

PRELIMINARY

# **Computer System Operator's Manual**

Preliminary

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## PREFACE

This manual describes how to operate the IBM Instruments Computer System using system commands. It consists of six chapters and an appendix:

- Chapter 1-- "General Introduction," describes the hardware and software components of the System.
- Chapter 2--"Component Operation," describes the controls and operation of the various hardware components.
- Chapter 3--"Getting Started," familiarizes new users of the computer system with common operations and commands.
- Chapter 4--"Working With Files," describes how to access files and how to manipulate data within them.
- Chapter 5--"Computer System Commands," describes the commands used to control the Computer System.
- Chapter 6--"Initiating and Terminating Tasks," describes how to start and stop tasks.
- Appendix A--"System Messages," explains the system messages issued by the Computer System.

This publication is intended to assist you in operating the Computer System. It is not necessary to have any previous experience operating a computer.

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Other publications discuss programming and service of the Computer System. These include:

Computer System Product Description, GC22-9183

BASIC Programming Manual, GC22-9184

Computer System Operating System Reference Manual, (Part 1: Operating System GC22-9199; Part 2: Logical I/O and System Services GC22-9200)

Computer System Problem Isolation, GC22-9192

The U.S. Federal Government requires that the following statement be printed in operating manuals for all Class A computing devices:

"WARNING - This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with its associated publications, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference."

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## 1.0 GENERAL INTRODUCTION

The IBM Instruments Computer System consists of an easy-to-use, high performance processor, an operating system, and I/O (input/output) units. Depending upon the configuration, you can communicate with the system by keypad or keyboard. Output from the Computer System can be displayed either on a cathode ray tube (CRT) or a printer/plotter or sent to other devices by one of the system connections. The operating system controls this output and will display system messages, system status, and responses to requests from either the keypad or keyboard.

Input to the Computer System can also be received from disks, diskettes, and I/O devices via RS-232C, IEEE-488, and Sensor I/O connectors. The system supports both optional 5¼ and 8-inch diskette drives as well as Winchester-type hard disk drives. The diskette drives and hard disk drives can also be used as output devices, to store data or programs. The I/O connectors allow the Computer System to be attached to other computer systems or devices to receive input or transmit output.

## 1.1 TYPICAL CONFIGURATIONS

Several configurations of the system's features are possible. Mixing and matching of a variety of features can be used to tailor the system to meet various needs. For example, a base system unit as shown in Figure 1-1 consists of a processor, a keypad, and a display, while a maximum system like the one shown in Figure 1-3 may consist of those items plus a printer/plotter, a keyboard, up to four diskette drives, plus expansion (with the Expansion Feature) for a mixture of additional memory, sensor boards, or hard disk controller. Optional programming packages are also available.

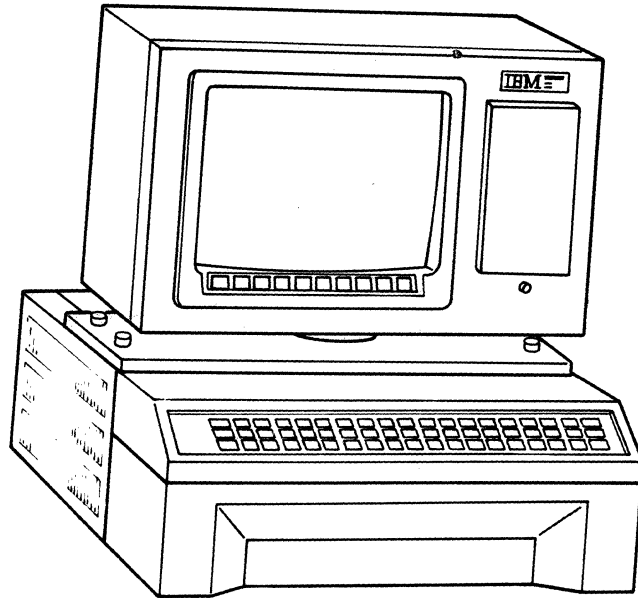


Figure 1-1. Base System Unit

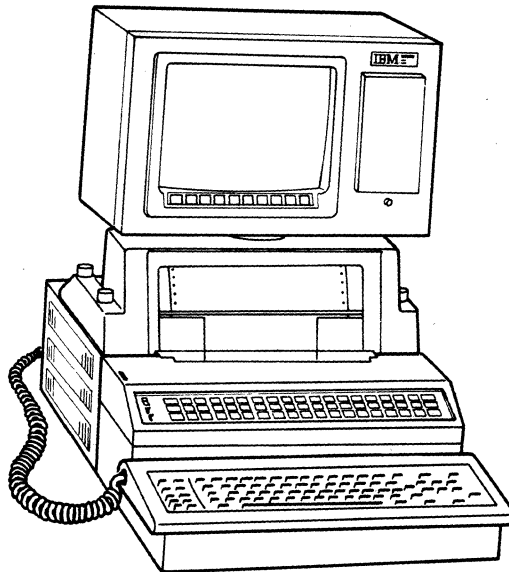


Figure 1-2. Base System Unit with Optional Printer/Plotter and Keyboard



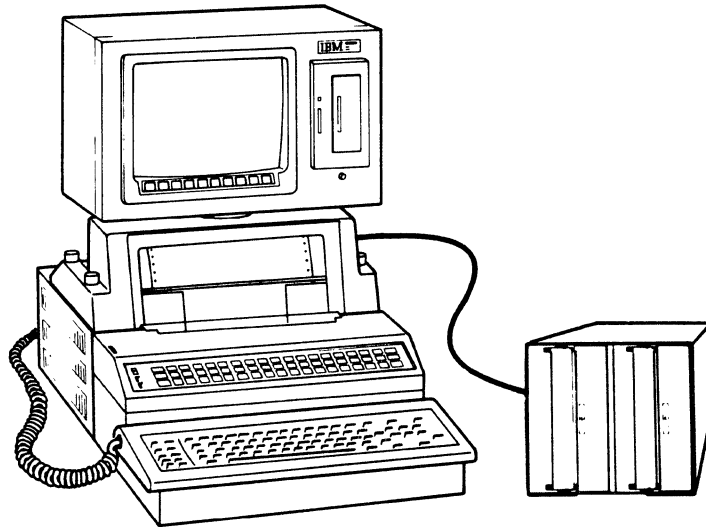


Figure 1-3. Base System Unit with Optional Printer/Plotter, Keyboard, and Diskette Units

The next topics, "Hardware" and "Software," identify standard and optional features. Refer to the Computer System Product Description, GC22-9183 for further information about ordering optional features.

## 1.2 HARDWARE

The Computer System hardware consists of a Base System Unit and a variety of optional features. The Base System Unit includes a processor, a CRT, and a keypad. The processor is based on a 68000 8 MHz microprocessor and provides 128K bytes of random access storage and up to 128K bytes of read-only storage.

In addition to the Base System Unit components, there are the following optional I/O units:

- Keyboard
- Printer/plotter
- Diskette drives--up to four, 5¼ and 8-inch models
- Winchester-type drives--up to four 5¼-inch hard-disk drives of five or ten megabyte size.

Options that use the 5-slot expansion feature are:

- Sensor I/O Board -- Analog-to-digital, 8-Bit Parallel, pulse/counter/timer, and additional RS-232C interface
- Memory expansion - 1 megabyte per card in 256K-byte increments

Refer to the Computer System Product Description, GC22-9183 for more information about the Computer System hardware.

### 1.3 SOFTWARE

The IBM Instruments Computer System uses a real-time, multitasking operating system. You need only start the system ("power-on") to have a functioning operating system. There are no complex commands needed to initialize the system, no need for complicated job control languages, and no constant need to attend peripheral I/O units. Nor is there any need to identify complicated series of commands to make the system work.

Although it is not needed to operate the Computer System, available software support includes a BASIC language interpreter, a text editor that utilizes the CRT display, and a macro assembler. FORTRAN and PASCAL compilers and a Scientific Subroutine Library package will be available.

The Computer System can also support IBM Instruments application programs or user-written application programs. IBM Instruments offers an optional Chromatography Application Program that provides for chromatography data capture and analysis, reports, and user interaction. The user communicates with this program through the keypad. Programming within the Chromatography Application Program allows the Computer System to "talk" with chromatographs and in some cases control their operation. Refer to

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the Chromatography Application Program Product Description, GC22-9188 for more information about the program and to the Computer System Product Description, GC22-9183 for more information about Computer System software.

### 1.4 FILE SUPPORT

The Computer System can store programs and data in files on diskettes or hard disks. The Computer System controls these files so you have very little to do in terms of file management except occasionally deleting unneeded files. A directory keeps track of the files and you can display or print a list. You can create, modify, delete and access files.

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## 2.0 COMPONENT OPERATION

This chapter describes the hardware components of the Computer System and explains how to operate them. This chapter also describes the I/O interfaces and all I/O units--standard and optional.

The hardware components include:

- Processor
- Keypad
- Keyboard
- Cathode ray tube display
- Printer/plotter
- Diskette drives
- I/O interfaces
  - RS-232C
  - Eight-bit parallel port
  - IEEE-488 bus

### 2.1 PROCESSOR

The processor has no external operator controls except the power-on switch located on the right side of the unit. When the processor is turned on, a series of diagnostic checks are run. After a few seconds, the Computer System operating system begins to run, and commands can be entered or any other valid system functions performed. Powering off the processor also stops system operation (except for the battery backed-up calendar/clock). No vital user operation should be underway when the processor is powered

off, or data could be lost. In addition, diskettes should be removed from diskette drives before powering off.

## 2.2 KEYPAD CONTROLS

The programmable keypad provides control of the Computer System, but no general alphanumeric data entry capability. The keypad consists of indicator lights, two switches, and a series of pressure-sensitive keys. The functions of the keys can be printed on a clear overlay and special purpose overlays to match the different functions are available for different applications. With the proper programming, when one of the keys is pressed, the keypad can provide an audible response and the function selected can be displayed on the CRT.

When the Computer System is used as a general purpose device, the operation of the keypad controls can be defined by the user. Refer to the LC/Computer System User's Manual for a description of the keypad controls when used with chromatography instruments.

Figure 2-1 illustrates the keypad and its controls.

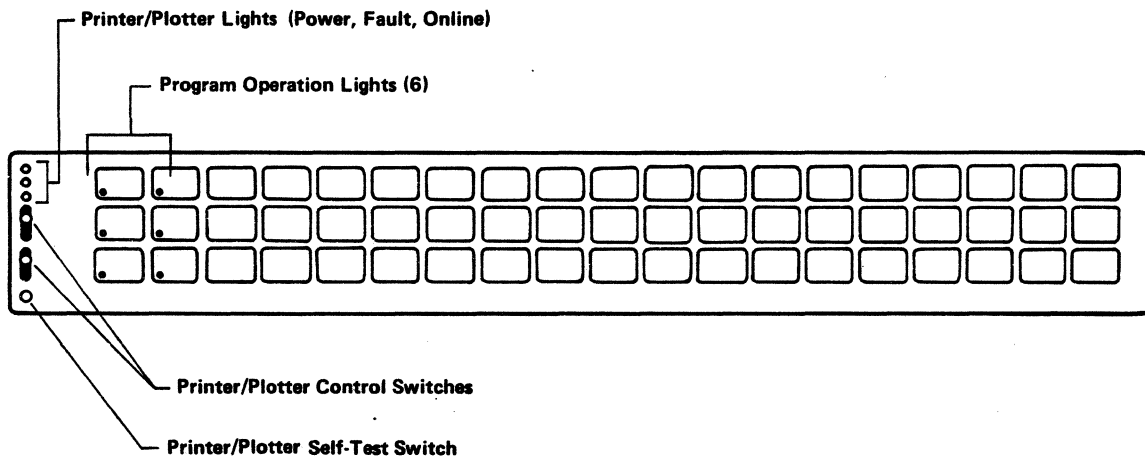


Figure 2-1. Keypad

## 2.2.1 KEYPAD INDICATOR LIGHTS

The keypad uses indicator lights to show program operation and printer/plotter status. The six program operation lights are defined by the application program in use and are also used by the diagnostics at power-on. The printer/plotter lights provide the following indications (for the printer/plotter only):

- Power on indication
- Paper out and fault indication
- Online indication

## 2.2.2 PRINTER/PLOTTER CONTROL SWITCHES

The printer/plotter control switches at the left of the keypad provide control of the optional printer/plotter:

- Online/Offline/Formset
- Formfeed/Linefeed switching

Refer to Section 2.6 for information on using these switches.

## 2.3 KEYBOARD CONTROLS

The optional keyboard is used to communicate with the system for programming or other general purpose uses. It provides general alphanumeric capability as well as system control. The characters entered at the keyboard can be displayed on the CRT, or with some applications you can specify that data entered at the keyboard be printed on the printer/plotter. With certain application programs, the keyboard also

controls the cursor. User-programmed functions can be activated with program function keys that have been appropriately programmed.

## THE KEYBOARD KEYS

The keyboard has 83 keys that can be divided into three types:

- Keys for entering alphabetic, numeric, and special characters
- Keys for selecting programmed functions
- Calculator-style numeric keys that can be programmed to control the cursor on the display

Figure 2-2 identifies and illustrates the locations of the keys that perform the functions above.

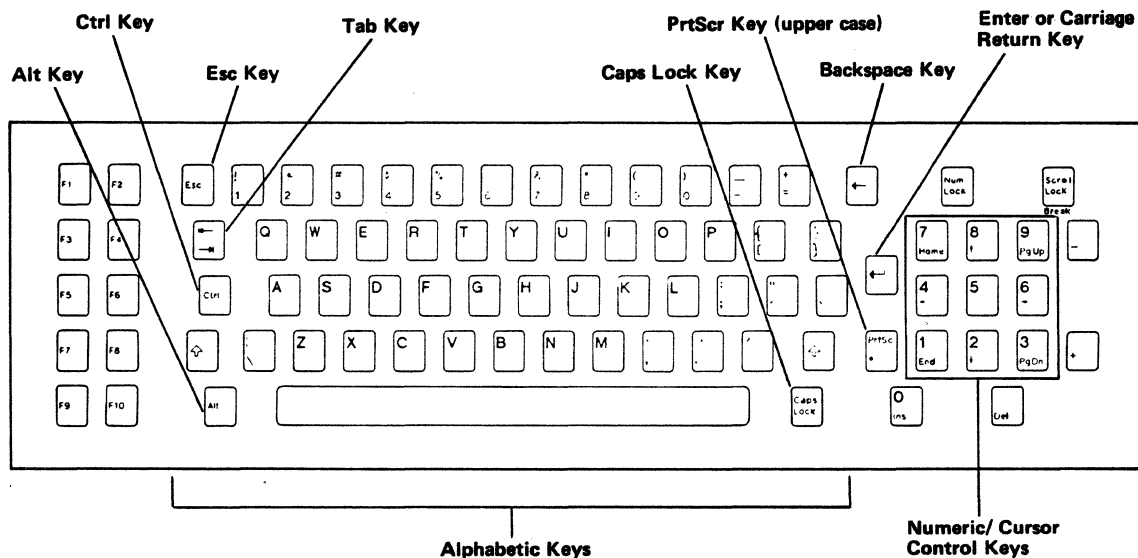


Figure 2-2. Keyboard



## Alphanumeric Keys

There are 58 alphanumeric keys, the space bar, and special characters, as identified in Figure 2-2. The alphanumeric keys are white and are used to enter commands or data. The upper case keys and the "Caps Lock" can be used, as with a regular typewriter, to enter capital letters or alternate special characters. (When powered-on, the system is in uppercase mode and must be released to lower case mode.)

There are also seven other keys that work together with the alphanumeric keys. Colored grey and identified in Figure 2-2, these are the:

- "Esc" (escape) key, often used to indicate that the next series of keys to be entered have a special function.
- Tab key, used to tab the cursor. This key tabs to the right in lower case mode and to the left in upper case mode.
- "Ctrl" key, used to specify a control function for another selected alphanumeric key (such as a "Ctrl A" sequence). The "Ctrl" key must be pressed and held down while another key is pressed.
- "Alt" key, used to select an alternate function of an existing alphanumeric or cursor control key. The alternate function is written on the face of the key. Only certain keys have alternate functions. To use the alternate function, press the "Alt" key, hold it down, and then press the chosen key.
- Backspace key, used to move the cursor backwards (to the left) on a line, erasing previously typed data so that data can be re-keyed.
- Carriage return key, also called the Enter key, marked with a left-pointing arrow. It is used to move the cursor back to the left hand margin and down one line. This is exactly like the carriage return on a typewriter except that (in Command Mode) it also transmits the entered data to the processor for execution.
- "PrtSc" key, used in conjunction with an upshift key, prints the screen image on the printer/plotter. By using these two keys, you can have a hard copy of the contents of the screen saved on paper for future reference or later use. No other action is necessary to print the screen image. Note: No other keys should be pressed until the screen image has been printed, and PRTSC should not be pressed if another printout is in progress.

## Programmed Function Keys

There are ten program function keys on the keyboard that can be programmed by users to perform special functions. Refer to Figure 2-2 for their location. Details about programming these keys are found in the Computer System Operating System Reference Manual Part 2, GC22-9200. The power-on menu describes the default operating system functions for these keys.

## Cursor Control and Numeric Keys

These keys, identified in Figure 2-2, can provide two sets of functions in combination with appropriate applications programs. They position the cursor on the display and they allow numeric data to be entered in a desk-top calculator mode. The Computer System's operating system does not utilize these keys.

Two keys, the "Num Lock" and "Scroll Lock," determine the function of the cursor/number keys. With applications that use the cursor control keys, pressing the "Scroll Lock" key causes the keys to control the cursor, page the screen image up and down, and insert and delete data.

The cursor control keys (marked with arrows) allow left, right, up and down movement. The cursor is moved in three ways: a single space per key stroke (character width right or left or line width up or down); a series of spaces when a key is pressed and held; or a jump to "home." ("Home" is defined as the bottom left-hand corner of the screen.) By moving the cursor, you can select the location on the display where data is to be entered.

The screen image can be moved forward (up) and backwards (down) by pressing the "PgUp" and "PgDn" keys respectively. This movement (called "paging") presents the next full screen image so that it can be viewed. Key number 7, the "Home Key," moves the cursor to "home."

The "Ins" and "Del" keys insert or delete data, respectively. "Insert Mode" can be entered by pressing the "Ins" key. Then, by positioning the cursor one character to the left of where the characters must be added, characters can be entered. To exit Insert Mode, press the "End" key.

Delete characters by positioning the cursor directly under the character to be deleted. Press the "Del" key once to delete each character. Holding the "Del" key down will delete multiple characters.

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The "Num Lock" key allows the keys to enter numeric data as if the keyboard were part of a desk calculator. In this case, numbers appear on the screen where the cursor is located, just as if the data were text. The minus sign (-), the plus sign (+), and the multiplication sign (\*) on the "PrtSc" key are the operators.

### Keyboard Operation

When data is entered at the keyboard, the Computer System may display alphanumeric characters at the CRT or perform the requested function entered. The system operates on alphanumeric data only after the "enter" or "carriage return" key is pressed. For program function keys, the system performs the operation when the key is pressed.

Data can be typed over so you can easily modify it before it is entered. This is done by "backspacing" or positioning the cursor to the first character to be corrected and typing over the character or characters to be corrected on the line.

Note that in most cases any correction, addition, or deletion is not complete until the "enter" or "carriage return" key is pressed. Some languages and application programs may allow other forms of entry.

## 2.4 DISPLAY UNIT

The cathode ray tube (CRT) provides an online graphic and alphanumeric display. The display unit is mounted directly on the processor housing for configurations without printers/plotters. It is mounted on a bridge directly above the printer/plotter when the configuration includes one. It can be swiveled up and down, or right and left to be easily viewed by the operator. In addition, the bridge and the CRT can both be removed if you wish to put them beside the processor unit. Figure 2-3 illustrates the screen of the display unit.

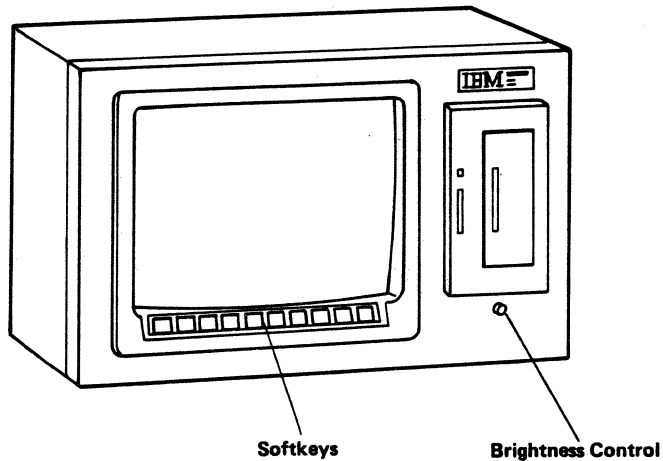


Figure 2-3. Display Unit

### **BRIGHTNESS CONTROL**

A brightness control knob is located just beneath the diskette door on the CRT unit (or under the black plate on systems not equipped with CRT diskette drives). Turning this knob clockwise increases the brightness of the CRT display.

### **SOFT KEYS**

Ten "soft" or programmable keys are located just below the CRT screen on the CRT unit. The functions of these keys can be separately defined and changed under the control of an application program each time the display on the CRT is changed. This is especially useful for complex programs and to simplify operator usage. Refer to Computer System Operating System Reference Part 2, GC22-9200 for details.

### **DISPLAY OPERATION**

The keyboard, soft keys, and keypad can control the display. The operating system and other programs display entries and requests, graphics, or system status or messages as required.

The contents of one screen image, stored internally by the Computer System, can also be printed on the printer/plotter. This is done by

pressing the "PrtSc" key in conjunction with an upshift key. No other keys should be pressed until the screen image has been printed.

## 2.5 OPTIONAL DISKETTE DRIVES

Optional diskette drives can store files online for the Computer System. Up to four diskette drives can be attached to the system. There are two types: 5¼-inch diskette drives store up to 322,000 formatted bytes of data; 8-inch diskette drives store up to 985,000 formatted bytes. Double sided, double density diskettes are used. The 8-inch diskette stores data in a format compatible with other IBM systems using double sided, double density diskettes.

Both types of diskette drive can be easily attached to the Computer System with connectors. A single 5¼-inch diskette may reside above the processor in the display housing, to the right of the display. Dual drive housings are provided for both the 5¼ and the 8-inch units. Figure 2-4 illustrates the 5¼-inch and the 8-inch diskette drive units.

The diskettes must be formatted and initialized the first time they are used. This is part of the initialization process, described under the FORMAT command later in this manual.

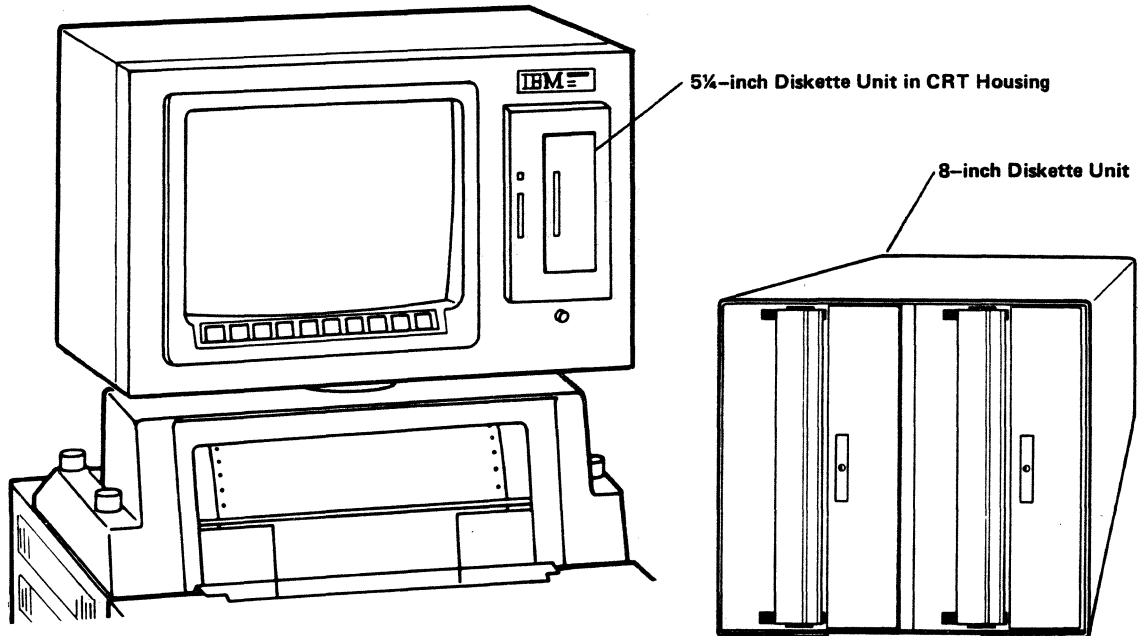


Figure 2-4. 5 1/4 and 8-inch Diskette Units

### DISKETTE DRIVE CONTROLS AND INDICATORS

The diskette drives are controlled by the power on switch (for 8-inch units) and the diskette door. In addition, 8-inch drives have drive select switches. The power on switch and drive select switches are located at the rear of the 8-inch unit. The door locks the diskette into place and (with the 8-inch diskettes only) automatically signals to the Computer System that the diskette drive is ready to send or receive data. Opening the door signals to the Computer System that the diskette drive cannot send or receive data.

Each diskette drive has a single indicator light that glows when the system addresses it.

## DISKETTE OPERATION

Operate each type of diskette drive by:

- Opening the diskette door. (Refer to Figures 2-4 for the location of the doors). Push the locking tab to open the door. On 8-inch units, if any drive is in use the doors cannot be opened.
- For new diskette units only, remove the cardboard inserts.
- Check to see if the diskette is 'protected.' If there is a notch on the bottom edge of an 8" diskette, information cannot be written to the diskette until the notch is covered. On 5 1/4" diskettes, however, the opposite is true. 5 1/4" diskettes are protected when they have no notch; to write to them, they must be notched.
- Insert the diskette with its label toward the open diskette drive door.
- Close the diskette door; the locking tab automatically locks the door. The diskette drive is now ready to operate.

## DISKETTE DRIVE ADDRESSING CONVENTIONS

The Computer System uses a specific addressing convention for the diskette drives in order to identify where data resides. If only one diskette drive exists, it is identified to the system as drive 0, the default number. If there are two diskette drives, the first will be drive 0 and the second will be drive 1. Third or fourth drives are identified as drive 2 and drive 3, respectively.

Diskette drive addresses are set by means of the diskette drive select switches located on the back of the 8" drive cabinet, in the lower right hand corner as shown in Figure 2-5. The switches must be set to inform the system which drive will be drive 0, which will be drive 1, and so on.

NOTE: If the system is equipped with a 5 1/4" diskette drive in the CRT display housing, that drive will be set to be drive 2.

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The first four switches control the left drive in the cabinet (as viewed from the front) and the second four control the right. To set an address, turn the appropriate switch ON and all the other switches OFF. For example, to identify the left drive as drive 0 and the right drive to drive 1, set switches 2 and 5 ON and all other switches OFF as shown in Figure 2-5.

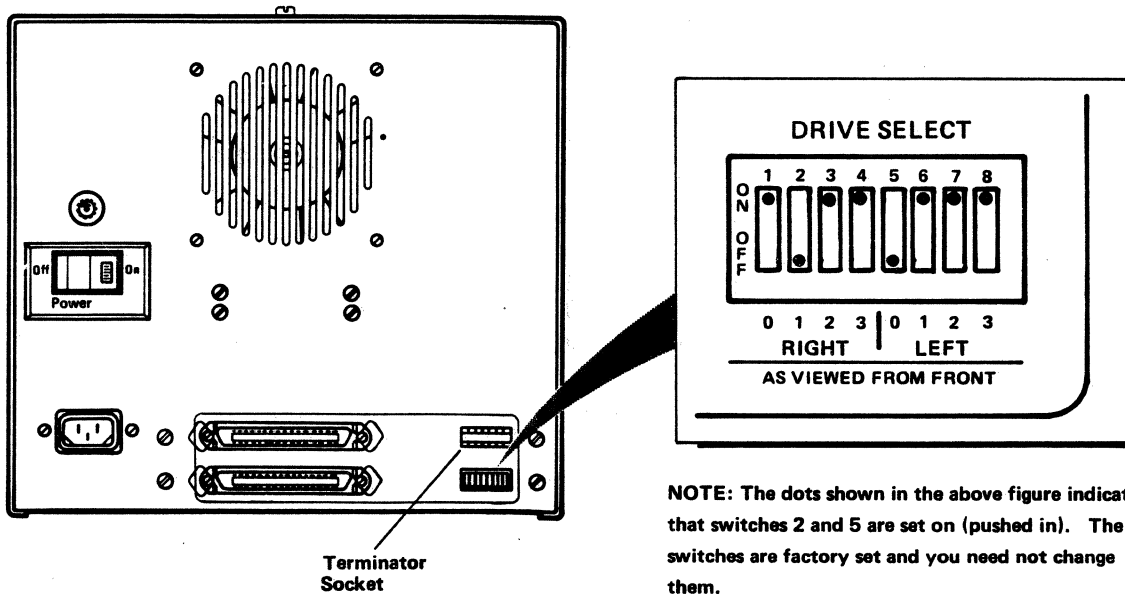


Figure 2-5. Drive Select Switches

Drive addresses are important when system commands that affect the diskette drives are issued. The system selects the default drive volume if no drive number is specified. Issuing a DIR command for a diskette drive will light the LED for that drive; this is an easy means of identifying which drive is which. (Refer to Chapter 5 for a description of the DIR command.)



## 2.6 PRINTER/PLOTTER

The printer/plotter can print either continuous, fanfold paper or single forms. It has controls and indicators (located on the keypad and on the printer/plotter unit itself) that provide several ways of controlling and printing data.

Vertical form lengths and margins can be programmed and are not restricted to the default values established at power up or the physical positioning of the paper tractors. Refer to the Computer System Operating System Reference Part 2, GC22-9200 for information regarding program codes for these functions.

### MANUAL CONTROLS AND INDICATORS

Figure 2-6 illustrates the printer/plotter. The controls are divided into two separate categories as follows:

- Operating Switches and Status Indicators--Used to switch the printer on line, position paper vertically, and activate self-test/buffer clear functions. Three status indicators located on the left hand side of the keypad provide printer status information - online, offline or fault.
- The Form Thickness Adjusting Lever is located beneath the printer cover on the righthand side of the printer/plotter, this lever adjusts print head pressure to compensate for changes in paper thickness or multipart forms.
- The single page mode or continuous mode selector lever (friction feed) is located on the lefthand side of the printer/plotter.

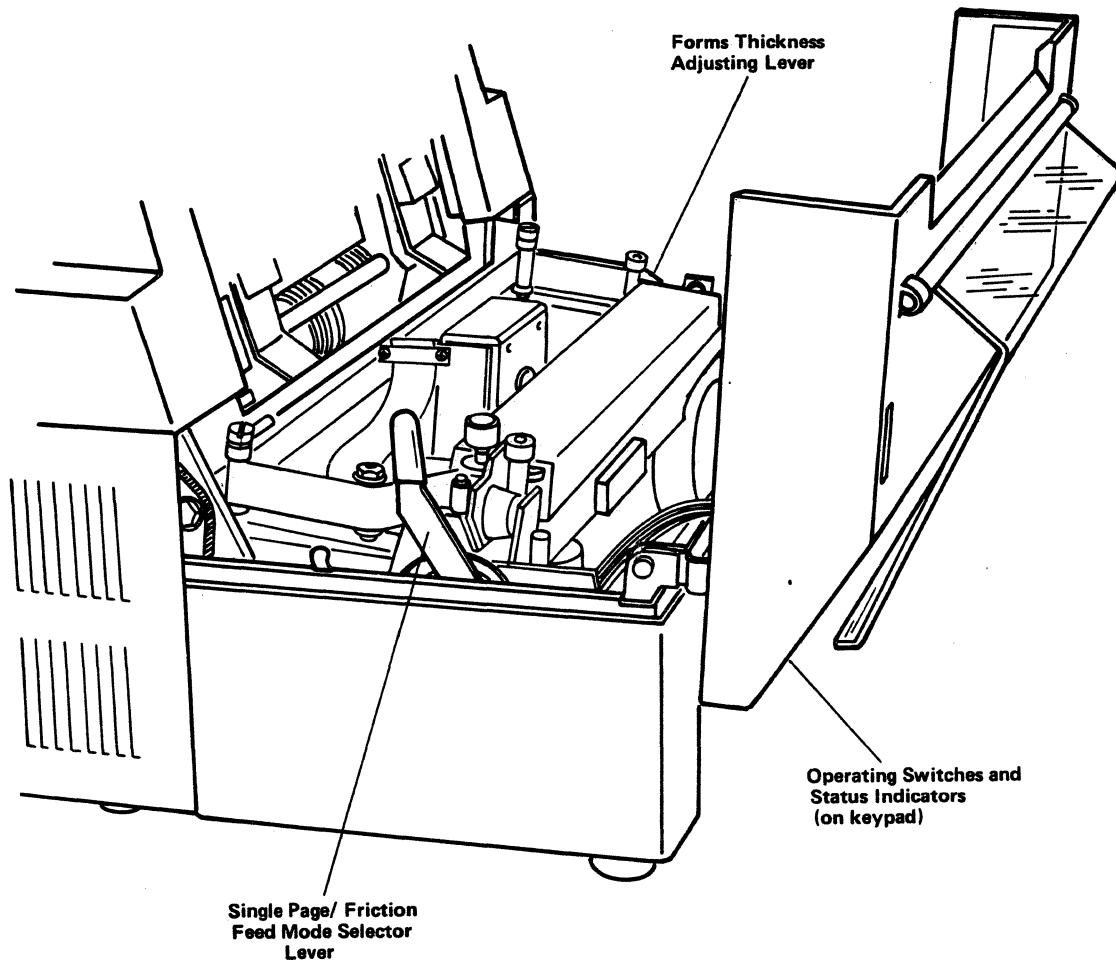


Figure 2-6. Printer/Plotter

## PAPER AND RIBBON HANDLING PROCEDURES

You will have to load paper or forms into the printer, manually adjust the print margins, set the top-of-form position, and replace the ribbon when required.

### LOADING PINFEED PAPER INTO THE PRINTER/PLOTTER

Pinfeed paper up to 9 1/2 inches wide can be loaded into the printer/plotter quickly and easily by referring to Figure 2-7 and following these steps:

1. Move the ONLINE/OFFLINE/FORMSET switch on the front panel (A) to the OFFLINE position.
2. Lift the printer/plotter cover from the back and rotate it forward on its hinges, exposing the printer/plotter (B).
3. Use the Form Feed/Line Feed switch on the front panel (C) to page out any paper that remains in the printer/plotter.
4. Pull the paper tray away from the processor unit to expose the front of the printer/plotter and the paper chute (C).
5. If you are using fanfold paper, position the stack of paper in the tray and pull approximately 18 inches of paper from the supply (D). If you are using another form of continuous paper, feed the paper through the paper tray allowing 18 inches for loading.
6. Position the Form Feed/Friction Feed lever (E) to the rear. This lever is located on the left end of the printer/plotter.
7. Center the paper in the throat of the paper chute and push forward (F). The printer/plotter will take hold of the paper and automatically index it until it reaches the first print line.
8. Open the tractor covers (G).
9. Use the Line Feed switch (C) to move the paper up until the top edge of the paper is at the top of the tractor mechanism (about 2 inches).
10. Position the Form Feed/Friction Feed lever (E) located on the left end of the printer/plotter toward the front.

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11. Position the holes on the edges of the paper onto the pins of the tractor mechanism, adjusting the tractors for the width of the paper if necessary. This is done by pushing down the levers on the tractors and sliding the tractors.
12. Close the tractor covers (G).

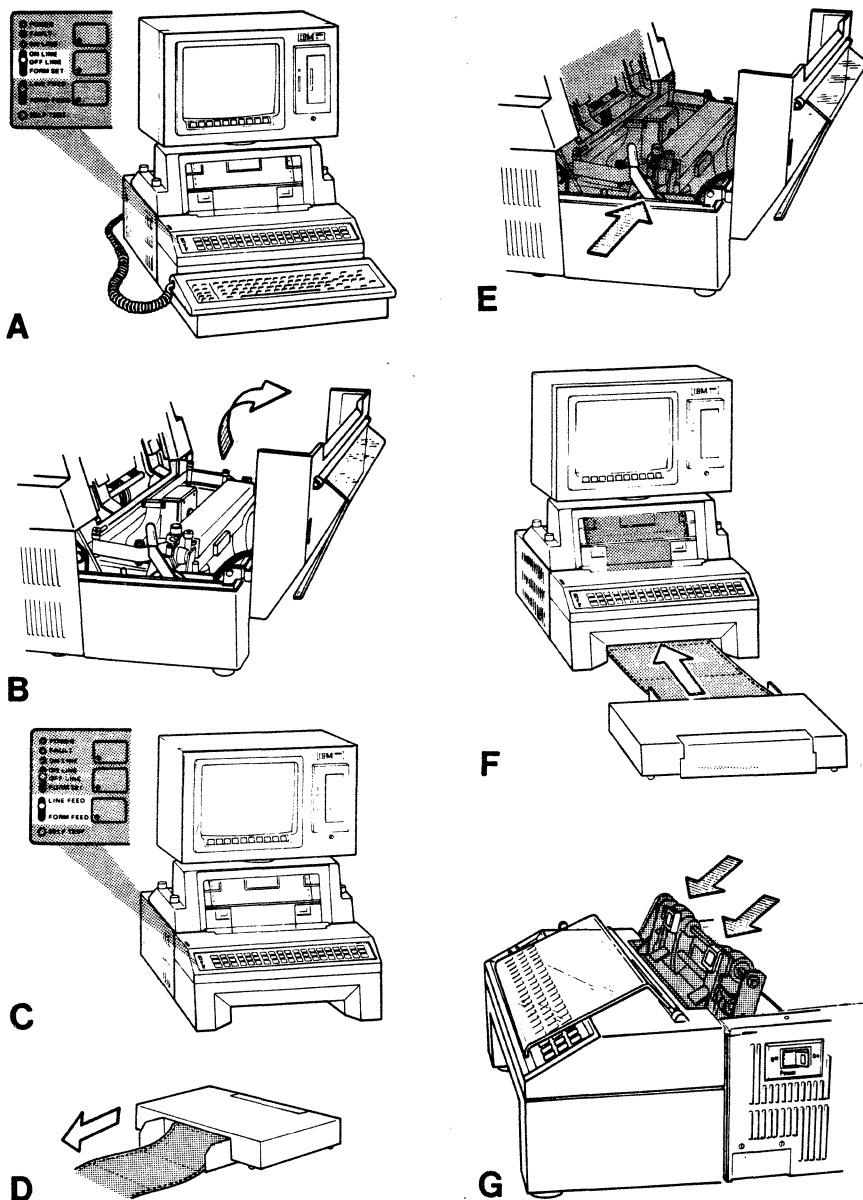


Figure 2-7. Loading Paper in the Printer/Plotter

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13. Place the holes in the paper over the pins, ensuring that the paper is straight.
14. Close the tractor covers.
15. Use the LINEFEED switch to position the top of form where desired.
16. Set the ONLINE/OFFLINE/FORMSET switch to the FORMSET position.
17. Use the LF/FF switch on the front cover to advance the paper up or down in small increments to set forms. The paper must be adjusted at least one increment to set forms.
18. The paper is now loaded and positioned for use. Replace the printer/plotter cover and push the paper tray back into position.
19. Set the ONLINE/OFFLINE/FORMSET switch to ONLINE to resume printing.

### Loading Single Sheets Into The Printer/Plotter

A similar procedure is used to load forms into the printer/plotter. Refer to Figure 2-6 and follow these steps:

1. Move the ONLINE/OFFLINE/FORMSET switch on the front panel to the OFFLINE position.
2. Pull the paper tray away from the processor unit to expose the front of the printer/plotter and the paper chute.
3. Position the FORMFEED/SHEETFEED lever located on the left end of the printer/plotter toward the rear (SHEETFEED position).
4. Center a single sheet of paper in the throat of the paper chute and push forward. The printer/plotter will take hold of the paper and automatically index it until it reaches the first print line.
5. Use the LINEFEED switch to move the paper up if necessary.

### RIBBON REPLACEMENT

Ribbon for the printer/plotter is supplied in a snap-in cartridge that makes replacement clean and easy. For best results, use only IBM Instruments ribbon cartridges. To remove used cartridges and insert new ones refer to Figures 2-7 and 2-8 and follow these steps:

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1. Position the ONLINE/OFFLINE/FORMSET switch on the front panel to the OFFLINE position.
2. Lift the printer/plotter cover from the back and rotate it forward on its hinges, exposing the printer/plotter.

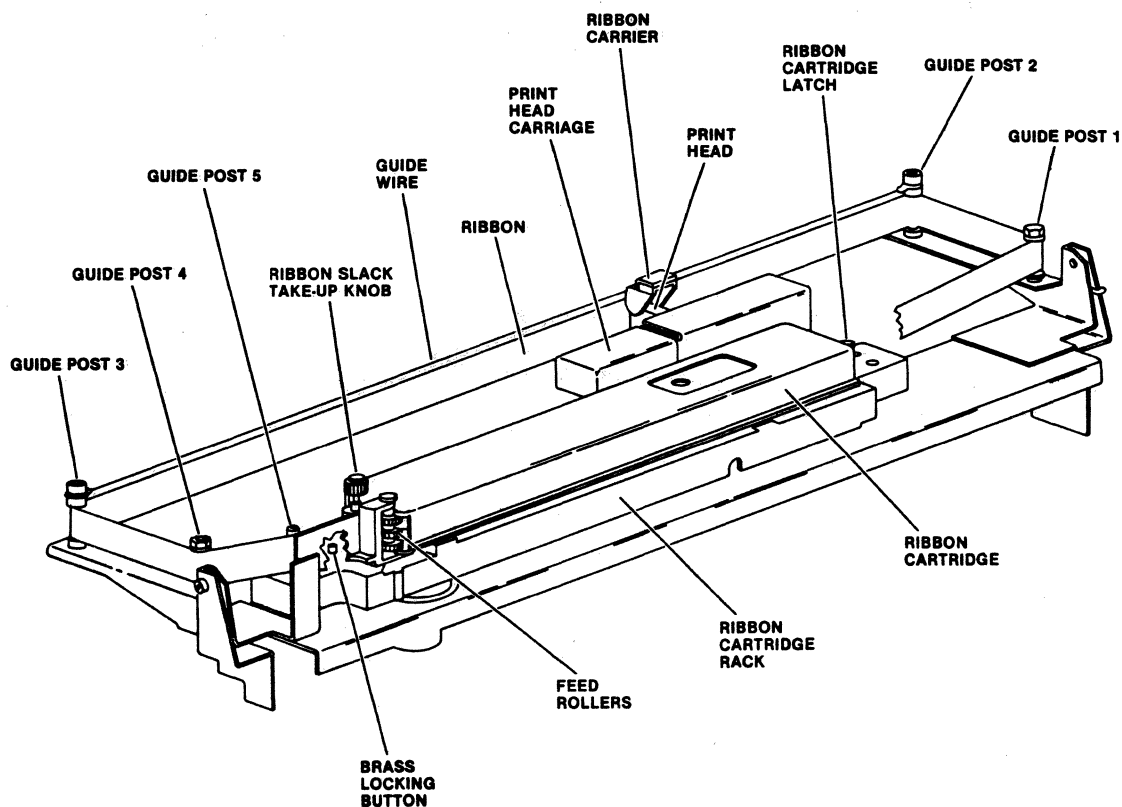


Figure 2-8. Ribbon Replacement

3. Open the feed rollers by pulling them forward until they latch out.
4. Slide the print head mechanism to the middle of the writing line.

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5. Push down on the spring-loaded lever (the Ribbon Cartridge Latch) near the right side of the ribbon cartridge. This will release the cartridge.
6. Slide the cartridge to the right about an inch.
7. Remove the ribbon from the ribbon guide on the print head. Lift the ribbon off the corner guides and discard the ribbon cartridge.
8. Remove a new ribbon cartridge from its package. Discard the cardboard insert from the end of the cartridge.
9. Pull four inches of ribbon from the right end of the cartridge.
10. Position the cartridge on the cartridge rack about one inch to the right of the feed rollers its final position. (The rack has small runners and the cartridge itself has ridges in the bottom.) Insert the ribbon from the left end of the cartridge between the feed rollers but not around any of the other ribbon posts at this time.
11. Press the cartridge down on the rack and slide it to the left until it snaps into position. Pull up slightly on the cartridge to ensure that it is locked in place.
12. Now, working from the right to the left, bring the ribbon around guide posts 1 and 2, between the nylon ribbon carrier and the print head hooks (and under the hooks), and finally around guide posts 3, 4, and 5.
13. Move the feed rollers toward the front of the printer/plotter. Press down the small brass locking button on the left side of the cartridge rack. This allows the front and rear feed rollers to engage.
14. Use the blue knob on the ribbon cartridge to take up any slack in the ribbon.
15. The new ribbon cartridge is now ready for use. Replace the printer/plotter cover, set the ONLINE/OFFLINE/FORMSET switch on the front panel to online to continue operation.

## 2.7 I/O INTERFACES

The IBM Instruments Computer System has several I/O interfaces that can be used to connect a variety of devices. The locations of these interfaces are shown in Figure 2-9.

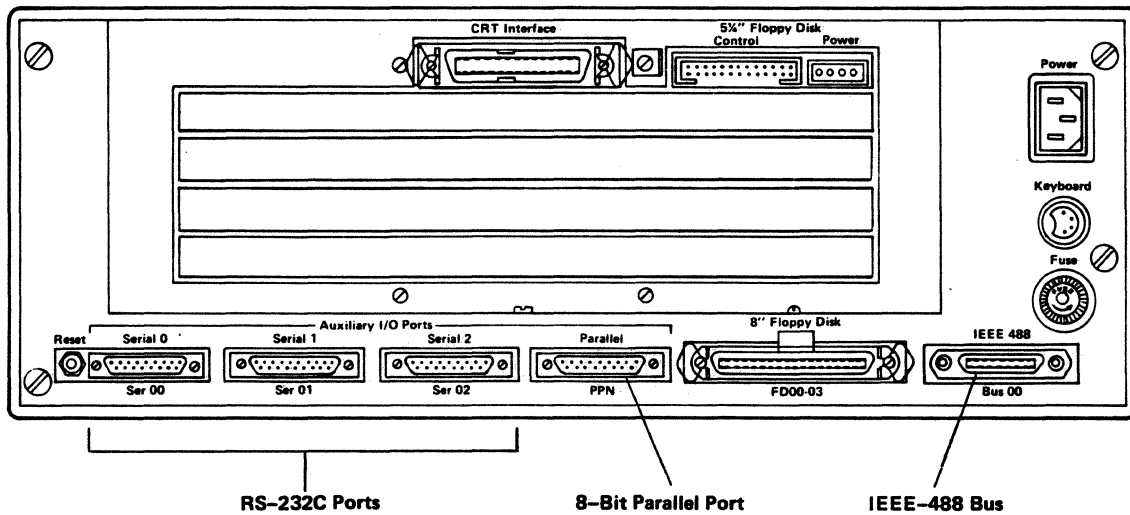


Figure 2-9. I/O Interfaces

### RS-232C PORTS

The RS-232C ports are used when serial communication is required between the Computer System and a terminal, a modem, another computer host, or other instruments.

These RS-232C ports permit the Computer System to send control characters to and receive data from other devices that have a serial ASCII interface. They also permit the Computer System to be used as a terminal on other communication or computer systems. The ports are operated by using the communication software of the Computer System.



### **EIGHT-BIT PARALLEL PORT**

The eight-bit parallel port is designed to transfer byte-wide (8 bits in parallel) data between the Computer System and similar ports on other user devices such as printers, punches, photocopiers, or plotters. This port is operated by using the parallel I/O software interface provided with the Computer System.

### **IEEE-488 BUS**

The IEEE-488 bus is used to attach one or more user devices operating with the IEEE-488 interface. Up to fourteen devices can be sequentially connected along the bus cable. The Computer System may act as the controller, talker, or listener. This bus is operated by using the GPIB software utility provided with the Computer System. No hardware selection is required in the connector.

For information about programming these interfaces, refer to Computer System Operating System Reference Part 2, GC22-9200.

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Component Operation 2-22

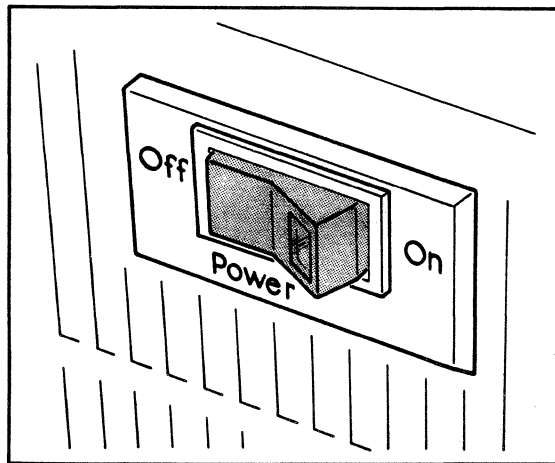
### 3.0 GETTING STARTED

This section is for first-time users of the Computer System. It is intended to make you familiar with some of the operations and commands of the system. It presumes that your system is equipped with a keyboard, a printer/plotter, and some diskette capability. The example of creating a program presumes that you have the BASIC language interpreter and the operating system extensions. Follow the steps outlined below and check the responses you receive against those shown.

#### 3.1 POWERING-ON AND LOADING A DISKETTE

(NOTE: Your system should be assembled as described in the Computer System Setup Instructions, GC22-9193, and it should be plugged into a wall outlet.

1. The (red) Power switch is located on the right hand side of the processor unit. Turn the switch on.



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The Power switch should light and the system should show some signs of life:

- The keypad LEDs (at the left of the keypad) should light.
- The fans on the left-hand side of the unit should come on.
- If your system is equipped with a printer/plotter, the printer/plotter should do a carriage return (a quick movement to the left-hand margin)

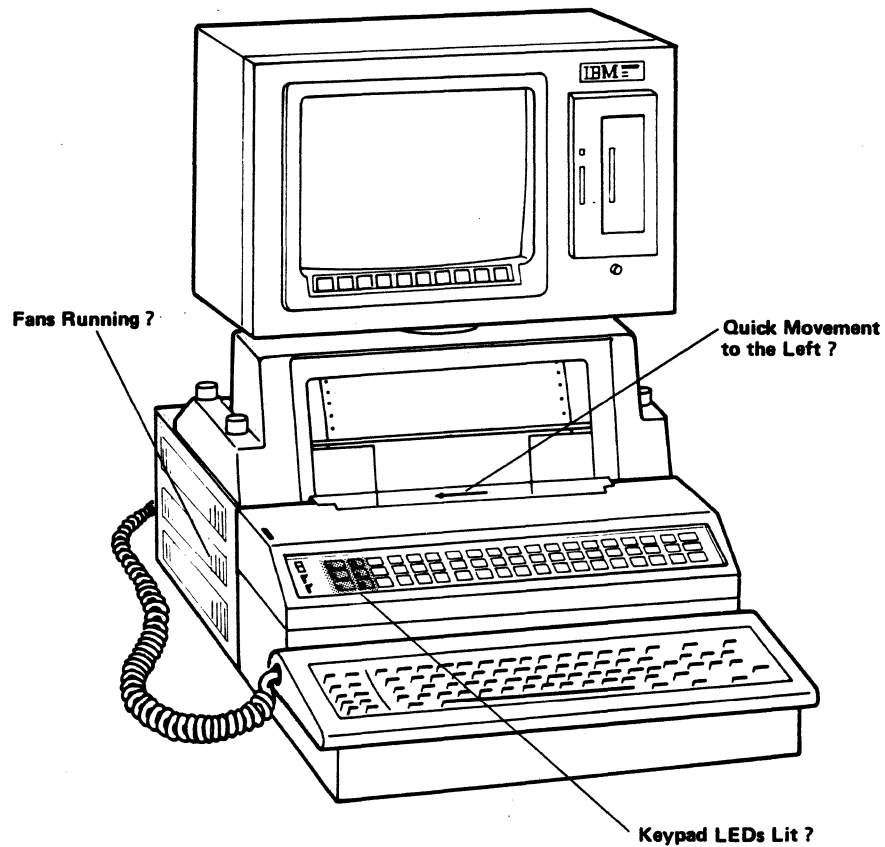


Figure 3-1. Computer System Startup.

(If none of the things above happen, refer to the Computer System Problem Isolation Manual GC22-9192, for help.)

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2. To load diskettes into a diskette drive unit:
  - a. Identify which diskette drive is the primary diskette drive (drive 0). If you have a 5 1/4-inch diskette in the CRT housing, it will be drive 2. All other diskette drives should be labeled when they are attached.
  - b. Open the diskette door by lifting the flap (5 1/4") or by pressing the diskette door latch (8").
  - c. Remove the cardboard insert (if present) from the diskette slot and close the door again.
  - d. If you have a diskette unit in the CRT housing, it's drive motor is only turning when its light is lit. If you have an 8-inch diskette drive in a separate cabinet you must power on the unit(s); the power switch is located at the rear of the unit.

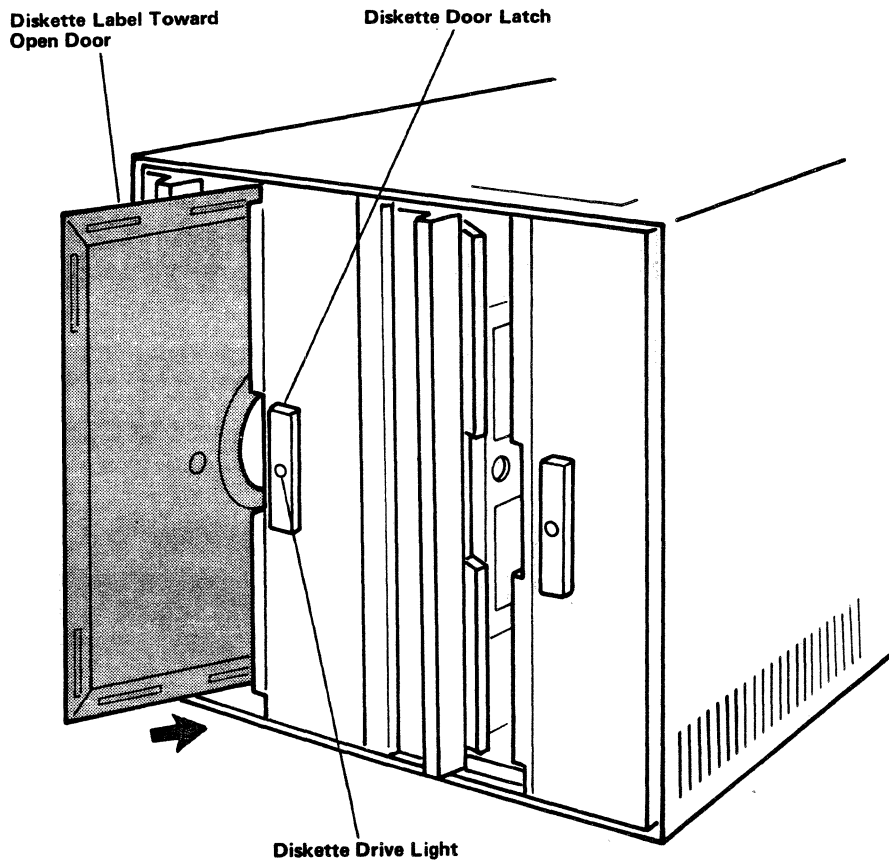
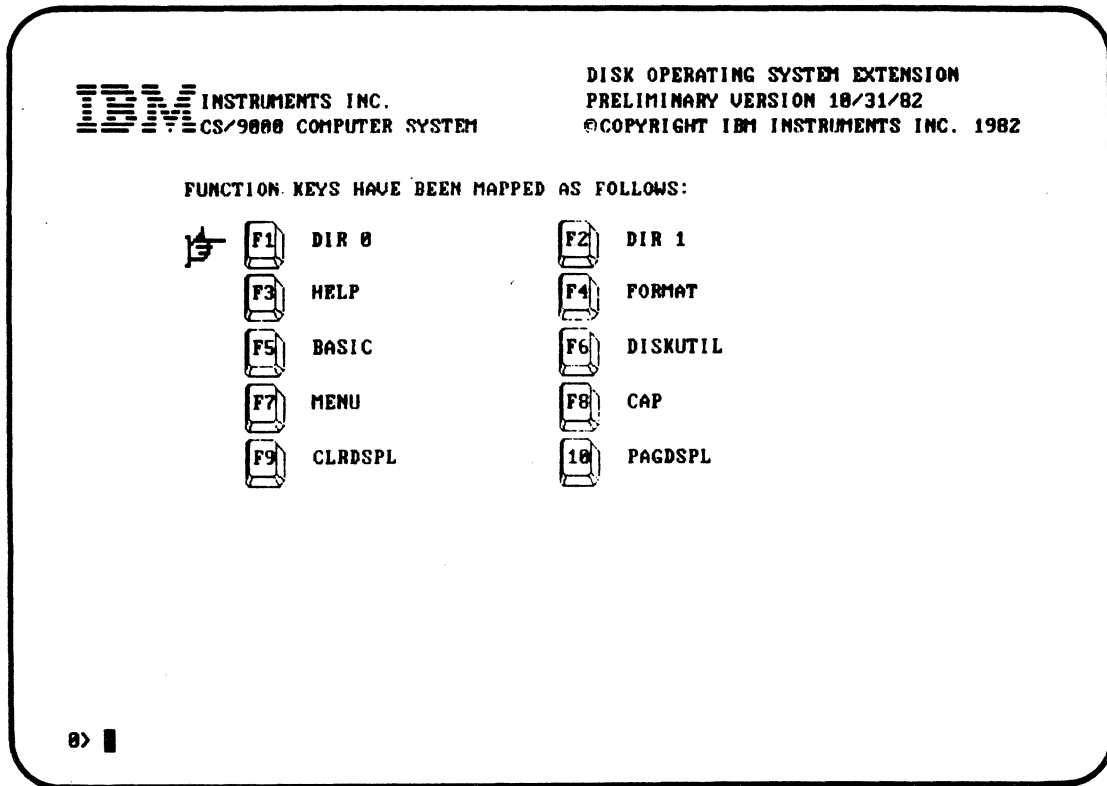


Figure 3-2. Inserting a Diskette

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3. Open the drive 0 diskette unit door again and insert a the Operating System Extensions diskette into the diskette slot. The label on the side of the diskette should be facing the open door. Slide the door closed.
4. Type the command: MENU.

The Computer System power-on menu should appear on the screen; it looks like this:



The 0> at the bottom left-hand corner is the command entry prompt. This is where you should type your system commands.

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5. Type the command: FORMAT

The Computer System will respond with the following screen display:

CS/9000 FORMAT 1.0 10/31/82 COPYRIGHT 1982 IBM INSTRUMENTS, INC.

WARNING: THIS PROGRAM DESTROYS DISKETTE CONTENTS

A CARRIAGE RETURN MAY BE ENTERED  
WHERE DEFAULT VALUES ARE SPECIFIED

PROGRAM FUNCTIONS

- (1) FORMAT/INIT: FORMAT DISKETTE IN GIVEN  
DENSITY AND SECTOR SIZE,  
THEN INITIALIZE SECTORS
- (2) INIT: INITIALIZE SECTORS TO ZERO  
AND LINK FREE SECTORS

(Q) END PROGRAM

ENTER CHOICE (DEFAULT=1): \_

15:11:23



6. For our example, the default will do nicely, so just press the carriage return key. The system will respond by clearing the screen of everything but the warning and:

ENTER DRIVE NAME: #FDO\_

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---

7. Remove the Operating System Extensions diskette from drive 0. Insert a fresh, double density diskette in drive 0, close the door and then,
8. Enter 0.

The line will now read: ENTER DRIVE NAME: #FD00. The system will also respond by printing the following choices for a 5.25-inch diskette:

FORMAT 5.25" DISKETTE TYPE:

- (1) DISKETTE 2D - SECTOR SIZE 256
  - (2) DISKETTE 1D - SECTOR SIZE 256
- ENTER FORMAT TYPE (DEFAULT=1): \_

or choices for an 8-inch diskette:

FORMAT 8" DISKETTE TYPE:

- (1) DISKETTE 2D - SECTOR SIZE 256
  - (2) DISKETTE 1 - SECTOR SIZE 256
  - (3) DISKETTE 2 - SECTOR SIZE 256
- ENTER FORMAT TYPE (DEFAULT=1): \_

The default format is "2D". The 2 refers to the number of sides per diskette and the "D" means double density. Choices with a number alone are single density.

9. Choose the default by pressing the carriage return key.

The system will add the line:

ENTER VOLUME IDENTIFIER:

10. Enter TST as the volume identifier and then press the carriage return key. The system will respond with:

ENTER SECTOR SEQUENCE NUMBER:

11. For our example, choose 13 as the sector sequence number. The system will respond:

OK TO FORMAT #FD00 (Y OR N) ? \_

12. Type Y.

The system will begin to format the diskette in drive 0 (#FD00).



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This will take a few minutes and a running "count" will be displayed while formatting is in progress. Then the following message will be displayed:

FORMAT COMPLETE

You are now ready to work with the formatted diskette. We will begin by creating a file on the diskette with the Computer System's line editor.

### 3.2 CREATING A FILE WITH THE EDITOR

To work with the editor, do the following:

1. Type the command: EDIT

The system will respond with the message:

FILE TO BE EDITED:

2. Type: FIRSTFIL.TXT

The system will respond with the message:

CREATE A NEW FILE?

It does this in case you meant to edit an existing file and made a typing error. In this case, however, you really want to create a new file, so...

3. Type: Y

The editor will respond with > and will create a file for you to work with.

4. Type the editor command: I (followed by carriage return)

This is the "Insert" command; it will position you at the top of the file and allow you to enter data.

5. Begin by typing the line: NOW IS THE TIME and then pressing the carriage return key (left-pointing arrow). This will become line #1 of your file.

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For all of the steps below, when you enter a command, you must press the carriage return key for the command to take effect.

6. Now type:

```
FOR ALL GOOD MEN (carriage return)
TO COME TO THE (carriage return)
AID OF THEIR COUNTRY (carriage return)
```

7. Follow this entry by pressing the ESC key and then the carriage return key. This will put you back into the editor command mode. Now try listing your newly created, four-line file...

8. Type the editor command: L

This will "list" or display your file on the CRT, like this

```
NOW IS THE TIME
FOR ALL GOOD MEN
TO COME TO THE
AID OF THEIR COUNTRY
```

9. Type the editor command: T

This will position you at the top of the file.

10. Now type the editor command: C / THE / XXX /G

Be sure to include the blanks.

The editor will change the word "THE" (in upper case) to "XXX" every place that it finds it in your file. You can check this now...

11. Type the editor command: L

The editor should list your file as follows:

```
NOW IS XXX TIME
FOR ALL GOOD MEN
TO COME TO THE
AID OF THEIR COUNTRY
```

First, notice that although "THE" was changed in line #1, it was not changed in line #3. This is because in line #3, "THE" is preceded by

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a blank, but it is followed not by a blank, but by a carriage return character. Now, check the word "THEIR". It should not have changed. If it changed to "XXXIR", it is because you did not leave blanks before and after the word THE in your change command; try again.

12. Now try moving a few lines around. Enter the editor command: TOP

This will put you at the top of your file again. The line NOW IS THE TIME should be displayed.

13. Type the editor command: MF

This will mark the first line as the place to begin moving.

14. Now go down to line four by typing the editor command: N 3

The line TO COME TO XXX should be displayed.

15. Type the editor command: MT

This will mark line four as the place to move data to. (Data will be moved to before this line.)

16. Now the actual move takes place. Type the editor command: ML 2

The editor will move two lines, beginning at line one, to a position just before line four.

17. Type the editor command: L

The editor should display the new order of your file like this:

```
TO COME TO XXX
NOW IS XXX TIME
FOR ALL GOOD MEN
AID OF THEIR COUNTRY
```

If your display does not look like this, reread the steps above to make sure that all the spaces and numbers are correct.

You may wish to try other editor commands at this point. You will find them described in the Computer System Operating System Reference Manual, Part 1. GC22-9199.

18. To finish editing, type: ZIP

This will return you to the operating system.

### 3.3 CREATING A PROGRAM WITH BASIC AND RUNNING IT

This section will show you how to create a simple program with the BASIC language editor, store it and then run it under the control of the Computer System's operating system.

1. Insert a diskette with BASIC into disk drive 0.
2. Then, you must enter BASIC. To do this, press function key F5. (Or, if you wish, you may type BASIC on the command entry line.)

The system will call BASIC for you and you will see the response:

```
COMPUTER SYSTEM BASIC INTERPRETER
© COPYRIGHT 1982 IBM INSTRUMENTS, INC.
```

```
READY
```

```
-
```

3. Now type: NEW COUNT

This command clears a work area for you and creates a BASIC file called "COUNT".

4. Type the following lines:

```
10 FOR I = 1 to 100      (carriage return)
20 PRINT I;             (carriage return)
30 NEXT I               (carriage return)
40 END                  (carriage return)
```

This is a simple BASIC program that will type numbers from 1 to 100 on the CRT screen when it is called.

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5. Next you must store the program so that you can run it later. Do this by typing: SAVE.

The file will be saved as filename COUNT.BAS. The "BAS" stands for **B**Asic **S**ource.

6. Now type the command LIST.

Your newly created file will be displayed on the screen.

Now that you have created a BASIC file and have stored it and listed it, you can run the file.

7. Type the command RUN COUNT.

You should see the numbers from 1 to 100 displayed on your CRT screen.

8. Now you can exit the BASIC interpreter. Type the command: BYE.

The BASIC interpreter will respond:

CONFIRM: \_

9. Type the letter: Y

This will confirm that you really do mean to exit the BASIC interpreter.

### 3.4 ISSUING A FEW SYSTEM COMMANDS

Now that you have returned to the Computer System's command mode, you may wish to try a few system commands.

1. Type the system command: DIR

The system will display the files that you have stored on diskette drive 0, since that is the default for the DIR command. You should see both FIRSTFIL.TXT and COUNT.BAS listed along with their

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locations, the time and date of creation (or in the case of FIRSTFIL, update) and other information.

2. Now you can check the time. Type the system command: TIME

The date and time should be displayed as follows:

```
dwk dm mon yr hh:mm:ss
```

(dwk is the day of the week, dm is the day of the month, mon is the month, and yr is the last two digits of the current year. hh:mm:ss is the hour, minutes, and seconds.) For example, at noon on Christmas day, you might see:

```
SAT 25 DEC 82 12:00:00
```

3. If the time that was displayed was all zeroes, you will have to set the time. To do this, type the system command:

```
TIME= dwk dm mon yr hh:mm:ss
```

(This time, you supply the correct time and date; the system will use that time and date to begin its timekeeping.)

You may wish to try other system commands. They are all described in Chapter 5 of this manual.

The jobs described in this section are representative of the sort that you may be asked to perform regularly. This manual and the other publications for the Computer System should provide you with all of the information that you will need. Good luck!

## 4.0 WORKING WITH FILES

The Computer System stores information in files on hard disk or diskette. Files are nameable and addressable by the operating system. The naming conventions and a "wild card" feature, as well as the way files are stored on disk-type media, provide flexibility. In addition, the manner in which you can retrieve files from storage (for execution if they are programs), list files and perform file maintenance, and transfer files or data within them simplifies file management. This chapter describes how to access files or manipulate data in files. For details on how files are stored, refer to the Computer System Operating System Reference, Part 1, GC22-9199.

### 4.1 FILE NAMES

Computer System files are identified in two parts: a name and an extension. The name can be a string of up to 8 alphanumeric characters with up to 3 alphanumeric characters for the extension, but the first character of each must be an alpha character. The name is separated from its extension by a period. Careful naming can greatly simplify information retrieval, especially in combination with the "WILD CARD" feature described below. It is recommended that the following pre-defined extensions are used.

- TXT for text files
- REL for relocatable object files
- LNK for link edited files
- BIN for binary files
- HEX for hexadecimal files
- TMP for temporary editor files
- SYS for system files
- MAC for macro library files
- ASM for assembly files
- PAS for PASCAL files
- BAK for back up files
- BAS for BASIC files
- BAC for compiled BASIC files
- LIB for library files

## SPECIFYING FILES

Files are specified by identifying the disk drive number, filename, and extension. Specify the drive number as a decimal digit followed by a colon (:). The following are examples of unique files:

0:INPUT.TXT    1:INPUT.TXT    1:INPUT.HEX    0:INPUT2.TXT

The system maintains a default drive. If a file is on the default drive, the drive number and colon may be omitted from the file specification. Normally, the default drive is zero. Therefore, the following file identifications are identical:

0:PGM2.BIN    PGM2.BIN

(Using the SET command, you may designate another default drive. Any drive in the system may become the default drive.)

The following examples illustrate valid filenames and types:

INPUT.TXT    MYFILE.BAK    H1.HEX    PGM1.BAS

Note that only alphanumeric characters appear in filenames or extensions. The following are invalid filenames:

1:PGMR1FILE.HEX    (name more than 8 characters)  
2:TEMP.FILE    (extension more than 3 characters)  
0 TEST.TMP    (colon missing after drive number)  
STBL+.BIN    (+ is a non-alphanumeric character)

## 4.2 THE "WILD CARD" FEATURE

The Computer System's "wild card" feature allows you to list, access, modify, or delete whole classes of files in one operation. Two wild card characters, the asterisk and the question mark, perform unique identification tasks.



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The asterisk (\*) serves as a substitute for an entire string of characters of any length. Since a complete filename consists of two strings, a name and an extension, the wild card filename \*.\* can be used to express all possible filenames of all possible extensions. The wild card filename \*.HEX expresses all filenames with the type HEX.

The second wild card character is the question mark (?). This character serves as a substitute for any single character, including a blank. For example, the filename TEST?.HEX is equivalent to TEST.HEX or TESTP.HEX or TEST2.HEX, but it is not equivalent to TESTING.HEX. The filename \*.\* is equivalent to ???????.???

The wild card asterisk (\*) can also be used to match the remainder of any string. If used in other than the first position of a string, it is equivalent to a number of (?) characters sufficient to fill out the string (up to 8 for filenames, up to 3 for extensions). For example, the following wild card file specifications match all files on the default drive whose names begin with the letters "WILD" and whose types begins with the letter "T."

WILD\*.T\*      WILD????.T\*      WILD????.T??

A practical application of this feature is when more than one user is sharing a disk or diskette. If users agree that the first two characters in their filenames will be their initials, the DIR command can be used to find all files belonging to one user (DIR IN\*.\*, where IN are a user's initials). Similarly, file names with device identifiers as part of the name can be used with DIR to find all files related to a specific device.

### 4.3 FILE PROTECTION

In addition to diskettes being protected by a notch on the edge, files on diskettes are protected by the Computer System with access codes. These access codes define whether files can be renamed or deleted by the operator. The access codes are:

00    can be renamed or deleted  
01    can be renamed but not deleted  
02    cannot be renamed or deleted

These access codes offer varying levels of protection to the files. A "02" access code means that the file is unchangeable until its access code

is changed. A "01" access code means that copies of a file can exist under different names, but these files cannot be deleted from the system. A "00" access code indicates that a file is free to be deleted. Such a file can be removed from storage by the DELETE command. (Refer to Chapter 5 for a description of this command.)

#### 4.4 ACCESSING FILES

Files can contain user data or user application programs. Data in these files may be created by application programs or by system users, or it may already be present on diskettes loaded into the diskette drives.

A binary file may be executed directly by using its full file specification as a system command. For example, if diskette drive number 1 has a program file on it called PGM.BIN, the program may be run with the command:

1:PGM.BIN or 1:PGM

The Computer System recognizes the 1 as a reference to diskette drive number one. It then loads the file into memory and begins to execute it if it has been properly prepared. Proper preparation is discussed in the Computer System Operating System Reference Manual, Part 1, GC22-9199.)

Parameters required by user programs may be entered on the same line as the command. A space, comma, or other non-alphanumeric delimiter must separate the parameters from the file specification. For example, the command:

1:EDITOR.BIN,INPUT.TXT,1:OUTPUT.TXT

invokes the EDITOR program from drive 1 and specifies the input and output files to be used.

#### 4.5 LISTING FILES

The Computer System keeps track of all files in its storage. The DIR command can be used to list the names of all the files, their extensions,

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addresses, and other file-related information. (Refer to Chapter 5 for a full description of this command.) Figure 4-1 illustrates a sample of output from the DIR command.

DIRECTORY OF DRIVE 0 VOLUME = RAMPV3										
NAME		T	A	FS	LS	NS		TIME		
DIR	.DIR	05	07	0004	0014	00017	03	DEC	82	01:13:19
LINK	.DIR	01	00	0015	0043	00047	03	DEC	82	01:16:23
LIB	.BIN	01	00	0044	0057	00020	03	DEC	82	01:16:26
XREF	.BIN	01	00	0058	0062	00011	03	DEC	82	01:16:29
TIMSET	.BIN	01	00	0063	0067	00005	03	DEC	82	01:16:31
HELP	.BIN	01	00	0068	006F	00008	03	DEC	82	01:16:33
00108 SECTORS USED										

Figure 4-1. Sample Output from the DIR Command

## 4.6 TRANSFERRING FILES

The Computer System provides the ability to copy and transfer data simply. This is done with the COPY and DISKCOPY commands. (Refer to Chapter 5 for a description of these commands and their syntax.)

Using the COPY or DISKCOPY commands, you can:

- Perform a total diskette-to-diskette copy
- Copy selected files from one diskette to another
- Transfer data between two different I/O units
- Create text files

## DISKETTE-TO-DISKETTE COPY

One aspect of file maintenance is the periodic copying of files from one diskette to another backup diskette. This minimizes the possible loss of important data. These operations should be done at regular intervals.

The command for a diskette-to-diskette copy with DISKCOPY, is as follows:

```
DISKCOPY source, destination
```

This copies the contents of the source drive exactly (sector-for-sector including empty sectors) onto the destination diskette. DISKCOPY prompts and waits, providing an opportunity to save the contents of the destination diskette. For example

```
DISKCOPY #FD00,#FD01
```

```
COPY FROM DRIVE #FD00 TO DRIVE #FD01 ?
```

will make the diskette in drive 1 an exact copy of the diskette in drive 0.

## COPY SELECTED FILES

A selected file can be copied to another disk or diskette with the following command

```
COPY source,destination
```

where source and destination are both file specifications. The command:

```
COPY VOL1:*.BIN,VOL2:*.BIN
```

copies all files on VOL1 that have the extension BIN onto VOL2.

## SEQUENTIAL COPY TO DISKETTE

It may be necessary, from time to time, to delete unneeded files. Also system efficiency is enhanced if the diskette is copied so that the remaining files are contiguous.

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The following command will copy all files from the diskette with the volume identifier 'VOL1' to the diskette with the volume identifier 'VOL2' and eliminate empty files.

```
COPY VOL1:*.*,VOL2:*.*
```

This operation is most useful when it becomes necessary to "clean up" diskette storage. Using the wild card filename.type will copy the files as sequentially as possible onto the new disk. Only the specified sectors are copied, not the entire disk. Also, this form prompts you as each file is copied, allowing selective copying.

### TRANSFERRING DATA BETWEEN I/O UNITS

COPY can transfer data between devices. For example, the following command can be used to view (transfer to console) the contents of a file:

```
COPY VOLUME:FILENAME.EXT,#SCRNO
```

This assumes that the file is a text file (type 03), so that the contents may be read.

Similarly, the contents of a text file could be printed using COPY.

```
COPY VOLUME:FILENAME.EXT,#PR
```

### CREATE TEXT FILES

COPY can be used to create text files with the command

```
COPY #CON,VOLUME:FILENAME.EXT
```

This transfers data typed at the console to the volume identifier and filename specified. The END-OF-FILE character (control-D on the keyboard, hex 04) is used to end the file.

### TRANSFER DATA

COPY can be used to transfer data from device to device as follows:

```
COPY #CON,#PR      (print data being typed at the console)
COPY #CON,#SER00   (send to "TTY" device data being typed at console)
```

and many other combinations.

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## 5.0 COMPUTER SYSTEM COMMANDS

The Computer System's control commands allow you to perform many different functions, such as:

- Listing the contents of diskette storage
- Entering and modifying system parameters
- Controlling input and output operations with the various I/O devices attached to the Computer System
- Starting and stopping tasks
- Manipulating files on diskette storage
- Setting the time and date

System commands can be loosely divided into two types:

1. Commands that are used to prepare the Computer System for operation or for application programming.
2. Commands that are commonly used during the operation of the system.

This chapter describes only those commands that are commonly used during normal operation. All commands are described in the Computer System Operating System Reference Manual, Part 1, GC22-9199.

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A list of the system commands follows:

COMMAND NAME -----	USED TO -----	WHERE DESCRIBED -----
ATCHDEV	Attach a device driver	GC22-9199
CLRDSPL	Clear a page of graphics memory	GC22-9199
COPY	Transfer data between files	Here
DISKCOPY	Copy one diskette to another	Here
DISKUTIL	Examine the contents of diskette sectors	GC22-9199
DELETE	Remove a file from storage	Here
DIR	List all files on a disk	Here
FORMAT	Format and initialize a diskette	Here
HELP	List available OS commands	GC22-9199
JUMP	Go to any absolute storage address	GC22-9199
KILL	Remove tasks from the system	Here
LISTDEV	List the current device assignments	
LOAD	Load an operating system	Here
PAGDSPL	Reverse pages in graphics memory	GC22-9199
PRIORITY	Change task priority	Here
RENAME	Rename a file	Here
RESUME	Replace a task on ready queue	Here
RUN	Start a task from console	Here
SAVE	Save any area of memory as a binary file	GC22-9199
SECURE	Change access code of a file	Here
SET	Control console and printer	GC22-9199
SHOW	Display logical units for a task	Here
SUBMIT	Execute a command file	Here
SUSPEND	Temporarily stop a task	Here
TASKS	Display current tasks	Here
TIME	Display or set time	Here

### 5.1 SYSTEM COMMANDS

Computer System control commands consist of a command name and optional parameters. Some commands reside in processor storage and will execute



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---

immediately; others are stored on diskette and are loaded before they are executed. To execute a system command, enter the full name with any operands. Some commands will "prompt" you for further data before they complete executing. 0> is used as the prompt. Your response should be entered after it.

Some commands require numeric data as input. Numeric values can be in either decimal or hexadecimal notation. If hexadecimal notation is used, values must be preceded by a dollar sign (\$).

The Computer System also supports user-written commands. Full command names must be entered. The files for these commands must be binary type (type 01) with transfer addresses. For details about writing commands, refer to the Computer System Operating System Reference, GC22-9191.

### 5.2 SYSTEM STARTUP (WITH DISK-BASED SYSTEMS)

When you start the operating system by powering on (or by restarting), the DOS command processor is automatically invoked. The command processor searches for a file named AUTOEXEC.SUB. This filename is special because it refers to a submit file containing one or more DOS commands that are automatically executed whenever the system is started. The AUTOEXEC.SUB file can be changed using the editor so you can cause programs or commands to be executed immediately, every time the system is started. (See the SUBMIT command description.)

### 5.3 STOPPING AND "WARM STARTING" THE SYSTEM

There may be times when the system should be restarted without reading a new copy of the operating system from diskette. For example, a device may not be working, or you may have entered the wrong command.

Holding the Ctrl key down and typing C will stop the system task. Any tasks that you have started will not be affected by the use of Control-C and will run normally after the system is restarted as described below. (To cancel these tasks, use the KILL or SUSPEND commands, as described later in this chapter.)

Typing Ctrl-Alt-Del simultaneously will cause the system to restart. (Hold down the Ctrl and ALT keys and press DEL.) This closes any open files,

cancels any pending I/O, stops command files from executing, prints the start-up logo, and prepares the Computer System for new commands. This "warm" start does not effect system parameters, time values, or device assignments.

#### 5.4 COMMAND SYNTAX

The commands used to control the Computer System are listed alphabetically below. Items enclosed within < > must be specified. Items within square brackets [ ] are optional.

## COPY COMMAND

The COPY command transfers data from one file to another, between a file and a device, or between two devices. No data conversion is performed.

Command      Operands

---

**COPY**      source, destination[;options]

---

## OPERANDS

Source and destination may be filespec, device, or both.

filespec      may include a volume identifier, (if not specified, the default volume identifier is used), a filename and a file extension (for example, VOL1:INFILE.SRC)

device        specifies the name of the device (for example, #TTY)

options      C for file compare and V for file verify

## EXAMPLES

### Copy between two files

Specify the filenames of the source and destination. The volume identifier may be omitted (the default will be used). The asterisk wild card character may be used in place of a filename, an extension, or within fields. For example,

```
COPY VOL1:*.BIN,VOL2:*.BIN
```

copies all files with a BIN extension from VOL1 to VOL2.

### Copy between a file and a device

In this example, ASCII characters are transferred between a file and a device (or between two devices). No data is saved on diskette when it is transferred between devices. For example,

```
VOL1:SAMPLE.SRC,#PR00
```

copies the text file SAMPLE.SRC to the printer #PR00.

## DISKCOPY COMMAND

The DISKCOPY command copies one diskette (source) logical to another diskette (destination). This is a sector copy beginning with sector #1 and copying through the total number of sectors per diskette. Both source and destination diskette must be of the same format.

Command	Operands
---------	----------

---

DISKCOPY	source, destination
----------	---------------------

---

source	must be the device name of the diskette drive from which data is to be copied. (For example, #FD00.)
--------	--

destination	must be the device name of the diskette to which the data is to be copied. (For example, #FD01.) If the destination field is omitted, a one drive copy is performed with prompting to change from source to destination diskette.
-------------	---

## DELETE COMMAND

The DELETE command is used to remove a file from diskette storage. Categories of files can be deleted by simply be specifying wild card characters in filenames. (Refer to Section 4.2 of this manual.)

The DELETE command will prompt you when the named file is found. A YES response ensures the operating system that this is, in fact, the file to be deleted. The YES can be abbreviated to Y; any other input is interpreted as a NO. The format of the DELETE command is:

Command	Operands
---------	----------

---

DELETE	[drive:] filename.type
--------	------------------------

---

### OPERANDS

drive number: specifies the diskette drive. The default is drive 0 if omitted.

filename.type: specifies a valid filename and type. The filename and type fields may contain wild card characters.

### Examples

To delete the file MYFILE.TMP, enter:

```
DELETE MYFILE.TMP
```

The Computer System responds with:

```
DELETE-0:MYFILE.TMP ? 0>
```

If you enter YES after the prompt character, the file is deleted, and the screen looks like this:

```
DELETE-0:MYFILE.TMP ? 0>YES
```

If you enter a similar command with a wild card filename (but not type) the result is:

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---

DELETE \*.TMP

The Computer System would respond with:

DELETE-0:MYFILE.TMP ? 0>

If you respond NO after the prompt character, the screen looks like this and the file is not deleted:

DELETE-0:MYFILE.TMP ? 0>NO

If several matches exist--due to the use of a wild card character in the filename--each will be prompted in turn, and any of the matches can then be removed. If, for example, drive 1 contains three TXT files named TEST1, TEST2 and TEST3 the following commands and system responses could be issued:

DELETE 1:TEST?.TXT

DELETE-1:TEST1.TXT ? 0>NO

DELETE-1:TEST2.TXT ? 0>YES

DELETE-1:TEST3.TXT ? 0>YES

In the example above, Line 1 is the DELETE command as entered with the "?" wild card character. Line 2 is the system's echo of the command with TEST1.TXT and the "0>" prompt and a user response of "NO". Lines 3 and 4 are the system's echo of the command with TEST2.TXT and TEST3.TXT, the prompt, and the user response "YES".

This series of commands and responses would remove the files TEST2.TXT and TEST3.TXT without removing TEST1.TXT.

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**DIR COMMAND**

The DIR command is used to provide a directory listing of the files on a specified diskette. The Computer System prints the the listing on the CRT display unless you specify that it go to the printer.

The directory listing displays information about the records on the diskette in the following format:

---

NAME	T	A	FS	LS	SC	TIME/DATE
						V
					V	Time of creation/update
				V		Sector Count
			V			Last Sector Location
		V				First Sector Location
	V					Access Code
V	Type					
File Name						

---

The sector locations are in hexadecimal notation. The number of sectors is in decimal. The type codes defined for the Computer System are:

- 00 binary file
- 01 binary file with transfer address
- 03 text (or hex) file
- 04 BASIC "save" file

The access codes defined for the Computer System are:

- 00 can be renamed or deleted
- 01 can be renamed but not deleted
- 02 cannot be renamed or deleted

Filenames are listed as 8-character strings with 3-character extensions. The DIR command allows several levels of file qualification for listing categories of files.

The format of the DIR command is:

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Command	Operands
DIR	[/L] [drive:] [filename.type]

---

### OPERANDS

/L: specifies that you want the directory to be printed on the printer/plotter, not displayed on the console

drive: specifies the diskette drive. The drive will default if omitted.

filename.type: specifies a valid filename and type. The filename and type fields may contain wild card characters.

### EXAMPLES

To list on the console all files from disk 1 that have the filetype HEX, enter:

```
DIR 1:*.HEX
```

To list on the printer/plotter all files from the default disk that have names beginning with TEST followed by a character (or blank), enter:

```
DIR /L TEST?.*
```



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---

### FORMAT COMMAND

The **FORMAT** command is used to format and/or initialize a specified diskette. All diskettes must be formatted and initialized before they can be used with the Computer System. The formatting process takes several minutes and erases the contents of a diskette. Upon completion the operating system returns control to the command level.

Command	Operands
---------	----------

---

<b>FORMAT</b>	(none; command prompts for additional information)
---------------	--

---

No operands need be specified with the **FORMAT** command. You will be prompted for additional information about the diskettes to be formatted and/or initialized.

## KILL COMMAND

The KILL command is used to remove tasks from the system. KILL works only on tasks that are running or tasks that are ready to run (status 01). Use KILL with great care, since resources acquired by a task could be lost (to you) if that task is terminated. All the Computer System devices are protected from this; if a task has acquired one or more of the system resources, it cannot be terminated until it releases those resources. The format of the KILL command is:

Command	Operands
---------	----------

---

KILL	taskname
------	----------

---

## OPERANDS

taskname: specifies the name of any task currently in the system (including SYSTEM). If the SYSTEM task is terminated, none of the the Computer System commands described in this manual will be available.

The error message:

TASK HOLDS RESOURCES

indicates that the task must release its system resources before it can be terminated. Similarly, the error message:

NOT ON READY QUEUE

indicates that the task is not in the proper state or that it has acquired some user resource.

## LISTDEV COMMAND

The LISTDEV command is used to display the present device assignments. The status is listed on the currently assigned console device. Control is returned directly to the command level after the devices are listed. The format of the LISTDEV command is simply:

Command	Operands
---------	----------

---

LISTDEV

---

### LOAD COMMAND (Resident)

The LOAD command puts programs into the transient area but does not execute them; control is returned to the operating system command level. LOAD requires that files be of binary type (00 or 01 type). The format of the LOAD command is:

Command	Operands
---------	----------

---

LOAD	[drive:]filename.type
------	-----------------------

---

drive:           will default if omitted

No wildcard characters are permitted in the filename or extension.

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---

### PRIORITY COMMAND

The PRIORITY command is used to change the priority of a running task. (The TASKS command can be used to find out which tasks are currently running and what their priorities are.) This may be necessary if one task seems to be using more time and system resources than you feel it should. This command can also be used to raise the priority of a task that is especially important or that has to run quickly. The format of the PRIORITY command is:

Command	Operands
PRI	taskname,priority

---

### OPERANDS

taskname: specifies the name of the running task.

priority: specifies the new priority (a decimal number from 1 to 255) of the task specified as "taskname."  
Remember, higher numbers have greater priority.

## RENAME COMMAND

The RENAME command is used to change the name of a file without modifying its contents. The new name cannot exist already with that type on that disk. The format of the RENAME command is:

Command	Operands
---------	----------

---

RENAME	[drive:] oldname.oldtype,newname.newtype
--------	--

---

### OPERANDS

drive: specifies the diskette drive number. The drive will default if omitted.

oldname.oldtype: specifies the existing name of the file.

newname.newtype: specifies the changed name for the old file. There can be no files with this name and type.

### EXAMPLE

To rename the file PGM1.OLD to PGM1.NEW, enter:

```
RENAME PGM1.OLD,PGM1.NEW
```

No wild card characters are permitted in either the new or old names or extensions.

## RESUME COMMAND

The RESUME command is used to immediately replace a suspended task on the ready-queue. RESUME has no effect on a task already running or on the order of the ready-queue. The format of the RESUME command is:

Command	Operands
RESUME	taskname

---

## OPERANDS

taskname: specifies the name of the suspended task.

If the taskname specified is not a current task, the error message

NO SUCH TASK

will be issued by the system.

## RUN COMMAND

The RUN command is used to start a task from the console. The format of the command is:

Command	Operands
---------	----------

---

RUN	filename.type,priority
-----	------------------------

---

## OPERANDS

filename.type: specifies the name of a binary program file of type 01.

priority: specifies the desired priority (decimal number from 1 to 255). Remember, higher numbers have greater priority.



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---

### SECURE COMMAND

The SECURE command is used to change the access code of a file. The access code determines security, that is, whether a file can be renamed or deleted. The DIR command can be used to display a file's present security level. The format of the SECURE command is:

Command	Operands
SECURE	[drive:] filename.type,access-code

---

### OPERANDS

drive: specifies the drive number. The drive will default to 0 if omitted.

filename.type: specifies a valid filename and type. No wild card characters are permitted in the filename or extension.

access-code: specifies one of the three access codes.

00 is used for files that can be renamed and deleted  
01 is used for files that can be renamed but not deleted  
02 is used for files that cannot be renamed or deleted.

### EXAMPLE

For example, To remove any protection from the file TEMPFILE.SYS on drive zero, enter:

```
SECURE TEMPFILE.SYS,0
```

To protect the file INIT.CMD from deletion, enter:

```
SECURE INIT.CMD,2
```

To allow INIT.CMD to be renamed but not deleted, enter:

```
SECURE INIT.CMD,1
```

## SHOW COMMAND

The SHOW command lists all logical unit numbers and devices currently opened for (made available for use by) a specified task. The logical unit number and the device name are both displayed. If the task specified is not found the message "NO SUCH TASK" is issued.

Command	Operands
---------	----------

---

SHOW	task identifier
------	-----------------

---

## OPERANDS

task identifier the name of a task whose associated logical units/device names you wish to determine.

## SUBMIT COMMAND

The SUBMIT command is used to execute a file containing multiple system commands instead of typing the commands individually from the console. This is called a "command file." Commands executed under SUBMIT can invoke any other system command used by the Computer System. All commands from the file will be echoed as they are read by the system. A command file must be a text file (type 03), built with either the editor or PIP. The format of the SUBMIT command is:

Command	Operands
SUBMIT	[drive:] filename.type [,param,...,param]

---

Note that if the Computer System is being restarted (even with CTL-ALT-DEL) any pending SUBMIT file will be terminated.

### OPERANDS

**drive:** specifies the diskette drive. The default drive is used if this is omitted.

**filename.type:** specifies the filename of the command file to be executed with the SUBMIT command. No wild card characters are permitted in the filename or extension.

**param:** specifies one of up to 10 parameters. All parameters must be separated by commas. Within the command file, each parameter must be identified by a special macro indicator (the ampersand symbol) and a single decimal digit. This permits a command file to use parameters entered with the SUBMIT command as the file executes. Therefore in a command file, &0 is the first parameter and &9 is the tenth parameter. A parameter entered in a specific position in the command will be substituted into the corresponding position in the command file. If the parameter does not exist, or the parameter number is incorrect, a carriage-return will be used as the parameter.

EXAMPLES

The following example illustrates macro substitution in command files. For this example, assume that a command file named SUBTST.TXT has been created on drive 4 and contains the following system commands:

```
DIR &0
LISTDEV
LOAD &0:TEST.BIN
(end of file)
```

Now, when the command file is executed with the following SUBMIT command:

```
SUBMIT 4:SUBTST.TXT,5
```

The Computer System will interpret the macros as follows:

```
DIR 5
LISTDEV
LOAD 5:TEST.BIN
(end of file)
```

Acting on this set of commands in combination with the parameters on the SUBMIT command, the Computer System will display the directory on drive 5, print the new device assignments, load the file TEST.BIN from drive 5, and return to the user.

## SUSPEND COMMAND

The SUSPEND command is used to temporarily stop a task from being executed. It takes a task off the ready queue (which prevents it from executing) for a specified number of "ticks." A task cannot run during this time, even if its priority is higher than other tasks in the system. Once the specified time has passed, the task will resume its place on the ready queue and be ready to execute. The format of the SUSPEND command is:

Command	Operands
---------	----------

---

SUSPEND	taskname [,ticks]
---------	-------------------

---

### OPERANDS

taskname: specifies the name of some task currently in the system.

ticks: specifies the amount of time, in twentieths of a second, that the task is to stop executing. The default is \$FFFFFFFF. (This is a delay measured in years, effectively "forever" and requires the RESUME command to put the task back on the ready queue.) The tick count may be any numeric value.

### EXAMPLES

To suspend a task for about 10 seconds, enter:

```
SUSPEND SYSTEM,200
```

To suspend a task indefinitely (in effect to terminate the task), enter:

```
SUSPEND TASK1
```

To suspend a task for about an hour:

```
SUSPEND MYTASK,$8000
```

## TASKS COMMAND

The TASKS command is used to display all tasks currently running in the system. The Computer System displays the output at the console as a single line for each task currently in the system. The data listed is the task name, its priority, its status, and time-of-generation. The task status in the system is one of the following values:

- 01 - on the ready-queue
- 02 - delayed or suspended
- 03 - waiting for a resource

The format of the TASK command is:

Command      Operands

---

TASKS  
or  
TASK

---

### EXAMPLE

The following is representative of the output display resulting from the TASK command:

<u>TASK</u>	<u>PRIORITY</u>	<u>STATUS</u>	<u>TIME</u>	<u>DATE</u>
SYSTEM	80 01	00:00:00	0000/00	
TASK1	07 01	10:20:39	0022/81	
MYTASK	11 03	12:11:10	0021/81	
SPOOLER	80 02	11:00:19	0022/81	

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---

### TIME AND TIME = COMMANDS

The TIME command is used to display the current time-of-day and date information maintained by the system. The TIME= command is used to reset the time. The Computer System keeps time in day-of-the-week, day-of-the-month, month, year, hours:minutes:seconds format. The time value is initialized to zero when the system is started.

When new files are created, the current time value will be automatically included as part of their directory entry. (Refer to the DIR command.)

The formats of the TIME and TIME= commands are:

Command	Operands
---------	----------

---

TIME	
------	--

---

or

---

TIME=	dwk dm mon yr hh:mm:ss
-------	------------------------

---

### OPERANDS

dwk specifies the day of the week (3 characters)

dm specifies the day of the month (2 digits)

mon specifies the month (3 characters)

yr specifies the last two digits of the year.

hh:mm:ss specifies the hours, minutes, and seconds to be set in the Computer System. The delimiters between the values may be blanks, colons, commas, or slashes.

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Either or both time values can be entered. Unspecified values remain unchanged. If an invalid TIME parameter is encountered, the current (or partially-updated) TIME is displayed.

### EXAMPLES

Enter the command TIME. The current time will be displayed as follows:

```
SAT 25 DEC 82 12:00:00
```

To update the hour use the TIME= command as follows:

```
TIME = 12:30:25
```

Then, to check the newly set time, enter TIME and the Computer System will display:

```
SAT 25 DEC 82 12:30:34 (assuming it took 9 seconds to type  
commands)
```



## 6.0 INITIATING AND TERMINATING TASKS

The Computer System power-on process starts what is known as the "system task". This is a main program that acts upon all Computer System commands and runs so that all other tasks can function.

### 6.1 TASKS AND MULTITASKING

A "task" is a program (a file with a 'BIN' file type) being run under the control of the Computer System. Tasks can run concurrently; that is, they appear to share the resources of the computer. (Such resources include the processor itself, the console, storage areas, diskette files, etc.) The Computer System schedules tasks in order to give each a share of the system's time and resources. This is called multitasking. Up to seven tasks can run concurrently.

#### TASK INITIATION

Tasks can be started by the RUN system command or they can begin as programs running under another, already-existing task (including the "system" task). Once started, the new task becomes independent of the task that started it. The initiating task may return to doing other things.

#### TASK NAMES

Each task in the system has an identifying name (the same as the program with the BIN type) that may have up to 8 alphanumeric characters. This name is the means by which tasks are called, suspended, or terminated (using the system commands described later). No two tasks in the system may have duplicate names. No wild card characters are permitted in task naming.

The task name SYSTEM is predefined and reserved for the operating system. This system task runs only when no other programs of a higher priority are being executed. Task priorities are discussed in the next section.

## TASK PRIORITIES

Each task has a priority value associated with it. The priority value is a number between 1 and 255. Within the Computer System, tasks are ordered by priority, with the higher numbers running ahead of the lower ones. Tasks of equal priority are scheduled each in turn or, "round robin". The task priority is set when the task is created, but may be changed with the PRIORITY system command. The priority of the SYSTEM task is 80 (hexadecimal).

Each potential task also has an associated status code. This code indicates the current status of the task and may be one of the following values:

- 0 - Not a task
- 1 - Task is ready to run (on "ready-queue")
- 2 - Task is delayed (SUSPEND or delay-call)
- 3 - Task is waiting for a resource

The time that each task is created (taken from the time-of-day clock) is part of the task information.

Task switching occurs on each real-time clock interrupt (every twentieth of a second) or when a running task must wait for a system resource or I/O device. The highest priority task on the ready-queue (this could be the running task) is dispatched and the new task begins its execution.

## 6.2 DELAYING AND TERMINATING TASKS

Tasks running under the control of the Computer System can be delayed or terminated. When a task is delayed it will not run, even if resources for it are available, until a certain amount of time has expired. (See the SUSPEND command description in Chapter 5.) When a task is terminated it stops running until restarted. (See the KILL command description in Chapter 5.)

A task can be delayed for several reasons. One typical reason is that a task resource may not be available for some time. Another is that you may know that data for a task will be available only at a certain time.

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The SUSPEND command can remove a task from the ready queue for a specified time. The suspended task will be placed back on the ready-queue after the time period (measured in twentieths of a second). The RESUME command provides a means to place a suspended task immediately back on the ready-queue.

Tasks that are already running or on the ready queue can also be terminated. When a task is terminated, any resources being used by it are freed; also, any data it was using is lost.

Note: Nothing prevents the System task from being terminated, but this means that you can no longer issue commands. It is therefore not recommended that you terminate the System task.

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**APPENDIX A: ERROR MESSAGES**

This appendix documents system error messages and device error messages, what they mean, and where possible, how to correct the error.

**SYSTEM ERROR MESSAGES**

FORMAT ERROR	The command line does not conform to the format specified for the command.
NUMBER ERROR	An incorrect numeric argument is present. For example, a drive number is out of range or is not followed by a colon.
FILE NOT FOUND	The requested file could not be found.
DISK ERROR:aa AT SECTOR: bbbb	This error message comes from either the INIT command or as a result of a back-linkage failure. The error type (aa) is a device-error number. (See page A-3).
SYNTAX ERROR INVALID SET PARM	This error message comes from the Set command. It indicates that an incorrect parameter was entered.
BAD INPUT (OUTPUT)	A device error has occurred. This message is usually accompanied by a device-error message.
ILLEGAL INPUT (OUTPUT) DEVICE	Indicates an attempt to use a device in an invalid manner, such as reading from a lineprinter.
BUFFER OVER-RUN	An over-long input line was encountered. The input file is probably the wrong type for the operation desired.

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ILLEGAL SWITCH	Indicates a format error in the switch portion of the command line.
READ (WRITE) ERROR	A read or write error was encountered in disk-to-disk copying. This message is usually accompanied by a device error message.
DIRECTORY ERROR	The directory could not be read properly. This message is usually accompanied by a device-error message.
CHECKSUM ERROR	The checksum of a hex-formatted file was not correctly read.
NO SUCH TASK	The specified name does not match one of the tasks in the system. (TERM, RESUME, or SUSPEND command)
NOT ON READY QUEUE	The task is not ready to run and may not be terminated.
TASK HOLDS RESOURCES	The task has acquired system resources and may not be terminated.
SUBMIT FILE ERROR	The filename in the SUBMIT command line could not be found or was not a TEXT file.
ILLEGAL FILE TYPE	The file specified for LOAD was not a binary file.
RENAMING ERROR DUPLICATE NAME FILE PROTECTED	These error messages come from the RENAME command. RENAMING ERROR indicates some form of disk error in accessing the drive containing the old file. DUPLICATE NAME indicates that the new name already exists on the disk. FILE PROTECTED indicates that the old file is protected from renaming. (Access code = 01 or 02).
UNABLE TO CHAIN filename.ext	This error message indicates that a CHAIN request was made to the Computer

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System with filename.ext but it cannot be done. (No such file, disk read error, file not the right type, etc.)

### FILE PROTECTED

Indicates that the file specified is protected from deletion (access code 02). It cannot be deleted until its access code is changed.

## SYSTEM DEVICE ERRORS

All device errors in the Computer System are reported in the following format:

device-name ERROR: number

where device-name is the three-character logical name and the error number is hex encoded. For example:

LPT ERROR: 0A  
DSK ERROR: 02

are system device error messages. The set of errors defined in the Computer System are:

- 01- end of directory found in search
- 02- file already in use
- 03- file already exists
- 04- no such file exists
- 05- read/write error
- 06- directory overflow
- 07- disk full
- 08- end-of-file encountered
- 09- bad disk sector, bad media
- 0A- device not ready
- 0D- illegal use of File Control Block
- 12- illegal operation (write a read file, etc.)
- 15- invalid file name
- 16- back-link error (disk corrupted during write)

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the Chromatography Application Program Product Description, GC22-9188 for more information about the program and to the Computer System Product Description, GC22-9183 for more information about Computer System software.

### 1.4 FILE SUPPORT

The Computer System can store programs and data in files on diskettes or hard disks. The Computer System controls these files so you have very little to do in terms of file management except occasionally deleting unneeded files. A directory keeps track of the files and you can display or print a list. You can create, modify, delete and access files.

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