IBM

# IBM 5110
General Information
and Physical Planning Manual
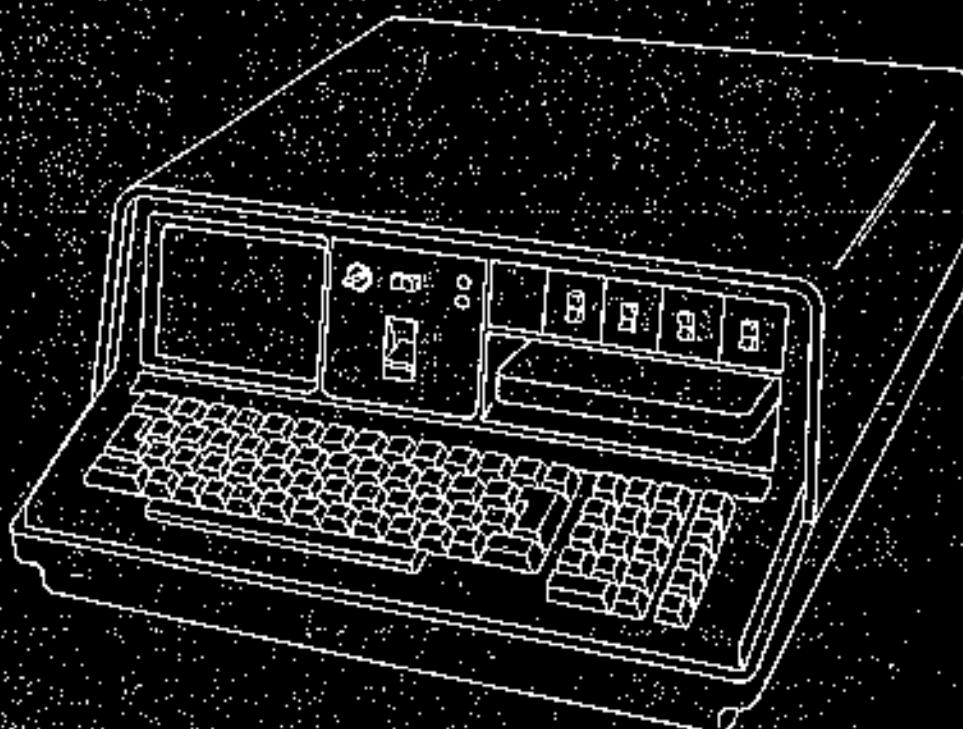
Preface

This manual introduces the IBM 5110 Computing System. This introduction to the IBM 5110 Computing System is intended for executives and supervisory personnel who want a summarized description of what the 5110 Computing System is and how it can be used to meet the information processing requirement of a small business or sub office/department location of larger companies.

The description of the IBM 5110 Computing System in the manual is written for readers who have no, or very little, direct experience using a computer. The description includes:

- An overview of the IBM 5110 Computing System physical and operating characteristics

- A description of the various system configurations available with the IBM 5110 Computing System

- A summary of the IBM 5110 Computing System services

The last chapter in this manual provides the physical planning information required when installing the IBM 5110 Computing System at your location. At the back of this manual is a glossary that defines the data processing terms introduced in this manual.

Related Publications

- *IBM 5110 APL Introduction*, SA21-9301

- *IBM 5110 APL User's Guide*, SA21-9302

- *IBM 5110 APL Reference Manual*, SA21-9303

- *IBM 5110 APL Reference Card*, GX21-9304

- *IBM 5110 Print Plot/APL User's Manual*, SA21-9305

- *IBM 5110 BASIC Introduction*, SA21-9306

- *IBM 5110 BASIC User's Guide*, SA21-9307

- *IBM 5110 BASIC Reference Manual*, SA21-9308

- *IBM 5110 BASIC Reference Handbook*, GX21-9309

- *IBM 5110 Print Plot/BASIC User's Manual*, SA21-9310

- *IBM 5110 Customer Support Functions Reference Manual*, SA21-9311

- *IBM 5110 Serial I/O Adapter Feature User's Manual*, SA21-9312

- *IBM 5110 Parallel I/O Adapter Feature User's Manual*, SA21-9313

- *IBM 5110 Asynchronous Communications Feature User's Manual*, SA21-9314

- *IBM 5110 Asynchronous Communications Reference Card*, GX21-9315

- *IBM 5110 Binary Synchronous Communications Feature User's Manual*, SA21-9316

- *IBM 5110 Computing System Setup Procedure*, SA21-9318

Note: This manual follows the convention that *he* means he or she.

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Chapter 1. An Overview of the IBM 5110 Computing System

The vigorous competition in today's marketplace is a challenge to every business. Despite this competition, business can meet this challenge through sound management and increased productivity. Sound management and increased productivity of your company depend in part upon the efficient handling of business information. For example, in order to make informed business decisions businessmen require timely and accurate reports.

How can a small business with a limited staff cope with such critical demands for information? Today the small business can increase its ability to handle information by employing the same method larger businesses have used. You can employ a computerized system that can be adapted to the problem area(s) of your business. The IBM 5110 brings the capabilities of a large-scale computing system into the office of virtually every business, thereby increasing the ability of your business to handle information.
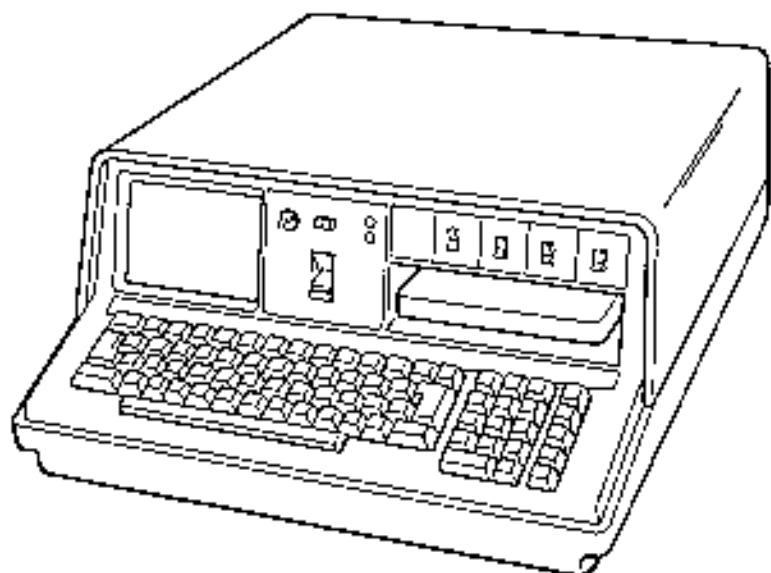
The 5110 Computer is a general-purpose desktop computer designed to meet the data processing requirements of a small business. Yet it has the capability, through media exchange and communications features, to distribute processing in large enterprises too. This system is well suited to business and problem-solving applications such as:

General ledger   Order writing/billing
Accounts payable   Sales analysis
Payroll   Cost estimating
Accounts receivable   Job cost analysis
Financial planning   _Linear programming
Inventory control   Word processing

The 5110 performs data processing tasks with the speed, efficiency, and reliability typical of larger computer systems. Yet it is appropriate for small businesses because of:

* Physical compactness and ease of installation. The IBM 5110 Computer fits right on top of your desk to give you the information you need. The physical installation requirements are found in virtually every office environment.

* Ease of operation. An experienced computer specialist is not required to operate the 5110. One of your own employees who has little or no computer experience can be trained to operate this system effectively.

* Application programs. These programs are made available by IBM to meet certain data processing requirements existing within a specific business or industry. Where applicable, the IBM-supplied application programs can eliminate the need for you to write your own programs. Your IBM representative can tell you what application programs are available.

* Either or both of two powerful programming languages: APL and BASIC. APL (A Programming Language) is a powerful mathematical language. It is particularly well-suited for scientific, engineering, and research applications. BASIC (Beginners All Purpose Symbolic Instruction Code) incorporates general business and mathematical problem-solving capabilities. Each language is easy to learn and has inherent capabilities that apply directly to the needs of business people who require fast and accurate data processing.

* Choice of system options to meet your particular needs: magnetic tape storage; magnetic diskette storage; printer; I/O adapters, both serial and parallel; and communications adapters, asynchronous and bisynchronous.

2

PHYSICAL CHARACTERISTICS OF THE 5110 COMPUTING SYSTEM

The 5110 computing system consists of the following parts:

- *A processing unit.* The processing unit is the arithmetic/logic unit and the control center of the system.

- *A keyboard.* The 5110 keyboard is similar to a standard typewriter keyboard. In addition, a 10-key numeric key pad is provided to aid in entering numbers. You use the keyboard to enter information and instructions into the system.

- *A display screen.* The 5110 display screen looks like a TV screen, measures 5 inches diagonally, and contains up to 1,024 characters of data. The display screen is used by the system to communicate information to you.

- *Magnetic media.* The 5110 can store data and programs on magnetic tape cartridges or diskettes. In this way, the system provides a way to recall and reuse information and programs, without the need for rekeying.

  Because the tapes and diskettes are removable, the amount of data you can store on the magnetic media is limited only by the number of tapes and diskettes available.
  - *Tape storage:* Various models of the 5110 have a built-in tape unit. The tape cartridges have a storage capacity of 204,000 characters (bytes) of information. An auxiliary tape unit can also be attached to the 5110s that have a built-in tape unit.
  - *Diskette storage:* All models of the 5110 can have up to two diskette units attached. Each diskette unit can have up to two diskette drives installed. The diskettes can have a storage capacity up to 1.2 million bytes. Thus, the 5110 can have a total online diskette storage capacity up to 4.8 million bytes.

  Note: The storage capacity of the magnetic media is measured in bytes; 1 byte can hold 1 character of information.

- *A printer.* The printer provides printed information from the system.
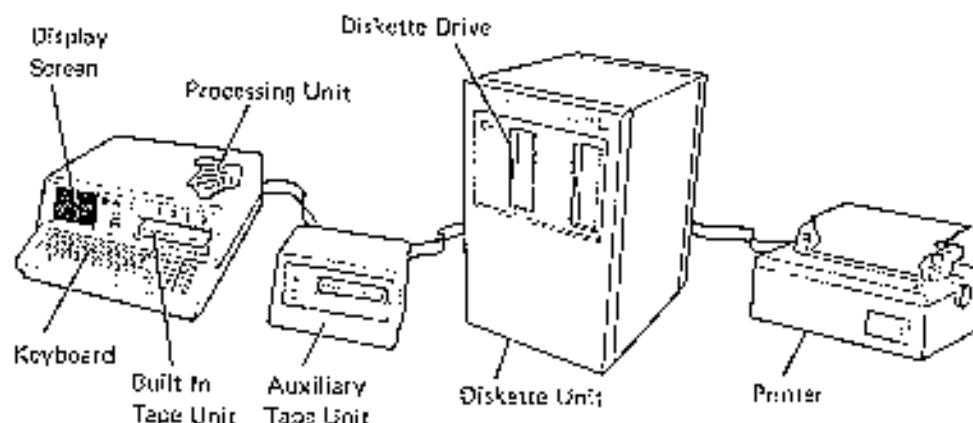
Three general system configurations are available in the 5110 family of products:

- A system with tape storage only

- A system with diskette storage only

- A system with tape and diskette storage

All of these systems can have a variety of input/output options and special features.

The physical requirements for the 5110 Computing System are operating space and grounded 115-volt outlets. See Chapter 5, Physical Planning Information for detailed information about the physical planning requirements.

OPERATING CHARACTERISTICS OF THE 5110 COMPUTING SYSTEM

Just as the installation of the 5110 places few demands upon the physical facilities of your office, so too the operation of the 5110 requires no additions to your professional staff.

The 5110 is designed for the business person who has little or no computer experience. Many operating aids are standard in the design of the 5110 to eliminate any requirements for a computer data processing professional. Knowledge of fundamental computer data processing concepts, plus training on the 5110, is sufficient background for confident operation of the system. Frequently an employee currently responsible for bookkeeping or other clerical duties can be expected to assume responsibility for operating the 5110.

Some 5110 operating aids are:

* *Familiar keyboard design.* The 5110 keyboard features a standard typewriter-like arrangement. The keyboard also contains a cluster of 10 numeric keys and calculator functions arranged like a standard adding machine. These familiar key arrangements aid in the rapid keying of information.
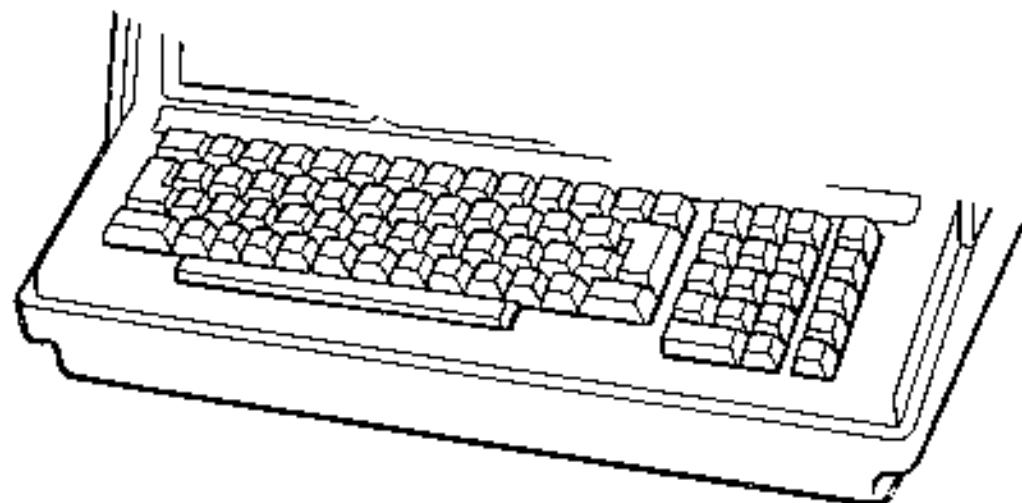
* *Keyboard function and command keys.* The 5110 keyword and command keys are easily identified. By using the keyword and command key, you can request specific system functions and enter character combinations with a single keystroke.

- *Simplified control statements.* You can control the system operation by using short, simple control statements. These statements, called command statements, are composed of familiar, easily understandable terms and let you avoid the highly technical control language normally used by a computer system.

- *Customer support functions.* A comprehensive set of customer support functions are provided with the 5110. These support functions perform routine tasks required by every data processing system. For example, the copy function copies selected information from one media to another, thus allowing you extra copies of the information for audit and control purposes, or for mailing to other locations.

- *Continuous system-to-operator communications.* The display screen provides communications between you and the 5110. As information is keyed on the keyboard, you can visually verify the information on the display screen. Messages are also displayed on the display screen. These messages can request input from the keyboard or identify keying errors detected by the system.

  The display screen has 16 lines with a total of 1,024 character positions. Also, if you want a group of people to view the same information that is on the display screen, you can attach up to six black-and-white TV monitors to the 5110. This allows the information on the display screen to be viewed on additional screens.
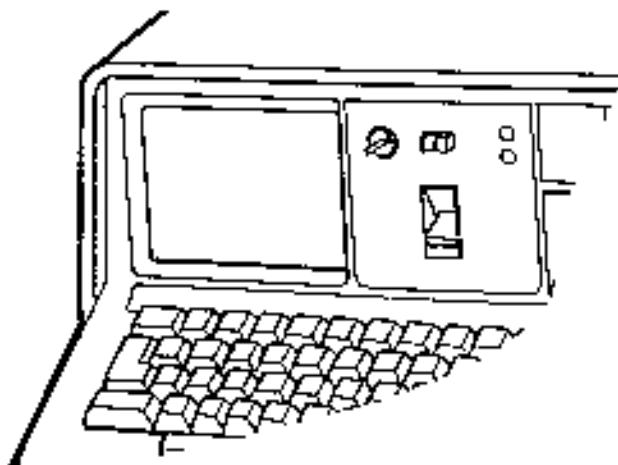
- *Magnetic storage devices.* The magnetic storage media allows you to save data and programs for later use. This means you do not have to rekey information into the system each time the system is used.

Chapter 2. Data Processing and the IBM 5110 Computing System

Though data processing may imply the presence of a computer, the term itself describes an activity that is as old as commerce: performing a series of planned actions (processing) upon information (data) to achieve a desired result. The result may be new information or the original information expressed in a more appropriate form. For example, adding a list of prices to discover the total cost is data processing. Preparing an invoice from a telephoned order is also data processing.

Commercial data processing has changed with the demands of doing business. As long as the number of transactions of a business remains small, and as long as the transactions are of little variety, one clerk can prepare all invoices, keep the accounts receivable up to date, control inventory levels, and so on. As a business grows, however, its transactions become more numerous and complex, and management often requires more information more readily in order to make necessary business decisions. In other words, data processing requirements have grown with business. Data processing methods have had to change as well.

ELECTRONIC DATA PROCESSING

The most recent innovations in data processing methods are incorporated in electronic data processing systems (computers). An electronic data processing system is an organization of equipment and procedures that can process huge amounts of data at electronic speeds. The evolution of such systems can be traced from manual data processing methods, through the introduction of mechanical bookkeeping machines and punched card devices, to the computer. Today the terms electronic data processing, data processing, and computer data processing are often used interchangeably.

INPUT, PROCESSING, AND OUTPUT

Though modern data processing systems have become very sophisticated, processing data by computer and recording daily transactions by hand still share the three elements fundamental to all data processing: input, processing, and output.

- *Input.* Input is data to be operated on (processed).

- *Processing.* Processing is the handling of input according to specific instructions or rules.

- *Output.* Output is the result of processing the input.

Suppose two clerks are given the same problem: add all receipts for the last month to produce a sales report. And suppose that one clerk uses an adding machine and the other clerk uses a computer.

- Input. In our example, a record of the month's sales is the input, whether that record exists in a handwritten register or is a data file on a magnetic media.

- Processing. Both clerks must add input to obtain a sum, and both the adding machine and the computer must operate according to the rules of addition and be used to achieve specific results for a particular job.

- Output. The output in our example is a sum that represents sales revenue, whether the sum is presented in a hand-drawn chart or a report printed by the computer.
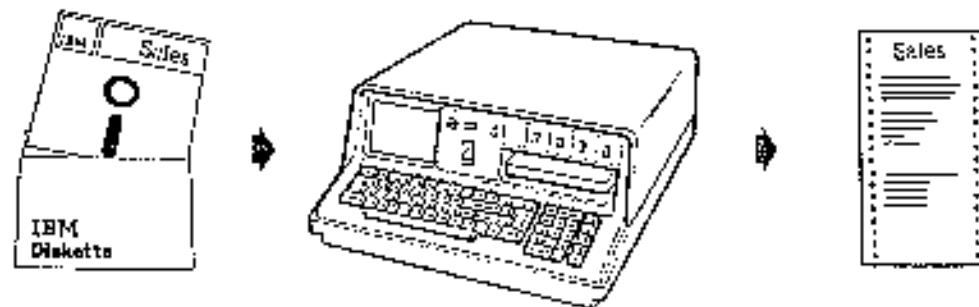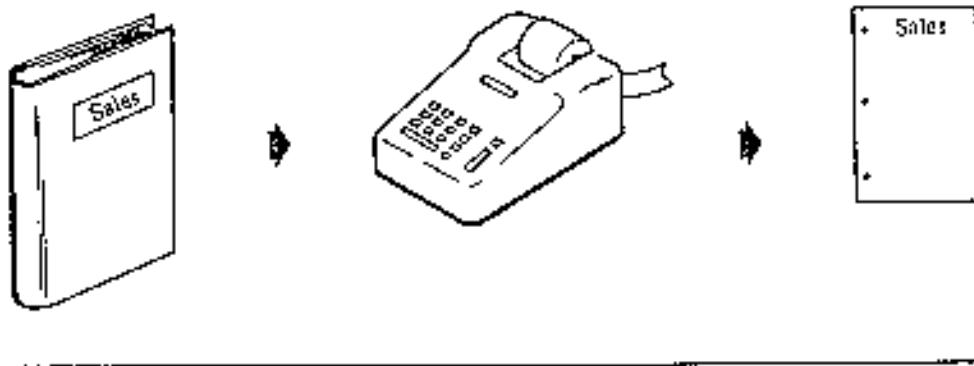
5110 DATA PROCESSING

The fundamental data processing concept (input, processing, and output) is reflected in every computer system.

Processing Unit (Processing)

Keyboard (Input)

Magnetic Tape (Input and Output)

Magnetic Diskette (Input and Output)

Printer (Output)
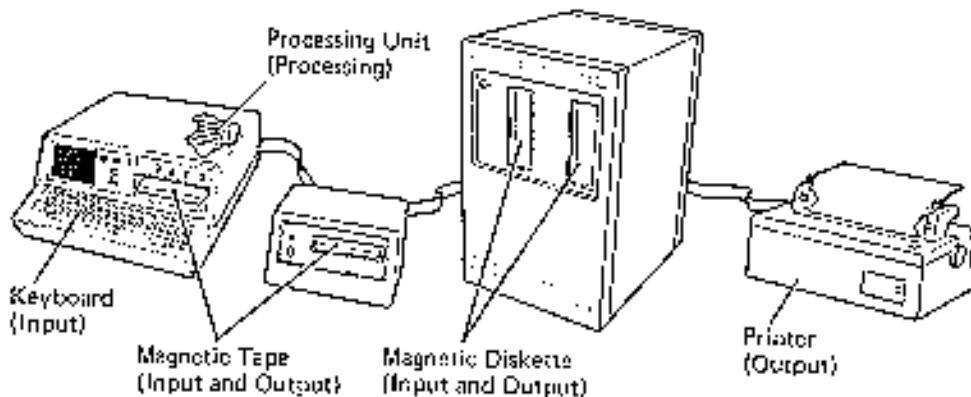
Input

Every computer must provide some way to get information (input) into the system for processing. On the 5110, input can be entered from the keyboard or read from the magnetic media. To write orders, for example, the operator can enter order information for immediate processing or place it on an appropriate magnetic storage media where it is stored until required.

If orders are to be processed immediately, processing begins as soon as the operator enters enough data for the 5110 to begin processing an order. The system processes additional data as it is entered. This method of processing, whereby the system continuously processes the data for a job as the operator enters the data, is called interactive processing.

On the other hand, the operator can prepare all the data required for a particular group of orders, record the data on one of the various magnetic media, and then instruct the 5110 to read the data and prepare all the orders at once. This method of processing, whereby all the data for a job is submitted in a single group, or batch, is called batch processing.

Processing

Every computer has a processing unit. The processing unit controls the system and manipulates data. It monitors the flow of information into the system, performs calculations and other operations on data, and regulates the flow of output.

But the processing unit must be told exactly where to find input, how to operate on input, and what to do with output. Such directions are given to the processing unit in the form of computer programs. A computer program is a sequence of precise instructions written in a special form that the computer can interpret. Before a computer performs any data processing, a program explaining where to find input, how to operate on the input, and what to do with output is read into the processing unit.

Programs are read into an area of the processing unit known as main storage. Main storage is the processing unit's work area. Input, programs, and output are moved in and out of main storage in whatever manner each particular data processing job requires.

Application Program

An application program specifies distinct operations to be performed on specific input to obtain unique output. A program directing a computer to update accounts receivable according to input provided by the operator is an example of an application program. A program instructing a computer to print a sales report based on a particular transaction file is another example of an application program. In other words, application programs operate directly on data to meet specific data processing requirements. Application programs are written in one of the 5110 programming languages, BASIC or APL.

Output

Every computer system must include some means of providing output. The 5110 can store output on a tape or diskette, display output on the display screen, or print output.

You can print output in the format best suited to each application. The 5110 can, for instance, print on forms of different kinds and sizes, such as paychecks and invoices. The 5110 can also print different kinds of reports, such as cost analysis reports and sales reports.

ADVANTAGES OF 5110 COMPUTER DATA PROCESSING

If data processing is always a matter of input, processing, and output, how is the 5110 Computer data processing different from manual or mechanical data processing? Computers process large volumes of data faster, more accurately, in less space, and with greater versatility.

- *Speed.* Because computers process data electronically, they operate at remarkable speeds that save a tremendous amount of time. The 5110 can read over 3,000 128-character records from a diskette to main storage in about one minute, and can print reports at rates up to 120 characters per second.

- *Accuracy.* A computer does exactly what it is told to do and only what it is told to do. Because of this constant dependence on instructions, the 5110 Computer follows program after program, second after second, hour after hour, with unvarying accuracy.

The 5110 Computer can also reduce transcription errors by dramatically reducing the need for manual transcription. Once your operator records data on the magnetic media, that data may never have to be written by hand again; you can update as many different files, complete as many different kinds of forms, and create as many different reports from that data as you have application programs that use the data. By referring to the display screen while first recording the data, you can ensure that the data is keyed correctly. And application programs that use the data can perform checks and balances to continually validate the accuracy of the data.

• *Data Compression.* Computers miniaturize data. Suppose a business enters its accounts receivable transactions in a machine-posted register like the one shown following.

ACCOUNTS RECEIVABLE TRANSACTION REGISTER							
			07/11/--				PAGE 001
DATE	CUST NO	CUSTOMER NAME	JOURNAL NO	INVOICE NO	CASH AMOUNT	INVOICE AMOUNT	JOURNAL AMOUNT
07/11/--	159020	SOUND OF THE SEVENTIE		063420		$ 46.23	
07/11/--	633970	OLDE VILLAGE SHOPPE		063421		09.70	
07/11/--	642990	PARAGON TV SALES		063422		20.10	
07/11/--	122620	CAIRITECHL STUDIOS		063423		129.76	
07/11/--	682030	RAYMOND5 RAPID REPAIR			$ 60.80		
07/11/--	742950	SARATOGA VARIETY			29.72		
07/11/--	314280	BAKER BRADLEY & CO.			43.50		
07/11/--	872060	UNIVERSITY ELECTRIC			97.75		
07/11/--	863290	VILLAGE MUSIC & TV	07-006				$18.25CR
07/11/--	006880	ALLSTONS	07-007				10.70CR
		TOTALS			$234.77*	$285.99*	$28.95CR*

The preceding example shows 10 sample entries, or records. Nearly 19,000 such transaction records can be stored by the 5110 on one diskette. That is, the 5110 enables you to store large volumes of business information in an economical and manageable form that can be processed as you require.

ACCOUNTS RECEIVABLE TRANSACTION REGISTER

07/11/--   PAGE 001

DATE	CUST NO	CUSTOMER NAME	COMPL NO	INVOICE NO	CASH AMOUNT	INVOICE AMOUNT	CUSTOM AMOUNT
07/11/--	350930	SOUND OF THE SEVENTIE		053920		$ 46.23	
07/11/--	603570	DUCK COLLEGE SHOPPE ---		053921		89.75	
07/11/--	662365	PARLSON TV SALES		053922		21.30	
07/11/--	172070	DAVIDRUGE STUDIES		063923		125.76	
07/11/--	652090	RAYMONDS RAPID REPAIR			$ 63.80		
07/11/--	248650	SARATOGA NURSERY			20.32		
07/11/--	914200	BEALE BRADLEY & CO.			41.50		
07/11/--	872090	LATVERSON ELECTRIC			33.75		
07/11/--	880010	VILLAGE RADIO & TV	07-035				$15.80CR
07/11/--	005750	ALLSTOSS	07-036				10.70CR
		TOTALS			$235.73*	$285.95*	$26.51CR*

Accts Receivable
Transaction
Register 07/11/--

- *Versatility.* The number of different tasks the 5110 can do is limited only by the number of different programs run on it. The 5110 Computer can do much more than just add, subtract, multiply, and divide. The 5110 can, for example, prepare invoices, keep accounts receivable up to date, print weekly paychecks, analyze data for thorough cost and sales analysis, prepare estimates, and so on.

Speed, accuracy, data compression, and versatility combine to reduce data processing errors and increase productivity. But a less obvious advantage of computers has a more fundamental effect.

Computers impose discipline. As explained, a computer is helpless without programs; it cannot think for itself. Neither can a computer guess whether its programs really reflect the problems at hand; you must see that they do. In other words, you must carefully analyze the data processing requirements of your organization in order to take full advantage of a computer. For instance, with the data processing capabilities a 5110 Computing System provides, what additional cost analysis, inventory control, and auditing procedures would you like to implement in your organization?

The responsibility for analyzing an organization's data processing requirements falls, of course, to management. But the discipline imposed by a computer extends throughout the data processing activities of the organization. Once you've designed or selected 5110 programs that reflect management directions, you've established management control that is automatically practiced each time those programs are used.

The 5110 Computing System building blocks are:

- The 5110 Computer

- The 5106 Auxiliary Tape Unit

- The 5114 Diskette Unit

- The 5103 Printer

THE 5110 COMPUTER

The 5110 is a high-level computer that is small without sacrificing function. The various models of the 5110 allow you to select:

- The APL, BASIC, or both programming languages

- Main storage capacities of 16, 32, 48, or 64K (K=1,024 bytes)

- A built-in tape unit

Main Storage ─────

Built-in Tape Unit (On 5110 Model 1 Only)
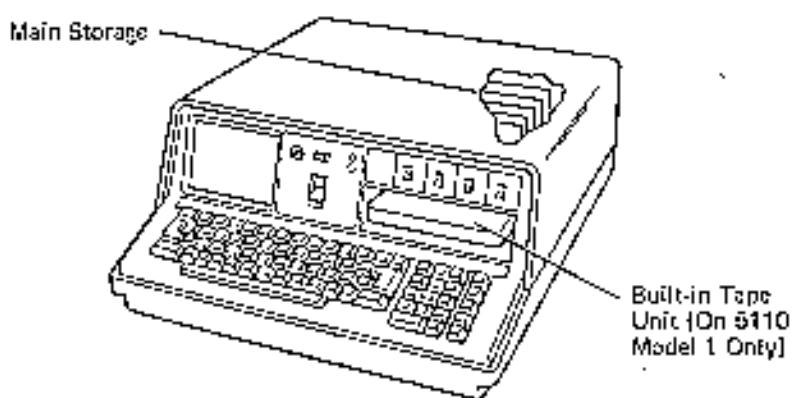
The Programming Languages

BASIC

The name BASIC stands for *Beginners All Purpose Symbolic Instruction Code*. The key terms in the name are *Beginners* and *All Purpose*. BASIC, as its name implies, is oriented toward the person who requires a direct, understandable programming language to satisfy the needs of his business. Because of its structure, BASIC allows you to feel comfortable using the language almost immediately. Then, as you gain confidence, you can proceed to the more sophisticated functions of the language. BASIC is all purpose because it allows you to manipulate its capabilities according to your individual needs. In other words, BASIC can be used to print an invoice, evaluate compound interest problems, or determine a hyperbolic cosine, depending on your needs. The BASIC language is composed of a series of commands and statements. What you enter tells the system what you want done and how you want it done. By their names, BASIC statements and commands imply the action they perform. For example, the PRINT statement prints data, and the INPUT statement allows you to enter data from the keyboard. Thus, the elements of the BASIC language speak for themselves.

APL

The name APL stands for *A Programming Language*. The APL language is particularly well-suited for scientific, engineering, and research applications; it also adapts easily to commercial business applications. Although powerful and concise, APL is designed to be simple and easy to learn. Most APL users require and use only a small subset of the total APL language to develop their own functions. There are, however, many powerful shortcuts available to the APL user, which allow you to express complex functions with a single keystroke. APL proves that power and simplicity can go together in a programming language. For example, the following is an APL statement that allows you to find the sum of a series of sales figures:

+/SALES

This same exercise might require several statements in other programming languages.

Main Storage Capacity

The processing unit contains the system's arithmetic logic unit, programming language, and main storage area. Main storage holds the program instructions and data to be processed for a job. The 5110 is provided with at least 16,384 bytes of main storage. Additional main storage can be provided to increase the capacity to 32,768 bytes, 49,152 bytes, or 65,536 bytes.

Built-in Tape Unit

The built-in tape unit is available only on the 5110 Model 1. Each tape cartridge has a storage capacity of approximately 204,000 bytes, on high quality, reusable tape. The tape unit accesses the tape data cartridge at the following rates:

Searching for Data	40 inches/second
Reading Data	2,850 bytes/second
Writing/Verifying Data	950 bytes/second
Data Transfer	4,000 bytes/second
Average Access Time	30 seconds

The data stored on a tape cartridge can be protected from accidental erasure through a protect feature. Also, when you leave the 5110, you can take the tape cartridge with you to ensure the safety and security of your data.

THE 5106 AUXILIARY TAPE UNIT

You can attach the auxiliary tape unit to the 5110 Model 1 to increase your online tape storage capability to approximately 408K bytes. The auxiliary tape unit can also be used to generate backup tapes and to provide access to two data files.

THE 5114 DISKETTE UNIT

You can attach one or two diskette units to the 5110. Each diskette unit can have one or two diskette drives. Therefore, you can have from one to four diskette drives attached to your 5110. This provides you with a total online diskette storage capacity of 1.2 million to 4.8 million bytes.
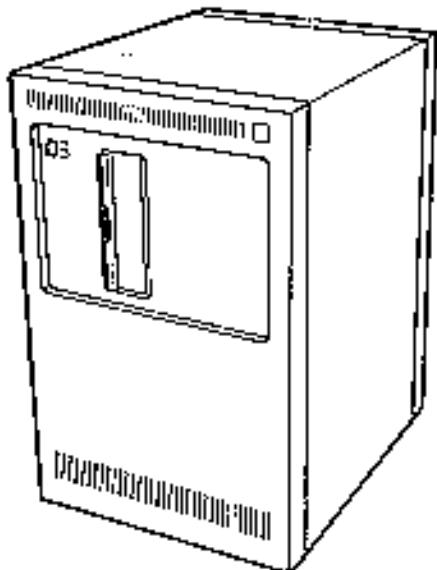
Diskette Storage

The diskette provides you with a large amount of magnetic storage that can be accessed quickly. When you use diskette storage, you can have multiple open data files on the same diskette drive, and randomly access individual records in those files. The diskette unit accesses the diskette at the following rates:

Reading Data	48,000 bytes/second
Writing/Verifying Data	16,900 bytes/second
Data Transfer	62,500 bytes/second
Average Access Time	0.25 second

The diskette also allows you to exchange data with other systems, such as:

- IBM 3741 Data Station

- IBM System/32

- IBM 3031/3032 Processor

- IBM System/34

The capability to exchange data with other systems helps you to adapt your 5110 to growing data processing needs. For example, data recorded by a 3741 can be read from the diskette and processed by the 5110 while the 3741 operator records more data on another diskette.

The diskette used to exchange data between the 5110 and another system must be IBM-compatible diskette types 1, 2, or 2D, and have the data recorded in the 128-byte basic exchange or 256-byte H-type exchange formats.

You can attach a 5103 Printer to your system to print reports or other documents. This printed output can be formatted by your APL or BASIC program.

The 5103 Printer is available in two models. Model 11 has a speed of 80 characters per second (cps), and Model 12 has a speed of 120 characters per second. The 5103 Printer is capable of printing uppercase and lowercase characters, numeric characters, and special symbols. The 5103 Printer prints in both directions, thus reducing print time.

The 5110 has a print overlap capability; that is, certain calculations and the printing of output can occur at the same time. For example, the 5110 can be calculating an extended price (unit price times quantity) while the printer is printing the results of a previous calculation. This overlap of functions can increase the speed with which the system completes a job.
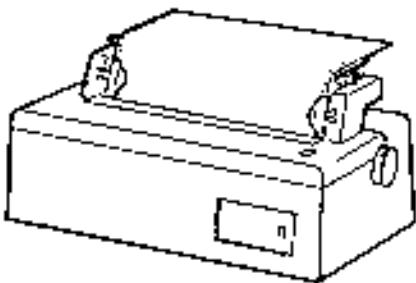
COMMON SYSTEM CONFIGURATIONS

The following examples show some of the more common system configurations:

Tape Storage Systems

5110 Model 1
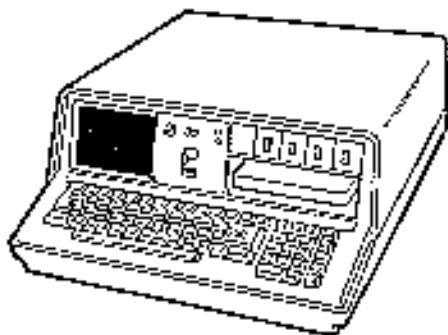
This configuration provides:

- The APL and/or BASIC language

- 16K to 64K bytes of main storage

- 204K bytes of online tape storage
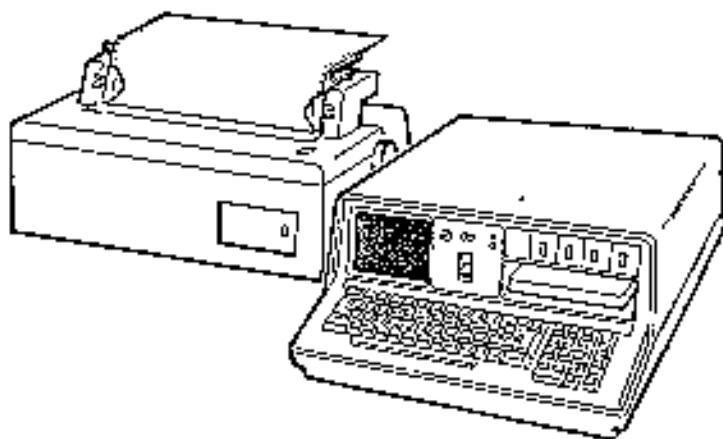
This configuration provides:

- The APL and/or BASIC language

- 16K to 64K bytes main storage

- 204K bytes of online tape storage

- *The ability to generate printed output*

5110 Model 1 with Printer and Auxiliary Tape
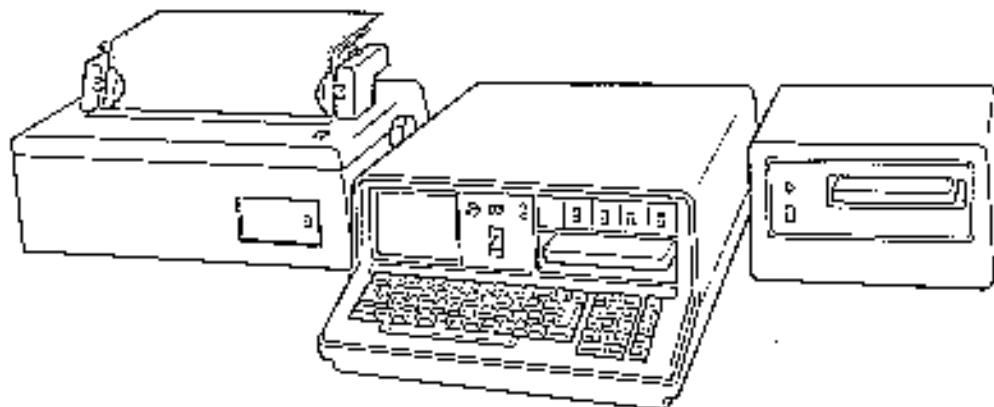
This configuration provides:

- The APL and/or BASIC language

- 16K to 64K bytes of main storage

- *408K bytes of online tape storage*

- The ability to generate printed output

5110 Model 1 with Printer and Diskette Unit
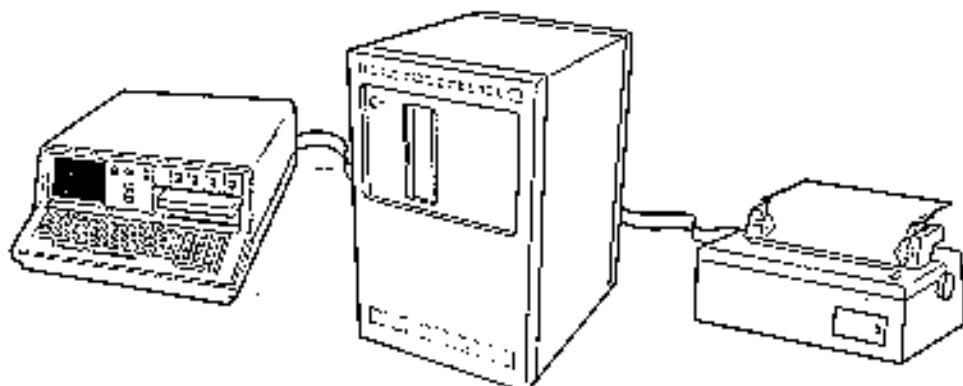
This configuration provides:

* The APL and/or BASIC language

* 16K to 64K bytes of main storage

* 204K bytes of online tape storage

* The ability to generate printed output

* Up to 1.2 million bytes of online diskette storage (one diskette drive)

Diskette Storage System

5110 Model 2 with Diskette Unit
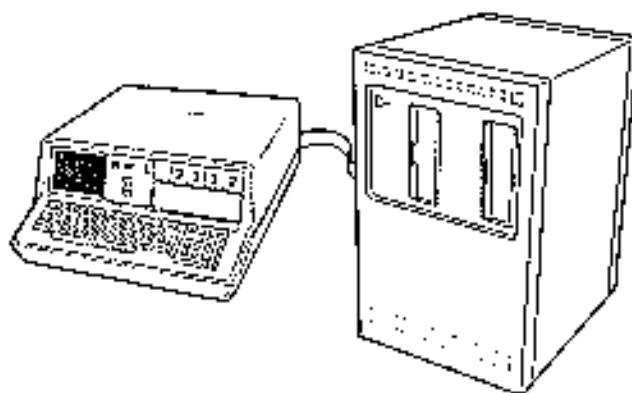
This configuration provides:

- The APL and/or BASIC language

- 16K to 64K bytes of main storage

- Up to 2.4 million *bytes of online diskette storage (two diskette drives)*
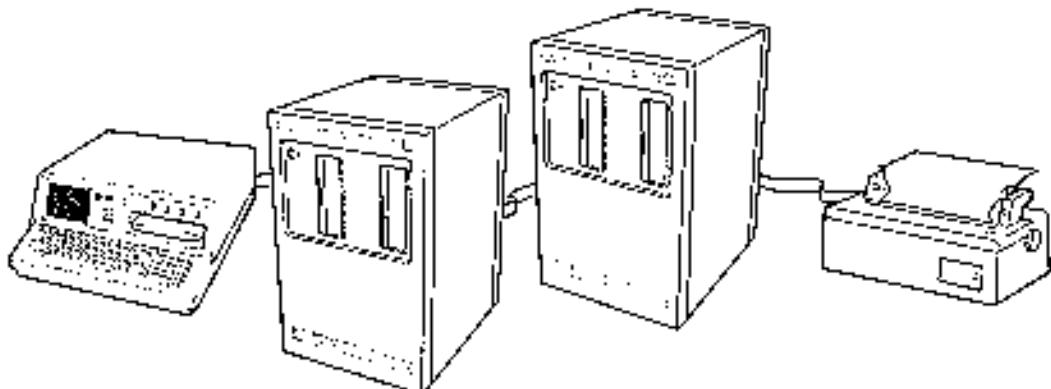
This configuration provides:

- The APL and/or BASIC language

- 16K to 64K bytes of main storage

- 204K bytes of online tape storage

- The ability to generate printed output

- Up to 4.8 million bytes of online diskette storage (four diskette drives)
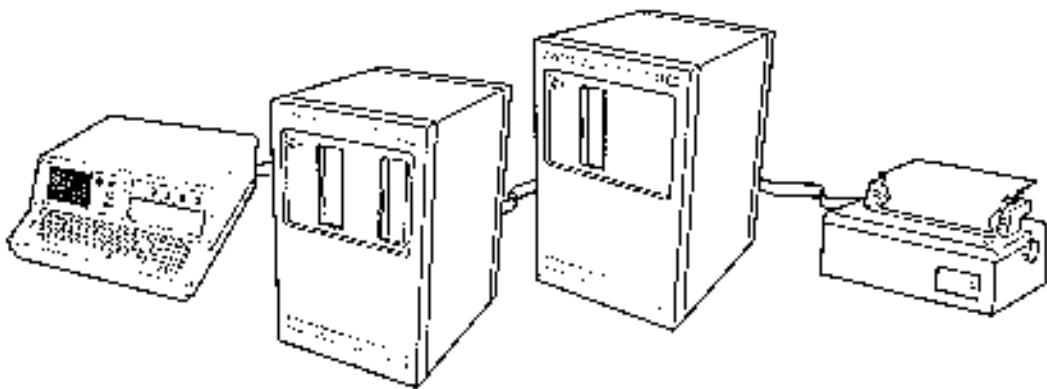
This configuration provides:

- The APL and/or BASIC language

- 16K to 64K bytes of main storage

- *Up to 3.6 million bytes of online diskette storage (three diskette drives)*

- *The ability to generate printed output*

From the previous system configurations examples you see that you can tailor your system to your own data processing needs. In other words, you can create a personalized system configuration. See your IBM marketing representative for details concerning your exact system configuration requirements.

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Chapter 4. Optional Features and Services for Your 5110 Computing System

OPTIONAL FEATURES

The following optional features are available for your 5110 Computing System:

- APL and BASIC languages

- Additional main storage

- Additional diskette drives

- Diskette Sort

- Expansion feature

- Asynchronous Communications

- Binary Synchronous Communications

- Serial I/O Adapter

- Parallel I/O Adapter

- Audible Alarm

- Channel Terminator

APL and/or BASIC Language

You can choose APL, BASIC, or both the APL and BASIC languages for your 5110. If you choose only one language initially, you can add the other language later to upgrade your 5110 to both languages.

Additional Main Storage

The 5110 is provided with at least 16,384 bytes of main storage. However, you can add additional storage in 16,384-byte increments to increase the storage capacity to 32,768 bytes, 49,152 bytes, or 65,536 bytes.

Additional Diskette Drives

If you have a diskette unit with one diskette drive, you can add one additional drive to increase the capacity of the diskette unit to a maximum of 2.4 million bytes.

Diskette Sort

With the Diskette Sort feature, you can sort diskette records in either ascending or descending sequence. Up to six fields of not more than 64 characters can be sorted with the feature. You can create a new diskette file containing the sorted records, or you can create a diskette file containing just the sorted record addresses (address out sort).

Expansion Feature

The Expansion feature is a prerequisite for the Serial I/O Adapter and/or Asynchronous Communications features.

Asynchronous Communications

With the Asynchronous Communications feature, the 5110 can transmit data to and receive data from a host system. The 5110 uses the IBM 2741 Communications Terminal data link control and, thus, can communicate with many systems that support the 2741 (start-stop) data link control.

With this feature you can:

- Enter data from the keyboard and transmit it to the host.

- Enter data from the keyboard and store it for printing, writing on tape, or writing on diskette. Later, the data can be transmitted to the host from the tape or diskette.

- Print the data that is transmitted to the host system.

- Write messages on tape or diskette that are received from the host system.

- Print data that is received from the host system.

- Inquire into host system data bases or program libraries.

The Asynchronous Communications feature transmits and receives data at 134.5 or 300 bits per second using the EBCD (extended binary coded decimal) or correspondence code structure. The 5110 connects to an external modem with a cable that meets the EIA RS232C/CCITT V.24 V.28 interface standard. Your IBM marketing representative can assist you in selecting the correct modem.

Binary Synchronous Communications

The Binary Synchronous Communications (BSC) feature allows the 5110 to communicate with another system, another terminal, or another 5110 that is equipped with binary synchronous communications.

The 5110 uses either the IBM 3741 data link control or the IBM 2770 data link control. When using the 3741 data link control, the 5110 can communicate with:

+ A System/3

+ A System/32

+ A System/34

+ A 3741 Model 2 or 4

+ Another 5110

The 5110 can also communicate with devices that are compatible with any of the above systems or terminals.

When using the 2770 data link control, the 5110 can communicate with a System/370 equipped with the appropriate subfeatures.

With the Binary Synchronous Communications feature, the 5110 transmits and receives data at speeds up to 4,800 bits per second using either EBCDIC (extended binary coded decimal interchange code) or the EBCDIC transparency. The 5110 can communicate on switched point-to-point or nonswitched point-to-point channels, or on a multipoint channel as a tributary station only.

The 5110 contains a microprocessor to control communications in addition to the APL and BASIC processor. This allows you to use the APL or BASIC language to write data to and read data from the Binary Synchronous Communications feature just as you do any of the other 5110 input/output devices.

You can also use the APL or BASIC language to overlap communications with other noncommunications functions (such as printing data, or reading and writing data from tape or diskette).

If you want to use communications functions such as transmitting data, receiving data, or inquiry, you can use either the APL or the BASIC binary synchronous communications support function that is provided with the feature.

Features for Connecting the BSC Feature to the Communications Channel

The 5110 connects to the communications channel with one of the following features:

- A 1200 BPS Integrated Modem

- An external modem using the EIA RS232C or CCITT V.24 V.28 interface standard

- Data-Phone[1] Digital Services Adapter

1200 BPS Integrated Modem

The 1200 BPS Integrated Modem (inside the 5110 Computer) transmits and receives data at speeds of 1,200 or 600 bits per second. The modem is available in one of the following versions:

- Nonswitched—for attachment to the 2-wire or 4-wire D3 facility

- Switched[2]—for attachment to the switched C2 facility

- Switched Network Backup with Auto-Answer[2]—for attachment to a nonswitched channel as the primary facility, and to a switched channel with auto-answer if the nonswitched channel is not functioning.

EIA/CCITT Interface

An IBM cable that meets the EIA RS232C and CCITT V.24 V.28 standard interface is supplied to attach the 5110 to an external modem, such as the IBM 3872 Model 1 or 3874 Model 1.

Data-Phone Digital Services Adapter

The Data-Phone Digital Services Adapter (DDSA)[2] allows you to connect the 5110 to the AT&T nonswitched Data-Phone Digital Service network. The adapter transmits and receives data at speeds of 2,400 or 4,800 bps.

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[1] Trademark of AT&T
[2] U.S. and Canada only

Serial I/O Adapter

The Serial I/O Adapter allows you to transfer data to or from the 5110 and a variety of external input/output devices, such as:

- Plotters and graphic displays

- Card readers and/or punches

- Printers

- Instrumentation devices

The Serial I/O Adapter feature is the connection between the 5110 language (API, or BASIC) and the external input/output device. The feature uses one of the following codes when transmitting data to or receiving data from the external input/output device:

- 5-bit

- 6-bit (plus parity)

- 7-bit (plus parity)

- 8-bit

The 5-bit, 6-bit, and 7-bit codes are compatible with input/output devices that use the Baudot, EBCD (extended binary coded decimal), and ASCII (American Standard Code for Information Interchange) character formats, respectively.

Only one input/output device at a time can be attached to the 5110, and the device must supply its own power.

The Serial I/O Adapter feature cannot be used while the Asynchronous Communications feature (if installed) is being used.

Parallel I/O Adapter

The 5110 Parallel I/O Adapter allows you to attach IEEE 488-1975 compatible devices to the 5110. The 5110 is the only active controller on the parallel input/output bus. Devices that you can attach include equipment such as laboratory instruments, plotters, and printers.

You control a parallel input/output device with device-dependent messages using the APL or BASIC language; this is similar to sending to and receiving from the other 5110 input/output devices. Device-dependent message are exchanged in either 8-bit binary code or 7-bit ASCII code according to the IEEE 488-1975 standard.

Audible Alarm

You can use the Audible Alarm feature for many purposes; for example, to indicate an error, to request operator action (such as changing printer forms or changing diskettes), or to alert the operator that a job is complete.

Channel Terminator

The channel terminator is required when you connect an auxiliary tape unit and/or diskette unit to the 5110 and you do not also connect the 5103 Printer.

Accessories

The following items are also available for your 5110 Computing System:

- Printer ribbons

- Printer forms

- Tape cartridges

- Diskettes

- Forms stand

- Carrying case

Contact your IBM representative for more information regarding these items.

Optional Services

The following optional services are available:

- Applications

- Print Plot program

- Education

- Maintenance

Applications

The 5110 Computing System is supported by a number of application programs. These application programs may provide a solution to your business problems, because the application programs meet a variety of data processing requirements from general accounting to specific industry solutions. Your IBM representative is ready to help you select, order, and install the application programs that fit your organization's data processing requirements.

Print Plot Program

The Print Plot program (provided in either APL or BASIC) allows you to use the 5103 Printer as a plotter. With the Print Plot program you can:

- Plot input data from the keyboard or output data from an APL or BASIC program.

- Plot line graphs, bar graphs, and histograms up to 13 inches (33.02 centimeters) wide by 20 inches (50.8 centimeters) high.

- Specify the origin of a graph.

- Plot labels, axes, ticks, scale numbers, and lines of different density.

- Specify symbols to be plotted at defined points.

- Plot curve fits.

Education

Training and confidence are essential to the effective use of any computer. Although the IBM 5110 requires a minimum of computer knowledge and training, education is provided to ensure productive use of your system.

IBM offers many 5110 courses. These courses, many of which are self study courses that you can take at your convenience, range from elementary implementation techniques to advanced programming techniques.

The IBM education program can help you develop the computer skills that your company needs to get the full benefit of the capabilities of your 5110.

Maintenance

Now That You Own an IBM Product

From the laboratory through manufacture and installation, IBM emphasizes quality in all its products. You can rely on performance. But you want continued performance. Serviceability is a major component of your IBM 5110 Computing System. Specially designed service techniques combined with built-in features offer maximum reliability and availability.

With an IBM Maintenance Agreement, you can expect:

- Planned service. A customer engineer is assigned to your installation to keep your IBM equipment in top working order.

- IBM management commitment. Management is accountable for having adequate manpower, skills, and parts available to sustain machine performance.

- Equipment improvements. Engineering changes that improve safety and reliability characteristics are distributed from IBM plants and automatically applied to your 5110 by a customer engineer.

- Plan support. Every modification made to your 5110 is recorded in a Machine Level Control history. This history is used by plant management in determining future engineering changes and requirements.

- Stable maintenance costs. No unexpected charges for service or expensive parts.

Summary

In summary, the options available for your 5110 let you select a system that meets your data processing requirements today and plan for those of the future. For example, you can select a magnetic storage capacity and printer speed that not only accommodate current data files and printing applications, but are also sufficient for increased volumes of data. Or, you can upgrade your 5110 magnetic storage capacity and printing speed as new requirements arise.

With other options you can increase the function of your 5110. For example:

- Communications allow you to send data to and receive data from remote computers or terminals.

- Applications allow you to use programs that are already written and tested.

- Serial I/O or Parallel I/O allows you to attach other input/output devices to your 5110.

Your IBM marketing representative can help you select the features or services that meet your data processing requirements.

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PHYSICAL DIMENSIONS

IBM 5110 Computer

The IBM 5110 Computer is supplied with a 6-foot (1.8-meter) power cord.

Size
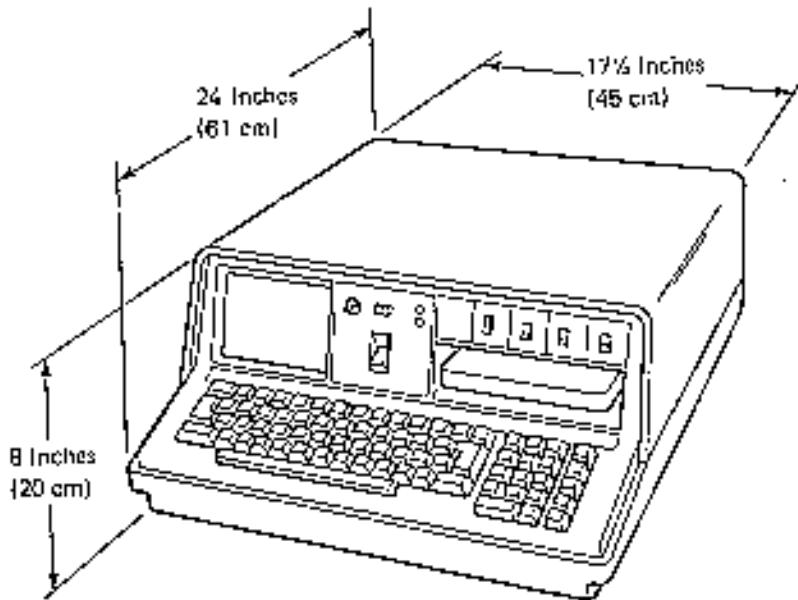
Weight

With Built-in Tape Unit (Model 1)	50 lb (23 kg)
Without Built-in Tape Unit (Model 2)	43 lb (20 kg)

IBM 5106 Auxiliary Tape Unit

The IBM 5106 Auxiliary Tape Unit is supplied with a 6-foot (1.8-meter) power cord and a 2-foot (0.6-meter) signal cord.

Size

10 Inches
(26 cm)

7¼ Inches
(18 cm)

12¼ Inches
(31 cm)
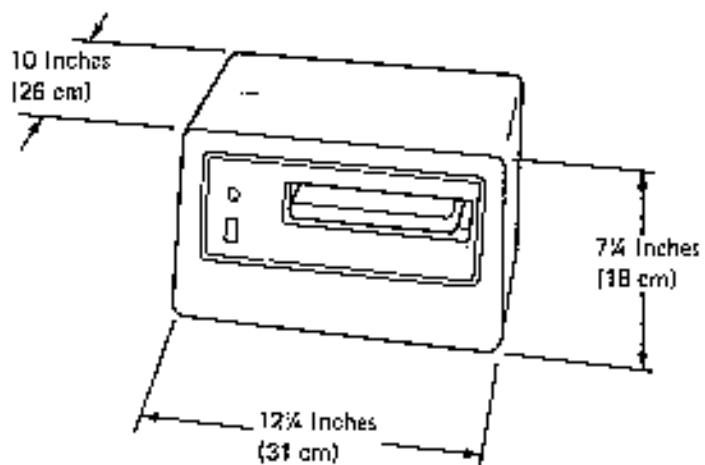
Weight

20 lb (9 kg)

IBM 5114 Diskette Unit

The IBM 5114 Diskette Unit is supplied with a 6-foot (1.8-meter) power cord and a 4-foot (1.2-meter) signal cable.

Size

29 Inches
(74 cm)

22½ Inches
(57 cm)

17¾ Inches
(45 cm)
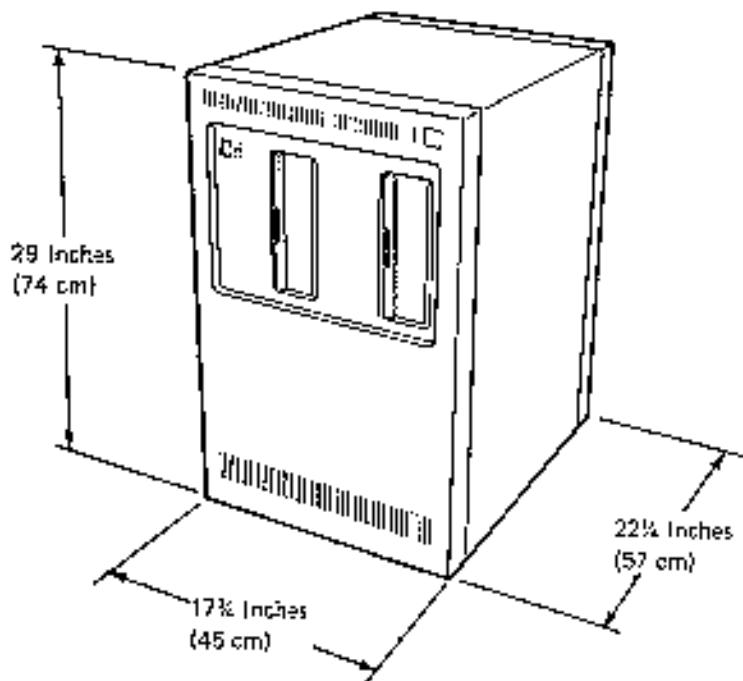
Weight

With One Diskette Drive	116 lb (53 kg)
With Two Diskette Drives	132 lb (60 kg)

IBM 5103 Printer

The IBM 5103 Printer is supplied with a 6-foot (1.8-meter) power cord and a 4-foot (1.2-meter) signal cable.

Size

24 Inches
(61 cm)

12¼ Inches
(31 cm)

7 Inches
(18 cm)

14 Inches
(36 cm)
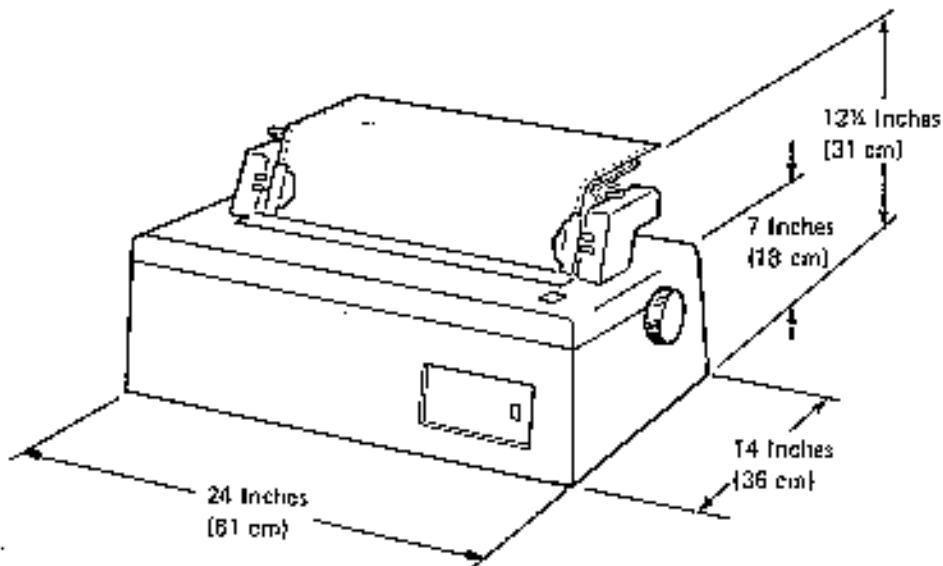
Weight

55 lb (25 kg)

ENVIRONMENT REQUIREMENTS

Operating Environment

Dry Bulb Temperature	15° – 32°C (60° – 90°F)
Relative Humidity	8% – 80%
Maximum Wet Bulb Temperature	23°C (73°F)

Nonoperating Environment

Dry Bulb Temperature	10° – 43°C (50° – 105°F)
Relative Humidity	8% – 80%
Maximum Wet Bulb Temperature	27°C (80°F)

ELECTRICAL REQUIREMENTS

A 15-ampere, single-phase grounded receptacle is required for each 5110 Computer and associated units. All power cords are 6 feet [1.8 meters] long.

NOTE

The importance of a grounded electrical circuit requirement cannot be over emphasized—an ungrounded system will not work properly and can be a safety hazard.

Make sure you have grounded electrical circuits available for your system. If you do not use grounded electrical circuits, you could experience:

- Intermittent machine failures

- Improper program operation

- Unreadable tapes or diskettes

- Expensive machine damage

The ac voltage requirements for the 5110, 5103, and 5106 are:

	Frequency Tolerance	AC Voltage	Voltage Tolerance
60 hertz	±1	100/115 Vac	10%
50 hertz	±1	100/200/235 Vac	10%

The ac voltage requirements for the 5114 are:

	Frequency Tolerance	AC Voltage	Voltage Tolerance
60 hertz	±1/2	100/115 Vac	10%
50 hertz	±1/2	100/220/235 Vac	10%

The power requirements and heat output are:

	Maximum kVA	Heat Output	
		Watts	BTU per Hour
5110 Computer	0.4	235	800
5103 Printer	0.2	120	410
5106 Auxiliary Tape Unit	0.1	20	65
5114 Diskette Unit	0.4	175	600

The 115-volt 60 hertz power plugs for the 5106 Auxiliary Tape Unit and the 5114 Diskette Units both have taps for electrical power so that a printer, video monitor, or communications modem can be attached.

Cabling

Each unit is supplied with a 6-foot (1.8-meter) power cord. The following units have signal cables:

Unit	Signal Cable Length
5106 Auxiliary Tape Unit	2 feet (0.6 meter)
5114 Diskette Unit	4 feet (1.2 meter)
5103 Printer	4 feet (1.2 meter)

The following illustration shows how the signal cables are connected between units:
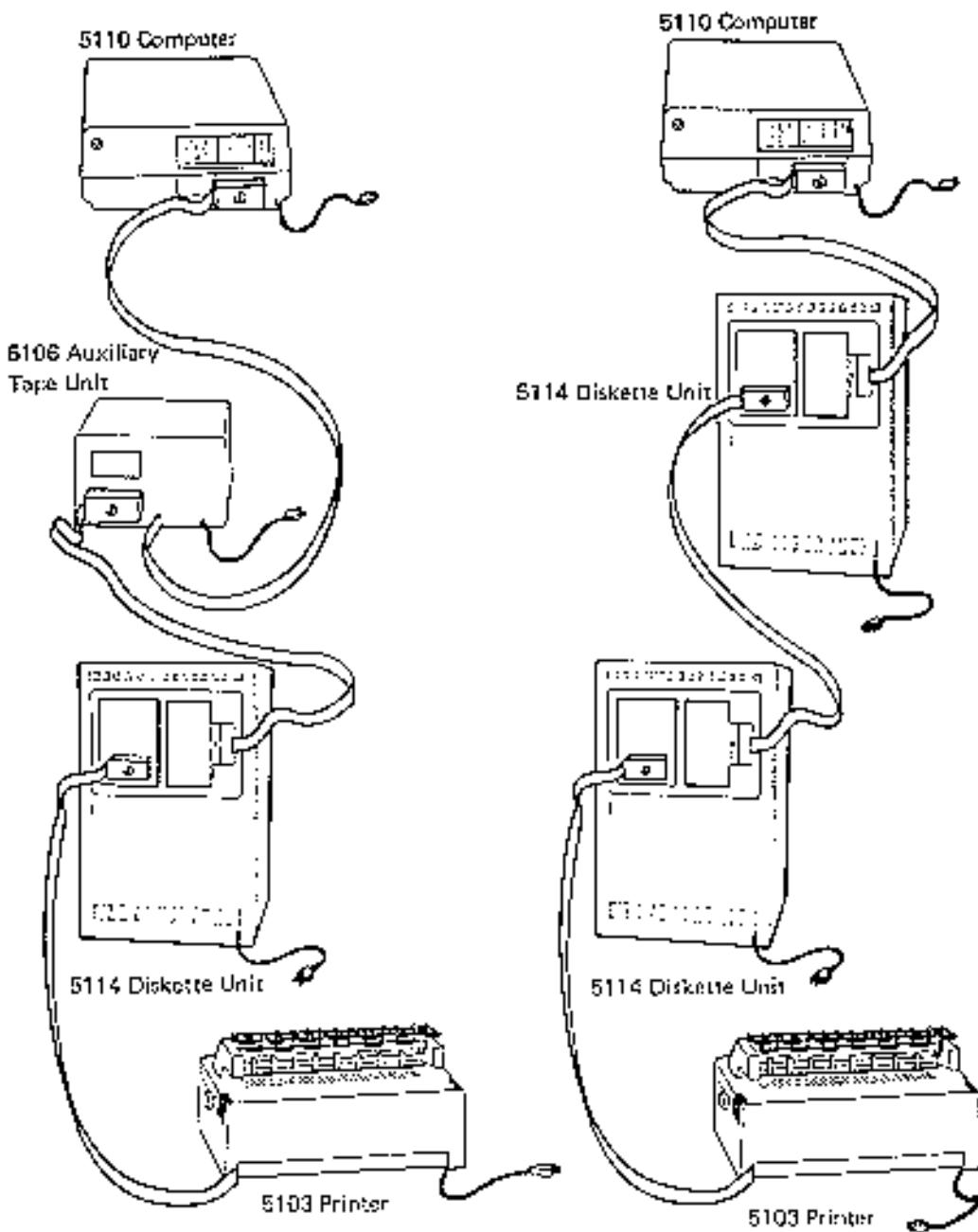
The signal cables form a chain as they connect one unit to the next. If your system does not have a particular unit, that unit is skipped and the cable connects into the next unit.

A 5108 Auxiliary Tape Unit can only be attached to a 5110 with a built-in tape unit and must be the first device in the chain. The 5103 Printer must be the last unit attached because another device cannot be attached to it. The channel terminator must connect to the last unit in the chain if you do not connect a 5103 Printer.

Typical Unit Placements

Following are illustrations of some typical unit placements:
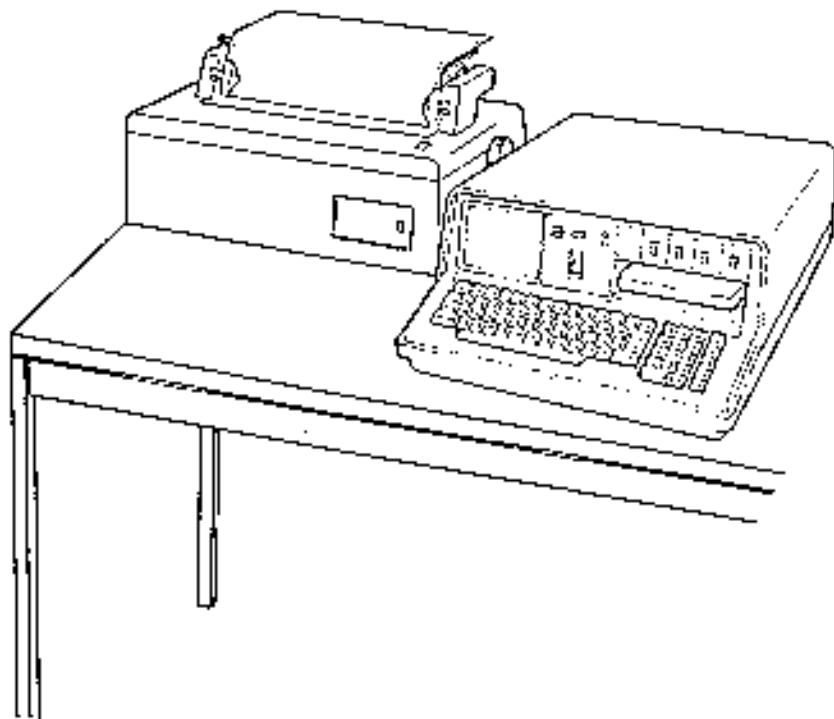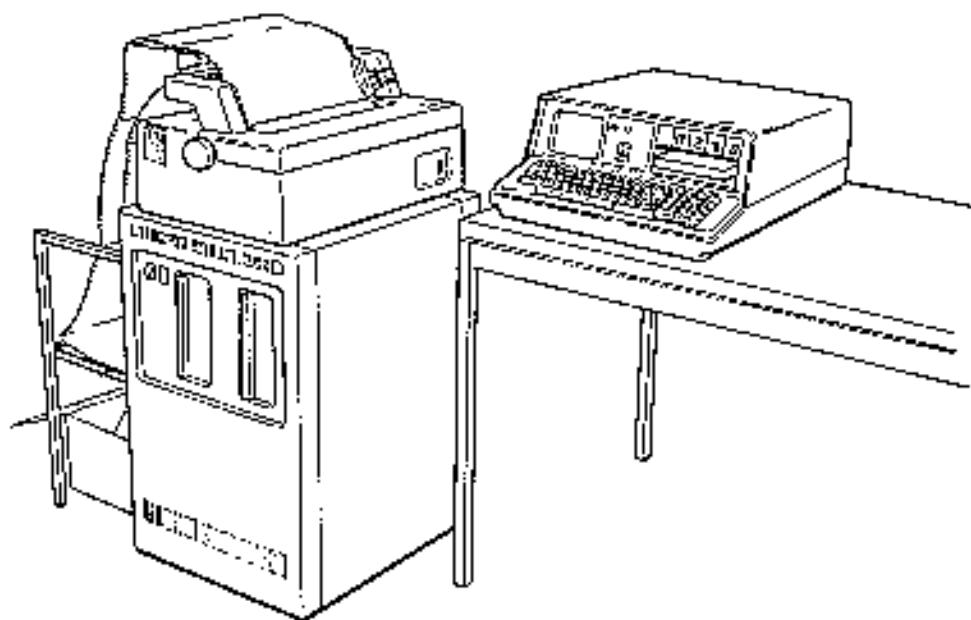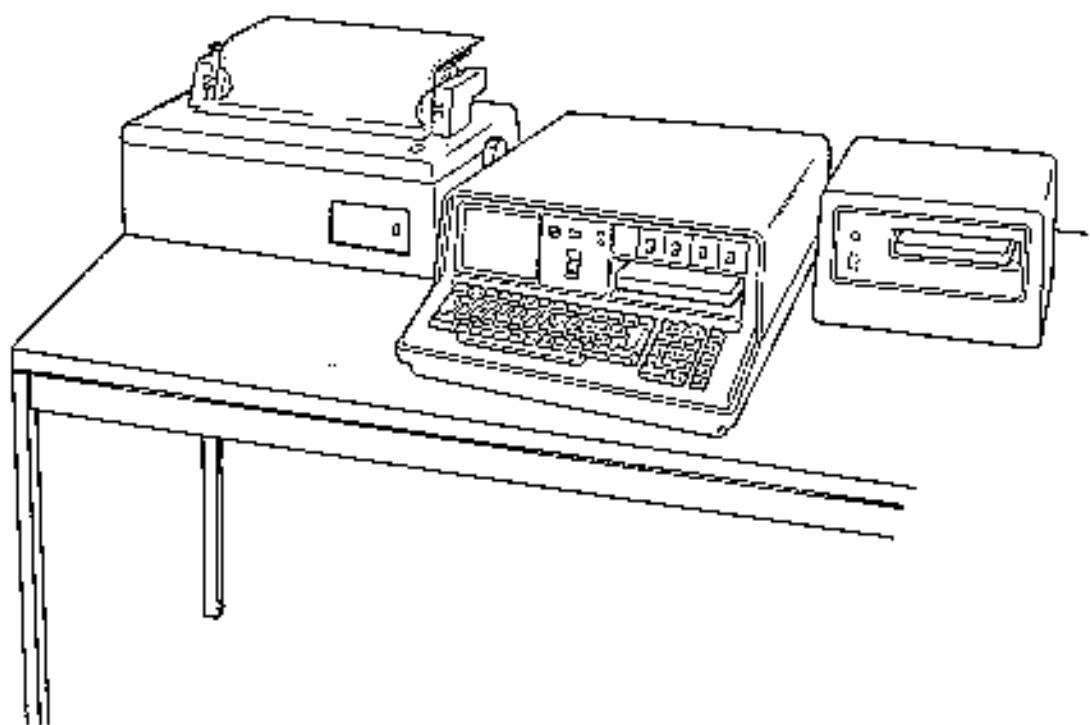
FEATURES

Communications

Contact your IBM representative to obtain modem specifications. Also contact your local communications common carrier company representative to allow adequate time for equipment hookup.

Cabling for Asynchronous Communications

The required 6-foot (1.8-meter) modem cable is supplied with the Asynchronous Communications feature. The connector on the modem must be compatible with AMP #205208-1 plug (25 positions) or equivalent.

Cabling for Binary Synchronous Communications

The required 20-foot (6.09-meter) cable supplied with the Binary Synchronous Communications feature has a 25-pin connector on the end that connects to the 5110. The type of connector on the other end of the cable and the number of conductors in the cable depend on whether you have an integrated modem, an external modem, or a Data-Phone Digital Services Adapter as follows:

+ IBM 1200 BPS Integrated Modem connected to a nonswitched communications channel in the United States and Canada—four conductor cables with a type WE 2B9 8 connector.

- IBM 1200 BPS Integrated Modem connected to a switched communications channel in the United States and Canada—eight conductor cables with eight spade lugs.

- External Modem—fourteen conductor cables with a 25-pin modem plug that is compatible with a cinch or cannon type DB-19604-433 plug.

- Data-Phone Digital Services Adapter (DDSA) connected to the common carriers channel service unit—six conductor cables with a 15-pin plug that is compatible with a cinch DMA-15-P or equivalent plug.

Serial I/O Adaptor

This feature conforms to the EIA RS-232-C/CCITT V.24-V.28 specifications. Two 6 foot (1.8 meter) cables are supplied with the feature; one, with an AMP #205207-1 or equivalent receptacle, is used when the 5110 is used as data communications equipment; the second, with an AMP #205208-1 or equivalent plug, is used when the 5110 is used as data terminal equipment.

Parallel I/O Adapter

This feature is based on the ANSI MC 1.1-1975 and IEEE Std 488-1975
standards. An optional 6.5-foot (2-meter) cable is available for this feature.
Devices or other cables to be connected to this cable must have a plug
compatible with an AMP 57-10210-4 or a receptacle compatible with an AMP
57-20240-2 or equivalent connector. A maximum total cable length of 65 feet
(20 meters) can be used with the Parallel I/O Adapter feature.

CUSTOMER SETUP

The 5110 Computer is desinged with ease of customer setup in mind.
Step-by-step instructions that are packaged in the shipping container will
enable you to set up and check out your system immediately upon arrival
without the assistance of a service representative in most cases. Relocation is
also possible without the assistance of a service representative.

Model 1's or 2's — 5110 — 48 Inches (121.9 cm) — 5114 — Terminator

Model 1's or 2's — 5110 — 48 Inches (121.9 cm) — 5114 — 48 Inches (121.9 cm) — 5114 — Terminator

Model 1's or 2's — 5110 — 48 Inches (121.9 cm) — 5114 — 48 Inches (121.9 cm) — 5103

Model 1's or 2's — 5110 — 48 Inches (121.9 cm) — 5114 — 48 Inches (121.9 cm) — 5114 — 48 Inches (121.9 cm) — 5103

Model 1's only — 5110 — 28 Inches (71.1 cm) — 5106 — 48 Inches (121.9 cm) — 5114 — 48 Inches (121.9 cm) — 5103

Model 1's only — 5110 — 28 Inches (71.1 cm) — 5106 — 48 Inches (121.9 cm) — 5114 — Terminator

Model 1's only — 5110 — 28 Inches (71.1 cm) — 5106 — Terminator
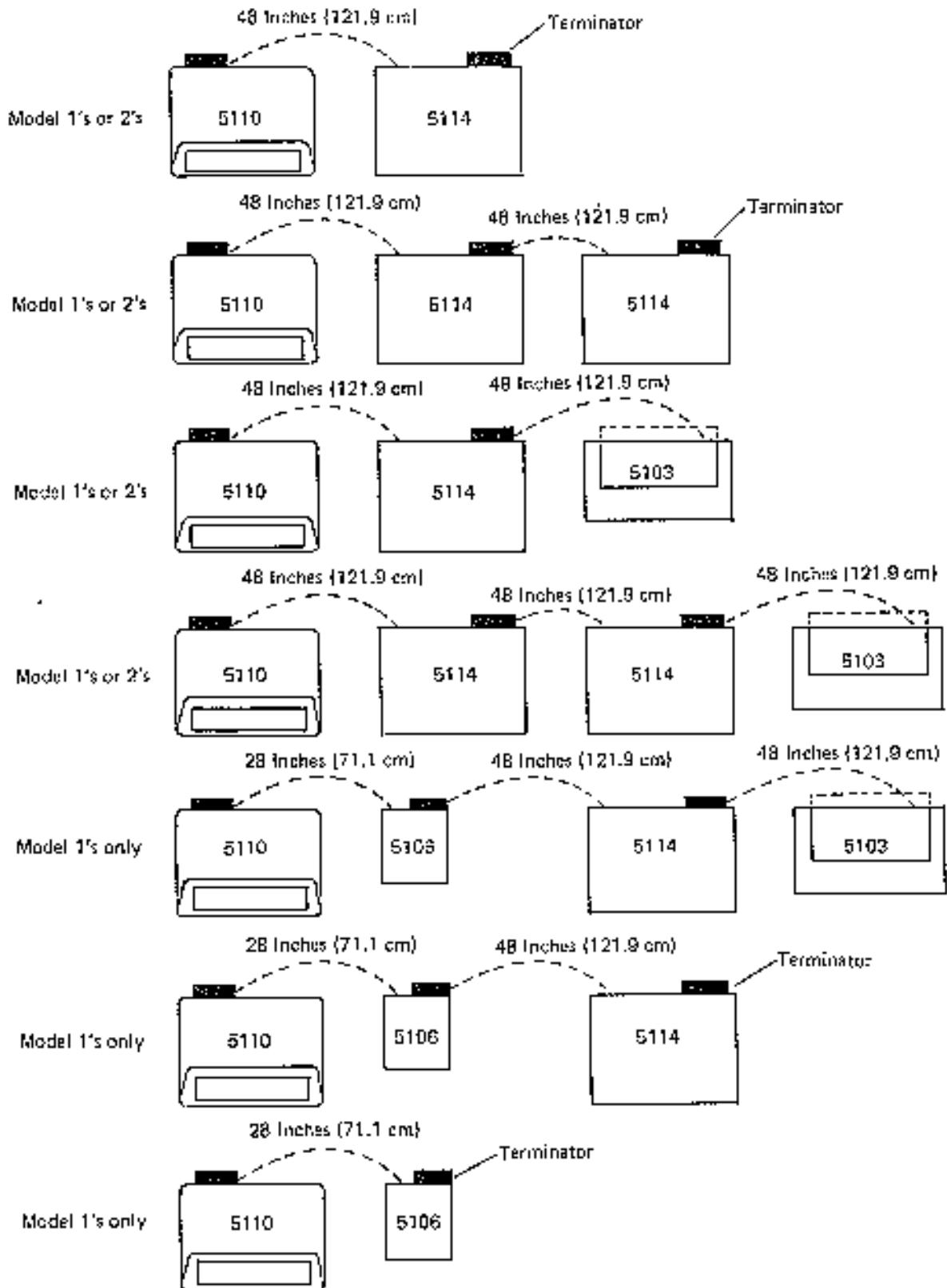
access time: The time between when the 5110 specifies to read or write data on tape or diskette and the storage device finds the location where the data is to be read from or written to.

application program: A program designed to perform the steps required for a specific application. For example, a program that does your monthly payroll.

asynchronous communications: Data communications between systems and/or devices using a start bit and a stop bit to indicate the beginning and the end of each character transmitted.

asynchronous communications adapter: Used to control asynchronous communications on the 5110.

basic data exchange: A diskette data exchange format that used 128-byte sectors. The basic exchange format allows you to exchange data between the 5110 and other IBM systems. For example, data recorded on the diskette using a 3741 can be processed using a 5110.

binary synchronous communications (BSC): Data communications between systems or devices using synchronous transmission of binary coded data.

binary synchronous communications adapter (BSCA): Used to control binary synchronous communications on the 5110.

built-in tape unit: The tape unit that is a physical part of the 5110 Model 1. The 5110 Model 2 does not have a built-in tape unit.

bit: The smallest unit of data in the 5110. Represented by a 1 or 0.

byte: The 5110 representation of a character. Consists of eight adjacent bits.

character set: The characters allowed by the APL or BASIC language.

customer support functions: Programs that can be used to aid you in operating your system.

data communications network: A number of communications channels interconnecting a host with terminals and/or other hosts.

data processing: The execution of a systematic sequence of operations performed upon data. Synonymous with information processing.

diskette: A media that is capable of storing data and information magnetically.

diskette data file: A portion of the storage on a diskette used to store information that is related. For example, the accounts payable for a business.

diskette drive: The device that reads data from or writes data to a diskette.

diskette storage: See diskette.

display screen: A TV-like screen which measures 5 inches diagonally and permits visual verification of your data and programs.

file: A group of related records on tape or diskette storage.

H-type data exchange: A diskette data exchange format that used 256-byte sectors. The H-type data exchange allows you to exchange data between the 5110 and other systems.

input: Data entered from the keyboard or read from the media that is processed by the 5110.

K: 1,024 bytes; used in referring to storage capacity.

keyboard: A device used for entering data into the 5110.

magnetic media: Tape or diskette storage.

main storage: The part of the 5110 storage where your data and programs are stored.

output: Data that is displayed, printed, or written on the media.

print overlap: Printing data while the 5110 continues to process other program statements.

processing: Performing specific operations on your data.

processing unit: The part of the 5110 that includes the circuits controlling the interpretation and execution.

program: A series of statements that achieve a certain result.   —

sort: To place the records in a data file according to some predefined order.

tape: A media that is capable of storing data and information magnetically.

tape cartridge: A device that contains the tape used by the 5110 for storing data.

tape unit: The part of the system that contains the tape drive, which reads and writes data on the tape.

5110 Model 1: Has a built-in tape unit.

5110 Model 2: Does not have a built-in tape unit.