Automatic card feeding and stacking. In most systems, the magnetic ledger card for each account to be processed must be selected by the operator and manually inserted into the machine. A few manufacturers offer automatic ledger-card readers, which feed, read, and stack the cards sequentially at substantially higher speeds. Most of these high-speed ledger card readers, however, lack the capability to record updated information on the cards. Thus, their usefulness is largely limited to the preparation of reports from data previously recorded on the cards; transaction processing and ledger-card updating must still be performed on the console printer, with manual insertion of one card at a time.

Magnetic Disc I/O

The inclusion of magnetic disc units can greatly increase the data storage and processing capabilities of a business data processing system. Disc 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 disc, 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, disc units can enable small accounting computers to handle applications and processing volumes that would otherwise be impossible. The principal disadvantages of disc 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 disc units impractical for many small computer buyers, despite the obvious appeal of disc-oriented data processing.

Maximum on-line disc capacity. This entry specifies the maximum quantity of disc-stored information that is directly accessible to the computer at any one time. The indicated figure may be the capacity of a single disc drive or the total capacity of two or more drives that can be connected.

Disc I/O speed. This is the rate at which data is transferred between the disc unit and the computer's internal storage during either a disc read or write operation.

Interchangeable discs. Most of the current disc-oriented computers use removable cartridges or "disc packs," which can be easily removed from the drive units and interchanged in much the same manner as magnetic tape reels. Interchangeable discs provide great flexibility and

make it practical to use a computer for both sequential and random data processing applications. In sequential applications, files of virtually unlimited size can be handled through the use of multiple disc packs or cartridges.

Other I/O Units

Many of the small accounting computers can be equipped with optional input/output devices such as card readers and punches, paper tape readers and punches, line printers, magnetic tape units, and data communications interfaces. The comparison charts indicate the availability and rated speed of each type of device. These I/O units, when judiciously selected and matched to your requirements, can greatly increase a system's versatility and power.

In many cases the vendor will connect a new type of peripheral unit to the system upon customer demand. To get a good idea of the full range of minicomputer-type peripheral devices available, please refer to DATAPRO 70 Feature Reports 70F-500-01, 70F-510-01, 70F-520-01, 70F-530-01, and 70F-540-01 for surveys of disk and drum, magnetic tape, printer, punched card, and punched tape units, respectively.

Punched cards, paper tape, and magnetic tape can all be used either to store master-file records or to accumulate previously recorded transaction data. For a detailed comparison of the advantages and disadvantages of each medium, please refer to DATAPRO 70 Feature Report 70F-370-01, "How to Select Data Entry Devices." It's worth noting that many of the paper tape readers and punches employed in these systems can also accommodate edge-punched cards, which represent an effective unit-record storage medium for many applications.

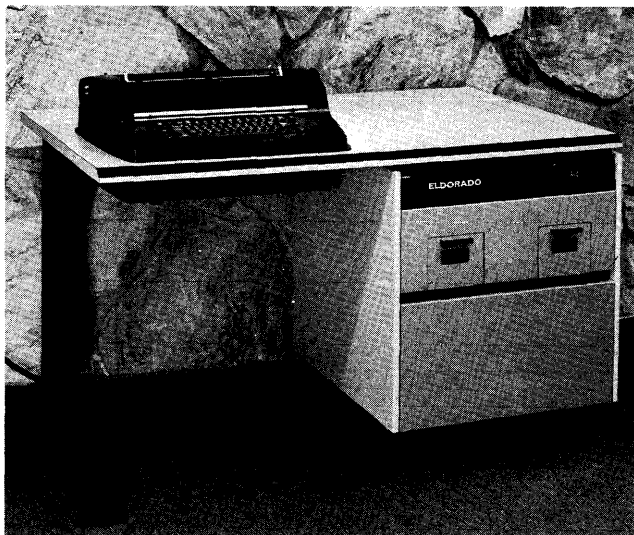
Line printers can be added to some small accounting computers to provide printed output at far higher speeds than the standard typewriter-style printers. But the line printers generally have much higher price tags and lack the flexible forms-handling capabilities of the slower standard printers.

Communications interfaces enable some of the small accounting computers to function as "intelligent terminals" in data communications networks. The 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.

Software and Support

Virtually as important as the computer hardware are the software and technical support each manufacturer furnishes to aid the user in utilizing the hardware effectively. ▷

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The Eldorado Electrodata 125 is a communications-oriented system that includes a minicomputer with up to 61K bytes of core storage and two magnetic tape cassette drives. A disc storage capability is optional.



The Basic/Four computer systems are built around a Microdata 1600 minicomputer and feature a replaceable-cartridge disc memory that holds from 2.1 million to 12.6 million bytes. The BASIC programming language is supported, and up to 8 interactive terminals can be connected to the system.

➤ The available software (if any), together with the pricing policies for both software and support, are summarized in this section of the comparison charts.

Assemblers. 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 programs 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.

Compilers. A compiler is another type of software designed to shift part of the program preparation task from the user to the computer itself. A compiler converts programs written in a simplified, procedure-oriented language such as COBOL into machine-language object programs. Compilers are now being 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 the small accounting computers. This trend is possible because of the more powerful minicomputers now being used, since compilation is an intricate process that requires more storage space and processing power than the earlier versions of this type of system 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.

Application programs. Some of the small computer manufacturers offer libraries of ready-made programs designed

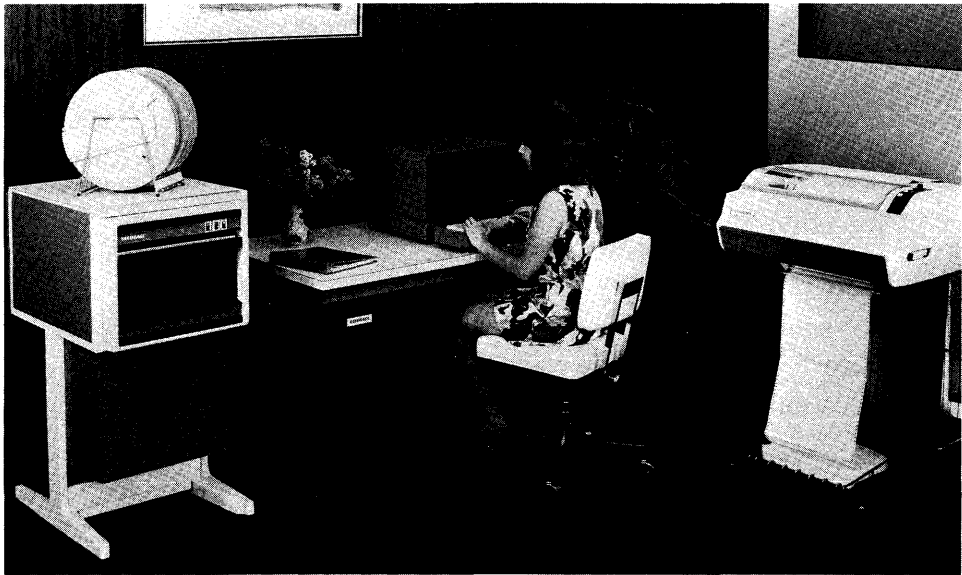
to handle commonly encountered data processing applications. If suitable programs are available, the user can sometimes save thousands of dollars worth of programming effort. But no two companies have exactly the same data processing requirements, so some modification of the standard packages, by either the user or the manufacturer, will be required in nearly every case. Even so, a library of application programs can be an important asset to consider when choosing a computer. Space precludes a complete listing of available application programs in the charts, so the entries attempt to summarize the size and scope of each system's program library, if any. The entry "standard business applications" indicates that programs are available to handle the most common business functions: billing, payroll, inventory control, etc.

Software separately priced. This entry tells whether the software described in the preceding entries, and any other available software, is included in the equipment price or offered at some additional cost. Separate pricing of software was virtually unheard of in the computer field until June 1969, when IBM "unbundled" by placing separate price tags on many of its software products and professional services. Since then, the various manufacturers have adopted a wide range of software pricing policies. Separate pricing of software, of itself, is neither good nor bad; the buyer must carefully assess the cost of the total package consisting of the equipment and all the software and support his installation will require. One of the major "unbundled" manufacturers states that the total software bill for a typical small accounting computer installation usually falls within the \$1,500 to \$2,000 range.

Technical help separately priced. This entry tells whether the services of the manufacturer's technical support staff are included in the equipment cost or separately priced. ➤

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This Ultimacc Disc System features a Data General 1200 minicomputer, a Centronics line printer, and 5 million bytes of disc storage (expandable to as much as 126 million bytes). Ultimacc supplies the hardware interfaces, standard software, and custom programming, and sells the system on a turnkey basis for accounting applications in small businesses.



➤ Nearly every company that is installing a computer for the first time will need a good deal of help from the equipment maker's systems analysts, programmers, and/or instructors (or, alternatively, from an independent consulting firm). In fact, the manufacturer does *all* the programming for the great majority of small accounting computer installations (more than 90 percent, according to one major supplier). The additional cost of these services, if any, should be carefully estimated and considered in all equipment comparisons.

Pricing and Availability

Purchase price of basic system. For each computer, this entry shows the minimum purchase price of a system equipped to perform basic business data processing functions. All of the facilities identified as "standard" in the charts (but none of the "optional" ones) are included in the listed prices. The addition of expanded storage capacities or optional input/output capabilities can lead to large price increases in nearly every case. For detailed pricing information, the manufacturers should be contacted directly.

Monthly rental of basic system. This entry shows the monthly rental for the basic configuration of each system, as described above. All rental prices are based on a one-year lease and include equipment maintenance unless otherwise indicated.

Date of first U.S. delivery. This entry tells when the first production models of each system were delivered (or are scheduled to be delivered) to customers in the United States.

Number installed in U.S. to date. This entry shows how many systems of each type had been delivered to U.S. customers as of approximately January 1, 1973. All

figures were supplied by the manufacturers themselves, and the entry "not specified" appears in all cases where the manufacturers chose not to release this information.

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.

SUPPLIERS

Listed below, for your convenience in obtaining additional information, are the full names and addresses of the 33 suppliers whose products are summarized in the comparison charts that follow.

Basic/Four Corporation, 18552 MacArthur Blvd., Santa Ana, California 92707. Telephone (714) 533-0200.

Berg-Haus Corporation, 770 Washington Street, Holliston, Massachusetts 01746. Telephone (617) 429-6836.

Burroughs Corporation, Business Machines Group, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Cascade Data, Inc., 3000 Kraft Avenue, S.E., Grand Rapids, Michigan 49508. Telephone (616) 949-8850.

Clary Datacomp, 2021 Business Center Drive, Irvine, California 92664. Telephone (714) 833-0934.

CNA/Systems, 310 South Michigan Avenue, Chicago, Illinois 60604. Telephone (312) 822-5178.

Computer Interactions, Inc., 425 Northern Blvd., Great Neck, New York, 11021. Telephone (516) 487-9810. ➤

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- ▷ *Custom Computer Systems*, 40 South Mall, Plainview, Long Island, New York 11803. Telephone (516) 293-5353.
- Digital Equipment Corporation*, 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111.
- Eldorado Electrodata Corporation*, 601 Chalomar Road, Concord, California 94518. Telephone (415) 686-4200.
- Focus IV Corporation*, 2103 Mannix, San Antonio, Texas 78217. Telephone (512) 828-3183.
- Honeywell Information Systems Inc.*, 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.
- International Business Machines Corp.*, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.
- International Computing Company*, 7314 Wisconsin Avenue, Bethesda, Maryland 20014. Telephone (301) 654-9120.
- Linolex Systems, Inc.*, 5 Esquire Road, North Billerica, Massachusetts 01862. Telephone (617) 667-4151.
- Litton Industries, Inc.*, Automated Business Systems (ABS) Division, 600 Washington Avenue, Carlstadt, New Jersey 07072. Telephone (201) 935-2200.
- Litton Industries, Inc.*, Monroe Division, 550 Central Avenue, Orange, New Jersey 07051. Telephone (201) 673-6600.
- Martin, Wolfe Inc.*, 8369 Vickers Street, San Diego, California 92111. Telephone (714) 277-3700.
- MBC, Inc.*, 88 White Pond Road, Waldwick, New Jersey 07463. Telephone (201) 447-2696.
- Microline Corporation*, 1310 E. Edinger Avenue, Santa Ana, California 92705. Telephone (714) 558-7721.
- Mini Computer Systems*, 1075 Central Park Avenue, Scarsdale, New York 10583. Telephone (914) 723-5776.
- Mobydata, Inc.*, One Nouvelle Park, New Hartford, New York 13413. Telephone (315) 797-0397.
- The National Cash Register Company*, Main & K Streets, Dayton, Ohio 45409. Telephone (513) 449-2000
- Nixdorf Computer, Inc.*, 5725 East River Road, Chicago, Illinois 60631. Telephone (312) 693-6600.
- Olivetti Corporation of America*, 500 Park Avenue, New York, New York 10022. Telephone (212) 371-5500.
- Paillard Incorporated*, 1900 Lower Road, Linden, N.J. 07036. Telephone (201) 381-5600.
- Philips Business Systems, Inc.*, 100 East 42nd Street, New York, New York 10017. Telephone (212) 697-3600.
- Prime Computer, Inc.*, 17 Strathmore Road, Natick, Massachusetts 01760. Telephone (617) 655-6999.
- Qantel Corporation*, 3474 Investment Blvd., Hayward, California 94545. Telephone (415) 781-3410.
- Scidata, Inc.*, 3 Executive Park Drive, Atlanta, Georgia 30329. Telephone (404) 325-3100.
- Search Computer Systems*, 111 Ash Street, East Hartford, Connecticut 06108. Telephone (203) 289-9506.
- The Singer Company*, Business Machines Division, 2350 Washington Avenue, San Leandro, California 94577. Telephone (415) 357-6800.
- Ultimacc Systems, Inc.*, 9 Brook Avenue, Maywood, New Jersey 07607. Telephone (201) 845-0500. □

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MANUFACTURER & MODEL	Basic/Four Model 300	Basic/Four Model 350	Basic/Four Model 400	Basic/Four Model 500	Berg-Haus Corporation
DATA FORMATS Word length, bits Digits per word Characters per word Operand length, words Instruction length, words	8-bit byte 1 per byte 1 per byte Variable Variable	8-bit byte 1 per byte 1 per byte Variable Variable	8-bit byte 1 per byte 1 per byte Variable Variable	8 bit-byte 1 per byte 1 per byte Variable Variable	16 4 2 Variable Variable
INTERNAL STORAGE Type of storage Storage capacity, words Cycle time, microseconds/word Storage usable for data Storage usable for programs	Core 8K-48K 1.0 Yes Yes	Core 8K-48K 1.0 Yes Yes	Core 8K-48K 1.0 Yes Yes	Core 8K-48K 1.1 Yes Yes	Core 4K-32K 0.9 Yes Yes
PROCESSING Programming technique No. of operational registers Capacity of each register Add time, milliseconds/word	Internally stored 6 Variable 0.00528	Internally stored 6 Variable 0.00528	Internally stored 6 Variable 0.00528	Internally stored 6 Variable 0.00528	Internally stored 8 1 word 0.005
KEYBOARD INPUT Alphanumeric (typewriter) keyboard 10-key numeric keyboard Full accounting keyboard	1 per system std. Standard No	1 per system std. Standard No	1 per system std. Standard No	1 per system std. Standard No	Up to 16 std. Standard Optional
PRINTED OUTPUT Printing speed, chars/sec Carriage width, inches Split platen Pin-feed forms handling Friction-feed forms handling Journal roll handling	45 8.0-25.6 Optional Optional Standard Yes	165 132 char. No No No No	165 132 char. No No No No	165 132 char. No No No No	30/165 132 char. Optional Standard No Optional
MAGNETIC LEDGER CARDS Data capacity, digits per card Automatic card alignment Automatic card feeding & stacking	No — — —	No — — —	No — — —	No — — —	No — — —
MAGNETIC DISC I/O Max. on-line disc capacity, chars Disc I/O speed, chars/sec Interchangeable discs	Standard 16,800,000 195,000 Yes	Standard 16,800,000 195,000 Yes	Standard 16,800,000 195,000 Yes	Standard 16,800,000 195,000 Yes	Standard 20,000,000 400,000 Yes
OTHER I/O UNITS Punched card input speed, cols/sec Punched card output speed, cols/sec Paper tape input speed chars/sec Paper tape output speed, chars/sec Line printer output speed, lines/min Magnetic tape I/O speed, chars/sec Communications interface	533 No 300 75 200 10,000 Optional	533 No 300 75 200 10,000 Optional	533 No 300 75 200 10,000 Optional	533 No 300 75 200 10,000 Optional	300 No 600 No 600 10,000 Optional
SOFTWARE / SUPPORT Assembler Compilers Application programs Software separately priced Technical help separately priced	No BASIC Std. business applications Yes No	No BASIC Std. business applications Yes No	No BASIC Std. business applications Yes No	No BASIC Std. business applications Yes No	Yes Proprietary lang. Std. business applications Yes Yes
PRICING & AVAILABILITY Purchase price of basic system Monthly rental of basic system Date of first U.S. delivery Number installed in U.S. to date	\$25,900 \$570 August 1971 See Comments	\$30,900 \$680 September 1971 See Comments	\$31,900 \$702 August 1971 See Comments	\$32,900 \$724 May 1972 See Comments	\$23,500 \$680 February 1971 Not specified
COMMENTS	Systems based upon Microdata 1600 minicomputer. More than 230 systems of all models installed. Model 300 can have one accounting machine terminal per system; Models 350, 400, and 500 can have one, four, or eight video display terminals per system, respectively.				Minicomputer-based system. Applications include manufacturing control.

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MANUFACTURER & MODEL	Burroughs Series E 4000	Burroughs Series E 8000	Burroughs L 2000 & L 3000	Burroughs L 4000	Burroughs L 5000
DATA FORMATS					
Word length, bits	—	—	64	64	64
Digits per word	12 + sign	12 + sign	16	16	16
Characters per word	6	6	8	8	8
Operand length, words	1	1	1	1	1
Instruction length, words	3 Instr./word	3 Instr./word	4 Instr./word	4 Instr./word	4 Instr./word
INTERNAL STORAGE					
Type of storage	Core	Core	Disc	Disc	Disc
Storage capacity, words	200 max.	400	1280	1280	1280
Cycle time, microseconds/word	12	12	See Comments	See Comments	See Comments
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	—	—	—	—	—
Capacity of each register	—	—	—	—	—
Add time, milliseconds/word	1.596	1.596	40	40	40
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Optional	Standard	Standard	Standard	Standard
10-key numeric keyboard	No	No	Standard	Standard	Standard
Full accounting keyboard	Standard	Standard	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	7	7	20	20	20
Carriage width, inches	22	22	15	26	26
Split platen	Standard	Standard	Standard	Standard	Standard
Pin-feed forms handling	Optional	Optional	Standard	Standard	Standard
Friction-feed forms handling	Standard	Standard	Standard	Standard	Standard
Journal roll handling	Standard	Standard	Standard	Standard	Standard
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	Optional 120 or 240	Standard 240	No	No	Standard 349
Automatic card alignment	Optional	Standard	—	—	Standard
Automatic card feeding & stacking	Optional	Optional	—	—	Standard
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	No	No	No	No
Disc I/O speed, chars/sec	—	—	—	—	—
Interchangeable disc	—	—	—	—	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	132	264	133	133	133
Punched card output speed, cols/sec	22	22	22	22	22
Paper tape input speed, chars/sec	No	No	40	40	40
Paper tape output speed, chars/sec	25	25	40	40	40
Line printer output speed, lines/min	No	165	No	No	No
Magnetic tape I/O speed, chars/sec	No	No	10,000	10,000	No
Communications interface	No	No	Optional	Optional	No
SOFTWARE & SUPPORT					
Assembler	No	Yes	Yes	Yes	Yes
Compilers	No	Yes	COBOL	COBOL	COBOL
Application programs	Std. business applications	Std. business applications	Many available	Many available	Many available
Software separately priced	Yes	Yes	Yes	Yes	Yes
Technical help separately priced	Yes	Yes	Yes	Yes	Yes
PRICE & AVAILABILITY					
Purchase price of basic system	\$17,500-26,000	\$18,000-30,000	\$6,990	\$12,290	\$19,990
Monthly rental of basic system	\$425-665	\$500-750	\$184	\$307	\$500
Date of first U.S. delivery	1967	1970	Feb. 1969	May 1970	Oct. 1970
Number installed in U.S. to date	4,500	1,100	Over 6,500	Over 1,500	Over 4,000
COMMENTS	External "Program Control Center" complements stored program by controlling print format, etc.	COBOL programs can be compiled on a Burroughs B 3500 computer system.	Disc memory has 32 tracks, each served by a fixed read/write head, and 5-millisecond average access time. L 3000 accommodates front-inserted forms, while L 2000 does not. L 2000 with communications interface becomes TC 500, described in Report 70D-112-01.		

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MANUFACTURER & MODEL	Burroughs L 7300 & L 7400	Burroughs L 7500	Burroughs L 8200 & L 8300	Burroughs L 8400	Burroughs L 8500
DATA FORMATS					
Word length, bits	64	64	64	64	64
Digits per word	16	16	16	16	16
Characters per word	8	8	8	8	8
Operand length, words	1	1	1	1	1
Instruction length, words	4 instr./word	4 instr./word	Variable	Variable	Variable
INTERNAL STORAGE					
Type of storage	Disc	Disc	Semiconductor	Semiconductor	Semiconductor
Storage capacity, words	7104	7104	4K-49K bytes	4K-49K bytes	6K-49K bytes
Cycle time, microseconds/word	See Comments	See Comments	1.5	1.5	1.5
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	1-256	1-256	—	—	—
Capacity of each register	16 digits	16 digits	—	—	—
Add time, milliseconds/word	25	25	1.8	1.8	1.8
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	20	20	20	20	20
Carriage width, inches	15-26	26	15	26	26
Split platen	Standard	Standard	Standard	Standard	Standard
Pin-feed forms handling	Standard	Standard	Optional	Optional	Optional
Friction-feed forms handling	Standard	Standard	Standard	Standard	Standard
Journal roll handling	Standard	Standard	Standard	Standard	Standard
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	No	Standard	No	No	Standard
Automatic card alignment	—	349-699	—	—	349-699
Automatic card feeding & stacking	—	Standard	—	—	Standard
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	No	No	No	No
Disc I/O speed, chars/sec	—	—	—	—	—
interchangeable discs	—	—	—	—	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	800	800	480	480	480
Punched card output speed, cols/sec	25	25	96	96	96
Paper tape input speed, chars/sec	40	40	40	40	40
Paper tape output speed, chars/sec	40	40	40	40	40
Line printer output speed, lines/min	60	60	90/180	90/180	90/180
Magnetic tape I/O speed, chars/sec	No	No	10,000	10,000	10,000
Communications interface	No	No	Optional	Optional	Optional
SOFTWARE & SUPPORT					
Assembler	No	No	Yes	Yes	Yes
Compilers	COBOL	COBOL	COBOL	COBOL	COBOL
Application programs	Many available	Many available	Many available	Many available	Many available
Software separately priced	Yes	Yes	Yes	Yes	Yes
Technical help separately priced	Yes	Yes	Yes	Yes	Yes
PRICING & AVAILABILITY					
Purchase price of basic system	\$15,000-16,400	\$23,500	\$12,990	\$14,690	\$20,990
Monthly rental of basic system	\$540-586	\$888	\$394	\$446	\$667
Date of first U.S. delivery	Nov. 1971	Dec. 1971	1st qtr. 1973	1st qtr. 1973	3rd qtr. 1973
Number installed in U.S. to date	Not specified	Not specified	—	—	—
COMMENTS	Uses disc memory with average access time of 5 msec. All models accommodate front-inserted forms.		Other I/O units include 1000 cps tape cassette handler and both 80-col. and 96-col. card equipment. Card rates shown over for 96 cols. Note that L 8300 accommodates front-inserted forms while L8200 does not. For details, see DATAPRO 70 Report 70C-112-21.		

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MANUFACTURER & MODEL	Cascade Data 80/20	Cascade Data 80/30	Cascade Data 80/40	Clary Datacomp 404	CNA/systems SERVUS 100
DATA FORMATS					
Word length, bits	8	8	8	16	16
Digits per word	1	1	1	4	4
Characters per word	1	1	1	2	2
Operand length, words	Variable	Variable	Variable	1 to 4	Variable
Instruction length, words	2-5	2-5	2-5	1 or 2	Variable
INTERNAL STORAGE					
Type of storage	Core	Core	Core	Core	Core
Storage capacity, words	8K-16K	8K-65K	16K-65K	4K-65K	8K-32K
Cycle time, microseconds/word	0.9	0.9	0.9	2.0	1.0
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	16	16	16	4	7
Capacity of each register	16 bits	16 bits	16 bits	1 word	16 bits
Add time, milliseconds/word	8.8	8.8	8.8	0.09/15 digits	0.00279
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	Standard	Standard	Optional	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	30 or 165	30 or 165	30 or 165	15 to 165	100
Carriage width, inches	—	—	—	15	16
Split platen	No	No	No	Optional	No
Pin-feed forms handling	Standard	Standard	Standard	Standard	Standard
Friction-feed forms handling	No	No	No	Optional	No
Journal roll handling	No	No	No	Optional	No
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	No	No	No	Optional	No
Automatic card alignment	—	—	—	720 or 2160	—
Automatic card feeding & stacking	—	—	—	Standard	—
	—	—	—	Standard	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	Optional	Standard	Optional	Standard
Disc I/O speed, chars/sec	—	20,000,000	40,000,000	30,000,000	20,000,000
Interchangeable discs	—	195,000	195,000	200,000	199,000
	—	Yes	Yes	Yes	Yes
OTHER I/O UNITS					
Punched card input speed, cols/sec	No	400	400	400	800
Punched card output speed, cols/sec	No	No	No	80	No
Paper tape input speed, chars/sec	No	300	300	500	No
Paper tape output speed, chars/sec	No	75	75	80	No
Line printer output speed, lines/min	No	200 or 600	200 or 600	600	300 or 600
Magnetic tape I/O speed, chars/sec	2,000	Up to 120,000	Up to 120,000	72,000	No
Communications interface	No	Optional	Optional	Optional	Optional
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	RPG	RPG	RPG	COBOL, BASIC	RPG-II, FORTRAN
Application programs	Many available	Many available	Many available	Accounting MIS	Std. business applications
Software separately priced	Yes	Yes	Yes	Some	No
Technical help separately priced	Partial	Partial	Partial	Some	No
PRICING & AVAILABILITY					
Purchase price of basic system	\$28,045	\$30,670	\$45,707	\$19,950	Lease only
Monthly rental of basic system	\$653 (5-year lease)	\$715 (5-year lease)	\$1,065 (5-year lease)	\$575 (5 year lease)	\$1,000 (5-year lease)
Date of first U.S. delivery	Jan. 1970	Jan. 1970	Jan. 1970	Jan. 1970	September 1972
Number installed in U.S. to date	Not specified	Not specified	Not specified	Not specified	Not specified
COMMENTS	All three systems are based on a minicomputer manufactured by Cascade. A CRT display interface is available.			Magnetic Card Unit reads and writes at up to 3000 chars/sec.	Turnkey MIS and service system for insurance agents.

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MANUFACTURER & MODEL	Computer Interactions CI-2	Custom Computer Simplex-70	DEC Datasystem 300 Series	DEC Datasystem 500 Series	Eldorado Electrodata 125
DATA FORMATS Word length, bits Digits per word Characters per word Operand length, words Instruction length, words	12 2 or 4 2 Variable Variable	16 2 or 4 2 1 1	12 2 2 Variable 1	16 4 2 Variable 1-3	8-bit byte 1 per byte 1 per byte 1 or 2 bytes 1-3 bytes
INTERNAL STORAGE Type of storage Storage capacity, words Cycle time, microseconds/word Storage usable for data Storage usable for programs	Core 4K-32K 1.2 Yes Yes	Core 4K-32K 1.2 Yes Yes	Core 32K 1.2 Yes Yes	Core or semicond. 128K 0.9 or 1.2 Yes Yes	Core 4K-65K bytes 1.2 Yes Yes
PROCESSING Programming technique No. of operational registers Capacity of each register Add time, milliseconds/word	Internally stored 9 1 word 0.0026	Internally stored 4 1 word 0.00135	Internally stored 8 1 word 0.0026	Internally stored 8 1 word 0.0023	Internally stored 128 2 bytes .004
KEYBOARD INPUT Alphanumeric (typewriter) keyboard 10-key numeric keyboard Full accounting keyboard	Standard Standard No	Standard Optional No	Standard Optional No	Standard Optional No	Standard Optional No
PRINTED OUTPUT Printing speed, chars/sec Carriage width, inches Split platen Pin-feed forms handling Friction-feed forms handling Journal roll handling	132 or 480 12 or 17 No Standard No No	60/pm 132 positions No Standard Optional No	165 25.6 No Standard Optional No	165 25.6 No Standard Optional No	15 13.5 No Standard Standard No
MAGNETIC LEDGER CARDS Data capacity, digits per card Automatic card feeding & stacking	No — —	No — —	No — —	No — —	No — —
MAGNETIC DISC I/O Max. on-line disc capacity, chars Disc I/O speed, chars/sec Interchangeable discs	Standard 52,000,000 260,000 Yes	Standard 200,000,000 200,000 Yes	Optional 13,000,000 250,000 Yes	Standard 320,000,000 190,000 Yes	Optional 40,000,000 — Yes
OTHER I/O UNITS Punched card input speed, cols/sec Punched card output speed, cols/sec Paper tape input speed, chars/sec Paper tape output speed, chars/sec Line printer output speed, lines/min Magnetic tape I/O speed, chars/sec Communications interface	Optional Optional 10-300 30-60 60-356 Optional Optional	540 130 10-300 10-60 60-600 20,000 Optional	400 No 300 50 60-245 8,500 Optional	400-1600 No 300 50 300-1200 36,000 Optional	400 No 300 75 40-600 500 Standard
SOFTWARE & SUPPORT Assembler Compilers Application programs Software separately priced Technical help separately priced	Yes No Std. business applications No See Comments	Yes FORTRAN Std. business applications Some Some	No Mini-COBOL No No Yes	Yes RPG II, FORTRAN No No Yes	Yes ESP, BASIC Edit routines No Some
PRICING & AVAILABILITY Purchase price of basic system Monthly rental of basic system Date of first U.S. delivery Number installed in U.S. to date	\$40,000-60,000 \$880-1,320 (5-yr. lease) 1972 Not specified	\$42,500 \$945 (5-yr. lease) June 1971 7	\$28,835 \$850-900 (5-yr. lease) March 1972 Not specified	\$52,170 \$1,550-1,600 (5-yr. lease) May 1972 Not specified	\$17,750 \$402 (5-yr. lease) 1970 100
COMMENTS	Technical help separately priced after "start-up". Based on DEC mini-computer.	Based on Data General Nova minicomputer. Accommodates terminals.	Based on DEC PDP-8 family of minicomputers.	Based on DEC PDP-11 family of minicomputers.	Minicomputer-based system with 2 magnetic drives

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MANUFACTURER & MODEL	Eldorado Electrodata 140	Focus IV 400/10	Focus IV 400/40	Honeywell Model 58	IBM 6405
DATA FORMATS					
Word length, bits	8-bit byte	16	16	8-bit byte	—
Digits per word	1 per byte	4 + sign	4 + sign	1 or 2/byte	10 + sign
Characters per word	1 per byte	2	2	1/byte	—
Operand length, words	1 or 2 bytes	1	1	1 to 10 bytes	1
Instruction length, words	1-3 bytes	1 or 2	1 or 2	1 to 8 bytes	—
INTERNAL STORAGE					
Type of storage	Core	Core	Core	Core	Core
Storage capacity, words	4K-65K bytes	4K-32K	4K-32K	5K or 10K bytes	20 to 120
Cycle time, microseconds/word	1.2	1.76	1.76	1.2	Not specified
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	No
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Plugboard; 60 to 190 program steps
No. of operational registers	128	18	18	100	—
Capacity of each register	2 bytes	16 bits	16 bits	5 bytes	—
Add time, milliseconds/word	0.004	0.00176	0.00176	0.12/9 digits	4.32
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	15	165	165	100 to 650 lpm	15-5
Carriage width, inches	13.5	13.2	13.2	16	22
Split platen	No	No	No	No	Standard
Pin-feed forms handling	Standard	Standard	Standard	Standard	Standard
Friction-feed forms handling	Standard	No	No	No	Standard
Journal roll handling	No	No	No	No	No
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	No	No	No	No	No
Automatic card alignment	—	—	—	—	—
Automatic card feeding & stacking	—	—	—	—	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	Optional 40,000,000	Optional 1,600,000,000	Standard 1,600,000,000	Optional 23,000,000	No
Disc I/O speed, chars/sec	—	300,000	300,000	156,250	—
Interchangeable discs	Yes	Yes	Yes	Yes	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	400	480	480	240-720	15
Punched card output speed, cols/sec	No	96	96	40	15
Paper tape input speed, chars/sec	300	33-500	33-500	No	15
Paper tape output speed, chars/sec	75	20	20	No	15
Line printer output speed, lines/min	40-600	1200	1200	100 to 150	No
Magnetic tape I/O speed, chars/sec	500	160,000	160,000	No	No
Communications interface	Optional	Standard	Standard	Optional	No
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	No	No
Compilers	ESP, BASIC	RPG II	RPG II	MinicOBOL	No
Application programs	Accounting applications	Std. business applications	Std. business applications	Std. business applications	No
Software separately priced	No	Some	Some	No	—
Technical help separately priced	Some	Yes	Yes	Some	Yes
PRICING & AVAILABILITY					
Purchase price of basic system	\$21,050	\$11,450	\$39,500	\$35,500-\$58,000	\$10,430
Monthly rental of basic system	\$485 (-yr. lease)	\$849 (5-yr. lease)	—	\$950-1350	\$333
Date of first U.S. delivery	1970	January 1973	December 1972	Oct. 1970	1965
Number installed in U.S. to date	250	Not specified	Not specified	Not specified	Not specified
COMMENTS					
	Minicomputer-based system with 3 magnetic tape cassette drives.	Based on GRI 99 minicomputer system.	Based on GRI 99 minicomputer system.	For details, see DATAPRO 70 Report 70C-480-21. FORTRAN compiler is also available.	Has from 4 to 24 selectors and 20 command keys.

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MANUFACTURER & MODEL	IBM 6420	IBM 6430	IBM System/3 Model 6	ICC System 95/99	Linolex Model A
DATA FORMATS					
Word length, bits	—	—	8-bit byte	16	8
Digits per word	10 + sign	10 + sign	1 per byte	4	2
Characters per word	Variable	Variable	1 per byte	2	1
Operand length, words	1	1	1-16 digits	Variable	1-256
Instruction length, words	—	6 digits	4-6 bytes	Variable	1-4
INTERNAL STORAGE					
Type of storage	Core	Core	Core	Core	Semiconductor
Storage capacity, words	20 to 40	See Comments	8K to 16K bytes	8K-32K	4K-32K
Cycle time, microseconds/word	Not specified	Not specified	1.52	1.2	1.0
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	No	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Plugboard; 100 to 190 program steps	Stored; 160 or 320 instructions	Internally stored	Internally stored	Internally stored
No. of operational registers	—	—	—	4	Variable
Capacity of each register	—	—	—	16 bits	Variable
Add time, milliseconds/word	4.32	4.32	0.026 (5 digits)	0.00135	0.020
KEYBOARD INPUT					
Alphanumeric (typewriter) Keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	15.5	15.5	85	165	275
Carriage width, inches	22	22	13.2 or 22	132 char.	15
Split platen	Standard	Standard	Optional	No	No
Pin-feed forms handling	Standard	Standard	Standard	Yes	Optional
Friction-feed forms handling	Standard	Standard	Optional	No	Optional
Journal roll handling	No	No	No	No	No
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	Optional 191 characters	No	No	No	No
Automatic card alignment	Yes	—	—	—	—
Automatic card feeding & stacking	Optional	—	—	—	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	No	Standard 9,800,000	Standard 4,588,000	Optional 18,000,000
Disc I/O speed, chars/sec	—	—	199,000	180,000	10,000
Interchangeable discs	—	—	Yes	Yes	Yes
OTHER I/O UNITS					
Punched card input speed, cols/sec	15	15	20	No	533
Punched card output speed, cols/sec	15	15	20	No	No
Paper tape input speed, chars/sec	15	No	No	No	No
Paper tape output speed, chars/sec	15	No	No	75	No
Line printer output speed, lines/min	No	No	No	No	10,000
Magnetic tape I/O speed, chars/sec	No	No	No	See comments	Optional
Communications interface	No	No	Optional	Optional	
SOFTWARE & SUPPORT					
Assembler	No	No	No	Yes	Yes
Compilers	No	No	BASIC, RPG II	FORTRAN	BASIC
Application programs	No	No	Std. business applications	Std. business applications	Std. business applications
Software separately priced	—	—	Yes	Yes	Yes
Technical help separately priced	Yes	Yes	Yes	Yes	No
PRICING & AVAILABILITY					
Purchase price of basic system	\$17,655	\$15,315	\$46,925	\$25,000	\$10,800
Monthly rental of basic system	\$532	\$432	\$984	\$900 (3-year lease)	\$442 (1-year lease)
Date of first U.S. delivery	1964	1967	December 1970	October 1972	July 1972
Number installed in U.S. to date	Not specified	Not specified	Not specified	2	29
COMMENTS					
	Basic storage of 20-40 numeric words is augmented by special alpha and ledger storage.	Three separate storage areas hold 64 numeric words, 96 alpha chars., and 160 or 320 instructions.	For details, see DATAPRO 70 Report 70C-491-21. Offers optional CRT display output.	Based on Data General 1220 minicomputer. LINC tape provides 400,000 bytes of directly addressable storage.	Basic system includes 3 tape drives, 1600-character CRT, and 30-cps typewriter.

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MANUFACTURER & MODEL	Litton ABS/1210	Litton ABS/1220	Litton ABS/1221	Litton ABS/1231	Litton ABS/1241
DATA FORMATS					
Word length, bits	36	40	40	40	40
Digits per word	10	10	10	10	10
Characters per word	—	5	5	5	5
Operand length, words	1	1	1	1	1
Instruction length, words	1	1	1	1	1
INTERNAL STORAGE					
Type of storage	Drum	Drum	Drum	Drum	Drum
Storage capacity, words	375	1726-1854	1726-1854	2048	4096
Cycle time, microseconds/word	17,100	5000	5000	5000	5000
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	2	2	2	2	2
Capacity of each register	10 digits	10 digits	10 digits	10 digits	10 digits
Add time, milliseconds/word	Not specified	Not specified	Not specified	25	Not specified
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	No	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	10	35	35	35	35
Carriage width, inches	70 positions	190 positions	190 positions	190 positions	190 positions
Split platen	No	Standard	Standard	Standard	Standard
Pin-feed forms handling	Standard	Standard	Standard	Standard	Standard
Friction-feed forms handling	No	Standard	Standard	Standard	Standard
Journal roll handling	No	Standard	Standard	Standard	Standard
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	No	No	No	No	No
Automatic card align	—	—	—	—	—
Automatic card feeding & stacking	—	—	—	—	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	No	No	No	No
Disc I/O speed, chars/sec	—	—	—	—	—
Interchangeable discs	—	—	—	—	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	No	No	No	No	No
Punched card output speed, cols/sec	No	No	No	No	No
Paper tape input speed, chars/sec	30	50	50	50	50
Paper tape output speed, chars/sec	10	50	50	50	50
Line printer output speed, lines/min	No	No	No	No	No
Magnetic tape I/O speed, chars/sec	No	No	No	No	No
Communications interface	No	No	No	No	No
SOFTWARE & SUPPORT					
Assembler	See Comments	See Comments	See Comments	See Comments	See Comments
Compilers	No	No	No	No	No
Application programs	Over 40 available	Over 40 available	Over 40 available	Over 40 available	Over 40 available
Software separately priced	Some	Some	Some	Some	Some
Technical help separately priced	Not specified	Not specified	Not specified	Not specified	Not specified
PRICING & AVAILABILITY					
Purchase price of basic system	\$7,950	\$14,900	\$16,150	\$19,760	\$22,760
Monthly rental of basic system	—	—	—	—	—
Date of first U.S. delivery	Not specified	Not specified	Not specified	June 1968	Oct. 1970
Number installed in U.S. to date	Not specified	Not specified	Not specified	Not specified	Not specified
COMMENTS	Mnemonic Interpretive Language facilitates programming. All models except the ABS/1210 can read and punch paper tape and edge-punched cards at 50 char/sec. ABS/1221 differs from ABS/1220 in that the 1221 has facilities for front-feeding of ledger sheets.				

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MANUFACTURER & MODEL	Litton ABS/1281	Litton Model 200	Martin, Wolfe Mesa II	MBC System 4	MBC System 7
DATA FORMATS					
Word length, bits	40	16	16	16	16
Digits per word	10	12 or 15	2	4	4
Characters per word	5	None	2	2	2
Operand length, words	1	15	1	1	1
Instruction length, words	1	14 bits	1	1	1
INTERNAL STORAGE					
Type of storage	Drum	MOS shift register	Core	Core	Core
Storage capacity, words	4096	8 words	65K bytes	4K-64K	24K-64K
Cycle time, microseconds/word	5000	600	62	1.2	1.2
Storage usable for data	yes	yes	yes	yes	yes
Storage usable for programs	yes	No	yes	yes	yes
PROCESSING					
Programming technique	Internally stored	Diode matrix board	Internally stored	Internally stored	Internally stored
No. of operational registers	2	10	6	4	4
Capacity of each register	10 digits	12 or 15	1 word	1 word	1 word
Add time, milliseconds/word	Not specified	0.6	0.00135	0.00135	0.00135
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	No	Standard	Optional	Optional
Full accounting keyboard	No	No	No	Optional	Optional
PRINTED OUTPUT					
Printing speed, chars/sec	35	18	165	165	165
Carriage width, inches	192 char.	13	132 char.	132 char.	132 char.
Split platen	No	No	No	No	No
Pin-feed forms handling	Standard	No	Standard	Standard	Standard
Friction-feed forms handling	Standard	Standard	No	Standard	Standard
Journal roll handling	Standard	Standard	No	Optional	Optional
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	Standard	No	No	No	No
Automatic card alignment	1199	—	—	—	—
Automatic card feeding & stacking	Standard	—	—	—	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	No	Standard	No	Standard
Disc I/O speed, chars/sec	—	—	38,400,000	—	20,000,000
Interchangeable discs	—	—	190,000	—	200,000
			Yes	—	Yes
OTHER I/O UNITS					
Punched card input speed, cols/sec	No	No	No	150	150-1000
Punched card output speed, cols/sec	No	No	No	No	Optional
Paper tape input speed, chars/sec	50	No	No	No	10-150
Paper tape output speed, chars/sec	50	No	No	No	10-150
Line printer output speed, lines/min	No	No	200 or 600	No	600
Magnetic tape I/O speed, chars/sec	No	No	36,000	No	36,000
Communications interface	No	No	Optional	No	Optional
SOFTWARE & SUPPORT					
Assembler	See Comments	No	Yes	Yes	Yes
Compilers	No	No	RPG	BASIC, FOR-TRAN	BASIC, FOR-TRAN
Application programs	Over 40 available	Billing	Custom	Std. business applications	Std. business applications
Software separately priced	Some	No	Some	No	No
Technical help separately priced	Not specified	No	Some	No	No
PRICING & AVAILABILITY					
Purchase price of basic system	\$22,960-24,960	\$4395	\$50,000	\$30,250	\$50,350
Monthly rental of basic system	—	\$413 (1-yr. lease)	—	\$825	\$1,342
Date of first U.S. delivery	September 1972	November 1972	January 1971	Not specified	Not specified
Number installed in U.S. to date	Not specified	Not specified	4	2	34
COMMENTS					
	Mnemonic Interpretive language. Dual ledger card handler available.	Designed for billing and invoicing applications.	Minicomputer based system.	Dual cassette unit is standard.	Dual cassette unit is standard.

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MANUFACTURER & MODEL	Microline MMCS	MCS MICOS	Mobydata System 500	Mobydata System 1000	NCR 395
DATA FORMATS					
Word length, bits	16	16	16	16	—
Digits per word	4	2	2	2	14
Characters per word	2	2	2	2	—
Operand length, words	1	Variable	1	1	1
Instruction length, words	1	Variable	1	1	—
INTERNAL STORAGE					
Type of storage	Core	Core	Core	Core	Disc
Storage capacity, words	16K-32K	24K-32K	8K-32K	8K-32K	20-200
Cycle time, microseconds/word	.98	1.2	1.2	1.2	Not specified
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	No
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Control panel, front bar
No. of operational registers	6	4	4	4	—
Capacity of each register	16 bits	16 bits	16 bits	16 bits	—
Add time, milliseconds/word	0.0019	0.00135	0.00135	0.00135	Not specified
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Optional	Standard	Standard	Standard
10-key numeric keyboard	Standard	Optional	Optional	Optional	No
Full accounting keyboard	Standard	No	Optional	Optional	Standard
PRINTED OUTPUT					
Printing speed, chars/sec	10, 30, or 165	165	30	165	150 cycles/min.
Carriage width, inches	15	132 char.	12	15	26
Split platen	No	No	No	No	Standard
Pin-feed forms handling	Standard	Yes	Optional	Standard	Optional
Friction-feed forms handling	No	No	Standard	Optional	Standard
Journal roll handling	No	No	No	No	Standard
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	No	No	No	No	No
Automatic card alignment	—	—	—	—	—
Automatic card feeding & stacking	—	—	—	—	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	Standard	Standard	Standard	Standard	No
Disc I/O speed, chars/sec	200,000,000	400,000,000	24,000,000	24,000,000	—
Interchangeable discs	312,000	312,000	166,400	166,400	—
	Yes	Yes	Yes	Yes	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	330	533	No	No	133
Punched card output speed, cols/sec	No	No	No	No	25
Paper tape input speed, chars/sec	500	300	No	No	No
Paper tape output speed, chars/sec	75	100	No	No	30
Line printer output speed, lines/min	100, 300, or 600	600	No	No	No
Magnetic tapes I/O speed, chars/sec	20,000	37,500	No	No	No
Communications interface	Standard	Optional	Optional	Optional	No
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	Yes	No
Compilers	BASIC, COMFORT	BASIC	MOBOL	MOBOL	No
Application programs	Material Control system	See Comments	Std. business applications	Std. business applications	Many available
Software separately priced	No	Yes	No	No	Yes
Technical help separately priced	No	Yes	Yes	Yes	Yes
PRICING & AVAILABILITY					
Purchase price of basic system	\$50,000	\$55,000	\$20,538	\$26,633	\$9,900
Monthly rental of basic system	\$1,560 (1-year lease)	\$1,467 (1-year lease)	\$589 (1-year lease)	\$734 (1-year lease)	\$330 (1-year lease)
Date of first U.S. delivery	April 1972	December 1971	Not specified	December 1972	Not specified
Number installed in U.S. to date	Not specified	About 15	Not specified	2	Not specified
COMMENTS	Up to 16 video display terminals can be attached. Based on mini-computer.	MICOS operating system plus about 12 applications programs. Based on Data General 1220, 800, or Super Nova.	Uses CRT console. Based on mini-computer.	Designed for point-of-sale applications. Uses CRT Console. Based on minicomputer.	Features standard typewriter keyboard plus full accounting keyboard.

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MANUFACTURER & MODEL	NCR 399	NCR 400	NCR 500	Nixdorf 820/03	Nixdorf 820/04
DATA FORMATS					
Word length, bits	4-2048	—	—	64 & 18	64 & 18
Digits per word	1-16	13	12	16 & 5	16 & 5
Characters per word	1-256	—	12	8 & 3	8 & 3
Operand length, words	1-256	1	1	1	1
Instruction length, words	6-12 digits	—	1	18 bits/instr.	18 bits/instr.
INTERNAL STORAGE					
Type of storage	Core	Disc	Core	Core & rod cell	Core & rod cell
Storage capacity, words	16K bytes	40-200	200-800	4,128 max.	4,128 max.
Cycle time, microseconds/word	1.2	Not specified	Not specified	2.0	2.0
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	No	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Mylar tape, front bar	Internally stored	Internally stored	Internally stored
No. of operational registers	—	—	—	15	15
Capacity of each register	—	—	—	Varies	Varies
Add time, milliseconds/word	2.2	Not specified	Not specified	7.2	7.2
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	No	Standard	Standard	Standard
Full accounting keyboard	Optional	Standard	Standard	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	24	150 cycles/min.	Not specified	15	15
Carriage width, inches	22.1	26 inches	26 inches	13.5	8" + Passbook printer
Split platen	Standard	Standard	Standard	No	No
Pin-feed forms handling	Optional	Optional	Optional	Optional	No
Friction-feed forms handling	Standard	Standard	Standard	Optional	Passbook printer
Journal roll handling	Standard	Standard	Standard	No	No
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	Optional	Optional	Optional	No	No
Automatic card alignment	354-1500	260	216	—	—
Automatic card feeding & stacking	Optional	Standard	Standard	—	—
	Optional	Optional	Standard	—	—
MAGNETIC DISCS I/O					
Max. on-line disc capacity, chars	No	No	No	No	No
Disc I/O speed, chars/sec	—	—	—	—	—
Interchangeable discs	—	—	—	—	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	400	133	133	200	No
Punched card output speed, cols/sec	26	25	133	19 or 50	No
Paper tape input speed, chars/sec	125	No	600	200	No
Paper tape output speed, chars/sec	75	30	120	25	No
Line printer output speed, lines/min	125, 200, 300	No	125	60-200	No
Magnetic tape I/O speed, chars/sec	No	No	No	Tape cassette	Tape cassette
Communications interface	Optional	No	No	Yes	Yes
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	No	No	No	No	No
Application programs	Many available	Many available	Many available	Many available	Many available
Software separately priced	Yes	Yes	Yes	Yes	Yes
Technical help separately priced	Yes	Yes	Yes	Yes	Yes
PRICING & AVAILABILITY					
Purchase price of basic system	\$14,000	\$10,900	\$23,000	\$9,000-\$16,000	\$10,000-\$12,000
Monthly rental of basic system	\$420 (1-year lease)	\$365	\$605	—	—
Date of first U.S. delivery	October 1972	1967	Not specified	1969	1970
Number installed in U.S. to date	50	4500	Not specified	See comments (next page)	See comments (next page)
COMMENTS					
	Tape cassette is used to store both application and computer control programs. For details, see DATAPRO 70 Report 70C-656-11.	External program tape may be in either loop or strip form.	Optional optical reader reads journal tape at up to 520 char/sec.		

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MANUFACTURER & MODEL	Nixdorf 820/07	Nixdorf 820/08	Nixdorf 820/10	Nixdorf 820/21	Nixdorf 820/23
DATA FORMATS					
Word length, bits	64 & 18	64 & 18	64 & 18	64 & 18	64 & 18
Digits per word	16 & 5	16 & 5	16 & 5	16 & 5	16 & 5
Characters per word	8 & 3	8 & 3	8 & 3	8 & 3	8 & 3
Operand length, words	1	1	1	1	1
Instruction length, words	18 bits/instr.	18 bits/instr.	18 bits/instr.	18 bits/instr.	18 bits/instr.
INTERNAL STORAGE					
Type of storage	Core & rod cell	Core & rod cell	Core & rod cell	Core & rod cell	Core & rod cell
Storage capacity, words	6,128 max.	6,256 max.	6560 max.	17,408 max.	6012 max.
Cycle time, microseconds/word	2.0	2.0	2.0	2.0	2.0
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	15	15	15	15	15
Capacity of each register	Varies	Varies	Varies	Varies	Varies
Add time, milliseconds/word	7.2	7.2	7.2	7.2	7.2
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	15	15	15	15	15
Carriage width, inches	13.5	13.5	13.5	13.5	13.5
Split platen	No	No	No	No	No
Pin-feed forms handling	Optional	Optional	Optional	Optional	Optional
Friction-feed forms handling	Optional	Optional	Optional	Optional	No
Journal roll handling	No	No	No	No	No
MAGNETIC LEDGER CARDS	No	No	No	No	Standard
Data capacity, digits per card	—	—	—	—	496/side
Automatic card alignment	—	—	—	—	Standard
Automatic card feeding & stacking	—	—	—	—	Standard
MAGNETIC DISC I/O	No	No	No	No	No
Max. on-line disc capacity, chars	—	—	—	—	—
Disc I/O speed, chars/sec	—	—	—	—	—
Interchangeable discs	—	—	—	—	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	No	No	200	200	200
Punched card output speed, cols/sec	No	No	19 or 50	19-50	19-50
Paper tape input speed, chars/sec	No	No	200	200	200
Paper tape output speed, chars/sec	No	25	25	25	25
Line printer output speed, lines/min	No	No	No	60-200	60-200
Magnetic tape I/O speed, chars/sec	No	No	Tape Cassette	Tape cassette	Tape cassette
Communications interface	No	No	No	No	No
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	No	No	No	No	No
Application programs	Many available	Many available	Many available	Many available	Many available
Software separately priced	Yes	Yes	Yes	Yes	Yes
Technical help separately priced	Yes	Yes	Yes	Yes	Yes
PRICING & AVAILABILITY					
Purchase price of basic system	\$6,000-\$14,000	\$10,000-\$19,000	\$9,000-\$18,000	\$12,000-\$30,000	\$15,000-\$23,000
Monthly rental of basic system	—	—	—	—	—
Date of first U.S. delivery	1970	1970	1969	1969	1970
Number installed in U.S. to date	See Comments	See Comments	See Comments	See Comments	See Comments
COMMENTS	Contain 16 to 1024 64-bit words of core storage, up to 16,384 18-bit words of rod cell program storage, plus microprograms. Manufactured in West Germany. Total of over 25,000 installed to date, mainly in Europe, with about 1000 in the U.S.				

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MANUFACTURER & MODEL	Nixdorf 820/24	Nixdorf 820/25	Nixdorf 820/30	Olivetti Auditronic 730	Olivetti Auditronic 770
DATA FORMATS					
Word length, bits	64 & 18	64 & 18	64 & 18	84	Variable
Digits per word	16 & 5	16 & 5	16 & 5	14	1-149
Characters per word	8 & 3	8 & 3	8 & 3	—	1-74
Operand length, words	1	1	1	14	1-31 digits
Instruction length, words	18 bits/instr.	18 bits/instr.	18 bits/instr.	1	Variable
INTERNAL STORAGE					
Type of storage	Core & rod cell	Core & rod cell	Core & rod cell	Core	Delay line
Storage capacity, words	4512 max.	17,408 max.	17,408 max.	30 14-digit words	841 digits
Cycle time, microseconds/word	2.0	2.0	2.0	24 per digit	Not specified
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	No	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Stored on mag. tape cartridges	Stored on mag. tape cartridges
No. of operations	15	15	15	31	1-159
Capacity of each register	Varies	Varies	Varies	14 digits each	149 digits total
Add time, milliseconds/word	7.2	7.2	7.2	4.4	30
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10 key numeric keyboard	Standard	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	15	15	15	15	15
Carriage width, inches	13.5	13.5	13.5	27.5	27.5
Split platen	No	No	No	Standard	Standard
Pin-feed forms handling	Standard	Standard	Standard	Standard	Standard
Friction-feed forms handling	No	No	No	Standard	Standard
Journal roll handling	No	No	No	Standard	Standard
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	Standard	Standard	Standard	Optional	Optional
Automatic card alignment	1024/side	1024/side	1024/side	50 chars/side	300 chars/side
Automatic card feeding & stacking	Standard	Standard	Standard	Standard	Standard
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	No	No	No	No
Disc I/O speed, chars/sec	—	—	—	—	—
Interchangeable discs	—	—	—	—	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	No	No	200	No	50
Punched card output speed, cols/sec	No	No	19 or 50	No	20-40
Paper tape input speed, chars/sec	200	No	200	50	50
Paper tape output speed, chars/sec	25	No	25	15-50	50
Line printer output speed, lines/min	No	No	No	No	No
Magnetic tape I/O speed, chars/sec	No	No	Tape cassette	No	No
Communications interface	No	No	No	No	Optional
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	No	No
Compilers	No	No	No	No	Yes (generators)
Application programs	Many available	Many available	Many available	Std. business applications	Std. business applications
Software separately priced	Yes	Yes	Yes	Yes	Yes
Technical help separately priced	Yes	Yes	Yes	Yes	Yes
PRICING & AVAILABILITY					
Purchase price of basic system	\$18,000-\$26,000	\$19,000-\$50,000	\$21,000-\$55,000	\$8,245	\$11,500
Monthly rental of basic system	—	—	—	\$147	\$340
Date of first U.S. delivery	1971	1969	1969	Oct. 1971	June 1970
Number installed in U.S. to date	See Comments	See Comments	See Comments	Over 250	Over 150
COMMENTS	Contain 16 to 1024 64-bit words of core storage, up to 16,384 18-bit words of rod cell program storage, plus microprograms. Manufactured in West Germany. Total of over 25,000 installed to date, mainly in Europe, with about 1000 in the U.S.			Each mag. tape cartridge may contain 1280 instructions. Over 50 applications available.	1 or 2 mag. tape cartridges hold both instructions and data.

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MANUFACTURER & MODEL	Olivetti P203	Olivetti P603	Paillard Hermes F-4	Philips P-351	Philips P-352
DATA FORMATS					
Word length, bits	Variable	Variable	—	64	64
Digits per word	15 or 30	1-30	11	15+ sign	15 + sign
Characters per word	—	1-30	—	8	8
Operand length, words	1	1-30 digits	11 digits	1	1
Instruction length, words	1	1-3	—	1	1
INTERNAL STORAGE					
Type of storage	Delay line	Delay line	IC Registers	Core	Core
Storage capacity, words	7 30-digit words	414	3, 7, or 15	400	400-1200
Cycle time, microseconds/word	Not specified	Not specified	Not specified	3.5	3.5
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	No	Yes	Yes
PROCESSING					
Programming technique	Internally stored (see Comments)	Internally stored	Diode plugboard	Internally stored	Internally stored
No. of operational registers	3	3	3, 7, or 15	—	—
Capacity of each register	30 digits	30 digits	11 digits	—	—
Add time, milliseconds/word	80	Not specified	Not specified	1.5	1.5
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	15	15	17	40	40
Carriage width, inches	18	18	13	18	18
Split platen	Optional	Optional	No	Standard	Standard
Pin-feed forms handling	Optional	Optional	Optional	Standard	Standard
Friction-feed handling	Standard	Standard	No	Standard	Standard
Journal roll handling	Standard	Standard	No	Optional	Optional
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	No	No	No	No	No
Automatic card alignment	—	—	—	—	—
Automatic card feeding & Stacking	—	—	—	—	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	No	No	No	Yes
Disc I/O speed, chars/sec	—	—	—	—	2,900,000
Interchangeable discs	—	—	—	—	Not specified
OTHER I/O UNITS					
Punched card input speed, cols/sec	No	No	No	No	373
Punched card output speed, cols/sec	No	No	20	50	50
Paper tape input speed, chars/sec	No	20	No	No	50
Paper tape output speed, chars/sec	40	20	20	50	50
Line printer output speed, lines/min	No	No	No	No	55
Magnetic tape I/O speed, chars/sec	No	No	Optional	No	No
Communications interface	No	No	No	No	Optional
SOFTWARE & SUPPORT					
Assembler	No	No	No	No	Yes
Compilers	No	No	No	No	No
Application programs	Std. business applications	Std. business applications	Billing Process application	Over 200 avail.	Over 200 available
Software separately priced	Yes	Yes	No	Yes	Yes
Technical help separately priced	Yes	Yes	No	Yes	Yes
PRICING & AVAILABILITY					
Purchase price of basic system	\$5,250	\$6,260	\$4,195	\$8,395	\$10,990
Monthly rental of basic system	\$140	\$165	—	\$185	\$242
Date of first U.S. delivery	April 1968	July 1972	Oct. 1969	June 1970	June 1970
Number installed in U.S. to date	Over 2500	Over 100	600	Not specified	Not specified
COMMENTS	Programs may contain up to 160 instructions and are loaded from magnetic cards. Over 140 programs available	Dollar-sized magnetic cards can hold 384 instructions. Over 80 appli- cations available.	Design mainly for billing and source data recording. Mini- cassette output tape available.	Uses core storage for both instruc- tions and data. Upward compat- ible with larger Philips systems.	See Comments on next page.

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MANUFACTURER & MODEL	Philips P-354	Philips P-356	Philips P-358	Philips P-359	PRIME 200
DATA FORMATS					
Word length, bits	64	64	64	64	16 + 2 parity
Digits per word	15 + sign	15 + sign	15 + sign	15 + sign	4
Characters per word	8	8	8	8	2
Operand length, words	1	1	1	1	Variable
Instruction length, words	1	1	1	1	1 or 2
INTERNAL STORAGE					
Type of storage	Core	Core	Core	Core	Semiconductor
Storage capacity, words	600-1200	400-1200	600-1200	800-1200	4K-32K
Cycle time, microseconds/word	3.5	3.5	3.5	3.5	0.75
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	—	—	—	—	1 word
Capacity of each register	—	—	—	—	—
Add time, milliseconds/word	1.5	1.5	1.5	1.5	0.00188
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Standard	Standard	Standard	Standard	Optional
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	40	40	40	40	10
Carriage width, inches	18	29	29	29	72 char.
Split platen	Standard	Standard	Standard	Standard	No
Pin-feed forms handling	Standard	Standard	Standard	Standard	Optional
Friction-feed forms handling	Standard	Standard	Standard	Standard	Standard
Journal roll handling	Optional	Optional	Optional	Optional	Optional
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	Standard	No	Standard	Standard	No
Automatic card alignment	336/side	—	336/side	336/side	—
Automatic card feeding & stacking	Standard	—	Standard	Standard	—
	No	—	No	No	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	No	Yes	No	No	Yes
Disc I/O speed, chars/sec	—	2,900,00	—	—	24,000,000
Interchangeable discs	—	Not specified	—	—	312,000
	—	Yes	—	—	Yes
OTHER I/O UNITS					
Punched card input speed, cols/sec	373	373	373	373	200
Punched card output speed, cols/sec	50	50	50	50	No
Paper tape input speed, chars/sec	50	50	50	50	300
Paper tape output speed, chars/sec	50	50	50	50	75
Line printer output speed, lines/min	No	55	No	No	100
Magnetic tape I/O speed, chars/sec	No	No	No	No	36,000
Communications interface	Optional	Optional	Optional	Optional	Optional
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	No	No	No	No	FORTRAN
Application programs	Over 45 available	Over 200 available	Over 45 available	Over 45 available	See Comments
Software separately priced	Yes	Yes	Yes	Yes	Yes
Technical help separately priced	Yes	Yes	Yes	Yes	Some
PRICING & AVAILABILITY					
Purchase price of basic system	\$18,240	\$14,000	\$20,500	\$22,990	\$35,000-38,000
Monthly rental of basic system	\$415	\$300	\$475	\$525	—
Date of first U.S. delivery	January 1972	June 1972	May 1971	May 1971	September 1972
Number installed in U.S. to date	Not specified	Not specified	Not specified	Not specified	Not specified
COMMENTS	Can control up to 16 I/O units, up to 4 of which can operate simultaneously. Can be equipped with 1 or 2 front forms feeds, journal roll feed, and continuous forms feed. P-358 and P-359 can have dual continuous forms feed. A mosaic line printer and an automatic magnetic ledger reader were added to the line in 1972.				Interactive DOS and Real-Time operating systems. Mini-computer based.

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MANUFACTURER & MODEL	Qantel Answer	Scidata Series 5	Scidata Series 6	Search System 70	Search System 75
DATA FORMATS					
Word length, bits	8	12	16	12	12
Digits per word	—	2	4	2	2
Characters per word	1	2	2	2	2
Operand length, words	1	Variable	Variable	Variable	Variable
Instruction length, words	2	1	1-3	1	1
INTERNAL STORAGE					
Type of storage	MOS I.C.	Core	Core	Core	Core
Storage capacity, words	4K-32K	4K-32K	4K-128K	8K-32K	8K-32K
Cycle time, microseconds/word	1.5	1.2	0.9 or 1.2	1.2	1.2
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	Yes	Yes	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	—	8	8	8	8
Capacity of each register	—	1 word	1 word	1 word	1 word
Add time, milliseconds/word	Not specified	0.0026	0.0023	0.0026	0.0026
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Optional	Standard	Standard	No	No
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	15	30	30	165	165
Carriage width, inches	17	132 char.	132 char.	14.5	14.5
Split platen	No	No	No	No	No
Pin-feed forms handling	Standard	Standard	Standard	Standard	Standard
Friction-feed forms handling	Standard	No	No	Optional	Optional
Journal roll handling	No	No	No	No	No
MAGNETIC LEDGER CARDS					
Data capacity, digits per card	No	No	No	No	No
Automatic card alignment	—	—	—	—	—
Automatic card feeding & stacking	—	—	—	—	—
MAGNETIC DISC I/O					
Max. on-line disc capacity, chars	Optional	Standard	Standard	No	No
Disc I/O speed, chars/sec	61,200,000	27,200,000	27,200,000	—	—
Interchangeable discs	—	—	—	—	—
OTHER I/O UNITS					
Punched card input speed, cols/sec	400	800-1333	800-1333	266	266
Punched card output speed, cols/sec	No	133	133	No	No
Paper tape input speed, chars/sec	50	300	300	10-300	10-300
Paper tape output speed, lines/min	50	50	50	No	No
Line printer output speed, lines/min	60-1,800	200-600	200-600	100-240	100-240
Magnetic tape I/O speed, chars/sec	60,000	60,000	60,000	2,600	22,000
Communications interface	Optional	Standard	Standard	Optional	Optional
SOFTWARE & SUPPORT					
Assembler	Yes	Yes	Yes	Yes	Yes
Compilers	No	Fortran, RPG	Fortran, RPG	Search Bus. Lang.	Search Bus. Lang.
Application programs	Many available	Std. business applications	Std. business applications	Std. business applications	Std. business applications
Software separately priced	Yes	No	No	Yes	Yes
Technical help separately priced	Yes	No	No	No	No
PRICING & AVAILABILITY					
Purchase price of basic system	\$12,315	\$45,000-80,000	\$55,000-100,000	\$33,000	\$50,000
Monthly rental of basic system	—	\$900-1,600 (5-year lease)	\$1,100-2,000 (5-year lease)	\$970 (1-year lease)	\$1400 (1-year lease)
Date of first U.S. delivery	April 1970	October 1970	September 1972	September 1971	March 1973
Number installed U.S. to date	About 150	About 60	1	30	None
COMMENTS					
	Minicomputer based system.	Designed for wholesale distribution, agricultural, and automobile agency applications. Series 5 and 6 are based on DEC PDP/8-E and PDP-11 mini-computers, respectively.		Based on DEC PDP/8 mini-computer. Uses tape cartridge.	Based on DEC PDP/8 mini-computer. Uses 9-track tape. More powerful operating system than System 70.

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MANUFACTURER & MODEL	Singer 5005 Computer	Singer 5800	Ultimacc Disc I	Ultimacc Disc II	Ultimacc Super Disc
DATA FORMATS					
Word length, bits	48	64	16	16	16
Digits per word	12	16	2 or 4	2 or 4	2 or 4
Character per word	—	3	2	2	2
Operand length, words	1	1	Variable	Variable	Variable
Instruction length, words	7 bits/instr.	6 bits/instr.	Variable	Variable	Variable
INTERNAL STORAGE					
Type of storage	Delay line	Core	Core	Core	Core
Storage capacity, words	5	26-90	4K-32K	4K-32K	4K-32K
Cycle time, microseconds/word	Not specified	Not specified	1.2	1.2	1.2
Storage usable for data	Yes	Yes	Yes	Yes	Yes
Storage usable for programs	See Comments	See Comments	Yes	Yes	Yes
PROCESSING					
Programming technique	Internally stored	Internally stored	Internally stored	Internally stored	Internally stored
No. of operational registers	3	6	4	4	4
Capacity of each register	12 digits	16 digits	1 word	1	1
Add time, milliseconds/word	11.0	1.0	0.00135	0.00135	0.00135
KEYBOARD INPUT					
Alphanumeric (typewriter) keyboard	Standard	Standard	Standard	Standard	Standard
10-key numeric keyboard	Optional	Standard	Standard	Standard	Standard
Full accounting keyboard	No	No	No	No	No
PRINTED OUTPUT					
Printing speed, chars/sec	12	25	30	No	No
Carriage width, inches	16 or 20	20	17	No	No
Split platen	Optional	Optional	Standard	No	No
Pin-feed forms handling	Optional	Optional	Standard	No	No
Friction-feed forms handling	Standard	Standard	Standard	No	No
Journal roll handling	No	No	Standard	No	No
MAGNETIC LEDGER CARDS	No	Optional	No	No	No
Data capacity, digits per card	—	448	—	—	—
Automatic card alignment	—	Standard	—	—	—
Automatic card feeding & stacking	—	Feeding: opt. Stacking: std.	—	—	—
MAGNETIC DISC I/O	No	No	Standard	Standard	Standard
Max. on-line disc capacity, chars	—	—	20,000,000	20,000,000	126,000,000
Disc I/O speed, chars/sec	—	—	200,000	200,000	312,000
Interchangeable discs	—	—	Yes	Yes	Yes
OTHER I/O UNITS					
Punched card input speed, cols/sec	No	250	267	267	267
Punched card output speed, cols/sec	No	No	No	No	No
Paper tape input speed, chars/sec	70 (cartridge)	20	300	300	300
Paper tape output speed, chars/sec	20	20	100	100	100
Line printer output speed, lines/min	No	30	66-300	66-300	66-300
Magnetic taps I/O speed, chars/sec	No	Optional	30,000	30,000	30,000
Communications interface	No	Optional	Optional	Optional	Optional
SOFTWARE & SUPPORT					
Assembler	No	No	Yes	Yes	Yes
Compilers	No	No	BASIC, FORTRAN	BASIC, FORTRAN	BASIC, FORTRAN
Application programs	Some	Many available	See Comments	See Comments	See Comments
Software separately priced	Yes	Yes	No	No	No
Technical help separately priced	Yes	Yes	No	No	No
PRICING & AVAILABILITY					
Purchase price of basic system	\$4,995	\$11,995	\$50,900	\$57,600	\$67,600
Monthly rental of basic system	\$135 (5-yr. lease)	\$323 (5-yr. lease)	\$1025 (5-yr. lease)	\$1,525 (5-yr. lease)	\$1,775 (5-yr. lease)
Date of first U.S. delivery	March 1968	Sept. 1971	August 1971	December 1971	January 1972
Number installed in U.S. to date	2500	700	4	25	1
COMMENTS	Separate delay line memory holds 406 instructions. Programs are loaded from snap-on punched tape cartridges.	Separate core storage for program holds 1K to 4K instructions.	Based on Data General 1200 minicomputer. Basic disc storage capacity is 5 million bytes. On-line inventory control system available.		