AUERBACH GUIDE to

# Small Business Computers

The material contained in this publication
will be included in
AUERBACH Computer Technology Reports,
an analytic reference service that provides
comprehensive coverage of
the information processing industry.

**AUERBACH Publishers Inc.**
**Philadelphia, Pennsylvania 19107**

# PREFACE

The prudent traveler to a foreign land packs a guidebook along with his checkbook, operating on the principle that what you don't know is almost certain to hurt you. Most small businessmen trying to come to grips with the world of the computer are entering a strange new land, which may be full of opportunity but also has its share of hazards. The novice needs advice and guidance, yet the vast bulk of the available literature concerns itself with medium and large computer systems, and is usually presented at a level that can only be digested by the technically sophisticated.

The AUERBACH Guide To Small Business Computers is addressed to small businessmen who are taking a first look at computers and are trying to relate the capabilities of the many available systems to the actual needs of their daily operations. The Guide strips away the technical jargon and presents reports and charts that ease the small business computer evaluation and selection task.

Special reports offer detailed yet easy-to-follow advice on how to decide whether a business really needs an in-house computer and alternative, less costly approaches to data processing for those that don't. Other special reports describe the small business computer industry today and the characteristics to consider in evaluating and selecting a small business computer. The Guide also presents (in a separate appendix) a scoring system specifically developed for small business computers. It is a simple system that yields the relative value, in computing power per dollar, of the computers under consideration.

Individual device reports contain descriptive analyses of most of the major SBC systems and a representative sample of minor systems.

The search chart presents important SBC highlights and provides a quick reference to help you choose devices of interest.

Specification charts offer a fast approach for comparing the characteristics and performance of SBC system components.

A separate price structure section includes component prices and describes the financial side of vendor maintenance policies.

In addition to a point scoring system, the appendixes include a list of suppliers (with local addresses and telephone numbers) and a glossary which defines terms that may be unfamiliar to the reader.

The AUERBACH Guide To Small Business Computers presents information in several levels of detail. Special reports help the small businessman decide whether he needs an SBC, describe the SBC industry today, and explain how to go about evaluating and selecting his own SBC. Each major SBC and some minor ones are covered in a separate analytical report.

The reader can look through the Table of Contents for a system which interests him. If the reader wants a quick view of the SBCs covered in the Guide, he should check the search chart. Should he want a brief overview of a specific system, he can consult the specification charts, which compare physical characteristics and performance for each system component. For more detailed information on a manufacturer's components, the reader should go to the individual product reports. One of a user's main concerns in choosing an SBC will be price, so the different vendor cost arrangements have been combined into a single price list, which also includes information about vendor-maintenance charges. When the user has evaluated the SBCs and selected the ones that seem most likely to fulfill his needs, he can consult the list of suppliers for addresses and phone numbers of the closest local sales representatives.

This selection guide presents the following type of information:

- Special Reports

  - Time Sharing Versus In-House Computing: offers detailed advice on how to decide whether a business really needs an SBC and alternative, less costly approaches to data processing for those that don't.

  - Overview: discusses the state of the SBC industry.

  - Evaluation and Selection: establishes criteria for evaluating and selecting an SBC. A detailed checklist is also included.

- Device Reports

  - Text: describes characteristics of various small business computer systems. Each product report begins with a summary and then discusses configuration, software, design features, performance, maintenance, and company history.

  - Product Specifications: a chart that summarizes information on the com-

ponents' performance, capacity, and design.

- Charts — provide a quick way to compare the SBCs covered in the product reports.

  - Search: lists the major peripheral devices and programming languages for all SBCs covered in the reports.

  - Specification: highlights of each component's technical specifications; use these to get a quick side-by-side comparative overview of each SBC system.

- Pricing Structure — discusses each vendor's lease/purchase arrangement, conversion-to-purchase options, and any over-time or maintenance restrictions. Detailed price lists are also included.

- Appendixes

  - Point Scoring System: an actual point rating that can be assigned to each vendor's proposal. In effect, it comes up with a relative comparison of computing value-per-dollar based upon the likely performance of the proposed hardware/software configuration.

  - Suppliers: an alphabetical directory of SBC vendors to help the reader find the address and phone number of the sales office nearest him.

  - Glossary: definitions of unfamiliar data processing terms.

To use the guide effectively, it is important to know what information is contained in each section of a product report. Separate sections discuss a device's advantages and marketing, configuration possibilities, facilities requirements, performance characteristics, and service. The company's background is also covered.

The Summary gives the name of the company marketing the SBC, its special features and advantages, as well as the user group most likely to benefit from a particular SBC.

The Configuration Guide identifies the major system components, states their performance as well as any relevant interface requirements, and lists available options. This section also gives information on such factors as capacities of main and auxiliary storage, data structure, and speeds of input/output devices.

The Software section identifies the major software available to the SBC under consideration. This includes discussions of the applications software offered by the vendor.

Design Features identifies an SBC's special capabilities or unique features and their significance to the user.

The Performance section evaluates the SBC's competitive position, performance capabilities, special strengths and weaknesses, as well as its impact on other systems in the marketplace.

Since maintenance is another important aspect in selecting an SBC, a section of each report specifies the company providing maintenance and its experience.

The last section of the report is a company history, which tells the date the firm was established and its major business, especially noting the growth of its SBC line.

# CONTENTS

v

| MANUFACTURER AND MODEL NUMBER | First Delivery Date | Specification Chart Coverage | Report Coverage | Under 32K Bytes | 32K Bytes and Over | Disc/Drum | Magnetic Tape | Magnetic Ledger | Punched Cards | Paper Tape | Character Printer | Line Printer | Cobol | RPG | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic/Four 300 | 10/71 | X | X | | X | X | X | | X | X | X | X | | | X |
| Basic/Four 350 | 9/71 | X | X | | X | X | X | | X | X | X | X | X | | X |
| Basic/Four 400 | 8/71 | X | X | | X | X | X | | X | X | X | X | X | | X |
| Basic/Four 500 | 11/71 | X | X | | X | X | X | | X | X | X | X | | | X |
| Burroughs L2000 | | X | X | X | | | | | X | X | X | | X | | |
| Burroughs L3000 | | X | X | X | | | | | X | X | X | | X | | |
| Burroughs L4000 | 1970 | X | X | X | | | | | X | X | X | | X | | |
| Burroughs L5000 | 1970 | X | X | X | | | | X | X | X | X | | X | | |
| Burroughs L7000 | 1971 | X | X | X | | | X | X | X | X | X | | X | | |
| Cascade Data 80/20 | 1970 | X | X | X | | | X | | X | X | X | | | X | |
| Cascade Data 80/30 | 1970 | X | X | | | X | X | | X | X | X | X | | X | |
| Cascade Data 80/40 | 1/71 | X | X | | | X | X | | X | X | X | X | | X | |
| Eldorado Electrodata Model 140 | | X | X | X | | X | X | | X | X | X | X | | | X |
| HIS Series 50, Model 58 | 1970 | X | X | X | | X | | | X | | X | X | X | | X |
| HIS Series 100, Model 15 | 1971 | X | X | | X | X | X | | X | X | | X | X | X | X |
| HIS Series 200, Model 105 | 1971 | X | X | X | | X | X | | X | X | X | X | X | X | X |
| HIS Series 200, Model 115 | 1970 | X | X | X | | X | X | | X | X | | X | X | X | X |
| IBM System 3, Model 6 | 1970 | X | X | X | | X | | | X | | X | | | X | X |
| IBM System 3, Model 10 | 1970 | X | X | | | X | X | | X | | X | X | X | X | X |
| IBM System 360 Model 20 Submodel 5 | 1969 | X | X | | | X | X | | X | | X | X | | X | |
| IBM System 360 Model 20 Submodel 6 | 10/71 | X | X | X | | | X | | X | | X | X | | X | |
| Litton Automated Business 1220/1221 | | X | X | X | | | | | | | X | X | | | |
| Litton Automated Business 1231 | | X | X | X | | | | | | | X | X | | | |
| Litton Automated Business 1241 | | X | X | X | | | X | | | | X | X | | | |
| Litton Automated Business 1252 | | X | X | X | | | X | | | | X | X | | | |
| NCR Century 50 | 2/71 | X | X | | | X | X | X | | X | X | | X | | X |
| NCR Century 100 | 1968 | X | X | | X | X | X | | | X | X | | X | | X |
| NCR N-500 | 1965 | X | X | X | | | | X | X | X | X | X | | | |
| Philips Business System P-351 | 1970 | X | X | X | | | | | X | X | X | | | | |
| Philips Business System P-352 | 1970 | X | X | X | | | | | X | X | X | | | | |
| Philips Business System P-353 | 1970 | X | X | X | | | | X | X | X | X | | | | |
| Philips Business System P-358 | 12/71 | X | X | X | | | | X | X | X | X | | | | |
| Philips Business System P-359 | 6/71 | X | X | X | | | | X | X | X | X | | | | |
| Qantel QA-2 | | X | X | X | | X | X | | X | X | X | X | | | |
| Qantel QB-2 | | X | X | X | | X | X | | X | X | X | X | | | |
| Qantel QC-1 | | X | X | X | | X | X | | X | X | X | X | | | |
| Qantel QD-1 | | X | X | | | X | X | | X | X | X | X | | | |
| Singer System 10 | 1970 | X | X | | | X | X | | X | X | X | X | | X | |

* New Listing

| MANUFACTURER AND MODEL NUMBER | First Delivery Date | Specification Chart Coverage | Report Coverage | MAX MAIN MEM Under 32K Bytes | MAX MAIN MEM 32K Bytes and Over | Disc/Drum | Magnetic Tape | Magnetic Ledger | Punched Cards | Paper Tape | Character Printer | Line Printer | Cobol | RPG | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ultimacc Tape System | 1970 | X | X | | X | | X | | | | X | | | | X |
| Ultimacc Disc System | 8/71 | X | X | | X | X | | | | | X | X | | | X |
| Univac 9200 | 1967 | X | X | X | | X | | | X | X | | X | X | X | X |
| Univac 9200II | | X | X | | X | X | X | | X | X | | X | X | X | X |
| Victor Comptometer 820/07 | 1970 | X | X | X | | | | | | | X | | | | |
| Victor Comptometer 820/08 | 1971 | X | X | X | | | | | | X | X | | | | |
| Victor Comptometer 820/10 | 1969 | X | X | X | | | X | | | X | X | | | | |
| Victor Comptometer 820/21 | 1969 | X | X | X | | | X | | | X | X | | | | |
| Victor Comptometer 820/23 | 1970 | X | X | X | | | X | X | | X | X | | | | |
| Victor Comptometer 820/25 | 1969 | X | X | X | | | | X | | | X | | | | |
| Victor Comptometer 820/30 | 1969 | X | X | X | | | X | X | X | X | X | | | | |

* New Listing

# I. SPECIAL REPORTS

# TIME SHARING SERVICES VERSUS IN-HOUSE COMPUTING

## INTRODUCTION

Businessmen who are the objects of sales pitches by computer marketeers generally fall into two categories — those who have substantial experience with computers, and those who don't. Small businessmen, virtually without exception, fall in the latter group; typically they have had little exposure to computers and even less experience. However, this group is now being wooed by data processing salesmen who are pushing the small business computer and time sharing services as being the answer to the small businessman's data processing needs.

The businessman deciding whether to obtain an in-house computer installation or contract with a time sharing service should answer one vital question. Considering the nature and volume of his business, which approach costs less? In the following portion of this report, we discuss some of the important factors to consider in arriving at an answer.

## HOW MUCH DATA PROCESSING DO YOU NEED?

Sometimes, a straightforward analysis of the cost/benefit tradeoffs argue against data processing. However, special circumstances may compel a businessman to incur the additional expense. The most common special circumstance relates to his competitors: If they are using data processing, then the benefits they may be deriving from timely and comprehensive data about their operations can provide a major competitive edge. The cash value of such data as sales trends, early identification of areas of rising or declining profitability, schedule slippage forecasts, etc., is difficult to assess. Thus an analysis of the costs of data processing versus alternative techniques rarely extends beyond the obvious accounting functions, with their clearly definable capital, direct labor, and overhead expenses. Yet, the decision to convert to EDP is almost invariably made solely on the basis of the volume of accounting-type operations, and then users typically find their machines standing in costly idleness unless a company-wide program of non-accounting applications has been instituted. Users of medium and large computers have learned this fact at great cost, and users of small computers should take that lesson to heart.

A good approach is to think of all the operational problems one has ever encountered and write out a few dozen sentences beginning with the conjecture "Suppose it were practical to ..." When imagination fails, ask a data processing salesman for assistance. A computer can often

make practical types of data analysis that formerly were deemed hopelessly time-consuming and costly.

Even when an analysis of company needs clearly indicates the need for a data processing capability, it may be more economical to rent the necessary time on a per-hour basis than to lease a system or buy it outright. Many time sharing services are now available, the majority of which are increasing their attention to business-data processing.

Most time sharing service companies offer such generalized accounting software as payroll, accounts receivable, accounts payable, and general ledger. For interactive processing, a time sharing user need only lease an input/output terminal, such as a teletypewriter, for about $100 per month. Access to the computer is by standard telephone line, and the cost of an hour of computer time comes to about $15 plus the phone company's regular rates for that hour's hookup. Standard (and occasionally, special) software packages are supplied without charge. The user simply types out the designation of the desired program, enters his data, and awaits the printout, all of which can occur in just a few minutes.

For jobs requiring large blocks of data transfer between a remote terminal and computer, interactive time sharing can be wasteful. A keyboard is essentially a slow input/output device that has the effect of grossly underutilizing the phone-line hookup. Remote batch processing time sharing is a far more efficient mode of operation.

In batch mode, all the data is fed to the computer in one continuous burst, typically through a card reader whose data-transmission rate fully utilizes the phone line's available bandwidth. Batch is as natural a mode for the bulk data processing requirements of business operations, as interactive is for scientific applications.

If no standard program satisfies the needs of a potential user, the same time sharing company will generally develop suitable software — for a fee. In fact, such companies frequently offer contract programming services to businesses that have specialized software needs, yet hope to avoid the expense of hiring a programmer.

Most businesses that maintain a staff accountant also frequently use an in-house electronic accounting or billing machine. A simple accounting machine accepts data entered manually through an accounting keyboard, performs a few

simple calculations, and uses a carriage printer to hardcopy the results onto such forms as bills, payroll checks, etc. Successively more elaborate models may add a modest amount of core memory, alphanumeric keyboards, check digit capability, the ability to handle magnetic-striped ledger cards, and the ability to accept punched-card data input. Interestingly, the latter capabilities resemble those of some small business computers.

The overlap in price/performance between small business computers and electronic accounting machines is broad in all categories but one — master file access. That capability is therefore critical in deciding between an accounting machine or equivalent system and a small business computer. If no more than two master records (with roughly 80 characters each) need be referred to per second, an accounting machine is the sensible choice; beyond that rate, a small business computer or unit record (tab) equipment is desirable.

Unit record equipment processes punched cards with such devices as sorters, collators, reproducers, and calculators. Installations of unit record equipment are available at lease rates of between $500 and $2,000 per month, rates comparable to those for small business computers in the minimal-to-medium-performance categories. Furthermore, staff size and salaries are also comparable for both types of equipment. However, unit record equipment has a basic speed limitation; it cannot process more than 33 records per second, since that is the maximum rate at which card readers operate. In general, a business with several thousand stock items, doing on the order of 120 transactions a day, with each transaction involving an average of five different items, is approaching the processing limit of an accounting machine. Unit record equipment can manage roughly 15 to 20 times as many comparable transactions, but to handle a volume above that level, a computer is required.

## COST COMPARISONS

A direct comparison can be made between projected expenditures using a small business computer and those incurred by going the service bureau or time sharing route. A service bureau user doesn't need a data processing staff. He simply submits his raw data, and the bureau does the rest. The user of time sharing, on the other hand, does his own keypunching or keyboard data entry and pays an operator as well, even when standard software meets his needs, and he incurs no programming costs.

To illustrate the difference, suppose a service bureau user is being billed $2,500 per month, and sets that limit, $30,000 per year, for data processing expenditures using a small business computer. That user will have to hire a keypunch or keyboard operator (unless the computer is a one-station, one-operator minicomputer) and a combination programmer/operator at direct labor charges of about $6,000 per year and $12,000 per year, respectively. This is exclusive of so-called "intangibles," which may add as much as an additional $6,000 per year. That totals $24,000 leaving $500 per month for the computer lease, a figure that accords well with the general experience of computer users, who say that direct salary costs for their data processing staffs typically total two-and-a-half to three times as much as the computer lease costs.

A time sharing user must employ a keypunch or keyboard operator and someone to run the operation. However, that person is not necessarily a programmer and may only spend three-fourths of his time at data processing. Assuming the same $6,000 per year direct labor cost for the keypunch operator, but only $10,000 for the person running the operation (and only $7,500 of that $10,000 is chargeable to that operation), the time sharing user is incurring $13,500 per year in direct labor costs, or about $18,000 per year including intangibles. If he is being billed $1,000 per month, his data processing expenditures total $30,000, the same as those of the service bureau user. To convert to a computer, he would have to upgrade his operation through a full-time programmer/operator, raising labor expenditures to the $24,000 level, the same costs that the former service bureau user would incur.

Admittedly, the value of intangibles will vary from one company to another, and one-third of direct labor is on the steep side. Further, it may be possible to use fewer, more flexibly trained people to staff the operation. However, it is unrealistic, in the case of an unsophisticated user, to imagine that anything more than 25% of the total data processing budget can be allocated for small business computer lease costs. The point at which a user of time sharing services begins to seriously consider converting to an in-house system appears to lie between 45 and 70 hours of computer use per month — that is when he is being billed approximately $675 to $1,050 a month for computer time.

## FOLLOW THIS PROCEDURE

If you're a businessman who plans to convert from manual or electronic accounting methods,

but you know little about data processing, first take a year to educate yourself and the staff who will eventually be assigned to run the operation. Consider carefully the possible pitfalls that can develop even if you obtain a turnkey system. Problems sometimes arise that can best be solved by one's own staff, in terms of both on-the-spot timeliness and lower cost. This education need not precede the use of data processing; in fact most of it can be acquired through gradual "hands-on" practice.

As a starting point, for about 6 months, you can contract with a service outfit to do the company's data processing. Some understanding of what is involved will sink in, if only by osmosis, and will generate enough self-confidence to enable you either to hire an operator/programmer, or to have a staff member tackle a programming course.

The next step is to get some in-house practice with a time sharing system. This has a two-fold advantage over an early commitment to a small business computer. First it permits the user to acquire some basic skills in data processing. Second it provides a realistic test of the need for an in-house small business computer installation. If, after a reasonable startup and debugging period, the user finds that with the time sharing approach he consistently incurs costs for over 50 hours of computer-connect time each month, then he should seriously consider installing a small business computer. Conversely, if computer-connect time regularly (or even on an average) falls below 50 hours per month, it will generally prove less costly to continue with the time sharing system. Interestingly, an AUERBACH survey has disclosed that half of those companies currently using time sharing are fully satisfied with the results and plan no changes, while a further 25% indicate that conversion to a small business computer is only a possibility during the next 5 years.

# SMALL BUSINESS COMPUTERS
## Industry Overview

### INTRODUCTION

The revolution in electronic technology that has so sharply reduced the cost of computer system elements and components in recent years has resulted in correspondingly sharp increases in processing power per dollar of system lease costs. These benefits, originally applied to large computers, were expected to trickle down gradually to the smallest and least costly computers. And so they have.

Users of small computers now enjoy a degree of processing power and operational flexibility and an amount of mass data storage that 5 years ago would have been considered impossible at such low cost. The smaller systems, commonly called small business computers (SBCs) because of the market they typically serve, are so sophisticated that they actually appear simple to those who use them.

Today's user can have a ready-to-go program at the flick of a switch, while the user of just a few years back might have toiled for weeks only to have to go back again to debug. The SBC user with an EDP staff capable of programming can utilize an array of powerful programming languages, comparable to those used for quite large machines.

Of course, the mere availability of a suitable technology would not by itself have attracted the capital needed to develop these computers. The market had to be there as well. Clear existence of the market for SBCs and the near saturation point of the major manufacturers' traditional market for medium and large computers have combined to bring both the established manufacturers and a spate of newcomers into the ranks of SBC producers.

The market statistics have two sides. On the one hand, over 80% of the medium- to large-sized businesses (at least 500 employees) in the country already have their own computer installations; on the other hand, less than 1% of the small businesses (fewer than 50 employees) have in-house computers, although it is estimated that at least 250,000 of them could profitably use them. Established manufacturers hope to capture this market estimated at $500 million per year by 1975. They also hope to expand their customer base for future upgrading to the larger, more profitable computers, which have been experiencing a slowdown in market growth rate.

Newer vendors anticipate an enormous market for a wide variety of machines. Often they simply assemble systems from the central processors and peripheral equipment manufactured by specialists in their respective categories. They then supply the systems to users on a turn-key basis — preprogrammed and ready to perform on the day they are installed.

These preprogrammed systems generally include standard accounting functions such as payroll, accounts receivable, and general ledger. They rarely include software for operational applications, such as inventory management and forecasting and sales analysis reports. That category of software is generally available only from the larger manufacturers, who have already amortized the great cost of developing such programs for their other computer models and who often provide a comprehensive package of industry-specific application software with each SBC installation.

Software is not the only area where costs have remained relatively high. Peripheral devices, too, have been only modestly impacted by the advent of low-cost, high-performance electronic components, primarily because they are electromechanical rather than electronic devices. This is changing as electromechanical functions are increasingly replaced by purely electronic ones. Indeed the gradually diminishing prices of peripherals reflect these changes. But the rate of change is slow. A typical SBC user may find that three-fourths of his lease costs are related to the peripheral complement of a relatively inexpensive central processor.

However, these aspects are heavily outweighed by the excellent performance of most SBCs. They offer the small businessman the powerful assistance of a modern data processing system — support he needs for maintaining a competitive and profitable business — at a price he can afford.

### DEFINITION

So much for how the SBC came into being. To examine the field in some detail a definition is needed: What constitutes an SBC? How can it be distinguished from other computer systems?

The range of performance and of configuration among machines marketed to small businesses is so wide that it is almost impossible to form a rigid definition. However, a general segregation of systems by price provides a useful guide. For the purposes of this report, an SBC can be considered to be a stored program computer renting for under $3,000 per month and used to perform standard commercial data processing functions. This definition based on price will change over the next 5 years, during which time a 30% reduction in system cost for a given level of performance is anticipated.

SBCs encompass a broad spectrum of products. The smallest ones have only limited processing capability. They are generally restricted to a few simple bookkeeping functions, and typically use magnetic ledger cards for data storage and for printout of processed data in a one-card-per-customer, one-card-handled-per-transaction technique that mimics manual bookkeeping. Large SBCs, in contrast, have most of the same capabilities as large computer systems and use the same techniques, but applied on a smaller scale and generally at lower speed.

SBCs comprise four basic subsystems — data input, printed output, auxiliary storage, and central processor. Each manufacturer offers a range of capabilities with matching prices, in each subsystem. In effect they provide a variety of configurations that are specially tailored to a user's needs.

At a minimum, the data input subsystem consists of an alphanumeric keyboard that frequently incorporates a separate numeric keyset. Successively more flexible input subsystems include punched paper tape systems and punched card systems. Data for punched cards must be entered on the cards via a keypunch. An even faster data entry system uses magnetic tape whose contents have been entered by a similar keypunch.

Printed output subsystems include in order of increasing capability: carriage printers, which are variants of electric typewriters; serial printers, in which the printing head moves rather than the carriage; line printers, in which a complete line of data consisting of up to 144 characters in some cases is printed at one stroke. Some of these systems employ dot-matrix printers, which spray onto the paper an array of overlapping dots of ink to form letters, figures, and symbols.

Auxiliary storage subsystems range from simple magnetic-striped ledger cards, through punched cards, punched paper tape and magnetic tape, all the way up to magnetic disc. All of these are used for master-file storage and some for program storage as well. Several manufacturers also offer very large mass data storage systems based on magnetically imprinted plastic cards, useful where the data base is extremely large but is infrequently accessed.

The central processor of an SBC has different architecture from manufacturer to manufacturer, but it will always include an alterable memory; typically have magnetic core; and always be programmable, generally by the user, though sometimes only by the manufacturer's field engineers.

Programming is done in either an assembler language using mnemonic symbols, or in a compiler language that resembles conversational English, or in both.

The memory size, how it is organized, and whether it is expandable, will also vary from one manufacturer to another. Variations usually relate to the anticipated complexity of the programs the SBC will be required to run and the peripheral equipment it will have to handle. However, to be considered an SBC, the system should have a read/write memory of at least 1,000 bytes or characters.

Based on this discussion of configuration, an SBC can be more precisely defined. Specifically, it:

- Is a data processing system marketed and used to perform standard commercial EDP functions in stand-alone configurations.

- Has master-file storage capabilities.

- Operates under stored program control.

- Includes at least 1,000 bytes of alterable memory for both stored programs and data.

- Can be programmed in either an assembly or higher-level language.

- Features typical rental of less than $3,000 per month for commonly used configurations.

## Product Categories

Within the SBC definition an extensive range of systems exists. Minimum-capacity systems provide manual data entry, carriage printers, magnetic ledger card storage, and instruction execution times in milliseconds. The larger SBC systems provide punched card input, line printer output, disc storage, and instruction execution times in microseconds. Table 1 illustrates the range of typical SBC configurations.

## Modes of SBC Use

There are two fundamental methods of data entry to SBCs — interactive and batch. Although some products may be obtained in configurations that permit use in either mode or combinations of the two, most equipment employs one procedure exclusively.

Table 1. SBC Product Profiles

| Characteristics | Product Identifier | | | | |
| --- | --- | --- | --- | --- | --- |
| | SBC-1 | SBC-2 | SBC-3 | SBC-4 | SBC-5 |
| Typical rental ($/mo) | 300–600 | 600–1,200 | 1,200–1,600 | 1,600–2,200 | 2,200–3,000 |
| Data input | Keyboard | Keyboard | Keyboard and/or low-speed punched card | Medium-speed punched card | High-speed punched card |
| Printed output | Carriage printer | Serial printer | Serial or low-speed line printer | Low- or medium-speed line printer | High-speed line printer |
| Storage media | Magnetic ledger | Serial (single-track) magnetic tape | Punched card, disc, or 7- or 9-track magnetic tape | Disc and/or magnetic tape | Disc and/or magnetic tape |

Interactive Mode. Data requested by the program is entered directly into the memory of the computer, by an operator via a console keyboard. The data entry function can be interleaved with or performed independently of the processing function. With interleaved operation, the operator enters data under program control and processing is completed on the current transaction before further data is requested. With independent operation, all input data for a given job is entered into a transaction file, and processing of this file is completed in a separate cycle.

Interactive mode system throughput is limited largely by the operator's speed and is more costly on a per-transaction basis. Two procedures that improve throughput are to operate with several terminals connected to the same central processor in a time sharing configuration, and to combine console data entry with mechanical data entry from punched card or punched paper tape.

Batch Mode. Data preparation is accomplished off-line (independent of the central processor) with separate equipment, typically a keypunch. Then data is entered onto punched card or tape.

The central processor subsequently accepts data input via a peripheral device such as a card reader. Batch mode provides higher system throughput than interactive mode. Data is read by the system at several hundred characters per second as opposed to two or four characters per second available in the interactive mode. A partially offsetting limitation, however, is that the batch mode does not provide on-line editing of input data as does the interactive mode, so that input errors are detected during processing and require another cycle to correct.

INDUSTRY STRUCTURE

Intensified marketing efforts and increased availability of SBC systems resulted in domestic sales of about $230 million and shipments of 3,700 units in 1971. The suppliers of these systems cover a full spectrum, ranging from very small, newly formed companies to very large, diversified manufacturers. SBC suppliers can be conveniently divided into three groups — major computer manufacturers, other manufacturers, and system houses.

Major Computer Manufacturers

The most significant segment of the SBC industry with over 96% of the installed base is the major computer manufacturers. Specifically, five companies in this category — Burroughs, Honeywell, IBM, NCR, and Univac — offer products which are classifiable as SBCs. These companies provided SBCs as the low end of a complete line of computer systems. They have used their

reputations as general-purpose computer manufacturers and their worldwide marketing forces to participate in the SBC market.

IBM's penetration of the SBC market has been the most successful, with over 50% of the domestic installed base. Factors contributing to IBM's success are its reputation as the leading computer manufacturer, its unparalleled capabilities in marketing and system support, and the introduction of its System/3.

Honeywell Information Systems (HIS) and Univac have also entered the SBC market by downward extension of their product lines. Both companies have been active in the small business market for several years with the introduction of products that were forerunners of the IBM System/3. HIS's G-50 Series, first introduced in 1966, has a profitable foreign market. Univac's 9200, also introduced in 1966, is a card system for upgrading tab card installations to stored program computers. Subsequently, the system has itself been upgraded to include magnetic tape and disc capabilities.

Burroughs and NCR have entered the SBC market segment by means of upward expansion. These are the two leading manufacturers of electronic accounting machines (EAMs), having the broadest product lines and broadest market bases. Their market bases provide them with a special advantage among EAM users expanding into a full-scale SBC system.

NCR, with its Century 50 and 100, is also approaching the SBC market via downward expansion of a broad general-purpose computer product line. While Burroughs has not yet taken this route, such a move appears likely.

Other Manufacturers

The second segment of SBC suppliers is a diversified group of manufacturers. Within it are companies with special capabilities and those who are approaching the SBC market in unique ways. Minicomputer manufacturers number among these. Minicomputers are small computers priced under $25,000 in a minimum standalone configuration. They have found widespread acceptance as the central computational and control elements in various types of electronically automated equipment and machinery, and in industrial process-control systems.

Several minicomputer manufacturers, such as Digital Equipment and Data General, are suppliers to the SBC market. They sell their products to system assemblers, who use the minicomputers as the basis for their SBCs. Some of

these manufacturers have even developed their own SBCs, but to date have only been moderately successful in marketing them.

The SBC market is significantly different from the normal markets for minicomputers, because SBC users are less sophisticated in EDP technology and require more support in software, systems, and training. In addition, the sales force for the SBC market requires an applications orientation in business systems, which is not normally the strength of minicomputer salesmen.

Eldorado Electrodata is one of the few minicomputer manufacturers successfully marketing its own SBC. However, this is largely due to two unique factors: the unusual design of Eldorado's central processor, and Eldorado's experience in marketing two models of data terminals designed around that processor.

Several small, newly formed companies such as Basic/Four, Cascade Data, and Qantel have entered the SBC market as equipment manufacturers. These companies are orienting their efforts toward the solution of end-user problems by offering several application packages and customized programming, often on a turnkey basis.

Another part of this industry segment is the large, diversified manufacturers including Singer's Friden Division, Philips Business Systems, and Victor Comptometer. Friden and Victor previously entered the small business market with electronic accounting machines and are building upon this marketing base. Victor has been successfully marketing its flexible 820 Series in foreign markets since 1969 and is now widening its scope to include domestic sales. Friden's entry into the SBC arena is a small time-shared system directed at larger organizations with multiple users. Philips Business Systems is a wholly owned subsidiary of North American Philips, a diversified manufacturer of electronic and chemical products. The company entered the electronic office equipment field in 1969 and manufactures such related products as dictation systems, intercom equipment, and electronic calculators.

System Houses

The third segment of the SBC industry comprises several small, newly formed companies who are not manufacturers but system assemblers. They share a commonality based on the extensive systems and software experience of their founders. These companies purchase system hardware components — such as minicomputers, magnetic tapes, and card readers — from

equipment manufacturers, add their own software, and integrate all components into complete systems for sale to end users.

These companies have approached the SBC market from either of two directions: (1) concentration on special application or industry packages within the SBC market, for example, information retrieval, systems for accounting firms, and systems for wholesalers; or (2) development of a set of general accounting packages for sale in a limited geographical area. Their typically modest financial resources and the poor national economic conditions since these companies were founded have limited their success in the SBC area.

## MARKETS

The market that concerns the array of SBC suppliers, whether directly as manufacturers or system assemblers or indirectly as suppliers of minicomputers to those system assemblers, is a varied one. It includes both small organizations and branches of larger ones; in the latter case SBCs are often used both as independent processors and as intelligent terminals, communicating with a remote, centrally located larger computer.

To evaluate the magnitude and composition of this market, AUERBACH has surveyed a control sample of five industry groupings, categories which account for two-thirds of all general purpose computer installations.

Some surprises emerge from that survey. To begin with, financial establishments with as few as 13 employees turn out to be good candidates for an in-house SBC that leases for about $300 per month and requires about $6,000 labor costs. Such businesses include brokerage houses, real estate companies, and insurance agencies, in addition to finance companies and banks. The high ratio of professional, administrative, supervisory, and clerical personnel to other employees, appears to be an important factor in permitting a business in this group to make profitable use of an SBC, since most personnel in those categories perform functions that a computer can assist. This viewpoint is supported by the corresponding numbers for wholesale establishments, which, with about twice that ratio of employees in the "other" category, require a total of about 2-1/2 times as many employees, before an in-house SBC makes economic sense.

The number of small businesses in all categories that can use at least a minimal SBC installation is estimated at 250,000. This contrasts sharply with the approximately 18,000 installations of all types of SBCs and provides a clear view of the extent of the potential market.

The low number of in-house systems is not an accurate measure of the extent to which small businesses are using EDP. Far greater numbers of them actually use computers, but not units that are installed on their premises. In addition, many more use less flexible data processing systems, such as electronic accounting machines and punched card tabulators.

All of these compete with SBCs for the data processing expenditures of small businesses, and the prospective SBC user should be certain that such potentially less costly approaches will not satisfy his needs before he decides on an in-house SBC.

## PRICE AND PERFORMANCE PROFILES

The range of products currently available for small business applications can be understood by analyzing the price/performance characteristics of each of the major SBC subsystems: data input, printed output, auxiliary storage, and central processor. The following text describes these characteristics and demonstrates their combined impact on total SBC system price/performance.

### Data Input Subsystem

Three approaches most commonly used in SBC systems for the data input function are console keyboards, punched paper tape, and punched cards. Console keyboards are used in the interactive mode of operation in which the operator enters transaction data directly into the system. Input speeds are primarily a function of the operator's keying rate, typically two to four characters per second.

Punched paper tape and cards are used in the batch mode. Tapes or cards are prepared offline on equipment independent of the central processor. As seen in Table 2, tape and card approaches provide faster speeds than the keyboard, since the data rate is determined by the reading speed of an electromechanical device as opposed to an operator.

The prices listed in Table 2 are purchase prices for the data input subsystems: monthly lease costs for these and all other categories of SBC equipment usually run about 2% of the purchase price.

Table 2. Typical Range of Data Input
Characteristics and Prices

| Approach | Input Rate (cps) | Purchase Price ($) |
|---|---|---|
| Keyboard | 4 | 750-2,200 |
| Paper tape | 15-500 | 1,400-8,600 |
| Punched card | 120-1,400 | 3,600-14,500 |

## Printed Output Subsystem

Three principal types of printed output units
are available in SBC systems — carriage, serial,
and line. The carriage printer is limited in its
printing rate by the mechanical movement of the
print unit across a line.

Greater speeds are achieved with line printers
than with carriage or serial printers. Typical
capabilities available are 5 to 20 and 10 to 85
characters per second for carriage and serial
printers, respectively, and 100 to over 1,200
lines per minute for line printers. Prices cover
approximately a 20:1 range, from about $2,000
for the slowest serial printers to about $40,000
for the fastest line printers.

## Auxiliary Storage Subsystem

The auxiliary storage subsystem provides the
mechanism for maintaining and accessing a mas-
ter file of accounts. Its access rate to master
file records is an important indicator of the total
throughput of an SBC system since it determines
the number of records that can be processed.
The extensive range of performance capabilities
in this subsystem generates broad variations in
the performance of SBC systems.

Four most commonly used SBC approaches for
the master file function are: magnetic ledger
cards, punched cards, magnetic tape, and mag-
netic disc. Magnetic ledger cards provide the
minimum capability for a master file. The ac-
cess rate to records is limited to less than one
every 4 seconds with an operator retrieving each
card and to approximately one record per second
with an automatic card reader.

While very slow in potential system through-
put, the ledger card provides the capability to
maintain an easily retrieved printed audit trail of
all transactions relative to an account. This
feature is an important advantage in many busi-
ness applications.

Punched cards provide a higher access rate to
the master file than magnetic ledger cards.

However, punched card access rates are still
limited by manual handling of the card decks and
by the mechanical movement of cards in a reader.
Magnetic tape and disc provide the highest per-
formance in the auxiliary storage subsystem.

A precise comparison of the performance ca-
pabilities of the latter two auxiliary storage al-
ternatives is complex because there are many
variables. However, disc systems offer one
unique advantage — they permit random access
of data rather than the sequential access required
by other systems.

As a result disc systems are more flexible
and provide higher computer system throughput
than tape, largely because they require fewer
sorting and merging operations on the data files.
This performance does have a price, in some
cases from three to four times as much as tape
systems with comparable storage — or as much
as one cent per character of storage — but most
users find the cost outweighed by the sharply im-
proved performance and readily pay it.

## Central Processor Subsystem

The CPU can be regarded as the heart of any
computer system, the "brains" of these elec-
tronic mimics of thinking beings. The revolution
in electronic technology that was previously
alluded to has primarily impacted the CPU.

Many factors contribute to the performance
and price of the central processor: the subsys-
tem that performs the computation and the con-
trol functions. As a result, comparisons of
CPU price/performance among SBC systems
tends to be complicated. Systems are available
which vary in certain parameters from one to
three orders of magnitude. For example, basic
instruction (add) times range from 3 to 4,000
microseconds, and maximum memory capacities
range from 2,400 to 130,000 bytes. The range
of capabilities available in selected performance
measures of SBC central processors is indicated
in Table 3.

It is important to keep in mind the fact that
high CPU speed and memory capacity do not, by
themselves, make for a good system. Much
more is involved, not the least of which is the
available software. But as far as the hardware
is concerned, balance among all the computer
subsystems is most important to ensure that
each is used least close to its capacity. Other-
wise the system may have to wait for slowpoke
equipment to finish its task so the program can
continue.

Table 3. Comparison of
Representative Configurations

| Configuration | Equipment Lease Cost ($/mo) | Cost/ Transaction ($) |
|---|---|---|
| I — Keyboard data entry; carriage-type printer; magnetic ledger card storage | 400 | 0.054 |
| II — Keyboard data entry; character (serial) printer, disc storage | 1,000 | 0.034 |
| III — Punch card data entry, line printer, disc storage | 2,000 | 0.012 |

# EVALUATION AND SELECTION
## Small Business Computers

INTRODUCTION

There is no ideal computer on the market, there is no small business computer with the lowest possible price/performance ratio, and there is not a computer that is best for a particular user application. On the other hand, there are many good computers available, there are many computers with good price/performance ratios, and there are probably several computers that can do a particular job well.

The problem is, how does one find which computers can do the job for the least overall cost? Unfortunately, selecting a computer for a specific job is not easy. However, if done without panic and without haste, the rewards of the search can include raising the staff's technical competence, understanding the individual application better, and building a firm foundation for the decision making that will accompany future developments in the application.

The wise selection of a computer depends on the selector's full knowledge of the application. A number of people are usually involved, and cooperation among the ultimate users is essential. This group of end users must develop a set of criteria for selecting a suitable computer; and these criteria must reflect the needs of each user's application area, expressed in computer terms. Because it is human nature for each to consider his needs more important than anyone else's, some member of the selecting group must be responsible for leading the group towards satisfactory compromises.

Developing selection criteria is an educational process, which can be the hardest part of the selection procedure. Application areas must be viewed in terms of how they are presently handled, what can be done better by computers, and what can be done in the future. Each person in the group must learn, from the functional point of view, what computers can do; he must come to understand that computers vary in architecture because manufacturers have designed them differently for good reasons, and he must learn to think of applications vis-a-vis computers.

The computer salesman does have something to contribute and what he says should be considered as input to the development of selection criteria and as an information source for his computer's characteristics. However, the potential user who lets computer salesmen tell him what his selection criteria should be is guaranteeing a less than satisfactory system barring a statistical accident, and is removing the solid foundation his personnel need to use the system satisfactorily once it has been installed.

The architecture of computers varies for good reasons; the computer salesman will detail these, but he cannot be expected to discuss the compromises his firm made to attain that architecture at a reasonable cost.

Architecture is not the only criterion in evaluating a small business computer. Cost is another factor as is the vendor's ability to support the installation with adequate maintenance service.

## SMALL BUSINESS COMPUTER ARCHITECTURE

The major factors that distinguish one small business computer from another are the central processor and memory, input/output structure, interrupt systems, available peripheral devices, and software.

### Central Processor and Memory

The central processor and memory determine to a large extent the computing power of a computer system. Important memory characteristics are word length, cycle rate, and size. Ideally, the word length should correspond to the data precision required by the application. The cycle rate determines the speed of the computer, but the user must beware of considering cycle rate alone. Also he should consider whether the instruction set's efficiency meets his specific application. What use is lightning-speed addition if a communications interface is needed and two or three input/output instructions are required for each input/output operation?

The memory size determines the complexity and size of programs the computer can run and the type of software that can be supported. Additional features that may be important are memory parity for checking data accuracy and memory protection for preventing important data from being inadvertently erased or modified.

### Input/Output Structure

The input/output structure is a major factor in determining how efficiently a computer can distribute its processing power between input/output operations and internal processing demands. With an adequate balance the computer can optimize throughput (i.e., enter data into main memory, perform calculations or data manipulation, and output results to a suitable peripheral device).

The amount of processor time devoted to input/output operations is a function of the number of peripheral devices in the system, their frequency of use, and the execution time of the software

input/output handler routines. Input/output re-
quirements for the application must be carefully
analyzed and the criteria defined to eliminate from
consideration all computer systems that do not
have the minimum input/output facilities for a
particular function.

The basic input/output facility for a small
business computer consists of a channel shared
by a number of peripheral devices (party-line).
The input/output channel consists of data lines and
control lines that synchronize the operation of the
central processor and slower-speed peripheral
devices.

Important factors in considering how well an
input/output channel will satisfy your needs are
the number of devices the channel can support,
the input/output instructions, and the facilities for
determining which devices need servicing. In
addition, the maximum allowable distance that
devices can be placed from the central processor
can be particularly important to small business
environments, especially if the processor will be
centrally located for access by peripheral devices
distributed throughout various offices.

One of the most important factors in deter-
mining input/output rates and evaluating the input/
output structure for a particular application is
the means for identifying the device that requires
service. Generally, this can be achieved via
software only or in combination with hardware.

Software routines are available for polling each
device, testing its readiness for information
transfer, and transferring data between the de-
vice and the computer. If many devices are con-
nected to the input/output bus, the necessity of
executing a device identification software routine
can markedly increase the response time to a
service request, use processor time and memory
space, and cut down the number of peripheral
devices the system can handle. Because of these
problems, a large number of small business
computer systems include groups of external
priority interrupt lines as options; each line can
interface to one or possibly two devices and thus
eliminate a long device identification software
routine.

The function of an interrupt system is to sig-
nal the processor that something requires atten-
tion. A priority interrupt system establishes a
hierarchy for the attention-getting signals. In-
terrupt signals normally suspend execution of
the program in progress when the current
instruction is finished and begin executing the
interrupt servicing routine selected by the con-
tents of a core location dedicated to the interrupt
line.

## Peripheral Devices Available

Most small business computer manufacturers
do not make their own peripheral devices but
buy standard devices and provide the controllers
and interfaces to their particular system. Most
peripheral devices used with small business
computers are essentially the same as those used
with larger computer systems. Whereas the high
cost of these peripherals is not an inordinately
large fraction of the overall system cost for
medium to large-scale computers, they can be
fairly costly compared to small business com-
puter central processor costs. However, manu-
facturers are beginning to produce these devices
specifically for smaller applications. As a re-
sult each year their cost diminishes and they are
now becoming more practical for use with small
business computers.

Peripheral devices available for small busi-
ness computers consist of input devices, output
devices, and auxiliary storage memory that pro-
vides bulk storage to augment the central pro-
cessor's memory.

Data Input. Data input provides the mecha-
nism for entering the data to be processed.
Three approaches most commonly used in small
business computer systems for the data input
function are console keyboards, punched paper
tape, and punched card. Console keyboards are
used in the interactive mode of operation in which
the operator enters transaction data directly into
the system. Input speeds are primarily a
function of the operator's keying rate, typically
two to four characters per second. Punched
paper tape and cards are used in the batch mode
of operation. Tapes or cards are prepared off-
line on equipment independent of the central
processor. Tape and card approaches provide
faster speeds than the keyboard since the data
rate is determined by the reading speed of an
electromechanical device as opposed to that of
an operator. Recently, however, magnetic tape
cassettes have been replacing paper tape.

Printed Output. Printed output is the mech-
anism for presenting the processing results to
the user. Three principal types of printed output
units are available in small business computer
systems — carriage, serial, and line. The
carriage printer is limited in its printing rate by
the mechanical movement of the carriage past
the print station while the serial printer is re-
stricted by the mechanical movement of the print
unit across a line. Greater speeds are achieved
with line printers than with carriage or serial
printers. Typical capabilities available are 5 to

20 and 10 to 85 characters per second for carriage and serial printers, respectively, and 100 to over 1,000 lines per minute for line printers.

Auxiliary Storage. The auxiliary storage subsystem provides the mechanism for maintaining and accessing a master file of accounts. The access rate to master-file records is an important indicator of the total throughput of a small business computer system since it determines the number of records which can be processed. The extensive range of performance capabilities in this subsystem generates broad variations in the performance of small business computer systems.

Four approaches most commonly used in small business computer systems for the master file function are: magnetic ledger cards, punched cards, magnetic tape, and magnetic disc. Magnetic ledger cards provide the minimum capability for a master file. The access rate to records is limited to less than one every 4 seconds with an operator retrieving each card and to approximately one record per second with an automatic card reader. While very slow in potential system throughput, the ledger card provides the capability to maintain an easily retrieved printed audit trail of all transactions relative to an account. This feature is an important advantage in many business applications.

Punched cards provide a higher access rate to the master file than magnetic ledger cards. However, punched card access rates are still limited by manual handling of the card decks and by the mechanical movement of cards in a reader. Magnetic tape and disc provide the highest performance in the auxiliary storage subsystem.

A precise comparison of the performance capabilities of the latter two alternatives for auxiliary storage is complex because many variables affect their performance. However, disc systems offer one unique advantage; they permit data to be accessed randomly rather than sequentially as with the other systems.

As a result, disc systems are more flexible and provide higher computer system throughput than tape, largely because they require fewer sorting and merging operations on the data files. Disc performance does have a price, in some cases from three to four times as much as tape systems with comparable storage, or as much as one cent per character of storage, but most users find that cost outweighed by the sharply improved performance.

## Interfaces Available

A number of small business computer manufacturers provide interfaces to standard data communications devices and to sense and signal modules; these can turn an external device on/off or can sense the on/off state of an external device. Some of the larger manufacturers provide extensive amounts of data communications equipment as well as the software to support the equipment.

If the application requires interfaces to special-purpose devices, the selection criteria should include interface requirements. The cost of designing special interfaces can raise the price of an overall system to several times the initial small business computer cost.

## Software

Software development for a specific application is the most frequently underestimated item in the computer budget. Because the cost of small business computers is small, most manufacturers do not provide much system software. The selection criteria should include the required software. Also consider the desired features for future as well as current needs.

If the manufacturer writes off software production costs in the hardware price, the system cost increases. On the other hand, if the user needs system software not produced by the manufacturer, the cost for its development must be added to the price of his computer. This cost will be much higher than if the manufacturer distributed a software charge over many computers. In other words, well-conceived system software is much cheaper to buy from the manufacturer than to develop, and the selection criteria should reflect this view.

What are the software selection criteria? Because software criteria are tied to an application area as closely as hardware criteria, they can vary from application to application. Despite the previous disclaimers, certain general software characteristics should be included in the software criteria.

Small hardware configurations lend themselves most readily to applications where repetitive tasks are performed. Because programs may require changing from time to time, however, even the smallest hardware configuration should have the facilities for changing programs and for developing programs and incorporating them

in the system. The more the selection committee anticipates software changes, the more weight the group should give to the ease with which programs can be changed.

Utility routines should be supplied to debug source code and to edit output code. Input/output handlers should be provided. Loaders should be furnished to load all software supplied with the system and to load application programs.

Important system software components also include assemblers, compilers, and operating systems.

Assemblers. Assemblers are language translation programs that convert symbolic source language into numeric machine language usually with a one-to-one correspondence. The source language translated by an assembler is called the assembly language and is highly dependent on the computer's instruction set.

Assembly language programming is too complex for most small business computer users to perform themselves. However, assembly language capability can still be important for users who utilize packaged applications software rather than write their own programs. The flexibility of the packaged software is usually directly related to that of the assembly language.

Compilers. A compiler also translates source code into machine language, but each written statement in the computer language is translated into several machine instructions. Generally, the term "programming language" specifies the source language translated by compilers. Although programming languages are designed to be independent of any specific machine format, in most cases this goal is not completely achieved.

Compiler languages usually consist of terminology and procedures specifically to help the user write programs in a language capable of expressing concepts and relationships with which he is familiar. As a result, unless he is indeed a novice, the small business computer user can generally expect to write some programs in these languages. The two most common and useful programming languages available to business applications are Cobol, whose programs are stated in precise, easily learned English words and phrases, and RPG, a report generating language for producing programs that write reports in varying formats. Another language commonly encountered is Basic, which is used for interactive time sharing applications. Basic is so simple to learn and use that the novice programmer can begin writing programs almost immediately.

Operating Systems. An operating system is a comprehensive software facility consisting of a selection of routines that contribute to the efficient and convenient running of programs on a computer by assigning most housekeeping tasks to the computer and removing them from manual operator control.

A primary motivation for the use of operating systems results from the ability of computers to perform instructions at speeds that are orders of magnitude faster than a human being can ever achieve manually. Because of the complexity and variety of tasks an operating system is required to perform, however, the coding comprising an extensive operating system can occupy a significant portion of computer memory. Consequently, the development and growth of operating system technology are closely related to improvements in both computer memory and software technology.

The software that constitutes an operating system consists of a monitor or executive routine and a number of special-purpose housekeeping routines automatically controlled by the master routine. Actual facilities, however, vary widely. Some operating systems, designed to run on a minimum configuration system, provide only the bare essentials for controlling the operation of a computer; the user must code and insert any additional facilities desired. Other operating systems provide virtually complete control over the operating functions; operator communications with these operating systems is normally through job control statements entered via a dedicated systems device, such as a card reader, or perhaps through the console keyboard.

Operating systems for small business computers are particularly important for systems that include mass storage devices or are involved in interactive time sharing applications. However, a number of manufacturers don't offer operating systems, but incorporate control facilities via special hardware.

## KNOW YOUR VENDOR

With increasing frequency, data processing personnel are selecting their equipment on the basis of vendor reputation. The ingredients that determine a vendor's reputation are hard to define. In fact, two equally perceptive users may strongly disagree about the qualities of a specific vendor or his products. However, there are factors that will help you determine a vendor's stability and responsiveness to his customers' needs.

You can gauge the past performance of a vendor by checking how long the firm has been in business. Presumably, an established firm has been providing satisfactory products to its customers. Additionally, the firm will probably remain in business and continue to provide service, maintenance, and product upgrading. However, a new product can have bugs even if introduced by an established vendor, so you should know when the product was first delivered. Then you can decide whether it's been in the field long enough to perform satisfactorily.

As part of your investigation of the firm, find out the location of its sales offices. You'll tend to get better service from a local vendor. Since the vendor is not necessarily the manufacturer, investigate this point and learn the manufacturer's history. For example, what other equipment does the manufacturer produce? Does he also sell equipment to other manufacturers who use his product as components in their own systems? (This particular market is commonly called OEM for original equipment manufacturer.)

A significant OEM market can be a plus factor in favor of the vendor. OEM business expands a manufacturer's production volume, lowers his costs, and can improve his profitability via a more positive cash flow. As a result, the manufacturer is more financially sound and has a greater probability of survival. In addition, OEMs tend to make more technical demands than end users. Consequently, a manufacturer's involvement with OEM business leads to increased technical expertise and further product improvements.

A large company can usually offer considerably more services than a small manufacturer. Yet, a novice user will be small potatoes to those same giants, whereas his trade may be more important to a smaller outfit. The vital point to keep in mind is that once the deal is concluded, you should try to avoid being little more than an account number to the computer manufacturer. So, from the outset, try to gauge each supplier's future interest in and responsiveness to your problems, based on as much face-to-face discussion as possible.

We've presented general guidelines, but it's a good rule to make a full investigation of the vendor. If you're not satisfied with the vendor's credentials, look elsewhere.

## INSTALLATION AND MAINTENANCE

The quality of a vendor's maintenance and service facilities can be as difficult to quantify as its reputation. But as mentioned in the discussion of vendor history, guidelines can give you some feeling for the type of service you can expect.

A number of vendors don't have their own maintenance facilities. Instead they contract with third-party firms to provide installation and maintenance service. This type of arrangement is a fairly recent innovation. According to our contacts in the user community, third-party maintenance firms generally offer no better or worse service than received from a vendor's maintenance personnel. The quality of service depends upon the specific firm.

It's very necessary to have good cooperation and scheduling between your staff and vendor field service personnel during the computer's installation. Unforeseen pitfalls can sometimes develop and and delay installation. Before the equipment arrives, try to have some assurance against unexpected bugs. For example, rather than discontinue your old operation, continue with it until the new installation is working. However, this approach can sometimes be expensive since you'll be paying for two installations while only one is being used. A less expensive approach would be to check whether the vendor has a backup system located nearby. In case of delays, the backup system can be used while the new system is debugged. Even after installation, a backup system located nearby can prove useful in case your system malfunctions. In fact, if you know that a system similar to yours is located within a reasonable traveling distance, try to arrange reciprocal privileges, with each installation included in the other's disaster plans.

Another aspect of installation that should not be overlooked is the type of training provided by the vendor. Although most training can be provided by the vendor at his classroom facility, the vendor should also be expected to provide on-site training as part of the installation procedure. Training should be detailed and supported by first-rate manuals covering both the hardware and software. Well-organized, well-written documentation is also vital if your computer is ever to be used to its full potential.

Maintenance can include a variety of services. Ask the vendor to enumerate them. Are parts replaced free of charge? How often is preventive maintenance performed and when — prime shift only or at the user's convenience? How long must you wait between placement of a service call and arrival of a technical representative? Are there additional costs, such as traveling expenses? If so, how are these costs

calculated? In determining expected down-time, find out the distance between your firm and a spare-parts depot.

A service representative can respond to your call in a short time if he's located nearby, so a list of the cities housing service centers is important. Additional information that impacts a firm's service capabilities includes the number of service representatives employed and the different levels of employee experience. Do customer engineers have prior experience with small business computers? How are customer engineers trained (formal class, on-the-job-training, etc.)?

## PRICING CONSIDERATIONS

Most vendors offer a variety of pricing arrangements. The optimum price can vary, but it reflects a balanced mixture of lease duration, maintenance and overtime terms, and cost. Generally, vendors offer a choice of short-term leases that are renewable at less than yearly intervals or longer fixed-term leases that can extend from over one year to (in some cases) five years.

Short-term contracts benefit users who decide to cancel in favor of more technologically advanced or less expensive equipment because there is no penalty. Short-term leases can also be advantageous for users who want to operate a vendor's equipment on a trial basis to test the vendor's service and maintenance capabilities as well as the reliability and performance of the equipment. On the other hand, short-term leases have disadvantages. It is usually more expensive to rent by month than for a longer term. Additionally, the user is subject to more frequent price changes if he renews his lease during each short-term interval.

Although long-term leases (extending above one year) involve smaller monthly rental rates, do you want to commit yourself so far in advance? You are protected against price increases, but you can also be prevented from taking advantage of any price decreases.

If a customer breaks his lease, he incurs a penalty. Most vendors explicitly state the penalty for cancelling, but there's still a certain amount of latitude. One vendor assures us that his company doesn't exact a penalty for upgrading if his firm provides the new equipment. The company's spokesman also said that no penalty would be applied if his firm didn't market the upgrade equipment. In this case the vendor is offering a verbal guarantee, and could change his mind after you sign an agreement. However, a check of the vendor's history and reputation should indicate his credibility.

If you decide to purchase the equipment after leasing it, can any of the rental money be applied to the purchase price? In other words, does the vendor offer a conversion-to-purchase option? If he does, you should know the formula. For example, a vendor may allow a customer to apply all rental payments to the purchase price. Other vendors set limits based on a percentage of the purchase price, the lease's duration, or the amount of rental already paid.

The overtime charge is another feature that varies in different vendors' leases. Some vendors offer unlimited usage. Others base the rental terms on a fixed number of hours per month, and charge an additional fee for use of the equipment beyond the specified time. Because overtime charges can be significant, remember to consider them when pricing a small business computer system.

Maintenance is usually included in the lease price, but maintenance hours vary and the price changes accordingly. Just like other employees, maintenance personnel expect to be paid a larger salary for working weekends and evenings. Consequently, the customer generally pays higher maintenance fees for service outside the normal five-day, 40-hour working week. Unfortunately, the normal working week is "prime time" for most computer installations. This results in a tradeoff decision. Should you pay extra for on-call maintenance during hours that won't interrupt your installation's activity, or should you pay a smaller fee and risk system downtime during your most productive hours? That decision depends on your own constraints and requirements.

## CONCLUSION

Evaluating and selecting a small business computer is not a simple task. However, its complexity can be minimized if you proceed correctly. First, define the type of jobs your small business computer will be expected to perform. Next, establish a price ceiling based upon how much money you are willing to pay for getting the job done. Finally, match a system to these criteria.

To draw on the data processing experience of other businesses, check Table 1, which presents a summary of EDP costs encountered among five major industry groups. The table defines five standard SBC configurations, lists the typical size EDP staff employed and total annual EDP expenditures for each configuration, and relates

the company size within each industry group to each SBC configuration by listing a range of the number of personnel employed.

As an additional aid, we have prepared a checklist for use during your evaluation and selection procedure. After you have narrowed the selection to several roughly similar computer systems, use the scoring system presented in Appendix A to gauge their relative value.

Table 1. SBC Configurations and EDP Costs for Five Major Industry Groups

| Characteristics | Product Identifier | | | | |
| | SBC-1 | SBC-2 | SBC-3 | SBC-4 | SBC-5 |
| --- | --- | --- | --- | --- | --- |
| Data input | Keyboard | Keyboard | Keyboard and/or low-speed punched card | Medium-speed punched card | High-speed punched card |
| Printed output | Carriage printer | Serial printer | Serial or low-speed line printer | Low- or medium-speed line printer | High-speed line printer |
| Storage media | Magnetic ledger | Serial (single-track) magnetic tape | Punched card, disc, or 7- or 9-track magnetic tape | Disc and/or magnetic tape | Disc and/or magnetic tape |
| Average Sales Price | $20,000 | $40,000 | $60,000 | $82,500 | $113,000 |
| Typical Rental ($/mo) | 300–600 | 600–1,200 | 1,200–1,600 | 1,600–2,200 | 2,200–3,000 |
| Typical Size of EDP Staff | 1–2 | 1–3 | 3–4 | 4–6 | 6–8 |
| Total Annual EDP Expenditures ($) | 10,000–17,500 | 17,500–40,000 | 40,000–53,000 | 53,000–73,500 | 73,500–100,000 |
| Employee Range | | | | | |
| Financial | 13–23 | 24–53 | 54–70 | 71–97 | 98–131 |
| Wholesale | 32–56 | 57–129 | 130–171 | 172–237 | 238–322 |
| Manufacturing | 50–87 | 88–200 | 201–265 | 266–368 | 369–500 |
| Retail | 74–130 | 131–296 | 297–392 | 393–545 | 546–740 |
| Transportation, Communications, and Public Utilities | 38–66 | 67–151 | 152–200 | 201–278 | 279–378 |

# SMALL BUSINESS COMPUTER SELECTION CHECKLIST

CORPORATE DATA

Headquarters _____ name

_____ address

_____

_____ city, state

_____ telephone

National marketing contact _____ name

_____ title

_____ telephone

Local sales office_____ name

_____ address

_____

_____ city, state

_____ telephone

Local marketing contact_____ name

_____ title

_____ telephone

Date system first announced _____

Date system first delivered _____

Number installed_____

Current System Users

| Configuration | Corporate Name | Address | Telephone |
| --- | --- | --- | --- |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

Questions for References

Is vendor pleasant to deal with _____, have a good record of resolving

problems _____, meet commitments _____, deliver system on

time _____.

Vendor's Control over Product

Does he design _____, manufacture _____, inspect _____,

test _____, recondition _____.

If subject to other firm's: Name _____,

Address _____, Telephone _____,

Functions performed _____.

## HARDWARE SYSTEM

Central Processor

Model _____

Word size (bits) _____, Main memory size (Kbytes) _____,

Cycle time ($\mu$sec) _____, Add time ($\mu$sec) _____,

No. of instructions _____, Hardware multiply/divide _____,

Hardware multiple
precision _____, 
No. programmable
registers _____.

Addressing: Indirect _____, indexed _____, relative _____.

Interrupts: Hardware/software _____, no. levels _____.

Data Input/Output

| Type | Input/Output | Model No. | Speed |
|---|---|---|---|
| Punched card | _____ | _____ | _____ |
| Punched paper tape | _____ | _____ | _____ |
| Magnetic cassette | _____ | _____ | _____ |
| Line printer | _____ | _____ | _____ |
| Character printer | _____ | _____ | _____ |
| Other | _____ | _____ | _____ |

Auxiliary Storage

|  | Model No. | Capacity | Speed |
|---|---|---|---|
| Disc | _____ | _____ | _____ |
| Drum | _____ | _____ | _____ |
| Tape | _____ | _____ | _____ |
| Magnetic Ledger | _____ | _____ | _____ |
| Other | _____ | _____ | _____ |

## SOFTWARE

|  | Name | Description |
|---|---|---|
| Assembler | _____ | _____ |
|  | _____ | _____ |
| Compiler | _____ | _____ |
|  | _____ | _____ |
|  | _____ | _____ |
|  | _____ | _____ |
| Operating System | _____ | _____ |
|  | _____ | _____ |
| Application Library | _____ | _____ |
|  | _____ | _____ |
|  | _____ | _____ |

## USER SUPPORT

Coding Assistance _____

|  | Title | Length (days) |
|---|---|---|
| Training Courses | _____ | _____ |
|  | _____ | _____ |
|  | _____ | _____ |
|  | _____ | _____ |

|  | Title | Type |
|---|---|---|
| Documentation | _____ | _____ |
|  | _____ | _____ |
|  | _____ | _____ |
|  | _____ | _____ |

## MAINTENANCE

### Preventive

How often performed _____, days of week _____, hours _____.

### Emergency

Quoted response time (hours) _____, hours of availability _____.

### Customer Engineer Experience

Training: formal _____, on the job _____.

Prior experience: previous work with small business computers _____.

### Backup Facilities

Location of alternate site with comparable installation _____

_____.

Location of spare-parts depot _____.

## PRICING POLICY

Installation charge _____

Cancellation penalties _____

Upgrade and downgrade: alternatives _____,

restrictions _____,

penalties _____.

Effect of future price change _____

Delivery guarantees _____

Performance guarantees _____

Purchase options _____

Order cancellation before delivery _____

Acceptance period (days) _____

Policy on replacement hardware _____

# II. SMALL BUSINESS COMPUTERS

The following section contains descriptive analyses of most of the major SBC systems currently available, and of a representative sample of minor systems. It must be understood that what constitutes a significant feature in a small system may hardly be worthy of mention when describing a large system. Each system report should therefore be viewed within the context of the parameters and performance of comparable systems.

Reports on these companies and small business computers are included:

Basic/Four Corporation, Basic/Four System

Burroughs Corporation, L Series

Cascade Data, Inc., Cascade 80 Series

Eldorado Electrodata, Model 140

Honeywell Information Systems, Series 50 Model 58

Honeywell Information Systems, Series 100 Model 15

Honeywell Information Systems, Series 200 Models 105 and 115

IBM Corporation, System/3

IBM Corporation, System/360 Model 20

Litton Automated Business Systems, 1200 Series

National Cash Register, Century 50 and 100

National Cash Register, NCR 500

Philips Business Systems, 350 Series

Qantel, Q Series

The Singer Company, System Ten

Ultimacc Systems, Inc., Ultimacc

Univac, 9200 System

Victor Comptometer, 820 Series

# BASIC/FOUR

## Basic Basic/Four System

## SUMMARY

Basic/Four's series of small business computers is primarily marketed as an upgrade for users of electronic accounting machines. It bridges the wide gap between the simple, typewriter-oriented, interactive computers, which are preprogrammed with a handful of accounting-type programs, and the larger batch processing systems, which have compiler languages, extensive arrays of peripherals, and broad network capabilities.

Designed for multiple-user, interactive processing, Basic/Four comprises four models of a single, basic machine, field expandable so that the simplest configuration can be converted to the most powerful as the user's requirements grow.

The two simplest models of the series can use only a single terminal, but the other two models can support networks of terminals. In one model, up to eight terminals (each of which may be using a different program) can be serviced on a simultaneous basis by the central processor unit. Thus, although each terminal is in interactive mode, system throughput is far greater than that of an ordinary interactive processor because the CPU can be used to capacity by the combined demands of the several terminals.

The series is available in several combinations: on a turnkey basis, complete with software, operating system, and customized application programs; operating system and customized application programs only; and operating system alone, with the user's staff developing the application programs in the system's conversational programming language. A variety of support and programmer-training services are also available from Basic/Four.

## CONFIGURATION GUIDE

Basic/Four comprises four models: Models 300, 350, 400, and 500. All systems can be upgraded to the 500. A minimal-configuration Model 300 consists of a CPU with a 4K-byte memory, an accounting machine terminal (AMT), and a disc memory unit. The AMT has a split-platen, interactive printer with a standard keyboard plus numeric-key cluster. This unit can handle multiple, pin-feed and tractor-fed forms as well as front-feed ledger cards and can be used independently as a printout device. The CPU cabinet houses the disc memory unit, a dual-disc configuration with 2,100K bytes of storage to augment the 4K bytes of read/write memory.

The CPU includes 4K bytes of read-only memory and 16K bytes of read/write memory reserved for the Business Basic Operating System. It is a disc-oriented operating system that includes the interpreter for Business Basic, the conversational programming language, as well as the system's executive and monitoring software.

Model 300's memory is plug-in expandable to a maximum capacity of 48K bytes of read/write core and an additional 14,700K bytes of disc storage. The following peripherals are available: a 165 character-per-second (60 lines per minute) dot-matrix printer with a buffer for its full 132-character line; a buffered 200 line-per-minute line printer, with a 132-character line; magnetic tape transports that can read or write on either seven-track or nine-track tape; a communications controller to link a remote AMT to the CPU; and punched card readers for 80- or 96-column cards with speeds of up to 800 cards per minute. Paper tape readers and punches will soon be available.

Model 350 replaces the AMT with a video display terminal (VDT) and adds, as standard equipment, the 165 character-per-second dot-matrix printer. The video display terminal's CRT can display 1,998 characters in a 74-column by 27-row format and write up to 240 characters per second. The VDT has an alphanumeric keyboard and numeric keyset for data entry. The CRT's 12-inch screen can be used to display data for review and correction prior to entering it into the CPU, in addition to its use as an interactive communications device. Blank forms can be displayed, their outlines and section headings at reduced intensity, so that the operator can fill in the blanks with information in the desired format. The Model 350's memory capacities and its peripherals are the same as those of the Model 300.

Model 400 adds to the Model 350 a multi-terminal processor, capable of accommodating up to four interactive terminals, either AMT and/or VDT. All of these terminals can be remotely located and linked to the CPU by telephone lines, and all can work concurrently on the same or different programs.

Model 500 has the same basic components as the Model 400. However, it can handle up to eight interactive terminals simultaneously. More than four and eight terminals, respectively, can be linked to the Model 400 and Model 500, but they cannot be serviced by the CPU at the same time. Model 500 has the same memory capacity as the other models. All models can be expanded in the field to the level of a 500 by adding the necessary components.

## SOFTWARE

The Basic/Four series uses both a conversational programming language and an operating system, an unusually flexible combination for computers in this price range. Business Basic is Basic/Four's extended version of the widely known Basic language, developed at Dartmouth College to provide novice programmers with a powerful, yet easy-to-learn language. The additional features of Business Basic include: instructions for formatting input data and system printout in order to provide easily understood reports; instructions for management of disc data files, including password security arrangements to prevent unauthorized access to or alteration of stored data; and fixed-point (standard decimal) number representation and computation.

The Business Basic Operating System is available in two versions — one for the single-terminal systems of Models 300 and 350 and the other for the multiterminal systems of Models 400 and 500. The Business Basic Operating System assigns areas in core memory to the various users, implements the data file security features, manages the data files, and supports utility routines that include sorts and merges, data format conversion, file copying and listing, and file updates. The Business Basic Operating System also contains the Business Basic interpreter and exercises control over all I/O devices including the scheduling of command executions.

## DESIGN FEATURES

The chief design feature of the Basic/Four series is the main-memory partitioning that its operating system performs on a dynamic basis. A programmable operating system can offer greater flexibility than hardwired partitioning.

The operating system can be altered to accommodate new utility routines for any additional peripheral devices. This feature permits multi-programming on a time-shared basis, without the complex program software normally associated with such an operation. Furthermore, since a terminal can call up any of the programs stored in the disc file library, a network can use more programs than there are terminals, with output data from each program buffered onto core or disc and printed out in turn.

Another major feature of this series is the compatible upgrade ability of each model to the level of the Model 500, with its substantial networking capabilities. A user can initially acquire the smallest configuration that meets his needs. As his requirements grow, the system can be modularly expanded to keep pace. This approach optimizes price/performance.

## PERFORMANCE

Basic/Four is well matched to the needs of small businesses that are planning an upgrade from an electronic accounting machine installation because of an increased volume of business. The series' performance is far superior even in its single-terminal configurations to that of a punched card system, an alternate type of upgrade.

Multiterminal configurations in the series can support a far higher volume of business activity. While each terminal can function as an independent I/O device for order entry, invoice preparation, inventory monitoring, and so on, data entered once is always available to any authorized access for program execution. This feature eliminates multiple handling of files and the subsequent possibilities for error.

Basic/Four offers the standard accounting-type applications such as invoicing and payroll, all of which are available in customized form. It also provides easily programmed means of report generation which is useful to the small business whose operations are outgrowing simple management techniques.

## MAINTENANCE

Maintenance for the Basic/Four series is available through Sorbus, Inc., a broad based service company that has offices in over 100 cities across the country. Sorbus, like Basic/Four, is a subsidiary of Management Assistance Inc. Service is provided, by contract, either during regular business hours or, at higher rates, on a 24-hour basis.

## HISTORY

Basic/Four Corporation began marketing the system in June 1971 in Southern California. Genesis One Computer Corporation, another MAI subsidiary which markets a broad range of data processing products, introduced the Basic/Four system in the New York and Chicago areas in November 1971 and will gradually expand into other key areas in the United States. MAI International Corporation is marketing the system in Canada, Latin America, and Europe.

## PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 4 |
| Capacity (words) | 8–96K |
| Cycle Time ($\mu$sec) | 1.1 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 200 |
| Serial Printer | Yes |
| Card (cpm) | — |
| Paper Tape (cps) | 75 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 400; 800 |
| Paper Tape (cps) | 500 |
| SOFTWARE | |
| Assembler | No |
| Operating System | Yes |
| Compiler | Basic |

# BURROUGHS
## L Series



## SUMMARY

Burroughs L Series comprises a family of computers intended for accounting applications. Individual members vary in capabilities, but higher-performance members can be used for data analysis and report generation. The design emphasis is on interactive processing and simple control by novice users responding to the step-by-step guidance of indicator lights on the console. The series includes models capable of operating as terminals in a data processing network as well as models intended exclusively for stand-alone operation.

The family is distinguished from other small business computers by the nature of its working storage; L Series members utilize magnetic disc rather than core or semiconductor. Interestingly, however, only the most powerful member, the L 7000, has the capability for disc storage of on-line master files. The L 7000 is also unique in the series in that its working storage incorporates a scratchpad memory made from integrated circuits.

All L Series models support a Cobol compiler, a powerful tool for programming business applications.

## CONFIGURATION GUIDE

Burroughs L Series is composed of the following members: L 2000, L 3000, L 4000, L 5000, and L 7000.

L 2000 features a standard typewriter keyboard, a numeric keyset, a set of program select keys, indicator lamps, and service keys. It includes an integral serial printer with a rear-feed forms handler that can simultaneously handle up to two cut or continuous forms. In addition, L 2000 can support readers and punches for handling cards, paper tape, and edge-punched cards.

L 3000 differs from L 2000 primarily in its use of a front-feed forms handler. One version, the L 3000 Window Accounting Computer, has a tall, freestanding "pillar" shape, which makes it suitable for use at a teller's window.

L 4000 is also designed for front-fed forms but it differs from the L 2000 in its much larger platen, which provides a 255-character print line. In addition, its keyboard has space for 24 program select keys rather than for 16 as on the L 2000. The L 5000 resembles the L 4000, varying primarily in the 5000's ability to accept data input from magnetic record cards. Used in conjunction with a magnetic record reader that can read forms 11 inches long and from 6 to 14-1/2 inches wide, the L 5000 can process and analyze magnetic unit records to generate management reports.

The L 7000 is the most powerful of the L Series. It incorporates 2,560 words (16-bit) of magnetic disc main memory, which is field expandable to a maximum 8,704 words by the addition of three 2,048-word modules. Scratchpad memory is also available in 32-word increments, from 32 to 256 words capacity.

L 7000 Series can accommodate either single or dual 80-column punched card or punched paper tape/edge-punched card peripherals (two input devices, two output devices), in various combinations. A card/tape subsystem controller which contains input/output buffers controls the input/output devices. Like the L 5000, the L 7000 can accept data input from magnetic record cards. L 7000, however, can support a single-track record (interchangeable with the L 5000) and adds a dual-track capability.

## SOFTWARE

The L Series is unusual in terms of programming flexibility, because it remains the only one that permits Cobol programming for small operator-attended systems. Such Cobol programs must be compiled on the larger Burroughs B 3500 computer. However, if the L Series system has data communications ability, the program can be transmitted to a remote B 3500 for compilation.

This series can be programmed in assembler language. The programs are assembled either on the L Series machines or remotely on a B 3500 if desired. The company provides, at no

extra cost, preprogrammed routines to assist in program debugging, as well as several utility routines.

Burroughs offers a wide range of standard application packages including: accounts payable, general ledger and financial statements, payroll accounting with reports, public utility billing, billing and account updating, cash receipts and posting, general ledger and month-end reports, payroll accounting, accounts receivable, age analysis, and general billing. In addition, Burroughs will either modify these standard packages to meet the user's specialized needs or write appropriate customized programs.

## DESIGN FEATURES

The L Series is unique in its use of magnetic disc for main memory. However, except for the L 7000, no provision is made for storing auxiliary files on magnetic disc. The L 5000's ability to use a file of magnetic record cards offers some oompensation for this shortcoming.

Models L 2000 to 5000 use so-called firmware microprograms stored permanently in the disc memory to perform such functions as arithmetic and printer control. While storing firmware on the disc is more economical than processor residency, access times are usually slower. For the L 7000, special semiconductor memory is incorporated in the processor console to store firmware. This enables faster processing for the firmware function.

L Series also provides versatile printed output via an interchangeable ball-type printing head, available in a variety of fonts.

## PERFORMANCE

The fact that the L Series of computers can be programmed in Cobol gives it a versatility that exceeds the basic design as a series of sophisticated electronic accounting machines with the ability to be configured into a network. Both L 5000 and 7000, with their magnetic memory card capability and ability to generate management reports, have some of the flexibility of the larger small business computers. The L Series upper performance range is also significantly enhanced by the L 7000's magnetic disc storage capability.

Forty-eight standard application packages are available, all written in Cobol, and covering every ordinary accounting application, as well as sales analysis, daily operating control reports, cash flow forecasts, stock status reports, and others.

## MAINTENANCE

L Series maintenance is performed by Burroughs service personnel available on-call during normal business hours and operating from over 200 branch locations throughout the country, in addition to a large number of fully stocked residence posts. First-year maintenance is covered by a warranty. A separate contract covers subsequent service.

## HISTORY

Burroughs Corporation, founded in 1905, is one of the two largest manufacturers of electronic accounting machines, as well as one of the largest computer manufacturers. The company employs over 52,000 people, grosses approximately $900 million a year, and maintains a worldwide marketing force.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 64; 16 |
| Capacity (words) | 1,024-8,704 |
| Cycle Time ($\mu$sec) | 5 |
| Working Storage | Magnetic disc |
| AUX STORAGE | L 5000 and 7000, magnetic cards; L 7000 only, magnetic disc |
| DATA OUTPUT | |
| Line Printer (lpm) | — |
| Serial Printer | Yes |
| Card (cpm) | 19 |
| Paper Tape (cps) | 40 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 100; 200 |
| Paper Tape (cps) | 40 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | Cobol |

# CASCADE DATA
## Cascade 80 Series



CS2-9
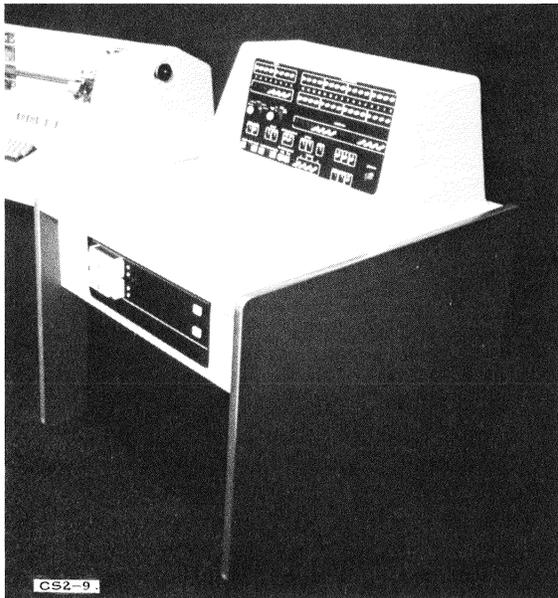
## SUMMARY

The Cascade 80 Series is designed for operation by secretaries and other office personnel who have little or no prior computer experience. It combines the ability to handle standard accounting and related functions with a broad report-writing capability that can be quite effective in providing management with timely overviews of company operations.

Cascade 80 Series comprises nine configurations of three basic computers with a complement of peripheral devices in every category except card punches and magnetic ledger card readers. Its report-writing capability is compatible with the Report Program Generator (RPG) program of IBM's System/360 computer. This compatibility can be a major convenience when a model of the 80 Series is used to provide divisional or branch-office data processing for a company whose prime data processing facility is an IBM System/360.

The CPU can be magnetic tape or magnetic disc oriented. Magnetic tape capability can be retained with a disc-oriented system. Available with the series are a Disc Operating System and a Tape Operating System.

Cascade's marketing policy is to test the user's specific application packages, running on a configuration identical to the one being purchased, before the contract is actually signed.

## CONFIGURATION GUIDE

Three basic configurations are available. The 80/20 is a direct-entry, interactive data processing system that uses a keyboard input, serial printer output, and a magnetic tape system for auxiliary, on-line storage. The 80/30 is oriented toward batch data processing by adding card reader capability to the 80/20. The 80/40 is also intended for batch processing, but by adding magnetic disc capability to the 80/30 it can also be used in interactive mode.

The central processor unit has a basic 8K-byte core storage memory, plug-in expandable to 32K bytes, and expandable to 64K bytes with module modification. The CPU can respond to 65 basically different instructions, a rather large instruction set for computers in this price range but essential to the development of the operating systems featured by the 80 Series. All models of the series include a standard keyboard. A serial printer, which prints a 132-position line at 30 characters per second and uses a pin-feed forms handler, is also standard.

Peripherals for the 80 Series include:

Card readers — one card reader that is added to the 80/20 to convert it to an 80/30 is capable of reading 300 cards per minute and is used primarily for data entry. A variant of this model is available with a pencil-mark sensing ability.

Magnetic disc drive — a dual-disc configuration with 5,000K bytes of on-line storage. Model 80/40 has at least one.

Magnetic tape storage drive — a four-drive cartridge tape unit, with a capacity of up to 1,750 100-character records on each tape. This unit is standard on all 80/20s and 80/30s, and optional on 80/40s. Both 80/20s and 80/30s can handle up to eight separate tapes. An 80/40 configuration can expand to a maximum of 20,000K bytes of on-line disc storage.

Line printers — include a 90 line-per-minute, 132-position matrix printer and a device that prints 200, 128-position lines per minute, or 13.5 times the maximum capacity of the serial printer.

Paper tape drives — comprise both tape readers and tape punches.

## SOFTWARE

System software includes three categories of programs: control, support, and application

programs. Control programs are fundamental to the system's operation and must be purchased separately for delivery with installation. They include such subroutines as binary-to-decimal and decimal-to-binary conversion and division; the control sequences that operate the console indicator lights; and utility routines for data management, transfer, format conversion, and so forth. Much of this software is included in the Disc Operating System (DOS) and Tape Operating System (TOS) available for the 80 Series.

Support programs include the assembler programs, the RPG language program, and a program that permits the sorting of magnetic tape files. RPG can be used only with CPU models that have at least 16K bytes of core storage. A series of application packages for such functions as order-entry invoicing, sales analysis, payroll, accounts payable, and general ledger, is available in either standard or customized form. Cascade has an hourly rate schedule for the development of special programs that the user may require. DOS and TOS greatly simplify the programmer's task by supervising automatically all I/O routines including error checking.

## DESIGN FEATURES

The Cascade 80 Series features ready expandability through plug-in modules and a very large maximum on-line auxiliary storage capacity for systems in this price range. Besides programming flexibility, it has a relatively large console display and control panel that assists novice operators in using the computer and also doubles as a diagnostic aid for servicing. Plug-in modules also simplify maintenance because any device in the system can be entirely and quickly replaced by the user's own personnel. Although the CPU cannot simultaneously process data and respond to input/output commands, the 200 line-per-minute line printer is buffered so that multiple print operations can be executed at the same time.

## PERFORMANCE

The performance of the 80 Series is appropriate to the needs of the small business whose gross annual volume is as high as a few million dollars. The series is optimal in day-to-day operations and is effective for management as a powerful analytical tool. Rapid system startup with previously untrained personnel as operators is another important aspect of this series' performance. Reportedly, after a 3-day easy-to-follow training course, clerical personnel and secretaries are able to operate the computer by themselves.

## MAINTENANCE

Maintenance of the 80 Series is covered by a warranty for the first 6 months, and by a separate service contract subsequently. Service is available both during normal business hours and, at a higher rate, after hours as well. Service centers are primarily in the Midwest, where most of the branch offices are also located, but maintenance is also available through several distributors in the East.

## HISTORY

Cascade Data, Inc. was founded in June 1969 exclusively to manufacture and distribute small business computers. The first Cascade 80 was delivered in January 1970, and several dozen systems in a variety of models have been installed.

### PRODUCT SPECIFICATIONS

| | |
|---|---|
| CENT PROCESSOR | |
| Word Size (bits) | 8; 16 |
| Capacity (words) | 8K–64K; 4K–32K |
| Cycle Time ($\mu$sec) | 0.900 |
| Working Storage | Core |
| AUX STORAGE | Disc; tape cartridge |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 90; 200 |
| Serial Printer | Yes |
| Card (cpm) | — |
| Paper Tape (cps) | 60 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 300 |
| Paper Tape (cps) | 300 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | RPG |

# ELDORADO ELECTRODATA
## Model 140

## SUMMARY

The Eldorado Model 140 is a small business computer system designed for interactive use by novice computer users. It is a desk-console, typewriter-oriented system, programmable in ESP (Eldorado String Processor), a powerful conversational language. ESP resembles Basic and Fortran II languages, but can be used only on the Eldorado computer. The system incorporates Eldorado's ee 200 processor, which is also used in Eldorado's Models 123, 124, and 125 batch processing data terminals.

Model 140 is available with a variety of application software including: accounting-type programs such as payroll, general ledger, invoicing, and accounts receivable; operational programs such as job cost accounting, labor cost analysis, sales analysis, inventory analysis and control, and maintenance scheduling, routing, and billing.

Financial programs include a software package specifically designed for CPAs, enabling them to rapidly prepare a variety of financial statements for their clients. A cost accounting package has been developed for attorneys which bills clients according to the time spent in case preparation and courtroom appearances. Finally, Eldorado has developed its own version of IBM's magnetic tape, typewriter control and editing software.

A variety of peripheral equipment provides flexible means of data input and output. Magnetic cassette capability is available for high-volume data and program storage. A random access storage medium facility is furnished by disc drives. The system can communicate with either its sister series of remote data terminals or with other computers — including Burroughs, Control Data, IBM, and Univac machines — through use of an assortment of emulation software. In order to communicate with other computers, Model 140 converts its data into a compatible format.

## CONFIGURATION GUIDE

The basic configuration of a Model 140 consists of a desk console housing the ee 200 processor with an 8K-byte core memory and a magnetic cassette drive capable of simultaneously handling three separate cassettes. The heavy-duty, interactive IBM Selectric typewriter on the desktop has a tractor for continuous forms and the option of multiple fonts.

This configuration can be expanded by extending main memory, in 4K-byte plug-in increments, up to a total of 61K bytes. Auxiliary disc and/or magnetic tape storage, any one of three IBM-compatible tape drives, and peripheral equipment can also augment the basic system.

The addition of a disc controller permits the system to handle up to four disc drives, each of which provides 5,000K bytes of on-line storage.

Peripheral equipment includes the following: a card reader operating at 300 cards per minute; an auxiliary numeric keyset; two buffered, 132-column line printers, with respective operating rates of 135 and 600 lines per minute; a 75 character-per-second paper tape punch; a 300 character-per-second paper tape reader; and synchronous or asynchronous communications controllers. Twelve, or optionally 27, of the preceding devices, in any combination, can be added to the basic configuration, with each memory module considered as one device.

## SOFTWARE

Eldorado's application software can be modified to meet the special needs of users. A customer programming service is also available. Programs are normally resident in the system's tape cassettes or disc files. They are stored in machine language form, following a two-step procedure using Eldorado's compiler and assembler tapes.

An assortment of system software that, in its combined functions, resembles an operating system comes with each installation. It includes routines for: loading programs from cassette into main memory and initiating their execution; file-to-file copying; program library construction; file search and listing; and file editing, including data deletion and modification. Sort/merge programs are also available.

Eldorado provides an executive system to permit operator control of program execution through the typewriter keyboard. This feature allows the operator to: print out and modify the contents of a memory cell or an operational register; print the contents of a memory area; load programs; write from memory onto cassettes; and assist in program debugging.

## DESIGN FEATURES

Eldorado's ee 200 processor incorporates a variety of unusual features. It uses a common bus to access both its memory and peripheral devices. This permits the peripherals to access each other or the system's memory directly, with minimal CPU intervention.

The system employs an asynchronous memory interface that permits ready intermixing of different types of memory. Various mixes of Eldorado's semiconductor, core, and read-only memories are made practical by this arrangement; however, the total cannot exceed 61K bytes.

The ee 200 has an exceptionally large instruction set for a minicomputer. Sixty-nine basic instructions can be modified into several hundred special instructions, providing unusual programming flexibility. The computer's addressing flexibility adds to the customary direct addressing the capability of indirect, relative, and indexed addressing. The ee 200 also features an extensive interrupt capability, with 15 levels of preassigned priorities to insure that the I/O devices performing the most important tasks have earliest access to the CPU. Such a hardware priority system eliminates the necessity of polling each device via software routines and results in more efficient system throughput. Several devices can share an interrupt level, in which case each device on the same level is serviced on a first-come, first-served basis.

Finally, the system's compactness and modularity facilitate expansion and repair. Three circuit boards comprise the complete CPU and power supply. Additionally, I/O device controllers and memory modules are plug-in cards.

## PERFORMANCE

Model 140 offers a good assortment of application programs and a mix of peripheral equipment that can afford the novice user considerable room for system expansion. Although the minimal system is primarily oriented toward interactive use, expanded configurations have a batch processing capability that has already been used by at least one service bureau.

The availability of operational programs, in addition to those purely for accounting, is another important feature. Several small manufacturers have installed this system largely because of the job costing and inventory analysis it provides.

Model 140's CPA software package addresses a relatively new, but extremely profitable market — the very small businessman who has an outside accountant prepare his financial state-

ments on a monthly basis. This automated system of statement preparation permits a CPA to at least quadruple the number of his accounts, while providing more timely and accurate service.

## MAINTENANCE

Maintenance for Model 140 is provided through Eldorado's sales and service agencies. There are 16 prime offices and four subagencies in major cities in the United States and Canada. Service is initially provided under a 90-day warranty. A separate contract covers subsequent maintenance.

On-call service is available either during regular business hours or, at higher rates, on a round-the-clock basis. Preventive maintenance is scheduled during regular business hours.

## HISTORY

Eldorado Electrodata has grown out of a digital instrumentation company founded in 1960. After developing its ee 200 computer, Eldorado incorporated the model in a line of remote batch terminals, introduced in 1969. Eldorado released Model 140 in mid-1970.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 16 |
| Capacity (words) | 4-32K |
| Cycle Time ($\mu$sec) | 1.2 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape; tape cassette |
| DATA OUTPUT | |
| Line Printer (lpm) | 135; 600 |
| Serial Printer | Yes |
| Card (cpm) | — |
| Paper Tape (cps) | 75 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 300 |
| Paper Tape (cps) | 300 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Keyboard executive |
| Compiler | Eldorado String Processor (ESP) |

# HONEYWELL INFORMATION SYSTEMS
## Series 50 Model 58
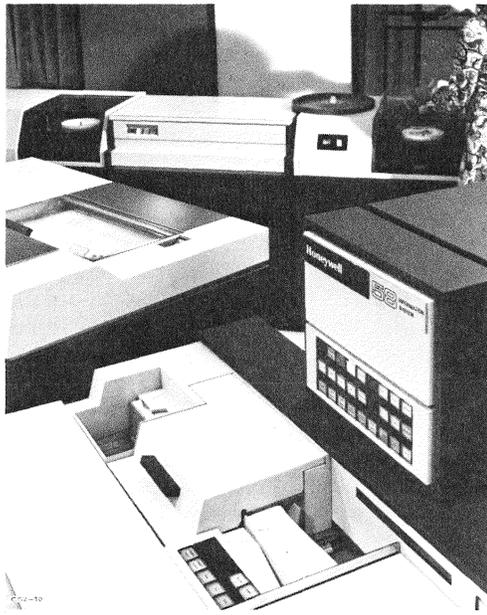
## SUMMARY

The Honeywell Information Systems (HIS) Model 58 is an interactive computer with batch processing capabilities, marketed both to novice users and to users of electronic accounting machines and punched card tabulators who are upgrading to a more powerful system. Model 58 is the third Series 50 machine, preceded by the Model 55 and Model 53. All are manufactured in France by Honeywell Bull, but only the Model 58 is actively marketed in the United States; the other two systems are marketed primarily in Europe. For those few U.S. installations of Models 55 and 53, Honeywell is emphasizing an upgrade to a Model 58.

Model 58 is available in two basic versions: punched card oriented and disc oriented. Six basic configurations can be expanded through additional peripherals and memory modules, and each has a communications capability to other 58s or larger HIS machines. All versions use a keyboard for interactive communication with the central processor, which responds through a 10-numeral digital display. The keyboard can also be used as a supplementary means of data entry. In interactive mode, operators are guided by step-by-step instructions, so that the existing clerical staff can use the system effectively after a brief orientation period.

HIS invites comparison between Model 58 and IBM's System/3 and has made point-by-point comparison of the two systems a major part of its marketing campaign. Model 58 has a number

of unusual features that make it attractive in terms of price/performance, price alone, and as a starting point for eventual growth into Honeywell's Series 200 computers. These features also uniquely adapt Model 58 to the needs of the wholesale/distributing industry.

Application software that comes with each installation includes an extensive complement of accounting-type packages, in addition to software especially tailored to the distribution, manufacturing, and construction industries.

### CONFIGURATION GUIDE

Model 58 can be divided into six basic configurations, two card and four disc. They differ from each other primarily in the number and types of peripheral devices included.

All have a central processor unit with 5K bytes of core memory, expandable to 10K bytes with a single plug-in memory module. The CPU has over 7K bytes of read-only memory devoted to arithmetic and special functions. On disc configurations the seemingly small core memory can be effectively used as though it were three or four times its actual size, through a program segmentation technique unique to Model 58.

All configurations have three slow-speed input/output channels for such peripherals as card readers and card punches, and a single multiplexed high-speed I/O channel with eight subchannels for such peripherals as line printers, magnetic disc units, and communications controllers.

Each configuration uses ⌐ desk console that contains the CPU, a standard alphanumeric keyboard, an auxiliary numeric keyset, a 10-numeral digital display used for both numeric readout and for coded interactive instructions to the operator, a system status-display/control panel, and a card reader. The standard reader operates at 100 cards per minute and is used in conjunction with a 96- or 128-column, 100 line-per-minute line printer and a 40 column-per-second card punch.

One optional feature permits cards to be interpreted and printed along one of their edges at 30 characters per second. Another permits the reader to optically read pencil-marked cards. A faster card-oriented system is also available, which combines a 200 card-per-minute reader with a 200 line-per-minute printer. Both models use 500-card hoppers and stackers. Also available is a 120 card-per-minute card punch.

The four disc-oriented configurations use the foregoing readers, punches, and line printers in

various combinations and add auxiliary storage in the form of disc drives. Disc capacity also depends on the specific system configuration and can vary from a minimum of 3.4 million bytes with two drives, to a maximum of 23 million bytes with four drives.

Other devices available for use with Model 58 are a single-line communication controller to link it to another Model 58 or to members of HIS Series 200, 400, or 600; an off-line, 12-pocket card sorter; and an off-line keypunch.

## SOFTWARE

Model 58 disc configurations come with a disc operating system whose functions include program execution management, file creation and editing, file indexing, and program segmentation. Most of the I/O control functions and all of the arithmetic functions are resident in the system's read-only memory, so both the card- and disc-oriented versions have use of virtually the entire core memory for processing.

Programming is done in MiniCobol, a subset of the widely used Cobol language. Programmers with Cobol experience can usually program effectively in MiniCobol after a 2-day reorientation Since MiniCobol is only modestly different from the Cobol offered to HIS Series 200 users, an upgrade to that series is generally smooth and involves minimal software modifications. Fortran IV, already released for European users of Model 58, will be made available in the United States.

Model 58 application software adds a wide variety of industry-specified operational programs to the customary and extensive accounting-type programs. The wholesale/distribution industry is served by an inventory management system that includes analysis and replenishment scheduling; a route accounting and deliveries system that includes packaging, loading, truck routing, and off-the-truck sales management; and a salesmen's commission system.

Manufacturers can draw on software to do job costing/estimating, task assignments, work-in-progress analysis, and daily plant efficiency analyses. Retailers can prepare invoices and customer statements, check inventory status, and combine the computer's remote-processing and stand-alone processing capabilities. Software is also available to assist in sheet metal layout, manage hospital bed assignments and hotel room bookings, schedule equipment use at construction sites, and perform sales analysis, among many other applications.

## DESIGN FEATURES

One of the most important Model 58 design features is its use of program segmentation, which in effect gives the system far more memory capacity than the user is paying for. Programs several times larger than the 5K or 10K bytes available in core can be handled, each new segment being automatically loaded into core when the instructions of the preceding segment have been carried out. The memory can contain a program with up to five subprograms to permit multitasking. One standard procedure effects inquiry to the disc files and readout on the digital display simultaneously with processing and line printout.

Another important feature is a system of disc-file addressing by up to 10 indexes. This eliminates the need for separate sort procedures, a task that can consume up to 40% of computer running time on other systems. Through use of the indexes, a type of in-process sorting is achieved; only those items that satisfy the specified indexes are accepted for further processing.

The optical-mark reader is an extremely useful option. Both sides of a standard-sized card can be written on with an ordinary No. 2 pencil for a total of 80 numerals, which can represent up to 77 items out of a possible 165 on any one of 2,475 catalog pages. This permits field preparation of data cards by salesmen, by delivery men making direct sales from their trucks, or, with slight format modifications, by meter readers, and others. It can, of course, also be used for automatic grading of exams without the restriction of a soft pencil that characterized earlier electrical readers.

## PERFORMANCE

HIS 58 in its various configurations offers the novice SBC user a mix of hardware and software that is well matched to his needs and that, in most cases, can compete with IBM's System/3. Model 58 offers excellent price/performance and does very well on a price-alone comparison, especially considering the software and support that is bundled in the lease price. A further consideration to the user looking to an eventual upgrade is the substantial software compatibility of Model 58 with members of the HIS Series 200.

## MAINTENANCE

HIS services Model 58 through its worldwide network of sales and service offices. There are about 135 in the United States and an equal number in foreign countries. Preventive maintenance is

performed during regular business hours. On-
call maintenance during any 9-hour period from
7:00 a.m. to 6:00 p.m. is included in the lease
costs. Service is available at other times at
standard per-hour rates.

## HISTORY

Honeywell Information Systems was formed in
1970 when Honeywell's 15-year-old computer di-
vision acquired the bulk of General Electric's
computer operations, including what was formerly
GE-Bull. Model 58 was announced in 1969 and
first delivered in the United States in December
1970.

**PRODUCT SPECIFICATIONS**

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 8 |
| Capacity (words) | 5K–10K; 7K |
| Cycle Time ($\mu$sec) | 1.2; 0.35 |
| Working Storage | Core; ROM |
| AUX STORAGE | Disc |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 100; 200 |
| Serial Printer | Yes |
| Card (cpm) | 25; 120 |
| Paper Tape (cps) | — |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 100; 200 |
| Paper Tape (cps) | — |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | MiniCobol; Fortran |

41

CS2-11

## SUMMARY

Honeywell's Model 15 is the most powerful of three new computers in the G-100 Series. Models 5 and 10 are successor products to the G-105 and G-115, respectively, except that the former two emphasize terminal rather than freestanding operations. Model 15 is a disc-oriented, free-standing batch processor that combines the features of the G-120 and G-130, and can use the fastest peripherals of the G-100 Series.

Model 15 is marketed as an upgrade for users of smaller SBCs and such systems as IBM's 360/20 and 360/25, Honeywell's G-105 and G-115, and comparable computers.

The system can simultaneously process, accept input data, and output processed data with up to three unbuffered peripherals and 31 additional buffered ones. Communications controllers and a variety of supporting software can interface Model 15 with any of the G-100 Series, with members of Honeywell's Series 200, 400, 600, or 6000, or with the Univac 1108.

Software provided with Model 15 includes the extensive complement of accounting programs developed for earlier members of the series, a production scheduling system, and a variety of specialized application packages, including programs for managing complex projects by the critical path method. Programming languages con-

sist of three assembly languages, three logic-generating languages (languages that combine elements of assemblers and compilers), and four compiler languages including Cobol, Fortran IV, and RPG.

Honeywell also offers system design guidance — including some of the programming details — for those applications previously developed for Series 200 computer users.

## CONFIGURATION GUIDE

A basic Model 15 consists of a central processor unit with a 16K-byte core memory; a 400 card-per-minute card reader; a 200 card-per-minute card punch; a 120-column, 600 line-per-minute line printer; and two disc drives with a storage capacity of 5.7 million bytes. Options include a memory cycle speedup from 4 microseconds to 2 microseconds, and a 600 card-per-minute reader feature.

Main memory can be expanded to 32K bytes in 8K-byte increments. It can be further expanded to 64K bytes, in two steps of 16K bytes each, by field replacement of the CPU. The replacement CPU includes the memory speedup feature. Auxiliary memory can be increased to a maximum of 92-million bytes (or 184-million packed digits), through use of increased-capacity features and more and higher-capacity drives.

As many as 34 input/output devices can be added through attachment of multiperipheral adapters to Model 15's four I/O connectors. Peripherals include two types of magnetic tape subsystems, each of whose controllers can accommodate up to seven additional tape handlers; line printers operating at up to 1,100 lines per minute; 300 card-per-minute reader/punches; paper tape readers and punches operating at up to 500 characters per second and 150 characters per second, respectively; magnetic-ink imprinted document sorters operating at 600 documents per minute; and any of five synchronous or asynchronous communications controllers.

## SOFTWARE

The application packages supplied to Model 15 users are supported by a disc operating system, an extended version of the one provided to Model 10 users. This system assists in program compilation and debugging, execution of programs and subroutines, and program linkup. It also creates and maintains data files, maintains the software library, manages communications with the operator, controls I/O operations, and manages the system's utility routines.

The accounting-type programs that are provided with Model 15 include payroll, accounts receivable, accounts payable, and customer billing. Application packages for other than accounting purposes include inventory management and control, sales analysis, personnel performance evaluation, and production scheduling and in-process control.

Project management for both business and industry is facilitated by a special package that enables complex projects to be modeled by the critical path method. A cost implosion system provides cost breakdowns and summaries for inventory management and production control. It also offers a ready means of assessing the impact that price changes in components and subassemblies have on the cost of major assemblies. A system designed for the textile printing and paper industries permits very rapid, precision color matching and dye mixture formulation through accurate dye selection on the basis of price/effectiveness.

Special-purpose software can be developed using the three assembly languages, three logic-generating languages, or four compiler languages provided with Model 15. The compiler languages are the widely used Cobol, Fortran IV, and RPG, and a unique Sort (or merge) Program Generator (SPG). Applications for which system design guidance and some programming details are provided include sales order processing, pupil class scheduling and evaluation, retail charge-account management, urban renewal analysis and tax projection, municipal utility billing, and fire and casualty insurance rate scheduling, and commission computation.

## DESIGN FEATURES

Model 15's design features include its unusually wide range of programming languages, its comprehensive operating system, and its very high disc-storage capability. The system's stated disc capacity is the actual amount available for user data. The space occupied by the operating system with its complement of translator and utility programs has already been subtracted from the initially available capacity.

Model 15's combination of freestanding and communications capabilities is supported by a single-level interrupt, primarily intended for use by a remote computer. Multitasking or multiprogramming can be accomplished through software, but the system has no special hardware or software features expressly for this purpose. One

exception is a standard feature that permits simultaneous performance of normal processing and file-to-file conversion or data printout.

## PERFORMANCE

The performance of Model 15, with its throughput of about 500,000 characters per second, is roughly comparable to that of a Honeywell 115/2 or an entry-level IBM System 360/30. Its capacity, application software, and price structure make an entry-level Model 15 most suitable for distributors and manufacturers with an annual business volume on the order of $10 million.

## MAINTENANCE

Honeywell services its Model 15 through its worldwide network of sales and service offices. There are about 135 in the United States and an equal number in foreign countries. Preventive maintenance is performed during regular business hours. On-call maintenance during any 9-hour period between 7 a.m. is included in the lease costs; service at other times is available at standard hourly rates.

## HISTORY

Honeywell Information Systems was formed in 1970, when Honeywell's 15-year-old computer division acquired the bulk of General Electric's computer operations. Model 15 was first delivered in the final quarter of 1971.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 8 |
| Capacity (words) | 16K–64K |
| Cycle Time ($\mu$sec) | 2 or 4 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 600; 780; 1,100 |
| Serial Printer | — |
| Card (cpm) | 200 |
| Paper Tape (cps) | 150; 300 |
| DATA INPUT | |
| Keyboard | — |
| Card (cpm) | 400; 600 |
| Paper Tape (cps) | 500 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | Cobol; Fortran; RPG |

# HONEYWELL INFORMATION SYSTEMS
## Series 200 Models 105 and 115



CS2-12
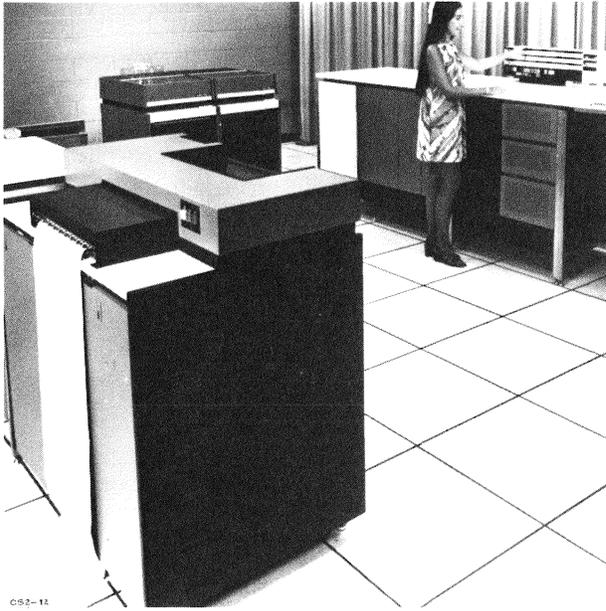
## SUMMARY

The Honeywell Model 105 and Model 115 are the smallest and second smallest computers, respectively, in Honeywell's 200 Series. All members of the series are disc file-oriented batch processors, with upward software compatibility to facilitate upgrading.

Both computers are marketed to three categories of users: novices who are converting from manual to electronic data processing, users of electronic accounting machines and punched card installations who require the increased productivity of a computer, and experienced computer users who are upgrading from smaller installations.

For those accustomed to manual or EAM procedures, Models 105 and 115 offer an interactive typewriter. The user of punched card equipment finds an assortment of card readers and punches, and the experienced SBC user finds categories of familiar equipment and procedures, with high throughput and networking capabilities.

Both Models 105 and 115 feature an interactive typewriter; an array of peripherals; the ability to read, process, and print out data simultaneously; and excellent data throughput. The basic differences between the 105 and 115 relate to speed, available peripherals, cost, and networking capabilities. Model 105 is a somewhat slower and less costly version of the very powerful and flexible Model 115. It can accommodate

fewer types of peripheral equipment, and less of them, and it hasn't the extensive networking capabilities of the 115. However, the 105 is a powerful system that is a formidable competitor for almost any SBC, especially when price is a factor. Also, it is an excellent system for beginners looking toward future growth.

A wide range of multi-industry application packages comes with each installation. These include a variety of accounting-type programs, banking applications for both commercial and savings banks, as well as applications for education and the publishing field. Application packages are also available for hospital management, real estate operation, and life and casualty insurance businesses, a complete range of programs for automatic phototypesetting, and a subscription management package.

Three compiler languages — Cobol, Fortran, and RPG — are available for in-house program development.

## CONFIGURATION GUIDE

A minimal Honeywell 105 installation consists of a central processor unit with an integral control panel and 16K characters of core memory, field expandable to 32K characters in 8K-character modules. It also includes a disc auxiliary storage system with 9.2 million characters of on-line storage; a 400 card-per-minute punched card reader; and a 120-column line printer, printing at up to 300 lines per minute. This configuration can service two input/output devices while processing; an optional feature expands its capability to three devices.

The minimal configuration can be expanded by adding disc drives of the same type or by changing to a higher-capacity type for a total of 36.8 million characters of storage. Both integral peripherals — those sharing power supplies and logic circuitry with the CPU — and self-contained peripherals can be added. Integral peripheral devices include a card punch operating at up to 400 cards per minute; a card reader/punch also operating at up to 400 cards per minute; a 600 character-per-second paper tape reader; a 120 character-per-second paper tape punch; a magnetic-ink imprinted document reader/sorter operating at 550 documents per mode; an operating console with an interactive typewriter, used to complement the system's control panel; and a single-channel communications controller. Magnetic tape drives are not integral to the CPU, but with a tape drive controller added to a peripheral attachment point, Model 105 can handle up to two magnetic tape units.

Such expansion is typically accompanied by increasing core memory with either of two more powerful CPUs.

The Honeywell Model 115 can accommodate a much wider range of peripherals, and more of them, and it has much broader networking capabilities. A minimal Model 115 installation consists of a CPU with an integral control panel and 16K characters of core memory, field expandable in 8K-character increments to a maximum of 32K characters; a disc drive with two packs of 3.6 million characters each of on-line auxiliary storage; a card reader operating at up to 400 cards per minute; and a 300 line-per-minute, 120-column line printer. Just as with Model 105, this configuration can service two I/O devices while processing; an optional feature expands its capability to three I/O devices.

This configuration can be expanded by adding up to two disc drives of the same type for a total of 21.6 million characters of on-line storage. Two categories of peripheral devices — integral and self-contained — can also be added. Integral peripherals can replace the basic configuration peripherals with faster models. These include a line printer operating at up to 1,100 lines per minute, and separate card readers and punches operating at up to 1,050 cards per minute and 400 cards per minute, respectively, or a combination reader/punch operating at 400 cards per minute. Higher-capacity disc drives can also be used, for a total of 280 million characters of disc storage.

Sixteen peripheral attachment points are also available for adding the following equipment: any of 10 models of seven- or nine-track magnetic tape units, with data transfer rates up to 149,300 characters per second; a 600 character-per-second paper tape reader; a 120 character-per-second paper tape punch; an optical-character-printed document reader and sorter; any of three models of magnetic-ink imprinted document reader/sorters, with speeds up to 1,625 documents per minute and with up to 32 sorting pockets, or a remote reader/sorter with an on-line rate of 350 documents per minute; any of a wide range of single-line or multiline communications controllers, with some of the latter capable of handling up to 63 peripheral devices through a single CPU connection point.

The devices that can be linked to the CPU through these communications controllers include a teller terminal, complete with a full-accounting keyboard and a transceiver that permits up to 10 such terminals to access the CPU on a single communications line; any of three interactive CRT display and data-entry terminals, with alphanumeric keyboards and the capability of displaying up to 2,024 characters; and any of a variety of remote data entry/output terminals, including magnetic tape models and models that read, print, and punch 80-column punched cards. Honeywell also has an off-line keyboard-to-magnetic-tape transcription device that offers a fast and economical alternative to keypunching as a means of data preparation.

Interactive typewriters can also be added to the system. These are integral to the three types of separate control consoles that can be used to augment the CPU's control panel. The typewriters are used for direct interactive access to the CPU and for more flexible control of the system than is afforded by the standard control panel. In addition, they can be used as auxiliary printers, and their continuous forms can provide a convenient record of computer operations. Such log keeping can be performed in conjunction with a variety of timekeeping devices, including an interval timer and a time-of-day clock.

Although in principle all these types of equipment can be appended to the basic CPU, any extensive system expansion would be preceded by a change to a more powerful Honeywell CPU, one with a basic 32K-character memory, expandable in 16K-character increments to a total of 64K characters. The upgraded CPU also has the capability of processing while simultaneously servicing up to four peripheral devices.

## SOFTWARE

The extensive repertoire of application software supplied with Models 105 and 115 includes a variety of industry-oriented software, in addition to the customary accounting software.

For the small manufacturer, a production scheduling and control package is provided to assist in scheduling shop orders and preparing management reports that detail job status, work-in-process evaluation, resource utilization, and plant efficiency. Other related software includes a bill-of-materials system, complete with parts breakdown and work-routing capabilities; a materials-and-components-requirements estimating system; an inventory control and analysis system; a sales order processing system; and three systems for computer-assisted development of control tapes for numerically controlled machine tools.

A sophisticated inventory control system is available for distributors. It combines item demand forecasting, based on seasonal characteristics, with an inventory-management evaluation system that uses actual item-demand history to

analyze the effects of varying stock levels and reorder points. This system can thus determine the most profitable procedures.

Retailers are served by an assortment of special software, useful to both multistore companies and those with only one store. Available software includes programs for analysis of fashion merchandising, enabling retailers to respond rapidly to fashion trends; comprehensive customer-billing programs for 30-day, revolving, and fixed-payment accounts; as well as customer credit-limit management programs, with account-balance analyses, automatic assignment of accounts for collection, and so forth.

Banking systems developed by Honeywell include a proof and transit system to sort magnetic-ink imprinted checks for distribution to as many as 700 points; a demand-deposit accounting system; systems for savings accounting, installment and mortgage loans accounting, and mortgage banking; and a system for on-line processing of remotely initiated transactions and inquiries, which can accept inputs from teller terminals, CRT display terminals, teletypewriters, and audio-response systems.

Individual hospitals and multihospital complexes can draw on a wide assortment of software including: a patient-accounting system; a cost-allocation and reporting system of a type acceptable for the Medicare program; a property ledger system, including depreciation scheduling; a personnel-files management system; an accounts payable system that includes patient refunds and blood credits; an inventory analysis and reporting system; and a variety of coordinated financial and administrative programs.

A system is available for schools which converts student course requests into a master class schedule. A student monitoring system is also available to keep track of each student's educational performance, social adjustment, and other factors from grade school through high school. Municipalities can use the real estate assessment, tax-billing, cash distribution, and special assessment systems, in addition to an urban information system for use in analyzing potential urban renewal programs. Insurance agencies can draw on a variety of programs for passenger car, truck, and homeowner rating, life insurance premium and billing calculation, commissions and dividend data calculation, and loan processing. Publishing companies can use the automated typesetting and photocomposition systems, and the circulation system. The automatic typesetting system offers automated formatting, justification

and hyphenation for hot-metal typesetting, and a complete range of programs for automatic photo-typesetting. The circulation system includes mailing and printing of labels and bills, and the preparation of ABC and BPA statistics, resubscription notices, and circulation management reports.

The extensive repertoire of application software is complemented by an operating system, which controls system operations, including job sequencing, program loading, and multiprogramming. It also creates, maintains, and manages data files, including input/output access; provides routines for program preparation, analysis, and testing, and program library maintenance; and supports the system's utility routines, which include disc-storage-file preparation, sorting, editing, and modification, and file-to-file copying and conversion.

Three programming languages — Cobol, RPG, and Fortran — are also available for users who wish to develop specialized software. For users changing from an IBM System 360/20 to Honeywell RPG programs and files, a conversion package is provided.

## DESIGN FEATURES

The chief design features of the Honeywell 105 and 115 are high throughput, an operating system which permits great programming flexibility, and networking capabilities. Model 115 also offers an extensive array of peripherals. Further features include the ability to upgrade to more powerful members of the 200 Series without changing programs, and the broad range of bundled software.

The systems' high throughput results from their three high-speed, program-assignable read/write channels. As they are called upon by the programs, these channels are wholly or partially assigned to the peripherals, in accordance with their particular data rates. Throughput — the measure of a computer's data handling capabilities — is roughly equivalent to the combined input and output data rates, a total of 500,000 characters per second for both Model 105 and Model 115. However, the 105 has a somewhat slower memory access time than the 115 and, as a result, slightly less throughput.

Models 105 and 115 both share the upward software compatibility of the 200 Series, one of the longest-lived computer series in the industry. This compatibility permits painless upgrading to more powerful members of the series when the

user's needs require it. Finally, the modular de-
sign of Models 105 and 115 simplifies system ex-
pansion and facilitates repair, while their net-
working capabilities and peripherals, particularly
those of Model 115, make practical large instal-
lations, specially tailored to individual businesses.

## PERFORMANCE

The Honeywell 105 and 115 offer such a broad
range of processing capabilities that they are
equally attractive to the novice user with his
limited requirements, and to the experienced
user seeking increased capacity through an up-
grade. The system throughput of both models is
formidable competition for IBM's System 360/20,
among many others. The exceptionally broad
range of industry-specific application programs,
coupled with the systems' several programming
languages, permits users to expand their EDP
functions gradually from standard accounting
procedures, through specialized operational
applications, to a comprehensive information
management system, fully integrated with every
aspect of the user's operations.

## MAINTENANCE

Honeywell services its computers through its
sales and service offices. There are about 135
in the United States, covering every major city,
and approximately the same number in foreign
countries. Maintenance is provided under a
service contract that includes on-call emergency
service on a round-the-clock basis. Preventive
maintenance is normally scheduled during
regular business hours, but arrangements can

be made for after-hours maintenance to prevent
disruption of company operations.

## HISTORY

Honeywell Information Systems was formed
in 1970, when Honeywell's 15-year-old computer
division acquired the bulk of General Electric's
computer operation. Honeywell's Model 115
was introduced in February 1970 and first de-
livered in June 1970. Model 105 was introduced
in July 1971 and first delivered in October 1971.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 6 |
| Capacity (words) | 16-32K |
| Cycle Time ($\mu$sec) | 3.5; 2.75 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 300; 650-1,100 |
| Serial Printer | Yes |
| Card (cpm) | 100-400 |
| Paper Tape (cps) | 120 |
| DATA INPUT | |
| Keyboard | Optional |
| Card (cpm) | 400; 600; 1,050 |
| Paper Tape (cps) | 600 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | Cobol; RPG; Fortran |

# IBM CORPORATION
## System/3

## SUMMARY

IBM's System/3 is designed to appeal to novice computer users, primarily businessmen with straightforward commercial data processing requirements. It is also geared to those whose needs include scientific, engineering, and mathematical problem solution. System/3's design emphasizes interactive data input and processing control through an operator keyboard console, with the avowed intention of facilitating use of the computer by relatively untrained people. The system also has a batch processing capability.

System/3 is available in Models 6 and 10. Model 6 is designed for small businesses that would subscribe to a time sharing or service bureau system if not diverted by an attractive alternative such as an in-house stand-alone data processing system that is versatile and inexpensive. Model 10 is more suited to general small business computer applications, for both the novice and the moderately experienced user.

A minimum-configuration Model 6 comprises a central processor, an operator keyboard console, a disc mass storage system, and a serial printer. It is field expandable to include two disc drives with eight times the capacity of the minimal system, a data recorder, a ledger-card processing capability, and a CRT display station. Model 6's software complement includes a Basic compiler for interactive problem solving and RPG for generating reports.

Compared to the Model 6, the Model 10 features a larger main memory. In addition, it can

support more disc storage capacity and, unlike the Model 6, can utilize industry compatible magnetic tape equipment. Other important Model 10 peripherals not offered by the Model 6 are high-speed card readers and line printers. Model 10's software is more powerful than Model 6's. It includes RPG, but also has the powerful business language capabilities of Cobol and the scientific problem solving facilities of Fortran.

While System/3 has been designed for stand-alone operation, it can be linked to IBM's System/360 and System/370 computers, in which case the System/3 installation is used as a remote station on a multipoint communications line. This feature makes System/3 especially useful in those cases where a small computer is to be installed to augment an on-site or remotely located computer of the 360 or 370 Series.

## CONFIGURATION GUIDE

A wide range of configurations is available for System/3 Model 6 and System/3 Model 10, starting with the central processor unit. There are three CPU versions for Model 6. A total of 12 CPU versions are available for the Model 10, six for card-oriented systems and six for disc-oriented systems.

The basic difference between the models in each category is their core memory capacity, which ranges from 8K bytes to as much as 49K bytes in some models. Each CPU provides arithmetic functions and control for its core memory, as well as a single input/output interface that can communicate with multiple I/O devices in a cycle-stealing mode.

Auxiliary storage for both Model 6 and Model 10 is available in four combinations of dual-disc-drive systems, which feature two discs on a common drive, with the topmost disc removable. This configuration facilitates program storage on the fixed disc and the storage of data on the removable disc. A further advantage is that the common drive permits the fixed disc to be used as a buffer or as a scratchpad memory for the removable disc. Dual-disc drives are available in two capacities: 9,380K bytes (up to four can be used interchangeably on Models 6 and 10) and 20,000K bytes which can be used only on the Model 10 (up to two).

System/3 can use the following input/output devices:

Operator keyboard console — standard alphanumeric keyboard, with an additional 10-key adding machine section, plus up to 16 operation-command keys.

Console printers — one is a serial printer which prints 132-character lines at 85 characters per second. Another model can print both right to left and left to right. A third console printer is a ledger card serial printer that can handle forms from 6 inches wide by 8 inches long to 14 x 11 inches. This printer will accept either manually fed cards or cards stacked up to 100 at a time for automatic feed. Typical processing rate is 3 or 4 seconds per card; but this printer cannot be used if the system configuration includes a display station.

Display station — rapid, silent TV-type display that can be used as an output device or for operator interaction with the system. It can display up to 15 lines of 64 characters each.

Card sorter — off-line, compact, tabletop sorter for sorting cards into numeric, alphabetic, and alphanumeric sequences. Low-speed and high-speed models are available, the latter operating at 1,500 cards per minute.

Binary synchronous communications adapter — single-channel communications adapter that permits System/3 Model 6 to communicate with another System/3, or with System/360 or System/370 installations that have the proper features.

Magnetic character reader — magnetically printed document reader that can be attached to System/3 via a special adapter in order to input character data to a 12K-byte disc system. Usable in on-line or off-line operations, this device can read 750 six-inch documents per minute.

Data recorder — a key-entry unit used for batch recording of data and programs on 96-column cards. With an appropriate attachment, it can also be used for on-line card input or output, reading or punching and printing 96-column cards at 22 cards per minute. The Model 10 can use this unit only as an off-line keypunch.

The Model 10 has a number of I/O devices that only it can use. These include:

Line printers — one line printer, available in three models, prints 96-position lines at rates from 100 to 300 lines per minute, a far greater output rate than the serial printers that the System/3 Model 6 uses. An even faster line printer is available in two models, with print speeds of 600 and 1,100 lines per minute.

Multifunction card units — one unit performs a full range of processing (reading, punching, interpreting, sorting, and collating). Using 96-column cards, this unit reads at 250 cards per minute and punches and prints at 60 cards per minute. A second model operates at double these rates. Another unit, similar to the two previous ones, adds such features as photoelectric reading, punch-verifying controls, error checking, and raised-character printing.

Data entry keyboard — a unit similar to the data recorder except that it provides on-line data recording and verification under processor I/O control for the Model 10.

Printer-keyboard — a combination inquiry device and auxiliary printer, this unit keys inquiries directly into core storage. When printing, it operates under program control at a speed of 15.45 characters per second.

Tape control unit (including a tape unit) — magnetic tape auxiliary storage available in three models, with respective transfer rates of 20, 40, or 80K bytes per second.

System/3 Model 10 can use any of the off-line peripherals that the Model 6 uses. It can also use the magnetic character reader and, in off-line mode, the data recorder.

## SOFTWARE

Two compiler languages are available to System/3 Model 6 users — Report Program Generator II (RPG II), a language especially designed for the creation of reports based on source data contained in peripheral storage files; and Basic, an easy-to-learn conversational language combined with powerful capabilities for numerical problem solution.

RPG II uses preprinted specification sheets that permit the programmer to specify the form of the input data, the operation to be performed on the data, and the output format, including line layout, page and paragraph headings, page numbering, and so on.

To simplify the user's programming tasks, System/3 includes system control programming (SCP) programs, a software package that is supplied with the hardware. For Model 6 these programs include disc-file manipulation, disc library maintenance, and processing system management, as well as selected utility programs. SCP programs for Model 10 include card and disc utility programs such as reproduce, sort, collate, list, record, and verify, as well as magnetic character processing programs such as sort, read, total, and data recording. A variety of the SCP programs are available at additional charge.

System/3 Model 10 does not use Basic. It handles scientific, engineering, and mathematical

problems with Fortran IV, a more powerful language than Basic and a more economical one, in terms of the number of statements needed to process a given data set. Model 10 also uses Cobol, a powerful business-application-oriented language in wide use for more than a decade.

Data files generated by Model 6 Basic can be made compatible with Model 10's RPG. This is accomplished via an optional Data Interchange program that converts data files so that they can be interchanged between Basic and RPG programs.

To assist the user of a Model 10 system in developing the precise software that he requires, IBM has instituted an Application Customizer Service, with separately priced assistance in six major commercial application areas: order writing and invoicing, accounts receivable, inventory accounting, sales analysis, payroll, and general ledger accounting.

## DESIGN FEATURES

System/3 includes such a wide range of central processor units and peripherals that it comprises a compatible family of computers, within which the user can easily upgrade as his requirements increase, with only modest changes in software. Because of its ability to operate in a communications mode, System/3 is especially attractive to those larger users who wish to link several small divisions or branch offices with a centrally located, primary data processing facility of the System/360 or System/370 variety, while at the same time providing these remote sites with a flexible computer facility of their own.

Further, System/3's design incorporates a number of features such as a familiar keyboard and front-panel operation control switches that contribute to its interactive use by relatively untrained personnel. A flexible, if modest, configuration has a desk-like size and appearance particularly desired by small companies with limited office space, just getting started in data processing.

## PERFORMANCE

System/3 is well suited to the typical scope of business data processing needs. In fact, the technical specifications of Model 10 equal or surpass those of the more costly IBM 360/20 and IBM 1401-G in all categories except card punching rate. The latter two punch cards at roughly three times and two times the rate, respectively,

of the Model 10. System/3 also lacks the punched paper tape capability of the 1401-G, but it can exceed the magnetic tape auxiliary storage and data transfer capability of the 360/20. Much the same comparison can be made between the System/3 Model 6 and the 360/20, 1401-G, and 1401-H, except that the Model 6 has substantially lower data input and output rates and has no magnetic tape capability.

Since RPG II can be used to process data files and generate detailed summaries of the results, it is ideal for ready-to-read analysis of a broad variety of data. System/3 Model 6 has been used for analysis of bonds, securities portfolios, leases, potential acquisitions and mergers, sales, cash flow, and the performance of advertising media. It is also well adapted for cost estimation, job scheduling, project control, and pricing analysis.

The Model 6's use of the Basic compiler language offers the user a capability for engineering and scientific calculation, in addition to such simple computations as interest and amortization schedules. Basic, like RPG II, permits the programming of output format to provide well-organized reports. It can also be used by anyone from the mere novice to the experienced programmer. In the latter's hands, Basic programs incorporating up to 990 statements can be processed on System/3.

## MAINTENANCE

Maintenance for System/3 is available through the more than 50 Basic Systems Centers that IBM operates across the country. IBM offers comprehensive customer training courses and system engineering services to accommodate the needs of the IBM System/3 users. These services are separately priced. The education courses provide a sound knowledge of basic System/3 concepts, application design, disc system design, and programming fundamentals. System engineers are ready to do the job in its entirety for the user who does not wish to acquire a programming staff or who does not wish to assign System/3 programming tasks to his current programming group.

## HISTORY

System/3 is IBM's attempt to penetrate the attractive and relatively untapped computer market represented by smaller businesses with limited or no computer experience. Since its inception, IBM has continually expanded System/3's capabilities by adding new peripherals as well as models to the product line.

PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 8 |
| Capacity (words) | 8K–32K |
| Cycle Time ($\mu$sec) | 1.52 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 100; 200; 300 |
| Serial Printer | Yes |
| Card (cpm) | 22; 60; 120 |
| Paper Tape (cps) | -- |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 22; 250; 500 |
| Paper Tape (cps) | -- |
| SOFTWARE | |
| Assembler | Model 10 only |
| Operating System | No |
| Compiler | Mod 6--Basic, RPG; Mod 10--Cobol, RPG, Fortran |
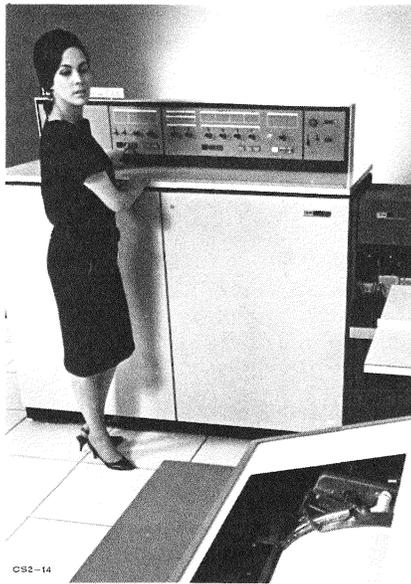
CS2-14

## SUMMARY

IBM's 360/20 was originally introduced as a relatively low-cost batch processing upgrade for punched card equipment users converting to EDP. Since then it has experienced a number of reorientations in the form of lower-priced and more flexible submodels. The original 360/20 Series include Submodels 1, 2, 3, 4, and 5, with Submodel 2 the performance leader. However, in May 1971 Submodel 2 was replaced by Submodel 6. The latter is the latest step in the gradual conversion of the 360/20 Series to computer systems aimed at the small business market.

Of the six versions, only Submodels 5 and 6 are being actively marketed since IBM's System/3 is the firm's main small business computer offering. However, the 360/20 offers to the tab user a number of familiar categories of card handling equipment.

The 360/20 is not upward-compatible with the more high-powered members of the 360 family. However, it is to some degree software-compatible with the 360/25.

IBM offers 360/20 users a variety of application packages, including those for the standard accounting functions. It also provides specialized applications such as: hospital patient and accounts receivable billing; bill of material processing; telephone company accounting, including toll call pricing and billing; inventory management and forecasting; and sterling currency routines.

## CONFIGURATION GUIDE

Submodel 5 comes with a minimum of 8K bytes of core memory, expandable to 32K bytes. Submodel 6 also has a minimum of 8K bytes of core memory. However, it can be expanded to only 16K bytes in 4K-byte increments.

Auxiliary on-line storage is available in the form of disc or magnetic tape. The magnetic tape units can have up to six drives. Within the nine available units, data transfer rates range from 15,000 to 60,000 characters per second. Submodel 6 can use units with up to 30,000 characters per second, while Submodel 5 can accommodate units with 60,000 characters per second.

Submodel 5 can accommodate the greater amount of disc storage — up to four disc drives of two types for an on-line total of 21.6 million bytes of storage. Submodel 6 can accommodate two disc drives of two types for a total storage of 10.8 million bytes.

Submodel 5 is the most powerful processor, and along with Submodel 6, can accommodate a broad range of fast peripherals. These peripheral devices include:

- A multifunction card unit with two 1,200-card hoppers and the capability to read 500 cards per minute, punch 91 cards per minute, and print 140 characters per second.

- A reader/punch that can read and punch 500 cards per minute.

- Either of two models of card readers operating at up to 1,000 cards per minute.

- Any of three models of card punches operating at up to 500 cards per minute.

- Any of four models of line printers printing up to 1,000 132-column lines per minute (with a 144-column option in a slower model).

- A magnetic-ink imprinted document reader/sorter that can sort 600 documents per minute into 11 pockets.

- A Selectric typewriter that can print 15.5 characters per second.

Both submodels are limited to configurations with a maximum of three card readers, two card punches, and one card printer; no more than one line printer, magnetic character reader, type-

writer, and communications adapter; and no more than six magnetic tape drives.

## SOFTWARE

Software for System 360/20 includes separate packages for card-, tape-, and disc-oriented configurations.

Card-oriented software includes a basic assembler language, a report program generator (RPG) language, an input/output control system (IOCS), and a set of utility routines. The utility routines include four programs that use the multifunction card unit to simulate many of the functions of punched card tabulating systems.

For tape-oriented configurations, IBM offers an expanded assembler language, RPG, IOCS, utility routines, and a separate sort/merge program. To fully utilize the software's capabilities, a tape unit with at least four tape drives should be used along with punched card equipment and a line printer, in addition to a minimum of 8K bytes core memory.

A comparable software package is offered to users of disc-oriented system. However, a single six-disc drive of core, punched card equipment, a line printer, and at least 12K bytes are needed to take full advantage of the available software.

Although IBM offers an assembler language, it emphasizes the quite powerful and flexible RPG as the programming language of choice. Application software offered by IBM includes standard accounting-type packages and specialized software for hospitals, distributors/wholesalers, small telephone companies, and small manufacturers, in addition to a special set of currency processing routines.

## DESIGN FEATURES

The design features of the 360/20 include functional simultaneity that permits card reading, punching, and printing, as well as typewriter printing to take place at the same time as processing. An extension of this capability permits reading or writing on one tape and one disc in addition to performing input/output operations while simultaneously processing.

A feature on Submodel 5 permits a suitably configured version to run IBM 1401 or 1440 software. Also featured is software-compatibility with a suitably equipped 360/25, so that some relatively easy upgrading is possible within the 360 Series. The 360/20 also has the ability to function as a remote terminal processor, com-

municating with more powerful models of the 360 Series over telephone lines via a communications adapter.

## PERFORMANCE

A wide range of performance is available with the 360/20, depending on the specific configuration used. Submodel 5 has the highest system throughput. The processing power of Submodel 5 is approximately equal to that of Honeywell's Model 105, somewhat below that of Honeywell's 115, and substantially below that of IBM's System/3.

## MAINTENANCE

Maintenance for the 360/20 is available through IBM's worldwide network of field engineering offices. The standard service contract provides for on-call service during any desired eight-hour period from 7 a.m. to 6 p.m. Round-the-clock emergency service is available at higher rates. Regularly scheduled preventive inspections are based on 176 hours of computer use a month, the equivalent of 22 eight-hour days.

## HISTORY

IBM is the world's largest manufacturer of computer systems. The 360/20, first introduced in 1964 and most recently offered in a new version, Submodel 6, is one of several computers manufactured by IBM for the small business market.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 8 |
| Capacity (words) | 8–32K |
| Cycle Time ($\mu$sec) | 2.0; 3.6 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 350; 600; 1,100 |
| Serial Printer | Yes |
| Card (cpm) | 91–360; 500 |
| Paper Tape (cps) | — |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 500; 600; 1,000 |
| Paper Tape (cps) | — |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | No |
| Compiler | RPG |

# LITTON
## ABS 1200 Series

---
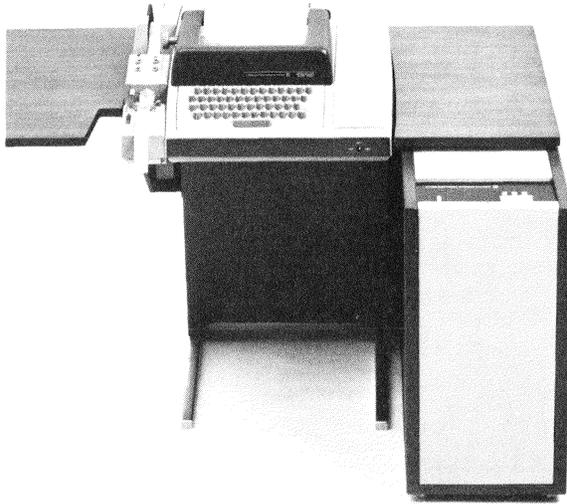


CS2-15

## SUMMARY

Litton Automated Business Systems markets its ABS 1200 Series to small businesses that need the benefits of automated paperwork procedures and a data analysis tool for management control. Members of the ABS 1200 Series operate in the interactive mode. Litton's 1200 Series appeals to users of electronic accounting machines who require an automated system with stored program control.

The ABS 1200 Series comprises five configurations of a basic processor with paper tape and character-printer input/output devices. Somewhat unique among small business computers, the ABS 1200 Series uses magnetic drum storage for its working storage. This type of storage has a longer access time than core or semiconductor memories. However, it's quite suitable for the interactive applications performed with Litton's system.

Litton markets its systems on a turnkey basis with all programming, training, and installation guidance provided by its staff. The firm offers over 40 applications covering a wide range of business requirements. Customized modifications are also available.

## CONFIGURATION GUIDE

The ABS 1200 Series includes the following five models: 1210, 1220/1221, 1231, 1241, and 1252. All models are distinguished by the capacity of their drum memory, the number of input/output channels, and the speeds of their peripheral devices.

A basic ABS system comprises a central processor (storing up to 4,096 40-bit words), a keyboard for entering data manually into the central processor, a character printer, a reader for paper tape or edge-punched cards, and a punch for paper tape or edge-punched cards.

Printers offer speeds of 10 or 35 characters per second and automatically control forms handling. The paper tape reader reads punched paper tape or edge-punched cards containing operating programs or data at 30 characters per second. Paper tape is punched at 30 characters per second.

On its ABS 1241 and 1252 systems, Litton offers magnetic drums for auxiliary file storage. Each drum has a capacity of 16K words (40 bits). Also available on the 1241 and 1252 is 50 character-per-second reader/punch capability.

## SOFTWARE

Litton's 1200 Series is usually offered on a turnkey basis. However, it includes an operating system designed to direct the operator through its interactive procedures. Under an operator's direction, the operating system also controls the error protection and correction procedure. Software for modifying and duplicating programs and records as well as for input/output handling is included in the 1200 Series' repertoire of utility routines.

ABS application programs are written in Litton's assembly language which is a mnemonic interpretive language. The firm offers a wide range of application software covering billing and analysis, financial statements, production orders work loading/scheduling, accounts receivable/payable, invoicing, account aging, sales distribution analysis, inventory, payroll writing, labor analysis, job costing, standard costs, internal expense analysis, general ledger distribution, financial statement preparation, and revenue analysis.

## DESIGN FEATURES

Litton designed its 1200 Series to operate in a normal office environment; it requires no special flooring. Each model is housed in compact desk-high modules. All modules house a processor, keyboard, printer, and tape reader and punch. The drum memory used for auxiliary storage with Models 1241 and 1252 can be located either at the side or in front of the processor.

An application program, which is entered into magnetic drum memory from paper tape, controls the system. Thus, accounting documents

are prepared automatically with manual operator actions normally required only to handle such input media as edge-punched cards containing customer and product data, to enter keyboard data such as item quantity, and to initiate and terminate program execution. All operator-directed procedures are performed via an interactive keyboard.

## PERFORMANCE

When compared to other small business computers, Litton's 1200 Series doesn't offer the same processing power or upward growth capabilities as achieved with, for example, the IBM, NCR, or Univac systems. However, ABS 1200 is not designed to compete at that level. Instead, the 1200 Series offers an attractive low-cost alternative to small businesses whose current EAM equipment can't handle their firms' increased data handling requirements.

With the 1200 Series' stored program capabilities, new application demands can be satisfied without any major hardware changes. This flexibility is not encountered in standard electronic accounting machines.

## MAINTENANCE

Litton provides maintenance for its 1200 Series equipment via its international staff of field service engineers. The system support staff is located in over 60 cities across the United States and in major cities in Europe. Each service center is staffed and equipped to service and maintain systems in its jurisdiction.

Preventive maintenance is performed on a 90-day schedule. All parts and labor are included in maintenance plans. Software maintenance for turnkey systems is furnished as required.

## HISTORY

Litton Automated Business Systems is a division of Litton Industries. The firm manufactures a diversified line of electronic office equipment. Its small business computer experience comes from specializing in the sale of electronic accounting equipment.

Litton ABS maintains an international marketing force. It markets turnkey systems to end users, including hardware, system and application software, and installation training. Customized programming and a wide variety of pre-packaged software are also available.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 40 |
| Capacity (words) | 2K-4K |
| Cycle Time ($\mu$sec) | 0.5 |
| Working Storage | Drum |
| AUX STORAGE | Drum (Models 1241 & 1252 only) |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | — |
| Serial Printer | Yes |
| Card (cpm) | — |
| Paper Tape (cps) | 30; 50 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | — |
| Paper Tape (cps) | 30; 50 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | No |

# NATIONAL CASH REGISTER
## NCR Century 50 and Century 100



CS2-16
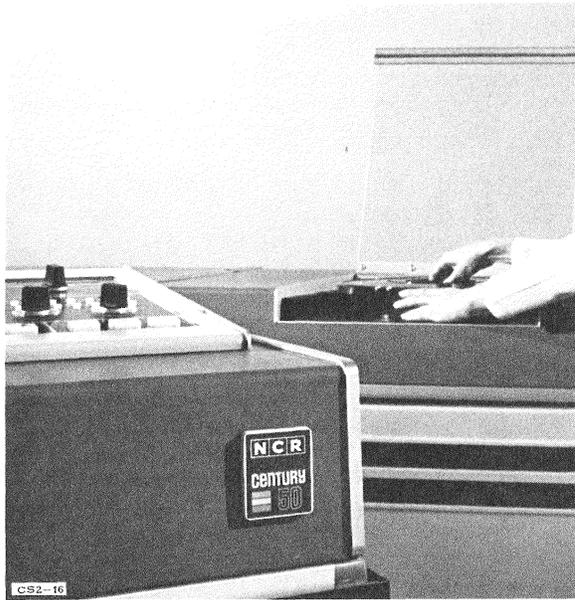
## SUMMARY

National Cash Register's Century Series is a family of general-purpose computers designed for first-time computer users as well as for those users who currently have an installed small computer system. It's particularly suited for upgrading from punched card or electronic accounting machine data processing to the more powerful and flexible facilities available with small business computers.

One major advantage is direct, upward software interchangeability between members of the series. By extending this feature down to the Century 50, NCR eases the transition of Century 50 users who want to upgrade to a Century 100 or even more powerful models of the series.

Other manufacturers of major computer systems do not yet offer software compatibility down to their small business computers. For example, upgrading from an IBM small business computer, the System/3 Model 10, requires switching to the System/360 which does not have compatible software. This results in disruptions and inconvenience for the user.

NCR also offers a translator, which eases transition of IBM System/360 users to the Century Series. The translator, available on both Century 50 and 100, converts IBM 360/20's only compiler language into NCR's NEAT/3. Thus, no reprogramming is necessary when a 360 user switches to a Century 50 or 100.

NEAT/3, a multipurpose compiler language, includes the capabilities of a standard report program generator language. The Century Series also supports Fortran and Cobol compilers — powerful software for scientific and small business applications, respectively.

The Century 50 and Century 100 are both designed for batch data processing. Three-fourths of the installations have been in batch-oriented operations, namely, in service bureaus and as replacements for punched card systems.

Application packages in more than 24 major categories are available for these computers, including software for applications in manufacturing, distribution, and retailing. Also offered by the Century Series are standard accounting applications, packages for hospital patient-account management, packages for life insurance companies, such law enforcement packages as central information file and traffic-violation fine collection, and utilities billing packages, among others. Despite this library of software, NCR's marketing emphasis is not on turnkey systems, delivered complete with the desired software, but on systems whose software is developed by the users' own EDP staffs. NCR provides a variety of support-service packages to assist these staffs during the system startup phase.

## CONFIGURATION GUIDE

The primary difference between the Century 50 and 100 is that the 50 is basically a 100 with a more restricted input/output capability and a lower performance disc. With full upgrade, however, the Century 50 is virtually a 100.

A minimal Century 50 configuration comprises a central processor unit (CPU) with a 16K-byte thin-film rod memory, an 8,400K-byte magnetic disc auxiliary storage unit, a 300 card-per-minute punched card reader, and a 200 line-per-minute, 132-column line printer.

This configuration can be upgraded by any or all of the following steps: doubling main memory to 32K bytes; replacing the card reader with a 1,000 character-per-second punched paper tape reader; replacing the 200 line-per-minute printer with either a 300 line-per-minute or a 450 line-per-minute model (rates are for alphanumeric data — purely numeric data is printed at 600 lines per minute and 900 lines per minute, respectively); replacing the original disc drive, which has an access time of 153 milliseconds, with a model whose access time is only 65 milliseconds.

Further system flexibility is possible through the addition of an input/output typewriter console, a second disc drive, and a line printer

feature that permits the selection of line spacing at either six or eight lines per inch.

All of the preceding peripheral devices are integral to the computer, that is, they derive some of their operating voltages and logic functions from circuitry that resides within the basic computer. Further upgrading of the Century 50 requires the addition of a common trunk feature, which provides eight positions for attaching I/O devices. It also permits the CPU to service various combinations of the following peripherals: a 1,500 character-per-second paper tape reader; a 200 character-per-second paper tape punch; a controller for a slow-speed magnetic tape encoder; a card reader/punch which reads 560 cards per minute and punches 60 to 180 cards per minute; a 750 card-per-minute card reader; 60 to 180 card-per-minute card punch; and a 600 check-per-minute magnetic ink character recognition (MICR) sorter that can sort into 11 pockets.

The final step upgrading a Century 50 is to add a synchronous or asynchronous communications controller or one that combines the two types. This addition permits communication between the Century 50 and either sister computers or those of other manufacturers. The 15 lines of an asynchronous controller can also be used to link the CPU with teletypewriters, thermal printers, or CRT displays. NCR's thermal printer is a single-copy, 30 character-per-second, typewriter-like device that is used for remote inquiry and for interactive communication with the CPU. The CRT display includes a keyboard and performs the same functions as the thermal printer. CRT controllers are available with display capacities up to 1,000 characters.

Although closely related to the Century 50, the Century 100 adds a magnetic tape auxiliary storage capability, available in either seven-channel or nine-channel models of tape drives, the latter at data transfer rates of up to 240K bytes per second. The Century 100 provides the user with more types of peripheral equipment that have faster speeds. For example, the Century 100 includes a 450 line-per-minute printer and a 240 card-per-minute on-line card punch as standard equipment, and it can handle a 1,500 line-per-minute printer, optionally available in a 160-column model.

Other advances include a faster, more flexible MICR sorter that sorts 1,200 checks per minute into 18 pockets; an optical character recognition (OCR) capability, which lets the unit read the OCR-character-printed journal tapes that NCR cash registers commonly generate; and two common trunks, with a total of 16 positions. In addition to the 15-line communications controller, the Century 100 can add a 256-line communications multiplexer for use in networks that employ NCR's teller terminals and billing terminals of the CRT and Teletype variety.

A Century 100 can also control up to eight of NCR's CRAM random access data storage units. These devices use punched edge-coded, magnetic-oxide-coated mylar cards and provide a formidable data storage capability of up to 145 million bytes. Eight of these units can provide the system with a data bank of well over 1 billion bytes or the equivalent of more than 300,000 pages of printed data. Average access time of CRAM is only 125 milliseconds.

SOFTWARE

Although approximately 100 application packages are available to users of the Century 50 and Century 100, NCR does not emphasize turnkey installations. It prefers to assist the user's own EDP staff in developing the necessary software, typically modified versions of NCR's standard programs. However, many users take advantage of NCR's bundled software because it can be used without modification about 80% of the time.

The three compiler languages formerly available for programming the Century 50 — Cobol, Fortran II, and NEAT/3 — have been augmented by a fourth, Basic. The latter is a simple yet quite powerful general-purpose language that is easy to learn and permits even novice users to start programming quickly. Cobol and Fortran II are standard languages used for business and scientific applications, respectively, and are widely familiar to programmers. NEAT/3 is NCR's own multipurpose compiler language with report program generator capabilities, among many others.

Additionally, the Century Series supports many utility routines and an operating system for simplifying the programmer's job. Utility routines include a variety of sorting operations. Also available are routines for the following functions: copying data from one type of file to another, comparing data files, generating program test data, program checking, debugging, file-to-file conversion, and printout in the form of cross-referenced flowcharts.

The operating system handles all I/O functions, including those involved in simultaneous operation of multiple peripherals. It also performs program loading and program-to-program linkup. The system's dating facility permits date-referenced programs, such as end-of-week or end-of-month reports, to be run. With this

facility the operating system manages a dating scheme with a duration of up to 3 years, maintains a daily log on system operations including systems status, abnormal conditions, and others, and provides for long-term log maintenance.

## DESIGN FEATURES

The Century Series uses a far greater number of index registers that are customarily found in such relatively low-cost systems. Because the large number of registers greatly simplifies the software-command structure, the series affords the user exceptional processing flexibility. All members of the Century Series also have what amounts to three-way simultaneity — reading, processing, and printing.

NCR offers a moving-head disc storage system with an unusually large number of read/write heads per recording surface. Each of six recording surfaces can be accessed by a moving arm with 12 read/write heads. As a result, up to 256K bytes of data can be stored and recovered without the delay of repositioning the access arm. Thus, the user who wants to process sequential data of less than a few thousand items, such as product lists or customer lists, can do so efficiently on the Century 50. The organization of the disc files is also unique in that sequential blocks of data are not stored contiguously but are diagonally opposite each other on the disc. This arrangement allows enough time for data in the first sector to be processed and then, half a revolution later, written into the second sector, and so on.

For the user who requires a huge data bank capacity, the Century 100 offers CRAM, a mass storage capability unique among small business computers.

All members of the Century Series make extensive use of integrated circuits. Large numbers of a single basic circuit are variously interconnected and used for all data processing functions. Standardization also extends to the plug-in printed circuit boards which comprise the bulk of the system's circuitry. The Century 100, for example, uses only 81 circuit boards, and 80% of them are of six standard types. This design commonality not only simplifies maintenance but also makes it easy to learn the system.

## PERFORMANCE

The Century 50 is well suited to users of punched card or electronic accounting machine data processing who are upgrading to a more powerful, more flexible system. It is marketed as a competitor to the disc-oriented version of IBM's System/3 Model 10. The NCR machines fare well in a feature-by-feature comparison except in the area of main memory. Century 50 and Century 100 have 32K-byte maximum capacities, compared to 49K bytes for the System/3 Model 10.

Although NCR markets the Century 50 as a direct competitor to System/3 Model 10, there is a basic difference in the orientation of the two series. System/3 is intended for users who are novices in electronic data processing. Thus, while it has a batch processing capability, its design emphasis is on interactive processing through a typewriter keyboard. The Century Series, however, is designed as an upgrade from punched card or electronic accounting machine installations and is strictly intended for batch processing. Its typewriter is an optional feature that serves primarily for communication with the CPU.

NCR emphasizes the programming capabilities of the user's own EDP staff, and has developed training methods designed to build staff skills quickly. This approach results in high installation productivity because the user's staff has shared in software development.

## MAINTENANCE

Maintenance for the Century Series is available through the almost 300 NCR service offices in the United States and Canada and the approximately 900 overseas offices. This series is easy to service because its high degree of circuit standardization makes possible the correction of virtually all malfunctions with a handful of plug-in replacement circuit boards. Therefore, system downtime is kept to a minimum. The standard service contract offers maintenance during any selected 8-hour period between 8 a.m. and midnight, and special arrangements can be made for 24-hour service at higher rates.

## HISTORY

NCR, founded in 1882, is one of the two largest manufacturers of electronic accounting machines and one of the six largest computer manufacturers. The firm manufactures a full line of data processing equipment and offers related products and services. Century 100 was introduced in 1968, and the Century 50 early in 1971.

PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 8 |
| Capacity (words) | 16K–32K |
| Cycle Time ($\mu$sec) | 0.8 |
| Working Storage | Rod (thin film) |
| AUX STORAGE | Disc; magnetic tape; magnetic cards (CRAM) |
| DATA OUTPUT | |
| Line Printer (lpm) | 200; 300; 450 |
| Serial Printer | Yes |
| Card (cpm) | 60–180 |
| Paper Tape (cps) | 200 |
| DATA INPUT | |
| Keyboard | Optional |
| Card (cpm) | 300; 560; 750 |
| Paper Tape (cps) | 1,000; 1,500 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | Basic; Cobol; Fortran; NEAT/3 |

# NATIONAL CASH REGISTER
## NCR 500



CS2-17

## SUMMARY

The National Cash Register 500 computer is primarily intended for computer novices who want to automate their small-business accounting procedures. The NCR 500 typically is run by operator-programmers who can and do modify NCR's standard software in addition to developing their own.

This system differs from most computers intended for the small business market usually emphasizing turnkey operation with no previous experience. No compiler language is available, and programs must be written in either machine language or a symbolic assembler language (SLIP). However, because the 500 can initiate multiple program instructions with only a single command, programming complexity is reduced. NCR contends that within several weeks a typical programmer can perform effectively. The firm provides, without charge, a 40-hour tape-recorded programmer training course and a package of programming-support, debugging, and training services.

The NCR 500 can handle both interactive and batch processing. Most installations include an interactive, magnetic stripe card handling capability, preferred by users accustomed to manual billing and accounting procedures. In interactive mode, using the standard, moving-carriage printer, the system can write 120 payroll checks an hour, a sufficient rate for a small company. However, in batch mode, using a 300 line-per-minute printer, approximately 2,000 checks can be written in an hour.

In addition to its use in standard accounting-type applications, the system has been used in financial, credit, retailing, real estate, and tax areas.

## CONFIGURATION GUIDE

An NCR 500 consists of a central processor unit with up to 400 words (48 bits per word) of core memory, along with one of three consoles, the desired assortment of peripheral devices, as well as the buffers, controllers, and adapters these require in order to interface with the CPU.

The three console choices are:

C-521-1 — features a numeric keyboard, a numeric journal tape printer, and a set of seven operation control keys. Although instructions or numeric data can be entered into the CPU through the keyboard, it is mainly used to debug programs and to operate the system.

C-590-1 — has an alphanumeric keyboard used for interactive processing, operational control, and data entry to the CPU. It has a 26-inch, split-platen moving carriage printer; a dual, pin-feed forms-handling capability; and the ability to process magnetic stripe ledger cards.

C-590-2 — resembles the C-590-1 but can process only standard ledger cards.

In addition to the consoles, the following peripherals can operate as input devices to the CPU: up to two paper tape readers; an optical character recognition (OCR) reader replacing one of the paper tape readers; up to two punched card readers; and a magnetic stripe ledger card reader.

Either the C-590-1 or C-590-2 console can be used by the CPU for data output. In addition, the CPU can drive a paper tape punch, a serial card punch, and up to two different line printers. The latter three devices have buffers for maximizing system throughput. NCR also offers a number of devices for off-line preparation of punched paper tape and punched cards.

## SOFTWARE

More than 100 programs are available from NCR, including a comprehensive set of accounting-type programs. Summary-report programs prepare IRS forms; and there are special packages for chains of department stores that include programs for the preparation of customer statements, for store-by-store sales analysis, and for sales-category analysis. Other packages include: gas and electric billing with hand-coded

meter-reading cards; water and sewer assessment, billing, and account supervision; retail-route planning, analysis, and management, and so on. Several utility programs, such as file-to-file conversion, are also available.

## DESIGN FEATURES

The 500's design is enhanced by a powerful instruction repertoire that provides multiple instruction execution with a single command. Storage space is efficiently utilized by allowing only active programs to be core resident.

Machine language instructions are 12 digits long, and typically contain four addresses in addition to the processing instruction. With such an addressing scheme, a single command can accomplish the same processing as four individual instructions performed by a single address processor. For example, a single instruction can access two memory locations, add their contents, enter the result into a third memory location, and direct the processor to access a fourth location for its next instruction. The same capability is available with the symbolic assembler program. Each instruction is a string of simple descriptive words, including the names of up to four addresses and processing instructions.

The programmable operation-control keys provide a highly flexible means of system control. They can be used to initiate processing, to interrupt a program, to insert subroutines, and for other functions. The OCR capability is a useful adjunct to the optical character printing capability of NCR cash registers, since it permits batch processing of the data contained in their optical-character-printed journal tapes.

## PERFORMANCE

Although the 500 is strongly oriented toward processing data on an interactive, per-transaction basis, the system has a good batch processing capability, and even offers a high-speed, magnetic stripe ledger card reader for those users who want the best of both worlds. The fact that it can accept inputs from an OCR reader, coupled with the general use of OCR printing in NCR cash registers, permits the

system to generate daily summary reports for large retail establishments.

## MAINTENANCE

NCR provides maintenance for the 500 system under a warranty for the first year and by contract subsequently. The standard contract offers service during any desired 8-hour period between 8 a.m. and midnight, and special arrangements can be made for round-the-clock service at higher rates. Maintenance is available through the almost 300 service offices in the United States and Canada and through many sales and service centers overseas.

## HISTORY

NCR, founded in 1882, is one of the two largest manufacturers of electronic accounting machines and is also one of the six largest computer manufacturers. Since 1965, when the NCR 500 was first marketed, approximately 4,000 units have been installed around the world. NCR also markets two more powerful small business computers, the Century 50 and the Century 100.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 48 |
| Capacity (words) | 200-400 |
| Cycle Time ($\mu$sec) | 1,080 |
| Working Storage | Core |
| AUX STORAGE | Magnetic stripe ledger |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 125; 300 |
| Serial Printer | Yes |
| Card (cpm) | 100 |
| Paper Tape (cps) | 30; 120 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 100 |
| Paper Tape (cps) | 50; 650 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | No |
| Compiler | No |

# PHILIPS BUSINESS SYSTEMS
## Philips 350 Series



## SUMMARY

Philips markets its 350 Series to medium-sized firms as main accounting systems. With large firms, Philips 350 is geared for departmental and batch operations. These operations are configured with output devices suitable for transmitting data to larger systems.

The Philips 350 Series basically comprises five small, desk-sized, console-type computers, that are punched-card-deck programmable for specified accounting applications. Design emphasis is on multiple forms handling and effective use by novice computer users in the business community, after minimal training.

In stand-alone operation, each console provides a keyboard and serial printer for interactive processing that is similar to that of an electronic accounting machine although more flexible and more powerful. However, by the addition of up to 16 peripheral devices, as many as four of which can operate simultaneously, an inexpensive batch processing system can be created.

Philips 350 Series supports only assembler language programming. However, the typical user buys or leases a P-350 Series installation on a turnkey basis, complete with the application packages he requires. These packages include the specialized programming required by the particular forms to be used. Philips markets the 350 Series indirectly to the end user via third-party leasing firms.

## CONFIGURATION GUIDE

With the exception of the P-351, which is limited to a 400-word core memory, all other consoles (P-352, P-353, P-358, P-359) are available in models with core memories modularly expandable to a maximum of 1,200 words. The major differences between consoles, other than memory size, concern the number and types of forms that can be simultaneously printed, as well as whether more than one form can be pin-advanceable, continuous stationery.

Each console includes a central processor to provide arithmetic functions and control of the core memory and input/output devices. Only the keyboard can input to the P-351, but the P-351 offers punched card and paper tape output capabilities as does the rest of the series. All of the other consoles can accept punched card and paper tape data input; and the P-353, P-358, and P-359 can also read and process magnetically striped ledger cards. Consoles other than the narrow-carriage P-351 can process two forms simultaneously. Although every console has a pin-feed arrangement for handling sprocketed, continuous forms, only the P-358 and P-359 can simultaneously handle two such forms.

The P-351 has a single I/O channel which can handle either a card puncher or a tape puncher. All other consoles have four I/O channels, and can handle up to 16 I/O devices, four of which can be in simultaneous use.

I/O devices include: a card punch that can punch 50 columns of an 80-column card each second; a card reader that can read 280 80-column cards per minute; and a paper tape puncher that can punch 50 characters per second. Early in 1972, Philips plans to add auxiliary disc storage capability and line printer output.

## SOFTWARE

Philips 350 Series currently supports only assembly language programming. For the non-programmer, Philips furnishes separately priced, customized application programs written in assembly language, which can be used for a variety of accounting applications. Philips is developing a Cobol-type compiler language that it plans to make available sometime in 1972.

## DESIGN FEATURES

The 350 Series emphasizes modular, plug-in design and device compatibility to facilitate system expansion. All components are compatible,

allowing users to upgrade without rewriting programs or disrupting routines. Both memory and peripherals can be easily added on as user needs increase.

Operator control of the processing system is simplified by a Communications Center, a console display panel that displays the equipment's status. The Center is directly tied to the operating program and is designed for the novice user by providing step-by-step operator instruction.

Among the 350's distinctive features are its ability to handle up to two diverse forms simultaneously and the ability to print forms from bottom to top as well as the ordinary top to bottom. This permits flexible formatting of reports. For example, a total that has been computed after a series of preliminary calculations can be printed at the top of the appropriate column, followed by the subtotals, rather than at the bottom of the column where its significance may be obscured and its impact diminished. This feature also permits sequential, multiple column typing, e.g., "Sold To" and "Shipped To" printout on the same line for invoicing applications.

Multiple, automatic, semiautomatic, and manual forms handling are features of the series, whose design provides automatic alignment for printing of both standard and magnetically striped ledger cards.

## PERFORMANCE

The P-350 Series is primarily suited to the accounting-function requirements of small businesses that need more than a simple electronic accounting machine but can afford neither the lease price nor the supporting labor costs of the typical small business computer installation.

A minimal P-350 installation offers ample capacity for the transaction volume, payroll processing requirements, and so on of such small businesses, while an installation augmented by the available peripherals offers a respectable batch processing capability for a much larger volume of operations. Batch mode operation, however, is hampered to some extent by the lack of a line printer.

## MAINTENANCE

Preventive and emergency maintenance is performed by Philips' own service personnel, available on-call during normal business hours, operating out of 25 branch locations and fully stocked personnel residence posts across the country. Maintenance includes parts, service, and labor.

Initially, maintenance falls under a 1-year warranty. A separate service contract covers subsequent maintenance. The firm quotes a 2-hour time lapse for responding to emergency service calls. Major spare parts depots are in all cities housing Philips sales and service centers.

## HISTORY

Philips both manufactures and markets the P-350 Series. The company is a wholly owned subsidiary of a large, highly diversified electronics manufacturer, the North American Philips Corporation (established in 1959). To broaden its base of activities in the fields of data processing and communications, North American's former Business Products Division was changed to Philips in 1969. The P-350 Series, announced in the latter part of 1969, is Philips' first entry into the computer market.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 16 |
| Capacity (words) | 400-1,200 |
| Cycle Time ($\mu$sec) | 3.2 |
| Working Storage | Core |
| AUX STORAGE | Magnetic stripe ledger card |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | — |
| Serial Printer | Yes |
| Card (cpm) | 37.5 |
| Paper Tape (cps) | 50 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 280 |
| Paper Tape (cps) | 50 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | No |
| Compiler | No |

CS2-19
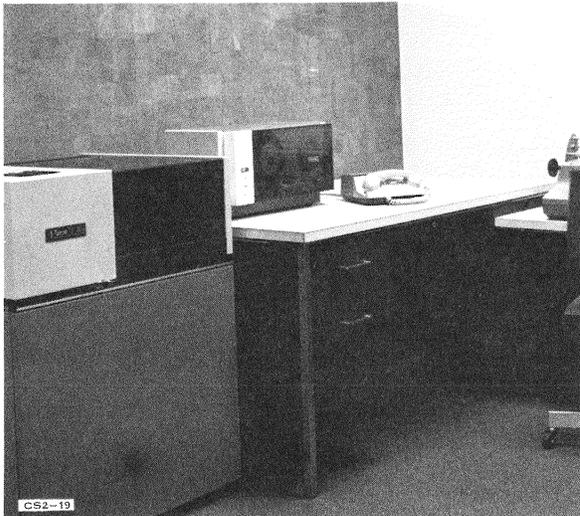
## SUMMARY

Qantel Q Series small computer systems emphasize networking and communications capabilities. They perform both interactive and batch data processing for a wide variety of business applications. These systems can support a network of input/output devices and can be used as preprocessors for larger computers.

The firm markets these computers either on a turnkey basis complete with the desired application packages — a useful facility for novice operators — or with only the system's assembler languages and utility programs, in the event the user wishes to develop his own software. Qantel also offers a programmer training course.

Qantel features such standard accounting application programs as payroll and order-entry invoicing. In addition, it has developed a number of financially oriented programs for such areas as Federal funds transfer and securities portfolio management. These special programs have spurred acceptance of the system by some of the nation's major banks.

## CONFIGURATION GUIDE

Qantel's Q Series processors vary only in memory size. Each CPU is housed in a standard-size secretarial desk, where the system is operated through an interactive keyboard. The CPUs have a basic 4K-byte integrated circuit (IC) memory, expandable to 32K bytes by module replacement and plug-in additions.

There are 12 I/O ports, nine of which access the central processor on an interrupt basis, an important feature in creating a data processing network. They all use the same peripherals.

The basic system comprises the desk unit with system power supply, the CPU, and the top mounted interactive typewriter. The typewriter uses a standard keyboard and a pin-feed forms handler or, optionally, a pressure-fed forms handler.

Peripherals that can be used with the systems include:

Disc storage units — magnetic disc auxiliary storage with 7,600K-byte capacity.

Magnetic tape transports — magnetic tape auxiliary storage available in three models, including a cartridge type and two nine-channel types.

Line printers — a 136-column 200 line-per-minute printer and a 132-column 600 line-per-minute printer are available. In addition, there is a dot-matrix serial printer that can print at the equivalent of 60 or 100 lines per minute.

Card reader — a 300 card-per-minute reader, with a 600-card hopper capacity.

Paper tape reader/punch — a unit with a 50 character-per-second read and punch rate. It can handle five-, six-, seven-, or eight-channel tape.

Ten-key keyboard — a unit with a standard numeric cluster for entering wholly numeric data.

Communications controllers — available in three models: synchronous/asynchronous, buffered asynchronous, and buffered synchronous/asynchronous.

## SOFTWARE

Business-oriented programming is achieved mainly via standard and customized application packages. These include Federal funds transfer; advertising media scheduling; hotel room inventorying and use scheduling; air-freight billing and shipment tracing; and securities portfolio management, in addition to standard accounting function application packages.

## DESIGN FEATURES

The chief design features of the Q Series systems relate to their communications capabilities. The basic processor has eight I/O ports, any of which can interface remote I/O devices or computers. With 12 I/O ports, the systems can be integrated into a data communications network

through communications controllers. In addition, nine of these ports can directly access the central processor.

The CPU can be programmed to automatically poll its entire complement of I/O devices. A single CPU can handle up to four typewriter units. When I/O ports are used to access the CPU on an interrupt basis, a system of port priorities determines which are serviced first.

Qantel's Q Series processors are field expandable, requiring no wiring changes or modifications. This advantage allows a system to expand economically and only when necessary. An optional Programmer Control Console feature serves as a diagnostic aid for maintenance personnel.

## PERFORMANCE

Qantel's systems are being used in applications where a good communications capability is the paramount consideration; for example, one Qantel computer is used as a front end for an IBM 360/40. Nationwide travel clubs, airfreight agencies, and networks of auto dealers are using these computers in a variety of effective ways. At the same time, because of the financial orientation of many of its application packages, the Qantel series has proven attractive to banks.

## MAINTENANCE

Maintenance for the Qantel series is available nationwide through 11 sales and service offices. Some of these are Qantel's, while others are those of independent software and computer service companies. Maintenance is available on a round-the-clock basis, although the standard contract calls for service during normal business hours. The company reports a 7-hour average

time in responding to emergency service calls.

Four depots for major replacement parts are in California, Atlanta, Chicago, and New York.

## HISTORY

Although Qantel was founded as recently as 1969 and delivered its first system early in 1970, the relatively young company has already established a good reputation and carved a niche for itself. There is evidence of this in the use of Qantel systems by banks such as First National City, Banker's Trust, Marine Midland, and Manufacturer's Hanover, in addition to such major companies as the Railway Express Agency, Levi Strauss Company, and Van Waters and Rogers.

### PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
| --- | --- |
| Word Size (bits) | 8 |
| Capacity (words) | 4K–32K |
| Cycle Time ($\mu$sec) | 1.5 |
| Working Storage | Integrated circuit |
| AUX STORAGE | Disc; magnetic tape and cartridge |
| DATA OUTPUT | |
| Line Printer (lpm) | 200; 600 |
| Serial Printer | Yes |
| Card (cpm) | — |
| Paper Tape (cps) | 50 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 300 |
| Paper Tape (cps) | 50 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | No |
| Compiler | No |

# SINGER
## System Ten
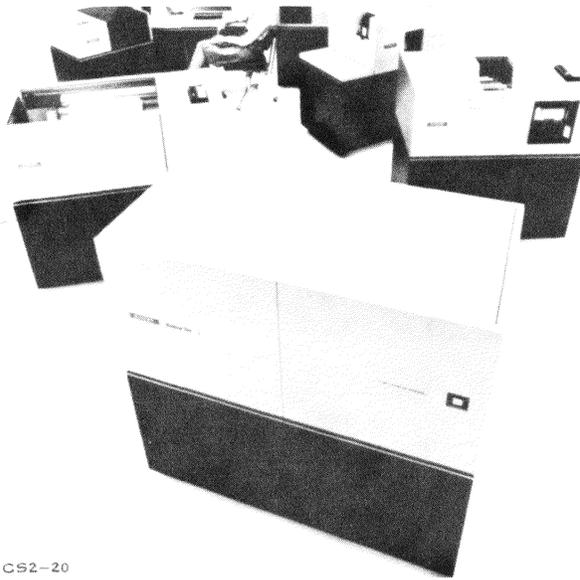


CS2-20

## SUMMARY

Singer's System Ten is one of the most flexible of the so-called small business computers. It's best suited for in-house data capture applications such as retail sales and inventory monitoring. At the heart of the System Ten is the fact that its core memory is partitioned into independent sections. Each section is devoted to an input/output channel that can accommodate as many as 10 devices. A hardware-established priority system automatically controls multiprogramming. As a result, the complex operating system software usually required to accomplish multiprogramming is not needed.

System Ten's design emphasizes modularity in order to permit plug-in upgrading of the system. Such versatility allows a user to expand his smaller system in the field as his requirements increase. His system can be raised virtually to the level of a medium-size computer. Also, individual System Tens can be configured in multiterminal networks so they can communicate with each other, and can also function as remote processors for larger computers. Its Synchronous Communications Adapter can, for example, link a System Ten to an IBM System/360 or System/ 370. For auxiliary storage, System Ten supports magnetic tapes and discs.

The availability of special-purpose peripheral equipment which replaces such devices as automated time clocks and semiautomatic merchandise checkout terminals also lends flexibility to System Ten. Special-purpose peripherals include employee badge readers and cash-register-type terminals with merchandise tag readers.

Up to 180 of these can be linked to the central processor by a simple two-wire line. Peripherals can be as far as 2,000 feet distant for some categories of devices, and 8 miles with others. As a result, peripherals can be dispersed throughout an organization and still access a single processor.

System Ten's software complement is limited to two levels of assembler language and to the Report Program Generator (RPG) language. As programming aids these languages are not as versatile or convenient as Cobol or Fortran. However, to alleviate user programming difficulties, the system is also available on a turnkey basis, complete with the required application packages.

## CONFIGURATION GUIDE

System Ten has a minimum 10K bytes of core storage, expandable to 110K bytes. System Ten's core memory can be divided into as many as 20 partitions. Each of these partitions has a dedicated input/output channel that can control up to 10 devices. Sections can communicate with each other only through a Common Storage partition. Channels of the multiterminal or management information system type control such low-speed devices as card readers and card punches. Those of the data collection type handle intelligent terminals.

Auxiliary storage magnetic disc and tape devices do not access each partition via the input/output channel. Instead, System Ten incorporates a single File Access Channel that links all partitions to the auxiliary storage files. This architecture alleviates the need for duplicating files used simultaneously by several partitions. Each partition can share an individual file via the File Access Channel.

Peripheral equipment available for System Ten includes the following:

Workstation — a desk-type data entry keyboard and serial printer output device, used for interactive communication with the CPU. The workstation features a standard alphanumeric keyboard and prints a 135-character line using a pressure-platen forms handler. Optional features include a carriage that can accommodate and print on 175-character-line forms, and a pin-feed forms handler. An operator panel uses indicator lights to assist the operator by displaying system status.

CRT display — another interactive device for communicating with the CPU. It adds a 10-key numeric cluster to the workstation. Also, instead of the workstation's serial printer, it uses

a CRT to generate a 1,600-character display, in an 80-column by 20-line format. This display is fully buffered so that the CPU simply reads into the buffer the 1,600 characters of the display, and then goes on to service another channel or I/O device. The CRT display can be programmed to resemble a blank form onto which the operator "types" entries before feeding the entered data to the CPU. This is an advantage to a new operator because it shortens the question and response time between the computer and operator. The unit can be located up to 2,000 feet from the CPU, and 10 can be serviced by a single I/O channel.

Disc drive — a magnetic disc auxiliary storage system with a capacity of 10 million characters of data per device. Up to 10 drives can be on-line to the central processor. The disc drives are linked to the CPU through the disc controller on the File Access Channel.

Magnetic tape drive — another type of auxiliary storage that can operate with disc storage. Magnetic tape typically is used to store frequently accessed sequential data, such as customer lists and inventory lists. Up to four, dual-tape versions of the System Ten tape drives can be operated on-line. Models are available for reading or writing on either 9-track or 7-track industry-compatible tape.

Line printer — a 132-column printer for rapid data printout on forms and reports. A buffer stores data for two lines of printing, so that the output flow remains uninterrupted when the CPU is servicing another channel or peripheral device.

Readers and punches — an on-line card reader can read 1,000 80-column cards in a single loading. One main memory partition can service 10 card readers. Each reader attaches to the CPU through a multiterminal I/O channel. A 100 card-per-minute on-line punch has 800-card capacity and automatic verification. Up to nine punches, connected to the CPU through a multiterminal I/O channel, can be serviced by a single main memory partition. An on-line paper tape reader can read either continuous reels or strips of punched or polyester tape. A paper tape punch, a companion unit to the reader, can punch 150 characters per second. Up to 10 readers and punches can be serviced by a single main memory partition.

Special-purpose peripherals for System Ten include the following:

Modular Data Transaction Terminal — a cash-register-type terminal used for remote data entry to the central processor, which also has the capabilities of a freestanding calculator, receipt printer, and totalizer. This compact unit is particularly useful in a retail environment. It can be used with automatic tag readers for both detachable and nondetachable merchandise tags, as well as with credit card readers. Its standard cluster of 10 numeric keys is augmented by 20 function keys which light in the proper preprogrammed sequence, to guide the operator in entering the required data. These function keys are useful to a computer novice such as a retail clerk.

The entered information and the results of the terminal's computation are automatically printed onto either a throw-out receipt or, in more detail, onto a multipart sales slip. In addition, every transaction is recorded on an internally stored audit tape that can store the details of approximately 400 transactions. For freestanding terminals not connected to the CPU the transaction is recorded on a detachable magnetic tape unit as well. The CPU can, at any time, poll each freestanding terminal by telephone line for its magnetic tape contents and use the data to update its library files. Tapes from every terminal can be processed at the end of each day or sent out. Further, directly linked terminals can be on-line to magnetic disc and/or magnetic tape files to ascertain customer credit limits, special customer discounts, and so on. Up to 180 such terminals can be connected by a simple two-wire line to a single System Ten CPU up to eight miles distant.

Job Information Station (JIS) — an intelligent terminal that guides the operator with a series of preprogrammed indicator lights. It is used primarily for numeric data entry from a workstation to a remote CPU. This device can read punch-coded employee badges and punched cards. It features a numeric keyboard for nonstandard data entry and a set of function keys.

The JIS has applications for monitoring work in progress, with regular reports directly from the manufacturing floor. Other manufacturing applications include stock room, tool room, and instrument room inventory control. JIS can also be used for check-in/check-out stations in libraries and warehouses and as a nurses' reporting and communications station in hospitals. A serial printer is an optional feature of this equipment. The badge reader used with the JIS can be used separately, as an on-line Time and Attendance Recorder.

SOFTWARE

System Ten supports user programs written in either of two symbolic assembler languages,

and a Report Program Generator language. None of these language implementations is compatible with those of any other computer. One of the symbolic assembler languages is a standard type, which uses mnemonic code words to generate machine instructions on a one-word-per-instruction basis. The other is a macroassembler, in which one word can generate several machine instructions. The system's assembler has a preprocessor to detect syntax and labeling errors, an important aid in creating new programs.

The System Ten is available on a turnkey basis, complete with either standard or customized application packages. A comprehensive set of utility routines facilitates programming. This includes routines for program loading, card and paper tape reading, punching, verifying, and duplicating. In addition, common calculating routines are available, as are sorting and merging programs for both disc and magnetic tape, and computer-to-computer communications programs.

Multiprogramming is accomplished without any specialized programs. Since each memory partition is independent, up to 20 programs can be loaded into System Ten, with each partition and its associated program serviced in turn by the CPU's arithmetic and control unit, on a timesharing basis. However, partitioning limits each program's size to 10K bytes.

## DESIGN FEATURES

System Ten's unique design features include its use of main memory partitioning for creating a multiprogramming environment. Depending on the mix of devices, partitioning permits a network of up to 200 peripherals, including intelligent terminals. System Ten is capable of executing as many as 20 programs simultaneously. No complex software, common to all ordinary multiprogramming techniques is required. This is accomplished by sharing among the partitions and their related I/O devices the available processing time of the single arithmetic and control unit. An inherent system of priorities determines which partitions have preference in requesting CPU time out of turn. However, each program can use only the maximum core allotted to a partition — 10,000 characters.

System Ten's field expandability means that operator stations or more storage modules can be added at the installation site without interrupting the operation. As a result, users can start out with small systems and expand to larger configurations as needed.

Console indicator lights are special design features for an untrained operator that guide him step by step through any given program. An error detection light allows the operator to discover mistakes and correct them as they occur.

Although System Ten is not program-compatible with any other computer, it is data format-compatible with IBM equipment in all categories except disc files. This feature allows branch offices with System Ten to send tapes, cards, or other input to the headquarters' System/360 where the data can be processed without any modification.

System Ten memory and work in progress are protected against loss due to power failure. The first 300 characters of the Common Storage partition are protected and the information cannot be altered by any program. This protected area stores program status information when partition switching occurs. Line voltage monitoring of the arithmetic and control unit allows status information to be saved when a power failure is about to occur.

## PERFORMANCE

System Ten adapts to a range of applications extending from the truly small business computer to the medium-size computer. Although a minimal configuration permits only interactive processing, a very modestly expanded installation offers the option of batch data processing. It performs best, however, in data entry applications.

In a minimal configuration, System Ten can be used for standard accounting and general business applications as well as for the analysis of company operations and the generation of comprehensive reports for accurate guidance of management decisions.

## MAINTENANCE

Singer offers maintenance for System Ten through its worldwide network of over 400 Friden sales and service offices. Emergency and preventive maintenance is available during normal business hours, but after-hours emergency service can be arranged in advance. Lease costs include those for maintenance based on use of the computer for 8 hours a day, 40 hours a week. Incremental charges are applied for higher use rates.

## HISTORY

Although Singer itself is only a recent entrant to the ranks of computer suppliers, its Friden

division, which manufactures and sells System Ten, was founded in 1934 and is currently one of the largest manufacturers of desk calculators and accounting machines. As a result Friden has an excellent understanding of the data processing needs of the business community, considerable expertise in manufacturing equipment to meet those needs, and detailed knowledge of the specific requirements of its accounting machine customers, many of whom may be considering a change to electronic data processing.

## PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 6 |
| Capacity (words) | 10-110K |
| Cycle Time ($\mu$sec) | 3.3 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 450 |
| Serial Printer | Yes |
| Card (cpm) | 100 |
| Paper Tape (cps) | 150 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 300 |
| Paper Tape (cps) | 300 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | No |
| Compiler | RPG |

# ULTIMACC SYSTEMS
## Ultimacc


CS2-21
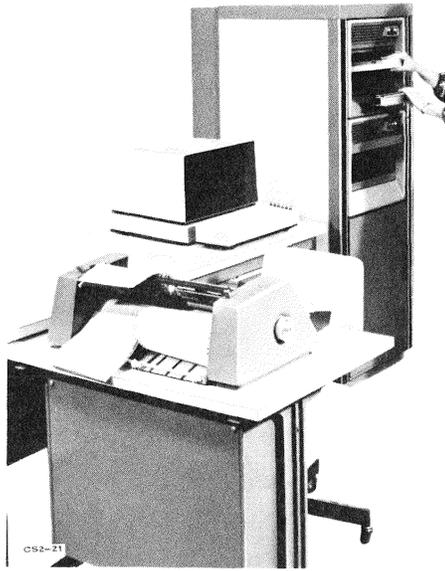
## SUMMARY

Ultimacc manufactures and markets an interactive data processing system geared to business accounting applications. The system is available in two models — disc and magnetic tape cartridge. Both models are marketed as upgrades for electronic accounting machine installations and are sold primarily as turnkey systems, including a comprehensive set of application programs and an operating system.

The Ultimacc systems are designed for operation by computer novices: all programs interactively direct the operator with step-by-step instructions. Up to 15 input/output devices can be connected to the central processor unit, which services them on a simultaneous basis.

Ultimacc's software concentrates on the rapid, automatic generation of business forms, accounting records, and management reports. Standard programs include the following monthly procedures: customer statements, profit and loss statements, aged trial balance, general ledger, and customer ledger card. Programs that run on a daily basis include: purchase journal, cash disbursements, cash receipts, sales journal, inventory report, reorder list, and month-to-date report.

Accounts payable and payroll-check writing are also included in Ultimacc's standard applications package, as are accounts receivable, invoicing, sales analysis, and job cost accounting where required. Ultimacc offers separately priced specialized management information report software.

Two programming languages, Basic and Fortran IV, are also available for users who wish to develop their own software, either initially or after installation.

## CONFIGURATION GUIDE

A basic Ultimacc configuration consists of a CPU mounted in an L-shaped desk console, with a wide-carriage serial printer and a compact magnetic tape cartridge file unit on the desktop. The CPU has an 8K-byte read/write core memory and 2K bytes of read-only memory, the latter largely reserved for the operating system. The configuration can be upgraded by plugging in additional core memory in 8K-byte increments for a total of 65K bytes.

The serial printer has a split platen and can handle multiple, pin-feed forms at the same time that it prints on a ledger card; the ledger card is held in a special feed on the carriage. The printer adds a numeric keyset to its standard alphanumeric keyboard. It can print a 192-character line at 30 characters per second. The cartridge file unit handles the tape cartridges on which the application programs and the data files are stored. Two cartridges, or a total of four tapes, can run simultaneously, representing a total on-line storage capacity of 3,700K bytes.

The Ultimacc disc system replaces the cartridge file unit with a dual-disc drive that has 5,000K bytes of storage. The CPU of a disc system has a minimum 16K bytes of core memory, expandable to 65K bytes in 8K-byte increments.

The disc-oriented configuration can expand by adding up to three disc drives for a total of 20,000K bytes of on-line storage. It can also accommodate up to four IBM-compatible magnetic tape drives, in addition to an assortment of other peripherals. The magnetic tape drives and peripherals can appear in any combination with a limit of 15 devices. Peripherals include: a video display terminal that combines a 12-inch CRT, which can display 1,998 characters in a 74-column by 27-row format and write up to 1,200 characters per second, with an alphanumeric keyboard and numeric keyset; a 135-line-per-minute, 132-column line printer; and a 300 line-per-minute line printer. A telephone coupler or an asynchronous modem can be used to link remotely located I/O devices to the CPU, whose 15-device total can include additional serial printers.

## SOFTWARE

A comprehensive package of accounting-type programs modified to the user's needs is

supplied with each Ultimacc installation. It comes with an operating system to manage the data files and network operation and to support the system's utility routines. These include data formatting and copying routines, file creation and editing routines, and an automatic restart routine.

Sort/merge, not considered a utility routine, is provided as a separate program with each installation. All programs are normally resident in the disc or tape files. They are called into core, as required, during processing.

Basic and Fortran IV are available to the user's EDP staff for the development of specialized software. Ultimacc offers customized programming services for the development of specialized management-report software when minor modifications to its standard accounting application programs will not meet the user's needs.

## DESIGN FEATURES

The chief design features of Ultimacc's disc-oriented system are its main-memory partitioning and operating system, which permit up to 15 I/O devices to run the same or different programs and to be serviced by the CPU on a time-shared basis. Several operators can communicate simultaneously with the system.

Partitioning is normally performed before installation, with portions of the core memory being software-dedicated to the various I/O devices in accordance with the complexity of the programs they will be using. However, more core can be added with peripherals in a field upgrade because of the system's multiprogramming capabilities. System throughput is increased because of the random access feature. Each partition is able to contain temporarily a desired program from the disc library file of programs.

On both the disc and tape systems the serial printer can print onto two continuous forms and a ledger card in a single pass. In a typical application, the printer would have an invoice form on one side of the carriage; a sales-journal form on the other side; and, in front of the latter form, a ledger card in a special feed device. When the customer's ledger card has a new purchase added to it, the keys' impact prints through onto the sales journal and, finally, the invoice is printed.

## PERFORMANCE

Ultimacc's comprehensive software package and, in the disc model, good networking

capabilities with effortless multiprogramming are well suited to the needs of small businesses upgrading from an electronic accounting machine installation. Although the system is interactive rather than batch oriented, throughput is quite high since the CPU is able to handle several terminals simultaneously. The system's magnetic tape capabilities offer a convenient means of using Ultimacc-developed data as input to larger, batch processing systems.

## MAINTENANCE

Maintenance for Ultimacc is performed, under contract, by Honeywell Information Systems, whose nationwide network of service offices includes most major cities. Service is available on a round-the-clock basis, but the standard contract generally provides on-call maintenance only during normal business hours. Preventive maintenance, generally performed every 2 months, can be scheduled for other than business hours, to prevent interference with on-going operations.

## HISTORY

Ultimacc Systems, formerly known as Automated Information Systems, was founded in October 1968. Its headquarters and sales offices are in Maywood, New Jersey, with marketing efforts focused on the Philadelphia/New York/Boston region.

## PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 16 |
| Capacity (words) | 4–32K |
| Cycle Time ($\mu$sec) | 1.2 |
| Working Storage | Core |
| AUX STORAGE | Disc; magnetic tape drive and cartridge |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | 135; 300 |
| Serial Printer | Yes |
| Card (cpm) | — |
| Paper Tape (cps) | — |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | — |
| Paper Tape (cps) | — |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | Basic; Fortran IV |

# UNIVAC
## 9200 System



GS2-22
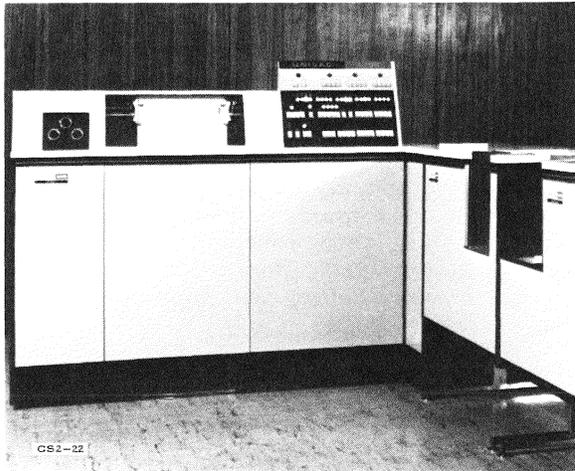
## SUMMARY

Univac 9200 is a small-scale, card-oriented system that enables the new computer user to make easy transition from tabulating machines to computers. It offers the advantages of a familiar recording medium plus the opportunity to use third-generation technology. The Univac 9200 should also be attractive to the user of a small IBM 360 who is concerned with the 360's complex instruction repertoire. Univac's 9200 has a simpler instruction set than the 360's, but it promises to do everything that the small business computer user ever needs to do, with fewer stumbling blocks.

The Univac 9200 is the lowest-priced member of the Univac 9000 Series, which includes the 9200, 9200 II, 9300, and 9400. Basic differentiating characteristics between the 9200 and the rest of the 9000 Series are the internal speed of the processor, the maximum main memory capacity, and the 9200's lack of magnetic tape capability. Univac 9200 II uses essentially the same central processor as the 9200, but extends its input/output capability and increases its main storage capacity.

One major advantage of the Univac 9200 is direct upward software interchangeability with the 9300 and upward compatibility with the 9400. Moreover, 9200 systems can be field converted into 9300 systems. This intrasystem compatibility eases the transition for Univac 9200 users who want to upgrade to a more powerful system. Most other major manufacturers don't offer such software compatibility.

Although the 9200 doesn't offer magnetic tape capability, it is available with the 9200 II. The 9200 II systems also support disc storage units

for storing auxiliary files, and in addition to a full assortment of peripherals, they have data communications capability.

Univac offers a selection of card-, disc-, or tape-oriented software. The complement includes an assembler and programming languages such as RPG (the report generator), Fortran (for scientific and engineering applications), and Cobol (a powerful language for business applications).

## CONFIGURATION GUIDE

The basic Univac 9200 system includes a 9200 processor with a built-in 250 line-per-minute printer; 8K, 12K, or 16K bytes of plated-wire memory; a 400 card-per-minute card reader; and a column card punch rated at 75 to 200 cards per minute. Only one of each of the basic input/output devices (i.e., one card reader or one printer) can be connected. The 9200 II has a maximum capacity of 32,768 bytes.

Disc storage devices are not supported by the 9200 standard input/output channel. However, an optional multiplexor I/O channel that does support discs can be added. The disc system supported by the multiplexor channel comprises four dual discs with capacities of 3.2 million bytes per pack. Besides adding disc capability, the multiplexor channel permits connection of a large variety of devices including a card controller (up to eight), a paper tape subsystem, two data communications subsystems handling a maximum of eight lines, and Univac's intelligent remote batch terminal (the 1004).

The 9200 II differs from the 9200 principally in that the multiplexor channel discussed in the preceding paragraph is standard equipment. Uniservo VI C tape units are available for attachment to this channel. Either of two card readers (400 or 600 cards per minute) and two card punches (75 to 200 cards per minute or 200 cards per minute), can be attached directly to the processor via built-in control units. Also available are high-speed printers (one with 900 or 1,100 lines per minute and another with 1,200 or 1,600 lines per minute). All peripheral equipment available with the 9200 is available with the 9200 II as well.

Univac's disc storage system for the 9200 provides random or sequential access to a moderate amount of on-line storage. Two independently operating disc handlers are housed in a single cabinet, and each handler services a single disc cartridge. Up to four dual-disc units are allowed in a maximum 9000 Series system configuration, providing a total on-line data capacity of 12.8 million bytes. Each single-disc cartridge can

store up to 3.2 million bytes, but only 1.6 million bytes of each cartridge can be accessed online. By physically removing each disc cartridge, turning it over, and replacing it on the drive, the remaining 1.6 million bytes of data become accessible.

Increased disc storage capacity is available for the 9200 II via a removable disc pack system that comprises six discs with a capacity of 7.25 million bytes per pack. This unit attaches to the 9200 II through a selector channel that is optionally available on the 9200 II (the channel is unavailable on the 9200).

The 9200 II supports the Uniservo VIC Magnetic Tape Handlers, which have been used with most of Univac's second-generation computers. Standard models use 9-track tape with a recording density of 800 bytes per inch; thus, they are compatible with the 2400 Series magnetic tape units used in the IBM System/360.

## SOFTWARE

One of the distinctive features of the 9000 Series is that total upward program compatibility exists. This means that no rewriting of programs is necessary when systems are upgraded. Univac offers its users a choice of three levels of operating system software: cards, disc, and tape (only tape is unavailable for 9200).

Besides supporting an assembler, the system supports two RPG languages, and Fortran and Cobol compilers. One RPG accepts problem-oriented specifications and generates programs that produce specified reports. The other permits functions normally associated with tabulating equipment to be described in problem-oriented terms.

Univac offers a broad selection of application packages that include: formula costing, general ledger, job costing, terminal sales analysis, pension statistics, merchandise billing, insurance ratings, verifying receivables, pension reporting, tax revenue distribution, volume analysis, interline reports, accounts payable, management information, customer statistics, accounts receivable, inventory status, production scheduling, spare parts inventory, sales trend analysis, payroll, raw material price comparison, billing, poll tax accounting, and bill-of-materials report.

Also offered are: scientific processing, pick-order preparation, automatic typesetting, medical statistics, engineering design, tariff bureau summary, voter registration, truck usage analysis, aged trial balance, purchasing, daily cash

receipt reports, mortgage accounting, traffic density reports, subscription fulfillment, budget forecast, ticket reservations, student loans, motor vehicle registration, capital assets accounting, garment cutting reports, linear programming, course selection, route accounting deduction journals tuition control, air cargo, cash requirement forecasting student file maintenance, labeling, check reconciliation, medication schedules, premium billing, truck revenue reporting, employee efficiency, admissions simulation, incentive payroll.

## DESIGN FEATURES

The overall architecture of the Univac 9200 is similar to that of the IBM System/360 processors. Univac's philosophy in designing the 9000 Series has been: to implement an instruction set that provides representation in each of the major classes, to assure upward compatibility among series members, and to enable efficient programming — but to achieve economies through exclusion of nonessential instructions. Far from useless, but nevertheless omitted, were all arithmetic floating-point hardware features; but since the primary market for the 9200 is in the business data processing environment, the lack of floating-point hardware is not a serious drawback.

## PERFORMANCE

Univac 9200 is appropriate for small businesses that are planning an upgrade from an electronic accounting machine installation because of an increased volume of business. Compared to other members in the 9000 Series, the 9200 has relatively slow input/output devices. But its performance is suited for small business applications.

The 9200 has good growth potential. A user can start with a card-oriented 9200 or 9200 II and, as his processing needs increase, expand the system to operate with disc- and (9200 II only) tape-oriented hardware. Additional growth potential is provided in the field convertability between 9200 and 9300 models. The lower-performance model can be converted to a 9300 at the user's installation site. Successful upward growth is assured by the intraseries software compatibility of the 9000 Series. Programs written for the lower-performance family members will run on the higher-numbered models.

## MAINTENANCE

Univac provides maintenance for its equipment through a nationwide staff of field service technicians. The firm supports installation and any

necessary conversions of field modifications. Univac also furnishes a comprehensive library of documentation that includes operating manuals and training guides.

## HISTORY

Univac is a division of Sperry Rand Corporation and was formed in 1947. Its principal business is the manufacture of a full line of general-purpose computers and related products. Univac is among the major computer manufacturers and has had considerable experience in accommodating the data processing user.

The firm markets bundled systems to end users and supplies hardware and software systems as well as a variety of prepackaged applications. It maintains a worldwide marketing force.

**PRODUCT SPECIFICATIONS**

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 8 |
| Capacity (words) | 8–32K |
| Cycle Time ($\mu$sec) | 1.2 |
| Working Storage | Plated wire |
| AUX STORAGE | Disc; magnetic tape (9200 II only) |
| DATA OUTPUT | |
| Line Printer (lpm) | 250–1,600 |
| Serial Printer | — |
| Card (cpm) | 75–200; 200 |
| Paper Tape (cps) | 110 |
| DATA INPUT | |
| Keyboard | — |
| Card (cpm) | 400; 600 |
| Paper Tape (cps) | 300 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | Yes |
| Compiler | RPG; Fortran; Cobol |

# VICTOR COMPTOMETER
## 820 Series

---



CS2-23
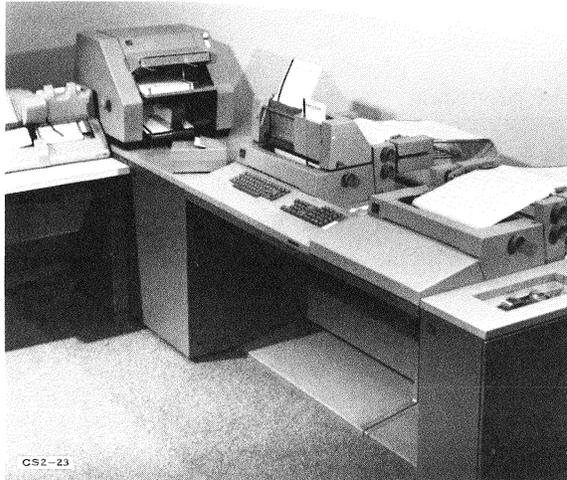
## SUMMARY

The Victor 820 Series is basically composed of sophisticated, operator-attended, desk-size electronic accounting machines with a full range of conventional peripheral devices common to most billing/accounting applications. It simultaneously handles multiple peripherals (including magnetic stripe ledger cards) and prepares multiple forms. The 820 Series interfaces with other computers on either a synchronous or asynchronous basis. Low cost and plug-in expandability are major attractions. Another major plus is that the 820 units have both a stand-alone capability and the ability to be used as remote intelligent terminals on-line to larger computer systems.

Available application packages are primarily those for standard accounting functions — general ledger, accounts payable, accounts receivable, payroll, and the like. However, a number of programs are available for manufacturing applications as well. Extensions of several of these programs are also available to provide summary reports, both in standard format for automatic preparation of IRS forms and in specialized format to inform and guide management.

## CONFIGURATION GUIDE

The 820 Series computer system can be assembled many different ways. Model designations have been assigned on the basis of memory capacity, number of peripherals, size of chassis, and so forth, and miscellaneous marketing considerations which relate to specific hardware configurations.

Model 820/07 provides a desk console housing a central processor unit and core and rod memories, which together comprise up to 14.7K bytes of storage. This minimum configuration also includes: 2,048 words of microprogramming; an alphanumeric keyboard; an auxiliary keyboard which includes a numeric keyboard and a set of 24 program modification keys; and a serial printer with a pressure-fed forms handler and options for pin-feed or traction-fed dual forms handling.

Model 820/08 differs from the 820/07 only in the addition of I/O channels to accommodate a punched paper tape output and a front-feed ledger card handler. Model 820/10 adds further I/O options including various combinations of paper tape punchers and readers, edge-punched card and standard 80-column card punchers and readers, and magnetic tape cassettes.

Model 820/21 offers up to three times the core capacity, up to two and a half times the rod cell memory, and three times the microprogramming capacity of the 820/10. The 820/21 can handle up to 14 peripheral devices through its I/O channels, operating as many as nine devices simultaneously.

Model 820/23 adds a magnetic stripe ledger card capability to the 820/21. The 820/23 can handle one at a time. The 820/25 has an expanded microprogramming capability and the ability to read/write and type on two different magnetic stripe ledger cards at the same time. The Model 820/30 has all the capabilities of the 820/25 with the addition of more I/O channels.

The 820/04, a special model for use as a bank teller's terminal, is a pillar-shaped version of the 820/10. It adds to the 820/10 a passbook-posting capability, a magnetic tape cassette to record all transactions in the event the remote, central computer is disabled, and an alphanumerically printed journal tape.

Up to 16 of these models can be connected in various combinations through a Communications Control Unit to form a data collection network, with up to two magnetic tape units as a common storage medium. The only hardware changes necessary are the replacement of the normal microprogramming module with a transceiving version and the addition of the proper I/O control panel in order to convert the individual freestanding computers into terminal computers. The resultant network, interconnected by cables up to 600 feet long or by telephone or telegraph lines, can in turn be linked to the computers of any other manufacturers through the CCU. It thus acts as preprocessor for a more powerful computer system.

The peripherals available for use with the 820 Series include a serial printer, which is identical

to that of the basic console and is used in conjunction with it to increase system throughput. This device has an interchangeable, ball-type printing head and prints at 15.5 characters per second. A buffered dot-matrix printer prints at 165 characters per second. An automatic magnetic stripe ledger card reader has up to a 750-card hopper capacity.

Other devices include: a front-feed unit for multiple form sets and both standard and magnetic stripe ledger cards; a buffered card punch and companion card reader for 80-column cards; a buffered paper tape punch and companion paper tape reader; an edge-punched card reader and a companion punch unit; and magnetic tape cassette and magnetic tape reel auxiliary storage.

## SOFTWARE

A comprehensive set of standard or customized business application programs is available from Victor for the 820 Series. Summary report programs are also offered. All software is assembled and compiled by Victor on company equipment reserved for this purpose. At an additional cost, customer equipment can be given assembling capability.

For program compilation, Victor uses an IBM 360/30 processor with 64K core, configured in a disc/tape/card system. An 820 installation generally comes preprogrammed with the desired application packages, but Victor also offers a programmer training course for personnel at those companies that want to be able to modify the software or to develop their own.

General application packages include billing, accounts receivable, inventory control, payroll, accounts payable, and related accounting programs. Victor also offers specialized applications which are geared to car dealers, credit unions, welding suppliers, contractors, and CPA firms, among others.

## DESIGN FEATURES

The most important features of the 820 Series are the very low cost of a minimal configuration and the plug-in expandability of such an installation via addition of peripherals and/or the addition of terminals to create a data processing network. To a large extent the system's low cost stems from a design philosophy that emphasizes the accounting-machine aspect of the series' performance, in order to satisfy at minimal cost the requirements of the smallest businesses, and thus compete for the largest market.

Further, the design effects substantial savings

by matching components to their precise tasks. One example is the use of rod cells, and inexpensive type of read-only memory, for the bulk of user programs, rather than the more costly read/write core memory commonly allocated for this purpose. The 820 Series also has a micro-programmed capability designed to facilitate hardware upgrade.

The 820 Series requires no special flooring. Malfunctions are detected by diagnostic type service programs used by field service engineers.

## PERFORMANCE

Victor's 820 Series provides a wide variety of data processing and forms handling capabilities. Models 820/07 and 820/08 perform most efficiently for the user who requires only basic billing applications. The 820/08 also adds punched card or tape output, providing the user with machine-readable copy.

These two systems can easily be upgraded to the fully automated 820/10, which provides a full line of input/output peripheral devices and handles accounting applications. It satisfies the user who requires conventional hard-copy ledger output. Besides supplying the user's need for larger core and read-only memories, the 820/21 provides a companion serial printer that can be used when additional printed output is required.

Models 820/23, 820/25, and 820/30 fill the requirements of a user who needs magnetic ledger card capability. The magnetic ledger card system electronically encodes on the magnetic stripe as well as visually presenting the printed material on the same ledger card. The 820/23 is suited to the user who requires only a small-capacity magnetic ledger card in a single chute. For the user who needs additional card capacity, the 820/25 and 820/30 can handle two large-capacity ledger cards on the same system.

This range of performance capabilities is evidenced by the diverse businesses that employ this series of machines. Most of the installations around the world are in very small companies. A growing number of big businesses are also using the 820 Series, including some of the largest automobile manufacturers and insurance companies in the United States.

## MAINTENANCE

Preventive and emergency maintenance is available through approximately 40 of Victor's 80 sales offices across the country. A warranty covers the first year's maintenance, and subsequent maintenance is available by contract.

Maintenance includes three inspections per year plus emergency service during normal business hours, with after-hours service available at higher rates. For turnkey installations branch-office personnel provide maintenance. Evidence of Victor's desire to service what it sells is the 3:1 ratio of system support personnel to sales personnel.

Victor retains a test and repair facility as well as spare parts at each branch office. The average response time to an emergency service call is quoted as 3 to 4 hours when the location is within 20 miles of a branch office.

## HISTORY

Victor Comptometer Corporation, founded in 1918, is one of the largest manufacturers of cash registers and electronic and electromechanical office equipment. The company penetrated the small business computer market in Europe in 1966 with its 820 Series, which is based on a German-made Nixdorf computer. Sales of the 820 in the United States began in 1969.

PRODUCT SPECIFICATIONS

| CENT PROCESSOR | |
|---|---|
| Word Size (bits) | 64 |
| Capacity (words) | 16-1,024; 1,000-16,000 |
| Cycle Time ($\mu$sec) | 2.0 |
| Working Storage | Core; rod cell |
| AUX STORAGE | Tape cassette |
| | |
| DATA OUTPUT | |
| Line Printer (lpm) | -- |
| Serial Printer | Yes |
| Card (cpm) | 15 or 38 |
| Paper Tape (cps) | 25 |
| DATA INPUT | |
| Keyboard | Standard |
| Card (cpm) | 120 |
| Paper Tape (cps) | 200 |
| SOFTWARE | |
| Assembler | Yes |
| Operating System | No |
| Compiler | No |

# SPECIFICATION CHARTS
## Small Business Computers

| MANUFACTURER | Basic/Four | Basic/Four | Basic/Four | Basic/Four |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | Model 300 | Model 350 | Model 400 | Model 500 |
| CPU Model No. | 300 | 350 | 400 | 500 |
| Word Length (bits) | 4 | 4 | 4 | 4 |
| I/O Channels | 2 | 2 | 2 | 2 |
| Type of Storage | Core | Core | Core | Core |
| Capacity (words) | 8K–96K | 8K–96K | 8K–96K | 8K–96K |
| Cycle Time ($\mu$ sec) | 1.1 | 1.1 | 1.1 | 1.1 |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | All models | | | |
| Assembler | No | | | |
| Operating System | Yes | | | |
| Compilers | Basic | | | |
| **DISC** | | | | |
| SYSTEM IDENTITY | All models | All models | All models | |
| Model No. | 2100 | 2200 | 2300 | |
| Capacity (char/pack) | 2.1M | 4.2M | 2.1M–4.2M | |
| Peak Xfer Rate (char/sec) | 100K | 100K | 100K | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | All models | | | |
| Model No. | 6100 | | | |
| Type | Reel | | | |
| Peak Xfer Rate (K char/sec) | 10 | | | |
| No. of Tracks | 7 or 9 | | | |
| Packing Density (bits/inch) | 800 | | | |
| **CARDS** | | | | |
| SYSTEM IDENTITY | All models | All models | | |
| Model No. | 4100 | 4200 | | |
| Type | Reader | Reader | | |
| Speed (char/min) | 400 | 400 or 800 | | |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | All models | | | |
| Model No. | — | | | |
| Type | Reader/punch | | | |
| Speed (char/sec) | 500/75 | | | |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | All models | All models | | |
| Model No. | 3100 | 3300 | | |
| Type | Dot-matrix | Line | | |
| No. of Columns | 132 | 132 | | |
| Speed | 165 cps | 200 lpm | | |
| **OTHER PERIPHERALS** | Model 300 Accounting machine terminal | Model 350 Video display terminal | Models 400 and 500 Accounting machine terminal; video display terminal | |

| MANUFACTURER | Burroughs | Burroughs | Burroughs | Cascade Data |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | L 2000, 3000 | L 4000, 5000 | L 7000 | System 80/20 |
| CPU Model No. | — | — | — | 8000 |
| Word Length (bits) | 64 | 64 | 16 | 8; 16 |
| I/O Channels | Integral | Integral | Integral | 1 |
| Type of Storage | Magnetic disc | Magnetic disc | Magnetic disc | Core |
| Capacity (words) | 1,024 | 1,280 | 2,560–8,704 | 8K–16K; 4K–8K |
| Cycle Time ($\mu$ sec) | 5 | 5 | 5 | 0.900 |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | All models | | | All models |
| Assembler | Yes | | | Yes |
| Operating System | Yes | | | Yes |
| Compilers | Cobol | | | RPG |
| **DISC** | | | | |
| SYSTEM IDENTITY | L 7000 | | | System 80/40 |
| Model No. | — | | | 4011 |
| Capacity (char/pack) | 5,120 | | | 5M |
| Peak Xfer Rate (char/sec) | 15,360 | | | 195,000 |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | | | | All models |
| Model No. | | | | 4001 |
| Type | | | | Cartridge |
| Peak Xfer Rate (K char/sec) | | | | 0.75 |
| No. of Tracks | | | | — |
| Packing Density (bits/inch) | | | | 600 |
| **CARDS** | | | | |
| SYSTEM IDENTITY | (All except L 7000) | All models | L 7000 | System 80/30 |
| Model No. | — | A 149 | A 9114 | 6050 |
| Type | Reader | Punch | Reader | Reader |
| Speed (char/min) | 100 | 19 | 200 | 300 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | All models | All models | | All models |
| Model No. | A 9122 | A 9222 | | 6080 |
| Type | Reader | Punch | | Punch |
| Speed (char/sec) | 40 | 40 | | 60 |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | L 2000, 3000 | L 4000, 5000, 7000 | | All models |
| Model No. | — | — | | 6001 |
| Type | Serial | Serial | | Serial |
| No. of Columns | 150 | 255 | | 132 |
| Speed | 20 cps | 20 cps | | 30 cps |
| **OTHER PERIPHERALS** | L 5000, 7000 Magnetic record reader | | | All models Console keyboard |

| MANUFACTURER | Cascade Data | Cascade Data | Eldorado Electrodata | Eldorado Electrodata |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | System 80/30 | System 80/40 | 140 | |
| CPU Model No. | 8000 | 8000 | ee 200 | |
| Word Length (bits) | 8; 16 | 8; 16 | 16 | |
| I/O Channels | 1 | 1 | 256 | |
| Type of Storage | Core | Core | Core | |
| Capacity (words) | 8K–64K; 4K–32K | 8K–64K; 4K–32K | 4K–32K | |
| Cycle Time ($\mu$ sec) | 0.900 | 0.900 | 1.2 | |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | | | EEC 140 | |
| Assembler | | | Yes | |
| Operating System | | | Keyboard exec | |
| Compilers | | | Eldorado String Processor (ESP) | |
| **DISC** | | | | |
| SYSTEM IDENTITY | | | EEC 140 | |
| Model No. | | | 2012 IOMAC | |
| Capacity (char/pack) | | | 5M | |
| Peak Xfer Rate (char/sec) | | | 48K | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | All models | | EEC 140 | EEC 140 |
| Model No. | 4005 | | Sykes | Pec |
| Type | Cartridge | | Cassette | Reel |
| Peak Xfer Rate (K char/sec) | 2.25 | | 0.456 | 10 |
| No. of Tracks | — | | 1 | 7; 9 |
| Packing Density (bits/inch) | 1,800 | | 1,000 | 556/800; 800 |
| **CARDS** | | | | |
| SYSTEM IDENTITY | | | EEC 140 | |
| Model No. | | | Documentation 200 | |
| Type | | | Reader | |
| Speed (char/min) | | | 300 | |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | All models | | EEC 140 | EEC 140 |
| Model No. | 6070 | | Digitronics | Facit |
| Type | Reader | | Reader | Punch |
| Speed (char/sec) | 300 | | 300 | 75 |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | Systems 80/30, 80/40 | All models | EEC 140 | EEC 140 |
| Model No. | 6010 | 6020 | Potter | Data Printer |
| Type | Line | Line | Line | Line |
| No. of Columns | 132 | 128 | 132 | 132 |
| Speed | 90 lpm | 200 lpm | 135 lpm | 600 lpm |
| **OTHER PERIPHERALS** | | | | |

| MANUFACTURER | Honeywell Information Systems | Honeywell Information Systems | Honeywell Information Systems | Honeywell Information Systems |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | Series 50 | | Series 100, | |
| CPU Model No. | Model 58 | | Model 15 | |
| Word Length (bits) | 58-1 | | 1M1560 | |
| I/O Channels | 8 | | 8 | |
| Type of Storage | 1-8 | | 4 | |
| Capacity (words) | Core; ROM | | Core | |
| Cycle Time ($\mu$ sec) | 5K-10K; 7K | | 16K-64K | |
| | 1.2; 0.35 | | 2 or 4 | |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | Model 58 | | Model 15 | |
| Assembler | Yes | | Yes | |
| Operating System | Yes | | Yes | |
| Compilers | MiniCobol; | | Cobol; Fortran; | |
| | Fortran | | RPG | |
| **DISC** | | | | |
| SYSTEM IDENTITY | Model 58 | | Model 15 | |
| Model No. | DSS 058 | | DSS 164 | |
| Capacity (char/pack) | 1.73M | | 2.8M | |
| Peak Xfer Rate (char/sec) | 156; 250 | | 37.5K | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | | | Model 15 | |
| Model No. | | | MTS 103 | |
| Type | | | Reel | |
| Peak Xfer Rate (K char/sec) | | | 30 | |
| No. of Tracks | | | 7 or 9 | |
| Packing Density (bits/inch) | | | 200/556/800 | |
| **CARDS** | | | | |
| SYSTEM IDENTITY | Model 58 | Model 58 | Model 15 | Model 15 |
| Model No. | — | CPA 050 | — | — |
| Type | Reader | Punch | Reader | Punch |
| Speed (char/min) | 100; 200 | 120 | 400; 600 | 200 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | | | Model 15 | Model 15 |
| Model No. | | | PTR 100 | — |
| Type | | | Reader | Punch |
| Speed (char/sec) | | | 500 | 150 |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | Model 58 | | Model 15 | |
| Model No. | — | | — | |
| Type | Line | | Line | |
| No. of Columns | 96; 128 | | 120 | |
| Speed | 100; 200 lpm | | 600; 780; 1,100 lpm | |
| **OTHER PERIPHERALS** | Model 58 Communications controller; digital display; optical mark reader | | Model 15 Magnetic ink document sorter; communication controller | |

| MANUFACTURER | Honeywell Information Systems | Honeywell Information Systems | Honeywell Information Systems | Honeywell Information Systems |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | | Series 200, Model 105 | Series 200, Model 115 | |
| CPU Model No. | | Type 106 | Type 116 | |
| Word Length (bits) | | 6 | 6 | |
| I/O Channels | | 3 or 4 | 3 or 4 | |
| Type of Storage | | Core | Core | |
| Capacity (words) | | 16K-32K | 16K-32K | |
| Cycle Time ($\mu$sec) | | 3.5 | 2.75 | |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | | Both models | | |
| Assembler | | Yes | | |
| Operating System | | Yes | | |
| Compilers | | Cobol; RPG; Fortran | | |
| **DISC** | | | | |
| SYSTEM IDENTITY | | Model 105 | Model 115 | |
| Model No. | | 170-2; 173-2 | 155; 172 | |
| Capacity (char/pack) | | 4.6M; 9.2M | 3.6M; 9.2M | |
| Peak Xfer Rate (char/sec) | | 147,500 | 147,500; 208,000 | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | | Model 115 | | |
| Model No. | | 204B Series | | |
| Type | | Reel | | |
| Peak Xfer Rate (K char/sec) | | 149.3 | | |
| No. of Tracks | | 7; 9 | | |
| Packing Density (bits/inch) | | 200-1,600 | | |
| **CARDS** | | | | |
| SYSTEM IDENTITY | Model 15 | Both models | Both models | Both models |
| Model No. | CRZ 111 | Type 123 | Type 214-1 | Type 214-2 |
| Type | Reader | Reader | Punch | Reader/punch |
| Speed (char/min) | 400 | 400 | 100-400 | 400/100-400 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | | Both models | Both models | |
| Model No. | | Type 209-2 | Type 210 | |
| Type | | Reader | Punch | |
| Speed (char/sec) | | 600 | 120 | |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | | Both models | Model 115 | |
| Model No. | | Type 112 | Type 122 | |
| Type | | Line | Line | |
| No. of Columns | | 120 | | |
| Speed | | 300 lpm | 650-1,100 lpm | |
| **OTHER PERIPHERALS** | | Model 105 Communications controller; console; MICR reader/sorter | Model 115 MICR reader/ sorter; OCR reader/sorter; remote terminals; teller terminals; console | |

| MANUFACTURER | Honeywell Information Systems | IBM | IBM | IBM |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | | System/3, Model 10 | System/3, Model 6 | |
| CPU Model No. | | 5410 | 5406 | |
| Word Length (bits) | | 8 | 8 | |
| I/O Channels | | Internal | Internal | |
| Type of Storage | | Core | Core | |
| Capacity (words) | | 8K–32K | 8K–16K | |
| Cycle Time ($\mu$ sec) | | 1.52 | 1.52 | |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | | System/3, Model 6 | System/3, Model 10 | |
| Assembler | | No | Yes | |
| Operating System | | No | No | |
| Compilers | | Basic; RPG II | RPG II; Cobol; Fortran | |
| **DISC** | | | | |
| SYSTEM IDENTITY | | Models 6 and 10 | Model 10 | |
| Model No. | | 5444 | 5445 | |
| Capacity (char/pack) | | 2.45M | 20.4M | |
| Peak Xfer Rate (char/sec) | | 199,000 | 312,000 | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | | Model 10 | Model 10 | Model 10 |
| Model No. | | 3411/3410, Mod 1 | 3411/3410, Mod 2 | 3411/3410, Mod 3 |
| Type | | Reel | Reel | Reel |
| Peak Xfer Rate (K char/sec) | | 20 | 40 | 80 |
| No. of Tracks | | 9 | 9 | 9 |
| Packing Density (bits/inch) | | 1,600 | 1,600 | 1,600 |
| **CARDS** | | | | |
| SYSTEM IDENTITY | Model 115 | Model 10 | Model 10 | Model 6 |
| Model No. | Types 123-2, –4 | 5424–A1 | 5424–A2 | — |
| Type | Readers | Reader/punch | Reader/punch | Reader/punch |
| Speed (char/min) | 600; 1,050 | 250/60 | 500/120 | 22 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | | | | |
| Model No. | | | | |
| Type | | | | |
| Speed (char/sec) | | | | |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | | Model 10 | Model 10 | Model 6 |
| Model No. | | 5203-1, –2, –3 | 5741 | 5213; 2222 |
| Type | | Line | Printer-keyboard | Serial; ledger card |
| No. of Columns | | 96 | 125 | 132; 220 |
| Speed | | 100, 200, 300 lpm | 15.45 cps | 85 cps |
| **OTHER PERIPHERALS** | | System/3, Model 6 Data recorder; CRT display station; ledger card; MICR reader | System/3, Model 10 Data entry keyboard; MICR reader | |

| MANUFACTURER | IBM | IBM | IBM | IBM |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | System 360/20 | System 360/20 | | |
| CPU Model No. | 2020 Submodel 5 | 2020 Submodel 6 | | |
| Word Length (bits) | 8 | 8 | | |
| I/O Channels | Integrated channels | Integrated channels | | |
| Type of Storage | Core | Core | | |
| Capacity (words) | 8K–32K | 8K–16K | | |
| Cycle Time ($\mu$ sec) | 2.0 | 3.6 | | |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | Submodels 5 and 6 | | | |
| Assembler | Yes | | | |
| Operating System | No | | | |
| Compilers | RPG | | | |
| **DISC** | | | | |
| SYSTEM IDENTITY | Submodels 5 and 6 | Submodels 5 and 6 | | |
| Model No. | 2311 Model 11 | 2311 Model 12 | | |
| Capacity (char/pack) | 5.4M | 2.4M | | |
| Peak Xfer Rate (char/sec) | 81,000 | 82,080 | | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | Submodels 5 and 6 | Submodel 5 | Submodel 5 | Submodel 5 |
| Model No. | 2415 Series | 2401 Series Model 1 | 2401 Series Model 2 | 2401 Series Model 4 |
| Type | Reel | Reel | Reel | Reel |
| Peak Xfer Rate (K char/sec) | 15 or 30 | 30 | 60 | 60 |
| No. of Tracks | 9; 7 | 9; 7 | 9; 7 | 7; 9 |
| Packing Density (bits/inch) | 800/1,600; 200/556 | 800; 200/556 | 800; 200/556 | 1,600; 200/556/800 |
| **CARDS** | | | | |
| SYSTEM IDENTITY | Submodels 5 and 6 | Submodels 5 and 6 | Submodels 5 and 6 | Submodels 5 and 6 |
| Model No. | 2501 Mods A1, A2 | 2520 Model A1 | 2560 MFCM | 1442 Model 5 |
| Type | Readers | Reader/Punch | Reader/Punch | Punch |
| Speed (char/min) | 600; 1,000 | 500 | 500/91 | 91–360 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | | | | |
| Model No. | | | | |
| Type | | | | |
| Speed (char/sec) | | | | |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | Submodels 5 and 6 | Submodels 5 and 6 | Submodels 5 and 6 | |
| Model No. | 1403 Mods 2, 7 | 1403 Mod N1 | 2203 Mod A1 | |
| Type | Line | Line | Line | |
| No. of Columns | 132; 120 | 132 | 120; 144 | |
| Speed | 600 lpm | 1,100 lpm | 350 lpm | |
| **OTHER PERIPHERALS** | Submodels 5 and 6 MICR reader; communications controller; Selectric typewriter | | | |

| MANUFACTURER | IBM | Litton Automated Business Systems | Litton Automated Business Systems | National Cash Register |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | | Models 1220/1221; 1231; 1241; 1252 | | Century 50 |
| CPU Model No. | | — | | 615–50 |
| Word Length (bits) | | 40 | | 8 |
| I/O Channels | | 16 | | 0 or 1 |
| Type of Storage | | Drum | | Rod (thin film) |
| Capacity (words) | | 2K–4K | | 16K–32K |
| Cycle Time ($\mu$ sec) | | 0.5 | | 0.8 |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | | All models | | Century 50 and 100 |
| Assembler | | Yes | | Yes |
| Operating System | | Yes | | Yes |
| Compilers | | No | | Basic; Cobol; Fortran IV; NEAT/3 |
| **DISC** | | | | |
| SYSTEM IDENTITY | | Models 1241, 1252 | | Century 50 and 100 |
| Model No. | | 52 | | 655–101 |
| Capacity (char/pack) | | 16,384 | | 8.4M |
| Peak Xfer Rate (char/sec) | | N/A | | 108K |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | | | | Century 50 and 100 |
| Model No. | | | | 633 |
| Type | | | | Reel |
| Peak Xfer Rate (K char/sec) | | | | 40/80 |
| No. of Tracks | | | | 9 |
| Packing Density (bits/inch) | | | | 800/1,600 |
| **CARDS** | | | | |
| SYSTEM IDENTITY | Submodels 5 and 6 | | | Century 50 and 100 |
| Model No. | 2520 Mods A2, 3 | | | 682–100 |
| Type | Punches | | | Reader |
| Speed (char/min) | 500; 300 | | | 300 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | | All models | Models 1241, 1252 | Century 50 and 100 |
| Model No. | | — | — | 662–100 |
| Type | | Reader/punch | Reader/punch | Reader |
| Speed (char/sec) | | 30 | 50 | 1,000 |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | | All models | | Century 50 |
| Model No. | | 20/30 | | 640–122 |
| Type | | Serial | | Line |
| No. of Columns | | 192 | | 132 |
| Speed | | 35 cps | | 200 lpm |
| **OTHER PERIPHERALS** | | | | |

| MANUFACTURER | National Cash Register | National Cash Register | National Cash Register | National Cash Register |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | Century 100 | | N-500 | |
| CPU Model No. | 615-100 | | C-517-1 | |
| Word Length (bits) | 8 | | 48 | |
| I/O Channels | 2 | | 1 | |
| Type of Storage | Rod (thin film) | | Core | |
| Capacity (words) | 16K-32K | | 200-400 | |
| Cycle Time ($\mu$ sec) | 0.8 | | 1,080 | |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | | | N-500 | |
| Assembler | | | Yes | |
| Operating System | | | No | |
| Compilers | | | No | |
| **DISC** | | | | |
| SYSTEM IDENTITY | | | | |
| Model No. | | | | |
| Capacity (char/pack) | | | | |
| Peak Xfer Rate (char/sec) | | | | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | | | | |
| Model No. | | | | |
| Type | | | | |
| Peak Xfer Rate (K char/sec) | | | | |
| No. of Tracks | | | | |
| Packing Density (bits/inch) | | | | |
| **CARDS** | | | | |
| SYSTEM IDENTITY | Century 100 | | N-500 | N-500 |
| Model No. | 686; 687 | | C-582-1 | C-577-1 |
| Type | Punch | | Reader | Punch |
| Speed (char/min) | 80-240; 100 | | 100 | 100 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | Century 100 | Century 100 | N-500 | N-500 |
| Model No. | 660-101 | 665-101 | C-562-1; C-563-1 | C-571-1; C-572-1 |
| Type | Reader | Punch | Readers | Punches |
| Speed (char/sec) | 1,500 | 200 | 650; 50 | 120; 30 |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | Century 50 | Century 50 and 100 | N-500 | |
| Model No. | 640-132 | 640-102 | C-541 | |
| Type | Line | Line | Line | |
| No. of Columns | 132 | 132 | 96 | |
| Speed | 300 lpm | 450 lpm | 125 lpm | |
| **OTHER PERIPHERALS** | | | N-500 Magnetic stripe ledger | |

| MANUFACTURER | Philips Business Systems | Philips Business Systems | Qantel | Qantel |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | P-351 | P-352; P-353; P-358; P-359 | Q Series | Q Series |
| CPU Model No. | — | — | QA-2 | QB-2 |
| Word Length (bits) | 16 | 16 | 8 | 8 |
| I/O Channels | 1 | 4 | 12 | 12 |
| Type of Storage | Core | Core | Integrated circuit | Integrated circuit |
| Capacity (words) | 400 | 400-1,200 | 4K | 8K |
| Cycle Time ($\mu$sec) | 3.2 | 3.2 | 1.5 | 1.5 |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | All models | | Q Series | |
| Assembler | Yes | | Yes | |
| Operating System | No | | No | |
| Compilers | No | | No | |
| **DISC** | | | | |
| SYSTEM IDENTITY | | | Q Series | |
| Model No. | | | MD-2 | |
| Capacity (char/pack) | | | 7.6M | |
| Peak Xfer Rate (char/sec) | | | 142.5K | |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | | | Q Series | Q Series |
| Model No. | | | MF-1 | MG-1 |
| Type | | | Reel | Reel |
| Peak Xfer Rate (K char/sec) | | | 10 | 10 |
| No. of Tracks | | | 9 | 9 |
| Packing Density (bits/inch) | | | 800 | 800 |
| **CARDS** | | | | |
| SYSTEM IDENTITY | All except P-351 | All models | Q Series | |
| Model No. | P-115 | P-110 | AC-1 | |
| Type | Reader | Punch | Reader | |
| Speed (char/min) | 280 | 37.5 | 300 | |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | All models | P-352; P-353; P-358; P-359 | Q Series | |
| Model No. | P-120 | P-125 | AD-1 | |
| Type | Punch | Reader | Reader/Punch | |
| Speed (char/sec) | 50 | 50 | 50 | |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | P-351; P-352; P-353 | P-358; P-359 | Q Series | Q Series |
| Model No. | — | — | PD-1 | PB-1 |
| Type | Serial | Serial | Serial | Line |
| No. of Columns | 165 | 256 | 132 | 136 |
| Speed | 22.5 cps | 22.5 cps | 132 or 220 cps | 200 lpm |
| **OTHER PERIPHERALS** | P-351 Keyboard input | P-353; P-358; P-359 Magnetic stripe ledger card | Q Series Communications controllers | |

| MANUFACTURER | Qantel | Qantel | Singer | Singer |
|---|---|---|---|---|
| CENTRAL PROCESSOR & WORKING STORAGE | | | | |
| SYSTEM IDENTITY | Q Series | Q Series | System Ten | |
| CPU Model No. | QC-1 | QD-1 | Model 20 | |
| Word Length (bits) | 8 | 8 | 6 | |
| I/O Channels | 12 | 12 | 21 | |
| Type of Storage | Integrated circuit | Integrated circuit | Core | |
| Capacity (words) | 16K | 32K | 10K-110K | |
| Cycle Time ($\mu$ sec) | 1.5 | 1.5 | 3.3 | |
| SOFTWARE | | | | |
| SYSTEM IDENTITY | | | System Ten | |
| Assembler | | | Yes | |
| Operating System | | | No | |
| Compilers | | | RPG | |
| DISC | | | | |
| SYSTEM IDENTITY | | | System Ten | |
| Model No. | | | Model 40 | |
| Capacity (char/pack) | | | 10M | |
| Peak Xfer Rate (char/sec) | | | 229,000 | |
| MAGNETIC TAPE | | | | |
| SYSTEM IDENTITY | Q Series | | System Ten | |
| Model No. | MT-1 | | Model 45 | |
| Type | Cartridge | | Reel | |
| Peak Xfer Rate (K char/sec) | 5 | | 20 | |
| No. of Tracks | 4 | | 7; 9 | |
| Packing Density (bits/inch) | 1,600 | | 800/556; 800 | |
| CARDS | | | | |
| SYSTEM IDENTITY | | | System Ten | System Ten |
| Model No. | | | Model 30 | Model 35 |
| Type | | | Reader | Punch |
| Speed (char/min) | | | 300 | 100 |
| PAPER TAPE | | | | |
| SYSTEM IDENTITY | | | System Ten | System Ten |
| Model No. | | | Model 60 | Model 65 |
| Type | | | Reader | Punch |
| Speed (char/sec) | | | 300 | 150 |
| PRINTERS | | | | |
| SYSTEM IDENTITY | Q Series | | System Ten | |
| Model No. | PC-1 | | Model 50 | |
| Type | Line | | Line | |
| No. of Columns | 132 | | 132 | |
| Speed | 600 lpm | | 450 lpm | |
| OTHER PERIPHERALS | | | System Ten Workstation | |

| MANUFACTURER | Ultimacc Systems | Ultimacc Systems | Univac | Univac |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** | | | | |
| SYSTEM IDENTITY | ULTIMACC Tape System | ULTIMACC Disc System | Univac 9200 | Univac 9200 II |
| CPU Model No. | NOVA 1200 | NOVA 1200 | 9200 | 9200 |
| Word Length (bits) | 16 | 16 | 8 | 8 |
| I/O Channels | 1 | 15 | Opt mpx | Standard mpx |
| Type of Storage | Core | Core | Plated wire | Plated wire |
| Capacity (words) | 4K–32K | 8K–32K | 8K–16K | 8K–32K |
| Cycle Time ($\mu$ sec) | 1.2 | 1.2 | 1.2 | 1.2 |
| **SOFTWARE** | | | | |
| SYSTEM IDENTITY | Both systems | | 9200 and 9200 II | |
| Assembler | Yes | | Yes | |
| Operating System | Yes | | Yes | |
| Compilers | Basic; Fortran IV | | RPG; Fortran; Cobol | |
| **DISC** | | | | |
| SYSTEM IDENTITY | Disc System | | 9200 and 9200 II | 9200 II |
| Model No. | IOMEC 2000 | | 8410 | 8411 |
| Capacity (char/pack) | 5M | | 3.2M | 7.25M |
| Peak Xfer Rate (char/sec) | 200,000 | | 100,000 | 156,000 |
| **MAGNETIC TAPE** | | | | |
| SYSTEM IDENTITY | Tape System | | 9200 II | |
| Model No. | TRI-DATA 4196 | | Uniservo VI C | |
| Type | Cartridge | | Reel | |
| Peak Xfer Rate (K char/sec) | 1.9 | | 34.2 | |
| No. of Tracks | 4 | | 9 | |
| Packing Density (bits/inch) | 300 | | 800 | |
| **CARDS** | | | | |
| SYSTEM IDENTITY | | | 9200 and 9200 II | 9200 and 9200 II |
| Model No. | | | 0711-00 | 0603-04 |
| Type | | | Reader | Punch |
| Speed (char/min) | | | 400 | 75–200 |
| **PAPER TAPE** | | | | |
| SYSTEM IDENTITY | | | 9200 and 9200 II | |
| Model No. | | | 0920-00 | |
| Type | | | Reader/punch | |
| Speed (char/sec) | | | 300/110 | |
| **PRINTERS** | | | | |
| SYSTEM IDENTITY | Tape System | Disc System | 9200 and 9200 II | 9200 II |
| Model No. | Litton Model 30 | 2 models | 3030-00 | 0768-00 |
| Type | Serial | Line | Line | Line |
| No. of Columns | 192 | 132; 136 | 96 | 132 |
| Speed | 30 cps | 135; 300 lpm | 250 lpm | 900/1,100 lpm |
| **OTHER PERIPHERALS** | Disc System Video (CRT) display station; Teletypewriter | | 9200 and 9200 II Card controller; remote batch terminal; data communications controllers | 9200 II Selector channel |

| MANUFACTURER | Univac | Univac | Victor Comptometer | Victor Comptometer |
|---|---|---|---|---|
| **CENTRAL PROCESSOR & WORKING STORAGE** SYSTEM IDENTITY CPU Model No. Word Length (bits) I/O Channels Type of Storage Capacity (words) Cycle Time ($\mu$ sec) | | | 820/07, 08, 10 — Core-64; rod-18 1; 2; 2 Core; rod cell 16K-512K; 2K-6K 2.0 | 820/21, 23, 25, 30 — Core-64; rod-18 5; 3; 4; 6 Core; rod cell 16K-1, 024K; 1K-16K 2.0 |
| **SOFTWARE** SYSTEM IDENTITY Assembler Operating System Compilers | | | All models Yes No No | |
| **DISC** SYSTEM IDENTITY Model No. Capacity (char/pack) Peak Xfer Rate (char/sec) | 9200 II 8414 29M 312,500 | | | |
| **MAGNETIC TAPE** SYSTEM IDENTITY Model No. Type Peak Xfer Rate (K char/sec) No. of Tracks Packing Density (bits/inch) | | | 820/10, 21, 23, 30 732 Cassette 0.136 1 556 | |
| **CARDS** SYSTEM IDENTITY Model No. Type Speed (char/min) | 9200 II 0711-02 Reader 600 | 9200 II 0604-00 Punch 200 | 820/10, 21, 23, 30 031/800 Reader/punch 120/15 or 38 | |
| **PAPER TAPE** SYSTEM IDENTITY Model No. Type Speed (char/sec) | | | 820/08 090 Punch 25 | 820/10, 21, 23, 30 035/090 Reader/punch 200/25 |
| **PRINTERS** SYSTEM IDENTITY Model No. Type No. of Columns Speed | 9200 II 0768-99 Line 132 1,200/1,600 lpm | | All models — Serial 132 15.5 cps | All models — Dot-matrix — 165 cps |
| **OTHER PERIPHERALS** | | | 820/23, 25, 30 Magnetic stripe ledger card | |

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| BASIC/FOUR | | | | |
| Model 300 Central Processing Unit (8K) With Accounting Machine Terminal, 2100 Disc System | NA | 23,900.00 | 119.50 | Conversion-to-purchase option available; otherwise, only third-party leases. |
| Model 350 Central Processing Unit (8K) With Video Display Terminal, 2100 Disc System, 3100 Printer | NA | 28,900.00 | 144.50 | 90-day guarantee on parts and labor. Maintenance available 24 hr/day, 7 days/wk; additional charge for off-hours preventive maintenance. |
| Model 400 Central Processing Unit (8K) With Video Display Terminal and/or Accounting Machine Terminal, 2100 Disc System, 3100 Printer | NA | 29,900.00 | 149.50 | |
| Model 500 Central Processing Unit (8K) With Video Display Terminal and/or Accounting Machine Terminal, 2100 Disc System, 3100 Printer | NA | 30,900.00 | 154.50 | |
| 2100 Disc System (2.1 Mc) | NA | 7,950.00 | 39.75 | |
| 2200 Disc System (4.2 Mc) | NA | 9,950.00 | 49.75 | |
| 2300 Disc System (2.1-4.2 Mc) | NA | 2,000.00 | 10.00 | |
| 6100 Magnetic Tape System (800 bpi) | NA | 8,250.00 | 91.25 | |
| 4100 Card Reader (400 cpm) | NA | 3,950.00 | 19.75 | |
| 4200 Card Reader (400 or 800 cpm) Paper Tape Reader/Punch (500/75 cps) | NA | 6,100.00 | 30.50 | |
| 3100 Printer (60 lpm) | NA | 5,950.00 | 29.75 | |
| 3300 Printer 200 lpm) | NA | 8,950.00 | 44.75 | |
| 7100 Accounting Machine Terminal (Models 400 and 500) | NA | NA | NA | |
| 7300 Video Display Terminal (Models 400 and 500) | NA | NA | NA | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * |
| BURROUGHS L SERIES | | | | |
| L2000 Processors (with keyboard) | | | | (1) Prices given are for 3-month warranty. Same styles can be purchased with 1-year warranty for $7,350 and $8,350. |
| L2000-008 (128 user words) | 243.00 | 6,995.00 (1) | NA | |
| L2000-208 (256 user words) | 276.00 | 7,995.00 (1) | NA | |
| L2101-008 (128 user words) | 280.00 | 8,490.00 | NA | |
| L2101-208 (256 user words) | 313.00 | 9,490.00 | NA | |
| L2101-408 (384 user words) | 346.00 | 10,490.00 | NA | |
| L2101-608 (512 user words) (2) | 379.00 | 11,490.00 | NA | (2) User words may be fewer, depending on firmware requirements. |
| L2301-008 (128 user words) | 290.00 | 8,790.00 | NA | |
| L2301-208 (256 user words) | 323.00 | 9,790.00 | NA | |
| L2301-408 (384 user words) | 356.00 | 10,790.00 | NA | Request maintenance information for L2000/ 3000/4000/5000 from manufacturer. Maintenance costs shown for L7000 are for lowest cost, metropolitan area plan. Other plans available; prices higher outside metropolitan areas. |
| L2301-608 (512 user words) (2) | 389.00 | 11,790.00 | NA | |
| L2302-908 (768 user words) (2) | 455.00 | 13,790.00 | NA | |
| L3000 Processors (with keyboard) | | | | |
| L3111-008 (128 user words) | 326.00 | 9,890.00 | NA | |
| L3111-208 (256 user words) | 359.00 | 10,890.00 | NA | |
| L3111-408 (384 user words) | 392.00 | 11,890.00 | NA | |
| L3111-608 (512 user words) (2) | 425.00 | 12,890.00 | NA | |
| L3311-008 (128 user words) | 336.00 | 10,190.00 | NA | Leases also available for 2-, 3-, 4-, or 5-year terms. |
| L3311-208 (256 user words) | 369.00 | 11,190.00 | NA | |

NC  No Charge      — Not Applicable     TM  Time and Material Basis
S  Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| BURROUGHS L SERIES (CONTD) | | | | |
| L3311-408 (384 user words) | 402.00 | 12,190.00 | NA | |
| L3311-608 (512 user words) (2) | 435.00 | 13,190.00 | NA | |
| L3312-908 (768 user words) (2) | 495.00 | 14,190.00 | NA | |
| L3231-307 (256 user words) | 297.00 | 8,990.00 | NA | |
| L3231-608 (320 user words) | 363.00 | 10,990.00 | NA | |
| L3331-608 (288 user words) | 396.00 | 11,990.00 | NA | |
| L4000 Processors (with keyboard) | | | | |
| L4111-209 (256 user words) | 406.00 | 12,290.00 | NA | |
| L4111-409 (384 user words) | 439.00 | 13,290.00 | NA | |
| L4111-609 (512 user words) (2) | 472.00 | 14,290.00 | NA | |
| L4311-209 (256 user words) | 415.00 | 12,590.00 | NA | |
| L4311-409 (384 user words) | 448.00 | 13,590.00 | NA | |
| L4311-609 (512 user words) (2) | 481.00 | 14,590.00 | NA | |
| L4312-909 (768 user words) (2) | 514.00 | 15,590.00 | NA | |
| L5000 Processors (with keyboard) | | | | |
| L5012-609 (608 user words) | 660.00 | 19,990.00 | NA | |
| L5112-679 (608 user words) (2) | 710.00 | 21,500.00 | NA | |
| L5112-609 (608 user words) (2) | 759.00 | 22,900.00 | NA | |
| I/O Subsystems for L2000/3000/4000/5000 | | | | |
| A595 Card Reader | 97.00 | 2,950.00 | NA | |
| A596 Card Reader | 115.00 | 3,490.00 | NA | |
| A509 Card Punch Control Unit | 33.00 | 1,000.00 | NA | |
| A149 Card Punch (GPV product) | 120.00 | 5,990.00 | NA | |
| A581 Paper Tape/Edge Punched Card Reader | 46.00 | 1,390.00 | NA | |
| A562 Paper Tape/Edge Punched Card Perforator | 52.00 | 1,590.00 | NA | |
| A4005 Magnetic Record Reader (L5000 only) | 148.00 | 4,490.00 | NA | |
| L7000 Processors (with console) | | | | Available user words |
| L7300-300 | 495.00 | 15,000.00 | 62.08 | on L7000 processors |
| L7300-350 | 500.00 | 15,150.00 | 62.91 | depend on interpreter |
| L7400-400 | 541.00 | 16,400.00 | 64.08 | requirement. |
| L7400-450 | 546.00 | 16,550.00 | 64.91 | |
| L7500-501 | 843.00 | 25,550.00 | 85.50 | |
| L7500-551 | 848.00 | 25,700.00 | 86.33 | |
| L7500-502 | 888.00 | 26,900.00 | 93.83 | |
| L7500-552 | 893.00 | 27,050.00 | 94.67 | |
| A2311 Extended Memory Controller | 42.00 | 1,275.00 | 3.33 | |
| A5400 Scratchpad Memory Module (32 words) | 15.00 | 45.00 | 0.50 | |
| A7311 Extended Memory Module Control | 6.00 | 175.00 | 0.50 | |
| A7312 Cable for Third Extended Memory Module | 7.00 | 200.00 | 0.50 | |
| A9371 Extended Memory Module- (2,048 words) | 83.00 | 2,500.00 | 5.00 | |
| I/O Subsystems for L7000 | | | | |
| A2321 Card/Tape Subsystem Controller | 33.00 | 1,000.00 | 3.75 | |
| A6321 Card/Tape Subsystem Buffer No. 2 or No. 4 | 5.00 | 165.00 | 0.58 | |
| A6322 Card/Tape Subsystem Buffer No. 3 | 12.00 | 350.00 | 1.33 | |
| A3111 Card Reader Control | 10.00 | 310.00 | 1.17 | |
| A9114 Card Reader | 70.00 | 2,120.00 | 19.83 | |
| A8111 Card Reader Code Conversion (BCL) | 2.00 | 60.00 | 0.25 | |
| A8112 Card Reader Code Conversion (EBCDIC) | 2.00 | 60.00 | 0.25 | |

NC  No Charge     — Not Applicable    TM  Time and Material Basis
S    Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| BURROUGHS L SERIES (CONTD) | | | | |
| A3211 Card Punch Control | 31.00 | 775.00 | 2.92 | |
| A 149 Card Punch | 120.00 | 5,990.00 | 27.50 | |
| A8211 Card Punch Code Conversion (BCL) | 2.00 | 60.00 | 0.25 | |
| A8212 Card Punch Code Conversion (EBCDIC) | 2.00 | 60.00 | 0.25 | |
| A3121 Paper Tape/Edge Punched Card Reader Control | 14.00 | 425.00 | 1.58 | |
| A3222 Paper Tape/Edge Punched Card Punch Control | 14.00 | 425.00 | 1.58 | |
| A9222 Paper Tape/Edge Punch Card Punch | 38.00 | 1,165.00 | 11.67 | |
| A9161 Magnetic Record Reader (single track) | 148.00 | 4,490.00 | 24.83 | |
| A9162 Magnetic Record Reader (dual track) | 161.00 | 4,890.00 | 24.83 | |
| * * * * * * * * * * | * * * | * * * | * * * | * * * * * * * |
| CASCADE DATA 80 SERIES | | | | |
| 80/20 Computer System 8000 CPU (8-16K) Console Keyboard 4001 Magnetic Tape System (600 bpi) 4005 Magnetic Tape System ((1,800 bpi) Paper Tape Reader (100 cps) Paper Tape Punch (60 cps) 6001 Printer (20 lpm) 6020 Printer (200 lpm) | NA | 28,045.00– 33,345.00 | NA | All prices RPQ. Lease prices include maintenance and installation; lease is 5-yr, full payout, noncancell-able. Usage is unlimited. Included in cost of purchase or lease is 6-month full warranty, with maintenance contract available after that. |
| 80/30 Computer System 8000 CPU (8-64K) Console Keyboard 4001 Magnetic Tape System (600 bpi) 4005 Magnetic Tape System (1,800 bpi) 6050 Card Reader (300 cpm) Paper Tape Reader (100 cps) Paper Tape Punch (60 cps) 6001 Printer (20 lpm) 6010 Printer (90 lpm) 6020 Printer (200 lpm) | NA | 30,670.00– 38,970.00 | NA | Maintenance service 24 hr/day; additional rates for off-hour preventive maintenance. Free operator training; programmer training is $200. |
| 80/40 Computer System 8000 CPU (8-64K) Console Keyboard 4011 Disc System (5 mc) 4001 Magnetic Tape System (600 bpi) 4005 Magnetic Tape System (1,800 bpi) Paper Tape Reader (100 cps) Paper Tape Punch (60 cps) 6001 Printer (20 lpm) 6010 Printer (90 lpm) 6020 Printer (200 lpm) | NA | 45,705.00– 58,855.00 | NA | |
| * * * * * * * * * * | * * * | * * * | * * * | * * * * * * * |

NC  No Charge    — Not Applicable    TM  Time and Material Basis
S  Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **ELDORADO ELECTRODATA MODEL 140** | | | | |
| 140 Basic Processor (8K Memory; 3 read/write Cassette Drives; Selectric Typewriter with Forms Tractor) | – | 18,750.00 | 109.00 | Leases available through leasing firms, but not from manufacturer. |
| Memory (4–61K) | – | 2,000.00 | 12.00 | |
| 10-Key Auxiliary Keyboard and Interface | – | 800.00 | 5.00 | Maintenance charges 7% of purchase price per year. |
| Disc Controller (up to 4 Disc Drives) | – | 1,450.00 | 8.00 | Prices shown are per month, |
| Moving Head Disc (5 mb) | – | 10,250.00 | 60.00 | to the nearest dollar. |
| IBM-Compatible Magnetic Tape Controller (7- or 9-track) | – | 2,000.00 | 12.00 | |
| IBM-Compatible Magnetic Tape Transport (7- or 9-track; 7-in. reels) | – | 4,600.00 | 27.00 | |
| IBM-Compatible Magnetic Tape Transport 7- or 9-track; 10½-in. reels) | – | 6,100.00 | 36.00 | |
| Card Reader and Controller (300 cpm) | – | 3,300.00 | 19.00 | |
| Line Printer and Controller (132 columns; 60 lpm) | – | 4,300.00 | 25.00 | |
| Line Printer and Controller (132 columns; 135 lpm) | – | 6,750.00 | 39.00 | |
| Line Printer and Controller (132 columns; 600 lpm) | – | 14,200.00 | 83.00 | |
| * * * * * * * * * * | * * * | * * * | * * * | * * * * * * * * |
| **HIS SERIES 50, MODEL 58** | | | | |
| 58MOD1 Central System (5,000-byte processor; keyboard; 100 cpm card reader; 100 lpm, 96-column printer; 10 position visual display) | 842.00 | 31,620.00 | 181.00 | Rental entitles the lessee to support services and unlimited equipment usage. If equipment is installed in a location remote from the nearest |
| AMK050 Additional 5,000 Bytes of Memory | 208.00 | 7,740.00 | 45.00 | Honeywell Field Engineering District Office that normally |
| CRS050 200-cpm Option for Card Reader | 198.00 | 7,350.00 | 43.00 | services it, a monthly |
| OMR050 Optical Mark Reading Option for Card Reader | 62.00 | 2,320.00 | 14.00 | maintenance surcharge applies. |
| PMK051 128-Column Option for Printer | 42.00 | 1,550.00 | 10.00 | 3- and 5-year leases are |
| PMK053 200-lpm Option for Printer | 114.00 | 4,260.00 | 26.00 | available at lower rates. |
| DSS058 Disc Storage Subsystem (3.46 mb) | 499.00 | 25,920.00 | 188.00 | |
| ADS158 Additional Disc Storage (2.3 mb) | 135.00 | 3,360.00 | 22.00 | |
| ADS258 Additional Disc Storage (5.76 mb) | 239.00 | 6,000.00 | 32.00 | |
| DSC050 Disc Controller (max 1/system) | 146.00 | 5,520.00 | 44.00 | |
| DSU110 Disc Drive (2.3 mb; max 2/DSC050) | 338.00 | 13,730.00 | 45.00 | |
| CPA050 Card Punch (40 cps) | 104.00 | 3,870.00 | 26.00 | |
| PCP050 Print Option for CPA050) | 31.00 | 1,160.00 | 6.00 | |
| SLC055 Single-Line Communications Controller | 229.00 | 8,520.00 | 49.00 | |
| PLF055 Polling/Selection Mode for SLC055 | 62.00 | 2,320.00 | 14.00 | |
| CS100 Off-Line Card Sorter | 83.00 | 3,880.00 | 26.00 | |
| P112 Off-Line Keypunch | 114.00 | 4,150.00 | 46.00 | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |

NC  No Charge          —  Not Applicable    TM  Time and Material Basis
S    Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **HIS SERIES 100, MODEL 15** | | | | |
| | | | | Configuration: CPU comes |
| 1M156D  16K Processor | 1,971.00 | 79,590.00 | 287.00 | with 400 cpm card reader |
| 1M156F  24K Processor | 2,283.00 | 92,190.00 | 325.00 | and 200 cpm card punch. |
| 1M156H  32K Processor | 2,595.00 | 104,790.00 | 362.00 | DSS164 Disc Storage |
| 1M156L  48K Processor | 3,635.00 | 146,790.00 | 443.00 | Subsystem and PRT 110, |
| 1M156P  64K Processor | 4,259.00 | 171,990.00 | 524.00 | 120, or 130 printer |
| | | | | required.  Model 1M156L |
| Additional Basic Configuration | | | | and 1M156P require the |
| Requirements | | | | MSOP115 CPU Upgrade. |
| DSS164 Disc Storage Subsystem | | | | |
| (5.7 mb) | 634.00 | 29,280.00 | 210.00 | 3- and 5-year leases |
| MSOP115 CPU Upgrade (required for | | | | available at lower cost. |
| 1M156L and 1M156P) | 218.00 | 8,820.00 | 32.00 | Lease charge entitles |
| PRT110 Printer (600 lpm),    or | 629.00 | 22,080.00 | 156.00 | lessee to support services, |
| PRT120 Printer (780 lpm),    or | 936.00 | 32,835.00 | 232.00 | and scheduled use and |
| PRT130 Printer (1,100 lpm) | 1,144.00 | 40,175.00 | 283.00 | maintenance during up to |
| | | | | 9 consecutive hr/day |
| Basic Configuration Options | | | | between 7:00 a.m. and 6:00 |
| ADS164 Capacity Upgrade for DSS164 | | | | p.m., Monday through |
| (5.7 mb) | 239.00 | 6,000.00 | 32.00 | Friday.  Additional |
| ADU164 Additional Disc Pack Drives | | | | charge for equipment |
| for DSS164 (11.4 mb) | 676.00 | 28,600.00 | 159.00 | usage scheduled outside |
| CS0600 Card Reader Upgrade (to 600 cpm) | 47.00 | 1,440.00 | 16.00 | this period. |
| | | | | |
| Peripheral Equipment | | | | |
| DSU130 Disc Control (up to 5 drives) | 312.00 | 13,055.00 | 30.00 | |
| DSU130 Disc Drives (2.98 mc) | 286.00 | 10,705.00 | 56.00 | |
| DSS161 Disc Storage Subsystem | | | | |
| (15.36 mc) | 1,695.00 | 48,360.00 | 198.00 | |
| DSU160 Additional Disc Pack for DSS160 | | | | |
| (7.68 mc; up to 6 can be | | | | |
| added to DSS161) | 645.00 | 15,780.00 | 80.00 | |
| | | | | |
| MTS163 Magnetic Tape Subsystem | | | | |
| (control and 1 tape unit; add up | | | | |
| to 7 units; 9-track, 30 kc/sec) | 832.00 | 34,416.00 | 89.00 | |
| MTH163 Magnetic Tape Unit (9-track, | | | | |
| (30 kc/sec) | 312.00 | 12,240.00 | 48.00 | |
| OPT173 7-track Compatibility | | | | |
| (200/556/800 bpi) | 26.00 | 1,008.00 | 4.00 | |
| OPT183 200/556/800 bpi Recording | | | | |
| Densities | 208.00 | 8,832.00 | 17.00 | |
| OPT193 800 bpi Recording Density | 26.00 | 1,008.00 | 4.00 | |
| | | | | |
| MTS166 Magnetic Tape Subsystem (control | | | | |
| and 1 tape unit; add up to 7 | | | | |
| units; 9-track, 60 kc/sec) | 1,248.00 | 51,744.00 | 131.00 | |
| MTH166 Magnetic Tape Unit (9-track, | | | | |
| 60 kc/sec) | 468.00 | 18,528.00 | 69.00 | |
| OPT176 7-track Compatibility | | | | |
| (200/556/800 bpi) | 26.00 | 1,008.00 | 4.00 | |
| OPT186 200/556/800 bpi Recording | | | | |
| Densities | 208.00 | 8,832.00 | 17.00 | |
| OPT196 800 bpi Recording Density | 26.00 | 1,008.00 | 4.00 | |
| | | | | |
| CRZ100 Card Reader and Control (300 | | | | |
| cpm) | 156.00 | 5,760.00 | 32.00 | |
| CRZ111 Card Reader and Control (400 | | | | |
| cpm; includes 2 stackers) | 239.00 | 8,880.00 | 48.00 | |
| CRZ120 Card Reader and Control (600 | | | | |
| cpm; includes 2 stackers) | 286.00 | 10,320.00 | 65.00 | |
| CPZ101 Card Punch and Control (200 | | | | |
| cpm) | 328.00 | 11,670.00 | 77.00 | |
| CPZ103 Card Punch and Control (300 | | | | |
| cpm) | 629.00 | 22,420.00 | 148.00 | |
| CRP100 Card Reader/Punch and Control | | | | |
| (300/300 cpm, includes 3 | | | | |
| stackers) | 614.00 | 21,510.00 | 153.00 | |

NC  No Charge         —  Not Applicable    TM  Time and Material Basis
S    Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| HIS SERIES 100, MODEL 15 (CONTD) | | | | |
| OPT024 51-Column Adapter for CRZ111 | 52.00 | 2,016.00 | 9.00 | |
| OPT025 51-Column Adapter for CRZ120 | 36.00 | 1,300.00 | 9.00 | |
| PTR100 Paper Tape Reader (500 cps) | 125.00 | 4,520.00 | 28.00 | |
| PTP110 Paper Tape Punch (60 cps) | 114.00 | 4,080.00 | 27.00 | |
| PRT100 Printer and Control (300 lpm; 104 PP) | 432.00 | 15,120.00 | 108.00 | |
| OPT075 Extension of Print Positions to 120 | 36.00 | 1,300.00 | 9.00 | |
| OPT076 Extension of Print Positions to 136 | 73.00 | 2,545.00 | 18.00 | |
| OPT080 Fast Skip (63 ips) | 73.00 | 2,545.00 | 18.00 | |
| PRT110 Printer and Control (600 lpm; 104 PP) | 629.00 | 22,080.00 | 156.00 | |
| OPT077 Extension of Print Positions to 120 | 47.00 | 1,635.00 | 12.00 | |
| OPT078 Extension of Print Positions to 136 | 94.00 | 3,270.00 | 24.00 | |
| OPT079 Fast Skip (63 ips) | 73.00 | 2,545.00 | 18.00 | |
| PRT120 Printer and Control (780 lpm, 120 PP) | 936.00 | 32,835.00 | 232.00 | |
| OPT085 Extension of Print Positions to 136 | 104.00 | 3,650.00 | 26.00 | |
| OPT086 Fast Skip | 73.00 | 2,545.00 | 18.00 | |
| PRT130 Printer and Control (1,100 lpm; 120 PP; fast skip) | 1,144.00 | 40,175.00 | 283.00 | |
| OPT087 Extension of Print Positions to 136 | 104.00 | 3,650.00 | 26.00 | |
| PSC100 Manual Switch Console (includes 1 PSU100) | 166.00 | 6,480.00 | 27.00 | |
| PSU100 Manual Switch (for switching 2 peripheral controls to same central processor) | 42.00 | 1,632.00 | 6.00 | |
| PSC101 Manual Switch Console (includes 1 PSU101) | 166.00 | 6,480.00 | 27.00 | |
| PSU101 Manual Switch (for switching 1 peripheral control between 2 central processors) | 42.00 | 1,632.00 | 6.00 | |
| SLC100 Datanet 10 Single-Line Communications Controller (half-duplex, synch, up to 2,400 bps, ASCII code) | 218.00 | 9,320.00 | 17.00 | |
| SLC102 Datanet 12 Single-Line Communications Controller (half-duplex, synch, up to 50,000 bps; ASCII code) | 312.00 | 12,100.00 | 52.00 | |
| SLC111 Single-Line Communications Controller (half-duplex; asynch; up to 1,200 bps; ASCII code) | 218.00 | 8,592.00 | 33.00 | |
| SLC112 Single-Line Communications Controller (half-duplex; synch; up to 150,000 bps; ASCII code) | 312.00 | 12,288.00 | 47.00 | |
| SLC113 Single-Line Communications Controller (half-duplex; synch; up to 2,400 bps; ASCII code) | 218.00 | 8,592.00 | 33.00 | |
| SLC114 Single-Line Communications Controller (half-duplex; synch; up to 150,000 bps; ASCII code) | 218.00 | 8,592.00 | 33.00 | |
| SLC115 Single-Line Communications Controller (half-duplex; synch; up to 2,400 bps; Excess 3 code) | 218.00 | 8,592.00 | 33.00 | |

NC  No Charge          —  Not Applicable     TM  Time and Material Basis
S   Single Use Charge     NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **HONEYWELL SERIES 200 MODELS 105 AND 115** | | | | |
| Model 105 Central Processing Unit | | | | Monthly lease prices for |
| 106-1 (16K; power supply; control panel) | 555.00 | 27,170.00 | 83.00 | Model 105's not on a Group B contract include maintenance, |
| 106-2 (24K; power supply; control panel) | 1,032.00 | 46,560.00 | 154.00 | support services, and unlimited equipment usage. For use of |
| 106-3 (32K; power supply; control panel) | 1,453.00 | 60,060.00 | 216.00 | Model 115 outside of the 7 a.m. to 6 p.m. time period, |
| 1014 8-Bit Code Handling Instruction | 27.00 | 1,250.00 | 3.00 | increase base monthly rental |
| 1019-1 Simultaneous Use of Third R/W Channel | 68.00 | 3,025.00 | 11.00 | by (.0006 x monthly rental) x (hours of extra use). |
| Model 115 Central Processing Unit | | | | Models 105 and 115 are available under 1, 3, and 5 year leases. |
| 116-1 (16K; power supply; control panel) | 1,118.00 | 50,020.00 | 168.00 | |
| 116-2 (24K; power supply; control panel) | 1,430.00 | 63,985.00 | 215.00 | A monthly maintenance surcharge applies to equipment |
| 116-3 (32K; power supply; control panel) | 1,742.00 | 77,905.00 | 262.00 | installed remote from the nearest Honeywell Field |
| 1014 8-Bit Code Handling Instruction | 27.00 | 1,250.00 | 3.00 | Engineering District Office. |
| 1019 Simultaneity for Third R/W Channel | 130.00 | 5,810.00 | 13.00 | |
| 1044 Direct Transcription | 63.00 | 2,250.00 | 6.00 | |
| Features for 105 and 115 | | | | |
| 212-1 Central Processor Adapter (for connection of any two Series 200 processors) | 445.00 | 18,000.00 | 48.00 | |
| 212-2 Central Processor Memory-to-Memory Transfer Unit | 445.00 | 18,000.00 | 48.00 | |
| 213-3 Interval Timer | 100.00 | 3,600.00 | 11.00 | |
| 071 Interval Selector | 63.00 | 2,250.00 | 6.00 | |
| 213-4 Time-of-Day Clock | 226.00 | 9,000.00 | 26.00 | |
| Consoles for Models 105 and 115 | | | | |
| 220-1 (with printer) | 226.00 | 9,000.00 | 26.00 | |
| 220-3 (replaces control panel on 115) | 340.00 | 13,500.00 | 38.00 | |
| 008 Pin-Feed Drive | 27.00 | 1,125.00 | 6.00 | |
| Disc Storage for Model 105 | | | | |
| 170-2 Disc Storage Subsystem | 499.00 | 20,460.00 | 151.00 | |
| 173-2 Disc Storage Subsystem (18.4 M char) | 832.00 | 34,320.00 | 188.00 | |
| 070 Direct Access Time Speedup | 42.00 | 1,760.00 | 5.00 | |
| 173 Disc Pack Drive (for 173-2; 9.2M char) | 416.00 | 17,160.00 | 94.00 | |
| Disc Storage for Model 115 | | | | |
| 157C Disc Control for 155 Disc Pack Drive | 281.00 | 11,700.00 | 32.00 | |
| 257C Disc Control for 155 Disc Pack Drive | 322.00 | 13,500.00 | 38.00 | |
| 155 Disc Pack Drive (3.6M char) | 389.00 | 14,910.00 | 69.00 | |
| 171 Disc Pack Drive (4.6M char) | 335.00 | 12,875.00 | 75.00 | |
| 172 Disc Pack Drive (9.2M char) | 478.00 | 21,220.00 | 81.00 | |
| 276-2 Disc Storage Subsystem (74.8M char) | 1,498.00 | 67,200.00 | 271.00 | |
| 074 Write Protect | 21.00 | 900.00 | 4.00 | |
| 076 Dynamic Disc Addressing | 26.00 | 1,050.00 | 3.00 | |
| 079 Central Processor Finished (for 172 and 276-2) | 32.00 | 1,350.00 | 6.00 | |
| 276 Disc Pack Drive (for 276-2; 37.4M char) | 515.00 | 23,040.00 | 98.00 | |
| Magnetic Tape for Model 115 Only | | | | |
| 103F Tape Control (includes one 204B-21; controls up to four 204B-21 and -22 units) | 792.00 | 31,080.00 | 118.00 | |

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| HONEYWELL SERIES 200 MODELS 105 AND 115 (CONTD) | | | | |
| | | | | |
| 203B-1 Tape Control (up to eight 204B-1, -2, -3, -4 units) | 476.00 | 18,360.00 | 51.00 | |
| 203B-2 Tape Control (up to eight 204B-5 units; no interrupt) | 476.00 | 18,360.00 | 51.00 | |
| 203B-2A Tape Control (up to eight 204B-5 units) | 476.00 | 18,360.00 | 51.00 | |
| 293B-4 Tape Control (up to eight 204B-7, -8 units) | 476.00 | 18,360.00 | 51.00 | |
| 203B-6 and 203B-6A Tape Control (up to eight 204B-9 units) | 476.00 | 18,360.00 | 51.00 | |
| 203D-1 Tape Control (up to eight 204D-1 units) | 759.00 | 29,400.00 | 84.00 | |
| 203D-3 Tape Control (up to eight 204D-3 units) | 864.00 | 33,600.00 | 96.00 | |
| 050 IBM Format Feature (for type 203B) | 63.00 | 2,250.00 | 6.00 | |
| 051 IBM Code Compatibility Feature (for type 203B) | 63.00 | 2,250.00 | 6.00 | |
| 052 IBM 7-Channel Tape (for type 203D) | 166.00 | 5,500.00 | 16.00 | |
| 056 Dynamic Tape Addressing | 26.00 | 1,050.00 | 2.00 | |
| 059 Density Switch (for 203D, 103F) | 21.00 | 670.00 | 2.00 | |
| 1052 EBCDIC Code Translator (for type 203D) | 104.00 | 4,100.00 | 11.00 | |
| 1055 IBM Magnetic Tape Compatibility (for type 103F) | 63.00 | 2,160.00 | 6.00 | |
| 204B-1 Magnetic Tape Unit (200/556 bpi) | 396.00 | 15,120.00 | 89.00 | |
| 204B-2 Magnetic Tape Unit (200/556 bpi) | 343.00 | 12,960.00 | 75.00 | |
| 204B-3 Magnetic Tape Unit (200/556 bpi) | 560.00 | 21,600.00 | 126.00 | |
| 204B-4 Magnetic Tape Unit (200/556 bpi) | 506.00 | 19,440.00 | 114.00 | |
| 204B-5 Magnetic Tape Unit (200/556 bpi) | 791.00 | 30,240.00 | 176.00 | |
| 204B-7 Magnetic Tape Unit (556/800/ 1,200 bpi) | 448.00 | 17,280.00 | 100.00 | If specified at time of order 204B-7, -8, -9 can come with 200/800 bpi. |
| 055 1,200 bpi Recording Density | 53.00 | 2,100.00 | 6.00 | |
| 204B-8 Magnetic Tape Unit (556/800 bpi) | 675.00 | 25,920.00 | 151.00 | |
| 204B-9 Magnetic Tape Unit (556/800/ 1,200 bpi) | 896.00 | 34,560.00 | 200.00 | |
| 054 1,200 bpi Recording Density | 26.00 | 1,300.00 | 2.00 | |
| 204B-21 Magnetic Tape Unit (200/556 bpi) | NA | NA | NA | |
| 204B-22 Magnetic Tape Unit (220/556 bpi) | 338.00 | 12,800.00 | 86.00 | |
| 204D-1 Magnetic Tape Unit (800/1,600 bpi) | 417.00 | 15,960.00 | 91.00 | |
| 204D-3 Magnetic Tape Unit (800/1,600 bpi) | 601.00 | 23,100.00 | 131.00 | |
| | | | | |
| Punched Card for Models 105 and 115 | | | | |
| 123 Card Reader (400 cpm) | 223.00 | 9,000.00 | 62.00 | |
| 1043 51-Column Adapter | 32.00 | 1,125.00 | 8.00 | |
| 214-1 Card Punch (100-400 cpm) | 381.00 | 14,700.00 | 108.00 | |
| 214-2 Card Reader/Punch (400 cpm reading; 100-400 cpm punching) | 439.00 | 16,800.00 | 125.00 | |
| | | | | |
| Punched Card for Model 115 Only | | | | |
| 123-2 Card Reader (600 cpm) | 281.00 | 11,475.00 | 82.00 | |
| 123-4 Card Reader (1,050 cpm) | 375.00 | 14,490.00 | 108.00 | |
| 1043 51-Column Adapter | 32.00 | 1,125.00 | 8.00 | |
| 223 Card Reader and Control (800 cpm) | 344.00 | 13,500.00 | 92.00 | |
| 223-2 Card Reader and Control (1,050 cpm) | 392.00 | 15,120.00 | 113.00 | |
| 043 51-Column Adapter | 48.00 | 1,800.00 | 6.00 | |
| 044 Direct Transcription | 32.00 | 1,125.00 | 5.00 | |
| 045 90-Column Card Reading Capability (for 223) | 131.00 | 5,025.00 | 18.00 | |

NC  No Charge          —  Not Applicable     TM  Time and Material Basis
S    Single Use Charge      NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| HONEYWELL SERIES 200 MODELS 105 AND 115 (CONTD) | | | | |
| Paper Tape for Models 105 and 115 | | | | |
| 209-2 Paper Tape Reader and Control (600 frames/sec) | 367.00 | 14,625.00 | 43.00 | |
| 210 Paper Tape Punch and Control (120 frames/sec) | 257.00 | 10,125.00 | 34.00 | |
| 1021 NCR-Type Reel Hubs | NC | NC | NC | Either 1021 or 1022 must be specified. |
| 1022 NAB-Type Reel Hubs | NC | NC | NC | |
| Printer for Model 105 | | | | |
| 112 Printer (300 lpm) | 493.00 | 20,250.00 | 149.00 | |
| 1032 Extension of Print Positions from 120 to 132 | 63.00 | 2,250.00 | 15.00 | |
| Printers for Model 115 | | | | |
| 122-3 Printer (650 lpm; 120 print positions) | 909.00 | 35,070.00 | 244.00 | |
| 122-4 Printer (950 lpm; 120 print positions) | 1,198.00 | 46,200.00 | 286.00 | |
| 122-6 Printer (1,100 lpm; 120 print positions) | 1,340.00 | 51,660.00 | 299.00 | |
| 1034 Extension of print positions from 120 to 132 | 63.00 | 2,250.00 | 15.00 | |
| 222-3 Printer and Control (650 lpm; 120 print positions) | 1,015.00 | 40,500.00 | 271.00 | |
| 222-4 Printer and Control (950 lpm; 120 print positions) | 1,433.00 | 57,375.00 | 384.00 | |
| 222-6 Printer and Control (1,100 lpm; 120 print positions) | 1,522.00 | 60,975.00 | 393.00 | |
| 222-7 Printer and Control (300 lpm; 120 print positions) | 650.00 | 25,410.00 | 185.00 | |
| 032 Extension of Print Positions from 120 to 132 (for 222-3, -4 and -6) | 106.00 | 4,500.00 | 30.00 | |
| 034 Numeric Print (for 222-3) | 141.00 | 5,625.00 | 15.00 | |
| 035 Numeric Print (for 222-4) | 32.00 | 1,125.00 | 4.00 | |
| 036 Print Buffer (for 222-3, -4, -6 and -7) | 236.00 | 9,100.00 | 34.00 | |
| 1032 Extension of Print Positions from 120 to 132 (for 222-7) | 63.00 | 2,250.00 | 15.00 | |
| 1033 8-Channel Format Tape (for 222-7) | 32.00 | 1,125.00 | 4.00 | |
| Optical Document Reader for Model 115 | | | | |
| 243 Optical Document Reader and Control | 1,768.00 | 67,200.00 | 464.00 | |
| 042 Optical Mark Read | 333.00 | 12,600.00 | 87.00 | |
| MICR for Model 115 | | | | |
| 232 MICR Reader-Sorter and Control | 1,361.00 | 56,250.00 | 324.00 | |
| 236-1 MICR Control (for 236) | – | 14,950.00 | 32.00 | |
| 236 MICR Reader-Sorter (16 pockets; 1,625 doc/min) | – | 96,600.00 | 564.00 | All options must be stated at time of order. Leases are available for 3 and 5 years only. |
| 236-2 Multilevel E13B Recognition | – | 19,300.00 | 72.00 | |
| 236-3 Endorser | – | 10,120.00 | 65.00 | |
| 236-4 Expansion Unit (16 additional pockets) | – | 5,060.00 | 13.00 | |
| 236-5 Expansion Module (4 additional pockets) | – | 15,180.00 | 47.00 | |
| 236-6 Mobile Carrier | – | 175.00 | NC | |
| 236-7 Short Document Read Capability | – | 690.00 | 2.00 | |
| 236-8 Short Document Module Expansion | – | 460.00 | 2.00 | |
| 236-9 Batch Ticket Detector | – | 690.00 | 2.00 | |
| 236-10 Resettable Item Counter | – | 460.00 | 2.00 | |
| 236-11 Basic Off-Line Sort | – | 1,610.00 | 6.00 | |
| 236-12 Expanded Off-Line Field Sort | – | 460.00 | 2.00 | |
| 236-13 Digit Override | – | 690.00 | 2.00 | |

NC  No Charge    —  Not Applicable    TM  Time and Material Basis
S   Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| HONEYWELL SERIES 200 MODELS 105 AND 115 (CONTD) | | | | |
| | | | | |
| 236-14 Digit Edit | – | 690.00 | 2.00 | |
| 236-15 Zero Kill | – | 690.00 | 2.00 | |
| 236-16 Field Override | – | 690.00 | 2.00 | |
| 236-17 Field Edit | – | 690.00 | 2.00 | |
| 236-18 No Field/No Digit Outsort | – | 690.00 | 2.00 | |
| 236-19 Stacker Overflow | – | 690.00 | 2.00 | |
| 236-20 Valid Character Check | – | 460.00 | 2.00 | |
| 236-21 Extended Sort Control | – | 2,760.00 | 20.00 | |
| | | | | |
| Single Channel Communication Controls for Models 105 and 115 | | | | |
| 281-1A W.U. Telex | 168.00 | 6,750.00 | 28.00 | |
| 281-1B TWX CE (8-level teletypewriter) | 168.00 | 6,750.00 | 28.00 | |
| 281-1C 5-Level Teletypewriter | 168.00 | 6,750.00 | 28.00 | |
| 281-1D 8-Level Teletypewriter | 168.00 | 6,750.00 | 28.00 | |
| 281-1E TWX CE (IBM 1050) | 168.00 | 6,750.00 | 28.00 | |
| 281-1H Voice Lines for DATA SPEED 2 | 168.00 | 6,750.00 | 28.00 | |
| 1061 Interface for VIP 765 | NC | NC | NC | |
| 1062 Interface for VIP 775 and 785 | NC | NC | NC | |
| 281-1K W.U. 180 Baud (IBM 1050) | 168.00 | 6,750.00 | 28.00 | |
| 281-1KTP KEYTAPE/Communicator (private; 115 only) | 168.00 | 6,750.00 | 28.00 | |
| 281-1KTS KEYTAPE/Communicator (network; 115 only) | 168.00 | 6,750.00 | 28.00 | |
| 281-1R VIP Series Displays, Asynchronous | 226.00 | 8,930.00 | 38.00 | |
| 281-1TC Burroughs TC-500 | 226.00 | 8,930.00 | 38.00 | |
| 281-2A Voice Lines IBM 7701, 1013 | 258.00 | 10,125.00 | 43.00 | |
| 281-2B Voice Lines | 205.00 | 8,100.00 | 33.00 | |
| 281-2BSC IBM Binary Synchronous Communications Device | 258.00 | 10,125.00 | 43.00 | |
| 1060 Extended Speed (281-2B) | 52.00 | 2,055.00 | 14.00 | |
| 1061 Interface for VIP 765 (281-2B) | NC | NC | NC | |
| 1062 Interface for VIP 775 and 785 (281-2B) | NC | NC | NC | |
| 1070 2,000 bps (281-2B,-2BSC) | NC | NC | NC | |
| 1071 2,400 bps (281-2B,-2BSC) | NC | NC | NC | |
| 1072 3,600 bps (281-2B,-2BSC) | 22.00 | 840.00 | 9.00 | |
| 1073 4,800 bps (281-2B,-2BSC) | 22.00 | 840.00 | 9.00 | |
| 1074 5,400 bps (281-2B,-2BSC) | 22.00 | 840.00 | 9.00 | |
| 1075 7,200 bps (281-2B,-2BSC) | 22.00 | 840.00 | 9.00 | |
| 1076 9,600 bps (281-2B,-2BSC) | 22.00 | 840.00 | 9.00 | |
| 281-2D Voice Lines IBM 7702, 1013 | 258.00 | 10,125.00 | 43.00 | |
| 281-2F Telpak A | 258.00 | 10,125.00 | 43.00 | |
| 281-2R VIP Series Displays, Synchronous | 274.00 | 10,765.00 | 45.00 | |
| 281-137P 150 Baud (8-level teletypewriter) | 168.00 | 6,750.00 | 28.00 | |
| 281-137S Voice Lines (8-level teletypewriter) | 168.00 | 6,750.00 | 28.00 | |
| | | | | |
| Multi-Channel Communications Controls for Model 115 | | | | |
| 286-1 MCCC (for 2 to 3 lines) | 237.00 | 9,450.00 | 41.00 | |
| 286-2 MCCC (for 4 to 15 lines) | 358.00 | 14,400.00 | 60.00 | |
| 286-3 MCCC (for 16 to 63 lines) | 447.00 | 18,000.00 | 75.00 | |
| 086 Parity Check and Generation | 63.00 | 2,250.00 | 10.00 | |
| 087 Long Check | 63.00 | 2,250.00 | 10.00 | |
| 286-4 Message-Mode MCCC (for 2 to 32 half-duplex lines) | 893.00 | 34,000.00 | 149.00 | |
| 286-5 Message-Mode MCCC (for 33 to 63 half-duplex lines) | 1,288.00 | 51,750.00 | 224.00 | |
| 285-1A W.U. Telex | 37.00 | 1,350.00 | 8.00 | |
| 285-1B TWX CE (8-level teletypewriter) | 48.00 | 1,800.00 | 9.00 | |
| 285-1C 5-Level Teletypewriter | 37.00 | 1,350.00 | 8.00 | |
| 285-1D 8-Level Teletypewriter | 48.00 | 1,800.00 | 9.00 | |
| 285-1E TWX CE (IBM 1050) | 48.00 | 1,800.00 | 9.00 | |

NC  No Charge  — Not Applicable  TM  Time and Material Basis
S  Single Use Charge  NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| HONEYWELL SERIES 200 MODELS 105 AND 115 (CONTD) | | | | |
| | | | | |
| 285-1H Voice Lines for DATA SPEED 2, VIP 765 | 48.00 | 1,800.00 | 9.00 | |
| 285-1K W.U. 180 Baud (IBM 1050) | 48.00 | 1,800.00 | 9.00 | |
| 285-1KTP KEYTAPE/Communicator (private lines) | 48.00 | 1,800.00 | 9.00 | |
| 285-1KTS KEYTAPE/Communicator (switched network) | 48.00 | 1,800.00 | 9.00 | |
| 285-1MR DRD203 Remote MICR Reader-Sorter | 94.00 | 4,140.00 | 15.00 | |
| 285-1N 100 wpm ASCII TWX Service | 48.00 | 1,800.00 | 9.00 | |
| 285-1PD Teller Terminal (Direct) | 105.00 | 3,930.00 | 16.00 | |
| 285-1PM Teller Terminal (Remote) | 84.00 | 3,130.00 | 14.00 | |
| 285-1R VIP Series Displays, Asynchronous | 105.00 | 3,895.00 | 16.00 | |
| 285-1TC Burroughs TC-500 | 105.00 | 3,895.00 | 16.00 | |
| 285-2A Voice Lines IBM 7701, 1013 | 121.00 | 4,500.00 | 18.00 | |
| 285-2B Voice Lines | 74.00 | 2,700.00 | 12.00 | |
| 285-2BSC IBM Binary Synchronous Communications Device | 121.00 | 4,500.00 | 18.00 | |
| 1060 Extended Speed (285-2B only) | 52.00 | 2,055.00 | 14.00 | |
| 1061 Interface for VIP 765 (285-2B only) | NC | NC | NC | |
| 1062 Interface for VIP 775 and 785 (285-2B only) | NC | NC | NC | |
| 1070 2,000 bps (285-2B, -2BSC) | NC | NC | NC | |
| 1071 2,400 bps (285-2B, -2BSC) | NC | NC | NC | |
| 1072 3,600 bps (285-2B, -2BSC) | 22.00 | 840.00 | 9.00 | |
| 1073 4,800 bps (285-2B, -2BSC) | 22.00 | 840.00 | 9.00 | |
| 1074 5,400 bps (285-2B, -2BSC) | 22.00 | 840.00 | 9.00 | |
| 1075 7,200 bps (285-2B, -2BSC) | 22.00 | 840.00 | 9.00 | |
| 1076 9,600 bps (285-2B, -2BSC) | 22.00 | 840.00 | 9.00 | |
| 285-2D Voice Lines IBM 7702, 1013 | 121.00 | 4,500.00 | 18.00 | |
| 285-2R VIP Series Displays, Synchronous | 142.00 | 5,270.00 | 24.00 | |
| 285-3A Voice Lines DATA SPEED 5 | 100.00 | 3,600.00 | 15.00 | |
| 285-4A Voice Lines DATA SPEED 5 | 100.00 | 3,600.00 | 15.00 | |
| 285-5A Switched Circuits Auto Dialing | 48.00 | 1,800.00 | 9.00 | |
| 285-137P 150 Baud (8-level teletype-writer) | 48.00 | 1,800.00 | 9.00 | |
| 285-137S Voice Lines (8-level tele-typewriter) | 48.00 | 1,800.00 | 9.00 | |
| | | | | |
| Audio Response System for Model 115 | | | | |
| 285-8 Audio Response Adapter (6 lines) | 440.00 | 16,875.00 | 49.00 | |
| 082-1 Tone Answer Back Option (2 lines) | 21.00 | 675.00 | 2.00 | |
| 082-2 Voice Answer Back Option (2 lines) | 21.00 | 675.00 | 2.00 | |
| 083-1 Voice Cylinders (31 elements; phrases only) | – | 2,050.00 | – | |
| 083-2 Voice Cylinders (31 elements; words and phrases or words only) | – | 2,550.00 | – | |
| 083-3 Voice Cylinders (63 elements; phrases only) | – | 3,200.00 | – | |
| 083-4 Voice Cylinders (63 elements; words and phrases or words only) | – | 3,600.00 | – | |
| 083-5 Voice Cylinders (189 elements; words only) | – | 3,600.00 | – | |
| 285-8A Audio Response Expansion (2 lines) | 100.00 | 3,825.00 | 11.00 | |
| 285-8C Audio Unit (31 elements; 6 lines) | 649.00 | 24,750.00 | 71.00 | |
| 285-8D 2-Line Expansion (31 elements) | 37.00 | 1,350.00 | 5.00 | |
| 285-8F Audio Unit (63 elements; 6 lines) | 854.00 | 32,625.00 | 91.00 | |

NC  No Charge　　　—  Not Applicable　　TM  Time and Material Basis
S　Single Use Charge　NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **HONEYWELL SERIES 200 MODELS 105 AND 115 (CONTD)** | | | | |
| | | | | |
| 285-8G 2-Line Expansion (63 elements) | 48.00 | 1,800.00 | 5.00 | |
| 285-8J Audio Unit (189 elements; | | | | |
|       6 lines) | 1,351.00 | 51,750.00 | 146.00 | |
| 285-8K 2-Line Expansion (189 elements) | 53.00 | 2,050.00 | 5.00 | |
| | | | | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| | | | | |
| **IBM SYSTEM/3** | | | | |
| | | | | |
| 5406 Processing Units with Keyboard | | | | |
|     (disc systems) | | | | |
|   5406-B2  8K | 590.00 | 28,745.00 | 125.00 | |
|   5406-B3  12K | 705.00 | 34,545.00 | 130.00 | |
|   5406-B4  16K | 820.00 | 35,245.00 | 130.00 | |
|     1550 Command Keys 9-16 | 20.00 | 980.00 | 0.50 | |
|     5732 Processing Unit Expansion | 35.00 | 1,725.00 | 6.00 | |
|     7081 Serial I/O Channel | 150.00 | 7,350.00 | 5.00 | |
| | | | | |
| 5410 Processing Units (card systems) | | | | |
|   5410-A2  8K | 328.00 | 16,110.00 | 27.00 | |
|   5410-A3  12K | 434.00 | 21,300.00 | 29.00 | |
|   5410-A4  16K | 555.00 | 22,040.00 | 29.00 | |
|   5410-A5  24K | 800.00 | 39,220.00 | 30.00 | |
|   5410-A6  32K | 1,040.00 | 39,960.00 | 30.00 | |
|   5410-A7  49K | 1,360.00 | 57,870.00 | 78.00 | |
| | | | | |
| 5410 Processing Units (disc systems) | | | | |
|   5410-A12 8K | 461.00 | 22,600.00 | 73.00 | |
|   5410-A13 12K | 565.00 | 27,790.00 | 75.00 | |
|   5410-A14 16K | 685.00 | 28,540.00 | 75.00 | |
|   5410-A15 24K | 930.00 | 45,710.00 | 76.00 | |
|   5410-A16 32K | 1,170.00 | 46,450.00 | 76.00 | |
|   5410-A17 49K | 1,490.00 | 64,360.00 | 124.00 | |
| | | | | |
| Options for 5410 Processors | | | | |
|   3500 Dual Program | 116.00 | 5,720.00 | 1.00 | |
|   5372 Processing Unit Expansion | 37.00 | 1,820.00 | 3.00 | |
|   5501 Power Supply Expansion | 50.00 | 2,250.00 | 1.00 | |
|   5732 Processing Unit Expansion A | 35.00 | 1,725.00 | 3.00 | |
|   5733 Processing Unit Expansion B | 20.00 | 800.00 | 0.50 | |
|   5734 Processing Unit Expansion C | 55.00 | 2,200.00 | 1.00 | |
|   7081 Serial I/O Channel | 159.00 | 7,790.00 | 5.00 | |
| | | | | |
| 2265-001 Display Station (5406 only) | 170.00 | 5,430.00 | 40.00 | |
| 2265-002 Display Station (5406 only) | 170.00 | 5,430.00 | 40.00 | |
|   4766 Alphanumeric Keyboard | 29.00 | 900.00 | 5.00 | |
|   7960 2265 Attachment for -002 | 75.00 | 3,675.00 | 1.50 | |
| | | | | |
| 5471-001 Printer-Keyboard (5410 only) | 106.00 | 4,980.00 | 32.00 | |
|   4110 5471 Printer Keyboard Attachment | 53.00 | 2,965.00 | 5.00 | |
| | | | | |
| 5475-001 Data Entry Keyboard (5410 only) | 42.00 | 2,380.00 | 7.00 | |
|   4120 5475 Data Entry Keyboard | | | | |
|       Attachment | 47.00 | 2,675.00 | 1.00 | |
| | | | | |
| 5444-001 Disk Storage Drive | 164.00 | 8,550.00 | 47.00 | |
| 5444-002 Disk Storage Drive | 270.00 | 10,280.00 | 47.00 | |
| 5444-003 Disk Storage Drive | 164.00 | 8,550.00 | 47.00 | |
|   6378 Second Disk Attachment | 47.00 | 2,515.00 | 5.00 | |
| 5444-A1 Disk Storage Drive (5410 only) | 200.00 | 8,450.00 | 65.00 | |
| 5444-A2 Disk Storage Drive (5410 only) | 300.00 | 10,075.00 | 65.00 | |
| 5444-A3 Disk Storage Drive (5410 only) | 200.00 | 8,450.00 | 65.00 | |
|   4501 Higher Performance (first disc | | | | |
|       attachment) | 20.00 | 980.00 | 1.00 | |
|   4502 Higher Performance (second disc | | | | |
|       attachment) | 20.00 | 980.00 | 1.00 | |

NC  No Charge     —  Not Applicable   TM  Time and Material Basis
S    Single Use Charge   NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| IBM SYSTEM/3  (CONTD) | | | | |
| | | | | |
| 5422-001 Disk Enclosure | 100.00 | 4,900.00 | 12.00 | |
| 5440-001 Disk Cartridge (for all 5444 drives) | – | 175.00 | TM | |
| | | | | |
| 5445-001 Disk Storage Drive (5410 only) | 350.00 | 15,750.00 | 85.00 | |
| 5445-002 Disk Storage Drive (5410 only) | 335.00 | 15,075.00 | 80.00 | |
| 3901 First 5445 Disk Attachment | 500.00 | 20,000.00 | 33.00 | |
| 3902 Second 5445 Disk Attachment | 15.00 | 600.00 | 1.00 | |
| 2316-001 Disk Pack | 20.00 | 525.00 | TM | |
| | | | | |
| 3410-001 Magnetic Tape Unit (5410 only) | 185.00 | 7,700.00 | 45.00 | |
| 3410-002 Magnetic Tape Unit (5410 only) | 245.00 | 10,300.00 | 50.00 | |
| 3410-003 Magnetic Tape Unit (5410 only) | 305.00 | 12,800.00 | 55.00 | |
| 3411-001 Magnetic Tape Unit (5410 only) | 405.00 | 17,000.00 | 70.00 | |
| 3411-002 Magnetic Tape Unit (5410 only) | 515.00 | 21,600.00 | 75.00 | |
| 3411-003 Magnetic Tape Unit (5410 only) | 625.00 | 26,300.00 | 80.00 | |
| 3211 Single Density (1,600 bpi; phase encoded) | 55.00 | 2,500.00 | 7.50 | |
| 3221 Dual Density (800 or 1,600 bpi; NRZI; only for -002 and -003 models of 3410 and 3411) | 80.00 | 3,600.00 | 27.00 | |
| 7003 Attachment to System/3 (for 3411) | 75.00 | 3,150.00 | 3.00 | |
| 7951 3411 Magnetic Tape Attachment | 160.00 | 4,800.00 | 10.00 | |
| 9001 Additional Tape Units (for 3411) | NC | NC | NC | |
| 9150 Dual Density Control (for 3411) | NC | NC | NC | |
| | | | | |
| 1442-006 Card Read Punch (300 cpm reading; 80 cpm punching; 5410 only) | 265.00 | 14,140.00 | 55.00 | |
| 1442-007 Card Read Punch (400 cpm reading; 160 cpm punching; 5410 only) | 385.00 | 15,255.00 | 65.00 | |
| 3950 5410 Coupling | 30.00 | 1,475.00 | 1.00 | |
| 4130 1442-006, -007 Attachment | 190.00 | 9,310.00 | 15.00 | |
| 4661 Input/Output Adapter | 51.00 | 2,665.00 | 0.75 | |
| 4700 Isolation, Control Unit | NC | NC | NC | |
| 5880 Punch Column Skip | 21.00 | 970.00 | 0.50 | |
| | | | | |
| 129-001 Card Data Recorder (for 5406 only; reading 80 column cards at 50 cpm and punching at 12–50 cpm applies to all 129 models) | 125.00 | 6,125.00 | 38.00 | |
| 129-002 Card Data Recorder (for 5406 only) | 140.00 | 6,860.00 | 42.00 | |
| 129-003 Card Data Recorder (for 5406 only) | 150.00 | 7,350.00 | 43.00 | |
| 1020 Accumulate | 20.00 | 980.00 | 2.50 | |
| 1025 Additional Accumulate Program Levels | 5.00 | 245.00 | 1.00 | |
| 3215 Direct Punch Control | 6.00 | 295.00 | 1.00 | |
| 3610 Expansion Feature | 10.00 | 490.00 | – | |
| 5570 Production Statistics | 10.00 | 490.00 | 1.00 | |
| 6065 Reading Board Extension | – | 20.00 | – | |
| | | | | |
| 7503 Card Input/Output Attachment | 75.00 | 2,625.00 | 11.00 | |
| 8705 Verifying Read Control | 6.00 | 295.00 | 1.00 | |
| 9113 Data Recorder Attachment | 40.00 | 1,960.00 | 2.00 | |
| 9671 Special Character Arrangement ASCII | 150.00 S | 80.00 | – | |
| 9677 Special Character Arrangement EL | 150.00 S | 80.00 | – | |
| | | | | |
| 5486-001 Card Sorter | 90.00 | 4,690.00 | 38.00 | |
| 5486-002 Card Sorter | 121.00 | 5,370.00 | 58.00 | |
| 1225 Alphabetic Sorting | 7.00 | 222.00 | 1.00 | |
| 2370 Auxiliary Card Counter | 10.00 | 515.00 | 3.00 | |
| 7245 Sort Suppress/Digit Select | 10.00 | 515.00 | 1.00 | |

NC  No Charge          —  Not Applicable    TM  Time and Material Basis
S    Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| IBM SYSTEM/3  (CONTD) | | | | |
| | | | | |
| 5496-001 Data Recorder (for 5406 only) | 155.00 | 7,600.00 | 54.00 | |
| 3210 Data Recorder Attachment | 40.00 | 1,960.00 | 2.00 | |
| 7061 Self-Checking Number Mod 10 | 30.00 | 900.00 | 1.00 | |
| 7062 Self-Checking Number Mod 11 | 30.00 | 900.00 | 1.00 | |
| 7501 System/3 Attachment | 45.00 | 2,205.00 | 11.00 | |
| 7801 3735 Attachment | 45.00 | 2,205.00 | 4.50 | |
| 7850 2772 Attachment | 45.00 | 2,205.00 | 15.00 | |
| | | | | |
| 5424-A1 Multi-Function Card Unit (5410 only; 250 cpm) | 286.00 | 10,010.00 | 140.00 | |
| 5424-A2 Multi-Function Card Unit (5410 only; 500 cpm) | 429.00 | 13,320.00 | 200.00 | |
| 4100 MFCU Attachment 250/60/60 | 84.00 | 4,450.00 | 14.00 | |
| 4101 MFCU Attachment 500/120/120 | 100.00 | 5,640.00 | 14.00 | |
| | | | | |
| 5213-001 Printer (5406 only; pin-feed platen) | 160.00 | 6,200.00 | 48.00 | |
| 5213-002 Printer (5406 only; vertical forms control) | 200.00 | 8,000.00 | 65.00 | |
| 5213-003 Printer (5406 only; vertical forms control) | 250.00 | 8,200.00 | 75.00 | |
| 3901 Printer Attachment for -001 | 70.00 | 3,430.00 | 19.00 | |
| 3902 Printer Attachment for -002 | 70.00 | 3,430.00 | 19.00 | |
| 3903 Printer Attachment for -003 | 70.00 | 3,430.00 | 19.00 | |
| 4450 Forms Stand Stacker | – | 50.00 | – | |
| | | | | |
| 2222-001 Printer (5406 only; unidirectional) | 350.00 | 16,500.00 | 105.00 | |
| 2222-002 Printer (5406 only; bidirectional) | 385.00 | 16,700.00 | 115.00 | |
| 7951 Printer Attachment for -001 | 70.00 | 3,430.00 | 19.00 | |
| 7952 Printer Attachment for -002 | 70.00 | 3,430.00 | 19.00 | |
| | | | | |
| 5203-001 Printer (5410 only; 100 lpm; 96 positions) | 230.00 | 10,600.00 | 67.00 | |
| 5203-002 Printer (5410 only; 200 lpm; 96 positions) | 280.00 | 11,775.00 | 76.00 | |
| 5203-003 Printer (5410 only; 300 lpm; 96 positions) | 435.00 | 17,400.00 | 127.00 | |
| 3475 Dual Feed Carriage | 75.00 | 3,675.00 | 20.00 | |
| 3480 Dual Feed Carriage Control | 26.00 | 1,295.00 | 1.00 | |
| 3970 Printer Attachment for -001 | 58.00 | 3,100.00 | 10.00 | |
| 3971 Printer Attachment for -002 | 58.00 | 3,100.00 | 10.00 | |
| 3972 Printer Attachment for -003 | 95.00 | 4,525.00 | 13.00 | |
| | | | | |
| 4730 Additional Interchangeable Chain Cartridge | 75.00 | 3,675.00 | 1.00 | |
| 4740 Additional Interchangeable Chain Cartridge | 110.00 | 2,910.00 | 33.00 | |
| 5532 Additional Print Chain | – | 975.00 | – | |
| 5558 Additional Print Positions (24) | 50.00 | 1,500.00 | 2.00 | |
| 5559 Additional Print Positions (12) | 25.00 | 750.00 | NC | |
| 5560 Additional Print Positions (36) | 75.00 | 2,250.00 | 2.00 | |
| | | | | |
| 8371 Type Subs (first slug; chain) | 15.00 S | 5.00 | – | |
| 8372 Type Subs (each additional; chain) | 7.00 S | 5.00 | – | |
| 8373 Type Subs (first slug; train) | 20.00 S | 15.00 | – | |
| 8374 Type Subs (each additional; train) | 15.00 S | 15.00 | – | |
| 8639 Universal Character Set Attachment | 10.00 | 300.00 | 1.00 | |
| 8642 Universal Character Set Control | 15.00 | 477.00 | 1.00 | |
| | | | | |
| 9950 Artwork Per Character | – | 100.00 | – | |
| 9951 Matrix (per slug; 2 characters) | – | 150.00 | – | |
| 9952 Set Up for Two Characters | – | 50.00 | – | |
| 9953 Matrix (per slug; 3 characters) | – | 150.00 | – | |
| 9954 Set Up for Three Characters | – | 50.00 | – | |

NC  No Charge      —  Not Applicable     TM  Time and Material Basis
S   Single Use Charge     NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **IBM SYSTEM/3  (CONTD)** | | | | |
| 5421-001 Printer Control Unit for 1403 | 260.00 | 12,740.00 | 26.00 | |
| 1403-002 Printer (5410 only; 60 lpm) | 750.00 | 28,030.00 | 159.00 | 1403 Printer, features, |
| 1403-NI Printer (5410 only; 1,100 lpm) | 875.00 | 33,970.00 | 183.00 | and options (except those |
| 1376 Auxiliary Ribbon Feeding | 73.00 | 2,540.00 | 14.75 | items unavailable under |
| 4140 Printer Attachment for -002 | 120.00 | 5,880.00 | 21.00 | lease) are available |
| 4150 Printer Attachment for -003 | 175.00 | 6,380.00 | 21.00 | in a 12 to 23-month plan |
| 4740 Interchangeable Chain Cartridge Adapter | 73.00 | 2,580.00 | NC | that decreases list prices by 8% and a 24-month plan |
| 5110 Multiple Character Set Feature for -002 | 10.00 | 380.00 | 1.75 | that decreases list prices by 16%. |
| 5111 Multiple Character Set Feature for -NI | 10.00 | 380.00 | 1.75 | |
| 5381 Numerical Print | 218.00 | 7,460.00 | 9.00 | |
| 5523 Preferred Character Set Feature | 39.00 | 1,240.00 | 2.00 | |
| 5532 Additional Print Chain | 975.00 S | 975.00 | NC | |
| 6410 Selective Tape Listing for -NI | 184.00 | 6,680.00 | 10.00 | |
| 6411 Selective Tape Listing for -002 | 184.00 | 6,680.00 | 10.00 | |
| 6413 Selective Tape Listing Stacker | – | 250.00 | TM | |
| 6420 Selective Tape Listing for -NI only | 272.00 | 9,890.00 | 22.50 | |
| 8371 Type Subs (first slug; chain) | 15.00 S | 5.00 | – | |
| 8372 Type Subs (each additional slug; chain) | 7.00 S | 5.00 | – | |
| 8640 Universal Character Set for -NI | 10.00 | 380.00 | 1.75 | |
| 8641 Universal Character Set for -002 | 10.00 | 380.00 | 1.75 | |
| 8642 Universal Character Set Control | 15.00 | 450.00 | 1.00 | |
| 9950 Special Chain Artwork | – | 100.00 | – | |
| 9951 Matrix (per slug) | – | 150.00 | – | |
| 9952 Set Up (2 character slug) | – | 50.00 | – | |
| 1255-001 Magnetic Character Reader (500 doc/min; 6 stackers) | 805.00 | 38,645.00 | 210.00 | |
| 1255-002 Magnetic Character Reader (750 doc/min; 6 stackers) | 980.00 | 44,260.00 | 335.00 | |
| 1255-003 Magnetic Character Reader (750 doc/min; 12 stackers) | 1,300.00 | 60,240.00 | 440.00 | |
| 1470 Balance List | 68.00 | 3,260.00 | 6.00 | |
| 3215 Dash Symbol Transmission | 50.00 S | 35.00 | NC | |
| 4380 51-Column Card Sorting | 15.00 | 720.00 | NC | |
| 4520 High Order Zero and Blank Selection | 30.00 | 1,440.00 | 5.00 | |
| 6303 System/3 Adapter | 121.00 | 5,820.00 | 4.00 | |
| 7060 Self-Checking Number | 49.00 | 2,330.00 | 2.50 | |
| 7850 2772 Adapter | 44.00 | 2,095.00 | 3.00 | |
| 2074 Binary Synchronous Communications Adapter | 280.00 | 13,760.00 | 65.00 | |
| 1315 Auto Call | 42.00 | 2,075.00 | 1.00 | |
| 4703 Internal Clock | 26.00 | 1,295.00 | 1.00 | |
| 7477 Station Selection | 21.00 | 1,035.00 | 1.00 | |
| 7850 Text Transparency | 21.00 | 1,035.00 | 1.00 | |
| * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **IBM 360/20 COMPUTER SYSTEM** | | | | |
| 2020 Processing Unit Submodel 1 | | | | Disc drives, mag tape units, |
| 2020-B1 CPU (4K) | 500.00 | 16,005.00 | 37.00 | printers, and many features |
| 2020-C1 CPU (8K) | 700.00 | 22,130.00 | 42.00 | that connect to these devices |
| 2020-BC1 CPU (12K) | 950.00 | 30,035.00 | 48.00 | may also be leased on either |
| 2020-D1 CPU (16K) | 1,200.00 | 37,410.00 | 52.00 | a 12- to 23-month plan, which decreases 1-year lease prices |
| 2020 Processing Unit Submodel 2 | | | | approximately 8%, or a 24-month |
| 2020-B2 CPU (4K) | 575.00 | 18,375.00 | 40.00 | plan, which decreases 1-year |
| 2020-C2 CPU (8K) | 775.00 | 24,500.00 | 45.00 | lease prices approximately 16%. |
| 2020-BC2 CPU (12K) | 1,030.00 | 32,400.00 | 51.00 | |

NC  No Charge  — Not Applicable  TM  Time and Material Basis
S  Single Use Charge  NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **IBM 360/20 COMPUTER SYSTEM (CONTD)** | | | | |
| 2020-D2 CPU (16K) | 1,275.00 | 39,780.00 | 55.00 | |
| **2020 Processing Unit Submodel 3** | | | | |
| 2020-B3 CPU (4K) | 355.00 | 11,270.00 | 37.00 | |
| 2020-C3 CPU (8K) | 450.00 | 14,190.00 | 42.00 | |
| 2020-BC3 CPU (12K) | 605.00 | 19,080.00 | 48.00 | |
| 2020-D3 CPU (16K) | 760.00 | 23,700.00 | 52.00 | |
| **2020 Processing Unit Submodel 4** | | | | |
| 2020-B4 CPU (4K) | 395.00 | 12,560.00 | 40.00 | |
| 2020-C4 CPU (8K) | 490.00 | 15,415.00 | 45.00 | |
| 2020-BC4 CPU (12K) | 645.00 | 20,235.00 | 51.00 | |
| 2020-D4 CPU (16K) | 800.00 | 24,920.00 | 55.00 | |
| **2020 Processing Unit Submodel 5** | | | | |
| 2020-C5 CPU (8K) | 875.00 | 44,230.00 | 90.00 | |
| 2020-BC5 CPU (12K) | 1,125.00 | 56,260.00 | 100.00 | |
| 2020-D5 CPU (16K) | 1,375.00 | 70,615.00 | 105.00 | |
| 2020-DC5 CPU (24K) | 1,710.00 | 88,950.00 | 115.00 | |
| 2020-E5 CPU (32K) | 2,050.00 | 104,565.00 | 130.00 | |
| **2020 Processing Unit Submodel 6** | | | | |
| 2020-C6 CPU (8K) | 575.00 | 19,550.00 | 100.00 | |
| 2020-BC6 CPU (12K) | 800.00 | 29,600.00 | 110.00 | |
| 2020-D6 CPU (16K) | 1,000.00 | 40,000.00 | 115.00 | |
| **Features on all 2020 Processing Units** | | | | |
| 1315 Automatic Calling | 34.00 | 835.00 | 0.75 | |
| 2074 Binary Synchronous Communication Adapter | 410.00 | 11,545.00 | 16.50 | |
| 3901 1401/1440 Compatibility | 275.00 | 13,750.00 | 29.00 | |
| 4100 Full Transparent Text Mode | 20.00 | 490.00 | 0.50 | |
| 4442 1403-002 Attachment | 225.00 | 7,410.00 | 22.50 | |
| 4447 1403-007 Attachment | 200.00 | 7,245.00 | 22.50 | |
| 4448 1403-N1 Attachment | 275.00 | 7,740.00 | 22.50 | |
| 4460 1442-005 Attachment | 30.00 | 985.00 | 2.50 | |
| 4500 High Speed (19.2K bps) | 49.00 | 1,190.00 | 0.75 | |
| 4501 High Speed (40.8K or 50K bps) | 49.00 | 1,190.00 | 0.75 | |
| 4703 Internal Clock | 25.00 | 615.00 | 0.50 | |
| 7477 Station Selection | 29.00 | 715.00 | 0.50 | |
| 8070 2152 Attachment | 87.00 | 3,055.00 | 4.50 | |
| 8082 2203 Attachment | 55.00 | 1,815.00 | 5.00 | |
| 8083 2203 Attachment | 55.00 | 1,815.00 | 5.00 | |
| 8084 2203 Attachment | 55.00 | 1,815.00 | 5.00 | |
| 8085 2203 Attachment | 55.00 | 1,815.00 | 5.00 | |
| 8090 2501 Attachment | 20.00 | 670.00 | 2.00 | |
| 8092 2520-A1 Attachment | 50.00 | 1,640.00 | 6.00 | |
| 8095 2520-A2 or -A3 Attachment | 25.00 | 850.00 | 3.00 | |
| 8099 2560 Attachment | 75.00 | 2,470.00 | 4.75 | |
| 8100 2560 Attachment | 75.00 | 2,470.00 | 4.75 | |
| 2152-001 Printer-Keyboard | 131.00 | 5,430.00 | 61.00 | |
| 4450 Forms Stand Stacker | – | 60.00 | NC | |
| 7495 Storage Control Submodel 2 | 225.00 | 7,410.00 | 5.00 | |
| 7496 Storage Control Submodel 4 | 172.00 | 5,540.00 | 5.00 | |
| 7497 Storage Control Submodel 5 | 225.00 | 7,410.00 | 5.00 | |
| 7498 Storage Control Submodel 6 | 225.00 | 7,410.00 | 5.00 | |
| 2311-011 Disk Storage Drive | 570.00 | 21,030.00 | 55.00 | |

NC  No Charge  — Not Applicable  TM  Time and Material Basis
S  Single Use Charge  NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| IBM 360/20 COMPUTER SYSTEM  (CONTD) | | | | |
| | | | | |
| 2311-012 Disk Storage Drive | 350.00 | 18,390.00 | 35.00 | |
| 1316 Disk Pack | 15.00 | 360.00 | TM | |
| | | | | |
| 2401-001 Magnetic Tape Unit | 335.00 | 12,880.00 | 62.00 | |
| 2401-002 Magnetic Tape Unit | 485.00 | 18,720.00 | 70.00 | |
| 2401-004 Magnetic Tape Unit | 385.00 | 14,800.00 | 74.00 | |
| | | | | |
| 3471 Dual Density (800 to 1,600 bpi) | 25.00 | 990.00 | 1.75 | |
| 5121 Mode Compatibility | 10.00 | 380.00 | NC | |
| 5301 Native Tape Attachment for -001 and -002 | 440.00 | 22,000.00 | 170.00 | |
| 5302 Native Tape Attachment for -004 | 535.00 | 26,750.00 | 310.00 | |
| 5519 Power Window | 2,755.00 | 275.00 | NC | |
| 7125 7-Track Compatibility for feature 5301 | 50.00 | 2,500.00 | 22.00 | |
| 7126 7-Track Compatibility for feature 5302 | 110.00 | 5,500.00 | 33.00 | |
| 7160 Simultaneous Read While Write | 10.00 | 380.00 | NC | |
| | | | | |
| 2415-001 Magnetic Tape Unit and Control | 750.00 | 29,390.00 | 100.00 | |
| 2415-002 Magnetic Tape Unit and Control | 1,205.00 | 47,030.00 | 180.00 | |
| 2415-003 Magnetic Tape Unit and Control | 1,655.00 | 64,660.00 | 260.00 | |
| 2415-004 Magnetic Tape Unit and Control | 905.00 | 35,590.00 | 115.00 | |
| 2415-005 Magnetic Tape Unit and Control | 1,455.00 | 57,180.00 | 205.00 | |
| 2415-006 Magnetic Tape Unit and Control | 2,005.00 | 78,770.00 | 295.00 | |
| | | | | |
| 3228 Data Conversion | 45.00 | 1,730.00 | 1.00 | |
| 4658 Input/Output Channel | 150.00 | 4,935.00 | 4.75 | |
| 4701 Isolation Control Unit for -001, -002, -003 | NC | NC | NC | |
| 4703 Isolation Control Unit for -004, -005, -006 | NC | NC | NC | |
| | | | | |
| 5320 9-Track Compatibility | 135.00 | 5,190.00 | 10.00 | |
| 7125 7-Track Compatibility for -001, -002, -003 | 50.00 | 1,920.00 | 1.25 | |
| 7127 7-Track Compatibility for -004, -005, -006 | 95.00 | 3,640.00 | 3.50 | |
| 7135 7- and 9-Track Compatibility | 155.00 | 5,950.00 | 13.00 | |
| | | | | |
| 1442-005 Card Punch | 255.00 | 12,365.00 | 52.00 | |
| 3630 1130/1442 Coupling | 5.00 | 225.00 | NC | |
| 4661 Input/Output Adapter | 51.00 | 2,665.00 | 0.75 | |
| | | | | |
| 2501-A1 Card Reader | 195.00 | 11,010.00 | 35.00 | |
| 2501-A2 Card Reader | 255.00 | 11,240.00 | 49.00 | |
| 1531 Card Image | 30.00 | 1,550.00 | .50 | |
| 3630 1130/2501 Coupling | 5.00 | 150.00 | NC | |
| 4700 Isolation Control Unit | NC | NC | NC | |
| | | | | |
| 2520-A1 Card Read Punch | 730.00 | 31,515.00 | 98.00 | |
| 2520-A2 Card Punch | 650.00 | 28,225.00 | 93.00 | |
| 2520-A3 Card Punch | 470.00 | 27,945.00 | 72.00 | |
| 1531 Card Image for -A1 | 31.00 | 1,550.00 | 0.50 | |
| 4700 Isolation Control Unit | NC | NC | NC | |
| | | | | |
| 2560-A1 Multi-Function Card Machine | 615.00 | 27,055.00 | 97.00 | |
| 2560-A2 Multi-Function Card Machine | 480.00 | 19,885.00 | 97.00 | |
| 1575 Card Print, First Two Lines | 135.00 | 5,880.00 | 14.00 | |
| 1576 Card Print, Second Two Lines | 135.00 | 5,880.00 | 14.00 | |
| 1577 Card Print, Third Two Lines | 135.00 | 5,880.00 | 14.00 | |
| 1580 Card Print Control | 25.00 | 815.00 | 2.25 | |
| | | | | |
| 1403-002 Printer | 750.00 | 28,030.00 | 159.00 | |
| 1403-007 Printer | 630.00 | 26,960.00 | 124.00 | |
| 1403-N1 Printer | 875.00 | 33,970.00 | 183.00 | |

NC  No Charge          —  Not Applicable    TM  Time and Material Basis
S    Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **IBM 360/20 COMPUTER SYSTEM (CONTD)** | | | | |
| 1376 Auxiliary Ribbon Feeding | 73.00 | 2,540.00 | 14.75 | |
| 4740 Interchangeable Chain Cartridge Adapter | 73.00 | 2,580.00 | NC | |
| 5110 Multiple Character Set Feature for -002 | 10.00 | 380.00 | 1.75 | |
| 5111 Multiple Character Set Feature for -N1 | 10.00 | 380.00 | 1.75 | |
| 5381 Numerical Print | 218.00 | 7,460.00 | 9.00 | |
| 5523 Preferred Character Set Feature | 39.00 | 1,240.00 | 2.00 | |
| 5532 Print Chain, Additional | 975.00 S | 975.00 | NC | |
| 5575 Printer Features Control | 55.00 | 1,740.00 | 2.00 | |
| 6410 Select Tape List for -N1 | 184.00 | 6,680.00 | 10.00 | |
| 6411 Select Tape List for -002 | 184.00 | 6,680.00 | 10.00 | |
| 6413 Selective Tape Listing Stacker | – | 250.00 | TM | |
| 6420 Select Tape List for -N1 | 272.00 | 9,890.00 | 22.50 | |
| 8371 Type Subs, First Slug, Chain | 15.00 S | 5.00 | – | |
| 8372 Type Subs, Chain, Each Additional Slug | 7.00 S | 5.00 | – | |
| 8637 Universal Character Set Adapter | 15.00 | 505.00 | 3.50 | |
| 8640 Universal Character Set for -N1 | 10.00 | 380.00 | 1.75 | |
| 8641 Universal Character Set for -002 | 10.00 | 380.00 | 1.75 | |
| 9950 Service Charge – Matrix (per slug) | – | 150.00 | – | |
| 9952 Service Charge – Set Up (2-chain slug) | – | 50.00 | – | |
| **2203-A1 Printer** | 510.00 | 18,390.00 | 71.50 | |
| **2203-A2 Printer** | 390.00 | 14,020.00 | 71.50 | |
| 1901 Additional Character Set (13 characters) | 400.00 S | 400.00 | NC | |
| 1902 Additional Character Set (39 characters) | 450.00 S | 450.00 | NC | |
| 1903 Additional Character Set (52 characters) | 475.00 S | 475.00 | NC | |
| 1904 Additional Character Set (63 characters) | 500.00 S | 500.00 | NC | |
| 3475 Dual Feed Carriage | 100.00 | 4,000.00 | 8.50 | |
| 3480 Dual Feed Carriage Control | 10.00 | 350.00 | 1.50 | |
| 5558 24 Additional Print Positions | 45.00 | 1,980.00 | 4.00 | |
| 7815 6 Additional Tape Channels | 10.00 | 340.00 | 1.00 | |
| **1259-001 Magnetic Character Reader** | 1,065.00 | 48,015.00 | 250.00 | |
| 7081 Serial I/O Channel | 100.00 | 3,490.00 | 6.50 | |
| **1419-001 Magnetic Character Reader** | 2,205.00 | 107,185.00 | 224.00 | |
| 1445 Batch Numbering | 121.00 | 6,060.00 | 10.00 | |
| 3215 Dash Symbol Transmission | 50.00 S | 35.00 | NC | |
| 3610 Electronic Accumulation and Sequence Check | 242.00 | 9,455.00 | 17.75 | |
| 3791 Endorser | 365.00 | 17,800.00 | 30.00 | |
| 3792 Endorser Plate (no artwork) | – | 55.00 | – | |
| 3795 Endorse Only | 242.00 | 11,735.00 | 20.00 | |
| 3800 Expanded Capability | 150.00 | 7,285.00 | 0.50 | |
| 4380 51-Column Card Sorting | NC | NC | NC | |
| 4700 Isolation Control Unit | NC | NC | NC | |
| 5201 Multiple Column Control | 49.00 | 2,180.00 | 2.00 | |
| 5739 Program Control for Pocket Lights 1-6 | 25.00 | 960.00 | 0.50 | |
| 5741 Program Control for Pocket Lights 7-12 | 10.00 | 380.00 | 0.75 | |

NC  No Charge  — Not Applicable  TM  Time and Material Basis
S  Single Use Charge  NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **IBM 360/20 COMPUTER SYSTEM (CONTD)** | | | | |
| 7061 Self-Checking Number Mod 10 | 39.00 | 1,890.00 | 1.75 | |
| 7062 Self-Checking Number Mod 11 | 63.00 | 2,910.00 | 2.75 | |
| 7081 Serial I/O Channel | 100.00 | 3,490.00 | 6.50 | |
| 7440 Split Field | 20.00 | 1,190.00 | 0.75 | |
| 7720 S/360 Adapter-Single Address | 97.00 | 5,140.00 | 6.50 | |
| 7730 S/360 Adapter-Dual Address | 262.00 | 12,705.00 | 8.50 | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **LITTON 1241** | | | | |
| 1241 Basic System (1801 16-32K processor; keyboard; paper tape storage; paper tape reader and punch; and printer) | NA | 22,760.00 | NA | 2 to 5-year leases available. Free installation; unlimited usage. |
| 52 Drum Storage System (16K words) | NA | 10,750.00 | NA | Parts, labor, and 90-day preventive maintenance included in maintenance charges. Request price quotation for rental and maintenance prices. |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **NCR CENTURY 50 AND 100** | | | | |
| Century 50 Basic System 615-50/616-200 Processor with 16K Memory 682-100 Card Reader (300 cpm) 640-122 Printer (200 lpm) 655-151 Disc Unit (8.4mb; low speed) | 1,500.00 | 95,000.00 | 210.00 | Basic systems listed are minimum configurations that can be purchased. Device prices under the headings of Alternate Devices are amounts to be added to, or subtracted from, price of basic system. |
| Alternate Devices for Century 50 Basic System 615-50/616-300 Processor with 32K Memory | 400.00 | 18,750.00 | 10.00 | The Century 50 may only be leased under a 1-year plan, while the Century 100 may also be leased for 3 years, |
| 662-100 Paper Tape Reader (1,000 cps) | – | – | -15.00 | at $2,115/mo. and 5 years, |
| 640-132 Printer (300 lpm) | 150.00 | 6,000.00 | -15.00 | at $1,995/mo. Installation |
| 640-102 Printer (450 lpm) | 350.00 | 12,000.00 | 30.00 | charges included in lease |
| 655-101 Disc Unit (8.4 mb; high speed) | 150.00 | 5,000.00 | 35.00 | prices. |
| Additional Devices for Century 50 Basic System | | | | Conversion-to-purchase option allows 50% of rental to be |
| 6101 Input/Output Writer | 100.00 | 4,800.00 | 15.00 | applied toward purchase for |
| 655-152 Low Speed Disc (8.4 mb) | 550.00 | 26,500.00 | 75.00 | up to 24 months. For rental |
| 655-102 High Speed Disc (8.4 mb) | 625.00 | 28,750.00 | 110.00 | in nonmetropolitan areas, |
| 6401 6/8 Lines/Inch Feature (for 640-102, -122, -132) | 25.00 | 1,000.00 | – | increase lease price by adding 20% of maintenance |
| Century 100 Basic System 615-100/616-200 Processor with 16K Memory 682-100 Card Reader (300 cpm) 640-102 Printer (450 lpm) 655-101 Disc Unit (8.4 mb; high speed) | 2,350.00 | 112,000.00 | 275.00 | price; for purchased equipment increase the maintenance cost by 20%. |
| Alternate Devices for Century 100 Basic System 615-100/616-300 Processor with 32K Memory | 400.00 | 18,750.00 | 10.00 | Maintenance hours are from 8:00 a.m. to midnight; 24-hour plan optional. Preventive maintenance provided in off hours at no extra charge. Emergency |
| 662-100 Paper Tape Reader (1,000 cps) | – | – | -15.00 | service set at $22.00/hr, with no traveling expenses. |
| 626-101 Printer Control Unit (price included with printers) | – | – | – | There is a 90-day guarantee on parts and labor. |
| 640-200 Printer (1,500 lpm; 132 columns), or | 700.00 | 29,500.00 | 50.00 | Usage limited to 200 hrs/mo except for educational |
| 640-210 Printer (1,500 lpm; 160 columns), or | 800.00 | 34,250.00 | 50.00 | institutions, which have no limits. |

NC  No Charge     — Not Applicable     TM  Time and Material Basis
S  Single Use Charge     NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| NCR CENTURY 50 AND 100   (CONTD) | | | | |
| 640-300 Printer (600 1pm; 132 columns) | 700.00 | 29,500.00 | 25.00 | Training provided, with an allowance of 2 times the monthly rental.  System software and applications software included. |
| Additional Devices for Century 100 Basic System | | | | |
| 6101 Input/Output Writer (for 615-100) | 100.00 | 4,800.00 | 15.00 | |
| 6105 I/O Writer Selector Switch Assembly | 5.00 | 200.00 | 1.00 | |
| 6106 Software Initiated Alarm | 10.00 | 400.00 | 2.00 | |
| 6107 Remote Audible Alarm | 20.00 | 800.00 | 1.00 | |
| 6108 Extra Loud Alarm | 20.00 | 800.00 | 1.00 | |
| 625-101 Disc Control Unit | 300.00 | 14,000.00 | 15.00 | |
| 655-102 Disc Unit (as a second unit on 615-100 Processor) | 625.00 | 28,750.00 | 110.00 | |
| 655-201 Common Trunk Unit | 600.00 | 26,500.00 | 115.00 | |
| 955-1 Disc Pack for 655 Disc Units | 11.50 | 350.00 | – | |
| 623-201 CRAM Control Unit | 300.00 | 14,000.00 | 20.00 | |
| 653-101 CRAM Unit (145 mb) | 1,250.00 | 60,000.00 | 140.00 | |
| CRAM Deck | – | 450.00 | – | |
| 624-111 80 kb Control Unit | 450.00 | 21,000.00 | 20.00 | |
| 633-111 80 kb Single Unit (phase modulated, 9 channel) | 450.00 | 21,750.00 | 60.00 | |
| 633-121 80 kb Dual Unit (phase modulated; 9-channel) | 800.00 | 38,750.00 | 90.00 | |
| 624-211 144 kb Control Unit | 550.00 | 25,500.00 | 20.00 | |
| 633-211 144 kb Single Unit (phase modulated; 9-channel) | 650.00 | 31,500.00 | 60.00 | |
| 624-311 240 kb Control Unit | 650.00 | 30,000.00 | 20.00 | |
| 633-311 240 kb Single Unit (phase modulated; 9-channel) | 850.00 | 40,000.00 | 60.00 | |
| 624-119 9-Channel, 40 kc  Control Unit | 300.00 | 14,000.00 | 20.00 | |
| 633-119 9-Channel, 40 kc Unit (800 bpi) | 350.00 | 17,000.00 | 65.00 | |
| 624-179 7-/9-channel, 10/28/40 kc Control Unit (200/556/800 bpi) | 350.00 | 16,500.00 | 20.00 | |
| 633-117 7-channel, 10/28/40 kc Control Unit (200/556/800 bpi, respectively) | 350.00 | 17,000.00 | 65.00 | |
| 680-201 Card Reader (1,200 cpm) | 650.00 | 32,500.00 | 120.00 | |
| 686-101 Card Read/Punch (750/82-240 cpm) | 450.00 | 22,000.00 | 115.00 | |
| 686-201 Card Read (750 cpm) | 300.00 | 14,750.00 | 75.00 | |
| 686-301 Card Punch (82-240 cpm) | 350.00 | 17,000.00 | 115.00 | |
| 687-301/622-701 Card Punch and Controller (100 cpm) | 325.00 | 15,500.00 | 95.00 | |
| 660-101 Paper Tape Read (1,500 cps) | 300.00 | 14,750.00 | 35.00 | |
| 665-101 Paper Tape Punch (200 cps) | 375.00 | 18,000.00 | 55.00 | |
| 626-101 Printer Control Unit | 300.00 | 14,000.00 | 25.00 | |
| 640-102 Printer (450 1pm; 132 columns) | 575.00 | 27,500.00 | 60.00 | |
| 6401 6/8 Lines per Inch | 25.00 | 1,000.00 | – | |
| 640-200 Printer (1,500 1pm; 132 columns) | 950.00 | 43,000.00 | 85.00 | |
| 6402 640-200 Continuous Form Tab Set Handling Feature | 10.00 | 300.00 | 2.00 | |
| 640-210 Printer (1,500 1pm; 160 columns) | 1,050.00 | 47,750.00 | 85.00 | |
| 640-300 Printer (600 1pm; 132 columns) | 950.00 | 43,000.00 | 60.00 | |
| 622-401 MICR Sorter Control Unit | 200.00 | 15,100.00 | 10.00 | |
| 670-101 MICR Sorter (600 doc/min) | 990.00 | 45,000.00 | 150.00 | |
| 622-301 OCR Control Unit | 150.00 | 7,000.00 | 10.00 | |

NC  No Charge        –   Not Applicable    TM  Time and Material Basis
S    Single Use Charge     NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **NCR CENTURY 50 AND 100   (CONTD)** | | | | |
| | | | | |
| 420-1 Optical Character Reader | 1,200.00 | 48,000.00 | 184.00 | |
| 420-1 Optical Character Reader | 1,700.00 | 68,000.00 | 265.00 | |
| | | | | |
| 621-101 Communications Multiplexor | | | | |
| (15 lines) | 300.00 | 15,000.00 | 40.00 | |
| 621-102 Communications Multiplexor | | | | |
| (250 lines) | 475.00 | 22,750.00 | 45.00 | |
| 6921 End of Message Feature | | | | |
| (621-102 only) | 20.00 | 950.00 | – | |
| | | | | |
| 690-101 621-101 Auxiliary Cabinet | 50.00 | 2,500.00 | – | |
| 690-201 621-102 Auxiliary Cabinet | 250.00 | 12,500.00 | 5.00 | |
| 692-100 Asynchronous Character Adapter | 65.00 | 3,250.00 | 10.00 | |
| 692-401 Asynchronous Polling Adapter | | | | |
| 1 line/cage) | 100.00 | 5,000.00 | 10.00 | |
| 692-402 Asynchronous Polling Adapter | | | | |
| 2 lines/cage) | 140.00 | 7,000.00 | 15.00 | |
| 692-403 Asynchronous Polling Adapter | | | | |
| 3 lines/cage) | 165.00 | 8,250.00 | 20.00 | |
| 692-405 Terminal Adapter | | | | |
| 1 line/cage) | 100.00 | 4,800.00 | 15.00 | |
| 692-406 Terminal Adapter | | | | |
| 2 lines/cage) | 140.00 | 6,700.00 | 20.00 | |
| 693-200 735/736 Encoder Adapter | 175.00 | 8,250.00 | 15.00 | |
| 693-300 General Purpose Synchronous | | | | |
| Adapter | 160.00 | 7,750.00 | 25.00 | |
| 6901 Transparency Feature | 15.00 | 675.00 | – | |
| 6902 Wide Band Feature | 10.00 | 450.00 | – | |
| | | | | |
| 694-201 Voice Response Adapter | | | | |
| 1 line/cage) | 100.00 | 4,800.00 | 15.00 | |
| 694-202 Voice Response Adapter | | | | |
| 2 lines/cage) | 175.00 | 8,200.00 | 20.00 | |
| | | | | |
| 798-100 Voice Response Unit | 525.00 | 24,200.00 | 40.00 | |
| 7981 Voice Source Assembly Feature | 150.00 | 6,500.00 | – | |
| 7982 Output Module Feature | 25.00 | 1,200.00 | – | |
| 7983 Expansion Cage Feature | 50.00 | 2,400.00 | 10.00 | |
| 7984 Power Supply Feature | 15.00 | 650.00 | – | |
| Voice Film (first copy) | – | 300.00 S | – | |
| Voice Film (each additional copy) | – | 50.00 S | – | |
| *  *  *  *  *  *  *  *  *  *  * | *  *  * | *  *  * | *  *  * | *  *  *  *  *  *  *  * |
| | | | | |
| **NCR 500** | | | | |
| | | | | |
| 517-1 Central Processor (1.6-2.4K) | 505.00 | 18,400.00 | 50.00 | Maintenance from 8:00 a.m. to |
| Low-Speed Tape Input | 25.00 | 850.00 | 4.00 | 12:00 p.m. with optional |
| Low-Speed Tape Output | 10.00 | 450.00 | 2.50 | 24-hour service.  Preventive |
| High-Speed Tape Input | 175.00 | 8,000.00 | 20.00 | maintenance during off hours |
| High-Speed Tape Output | 40.00 | 1,375.00 | 4.00 | at no extra charge.  Emergency |
| | | | | calls are $22.00/hr; NCR pays |
| Punched Card Input | 40.00 | 1,450.00 | 6.00 | traveling expenses. |
| Punched Card Output (low-speed) | 25.00 | 1,050.00 | 3.00 | |
| Punched Card Output (high-speed) | 20.00 | 700.00 | 3.00 | Training provided for an |
| | | | | allowance equal to 2 times |
| Type-to-Memory | 40.00 | 850.00 | 8.00 | monthly rental. |
| Alphanumeric from Console | 25.00 | 1,700.00 | 4.00 | |
| Magnetic Ledger Feature | 130.00 | 1,250.00 | 20.00 | Conversion-to-purchase formula |
| | | | | – 50% of rental up to 24 months. |
| 521-1 Console | 30.00 | 2,300.00 | 9.00 | |
| 590-1 Console (magnetic ledger) | 250.00 | 7,700.00 | 88.00 | There is a 90-day guarantee. |
| 590-2 Console (without magnetic ledger) | 150.00 | 6,200.00 | 48.00 | |
| | | | | |
| 551-2 Punched Card and Printer | | | | |
| Controller (551 buffer) | 130.00 | 5,600.00 | 23.00 | |
| 581-1 Punched Card Input Controller | 65.00 | 4,200.00 | 15.00 | |

NC  No Charge — Not Applicable   TM  Time and Material Basis
S   Single Use Charge   NA  Not Available

© 1972 AUERBACH Publishers Inc.                                                                          115

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **NCR 500  (CONTD)** | | | | |
| 582-1 Punched Card Reader (100 cpm) | 35.00 | 1,200.00 | 15.00 | |
| 576-1 Serial Card Punch | 90.00 | 3,852.00 | 16.00 | |
| 577-1 Parallel Card Punch (100 cpm; requires 551-2 controller) | 125.00 | 4,900.00 | 50.00 | |
| 561-1 Paper Tape Reader (400 cps) | 215.00 | 7,600.00 | 42.00 | |
| 561-2 Paper Tape Reader (600 cps) | 240.00 | 8,450.00 | 42.00 | |
| 562-1 Paper Tape Reader (650 cps) | 185.00 | 6,800.00 | 35.00 | |
| 563-1 Paper Tape Reader (50 cps) | 35.00 | 1,350.00 | 15.00 | |
| 571-1 Paper Tape Punch (120 cps) | 140.00 | 3,250.00 | 67.00 | |
| 572-1 Paper Tape Punch (30 cps) | 60.00 | 1,800.00 | 13.00 | |
| 551-1 Printer Controller | 125.00 | 5,200.00 | 20.00 | |
| 541-1 Line Printer (requires 551-1 or -2 controller; 96 columns; 125 lpm) | 280.00 | 11,600.00 | 60.00 | |
| 420-2 Optical Journal Tape Reader | 1,450.00 | – | 184.00 | |
| 464-2 Alphanumeric Printing Paper Punch | 75.00 | 3,740.00 | 15.00 | |
| 586-1 Ledger Feeder Reader | 140.00 | 4,200.00 | 30.00 | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **PHILIPS 350 SERIES** | | | | |
| P-351 Central Processor (400 words) | 200.00 | NA | NA | Leases average 2.3% of |
| P-352 Central Processor (1,200 words) | 265-460.00 | NA | NA | purchase price. |
| P-353 Central Processor (1,200 words) | 360-550.00 | NA | NA | |
| P-358 Central Processor (1,200 words) | 480-600.00 | NA | NA | Maintenance free under |
| P-359 Central Processor (1,200 words) | 550-650.00 | NA | NA | 12-month warranty. After first year, 7% of purchase price. |
| P-115 Card Reader (280 cpm; for P-352, P-353, P-358, P-359) | 105.00 | NA | NA | Purchase prices range from |
| P-110 Card Punch (37.5 cpm) | 115.00 | NA | NA | $8,395.00 to $27,000.00. |
| P-120 Paper Tape Punch (50 cps) | NA | NA | NA | Average price of system |
| P-125 Paper Tape Reader (50 cps; for P-352, P-353, P-358, P-359) | NA | NA | NA | is $21,000. Request price quotations from manufacturer. |
| Serial Printer (8.2 lpm; for P-351, P-352, P-353) | NA | NA | NA | |
| Serial Printer (5.3 lpm; for P-358, P-359) | NA | NA | NA | |
| Magnetic Stripe Ledger Card (for P-353, P-358, P-359) | NA | NA | NA | |
| P-351 Keyboard Input | NA | NA | NA | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **QANTEL Q SERIES** | | | | |
| QA-2  Processing System (4K) | 271.00 | 12,315.00 | 57.00 | Maintenance available for 24 |
| QB-2  Processing System (8K) | 318.00 | 14,465.00 | 67.00 | hr/day, 7 days/wk. Hours other |
| QC-1  Processing System (16K) | 404.00 | 18,365.00 | 87.00 | than 8:00 to 5:00 weekdays are |
| QD-1  Processing System (32K) | 569.00 | 25,865.00 | 125.00 | overtime and are charged at $25/hr. Nonmaintenance calls |
| MD-2  Disc & Controller | 317.00 | 14,400.00 | 66.00 | are $17.50/hr. |
| MF-1  Tape Transport (600 ft) | 109.00 | 4,950.00 | 27.00 | |
| MG-1  Tape Transport (2,400 ft) | 175.00 | 7,950.00 | 45.00 | Operator training provided at |
| MT-1  Dual Cartridge | 109.00 | 4,950.00 | 25.00 | no cost. Higher maintenance prices outside service areas. |
| AC-1  Card Reader | 87.00 | 3,950.00 | 26.00 | Payment of traveling expenses |
| AD-1  Paper Tape Reader/Punch | 52.00 | 2,350.00 | 16.00 | determined by contract. |
| PD-1  Matrix Printer | 153.00 | 6,950.00 | 45.00 | Leases available for 24 or 36 |
| PB-1  Line Printer (200 lpm) | 253.00 | 11,500.00 | 75.00 | months. Maintenance contract |
| PC-1  Line Printer (600 lpm) | 429.00 | 19,500.00 | – | must be taken with 24- or 36-month lease. |

NC  No Charge          — Not Applicable    TM  Time and Material Basis
S    Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **QANTEL Q SERIES   (CONTD)** | | | | |
| CA-2   Communications Controller Synch/Asynch | 26.00 | 1,200.00 | 10.00 | |
| CB-2   Communications Controller Asynch, Buffered | 26.00 | 1,200.00 | 10.00 | |
| CC-1   Communications Controller Synch/Asynch, Buffered | 53.00 | 2,400.00 | 20.00 | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **SINGER SYSTEM 10** | | | | |
| 20 Processing Unit (10K) | 320.00 | 9,500.00 | NA | Purchase price excludes soft- |
| 10K Core Memory Unit | 135.00 | 5,200.00 | NA | ware, programming, education, |
| File Access Channel | 40.00 | 2,500.00 | NA | and maintenance.  Lease rates |
| Multi-Terminal I/O Channel | 40.00 | 1,100.00 | NA | include maintenance.  Singer |
| 70 Workstation | 155.00 | 4,950.00 | NA | does not publish separate |
| 7102 Console Typewriter with I/O Channel | 160.00 | 5,700.00 | NA | maintenance prices. |
| 40 Disc Controller | 95.00 | 3,000.00 | NA | |
| 40 Auxiliary Disc Controller | 25.00 | 650.00 | NA | |
| 40 Disc Drive | 360.00 | 12,500.00 | NA | |
| 40 Disc Pack | − | 400.00 | NA | |
| 45 Magnetic Tape Controller | 85.00 | 2,700.00 | NA | |
| 45 Magnetic Tape Drive | 390.00 | 12,000.00 | NA | |
| 30 Card Reader | 220.00 | 6,000.00 | NA | |
| 35 Card Punch | 320.00 | 9,000.00 | NA | |
| 60 Paper Tape Reader | 140.00 | 4,000.00 | NA | |
| 65 Paper Tape Punch | 180.00 | 5,000.00 | NA | |
| 50 Line Printer | 585.00 | 18,000.00 | NA | |
| On-Line Communications Adapter | 160.00 | 5,750.00 | NA | |
| Synchronous Communications Adapter 1 | 160.00 | 5,750.00 | NA | |
| Synchronous Communications Adapter 2 | 170.00 | 6,250.00 | NA | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **ULTIMACC COMPUTER SYSTEMS** | | | | |
| Disc System Basic Configuration | 1,150.00 min | 56,900.00 min | 225.00 min | Disc system handles maximum |
| NOVA 1200 Processor (8-32K) | | | | 15 devices. |
| IOMEC 2000 Disc Storage System (5M char; max 4) | NA | 8,000.00 | NA | Installation and unlimited |
| Printer (135 lpm) | | | | usage included in lease price. |
| Printer (300 lpm) | | | | Lease is 5-year full payout. |
| | | | | Conversion-to-purchase option |
| Other Peripherals for Disc System | | | | available. |
| Video Display Terminal | NA | NA | NA | |
| IBM-Compatible Magnetic Tape Drives (max 4) | NA | NA | NA | Service rates for emergency calls are $22.50 to $27.00/hr; |
| Telephone Coupler or Asynchronous Modem | NA | NA | NA | labor costs $20.00/hr.  Client pays room and board for |
| | | | | serviceman. |
| Tape System Basic Configuration | 975.00 | 42,500.00 | 175.00 | |
| NOVA 1200 Processor (4-32K) | | | | |
| TRI-DATA 4196 Tape Cartridge | | | | |
| Serial Printer (30 cps) | | | | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |

NC  No Charge          —  Not Applicable     TM  Time and Material Basis
S    Single Use Charge     NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **UNIVAC 9200 AND 9200II** | | | | |
| 3030-00 9200 Processor (with printer) | 398.00 | 13,485.00 | 88.00 | 9200 system also available for 3-year lease, with yearly costs set at 85% of 1-year rental rate. 5-year plan available with two options. |
| 3030-94 9200II Processor (with printer and multiplexor channel) | 459.00 | 15,834.00 | 95.00 | |
| F0822-00 1001 control | 49.00 | 1,775.00 | 5.00 | |
| F0822-02 1001 control (9200II only) | 105.00 | 4,064.00 | 10.00 | |
| F0869-98 Multiplexor I/O Channel (9200 only) | 58.00 | 2,175.00 | 5.00 | Yearly costs of level-payment agreement are 75% of 1-year rental rate, while the reducing-payment-agreement prices (percentages are at 1-year rental rate) are: first year, 85%; second year, 80%; third year, 75%; fourth year, 70%; fifth year, 65%. These agreements available for new orders only, but a customer over 2 years into his 5-year lease may convert to a new lease agreement. |
| F0943-99 Channel Adapter 1004/1005 | 109.00 | 4,079.00 | 16.00 | |
| F1104-99 Selector Channel (9200II only) | 78.00 | 3,330.00 | 10.00 | |
| 7007-85 Storage (32K; 9200II only) | 1,740.00 | 69,295.00 | 147.00 | |
| 7007-87 Storage (24K; 9200II only) | 1,318.00 | 52,505.00 | 111.00 | |
| 7007-91 Storage (16K) | 873.00 | 34,755.00 | 74.00 | |
| 7007-92 Storage (12K) | 728.00 | 29,275.00 | 55.00 | |
| 7007-93 Storage (8K) | 439.00 | 17,485.00 | 37.00 | |
| F0890-93 Storage Expansion (8K; 9200II only) | 422.00 | 16,790.00 | 36.00 | |
| F0890-94 Storage Expansion (16K; 9200II only) | 868.00 | 34,540.00 | 74.00 | |
| F0890-95 Storage Expansion (8K; 9200II only) | 445.00 | 17,750.00 | 37.00 | |
| F0890-96 Storage Expansion (4K) | 144.00 | 5,480.00 | 18.00 | |
| F0890-97 Storage Expansion (4K) | 144.00 | 5,480.00 | 18.00 | |
| F0890-98 Storage Expansion (4K) | 289.00 | 11,790.00 | 18.00 | |
| F0882-00 Multiply, Divide, Edit | 84.00 | 3,380.00 | 5.00 | |
| F0865-00 Variable Speed Printing | 84.00 | 2,900.00 | 16.00 | |
| F0866-00 120 Print Positions | 132.00 | 5,070.00 | 16.00 | |
| F0868-01 132 Print Positions | 201.00 | 7,730.00 | 22.00 | |
| F0868-00 Print Position Expansion | 68.00 | 2,655.00 | 5.00 | |
| F0963-00 300 lpm Print Speed | 53.00 | 2,175.00 | — | |
| F0969-00 8 lpi Print Spacing | 5.00 | 220.00 | — | |
| F1130-00 Forms Alignment | 10.00 | 410.00 | — | |
| 8541-95 Console/Inquiry (with printer) | 172.00 | 6,960.00 | 32.00 | |
| F1023-00 Disc File Control for 8410 | 255.00 | 9,356.00 | 40.00 | |
| F1023-01 Disc File Control for 8410 (if 1001 control or selector channel used) | 255.00 | 9,356.00 | 40.00 | |
| 8410-00 Dual Disc File Master | 467.00 | 13,475.00 | 157.00 | |
| 8410-92 Dual Disc File Slave | 441.00 | 13,475.00 | 131.00 | |
| 8410-02 Single Disc File Slave | 273.00 | 8,220.00 | 84.00 | |
| F1015-00 Buffer/Fastrand Search | 193.00 | 7,080.00 | 30.00 | |
| F1016-00 Disc Drive | 168.00 | 5,255.00 | 47.00 | |
| F1102-00 Cartridge | 12.00 | 240.00 | — | |
| 5024-00 Disc File Control for 8411 (subsystem for 9200II only) | 540.00 | 20,010.00 | 80.00 | |
| 8411-00 Disc Drive | 490.00 | 19,920.00 | 75.00 | |
| F1043-00 Dual Channel | 100.00 | 3,700.00 | 15.00 | |
| F1098-00 Record Overflow | 10.00 | 435.00 | — | |
| F1099-00 File Scan | 36.00 | 1,525.00 | — | |
| F1211-00 Disc Pack | 15.00 | 300.00 | — | |
| 5024-02 8414 Control (subsystem for 9200II only) | 640.00 | 26,400.00 | 90.00 | |
| 8414-92 Disc Storage (2 disc drives) | 950.00 | 33,000.00 | 130.00 | |
| 8414-94 Disc Storage (4 disc drives) | 1,800.00 | 66,000.00 | 260.00 | |
| 8414-96 Disc Storage (6 disc drives) | 2,550.00 | 99,000.00 | 390.00 | |
| 8414-98 Disc Storage (8 disc drives) | 3,200.00 | 132,000.00 | 520.00 | |
| 8414-85 Disc Drive (for expansion) | 475.00 | 16,500.00 | 65.00 | |
| F1043-00 Dual Channel | 100.00 | 3,700.00 | 15.00 | |
| F1214-00 Disc Pack | 20.00 | 440.00 | — | |

NC  No Charge          — Not Applicable    TM  Time and Material Basis
S    Single Use Charge      NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| UNIVAC 9200 AND 9200II (CONTD) | | | | |
| | | | | |
| Uniservo Tape Subsystems | | | | |
| (for 9200II only) | | | | |
| 0858-99 Uniservo VIC Subsystem | | | | |
| (9-track) | 1,002.00 | 33,800.00 | 230.00 | |
| 0858-10 Uniservo VIC Master (9-track) | 543.00 | 18,218.00 | 123.00 | |
| 0858-14 Uniservo VIC Slave (9-track) | 327.00 | 10,995.00 | 75.00 | |
| 0858-98 Uniservo VIC Subsystem | | | | |
| (7-track) | 1,002.00 | 33,800.00 | 230.00 | |
| 0858-00 Uniservo VIC Master (7-track) | 543.00 | 18,218.00 | 123.00 | |
| 0858-01 Uniservo VIC Slave (7-track) | 327.00 | 10,995.00 | 75.00 | |
| F0827-00 Data Conversion | 61.00 | 2,237.00 | 5.00 | |
| F0828-00 7-Track Feature (for 0858-99) | 61.00 | 2,237.00 | 5.00 | |
| F1021-00 7- to 9-Track Conversion | | | | |
| (from 0848-00/01 to 0858-10/14) | NC | NC | NC | |
| F1021-99 7- to 9-Track Conversion | | | | |
| (from 0858-98 to 0858-99) | NC | NC | NC | |
| | | | | |
| 5017-99 Uniservo 12 Control (9-track) | 632.00 | 23,294.00 | 96.00 | |
| 861-00 Uniservo 12 Master (9-track) | 590.00 | 21,016.00 | 107.00 | |
| 0861-01 Uniservo 12 Slave (9-track) | 359.00 | 12,332.00 | 75.00 | |
| 0861-04 Uniservo 12 Master (7-track) | 543.00 | 18,958.00 | 107.00 | |
| 0861-05 Uniservo 12 Slave (7-track) | 327.00 | 10,962.00 | 75.00 | |
| F0823-99 7-Track NRZI (allows | | | | |
| 5017-99 to also control 7-track | | | | |
| units) | 132.00 | 5,024.00 | 16.00 | |
| F0826-00 9-Track NRZI | 132.00 | 5,024.00 | 16.00 | |
| F0935-00 Dual Density | 63.00 | 2,284.00 | 10.00 | |
| F1028-95 7-Track Addition | | | | |
| (to F0826-00) | 94.00 | 3,654.00 | 10.00 | |
| F1028-96 9-Track Addition | | | | |
| (to F0823-99) | 94.00 | 3,654.00 | 10.00 | |
| F1041-00 7- to 9-Track Conversion | | | | |
| (for 0861-04) | 47.00 | 2,058.00 | NC | |
| F1042-00 7- to 9-Track Conversion | | | | |
| (for 0861-05) | 32.00 | 1,370.00 | NC | |
| | | | | |
| 0711-00 Card Reader (400 cpm) | 162.00 | 5,219.00 | 40.00 | |
| 0711-02 Card Reader (600 cpm; 9200II | | | | |
| only) | 233.00 | 6,962.00 | 73.00 | |
| F0872-00 Short Card Reading | | | | |
| (51 column) | 49.00 | 1,496.00 | 10.00 | |
| F0872-01 Short Card Reading | | | | |
| (66 column) | 49.00 | 1,496.00 | 10.00 | |
| F1054-01 90 Column Read | 21.00 | 452.00 | — | |
| F1097-00 Multi-Strobe Read | 32.00 | 1,202.00 | 5.00 | |
| | | | | |
| 0603-04 Card Punch | 229.00 | 6,630.00 | 77.00 | |
| 0604-00 Card Punch (9200II only) | 326.00 | 9,920.00 | 96.00 | |
| 0604-99 Card Punch and Control | | | | |
| (9200II only) | 456.00 | 15,660.00 | 96.00 | |
| F0870-00 Read/Punch | 87.00 | 2,982.00 | 16.00 | |
| F0871-00 Selective Stacker | 10.00 | 431.00 | — | |
| F0875-00 Read/Punch (for 0604-00, -99) | 163.00 | 4,970.00 | 47.00 | |
| F0945-00 250 CPM Rate (for 0604-00) | 137.00 | 6,027.00 | — | |
| | | | | |
| 0920-02 Paper Tape Control | 210.00 | 7,917.00 | 28.00 | |
| F1032-02 Punch (110 cps) | 154.00 | 5,754.00 | 22.00 | |
| F1033-02 Reader (300 cps) | 55.00 | 1,680.00 | 16.00 | |
| F1034-00 Reader Spooler | 44.00 | 1,680.00 | 5.00 | |
| F1035-00 Punch Take-Up Spooler | 20.00 | 688.00 | 5.00 | |
| | | | | |
| 0768-00 Printer and Control (1,100 lpm; | | | | |
| 9200II only) | 1,319.00 | 42,709.00 | 337.00 | |
| 0768-99 Printer and Control (1,600 lpm; | | | | |
| 9200II only) | 1,635.00 | 52,989.00 | 417.00 | |
| F1071-00 1600/1200 lpm Rate | | | | |
| (converts 0768-00 to 0768-99) | 316.00 | 10,280.00 | 80.00 | |

NC  No Charge     —  Not Applicable    TM  Time and Material Basis
S    Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| **UNIVAC 9200 AND 9200II (CONTD)** | | | | |
| 8575-00 Line Terminal Control-4 | 298.00 | 10,500.00 | 44.00 | |
| F1000-00 Line Terminal Control-1 | 126.00 | 4,570.00 | 16.00 | |
| F1002-00 CI Telegraph | 10.00 | 350.00 | 2.00 | |
| F1002-03 CI Private Line | 15.00 | 565.00 | 2.00 | |
| F1002-04 CI Data Phone | 15.00 | 565.00 | 2.00 | |
| F1002-05 CI Wideband | 27.00 | 915.00 | 5.00 | |
| F1002-08 CI 205B | 15.00 | 565.00 | 2.00 | |
| F1003-96 LT TWX | 78.00 | 2,160.00 | 11.00 | |
| F1003-97 LT Telex | 72.00 | 2,560.00 | 11.00 | |
| F1003-98 LT Telegraph Checking | 54.00 | 1,920.00 | 8.00 | |
| F1003-99 LT Telegraph Non-Check | 49.00 | 1,740.00 | 7.00 | |
| F1004-98 LT Medium Speed Checking | 69.00 | 2,470.00 | 10.00 | |
| F1004-99 LT Medium Speed Non-Check | 58.00 | 2,100.00 | 8.00 | |
| F1005-96 LT Synchronous Checking Odd LRC | 83.00 | 2,895.00 | 13.00 | |
| F1005-97 LT Remote Computer | 71.00 | 2,555.00 | 10.00 | |
| F1005-98 LT Synchronous Checking Even LRC | 67.00 | 2,375.00 | 10.00 | |
| F1005-99 LT Synchronous Non-Check | 58.00 | 2,100.00 | 8.00 | |
| F1006-99 LT Parallel | 45.00 | 1,600.00 | 6.00 | |
| F1007-99 Dialing Adapter | 57.00 | 2,060.00 | 8.00 | |
| F1008-00 LRC (longitudinal redundancy check; for 8575-00) | 49.00 | 1,735.00 | 7.00 | |
| F1008-99 LRC (for F1000-00) | 20.00 | 740.00 | 3.00 | |
| F1010-99 ATA (Asynchronous Timing Assembly; 16 available speeds) | 12.00 | 435.00 | 2.00 | |
| F1011-00 STA 1200 (Synchronous Timing Assembly) | 44.00 | 1,600.00 | 6.00 | |
| F1011-04 STA 600 | 44.00 | 1,600.00 | 6.00 | |
| F1011-05 STA 1800 | 45.00 | 1,600.00 | 6.00 | |
| 8577-00 Line Terminal Control-IC (for Binary Synchronous Data Communication Subsystem) | 221.00 | 8,640.00 | 32.00 | |
| F1357-00 Line Terminal Control-IC Integral (adds to 8577-00) | 157.00 | 6,000.00 | 26.00 | |
| F1358-00 LT Non-Transparent | 121.00 | 4,800.00 | 16.00 | |
| F1358-01 LT Transparent | 157.00 | 6,000.00 | 26.00 | |
| F1359-00 High Speed Buffer | 31.00 | 1,200.00 | 5.00 | |
| F1360-00 Polling | 41.00 | 1,680.00 | 5.00 | |
| F1361-00 Station Select | 31.00 | 1,200.00 | 5.00 | |
| F1363-00 Dialing Adapter | 41.00 | 1,680.00 | 5.00 | |
| F1395-00 Communication Interface | 20.00 | 720.00 | 5.00 | |
| F1395-01 Communication Interface | 47.00 | 1,920.00 | 5.00 | |
| * * * * * * * * * * * | * * * | * * * * | * * * * | * * * * * * * * |
| **VICTOR SERIES 800** | | | | |
| 820/07 Computer System | — | 7,600.00 | NA | Leases handled by leasing firms, not manufacturer. |
| 820/10 Computer Billing System (includes central processor, 6K words of rod cell memory, up to 512 words of core memory, I/O controls, keyboard, and printer) | — | 13,000.00 | NA | Hours for maintenance primarily 8:00 to 5:00. Emergency calls outside of this time period cost $25.00/hr, including travel time, plus expenses and a distance rate of $0.15/mile. |
| 820/21 Computer Billing System (includes central processor, 16K words of rod cell memory, up to 1K words of core memory, I/O controls for up to 9 devices) | — | 18,000.00 | NA | Maintenance includes three preventive inspections per year and emergency service during 8:00 to 5:00. All parts and labor have 1-year warranty. |

NC  No Charge      —  Not Applicable    TM  Time and Material Basis
S  Single Use Charge    NA  Not Available

| IDENTITY | LEASE (1YR) INCL MAINT, $/MONTH | PURCHASE PRICE, $ | MONTHLY MAINT $ | COMMENTS |
|---|---|---|---|---|
| VICTOR SERIES 800  (CONTD) | | | | Victor provides operator and program training. |
| 820/23 Computer System | – | 20,000.00 | NA | |
| 820/24 Computer System | – | 22,000.00 | NA | System software with devices, but there are separate charges for application software. |
| 820/25 Magnetic Ledger Card System (includes central processor, 16K words of rod cell memory, up to 1K words of core memory, I/O controls) | – | 24,000.00 | NA | Peripheral price quotations available from manufacturer. |
| 820/30 Magnetic Ledger Computer (same as 820/25, with ability to accept more peripheral devices) | – | 26,000.00 | NA | |

NC  No Charge  — Not Applicable  TM  Time and Material Basis
S   Single Use Charge   NA  Not Available

# III. APPENDIXES

A. SCORING SYSTEM
B. SUPPLIERS
C. GLOSSARY

# SMALL BUSINESS COMPUTERS
## Appendix A: Scoring System

### INTRODUCTION

The scoring system described in this appendix is provided to help you select a small business computer. Use this system cautiously, however. It cannot help you in the initial selection process, which must be based on the particular data processing needs of your company and any budgetary constraints that are imposed. The scoring system is useful only to determine the relative value of the roughly similar computer systems to which your choice must finally narrow.

Four major evaluation areas are considered and total points are assigned as follows, based on the relative importance of each area (see attached worksheet):

- Manufacturer (33 points)
- Central processor (24 points)
- Peripheral equipment (31 points)
- Software (12 points)

You will note that one-third of the weight is assigned to the manufacturer and two-thirds to the computer system itself.

If the system under consideration scores the maximum in all categories and if the manufacturer's credentials are perfect, the point total will be 100. After adding up the points in each category, divide the total by the lease costs — including a provision for the maintenance contract — and you have a measure of the system's value in terms of performance-per-dollar. Do the same for all other systems under consideration, and you've got a relative rating for each.

A further word of caution: be sure that you can live with the manufacturer's representatives before committing yourself to a system. Remember that you will always need some assistance from the manufacturer, and conceivably you may need a lot. Unless the manufacturer shows that he also needs your business and will work to get it, a high score based on other factors can prove meaningless. Here's where your experience in judging people and situations can be invaluable.

In comparing ratings, be sure that you have used total system costs, including those training and support costs that may only appear afterwards if the quoted price is an unbundled one. This is especially true of software costs, which will typically equal 15% of the total purchase price of a system. A software cost of $10,000 for a $70,000 system is about average. Be skeptical of quotations that reflect a much lower percentage: they may be unrealistic, no matter what company is making them.

### FACTORS RELATED TO MANUFACTURER

As previously mentioned, one-third weight (33 points) is assigned to the manufacturer to reflect items such as his ability to fill an order promptly, his experience and reputation, ability to provide prompt maintenance service, and training. These factors are discussed in the following paragraphs.

Prompt response to an order is the mark of a competent, experienced, and truly interested manufacturer. Allot seven points to this area, according to the contractually specified installation date, as follows: Seven points for three weeks or less, diminishing at a rate of roughly one point per week for each week in excess of three. An 11-week schedule would rate zero points. The one situation that doesn't follow this logic occurs when a long delivery schedule results from a computer becoming so popular that the manufacturer can't keep up with the demand for that model, and is forced to just add customers' names to a waiting list. However, this sort of special situation will be widely known whenever it occurs, and you are unlikely to make the mistake of penalizing the manufacturer in the scoring. However, since excessive delays can be costly, this should be considered in the evaluation.

The manufacturer's reputation is another important factor, but it must be evaluated in the light of his experience with the specific type of system that you are buying. Allot nine points as follows: As many as four points for the manufacturer's overall experience in the computer field and up to five points for specific experience with small business computers based on the number of similar systems delivered. Allocate on the basis of one point for each 20 systems; 100 or more systems delivered rates a full five points.

Sooner or later all equipment needs maintenance and, in accordance with Murphy's law, breakdowns always occur at critical times. Allot six points for the ability to get prompt maintenance service. Score the full six for local (within 50 miles) on-call service with a 24-hour turnaround on the central processor. Diminish this by one point for each additional 75 miles between your installation and the nearest service organization.

Training and documentation provided by the manufacturer is very important, especially to a novice user. Allow 10 points for this area, with a full score if the training is detailed and is supported by first-rate manuals covering both the hardware and the software. Well-organized, well-written documentation is vital if your SBC

is ever to be used to its full potential, so weight the scoring as follows: four points for the quality of training and six points for the quality of the documentation. Do not concern yourself with whether the training and documentation costs are bundled in the system price or separately specified. In a subsequent calculation the system's performance will be compared with its total price in order to arrive at a measure of its relative worth.

Finally, as a precaution against some stubborn maintenance problem, score one point for the availability of a comparable installation where you can arrange to have your programs run on an emergency basis.

## COMPUTER SYSTEM FACTORS

Of the two-thirds weight (67 percentage points) allocated to the computer systems area, the heaviest emphasis (31 points) is on peripherals since this equipment represents the largest portion of the system price. Next in priority is the central processor (24 points) and the third area covered is software (12 points). Each of these areas is discussed separately in the following paragraphs.

### Peripherals

Peripheral equipment consists of input devices, output devices, and auxiliary memory (bulk data storage used to augment the central processor's memory). The 31 points assigned to them should be scored as follows: 7 points for the input devices, 12 points for the output devices, and 12 points for auxiliary storage. The scoring system is a simple one that can easily be followed using the attached worksheet. Note that under Data Input no credit is given for a keyboard — some form of manual entry system is a basic requirement. Input rates for punched card and punched paper tape are treated as roughly equivalent, on the assumption that a typical 80-column card will contain only 60 characters. Thus, one card per minute is about the same as one character per second. Of course, if a 96-column card is used, its rate should be scaled up proportionately.

Under Data Output, note that the rating for character printers and line printers is based on the assumption that the typical line on a 135-column line printer will contain only 80 characters. Note further that the upper limit of character-printer performance is virtually coincident with the lower limit of line-printer performance. Thus, a character printer can be given a maximum score of two points, whereas a line printer can score no less than two points and a maximum of eight points. The computer system can accrue

as much as an additional four points if it also provides either punched card or punched tape output.

The 12-point total for Auxiliary Storage is divided as follows: On-line capacity can garner as much as three points; disc or drum transfer rate as much as four points; and tape transfer rate as much as an additional four points. In those systems which use tape auxiliary storage alone, the full four points that might have accrued from a disc (or drum) system are lost. However, in those cases where a disc (or drum) alone is used, only two points are lost, as the disc (or drum) transfer rate is then scored on the basis of a six-point maximum. Finally, a further point can be accrued if the average access time to the memory's data is sufficiently small.

### Central Processor

For the scoring of the central processor unit (24 points maximum), word size can add as much as two points to the total score, provided it is at least 24 bits long. Words of less than 16 bits rate zero. Main memory size is scored a maximum of five points for 130K bytes or more, and down to zero for memories smaller than 8 kilobytes. Add time, too, can score a maximum of five points if 1 microsecond or less, and as low as zero if it exceeds 100 microseconds. If the Instruction Set (the number of different operations such as add, subtract, and multiply that the computer can be instructed to perform) is more than 69, the score total gains one point. Nothing is added to the score if the Instruction Set comprises less than 69 operations. Score a maximum of two points under Arithmetic, depending on what arithmetic processes the computer hardware can perform. Addressing capability can add a maximum of three points to the total, as can Programmable Registers; in each case the scoring is scaled to the flexibility afforded. Finally, if the central processor has an interrupt capability, i.e., if it can temporarily suspend operation to receive new inputs, add two points to the total, with an additional point if the computer can handle at least three input sources and assign interrupt priorities to each.

### Software

A computer's ability to operate with a compiler language is an important asset since it enables the user to develop flexible application packages economically. In evaluating a computer's software capabilities, the 12 percentage points allocated to this area are scored as follows: For the first compiler language that it will accept, score four points, adding three points for a second language and one for a third. If operating systems can be used, add three

points for the first one and one point for the second. A computer with three compiler languages and two operating systems thus scores the full 12% allowed for software.

CONCLUSION

In summary, the Scoring System for Small Business Computers described in the preceding paragraphs is divided in a 2:1 ratio of computer system factors to manufacturer factors, and is structured to permit a meaningful comparison of roughly equivalent systems.

For clarity and convenience, all of the scoring details are summarized in the attached worksheet, which may be reproduced and used in performing a comparative evaluation.

WORKSHEET
SMALL BUSINESS COMPUTERS SCORING SYSTEM

| Factors Related to Manufacturer (33-point total) | Point Selections | Point Assignments |
|---|---|---|
| Delivery and Installation Time | 7 max<br>7 points for 21 days or less,<br>6 for 35, 5 for 50, 4 for 60,<br>3 for 65, 2 for 70, 1 for 75,<br>0 for more than 75. | _____ |
| Overall Experience | 4 max<br>4 points for extensive,<br>3 for good, 2 for modest,<br>1 for low, 0 if a new manufacturer. | _____ |
| Experience with SBCs | 5 max<br>5 points if 100 systems or more<br>have been installed, 4 for 80,<br>3 for 60, 2 for 40, 1 for 20,<br>0 for less than 20. | _____ |
| Maintenance<br>(distance to service organization,<br>assuming 24-hour turnaround time<br>on CPU and on-call service) | 6 max<br>6 points if within 50 miles,<br>5 if 125, 4 if 200, 3 if 275,<br>2 if 350, 1 if 425, 0 if over 425. | _____ |
| Training Provided | 4 max<br>4 points if excellent, 3 if very good,<br>2 if good, 1 if moderate, 0 if poor<br>or nonexistent. | _____ |
| Documentation Provided | 6 max<br>6 points if hardware manuals are<br>excellent, 4 if good, 2 for fair,<br>0 if poor or nonexistent. | _____ |
| Availability of Alternate Site<br>with Comparable Installation | 1 max<br>1 point if site is available within<br>75 miles, 0 if not available. | _____ |

| Peripheral Equipment (31-point total) | Point Selections | Point Assignments |
|---|---|---|
| **Data Input Devices**<br><br>Punched Card (cards/min)<br>or<br>Punched Paper Tape (char/sec) | 7 max<br><br>7 points for 2,000 or more cards/min or char/sec; 6 for 1,100; 5 for 600; 4 for 350; 3 for 200; 1 for 40; 0 for less than 40. | _____ |
| **Data Output Devices**<br><br>Line Printer (lines/min)<br><br>or<br><br>Character Printer (char/sec)<br><br>And, if available in the system, add the following:<br><br>Punched Card or Punched Paper Tape (cards/min or char/sec) | 12 max<br><br>8 points for 1,500 or more lines/min; 7 for 1,100; 6 for 840; 5 for 600; 4 for 400; 3 for 250; 2 for 125.<br><br>2 points for 165 char/sec, 1 for 40, 0 for less than 40.<br><br>PLUS (if the system provides this feature)<br><br>4 points for 1,000 or more cards/min or char/sec; 3.5 for 600; 3 for 300; 2.5 for 200; 1.5 for 100; 1 for 60; 0 for less than 0. | _____<br><br>_____<br><br><br>_____ |
| **Auxiliary Storage**<br><br>Auxiliary On-Line Capacity<br><br><br>PLUS A or B<br><br>A — Disc (or Drum) Transfer Rate (K bytes/sec) If System Uses Disc (or Drum) and Tape<br><br>B — Disc (or Drum) Transfer Rate (K bytes/sec) If System Uses Disc (or Drum) Alone<br><br><br>PLUS<br><br>Tape Transfer Rate (K bytes/sec) If Disc (or Drum) and Tape Are Used<br><br>PLUS<br><br>Average Access Time (msec) (positioning + latency) | 12 max<br><br>3 points for 10,000–100,000K bytes or more; 2 for 1,000–10,000; 1 for 100–1,000; 0 for less than 100.<br><br>PLUS A or B<br><br>A — 4 points for 500K bytes/sec or more, 3 for 250, 2 for 125, 1 for 50, 0 for less than 50.<br><br>B — 6 points for 500K bytes/sec or more, 5 for 320, 4 for 200, 3 for 125, 2 for 60, 1 for 30, 0 for less than 30.<br><br>PLUS<br><br>4 points for 80K bytes/sec or more, 3 for 40, 2 for 18, 1 for 6, 0 for less than 6.<br><br>PLUS<br><br>1 point for 78 msec or less, 0 for more than 78. | _____<br><br><br><br>_____<br><br><br>_____<br><br><br>_____<br><br><br>_____ |

| Central Processor (24-point total) | Point Selections | Point Assignments |
|---|---|---|
| Word Size (bits) | 2 max<br>2 points if 24 bits or more, 1 if between 16 and 23 bits, 0 if less than 16 bits. | _____ |
| Main Memory Size (kb) | 5 max<br>5 points for 130kb or more, 4 for 65, 0 for less than 8. | _____ |
| Add Time ($\mu$sec) | 5 max<br>5 points for 1 $\mu$sec or less, 4 for 3, 3 for 10, 2 for 30, 1 for 100, 0 for more than 100. | _____ |
| Instruction Set | 1 max<br>1 point for 69 or more, 0 for less than 69. | _____ |
| Arithmetic | 2 max<br>1 point for hardware multiply/divide PLUS 1 point for hardware multiple precision. | _____ |
| Addressing | 3 max<br>2 points for indirect addressing PLUS 1 point for indexed or relative addressing. | _____ |
| Programmable Registers | 3 max<br>3 points for more than 4 accumulators, 2 for 4, 1 for 2 and 3, 0 for 1. | _____ |
| Interrupts | 3 max<br>2 points for an interrupt capability PLUS 1 point for 3 or more priorities. | _____ |

| Software (12-point total) | Point Selections | Point Assignments |
|---|---|---|
| Compiler Languages (Cobol, Fortran, Basic, RPG, etc.) | 8 max<br>4 points for a first compiler language PLUS 3 points for a second PLUS 1 point for a third. | _____ |
| Operating Systems (TOS, DOS) | 4 max<br>3 points for a first operating system PLUS 1 point for a second. | _____ |

### Calculation of Relative Merit (RM)

Monthly Lease Rates

Hardware _____

Software _____

Maintenance _____

Training _____

Documentation _____

TOTAL COST _____

Total Points _____

Total Cost _____

$$RM = \frac{\text{Total Points}}{\text{Total Cost}} = \underline{\hspace{2cm}}$$

**HEADQUARTERS**
(For other offices, see listing on subsequent pages.)

**BASIC/FOUR CORPORATION**
1335 South Claudina Street
Anaheim CA 92805
Phone (714) 533-0200

**BURROUGHS CORPORATION**
6071 Second Avenue
Detroit MI 48232
Phone (313) 972-7000

**CASCADE DATA, INC.**
3000 Kraft Avenue S.E.
Grand Rapids MI 49508
Phone (616) 949-8850

**ELDORADO ELECTRODATA CORPORATION**
601 Chalomar Road
Concord CA 94520
Phone (415) 686-4200
TWX 910-481-9476

**FRIDEN DIVISION (SEE SINGER)**

**HONEYWELL INFORMATION SYSTEMS, INC.**
200 Smith Street
Waltham MA 02154
Phone (617) 237-4100

**IBM**
Armonk NY 10504
Phone (914) 765-1900

**LITTON AUTOMATED BUSINESS SYSTEMS**
600 Washington Avenue
Carlstadt NJ 07072
Phone (201) 935-2200

**NATIONAL CASH REGISTER COMPANY**
Main and K Streets
Dayton OH 45409
Phone (513) 449-3670

**PHILIPS BUSINESS SYSTEMS, INC.**
100 East 42nd Street
New York NY 10017
Phone (212) 697-3600

**QANTEL CORPORATION**
3474 Investment Boulevard
Hayward CA 94545
Phone (415) 783-3410

**THE SINGER COMPANY**
**FRIDEN DIVISION**
2350 Washington Avenue
San Leandro CA 94577

**ULTIMACC SYSTEMS, INC.**
1064 River Road
Edgewater NJ 07020
Phone (201) 845-0500

**UNIVAC**
Box 500
Blue Bell Pa 19422
Phone (215) MI 6-9000

**VICTOR COMPTOMETER CORPORATION**
**COMPUTER DIVISION**
3900 North Rockwell Street
Chicago IL 60618
Phone (312) 539-8200

**BASIC/FOUR CORPORATION**

2500 Wilshire Boulevard[1]
Los Angeles CA 90057

**BURROUGHS CORPORATION**

Consult your telephone directory for sales
offices.

**CASCADE DATA, INC.**

c/o Pan American Systems Corporation[2]
P.O. Box 2808
56 East Amelia Street
Orlando FL 32802

2500 Devon[3]
Des Plaines IL 60018
(Chicago area)

c/o R & S Systems, Inc.[2]
Three New England
Executive Park
Burlington MA 01803

3000 Kraft Avenue S.E.[3]
Grand Rapids MI 49508

24175 Northwestern Highway[3]
Southfield MI 48075
(Detroit area)

c/o Friedman, Tschirhart & Hamilton[2]
4130 Linden Avenue
Suite 390
Dayton OH 45432

**ELDORADO ELECTRODATA CORPORATION**

A list of sales offices is unavailable. Consult
your telephone directory.

**HONEYWELL INFORMATION SYSTEMS, INC.**

Consult your telephone directory for sales
offices.

**IBM**

A list of sales offices is unavailable. Consult
your telephone directory.

**LITTON AUTOMATED BUSINESS SYSTEMS**

4 Office Park Circle[4]
Suites 217-218
Birmingham AL

33 East McDowell Road[4]
Phoenix AZ

1101 West Second Street[4]
Little Rock AR

12931 Budlong Avenue[4]
Gardena CA

2828 Beverly Boulevard[4]
Los Angeles CA

1281-D Veterans Boulevard[4]
Redwood City CA

**LITTON (CONTD.)**

2245 Park Towne Circle[4]
Suite 1
Sacramento CA

5106 Federal Boulevard[4]
San Diego CA

450 Decatur[4]
Denver CO

621 Farmington Avenue[4]
Hartford CT

1700 Wisconsin Avenue N.W.[4]
Washington DC

4151 Woodcock Drive[4]
Suite 209
Jacksonville FL

35 S.W. Eighth Street[4]
Miami FL

110 South Hoover Boulevard[4]
Suite 111
Tampa FL

1117 West Peachtree Street N.W.[4]
Atlanta GA

530 North Lake Shore Drive[4]
Chicago IL

4721 Lima Road[4]
Fort Wayne IN

2464 North Meridian Street[4]
Indianapolis IN

1501 North Ironwood Drive[4]
South Bend IN

416 South Market[4]
Wichita KS

1517 Bardstown Road[1]
Louisville KY

2475 Canal Street[4]
New Orleans LA

2 Hamill Road[4]
Village of Cross Keys
Baltimore MD

1280 Soldiers Field Road[4]
Boston MA

30 Bowdoin Street[4]
Springfield MA

19215 West Eight Mile Road[4]
Detroit MI

353 Fuller Avenue N.E.[4]
Grand Rapids MI

**LITTON (CONTD.)**

2240 Weiss[4]
Saginaw MI

6415 Wayzata Boulevard[4]
Minneapolis MN

1711 Broadway[4]
Kansas City MO

222 South Meramac Avenue[4]
(Clayton)
St. Louis MO

1602 Pennington Road[4]
Trenton NJ

1600 Highway 22[4]
Union NJ

Cambridge Square[4]
4245 Union Road
Cheektowaga NY
(Buffalo area)

155 Delaware Avenue[4]
Delmar NY
(Albany area)

3 Adler Drive[1]
East Syracuse NY
(Syracuse area)

633 Third Avenue[4]
New York NY

550 Main Street[4]
Rochester NY

1433 Elizabeth Avenue[4]
Charlotte NC

1400-B West Northwood Street[4]
Greensboro NC

3810 Merton Drive[4]
Raleigh NC

533 East University Avenue[4]
Cincinnati OH

895 East Highland Road[4]
Cleveland OH

2201 Embury Park Road[4]
Dayton OH

4064 Monroe Street[4]
Toledo OH

2919 United Founders Boulevard[4]
Oklahoma City OK

4405 South Peoria[4]
Tulsa OK

1806 N.W. Couch[4]
Portland OR

---

(1)   Sales Office
(2)   Distributor
(3)   Branch Office
(4)   Sales and Service

3918-B Jonestown Road[4]
Harrisburg PA

Narrows Mall Office Building[4]
Kingston PA
(Wilkes Barre area)

3913 Chestnut Street[4]
Philadelphia PA

913 Penn Avenue[4]
Pittsburgh PA

Edificio Caribbean Towers[4]
Suite 205
Avenida Ponce de Leon 760
Santurce
San Juan PR

971-A Waterman Avenue[4]
East Providence RI
(Providence area)

3008 Millwood Avenue[4]
Columbia SC

741 North Pleasantburg Drive[4]
Greenville SC

808 Glamis Circle[1]
Chattanooga TN

2918 East Magnolia Avenue[4]
Knoxville TN

1294 Union Avenue[4]
Memphis TN

310 Philfre Court[4]
Suite 110
Nashville TN

2801 Maple Avenue[4]
Dallas TX

3121 Richmond Avenue[4]
Houston TX

420 South Main Street[4]
San Antonio TX

2150 South Second West[1]
Suite IJ
Freeway Plaza
Salt Lake City UT

Thomas Corner Station[4]
116-119 Janaf Office Building
Norfolk VA

6021 West Broad Street[4]
Richmond VA

3215 Brandon Avenue S.W.[4]
Roanoke VA

117 Warren Avenue, North[4]
Seattle WA

(1)    Sales Office
(2)    Distributor
(3)    Branch Office
(4)    Sales and Service

611 North Lynndale Drive[1]
Appleton WI

4075 North Teutonia Avenue[4]
Milwaukee WI

## NATIONAL CASH REGISTER COMPANY

Consult your telephone directory for sales
offices.

## PHILIPS BUSINESS SYSTEMS, INC.

7530 Frontage Road[3]
Skokie IL 60076
(Chicago area)
Phone (312) 679-8600

36 Washington Street[3]
Wellesley Hills MA 02181
(Boston area)
Phone (617) 237-9680

1620 Route No. 22[3]
Union NJ 07083
Phone (201) 686-8834

30-20 Review Avenue[3]
Long Island City NY 11101
Phone (212) 392-0100

292 Madison Avenue[3]
New York NY 10017
Phone (212) 889-2080

## QANTEL CORPORATION

3474 Investment Boulevard[1]
Hayward CA 94545
Phone (415) 783-3410

8622 Bellanca[1]
Los Angeles CA 90045
Phone (213) 641-8644

Computer Usage Company Inc.[2]
Presidential Park
Suite 123
3781 N.E. Expressway
Atlanta GA 30040
Phone (404) 451-4643

Computer Usage Company Inc.[2]
600 South Michigan Avenue
Chicago IL 60605
Phone (312) 427-1404

Central Iowa Computer Corporation[2]
1729 F Avenue
Nevada IA 50201
Phone (515) 382-2348

Computer Usage Company Inc.[2]
387 Elliot Street
Newton Upper Falls MA 02164
Phone (617) 969-4000

Computer Usage Company Inc.[2]
30233 Southfield Road
Southfield MI 40875
Phone (313) 647-8312, 647-8313

1405 Salem Church Road[1]
Inver Grove Heights MN 55075
Phone (612) 890-0797

Wenco[2]
P.O. Box 195
Grandview MO 64030
Phone (816) 765-1151, 765-1081

Computer Usage Company Inc.[2]
655 Madison Avenue
New York NY 10021
Phone (212) 752-5900

Computer Usage Company Inc.[2]
Barclay Building
City Line & Belmont Avenues
Bala Cynwyd Pa 19004
Phone (215) 839-4185

## THE SINGER COMPANY

The following cities have Singer sales
offices.

Birmingham AL
Long Beach CA
Los Angeles CA
Oakland CA
San Francisco CA
San Jose CA
Denver CO
Bridgeport CT
Hartford CT
Washington DC
Miami FL
Atlanta GA
Honolulu HI
Chicago IL
Peoria IL
Indianapolis IN
Kansas City KS
New Orleans LA
Baltimore MD
Boston MA
Detroit MI
Grand Rapids MI
Minneapolis MN
St. Louis MO
Hackensack NJ
Newark NJ
Trenton NJ
Buffalo NY
Mineola NY
New York NY
Scarsdale NY
Akron OH
Cincinnati OH
Cleveland OH
Columbus OH
Oklahoma City OK
Portland OR
Philadelphia PA
Pittsburgh PA
Puerto Rico
Corpus Christi TX
Dallas TX
Houston TX
San Antonio TX
Salt Lake City UT
Seattle WA
Milwaukee WI

---

**ULTIMACC SYSTEMS, INC.**

1064 River Road[1]
Edgewater NJ 07020
Phone (201) 845-0500

**UNIVAC**

Consult your telephone directory for sales offices.

**VICTOR COMPTOMETER CORPORATION COMPUTER DIVISION**

4311 Wilshire Boulevard[3]
Los Angeles CA 90010
Phone (213) 937-6120

500 North Michigan Avenue[3]
Chicago IL 60611
Phone (312) 644-1200

| | |
|---|---|
| (1) | Sales Office |
| (2) | Distributor |
| (3) | Branch Office |
| (4) | Sales and Service |

**VICTOR (CONTD.)**

850 Boylston Street[3]
Chestnut Hill MA 02167
(Boston area)
Phone (617) 731-1710

19675 West 10 Mile Road[3]
Southfield MI 48075
(Detroit area)
Phone (313) 352-9560

50 Union Avenue[3]
Room 800
Irvington NJ
(Newark area)
Phone (201) 399-3900

65-55 Woodhaven Boulevard[3]
Forest Hills NY 11374
Phone (212) 897-1131

**VICTOR (CONTD.)**

110 East 59th Street[3]
New York NY 10022
Phone (212) 758-8750

1801 East 9th Street[3]
Cleveland OH 44114
Phone (216) 861-2970

1845 Walnut Street[3]
Philadelphia Pa 19103
Phone (215) 568-3141

Two Greenway Plaza East[3]
Suite 114
Houston TX 77027
Phone (713) 621-3560

**Access time.** (1) The time interval between the instant at which data are requested from a storage device and the instant delivery is completed, i.e., the read time. (2) The time interval between the instant at which a request to store data is made and the instant at which storage is completed, i.e., the write time.

**Accounting machine.** (1) A keyboard-actuated machine that prepares accounting records. (2) A machine that reads data from external storage media, such as cards or tapes, and automatically produces accounting records or tabulations, usually on continuous forms.

**Accumulator.** A register that holds one operand, with means for performing various arithmetic and/or logical operations involving that operand and (where appropriate) another operand; usually, the result of the operations is formed in the accumulator, replacing the original operand. Note: Among computers currently in use, some have a single accumulator, others have multiple accumulators, and still others (especially those that use two-address or three-address instructions) have no accumulator as such. In the latter case, the results of arithmetic and logical results are usually formed in programmer-specified locations in the computer's main storage or in a general register.

**Arithmetic unit.** A computing system unit that contains the circuits to perform arithmetic operations.

**Assembler.** A computer program that assembles programs written in symbolic coding to produce machine language programs. Note: Assemblers are an important part of the basic software for most computers; their use can greatly reduce the human effort required to prepare and debug computer programs by enabling the coder to use a symbolic language that is simpler and more meaningful than the computer's machine language.

**Batch processing.** A technique in which similar items to be processed are collected into groups (i.e., batched) to permit convenient and efficient processing.

**Bit.** A binary digit; a digit (0 or 1) in the representation of a number in binary notation.

**Buffer.** A storage device used to compensate for differences in the rates of flow of data or in the time of occurrence of events when transmitting data from one device to another.

**Bus.** One or more conductors used for transmitting signals or power.

**Byte.** A group of adjacent bits operated upon as a unit and usually shorter than a word. Note: In a number of important current computer systems, the term "byte" has been assigned the more specific meaning of a group of eight adjacent bits, which can represent an alphanumeric character or two decimal digits.

**Cassette tape.** A form of inexpensive magnetic tape storage in which the tape is housed in a removable plastic cassette.

**Cathode-ray tube (CRT).** A tube used to display data.

**Central processor.** The unit of a computer system that includes the circuits to control the interpretation and execution of instructions. Synonymous with CPU (central processing unit) and mainframe.

**Command chaining.** A feature of the input/output control section of some computers to allow the execution of a sequence of input/output commands initiated by a single input/output instruction.

**Compiler.** A computer program that prepares a machine language program (or a program expressed in symbolic coding) from a program written in another programming language such as Cobol or Fortran. The compilation process usually involves examining and making use of the overall logic structure of the program, or generating more than one machine program instruction for each symbolic program statement, or both, as well as performing the function of an assembler.

**Control unit.** (1) The section of a computer that effects the retrieval of instructions in the proper sequence, interprets each instruction, and stimulates the proper circuits to execute each instruction. (2) A device that controls the operation of one or more units of peripheral equipment under the overall direction of the central processor.

**Conversational mode.** A mode of operation that implies a dialogue between a computer and its user, in which the computer program examines the input supplied by the user and formulates questions or comments that are directed back to the user.

Cycle. (1) An interval of space or time required to complete one set of events or phenomena. (2) Any set of operations repeated regularly in the same sequence. The operations can be subject to variations on each repetition.

Cycle time. The minimum time interval between the starts of successive accesses to a storage location. Contrast with access time. For example, if it takes 2 microseconds to read a word out of a core storage unit and 3 more microseconds to rewrite the word before another read operation can be initiated, then the unit has a read access time of 2 microseconds and a cycle time of $2 + 3 = 5$ microseconds.

Decimal arithmetic features. The provision of computer instructions to operate directly upon decimal, rather than binary, numbers.

Direct memory access. A type of input/output control permitting the execution of autonomous block transfers where registers used to control the transfer are special hardware registers within the controller. The only access required to main memory is for the actual transfer of data.

Executive routine. A routine designed to organize and regulate the work flow in a computer system by initiating and controlling the execution of other programs. Synonymous with supervisory routine.

File. A collection of related records treated as a unit. Thus in inventory control, one line of an invoice forms an item, a complete invoice forms a record, and the complete set of such records forms a file.

Firmware. Software that is stored in a fixed (wired-in) or "firm" way, usually in a read-only memory.

Fixed-point arithmetic. A method of calculation in which operations do not vary and in which the computer does not consider the position of the radix or base number.

Flag. (1) Any of various types of indicators used for identification, e.g., a word mark. (2) A character that signals the occurrence of some condition, such as the end of a word. (3) Synonymous with mark, sentinel, tag.

Gate. A device with one output channel and one or more input channels, so that the output channel state is completely determined by the input channel states, except during switching transients.

Head. A device that reads, records, or erases data on a storage medium, e.g., a small electromagnet used to read, write, or erase data on magnetic tape or drum storage, or a device that perforates or senses holes in punched tape.

Hopper. Part of a machine where punched cards or other documents are placed immediately prior to being fed into the device.

Indexing. A method of addressing memory in which the contents of a register can be added to or subtracted from an address prior to or during the execution of an instruction. Note: Indexing is the most common form of address modification used in stored-program computers. Indexing can greatly simplify programming by facilitating the handling of loops, arrays, and other repetitive processes. Some computers have many index registers, some have only one, and others have none.

Index register. A register whose contents can be added to or subtracted from an address prior to or during the execution of an instruction.

Instruction. A statement that specifies an operation to be performed and the values or locations of one or more of its operands. Note: In this context, the term instruction is preferable to the terms command and order, which are sometimes used synonymously.

Instruction set. The set of all the different instructions that can be executed by a particular computer.

Integrated circuit. A complete, complex electronic circuit, capable of performing all the functions of a conventional circuit containing numerous discrete transistors, diodes, capacitors, and/or resistors, all of whose component parts are fabricated and assembled in a single integrated process. The resultant assembly cannot be disassembled without destroying it. Note: Integrated circuits, now coming into widespread use in commercially available computers, promise dramatic improvements in speed, economy, reliability, and compactness.

Interactive mode. See conversational mode.

Interactive terminal. A local or remotely connected computer peripheral equipped with a human-readable form of output (i.e., CRT display or printer), which is attended by an operator and designed to access directly the

storage and processing facilities of the associated system for the retrieval and manipulation of alphanumeric or graphic data via a manual entry device such as a keyboard, light pen, etc.

Interblock gap. An area on a storage medium, such as tape, used to indicate the end of a block (a block is one record or a group of records).

Interrupt. To stop a process in such a way that it can be resumed.

Latency. The time between the completion of the interpretation of an address and the start of the actual transfer of the data from its storage location.

Mainframe. Same as central processor. That portion of a computer system not considered peripheral equipment.

Matrix printer. A high-speed printer that prints character-like configurations of dots, through the proper selection of wire-ends from a matrix, rather than conventional characters through the selection of type faces.

Memory. A device into which data can be inserted and retained and from which the data can be obtained at a later time.

Memory hierarchy. A set of memories with differing sizes and speeds and usually having different price/performance ratios. A hierarchy might consist of a very high-speed, small semiconductor memory, a medium-speed core memory, and a large, slow-speed core memory.

Merge. To form a single sequenced file by combining two or more similarly sequenced files. Note: Merging may be performed manually, by a collator, or by a computer system for which a merge routine is available. Repeated merging, splitting, and remerging of strings of records can be used to arrange the records in sequence; this process, called a merging sort, is frequently used as the basis for sorting operations on computer systems.

MICR (magnetic ink character recognition). The automatic reading by machine of graphic characters printed with magnetic ink.

Microinstructions. The instructions which are used to define the basic actions of a microprogrammed computer.

Microprogramming. A method of operating the computer control unit by initiating the execution of a sequence of microinstructions at an elementary level. The microinstructions are usually stored in a special read-only storage unit. Note: The instruction repertoire of a microprogrammed computer can be altered to suit particular requirements by simply changing the stored microinstructions.

Modem. A device which provides the appropriate interface between a data processing machine and a communications line. It converts data originating in digital form into analog signals suitable for transmission over telephone lines (and vice versa).

Monolithic IC. An electrical circuit fabricated as an inseparable assembly of circuit elements in a single structure which cannot be divided without permanently destroying its intended electronic function.

Multiprogramming. A technique for handling two or more independent programs simultaneously by overlapping or interleaving their execution. The overlapping or interleaving is usually controlled by an operating system that attempts to optimize the overall performance of the computer system in accordance with the priority requirements of the various jobs.

Multiplexor channel. A special type of input/output channel that can transmit data between a computer and a number of simultaneously operating peripheral devices.

Multipoint circuit. A circuit interconnecting several circuits that must communicate on a time-shared basis.

OCR (optical character recognition). The automatic reading by machine of graphic characters through use of light-sensitive devices.

Operating system. An organized collection of routines and procedures for operating a computer. These routines and procedures normally perform some or all of the following functions: (1) Scheduling, loading, initiating, and supervising the execution of programs. (2) Allocating storage, input/output units, and other facilities of the computer system. (3) Initiating and controlling input/output operations. (4) Handling errors and restarts. (5) Coordinating communications between the human operator and the computer system. (6) Maintaining a log of system operations. (7) Controlling operations in a multiprogramming, multiprocessing, or time sharing mode.

Note: Among the facilities frequently included within an operating system are an executive routine, a scheduler, an IOCS utility routine, and monitor routines.

Packing density. The number of useful storage cells per unit of dimension, e.g., the number of bits per inch stored on a magnetic tape or drum track.

Parity bit. A binary digit appended to an array of bits to make the sum of all the bits always odd or always even.

Parity check. A check that tests whether the number of bits in an array is either even (even parity check) or odd (odd parity check).

Peak transfer rate. The rate at which data is transmitted through a channel measured during the actual time of transmission. For tape, the rate is measured in terms of characters per second and is dependent only on the packing density, the linear tape speed, and the number of tracks, not on the gaps between words, blocks, records, or files.

Peripheral equipment. All of the input/output units and auxiliary storage units of a computer system.

Pin-feed platen. A cylindrical device that moves paper through equipment by rotating rings of pins engaging the feed perforations in the paper.

Plug-to-plug compatibility. Physical and electronic aspects of equivalence.

Poll. A flexible, systematic centrally controlled method for permitting stations on a multipoint circuit to transmit without contending for the line.

Program compatibility. The characteristic that enables one computer system to execute programs written for another computer and obtain identical results. Note: Program compatibility can be achieved through the use of two computer systems with similar instruction repertoires and facilities or between dissimilar computers through emulators, simulators, translators, or coding in a common language.

Push-down list. A set of items constructed and maintained in such a way that the next item retrieved is always the last item stored in the list; i.e., last in, first out (LIFO). Synonymous with stack.

Random access. (1) Pertaining to the process of obtaining data from, or placing data into, storage where the time required for such access is independent of the location of the data most recently obtained from or placed in storage. (2) Pertaining to a storage device in which the access time is effectively independent of the location of the data.

Read-only memory. A memory device into which data cannot be written by the computer with which it is used. Note: In some computers, portions of the core storage or drum storage can be made read-only by temporarily effecting manual or programmed write lockouts. Permanent read-only storage (ROS) is used in many current computers to implement microprogramming.

Real time. (1) Pertaining to the actual time during which a physical process transpires. (2) Pertaining to the performance of a computation during the actual time that the related physical process transpires in order that results of the computation can be used in guiding the physical process.

Record. A collection of related items of data, treated as a unit. Contrast with file.

Record gap. On a storage medium, an area used to indicate the end of a record.

Register. A device capable of storing a specified amount of data, such as one word, usually for some special purpose. Note: Among the registers included in minicomputers are accumulators, index registers, instruction registers, and sequence counters. Each register can be implemented by special hardware or by a reserved location within a larger memory such as a reserved core storage location.

RPG (report program generator). A name used by a number of manufacturers to describe their individual implementations of a high-level problem-oriented system for producing programs that write reports in varying formats, using source data contained in peripheral storage files.

Scratchpad. A small memory consisting of high-speed registers or memory locations.

Semiconductor memory. A memory using a semiconductor circuit as the storage medium. Often used for high-speed buffer memories and for read-only memories.

Serial access. Pertaining to the process of obtaining data from or placing data into storage when there is a sequential relation governing the access time to successive storage locations.

Software. The collection of programs and routines associated with a computer. Includes system software assemblers, compilers, utility routines, and operating systems to facilitate the programming and operation of the computer, and application software which solves specific user problems.

Storage. Pertaining to a device into which data can be entered, in which it can be held, and from which it can be retrieved at a later time.

Stored-program computer. A digital computer that, under control of internally stored instructions, can synthesize, alter, and store instructions as though they were data and can subsequently execute these new instructions.

Time Sharing. (1) The use of a given device by a number of other devices, programs, or human users, one at a time in rapid succession. (2) A technique or system for furnishing computing services to multiple users simultaneously, while providing rapid responses to each of the users. Note: Time sharing computer systems usually employ multiprogramming and/or multiprocessing techniques and are often capable of serving users at remote locations via a data communications network.

Translator. A device or computer program that performs translations from one language or code to another, e.g., an assembler or compiler.

Utility routine. A standard routine used to assist in the operation of a computer by performing some frequently required process such as sorting, merging, report program generation, data transcription, file maintenance, etc. Synonymous with service routine. Note: Utility routines are important components of the software supplied by the manufacturers of most computers.

Word. A group of bits or characters treated as a unit and capable of being stored in one addressable main memory location.

Word length. The number of bits or characters in a word.