I INTRODUCTION

The role of the operator of the GE-225 Information Processing System is discussed in this manual. Information is provided about the equipment, procedures for operating the system, and related operator duties such as record keeping and care of input and output media. The operator plays a most important role in the use of the computer system, as will be seen in chapters which follow.

A TYPICAL COMPUTER CENTER

A computer center is usually located in a main building of the organization which it serves. The function of the center is to assist in the performance of one or more of the clerical, industrial, management, and/or scientific jobs of the organization. For example, a center might handle a company's billing, its payroll, its inventory, and solve certain scientific problems on a routine basis.

When a center is first established, programs have to be debugged and operators have to be trained. During this stage of initial organization, a General Electric application engineer will be on hand to assist the setting up of operations which will soon become more or less routine. After the initial stage, the operator will use most of the same computer programs over and over, some on a daily basis and others at weekly or monthly intervals. The center usually operates under the supervision of the computer center manager.

Of immediate interest to the operator is the main computer room where he spends most of his working hours operating the GE-225 System. He may work under the immediate supervision of a shift supervisor who controls the flow of work into and out of the center; or at a large installation, the operator may work under the direction of a machine-room supervisor who works under the shift supervisor.

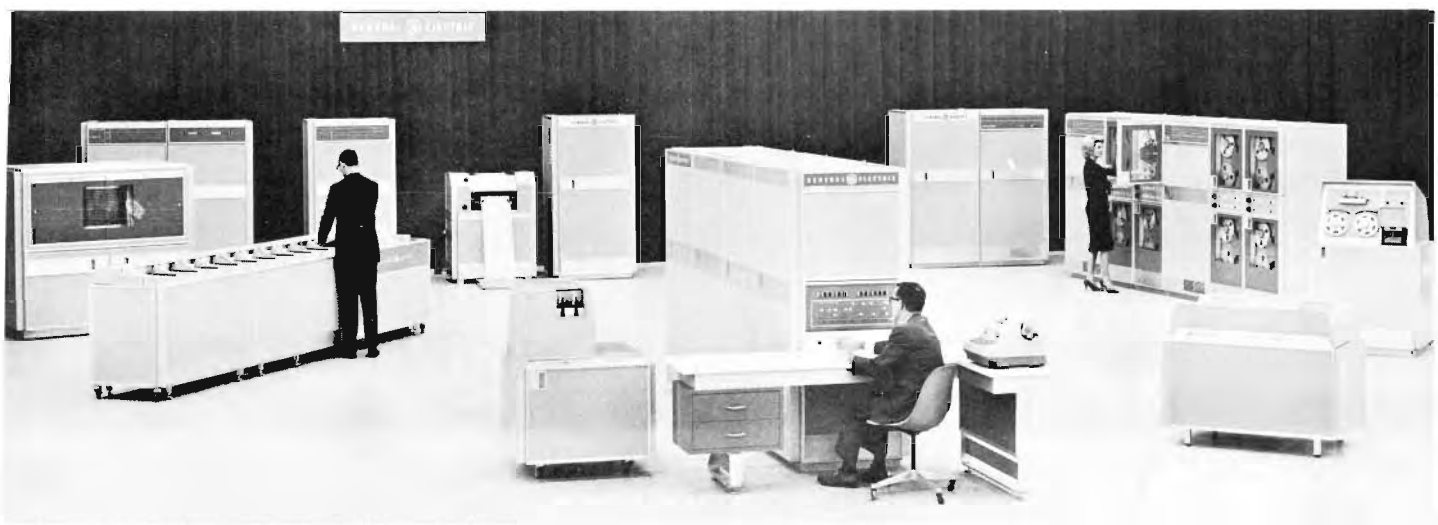

Figure I-1. The GE-225 Information Processing System

Adjacent to or located very close to the main computing room will be an area where service engineering personnel have their office and shop headquarters. Service engineering personnel maintain the GE-225 System and are either on hand or on call at all times.

Other areas of immediate interest to the operator are the tape library, the supply and storage area, and the office of the machine-room supervisor. At a large center, the tape library is usually in a separate room and is managed by a tape librarian. (Section II describes the duties of a tape librarian.) At a small computer center, a single room might serve as the tape library, the storage area, and the office.

A programming staff room may or may not be located in the immediate vicinity of the computer center. However, the operator should know how to contact a programmer for each of the center's major programs to obtain information, if necessary, when difficulty is encountered in the program's execution.

THE GE-225 INFORMATION PROCESSING SYSTEM

The GE-225 Information Processing System, illustrated in Figure I-1, is a medium-sized system which utilizes transistor and magnetic-core components. It consists of a central processor, control console, and a complete line of input-output equipment. The system is adaptable to a wide range of business and scientific applications.

SYSTEM CONFIGURATION

The number and type of input-output devices associated with a particular system depends upon the application and the end results desired. This means that operator duties vary somewhat depending upon the type of system installed.

A typical system configuration is illustrated in Figure I-2. This system uses punched cards for input and output. The system can be expanded by the addition of magnetic tapes and a high-speed printer.

The system which uses paper tape for input and output is illustrated in Figure I-3. Here again, the paper tape reader and punch are sufficient for input and output, but the magnetic tape can be added to enlarge the system's capability. This configuration is particularly suitable for scientific computation, for research and development, and for data reduction.

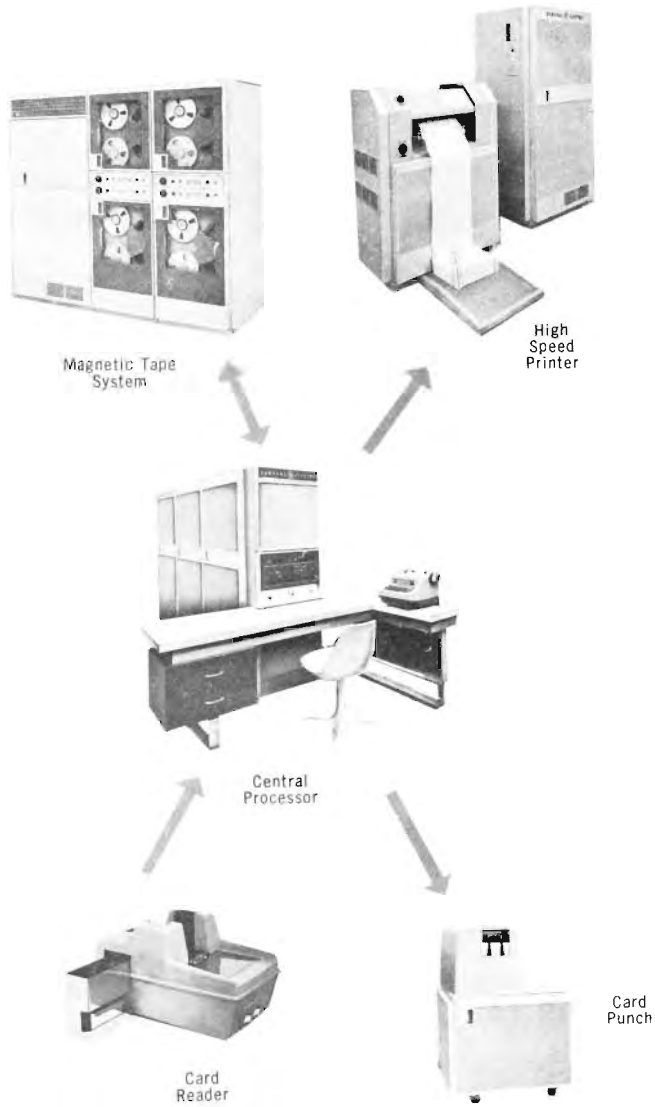

Figure I-2. The GE-225 System Using Punched Card Input and Output

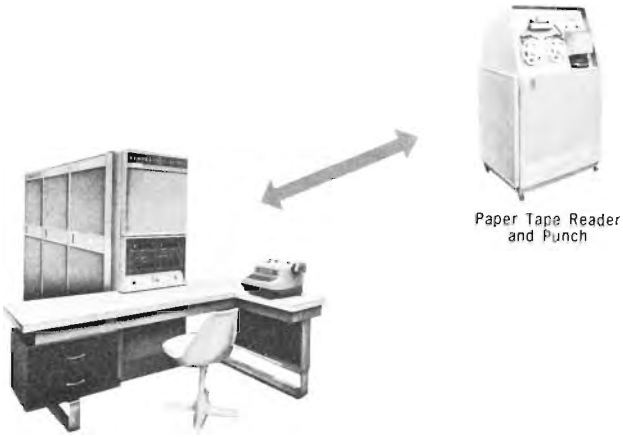

Figure I-3. The GE-225 System Using Paper Tape Input and Output

The central processor (Figure I-4) contains arithmetic, memory, and control sections. Its primary function is to store and execute programs. It also controls the various input-output operations such as reading and writing magnetic tape, reading cards, and printing. The central processor is available with three memory sizes: 4,096; 8,192; and 16,384 words.

The control console, with its indicator lights and control buttons, permits a certain degree of manual control over operation of the system. The operator spends a great deal of his time at this console. Here, he initially loads a program into memory, monitors its progress from messages on the console typewriter, and, when required, stops the run for checking or other purposes.

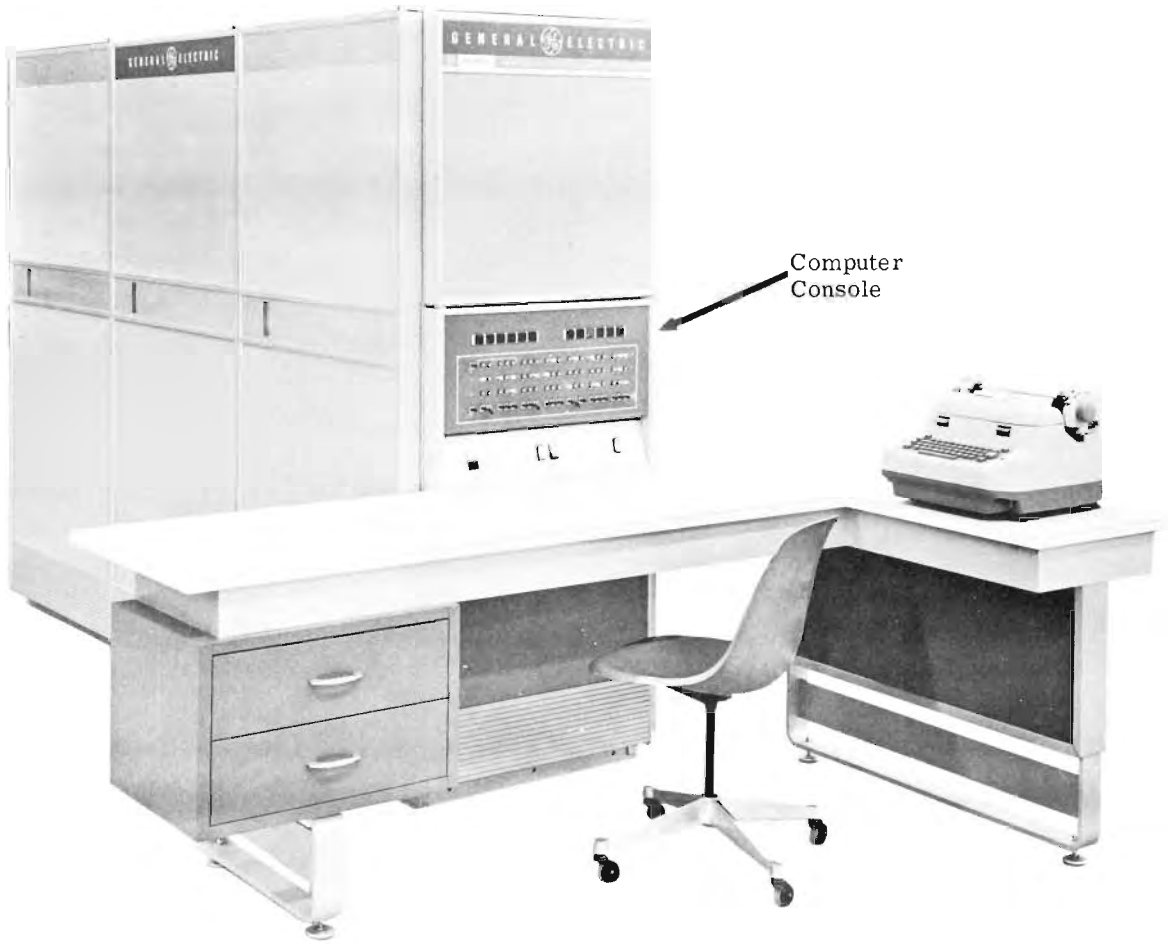

Figure I-4. The Central Processor

INPUT-OUTPUT DEVICES

Each of the various input-output devices used in the GE-225 System is described in a separate section of this manual.

Card Reader

The Card Reader enables information (such as business transactions or computer programs) punched on cards in either binary or Hollerith codes to be fed directly into computer memory for processing.

Either of two types of card reader can be used in the GE-225 System. The 400 card per minute reader is illustrated in Figure I-5 and described in Section VI. The high speed card reader is illustrated in Figure I-6 and described in Section VII. The same programs can be written for use with either reader. In addition to using the card reader to enter program and/or data cards, the operator maintains a file of software programs on cards (described in Section XVI) which he used over and over again for routine types of operations.

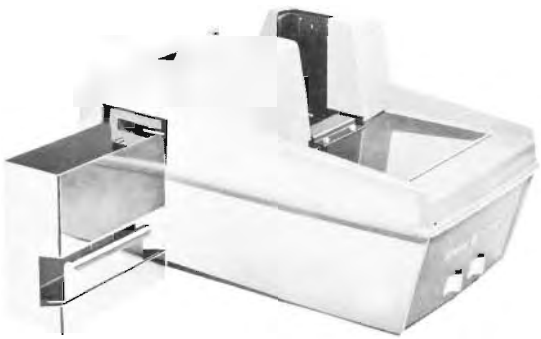

Figure I-5. The 400 Card Per Minute Reader

Figure 1-6. The High Speed Card Reader

Card Punch

The card punch, illustrated in Figure I-7, permits output information from the computer to be recorded directly on punched cards under control of the stored program. The punch can also be used for duplication (gang punching) of cards in an off-line mode. Section VIII describes the card punch, its capability, and operating functions pertaining to its use.

Magnetic Tape Subsystem

The magnetic tape subsystem, illustrated in Figure I-8, is used for both input and output to the central processor. Each subsystem contains a magnetic tape controller and from one to eight magnetic tape handlers. The subsystem described in Section IX contains a handler mechanism which transfers information at the rate of 15,000 characters per second. Other handlers with faster transfer rates are available. A good operator is one whose dexterity permits him to make rapid changes of tape reels, for time is of the essence in computer operations.

Figure I-7. The Card Punch

High-Speed Printer

The high-speed printer, illustrated in Figure I-9, permits rapid printing of reports under control of the stored program. It is used in applications where large amounts of output information from the computer must be transformed into a permanent visual record, such as tabulated listings. Nine hundred lines of alphanumeric information (as many as 120 characters per line) can be printed in one minute. Section X contains information on the printer and its controller and describes the various operator duties connected with printer operation, such as loading paper and controlling vertical spacing.

Paper Tape Reader and Punch

The paper tape reader and punch, illustrated in Figure I-10, provides still another means for entering information into the memory of the GE-225 System and for recording its output. The paper tape reader reads information represented as punched holes in the paper tape and transmits it directly to the computer memory. Output information from the computer is punched on paper tape by means of the paper tape punch. Section XI describes the paper tape reader and punch and its operation.

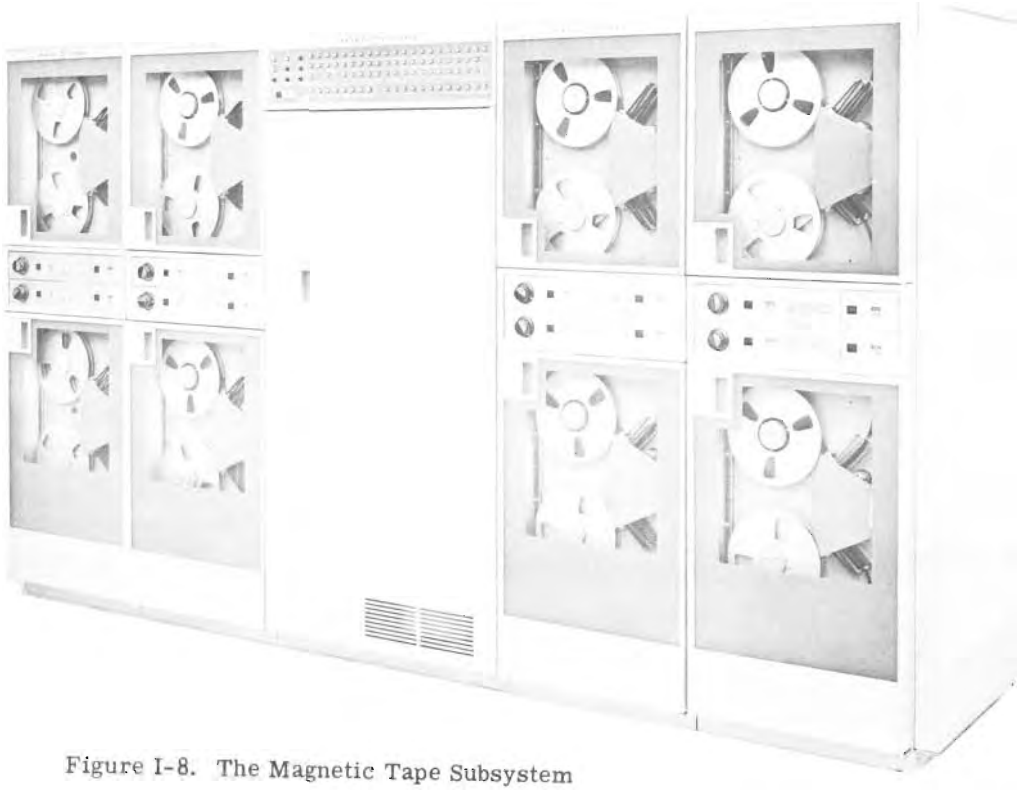

Figure I-8. The Magnetic Tape Subsystem

Figure I-9. The High-Speed Printer Subsystem

Figure I-10. The Paper Tape Reader and Punch

AUXILIARY COMPONENTS

Auxiliary Arithmetic Unit (AAU)

The addition of the GE Auxiliary Arithmetic Unit, Figure I-11, extends the arithmetic capability of the GE-225 System. This Unit is particularly useful in scientific and engineering applications where numerous floating point or double-word calculations are required. Binary arithmetic is described in Appendix A which contains a summary of number systems. Section XII describes the AAU and the operator duties connected with its operation.

Figure I-11. The Auxiliary Arithmetic Unit

Mass Random Access Data Storage

Another variation in system design is the extension of the memory capability of the central processor itself by the addition of one or more mass random access data storage (MRADS) units, illustrated in Figure I-12. This unit is extremely valuable in applications where large volumes of information must be stored and retrieved periodically with a minimum of delay. One of the chief advantages of the MRADS unit is that information stored does not have to be in any sequence, hence no sorting is required.

Figure I-12. The Mass Random Access Data Storage Unit

The use of two random access controllers, each having four disk units, adds a storage capacity sufficient to hold 275,200,000 decimal digits. Section XIII describes operator duties in connection with this peripheral unit.

Document Handler

The GE 12-Pocket Document Handler is an optional input device which accepts random-size documents encoded with a special font of magnetic ink characters, called 'MICR characters.' It reads the magnetically encoded information directly into the memory of the computer, and sorts the documents into any or all of its twelve pockets in some predetermined order. The system can be used as a separate unit to sort documents (off-line mode), or it can be connected to the computer with sorting controlled by the stored program (on-line mode). Although initially designed for processing bank checks, the document handler can be used to great advantage in any application where paper with MICR characters provides input to the computer. Two types of document handlers are available for use in the GE-225 System. The GE 12-pocket document handler

reads documents at the rate of 1200 documents per minute. It is illustrated in Figure I-13, and is described in Section XIV. The document handler which reads documents at the rate of 750 words per minute is illustrated in Figure I-14 and is described in Section XV.

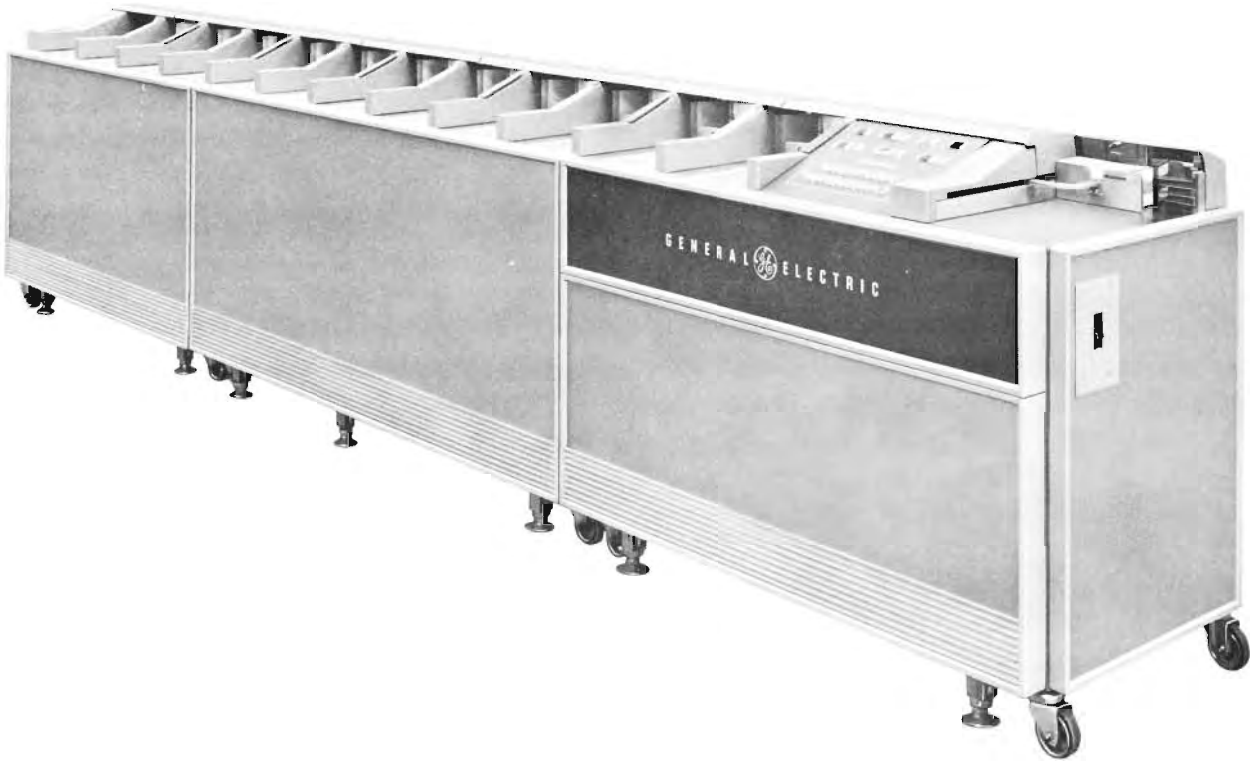

Figure I-13. The GE 12-Pocket Document Handler (1200 Documents/Minute)

Figure I-14. The 12-Pocket Document Handler (750 Documents/Minute)

PRIORITY CONTROL

All of the peripheral equipments just described, or any combination of them, can operate simultaneously in the GE-225 System. This is possible because each major GE-225 input-output peripheral device controls itself and executes its own commands; also because access to main memory is time-shared by all peripherals. A priority system in which each unit is assigned a priority number permits each peripheral to access main memory whenever necessary, without conflicting with any other peripheral.

All peripherals which do not access memory directly access it through a common control and data transfer channel known as the controller selector. The controller selector establishes communication between memory and the peripheral controller, and allocates priority control to the various units.

The connections of the peripherals and the central processor are described in Section IV. By use of plug-in connectors, illustrated in Figure I-15, peripheral units can be connected in varying configurations and interchanged according to the user's requirements. Figure I-16 is a schematic diagram which illustrates access of peripheral units to main memory via the central processor priority control.

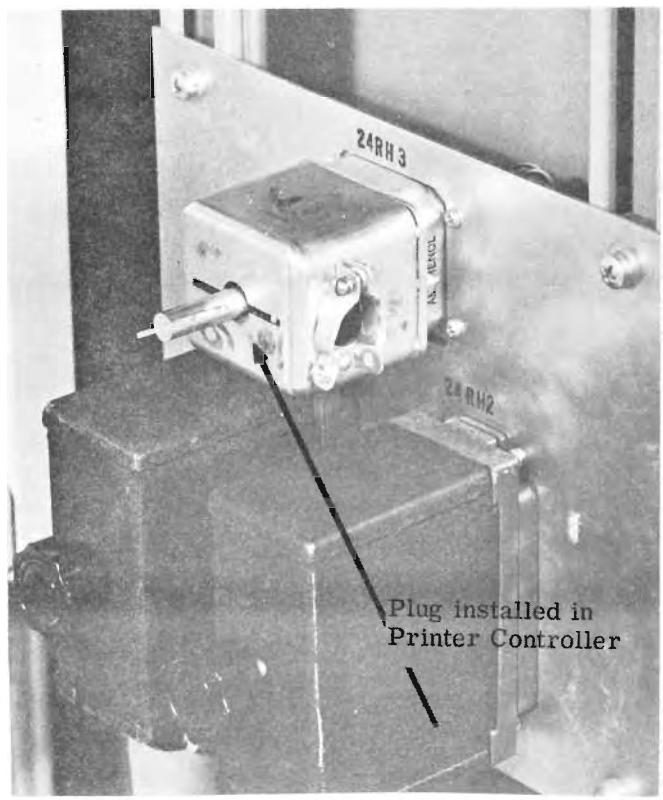

Figure I-15. A Plug-In Connector Installed

OPERATORS' USE OF EQUIPMENT

As a general rule, the operator uses only controls and indicators located on the exterior of the equipment. This manual specifies which operations may be performed by the operator, and mentions others that must be performed by service engineers. Only where this operating manual specifies that the operator open doors or remove covers, should he do so. The reason for this is that most of the internal parts of the equipment have exposed electrical wiring; such areas should be accessed only by personnel who have electrical and electronic training and are also familiar with the equipment. It is in the interest of safety that the operator stay away from parts of equipment out of his jurisdiction.

GE-225 INSTRUCTIONS

It is necessary that the operator learn to identify the octal (binary) configuration of the various programming instructions, particularly those pertaining to the peripheral equipment. The operator reads the octal representation of instructions from the A and I register lights of the console, and he enters instructions in octal from the console's option switches. Appendix E contains both an alphabetic and an octal list of instructions which may be used for reference purposes. For a complete description of the more than 150 instructions, the operator should refer to the GE-225 Programming Reference Manual.

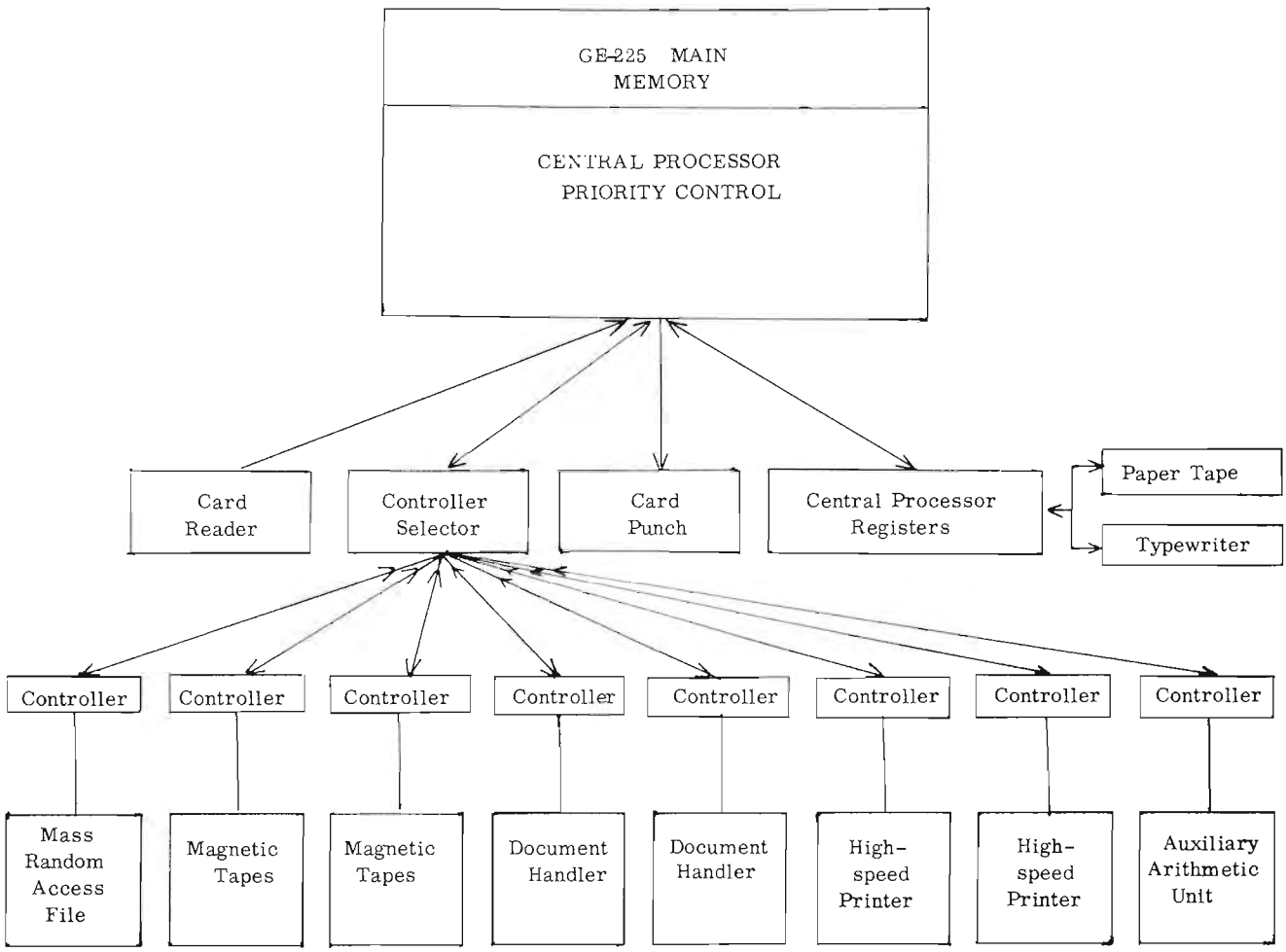

Figure I-16. Diagram of the GE-225 System