

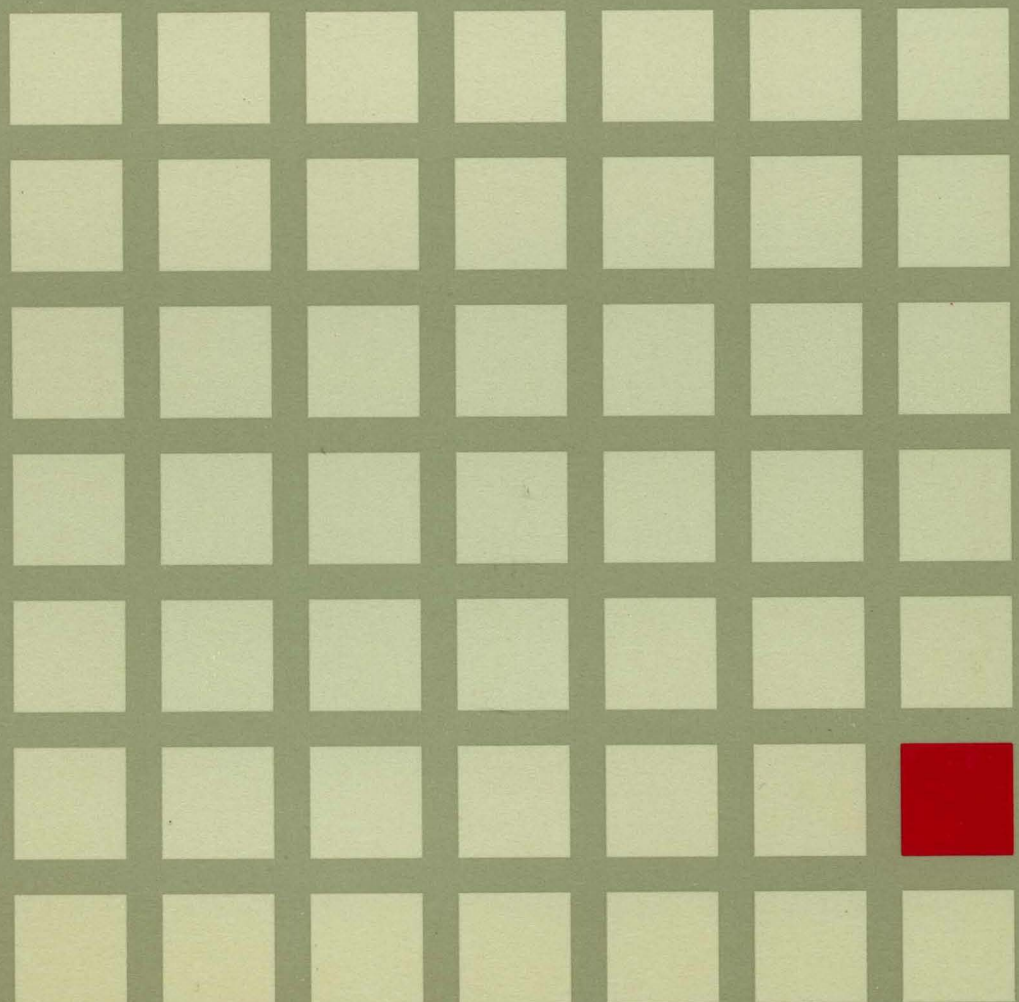


Virtual Machine/System Product

GC19-6206-05

Terminal Reference

Release 6





Virtual Machine/System Product

GC19-6206-05

Terminal Reference

Release 6

Sixth Edition (June 1988)

This edition, GC19-6206-05, is a major revision of GC19-6206-04, and applies to Release 6 of the Virtual Machine/System Product (Program Number 5664-167) and to all subsequent release of this product unless otherwise indicated in new editions or Technical Newsletters. Changes are made periodically to the information herein; before using this publication in connection with the operation of IBM systems, consult the latest *IBM System/370, 30xx, 4300, and 9370 Processors Bibliography*, GC20-0001, for the editions that are applicable and current.

Summary of Changes

For a detailed list of changes, see "Summary of Changes" on page 123.

Changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

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Preface

This book discusses various terminal types supported by VM/SP (Virtual Machine/System Product). If you are planning to install terminals, this book helps you decide which kinds of terminals to use in your installation. If you use a variety of terminals, this book tells you how to gain access to and use VM/SP with these terminals.

This book does not include detailed instructions on particular terminals, nor does it describe all terminals that you use with VM/SP. For a list of terminals and consoles that are used with VM/SP, and the books that describe them in detail, see Appendix A.

Many kinds of terminals are available to the VM/SP user. Devices that are equivalent to those explicitly supported by VM/SP may also function satisfactorily. However, it is your responsibility to determine the equivalency. IBM cannot assume any responsibility for the effect that any changes to IBM-supplied products or programs may have on such terminals or consoles.

How This Book Is Organized

This book contains six major chapters, and four appendices:

Chapter 1: Getting Acquainted with Your Terminal

This chapter discusses the characteristics of terminals in general.

Chapter 2: Using Your Terminal with VM/SP

This chapter tells how to use terminals to control VM/SP.

Chapter 3: Working Session Examples

This chapter gives examples of simple and complex working sessions from signing on to signing off.

Chapter 4: Some VM/SP Terminals

This chapter discusses the general characteristics of a number of different terminals that are supported by VM/SP.

Chapter 5: EBCDIC Devices

This chapter discusses the physical characteristics of a number of EBCDIC devices that are supported by VM/SP.

Chapter 6: ASCII Devices

This chapter discusses the physical characteristics of a number of ASCII devices that are supported by VM/SP.

Appendix A: Terminals and Consoles Supported by VM/SP

This appendix lists VM/SP-supported terminals and consoles, and their descriptive documentation.

Appendix B: Summary of Status Action on Display Terminals

This appendix contains a table showing the different states, or status, that a display terminal can be in, and how to change that status.

Appendix C: ASCII Translate Tables for Graphic-Hexadecimal Substitution

This appendix shows the relationship of hexadecimal codes to graphic characters for some terminal keyboards.

Appendix D: Entry Assist

This appendix discusses the Entry Assist feature. Entry Assist is a customizable feature available for 3274 control units.

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Chapter 1. Getting Acquainted with Your Terminal

What Terminal Types Are There?

Terminals are devices that let you communicate easily with a computer. They transmit to the computer information that you type in, and they display (on a screen) or print (on paper) information that is sent to you from the computer.

Terminals are composed of an input portion, usually a keyboard like that of a typewriter, and an output portion, which is either a display screen or a printer. Some terminals that we discuss in this book combine both printer and keyboard in a single piece of equipment that resembles an electric typewriter. We will refer to them as *typewriter-like terminals*. Other terminals do not have a printer but use a display screen instead. The display screen is usually (but not always) separate from its keyboard and connected to it by a cable. We will refer to these devices as *display terminals*.

Consoles, as used in this book, are terminals that manage system functions. Sometimes you may hear people call a terminal a console. Often the words are used interchangeably, although they should not be. A console is a terminal, but a terminal is not always a console.

The *real console* is part of the hardware for the whole system. Only the central system operator and certain maintenance people can use the real console. They use it to take some action to affect the real system. For example, the central operator uses it to start up the system after it has been shut down, or a service representative uses it to diagnose system problems.

Your terminal acts as a *virtual console* when you use it to manage your own virtual system, but what you do in your own virtual system has no effect on other users. Each user has his or her own virtual system. The system operator, on the other hand, issues commands on his real console to perform actions that affect all users on the real system.

Some terminals are used as either a terminal or a real console. A number of these are listed and discussed in Chapter 5, "EBCDIC Devices" on page 51 and Chapter 6, "ASCII Devices" on page 85. Other devices are generally *only* used as real consoles; they are included in Appendix A.

Physical Characteristics

Keyboards

The typical terminal keyboard looks like an electric typewriter but has, in addition to the keys found on typewriters, a number of special control keys.

On most terminals, the following keys operate in the same way as the keys on a standard typewriter:

- Alphabetic, numeric, and special-character keys
- Space bar and back-space
- On/off switch
- Shift and shift-lock
- Tab, tab-set, and tab-clear
- Margin release.

(Display terminals do not have the tab-set, tab-clear, and margin keys.)

Some keys have the typamatic feature. That is, when you lightly press one of these keys, the character is produced only once. When you press the key and hold it, the character or function repeats until you release the key.

ATTENTION and ENTER Keys

Two functions common to both display and typewriter-like terminals are attention and end-of-input (or enter) signaling. Press ENTER to request the system to accept the data you just typed. Press ATTENTION to interrupt whatever is being done by the system, so that you can do something else.

The keys that perform these two functions have different labels on different terminals, but this book uses:

- ATTN - to refer to the attention-signaling key, and
- ENTER - to refer to the end-of-input signaling key.

The labels of the keys that perform these functions on different terminals are shown in Table 1 on page 3.

Note that on certain terminals, ENTER performs both the end-of-input and attention functions. Generally, this should cause no confusion — if you have typed data on an input line, pressing ENTER is interpreted as end-of-input. If there is no data on an input line, pressing ENTER produces an attention signal.

CANCEL Key

CANCEL erases material in the output display area (see page 5), but leaves the input line intact. Use this key if you want to keep what you have typed in the input area, to be entered later. Like ATTN and ENTER, CANCEL can actually have a different label, perhaps CNCL or even PA2, but it *performs* the CANCEL function. The names of the keys that perform this function on different terminals are shown in Table 1 on page 3.

| Terminal | ATTN | ENTER | CANCEL |
|-----------------------------|------------------|--------------------------|-------------------------|
| 1052 | RESET LINE | RETURN or EOB | Not applicable |
| 2741 | ATTN | RETURN | Not applicable |
| 3101 | BREAK | BREAK, SEND, new-line | Not applicable |
| 3210, 3215 | REQUEST | END | Not applicable |
| 3277 | ENTER, DUP / PA1 | ENTER | FIELD MARK / PA2 / CNCL |
| 3178, 3278, 3279, 3290 | ENTER, PA1 | ENTER | FIELD MARK / PA2 |
| 3767 | ATTN | EOB, EOM | Not applicable |
| System/370 138, 148, 158 | ENTER | ENTER | FIELD MARK / PA2 |

Keyboard Lock

There are two kinds of locks on the terminal keyboard. One is the uppercase shift lock key, just like on a typewriter. The other kind of lock does not pertain to a particular key; it means that sometimes the system will lock the keyboard so that you cannot press any of the keys, or that pressing them will have no effect. If the keyboard is locked, it means that the system is busy and cannot accept input from you now. Usually the keys will unlock in a few seconds, and you continue your work.

On a display terminal, you type data on the terminal at the same time as the terminal is displaying other data to you. A typewriter-like terminal is more limited; only one line can be printed at a time. If you are typing data, the print mechanism is already busy and the system cannot print a message to you at the same time. If the system is printing something for you, the keyboard will lock to keep you from typing. Therefore, the keyboard is more likely to lock on a typewriter-like terminal.

On a display terminal, the keyboard lock might operate as follows:

Example 1 -- The system writes one or more lines of data in the top part of the screen. At the same time, you enter data into the input area at the bottom of the screen. When you finish typing the input line, you press ENTER to send the line from the input area to the system. This data now appears in the upper part of the screen. Note that the keyboard is not locked.

Example 2 -- You have just issued several related commands (called a string). You immediately type in additional commands for the machine to run. The system cannot accept the second string of commands until after it processes the first string. The keyboard locks for about three seconds and the message NOT ACCEPTED flashes on the screen. The second string of commands remains on the screen. Just wait a few seconds, then press ENTER again. Continue in this manner until the system accepts all the commands.

The following examples illustrate the operation of typewriter-like terminals with the keyboard lock feature:

Example 1 -- While you are typing data, the system sends you a message. The terminal senses when you get to the end of the line and locks the keyboard to

prevent you from typing more. When the system finishes printing the message to you, the keyboard unlocks and you can begin typing again.

Example 2 -- The system is printing an extensive amount of data on the typewriter terminal, but you want to do something else. You cannot make the change because the keyboard is locked until the current operation ends. You interrupt the job by pressing ATTN (or its equivalent — see Table 1 on page 3). Note that this key is *not* locked when the rest of the keyboard is locked. The printing stops and the keyboard unlocks so you can type in new information. For more information on attention interruptions, see “Attention Interruption and Mode Switching” on page 14.

Special-Feature Keyboards

Certain special-feature keyboards, such as the Data Analysis/Text and Data Analysis/APL keyboards, are available for some display terminals:

The Data Analysis/Text keyboard has, in addition to the standard alphanumeric characters, a number of special-use characters. These include characters such as superscript and subscript numerals, arrows, bullets (•), and graphic characters for drawing boxes and charts. These are especially helpful if you are doing text processing with your display terminal.

The Data Analysis/APL keyboard has APL characters in addition to alphanumeric characters. You need these characters if you plan to do any APL programming.

PTTC/EBCD or Correspondence keyboards may be available for your typewriter-like terminal. These special features apply to communication terminals installed on either switched (dial-up telephone connection) or leased lines (directly attached by cable).

There are also typewriter-like terminals available with an APL keyboard configuration and an APL typing element.

For additional information about special features offered, see the *VM/SP Planning Guide and Reference*, SC19-6201.

Display Screens and Screen Management

The physical layouts of VM/SP-supported display screens differ according to terminal model. Depending on the model, a terminal displays as few as 5 lines, or as many as 62; as few as 50 characters per line, or as many as 160. Details of other display screen features are given in the following text.

Screen Layout

Figure 1 on page 5 shows a general VM/SP layout. This discussion does *not* include how a CMS editing facility uses the screen. For information about any CMS editor usage, refer to the Bibliography.

The screen has four unequal-sized areas. They are:

- Output Display
- User Input
- Status Area

- Operator Information (on some terminals).

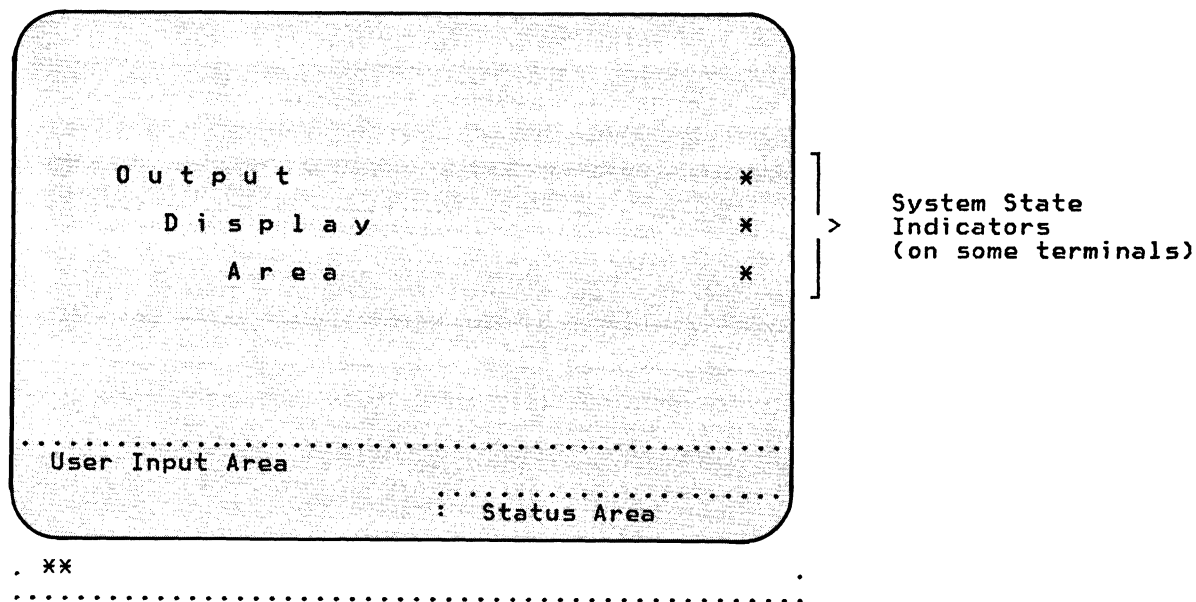


Figure 1. Display Screen Layout for Display Terminals

OUTPUT DISPLAY AREA:

The output display area spans most of the screen. Messages and other system output are displayed here. Commands and replies that you originally typed into the user input area are redisplayed here after you press ENTER.

VM/SP does not let you enter data directly into the output display area. For some terminals, if you attempt to do so, the keyboard locks and you must press RESET to continue. On other terminals, you enter data into the output display area, but the data is not accepted by the operating system. To determine how your particular terminal operates, either experiment with it, or check its documentation.

On some terminals, such as the 3277, a spot of light appears in any of three positions on the far right side of the Output Display Area. These are *system state indicators* and appear next to phrases engraved on the frame that surrounds the video display unit. For a description, see "System State Indicators" on page 61.

USER INPUT AREA:

This area consists of the bottom two lines of the screen, (except the right end of the bottom line is the the Status Area, described later).

All data that you type appears in this area before you press ENTER. When you press ENTER, the data in this area disappears and is sent to the VM/SP operating system. It reappears as the next entry in the output display area.

If you enter a command, the system displays the CMS ready message to let you know it has received and processed your command and is ready for another.

If you try to insert data outside this area, the Input Inhibited system state indicator or an Operator Information signal appears and the keyboard locks. You must press RESET before you proceed.

Note: The CMS ready message has two forms. The *short* form, which you obtain by entering the SET command:

```
set rdymsg smsg
```

looks like:

```
Ready;
```

Use the command

```
set rdymsg lmsg
```

to get the *long* form, as follows:

```
Ready; T=v.vv/r.rr hh:mm:ss
```

where *v.vv* and *r.rr* are the virtual and real processor times, and *hh:mm:ss* is the time-of-day in hours, minutes, and seconds.

STATUS AREA:

This area, the rightmost 21 characters of the bottom line of the screen, contains the name of the system followed by a status message. You cannot type in this area. The status message indicates the status of the screen you are looking at. Status is displayed as one of the following:

```
RUNNING  
CP READ  
VM READ  
MORE...  
HOLDING  
NOT ACCEPTED
```

RUNNING message: Control Program (CP) or your virtual machine is working on something, or is waiting for you to enter a command. The screen output display area is blank or partially filled. RUNNING also occurs if the screen is filled and there are no additional lines to display.

CP READ message: CP issued a read request to your terminal and is waiting for a reply. This occurs, for example, after a message that requires a response. If you enter your reply processing continues.

VM READ message: The operating system or a program running in the virtual machine issued a read request to your terminal and is waiting for a reply. Type in your reply and press ENTER to continue processing.

If the VM READ is issued by a program (or exec), any reply is interpreted as data by the program. Use the following procedure to avoid this situation:

1. Use the cursor movement key to move the cursor one position before the input area and press ENTER. This passes a null line to CMS without disrupting the VM READ status.
2. Enter the command you want passed to CMS in the input area and press ENTER. The command will be directly passed to CMS.

To pass subsequent commands to CMS, repeat the preceding steps. This procedure is useful for stopping programs (using HI or HX) that are in a VM READ loop.

MORE... message: CP or your virtual machine is running, but the output display area is full and there are more lines of output to be displayed.

The system does not stop if the screen is in a MORE... status. The situation is simply that there is not enough room on the display screen for all the data.

The current screenful of data is displayed for about one minute. (Some terminals sound an audible alarm when only 10 seconds remain for the current display.) Then the system erases the data, displays the lines that were waiting to be displayed, and changes back to RUNNING status.

If you press ENTER during the one minute of timed display, the data on the screen image is kept and the status changes to HOLDING.

If you press CANCEL or CLEAR, the output display area clears immediately, the waiting data is displayed, and the status changes to RUNNING.

With some terminals, a MORE... status condition can occur without a full display screen. When this occurs, press CANCEL to change the status so you can use the screen again.

HOLDING message: CP or your virtual machine is running, the screen is full, but you kept the current screen because you pressed ENTER while the MORE... status was being displayed.

With some terminals, HOLDING can also occur when a displayed message causes the audible alarm to sound.

If you press ENTER, the screen changes back to the MORE... status.

On any of the 3270 Information Display System terminals (see "3270 Terminals" on page 106), press CANCEL to clear the screen and display the next sequential information. The status changes to RUNNING.

On other than 3270 terminals, when you press CANCEL while the screen is in HOLDING status and TERMINAL MODE CP is set, the screen clears but any following data is not displayed. In this case, to display data on your screen:

1. First press ENTER, which causes the screen to go to MORE... status, then
2. Press CANCEL, which causes the next sequence of data to appear.

NOT ACCEPTED message: You issued a command or a line of data and pressed ENTER, but the system has not yet acted on it. VM/SP locks the keyboard for about three seconds while it displays the NOT ACCEPTED status, then reverts to its previous status. The rejected data stays in the user input area of the screen so you can retry the operation without typing it again. Just press ENTER after the NOT ACCEPTED message goes away.

Appendix B, "Summary of Status Action on Display Terminals" on page 111 summarizes the action taken when you press ENTER or CANCEL under each status and mode condition.

When you are working in full-screen CMS (with SET FULLSCREEN ON), the following status messages is displayed.

Note: For a complete explanation of the SET FULLSCREEN ON command, see the *VM/SP CMS User's Guide*, SC19-6210.

Enter a command or press a PF or PA key: The system is waiting to process your next input.

Executing a command: The system is processing your command.

Enter your response in vscreen 'vname': The system is waiting for you to reply to a request.

Note: In this message, vname is replaced by the name of the virtual screen in which you enter your response.

Press ENTER to view more data: The system is waiting for you to view more stored information.

Scroll for more information in vscreen 'vname': To see the waiting information you must scroll forward a window that is showing the specified vscreen.

Note: In this message, vname is replaced by the name of a virtual screen. Scroll forward a window connected to the virtual screen in order to see the waiting information.

The name of the system is not displayed with this message.

OPERATOR INFORMATION AREA:

Some terminals display an operator information area, which appears under the user input area and status area. You cannot type in this area. Graphic status messages are displayed in this area of the screen. Explanations of these graphic symbols are found in a *Problem Determination Guide* (for the particular keyboard) placed in a small drawer or slot under the hand rest of the keyboard.

Cursor-Controlled Editing

The *cursor* is a spot of light that appears on the display screen. You can move it around by using the cursor control keys. (See Table 6 on page 48.) Move the cursor to a position in the input area in order to add, change, or delete what is there. If you are using a full-screen editor such as XEDIT, you can also make changes in the output area — just move the cursor to where you want to make the change.

Use the INSERT, DELETE, ERASE EOF, and character keys to actually make the change (See Table 7 on page 48.).

Chapter 2. Using Your Terminal with VM/SP

What Is VM/SP?

VM/SP is an operating system that uses terminals to communicate with users.

It is *interactive*, which means that every entry you type calls forth a response from VM/SP.

It is *conversational*, which implies the ability to carry on a continuous dialogue with you.

You may want to use VM/SP to do different things; for instance:

- Define and control the real and physical resources of the computer
- Write programs that define and control the operating system and how it uses its physical resources
- Write programs that use the computer's operating system and physical resources to perform particular tasks
- Work with, and use, computer programs to perform particular tasks.

VM/SP is composed of the following components or major subsystems that assist you in using the computer's resources:

- CP: the Control Program, which controls the real machine and the real devices attached to it
- CMS: the Conversational Monitoring System, which communicates with, and controls, VM/SP in general
- GCS: the Group Control System, which manages subsystem environments that support a native Systems Network Architecture (SNA) network
- IPCS: the Interactive Problem Control System, which assists you in describing a system problem to IBM personnel, in order to help them fix the problem.¹
- RSCS: the Remote Spooling Communication Subsystem Networking program product, which assists you in communicating with other users and virtual machines at remote locations.

Each input line that you key in at the terminal is transmitted to the VM/SP system, where a routine examines, accepts or rejects the line. The part of the system that has control at the time of the input determines the particular processing routine.

¹ VM/SP IPCS provides function equivalent to the IPCS Extension program product (5748-SA1). For more information, see the pertinent publications listed in the Bibliography

VM/SP Environments

Each part of the system where you enter input constitutes a unique *environment*, and only a part of all possible input is accepted in any given environment. The VM/SP system environments are:

- CP
 - ECHO command subenvironment
- Virtual Machine (or CMS)
 - Editing command subenvironment (input/edit mode)
 - Debug command subenvironment
 - IPCS command subenvironment.
- Group Control System (or GCS) command
- RSCS command.

Besides these specific environments, you enter input to any other program that requests terminal input. These other input-processing programs run in a general category called the program environment, in which the executing program (for example, FORTRAN, Interactive Debug, or any user-written program) determines if an input line is acceptable.

You can cause control to pass from one environment to another at any time. Figure 2 on page 11 illustrates the transfer of control as you issue various commands and subcommands. See “Attention Interruption and Mode Switching” on page 14 for more information.

The CP environment accepts as input, CP commands, which are sometimes referred to as *console functions*. This is because, for the most part, they simulate system management functions you perform at a real computer console.

The ECHO subenvironment is entered when you issue the CP command ECHO. All keyed-in text lines return unchanged to the sending terminal for the number of times you specify. This command is only used to check the operation of a terminal and its communication line.

The Virtual Machine (or CMS) environment accepts CMS, CP, and IPCS commands.

An *editing command*, such as XEDIT, places your virtual machine in the editing command subenvironment. This lets you create a new file or make changes to an existing file.

Several editors are available with VM/SP, including the System Product Editor (XEDIT). In this book, information about editing refers to the System Product editor, unless otherwise specified. For complete information on using XEDIT subcommands, see the *VM/SP System Product Editor Command and Macro Reference*, SC24-5221.

Within CMS, *Session Services* provides window support for the end user. This support lets you:

- Define and delete windows
- Position windows anywhere on the screen

- Overlay one window with another
- Scroll backward and forward through data displayed in a window.

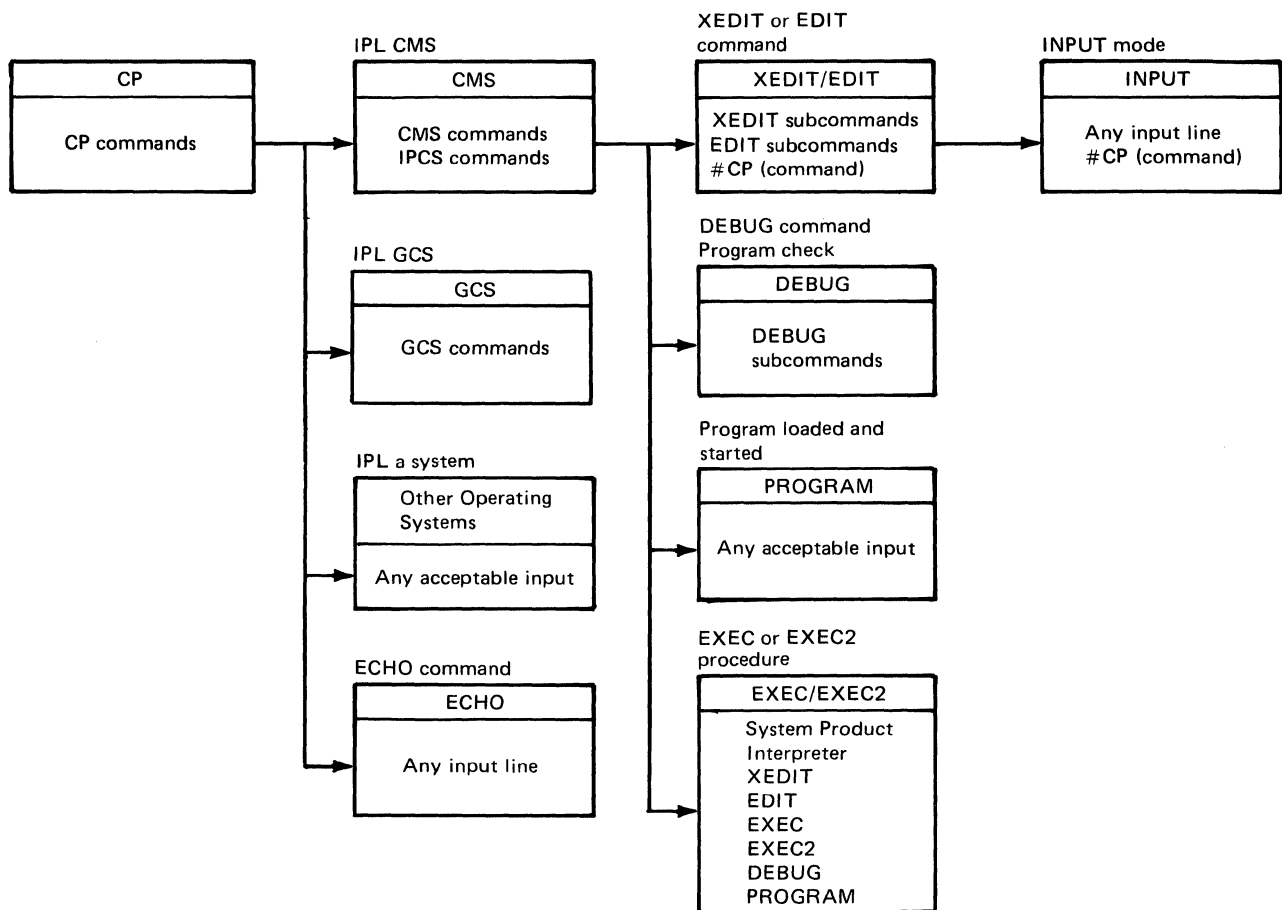


Figure 2. VM/SP Operating Environments and Commands

In addition, CMS Session Services let you write data into virtual screens and log data into a CMS file.

You can also run CMS in full-screen mode. In full-screen mode, the window support is available to control the CMS session. Full-screen CMS has the following characteristics:

- Routes VM output and messages into appropriate windows
- Supports extended highlighting (such as color) for CMS output
- Lets user define CMS PF keys
- Lets full screen input for CMS commands
- Lets user control the display of messages
- Provides more meaningful status indications to replace machine states. For example, in full-screen CMS, *HOLDING* is replaced by *Press any key to view more data*.

The *DEBUG* command places your virtual machine in the Debug subcommand environment. In this environment you issue commands to (for instance) display control word contents, registers, and storage, and to specify breakpoints (address instruction stops). The *DEBUG* subcommands are described in the *VM/SP CMS Command Reference*, SC19-6209.

The *VM/SP IPCS*, (VM/SP Interactive Problem Control System) provides system programmers and installation support personnel with problem analysis and management facilities. For details, see the *VM/SP Diagnosis Guide*, LY24-5241.

GCS, the Group Control System, provides an environment for running ACF/VTAM and networking applications that support a native Systems Network Architecture (SNA) environment. The *GCS* and SNA capabilities are fully explained in the *VM/SP Diagnosis Guide*, LY24-5241.

RSCS, the Remote Spooling Communication Subsystem, is a subsystem that supervises transmission of files and messages across a teleprocessing network. For details, see the *RSCS* publications listed in the Bibliography.

How Do Terminals and VM/SP Work Together?

A terminal is physically connected to the central part of the computer (called the *processor*). To do any work with your terminal, you must also connect it logically to the computer; you do this by typing phrases that establish your right to use the computer's facilities. This is called *logging on* to the computer, and the procedure is referred to as *logon*. It is described in the section "VM/SP Log-on Procedures" on page 30.

Physical Connections

Most terminals and processor consoles are attached to the System/370 processor in one of four ways:

- Directly to the processor through a selector channel, a block multiplexor channel, or a multiplexor channel. This method is reserved for system consoles and alternative system console devices.
- Locally (through a local or common control unit)
- Remotely (through a transmission control unit or ICA leased or switched lines).
- Remotely through a remote terminal control unit.

Other facilities for remote connection of terminals that are equivalent to leased or switched lines may also be used. Figure 3 on page 13 shows various terminal links to the processor, including leased or switched lines, direct attachment to a channel, or multiple direct attachment to a channel through a local or remote control unit.

Leased and Switched Lines

A *leased line* is a dedicated telecommunication line that contains no switching systems and that permanently links the terminal to the processor. A *switched line* uses regular telephone dialing to provide a temporary terminal-to-computer connection. The connection exists until you, or VM/SP, break it. Terminals using a switched line must use either a communications modulator/demodulator (or *modem*) or a standard telephone with an *acoustic coupler*. Both leased lines and switched lines are common carrier communication facilities. That is, they are part of a public

data transmission service that is provided by, for instance, a telephone or telegraph company.

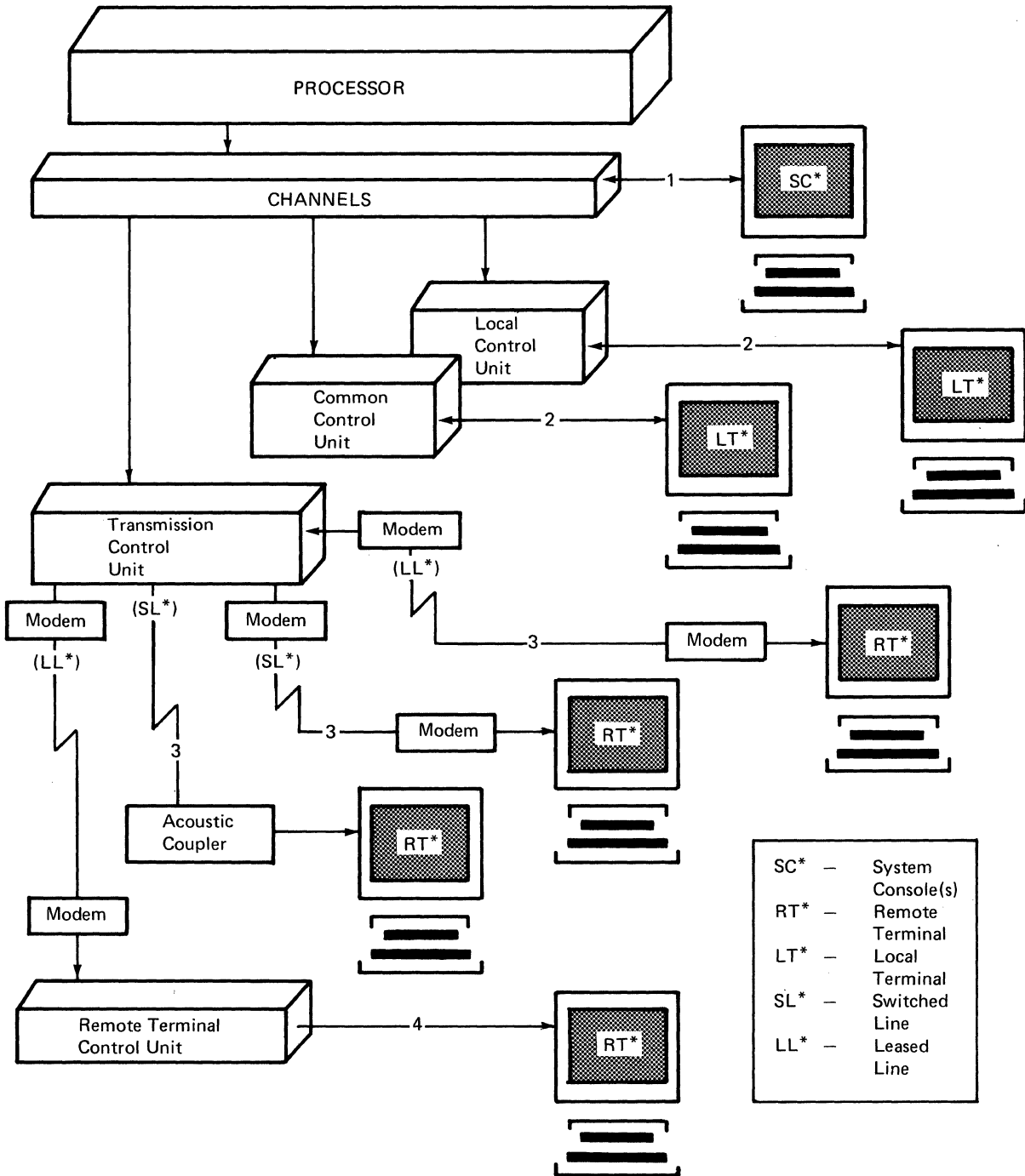


Figure 3. Terminal Links to the Processor

Establishing a Physical Connection

Turning on your terminal and pressing ENTER is usually enough to establish a physical connection with the processor.

For a terminal connected to the processor by a switched line, however, you also have to activate the modem or acoustic coupler. Generally, to do this:

1. Dial the proper telephone number.
2. Listen for the characteristic tone that signals the computer has answered the call.
3. Set the data switch.
4. Replace the handset.
5. Press ENTER on your terminal.

The detailed procedures for doing this depend on the particular device that is attached to your terminal, and they are not discussed in this book. Consult with your system administrator for instructions on using the line-switching equipment.

Logical Connections

After a physical connection has been made between your terminal and the computer, limited communication begins. You can, for example,

- Send messages to users or to the central operator
- Use the DIAL command to access another virtual machine

until you establish your right to use VM/SP. You do this by logging on to the system, which is described in the section "VM/SP Log-on Procedures" on page 30.

When you log on, you must identify yourself by giving your user-identification and a password. Your user-identification, or *user id*, is the name by which you are known to the computer and to other users. Your password is known only to you and the computer. Additionally, you may also be required to give an account number(s). Get your userid, password, and account number(s) from the system administrator before trying to use VM/SP.

Attention Interruption and Mode Switching

You can send an attention interruption to CP or to a program running in your virtual machine, by pressing ATTN on your terminal. The interruption suspends the current activity to let you do something else. To determine which key on your terminal signals an attention interruption, see Table 1 on page 3.

Remember, there are basically two operating environments to use with VM/SP:

- CP -- the environment for managing your system functions (or console functions).
- VM -- the environment for communicating with CMS (or the operating system that you are running in your virtual machine). The environment from which you enter subenvironments such as the editor.

CP is the base from which the other environments must operate. The word *mode* refers to the way or manner in which VM/SP reacts to input that you give to it. When you first log on, your terminal operates only in a manner, or mode, acceptable to CP. It operates in CP mode. Operating systems such as CMS, GCS, OS, or VSE, are loaded into your virtual machine when you issue the IPL command. Therefore, if you have not loaded an operating system, you send an attention signal

only to CP. After you load an operating system into the virtual machine, you interrupt either CP or the virtual machine, and your terminal operates in either CP mode or VM mode.

Mode Switching

Mode switching is a method, such as an attention interruption, to change from one environment to another. The method that you use depends on:

- Current operating environment
- Current status of the terminal regarding attention signaling
- Operating environment that you want to use.

You can specify how VM/SP handles attention signaling by using the **TERMINAL MODE** command:

On a typewriter-like terminal:

If you enter

```
terminal mode cp
```

pressing **ATTN** *once* forces the virtual machine to CP mode for console function input. To get back to CMS, use the **BEGIN** command. To get back to CMS, and to signal an attention interruption, press **ATTN**.

If you enter

```
terminal mode vm
```

pressing **ATTN** *once* signals the operating system running in the virtual machine (VM mode); pressing **ATTN** *twice in quick succession* places the virtual machine in CP mode. If you have reset your virtual machine while in **TERMINAL MODE VM**, you must press **ATTN** more than once to unlock the keyboard for CP input.

On a display terminal:

On some terminals, **ENTER** performs the same function as **ATTN**. On all 3270 display terminals, **PA1** alternately switches modes back and forth between VM and CP. However, the **TERMINAL MODE** command affects only **ENTER**.

Interrupting the System — An Example

Say you have a program running in your virtual machine that finishes by sending a file to the printer. Part way through the program, you remember that you want several copies printed. One way to do this is to interrupt the virtual machine, tell CP to have the printer make five copies, and then continue running the program in your virtual machine, like this:

1. Interrupt the virtual machine by pressing **ATTN**. You are now in the CP environment, and your terminal is operating in CP mode.
2. Tell CP to have the printer produce five copies. You can do this by entering the **SPOOL** command:

```
spool printer copy 5
```

3. Interrupt CP by entering

```
begin
```


After this, you are in the VM environment, your terminal is operating in VM mode, and your program is once again running in your virtual machine.

Other Mode Switching and Attention Processing Facilities

In addition to signaling attention, there are other ways you switch from CMS to CP. They include:

- CP command prefix
- #CP command prefix
- ATTN or REQUEST command
- TERMINAL ATTN ON/OFF command
- SET AUTOREAD ON/OFF command.

CP Command Prefix

Entering *CP* before a CP command causes CMS to pass the command to CP for execution. Because you enter CP commands while in CMS, the CP command prefix is usually unnecessary. However, you must include *CP* before CP commands:

- That are issued when SET IMPCP OFF is in effect
- To distinguish between CMS and CP commands with the same name
- To distinguish any CP commands from user-written commands of the same name
- That are issued from a CMS EXEC or EXEC 2 file, and are not processed by the System Product Interpreter (that is, REXX commands).

Note: The CP command prefix may not be allowed from within some CMS subsystems. For example, it is not permitted by CMS Debug.

When you enter a CP command, the system switches to CP mode, runs the command, and automatically switches back to CMS mode. If you, as a CMS user, wish to enter CP mode for an extended period of time and not immediately revert to CMS, enter:

CP

to switch to the CP environment. To return to the CMS environment, issue the CP command BEGIN, or press PA1.

#CP Command Prefix

Entering *#CP* before a command *immediately* switches mode to CP for execution. CMS is not involved. Because of this, use this prefix when an operating system *other than CMS* is running in your virtual machine. CP processes your command and returns control immediately to your virtual machine.

The pound symbol (#) represents the logical line end symbol in effect for your virtual machine. Note that any other character performs the same function if you so designate it.

Enter *#CP* without a command to switch to the CP environment for an extended period of time. To return to CMS, enter the BEGIN command or press PA1.

ATTN and REQUEST Commands

The ATTN and REQUEST commands are functionally identical. They run in CP mode and tell the virtual machine an interruption is pending.

TERMINAL ATTN ON/OFF Command

The CP command, TERMINAL, with the ATTN operand controls whether VM/SP will signal to a typewriter-like console when it receives an attention interrupt (from the console). When the ATTN ON option (the default) is in effect and you send an attention interrupt to VM/SP, it prints an exclamation point (or its equivalent), followed by a carriage return. This option provides a more complete record of events on the console log. It indicates both:

- Where, in the sequence of console interactions, the attention interrupts actually occur; and, for each occurrence,
- Which operating mode (VM or CP) is running -- two exclamation points (!!), signifying two attention interrupts, indicate CP mode.

TERMINAL ATTN OFF suppresses printing of the exclamation point.

SET AUTOREAD ON/OFF Command

The CMS command SET, used with the AUTOREAD ON/OFF operand, allows you the option of a console read immediately following a command execution. This command exists because of differences between display and typewriter-like terminal operations when you key in input data. You can determine your AUTOREAD status by using the QUERY AUTOREAD command.

Display Terminal: If AUTOREAD is OFF (the default), the screen status indicates RUNNING after the display of the CMS ready message (see page 6). If AUTOREAD is ON, the screen status indicates VM READ.

Typewriter-Like Terminal: If AUTOREAD is ON (the default), the keyboard is locked during RUNNING status.

Note: If you disconnect from one terminal and reconnect to another, the AUTOREAD status remains unchanged. This is important when going between a display terminal and a typewriter-like terminal.

For additional information on these commands, see the *VM/SP CMS Command Reference*, SC19-6209 and the *VM/SP CP System Command Reference*, SC24-5402.

Using Your Terminal

There are many procedures common to all VM/SP-supported terminals and consoles. The following text discusses some of these procedures.

Using Logical Line Editing Characters

There are four logical line editing characters recognized by VM/SP (see Table 2 on page 18). They are more useful with typewriter-like terminals (which do not have cursor-controlled line editing) than with display terminals, but are valid for both. The characters listed in Table 2 on page 18 are the default characters in the system and can be changed if your terminal keyboard does not have some of these characters. You can define some other infrequently used keyboard character to perform these editing functions, by using the CP TERMINAL command. For details on using the CP TERMINAL command to change default values, see the *VM/SP CP System Command Reference*, SC24-5402.

| Table 2. VM/SP Default Logical Line-Editing Characters and Their Use | | |
|--|---|--|
| Character | Function | Usage and Result Obtained |
| @ | Logical Character Delete deletes the preceding character(s). | abc#@@ results in ab abc@d results in abd ¢@def results in def abc@@@ deletes the whole line |
| # | Logical Line End divides a single physical input line into several logical input lines. | down 1#type 1#top results in execution of the commands as though entered: down 1 type 1 top |
| ¢ | Logical Line Delete deletes the preceding logical input line. | abc¢ results in abc#def¢ results in abc abc#def#¢ results in abc def abc#def#¢ghi results in abc defghi Note: The logical line delete symbol (¢) deletes all typed characters back to and including the previous logical line end symbol (#). Use the logical line delete symbol when you have made several errors in a line. |
| " | Logical Escape accepts the following @, #, or ¢ character as data, not as a logical line-editing character. | abc"¢d results in abc¢d ""abc"" results in "abc" Note: The editor ignores any quotation mark (") that appears as the last character of a line. |

Spooling Display Console Output

When you use a display terminal as a console, you do not get a printed record of the commands and responses, as you do with a typewriter-like terminal. A complicated program produces output data and messages on your display console that you may want to keep. You can spool this data to a DASD file or your virtual reader, and print it later. This is called console output spooling. To issue it, use the SPOOL CONSOLE ... and RECEIVE ... commands.

For details of console output spooling, see the following books:

VM/SP CMS User's Guide, SC19-6210

VM/SP CP System Command Reference, SC24-5402

VM/SP Operator's Guide, SC19-6202.

Indicating Program Execution — CMS BLIP

To indicate the progress of program execution, CMS signals you with a BLIP character for every two seconds of elapsed machine execution time. When you choose the real timer option, the BLIP also reflects system time and wait state time.

On typewriter-like terminals, the BLIP character default makes the type ball snap back and forth. Nothing is printed on the paper. You can use the SET command to define an actual character or word for the BLIP and have it print at your terminal.

On display terminals, the BLIP default is OFF; that is, no indication is given unless you use the SET command to define a BLIP character or word. The BLIP character is displayed on a new line in the output area.

For details on how the BLIP character works, see your particular terminal's *User's Guide* and the *VM/SP CMS Command Reference*, SC19-6209.

TAB Key Use

Typewriter-like terminals have a *TAB* key. When you press it, the typing element moves to columns that you specify by using the tab-set and tab-clear keys. Display terminals, however, have no designated tab key and you must define a PF key as a *logical* tab key. In CP/CMS command input mode, the CP SET PFnn TAB t1, t2, ... tn key defines the logical tab key *and* the tab stops. Whenever the assigned PF key is pressed, the cursor moves to the next tab position on the input line. For more information on the CP SET PFnn command, see the *VM/SP CP System Command Reference*, SC24-5402.

When in edit mode, use the SET TABS t1, t2, ... tn subcommand to set the tab stops. Press the PF key assigned *TABKEY* to tab the cursor to the specified columns of the file (see "PF Keys" on page 21). To determine the logical tab settings of a file while in edit mode, use the QUERY TABS subcommand. For a full discussion of these subcommands, see the System Product Editor publications listed in the Bibliography.

To avoid confusion, make sure the physical tab settings on a typewriter-like terminal match the positions of the logical tab settings. For more details, see "Using The TAB Key" on page 27.

Editing a File

When you want to create or change a file, use either the VM/SP System Product Editor (XEDIT) or the CMS Editor (EDIT). XEDIT is preferred because it offers more function, including full-screen display and editing. For examples about using XEDIT, see the *VM/SP System Product Interpreter User's Guide*, SC24-5238 or the *VM/SP System Product Interpreter Reference*, SC24-5239.

For details about using the CMS editor, see the *VM/SP CMS User's Guide*, SC19-6210 and the *VM/SP CMS Command Reference*, SC19-6209.

Using APL

To use APL, you must know the characteristics of your installation's implementation of the VS APL program and whether or not the VSAPL-CMS interface is in place.

In addition to restrictions imposed by the various CP command privilege classes on APL usage, the terminal and the communications controller to which it attaches affects your virtual machine operation. For example, if your terminal connects to a 3704/3705 transmission control unit, VM/SP supports the APL operand of the CP TERMINAL command for:

- Emulation Program (EP) only
- Related virtual machine only if your terminal is equipped with features that support APL operations.

For more information on using APL, see the APL publication listed in the Bibliography and consult your local system administrator.

Using Display Terminals

There are a number of specific characteristics to consider when you use a display terminal. Some of these characteristics are discussed in the following text.

Full-Screen and Line-Mode Display

Recall that when you type commands or data into the user input area and press the ENTER key, the information moves into the output display area. There are different ways, or modes, in which the data reappears:

- In full-screen mode (for 3270 type terminals only), the lines appear in the order that you entered them, until the screen is full and you have to clear it
- In line mode, (for TTY type devices) each new data entry reappears on the same line in the middle of the screen, while previous entries are shifted one line upward until they disappear off the top of the screen.

Typewriter-like terminals, of course, always operate in line mode. The 3101 and 3066 display terminals also operate in line mode in order to use telecommunication lines that have low data-transmission rates. When a display terminal is remotely connected in this way, full-screen mode performance may be hampered by slow transmission.

If you are using the System Product Editor (XEDIT) with one of the IBM 3270 terminals, you can switch between full-screen and line modes of operation by using the SET TERMINAL DISPLAY and SET TERMINAL TYPEWRITER commands.

A remote terminal switched to full-screen display is forced to line-mode operation when you enter input mode. When the terminal leaves input mode, the editor resumes with the mode (full-screen or line mode) in effect before the terminal entered input mode.

Data received by XEDIT from the display may be invalid due to transmission error. A transmission error occurs when either different information is transmitted than was entered by the user or when information received is transmitted when it should not be. XEDIT attempts to validate information received from the display to ensure that the change falls on the screen and within a view of a file. However, it is not always possible to detect errors. If invalid data falls in an unprotected screen area, or in an area protected by the SET CTLCHAR subcommand, then XEDIT cannot prevent this invalid data from being reflected back in the file. Transmission errors should be transient. If transmission errors persist, contact your support personnel.

Note: In the preceding section, full-screen mode refers to the characteristics of the display terminal. This should not be confused with the term *full-screen CMS* mentioned on pages 8 and 10.

Cursor-Controlled Editing

The *cursor* is a spot of light that appears on a display screen. It can be moved around by the cursor control keys. (See Table 6 on page 48.) Move the cursor to a position in the input area in order to add, change, or delete what is there.

If you are using a full-screen editor such as XEDIT, you can also make changes in the output area — just move the cursor to where you want to make the change. Use the INSERT, DELETE, ERASE EOF, and character keys to actually make the change (See Table 7 on page 48.).

PF Keys

Display terminal keyboards include a number of Program Function or *PF* keys. The functions that these keys perform depend on the program that is operating when you press the key(s). That is, pressing a certain key while you are using an editor in the VM environment produces a different result than if you press the same key while your terminal is in the CP environment.

You determine what functions the keys perform by using the QUERY command. By using the SET command, you define the PF keys' functions to perform most CP, CMS, or editing commands. In this way, you use the PF keys to help you perform tasks that would otherwise require you to repeatedly enter the same commands.

Querying PF Key Functions

The QUERY PFnn command determines what functions you have assigned to your PF keys. The format of this command is:

Query PF

or

Query PFnn

nn specifies the number of the key that you want to inspect. Issuing the command line without *nn* allows you to inspect the settings for all program function keys.

Setting PF Key Functions

The SET PFnn command defines the function of a particular PF key. The format of this command is:

SET PFnn command

nn specifies the number of the key that you want to define. Issuing the SET command line without *nn* is not allowed, and produces an error message. *command* specifies the Program Function command that you want when you press PF numbered *nn*. The command that you specify for PF remains valid until you log off or until you respecify PF.

Example -- Using the SET PFnn Command in CMS Mode

In CMS mode, you specify whether the command is executed immediately or if it is delayed so you can change or add details to the command.

For instance, if you defined PF 12 as follows:

SET PF12 IMMED PRINT MEMO1 SCRIPT

the SCRIPT file named *memo1* would be printed when you pressed PF 12. If, however, you defined PF 12 by using the command:

SET PF12 DELAY PRINT MEMO1 SCRIPT

the command

PRINT MEMO1 SCRIPT

would be displayed in the User Input Area, and you would have to press ENTER to run it. While it is in the User Input area, you change the wording of the command to be more useful, or you cancel it as you wish. Using the delay form of PF key definitions is especially helpful if you often use complicated commands that are only slightly different.

Note: You need not actually include the DELAY operand in the SET PF command. It is the default value, and the following SET command that would work the same as the delay example earlier:

SET PF12 PRINT MEMO1 SCRIPT

You can define PF to run more than one function, by including a logical line-end character (#) between the functions. To assign multiple functions to a PF key, enter:

SET LINEDIT OFF

before you use the following format:

SET PFnn command1 #command2 #...commandx

When you finish assigning the function to the PF key, type:

SET LINEDIT ON

CP treats the pound sign (#) as a logical line-end character in the operand line of the SET PFnn command. If you do not use the SET LINEDIT commands, CP interprets your SET PF command to be ended at the first #, and then goes on to immediately run **command2, command3...commandx**. This is probably not what you want to have happen.

Alternatively, you can use the following format without using SET LINEDIT OFF:

SET PFnn command1 "#command2 "#...commandx

In this example, CP treats the double-quotes (") as logical escape. That is, the double-quotes indicate that the following pound signs should be read as data to be entered with the SET PF command, and not read as logical line-end characters.

In either case, pressing PF that you have defined to contain the pound signs causes the commands

command1

command2

commandx

to be issued as though you had typed them separately.

Example -- Using XEDIT Subcommands

Generally, you QUERY and SET the PF keys in the XEDIT subenvironment the same way that was described in the preceding section. The PF functions are valid as long as you are operating in the XEDIT subenvironment.

An important difference is that, in the XEDIT subenvironment, SET and QUERY are actually XEDIT subcommands, and operate slightly differently from the CP commands of the same names. For instance, you QUERY the settings of various editing options that have no meaning in the CMS or CP environments. You SET the PF function to be performed BEFORE, AFTER, or instead of (ONLY) any subcommand that you might also have typed on the command line. You can also SET the PF function to be ignored if there is a subcommand on the command line.

If your PF keys are defined as shown in Table 3, issuing the QUERY PF command results in your terminal screen displaying the listing shown in Figure 4. Table 3 shows the default settings for the PF keys on a 3275 or 3277, when you are using XEDIT. The PF keys on other terminals are set in much the same way, although the keyboard layout is different. Do a QUERY PF to find out which keys perform which functions.

| | | |
|-------------|---------------|--------------------|
| HELP | ADD LINE | QUIT |
| TAB | CLOCATE | <u>?</u> CHANGE |
| ↑ SCROLL | SCROLL ↓ | = |
| ← → | SPLIT JOIN | CURSOR |

| | |
|------|--------------------|
| PF1 | BEFORE HELP MENU |
| PF2 | BEFORE SOS LINEADD |
| PF3 | BEFORE QUIT |
| PF4 | BEFORE TABKEY |
| PF5 | BEFORE SCHANGE 6 |
| PF6 | ONLY ? |
| PF7 | BEFORE BACKWARD |
| PF8 | BEFORE FORWARD |
| PF9 | ONLY = |
| PF10 | BEFORE RGTLEFT |
| PF11 | BEFORE SPLTJOIN |
| PF12 | BEFORE CURSOR HOME |

Figure 4. Display of PF Keys Before SETting XEDIT Functions

It may be that, for your XEDIT session, you will not be needing the HELP function (PF 1). Change the function of PF 1 to perform a more useful subcommand, such as *down 9*, as follows:

SET PF1 ONLY DOWN 9

The PF key stays set to *down 9* until you leave XEDIT or until it is redefined by another SET or CP TERMINAL command. That is, pressing the PF 1 key immediately causes the current line pointer on the screen to move nine lines toward the bottom of the file displayed on the screen. QUERYing the PF settings now produces the display shown in Figure 5.

| | |
|------|--------------------|
| PF1 | BEFORE DOWN 9 |
| PF2 | BEFORE SOS LINEADD |
| PF3 | BEFORE QUIT |
| PF4 | BEFORE TABKEY |
| PF5 | BEFORE SCHANGE 6 |
| PF6 | ONLY ? |
| PF7 | BEFORE BACKWARD |
| PF8 | BEFORE FORWARD |
| PF9 | ONLY = |
| PF10 | BEFORE RGTLEFT |
| PF11 | BEFORE SPLTJOIN |
| PF12 | BEFORE CURSOR HOME |

Figure 5. Display of PF Keys After Setting XEDIT Functions

For more examples and details of setting PF keys when using the System Product Editor, see the *VM/SP System Product Editor User's Guide*, SC24-5220 and the *VM/SP System Product Editor Command and Macro Reference*, SC24-5221.

Defining PF Keys in an Exec

You can SET any number of PF key definitions in an exec. Executing that exec defines (or redefines) all those PF keys at one time. Include CMS PF settings that you find most useful in your PROFILE EXEC file. They automatically take effect after you IPL CMS.

If you use multiple PF key formats, you can assign to one of the PF keys the name of another exec procedure that redefines the PF keys, including one to execute yet a third exec that defines PF keys, and so on. If you get confused while doing this sort of thing, remember that you can always QUERY PF to remind you what the keys do and run the PROFILE EXEC to start over again.

VM/SP exec procedures are detailed in the *VM/SP CMS User's Guide*, SC19-6210. For execs written in the REXX language, see the *VM/SP System Product Interpreter Reference*, SC24-5239.

The PF Key RETRIEVE Function

The RETRIEVE function is initiated by defining a program function key for it, for example:

```
SET PFnn RETrieve
SET PFnn RETrieve forward
```

the RETRIEVE function has backward and forward options. If the forward option is not specifically requested, PF will default to retrieve backward. Pressing the retrieve key displays the most recently saved input line of this terminal session. It displays this line in the User Input Area, so that you modify and reenter the data. If you press PF repeatedly, VM/SP scrolls through the input lines, retrieving input lines

one at a time, from the most recently saved, to the oldest. It then returns to the most recently saved line of input once again.

The forward option for the RETRIEVE function allows you to retrieve input lines in a forward direction, from older to more current lines. If the retrieve forward PF key is pressed just after input is entered, the oldest saved input line is displayed.

Repeatedly pressing PF scrolls forward through the saved input lines, displaying one line at a time until the most recently saved input line is displayed. It then returns to the oldest saved input line once again. Defining PF keys for both options will allow you to scroll through your saved input in any direction. For more information on SET PFnn RETRIEVE, see the *VM/SP CP System Command Reference*, SC24-5402.

VM/SP keeps track of several input lines. The number of lines kept depends on the length of the lines; VM/SP keeps more short lines than long lines, but it always keeps at least one full input line. If a line is the same as the line before it, CP does not keep it. For security reasons, input lines not displayed on the terminal (such as passwords) are not kept, nor are input lines kept from before the last time you logged on.

The PF Key COPY Function

Some display terminals let you copy the full screen display currently appearing on the screen. The SET PFnn COPY command lets you assign a copy function to a specified PF key. Pressing PF copies the current display on the screen by printing the display on an attached printer or typewriter-like terminal. Figure 6 on page 26 shows an example of what could appear on the printed sheet.

Note: The display printer must be varied online and then enabled by the operator before you use the COPY function. VM/SP does not support PF copy for remote dedicated display printers.

If you are using a remotely connected terminal, the display printer must be attached to the same control unit as the display terminal. If you are using a locally connected terminal, the copy of the screen can be printed on any printer. If your display station has only one printer, see the *VM/SP Planning Guide and Reference*, SC19-6201.

```

DEFINE STORAGE 16384K

STORAGE = 16384K

ipl 190

VM/SP CMS - mm/dd/yy  hh:mm

...

...

...

"user identification"

RUNNING ← (status)

```

Figure 6. Sample PFnn COPY Command Printout

Note: For locally attached units, status is not printed.

The “user identification” in the Figure 6 is an identifying name that you should give to the printout sheet if more than one remote terminal is using the printer. To enter this identifier, type it into the user input area immediately before you press the PF copy key.

If you are frequently using the COPY function, set PF with a user identifier as follows:

SET PFnn yourname...dept. no.

Press this PF key just before you press the PF copy key.

EXAMPLES

The following are examples of the SET PFnn IMMED COPY command and the results obtained.

Example 1

SET PF03 IMMED COPY 004

This command sets PF 3 to copy the screen data on the printer that has the resource identification number of 004.

Example 2

SET PF12 IMMED COPY

This command sets PF 12 to copy the screen data on the printer that has the lowest resource identification (if remote or cuu) and that is on the same control unit as the display station.

Example 3

SET PF10 IMMED COPY 109

This command sets PF 10 to copy the screen data on printer 09 of channel 1.

ERRORS

A NOT ACCEPTED message appears in the screen status area if the COPY command is invalid or if the printer is:

- Busy
- Not available
- Not attached to the same control unit as your display terminal (in the case of remotely connected units).

The request to copy the screen is not put in a queue. When the printer is again available, you should press PF again.

For additional information on the PFnn COPY command, see the *VM/SP CP System Command Reference*, SC24-5402.

Using Typewriter-Like Terminals

Using The TAB Key

When you press TAB (or equivalent) on a typewriter-like terminal, the typing element moves to the next physical tab stop position. At the same time, the editor inserts the correct number of spaces into the file.

The number of spaces that are created each time you press the tab key depends on the position of the type ball and the logical tab settings. To determine the logical tab settings of the file you are editing, use the QUERY TABS subcommand; to change the tab settings, use the SET TABS subcommand. For a full discussion of these subcommands, see the System Product Editor publications listed in the Bibliography.

Note: To avoid confusion, make sure the physical tab stops on your terminal match the logical tab settings.

The example that follows illustrates tabbing on a typewriter-like terminal.

1. Set up physical tab stops on the terminal on columns 21, 41, 61, 81, 101, and 121.
2. Use the SET TABS subcommand to set up identical logical tab stops.
3. Enter input mode and enter the indicated letters separated by tab-key action.

Type:

```
AA(tab)BBB(tab)CC(tab)DD(tab)EE....  
AA(tab)BB(tab)CC(tab)DDD(tab)EE....
```

The expanded record as it looks typed on the terminal sheet and in the file:

| | | | | | | |
|----|-----|----|------|----|----|----|
| AA | BBB | CC | DD | EE | FF | GG |
| AA | BB | CC | DDDD | EE | FF | GG |

1 21 41 61 81 101 121

(Columns)

Note: If you want tab characters to be accepted without expansion, use the SET IMAGE subcommand of the editor.

Cancelling Terminal Output

Certain CP console functions produce many lines of output at typewriter-like terminals in response to specific requests. If you want to cancel the output after several lines, press the ATTN key.

To stop CMS output, use the CMS Halt Typing command:

HT

Your program continues to run, but nothing is printed. When your program is finished, and the CMS ready message (see page 6) is produced, regular output resumes.

Chapter 3. Working Session Examples

A Typical Session

Before Attempting to Sign On

Obtain from your system administrator:

your *userid*, and

your *password*.

In many cases this will be all the information you need to use the system. Some VM/SP systems, however, include terminals that are part of a Systems Network Architecture (SNA) network. Find out from your administrator if your terminal is part of an SNA network. If it is, find out if the network is supported by VM SNA Console Support (VSCS) or the Virtual Machine/VTAM Communications Network Application (VM/VCNA).

Starting a Terminal Session (Logging On)

Before you use VM/SP, you must identify yourself to VM/SP by giving your user identification (*userid*) and your password. Both of these were assigned to you when you were originally authorized to access the VM/SP system. This identification procedure is called *logging on*, and establishes communication with CP. When you finish logging on, use the IPL command to load your virtual machine with some operating system, such as VSE, OS, OS/VS1, or the Conversational Monitor System (CMS).

Before using the logon procedure outlines, become familiar with the terminal you are using and turn it on. If someone else has turned on your terminal, before you wanted to use it, you can increase security by turning it off and then on again.

If your terminal is an SNA terminal, read the following section. Otherwise, go to the section titled "VM/SP Log-on Procedures" on page 30.

Logging on to an SNA Terminal

Before you log on to VM/SP, you must first perform an initial logon to a program that acts as a go-between for your terminal and VM/SP. The program will be either VSCS or VCNA.

Note: Some installations automatically log SNA terminals onto this program. If your terminal screen indicates that you are connected to VM/SP, skip the rest of this section and go to the "VM/SP Log-on Procedures" on page 30.

First, press the system request key (ATTN key), or if the keyboard is not equipped with one, press a key with equivalent function on the terminal keyboard. (Refer to Table 1 on page 3 for procedures to obtain equivalent functions for different terminal types.) Pressing the key lets your terminal contact VSCS or VCNA.

You must now perform your initial logon to VSCS or VCNA. The logon is:
LOGON APPLID(programid)

The *programid* for both VSCS and VCNA is most likely defined by your installation. This requires that you obtain the proper program id defined by your installation. If we assume that your installation has defined the VSCS program id as *VM1*, you would type *LOGON APPLID(VM1)*. ACF/VTAM also allows a shorter form of the LOGON. You could log on to VSCS by simply typing:

```
VM1
```

After doing this logon, your screen should indicate that you are connected to the VM/SP system. You may now log on to VM/SP by following the procedures discussed under "VM/SP Log-on Procedures."

VM/SP logon information is included as parameters on the VSCS or VCNA logon. This lets you reach VM/SP in one step. Possible combinations are:

```
LOGON APPLID(VM1) DATA(userid)
LOGON APPLID(VM1) DATA('userid options')
LOGON APPLID(VM1) DATA('DIAL userid')
```

In general, any CP command valid before a CP logon is used as data.

The CP DIAL command lets you attach a terminal (including a graphic device) to another virtual machine. This makes the SNA terminal appear to a virtual machine as a non-SNA terminal. You can also use this command to let non-SNA 3270 terminals, controlled by VM/SP, link to the ACF/VTAM machine and access application programs. You can issue the CP DIAL command with the logon or when the VM/SP logo is displayed.

Note: If you are using a nondisplay (keyboard/printer) terminal, you cannot include the DIAL command with the logon.

VM/SP Log-on Procedures

The following procedures should be followed when you want to logon to the system. If one or more of the procedures do not apply to your terminal or system, omit the procedure and go to the next one.

1. If someone else has turned on your terminal before you wanted to use it, you can increase security by turning it off and then on again.
2. Establish a communications connection between the terminal and the processor, as outlined in "Establishing a Physical Connection" on page 14.
3. If your terminal is a Systems Network Architecture (SNA) terminal supported through the VM SNA Console Services (VSCS) or Virtual Machine/VTAM Communications Network Application (VTAM/VCNA), press the system request key. This switches you to VTAM, and logs you on to the VTAM application. This ensures that your terminal is logically connected to your VM/SP system and not to some other user's virtual machine.
4. VM/SP acknowledges that communication has been established by displaying or printing a message in one of the following formats. For the message to be displayed or printed, VM/SP must be operational and the terminal must be turned on and connected to the system. The specific message that you receive is determined by the terminal type you are using. The terminal types and the corresponding messages are as follows:

TTY

```
VIRTUAL MACHINE/SYSTEM PRODUCT--systemid--
PRESS BREAK KEY TO BEGIN SESSION
```

3210, 3215

```
VIRTUAL MACHINE/SYSTEM PRODUCT--systemid--  
PRESS REQUEST KEY TO BEGIN SESSION
```

1050, 2741

```
VIRTUAL MACHINE/SYSTEM PRODUCT--systemid--  
PRESS ATTN KEY TO BEGIN SESSION
```

327x, 3290

```
VIRTUAL MACHINE/SYSTEM PRODUCT--
```

Notes:

- The systemid in the message for TTY and 3210, 3215, 1050, and 2741 terminal types is a user defined system identifier.
- The message printed on 2741 terminals appears twice; once with `xxxxxx` following the message and once with `xxxxxx xxxxxx` preceding the message. This is because the system does not yet know what type of 2741 terminal is active. In either case, ignore the portion indicated by the `x` string. Also, if one of the messages appears garbled, ignore that message.

When some display terminals are first turned on, the VM/SP system to which they are attached writes an installation-defined logo screen to the device. See Figure 7 for a typical sample logo screen for a 327X.

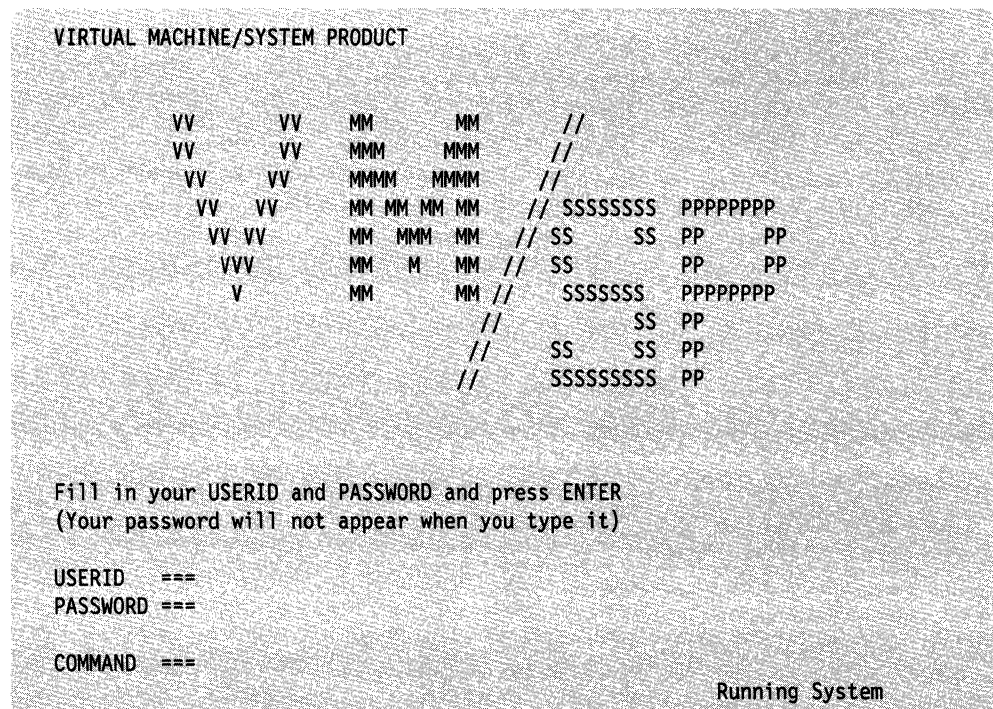


Figure 7. Sample Logo on an Activated Terminal Screen for a 327X

- Press the key specified by the `VIRTUAL MACHINE/SYSTEM PRODUCT` message, or initiate the logon procedure directly from the logo screen.

6. The system responds by entering the following prompt:

```
Enter one of the following commands:
LOGON userid          (Example: LOGON VMUSER1)
DIAL userid          (Example: DIAL VMUSER2)
MSG userid message   (Example: MSG VMUSER2 GOOD MORNING)
LOGOFF
```

Note: If your terminal is not a 3270-type, proceed to step 8.

7. If your terminal is a 3270-type terminal directly attached to VM/SP or a 3270-type SNA terminal attached to VM/SP via VTAM 3.1.1 and VSCS R2, you may log on directly from the logo screen.

Below the actual VM/SP logo on the logo screen are two lines instructing you to fill in your user ID and password. Following these instructions are three input lines labeled USERID, PASSWORD, and COMMAND. The cursor is placed at the input line for USERID.

Type your user ID and password in the USERID and PASSWORD input areas and press ENTER. If all of the information is entered correctly, the logo is cleared from the screen, no further prompts appear, and you will be logged on to the system. If an invalid user ID or password is entered (for example, line-editing characters are not valid password entries), the logo is cleared from the screen, and the following message and prompt are displayed:

```
DMKLOG050E LOGON unsuccessful--incorrect password
```

or

```
DMKLOG053E userid not in CP directory
Enter one of the following commands on the COMMAND line below:
LOGON userid          (Example: LOGON VMUSER1)
DIAL userid          (Example: DIAL VMUSER2)
MSG userid message   (Example: MSG VMUSER2 GOOD MORNING)
LOGOFF
```

If you enter only your PASSWORD in the input area or if your USERID, as entered, contains one or more blanks (VMUSER1), the following error message is displayed, followed by the logon prompts:

```
DMKCFM288E LOGON from the initial screen was unsuccessful
```

You can also enter your user ID in the USERID input area, without your password or enter the LOGON command, followed by your user ID, in the COMMAND input area. The following prompt is displayed:

```
Enter password (It will not appear when typed):
```

If you have correctly entered the information, the logo is cleared from the screen and you are logged on to the system.

Note: If you are using a 3270-type terminal, and have completed the logon procedure described, you can proceed to step 9.

8. Identify yourself to the system by entering the LOGON command and your user ID, as follows:

Logon userid

If the logon and user ID are correct, VM/SP displays the following:

```
Enter password (It will not appear when typed):
```

When you enter your password on a display terminal, the password is not displayed on the screen. In this way, VM/SP preserves the security of your password. Note that line-editing characters are not valid password entries.

When you use a typewriter-like or line-mode display terminal as a real system console or a VM/SP system console, you (or the system operator) can log on but cannot automatically protect your password. In these cases, once the password is typed, you (or the system operator) must mark over it or otherwise delete it.

Several different types of error conditions can occur during the logon procedure. (See "Error Messages during Logon" on page 35 for more information.) Messages and prompts are issued to help you recover from these errors as follows:

- User errors during the logon procedure

The following messages are issued for situations that prevent the logon process from being completed:

```
DMKLOG003E Invalid option - option
DMKLOG020E Userid missing or invalid
DMKLOG053E userid not in CP directory
DMKLOG054E Already logged on type rdev
DMKLOG067E Command format not valid
DMKCFM288E LOGON from the initial screen was unsuccessful
```

The following prompt is immediately displayed following any of these messages:

```
Enter one of the following commands:
LOGON userid          (Example: LOGON VMUSER1)
DIAL userid           (Example: DIAL VMUSER2)
MSG userid message   (Example: MSG VMUSER2 GOOD MORNING)
LOGOFF
```

- Invalid password entered during the logon procedure

If you enter an invalid or incorrect password during the logon procedure you receive the message:

```
DMKLOG050E LOGON unsuccessful--incorrect password
```

The following prompt is immediately displayed following the message:

```
Enter one of the following commands:
LOGON userid          (Example: LOGON VMUSER1)
DIAL userid           (Example: DIAL VMUSER2)
MSG userid message   (Example: MSG VMUSER2 GOOD MORNING)
LOGOFF
```

- Invalid commands

If you are not currently logged on when you enter an invalid command, you receive the message:

```
DMKFC015E Command not valid before LOGON: command
```

The following prompt is immediately displayed following the message:

```
Enter one of the following commands:  
LOGON userid          (Example: LOGON VMUSER1)  
DIAL userid           (Example: DIAL VMUSER2)  
MSG userid message    (Example: MSG VMUSER2 GOOD MORNING)  
LOGOFF
```

Exception:

If the terminal is a 2741 and the line code has not been identified, you will receive the message **RESTART** and no logon prompt will be sent. You must then re-enter **LOGON userid** on the command line.

If you are currently logged on when you enter an invalid command, you receive the message:

```
Unknown CP command: command
```

9. Assuming no logon errors, VM/SP acknowledges the logon with the following kinds of messages:

- Informational message(s) regarding linkage status of minidisks attached to your virtual machine
- LOGMSG setup time; that is, the time and date that the operator created a log message
- The log message line(s) that the operator created
- The FILES message (which tells you if you have any virtual reader, print, or punch files).
- The LOGON message.

If the VM/SP system operator has set up a log message that has asterisks (*) in the first column of the lines, they automatically appear on your terminal at this time. For example:

```
LOGMSG 09:34:54 12/30/84  
* FOR CMS, IPL 190 UNTIL FURTHER NOTICE  
* QUERY LOG FOR ADDITIONAL INFO.
```

Note: After you finish logging on, you can enter:

QUERY LOG

to obtain additional log message lines that do not have an asterisk in the first character position.

Following the log message, if any files are in your virtual card reader, printer, or punch, the message:

```
FILES: xxx RDR, xxx PRT, xxx PUN
```

is displayed, where **xxx** indicates the number of files of each type. VM/SP omits this message if there are none.

The system then displays a LOGON message that gives the time and date:

```
LOGON AT hh:mm:ss zzz weekday mm/dd/yy
```

where:

hh:mm:ss is the time of day

zzz is the time zone (for example, EST, EDT, CST, and so on)

weekday is the day of the week

mm/dd/yy is the date

The LOGON message indicates that VM/SP accepted the password and that the logon procedure is finished. Your terminal is now in the control program (CP) environment and you can issue any valid CP console function. You can also load any operating system into your virtual machine. To load CMS into the virtual machine, proceed to “Establishing Contact with CMS (IPL-ing)” on page 37.

10. To load an operating system other than CMS, issue the IPL command specifying the address of the virtual device that contains the operating system to be loaded (for example, IPL 293, or IPL 00C), or the system name if it is a saved system. If the device identified in the IPL command contains an operating system (such as OS/VS1), your terminal becomes the system console for that virtual machine.

Note: During logon for dial-up terminals, VM/SP uses the Line Timeout feature when it reads the user ID and password. If you fail to type any character during a 28-second period, the line is considered unused, and VM/SP disconnects the line. This feature prevents teleprocessing facilities from being tied up by unauthorized or accidental connections to VM/SP. You must redial the line.

Error Messages during Logon

Some of the reasons that VM/SP may reject your request for access are:

- Invalid password used
- User ID is already in use
- User ID is invalid or missing (not in VM/SP directory)
- An error occurred while reading your VM/SP directory entry.

When you try to log on from a 3278 or 3279 terminal, there are certain instances when the keyboard is locked and an error indicator appears in the operator information area of the screen. To clear the logo and enter the LOGON command, first press RESET, and then ENTER. If the condition consistently occurs, have the system programmer refer to the *VM/SP Installation Guide*, SC24-5237 to ensure that the necessary 3274 RPQs and hardware configuration support features have been installed.

Examples of VM/SP Error Messages

The following are some error messages that can appear at your terminal. Their meaning and suggested user actions are given. In this publication, variable terms in message examples are shown in lowercase; for example, *raddr* (real address) or *userid* (user identification). When these expressions appear on the display screen or print on your typewriter-like terminal sheet during a session, they give you the real device address or your identification.

DMKLOG003E Invalid option - option

you supplied an invalid option. The option that you supplied is shown in the message. Enter one of the commands indicated in the prompt which appears after the message. The command must be entered in the displayed format.

DMKFC015E Command not valid before LOGON: command

you supplied an invalid command before the logon process successfully completed. The command that you supplied is shown in the message. Enter one of the commands indicated in the prompt which appears after the message. The command must be entered in the displayed format.

DMKLOG020E Userid missing or invalid

you failed to provide a user ID or the user ID that you supplied was more than eight characters long. Choose one of the commands indicated in the prompt which appears after the message on your terminal. Be sure that the user ID is correct.

DMKLOG050E LOGON unsuccessful--incorrect password

you supplied an incorrect password. Enter one of the commands indicated in the prompt which appears after the message. The command must be entered as shown in the prompt. You will be asked to provide the password. You cannot see the password as it is entered, so be sure to correctly enter it. For example, line-editing characters are not valid password entries.

DMKLOG053E userid not in CP directory

The user ID that you supplied does not appear in the CP directory in the system. Be sure to use one of the commands indicated with the prompt and in the format shown. Be sure that the user ID is correct.

DMKLOG054E Already logged on type rdev

The user ID that you supplied is already active at the terminal whose real line address (*raddr*) is specified by three hexadecimal digits.

VM/SP does not allow two users with the same user ID to be logged on at the same time. Although you cannot log on, you can use the CP MESSAGE command to communicate with the user who is already logged on with that user ID or with the system operator.

DMKLOG067E Command format not valid

The format of the command that you supplied was not recognized by the system. Be sure to use one of the commands indicated with the prompt and in the format shown.

DMKCFM288E LOGON from the initial screen was unsuccessful

You entered only your password, or your user ID contained one or more blanks. Choose one of the commands indicated in the prompt which appears after the message on your terminal.

DMKLOG780E Maximum password attempts exceeded, try again later

You have exceeded the number of times allowed to enter an invalid password. You must now wait a specified amount of time before logging on or you will get the same message.

Unknown CP command: command

The command that you supplied was not a valid CP command. The command that you supplied is shown in the message.

For other messages and their meanings, see the *VM/SP System Messages and Codes*, SC19-6204 book.

Establishing Contact with CMS (IPL-ing)

Remember, you must operate in the CMS environment to run programs and to manipulate files. You use the IPL (Initial Program Load) command to establish contact with the CMS environment.

Some installations automatically run IPL as part of the logon procedure. If this is the case, you will not have to issue the IPL command yourself. Otherwise, run CMS in a typical installation by entering:

Ipl CMS

This loads a copy of the CMS system into your virtual machine.

Note: A saved CMS system need not be named *CMS*.

You can include a number of options on the IPL command that are helpful. For more information about the IPL command options, see the *VM/SP CP System Command Reference*, SC24-5402.

The terminal then displays an installation-defined message, perhaps like the following:

```
VM/SP CMS - 02/27/85 10:23 A.M. Welcome to CMS!
```

Press ENTER to run your PROFILE EXEC You must do this before you perform any real work. The PROFILE EXEC contains executable statements, such as CP and CMS commands. Typically, you would include in your PROFILE those CP and CMS commands that you would regularly enter at the start of every terminal session. Because your PROFILE runs automatically runs after CMS is loaded, you are relieved of the chore of entering these commands.

The CMS system is now in control and you can enter any CMS command. For a detailed description of the CMS facilities available, see the *VM/SP CMS User's Guide*, SC19-6210.

What Commands Can You Use?

In the CMS environment, the following message is displayed when you enter an invalid or unknown CP or CMS command:

```
Unknown CP/CMS command
```

If you use *CP* to prefix an invalid or unknown CP command, VM/SP enters a -1 return code response in the format:

```
Ready (-0001);
```

You might get these messages if you misspelled a command.

Note: If you have problems, use the CMS HELP command. For details, see the *VM/SP CMS Command Reference*, SC19-6209.

In the CP environment, if you enter a command that is not a valid CP command or one that requires a privilege class that you do not have, the following message is displayed:

```
Unknown CP command: command
```

The commands that you use depend upon the user privilege class you are assigned to. If you do not know the privilege class assigned to you, contact the VM/SP system administrator. If you wish to know which CP commands are available to your assigned privilege class or classes, refer to the *VM/SP CP Command Reference for General Users* book and the *VM/SP Operator's Guide*, SC19-6202.

Ending the Terminal Session

When you finish using the VM/SP system and wish to end the terminal session, log off from VM/SP by entering the LOGOFF command as described in "VM/SP Logoff Procedures."

VM/SP Logoff Procedures

If you are not already in either the CP or CMS environment at the time you wish to log off (that is, you are still using DOS, OS, or OS/VS1 in your virtual machine), enter the CP environment by entering the #CP command.

Then enter:

LOGoff

The following message is displayed:

```
CONNECT=hh:mm:ss VIRTCPU=mmm:ss.hs TOTCPU=mmm:ss.hs  
LOGOFF AT hh:mm:ss zzz weekday mm/dd/yy
```

and then displays one of the following, depending on the type of terminal you are using:

327x, 3290

```
Press enter or clear key to continue
```

SNA

```
Press enter key to continue
```

Pressing the appropriate key on your terminal causes the logo to appear on the screen which readies the terminal for the next session. For terminals not listed, control automatically returns to CP and the VIRTUAL MACHINE/SYSTEM PRODUCT message is printed.

This is also the case if you initiate a session on a remote system (CP DIAL command) and your session is interrupted and you receive the message:

```
DROP FROM userid
```

The CONNECT time is in hours, minutes, and seconds; the virtual processor (VIRTCPU) and total processor (TOTCPU) times are in minutes, seconds, and hundredths of a second. The logoff procedure then ends, the switched or dial-up line connection is broken, and you can turn off the terminal.

To end the terminal session, without losing the dial-up or switched connection with the processor (so another user can log on from the same terminal), enter:

LOGoff HOLD

The HOLD option requests CP to maintain the line connection with VM/SP and to produce the VIRTUAL MACHINE/SYSTEM PRODUCT message again, at the beginning of the log-on procedure. The next user then logs on to VM/SP without having to re-establish a line connection.

Logging off an SNA Terminal

You may log off VM/SP in any of the ways described in "VM/SP Logoff Procedures" on page 38. If you have logged on to VSCS or VCNA followed by VM/SP in separate steps, you remain logged on to VSCS or VCNA even after the VM/SP logoff. The VM/SP logo reappears and lets you log on to VM/SP again, or issue the VMEXIT command to log off VSCS or VCNA and return control to ACF/VTAM.

If you have logged on to VM/SP in one step, the CP LOGOFF command also logs you off VSCS or VCNA. Terminals dialed into the ACF/VTAM virtual machine use the UNDIAL command to disconnect from ACF/VTAM. You can also end sessions with VM/SP by turning your terminal off, then on. VSCS and VCNA disconnects your terminal when you turn the power off.

Disconnecting Your Terminal

There are situations when you should disconnect your terminal from your virtual machine. For example, let us say that you are running a job that takes a considerable amount of time to complete and requires no terminal input from you. If you had a second user ID, you could log on to a different terminal and do other work while your first job continued running.

By using the CP commands, SET RUN ON and DISCONN, you can disconnect your terminal from your virtual machine and let the program continue running unattended. You then log on again at the *same* terminal, using your secondary user

ID, and use another virtual machine to do other work. This is to your advantage if you can access only one terminal.

Alternatively, by letting a program run disconnected, you turn off your terminal and leave it unattended without compromising security.

Note: Your program runs disconnected until you again reconnect by issuing the LOGON command.

If, while running disconnected,

- Your program makes a read request to your terminal, or
- If the virtual machine goes into a disabled WAIT state,

you have about 15 minutes to log on (that is, reconnect your terminal to your virtual machine) before your virtual machine is automatically logged off. Therefore, you should not disconnect if your program requires a response from your terminal, because the read request cannot be satisfied.

Example

After starting a program that runs unattended, enter:

```
#CP SET RUN ON  
#CP DISConn
```

If your terminal is connected by a switched line, include the HOLD option on the DISCONN command by entering:

```
#CP DISConn HOLD
```

This prevents you from having to re-establish the terminal connection.

The system displays a message like the logoff message:

```
DISCONNECT AT ...
```

followed by one of the following, depending on the type of terminal you are using:

327x, 3290

```
Press enter or clear key to continue
```

SNA

```
Press enter key to continue
```

By pressing the appropriate key on your terminal causes the logo to appear on the terminal which readies the terminal for the next session. For terminals not listed, control automatically returns to CP and the **VIRTUAL MACHINE/SYSTEM PRODUCT** message is printed. You now either turn off your terminal or start the logon procedure with your secondary user ID.

For details of the SET RUN and DISCONN commands, see the *VM/SP CP System Command Reference*, SC24-5402.

Log-Off and Security

When telecommunication line failures affect VM/SP, it places your virtual machine in a DISCONNECT status for 15 minutes. You have 15 minutes to re-establish the connection for your virtual machine before an automatic logoff occurs.

For example, assume that you have completed your virtual machine activity, and you turn off your terminal instead of issuing the LOGOFF command. Your virtual machine is still logged on until:

- CP attempts to write data to your terminal while it is turned off, or
- Your terminal is turned on again.

When one of these conditions occurs, your virtual machine is placed in DISCONNECT status. It remains disconnected for 15 minutes (unless you reconnect), and then is logged off. Even if another user turns on the same terminal, he or she cannot use your virtual machine; he or she must log on, using his own user ID. The virtual machine is reconnected only by the regular logon procedure, which requires password identification.

Note: The same sequence of events occurs:

- If your terminal is physically disconnected from the control unit, or
- If, on some terminals, the security key is turned to the locked position and then turned back to the unlocked position, or
- When, on some display terminals, the unit is switched to TEST mode and then back.

Note: If you turn off the terminal without issuing the LOGOFF command when you finish using VM/SP, you are charged with at least of 15 minutes more system connect time than you actually used.

Other Operating Systems

CP lets you use a number of operating systems other than CMS in a virtual machine environment. They include batch or single-user interactive systems such as DOS/VSE, GCS, and RSCS, and multiple-access systems such as TSO (the time-sharing option of OS), and DOS/VSE with VSE/ICCF.

This book does not discuss these alternative operating systems but detailed information can be found in the following books:

VM/SP Running Guest Operating Systems, GC19-6212

VM/SP Diagnosis Guide, LY24-5241

VM/SP Application Development Guide for CMS, SC24-5286.

A Complex Session

When two or more computers are interconnected so that you can send messages and data between them, they compose a network of computers. The network is small, with only two or three computers participating in it, or very large, perhaps spanning an entire continent.

Remote Spooling Communication Subsystem Networking (RSCS) and the VM/Pass-Through Facility are program products that help a computer participate in a network. In the example that follows, we will assume that your computer is part of a network and has RSCS and Pass-Through available to it. Both RSCS and Pass-Through run disconnected in their own virtual machines. For information on these program products, see the related publications listed in the Bibliography.

Each computer in a network is called a node, and has a *node id*, that is, an identifying name by which it is known to all other computers in the network. Let's assume that the node id of our computer is HOME.

Example

You are on a business trip to a distant location. A VM/SP user there, named Joan, needs a file that you wrote at your home location, so you decide to send it to her, as follows:

1. Turn on a terminal that is connected to a computer in the network. The VIRTUAL MACHINE/SYSTEM PRODUCT message appears. The system responds in the same way as described in "VM/SP Log-on Procedures" on page 30. However, because you are not connected to the system where your data files are stored, you need to enter the DIAL command. **Do not attempt to log on.**

2. Enter the DIAL command to activate Pass-Through:

DIAL pvmid

where *pvmid* is the name of the virtual machine that Pass-Through is running in. If the logo screen did not tell the name of the Pass-Through virtual machine, ask Joan. It is probably no big secret.

Pass-Through asks you for the node id of the computer you want to communicate with. In this case, it is HOME.

After you reply, the VIRTUAL MACHINE/SYSTEM PRODUCT message (and logo screen) of your home system is displayed. You now operate as if you were seated at a terminal at your home location:

3. Log on to your home system, using your own user ID and passwords, as usual.
4. You may want to inspect the file you are going to transmit to Joan, to verify it is actually the one she needs. Do so, using your favorite file editor, and file any changes you make.
5. Ask Joan what her user ID is and the node ID of her location. (It is JOANSID, at BIGTOWN.) Tell your home system to transmit a copy of the file to Joan's virtual machine at her location issue:

SENDFILE *fn ft* TO JOANSID AT BIGTOWN

where *fn* and *ft* are the filename and filetype of the file you want to send to Joan. This starts the file on its way through the network to Joan's virtual reader at BIGTOWN.

RSCS produces some messages that trace the progress of the file through the network but, practically speaking, your work on the home system is finished, and you can enter:

6. LOGoff

But, do *not* turn off the terminal! You are still communicating with the Pass-Through Facility, which at this time tells you how to break communication. When you follow its instructions, VM/SP replies with a message like:

```
DROP FROM pvmid ...
```

followed by one of the following, depending on the type of terminal you are using:

327x, 3290

```
Press enter or clear key to continue
```

SNA

```
Press enter key to continue
```

Pressing the appropriate key on your terminal causes the logo to appear on the terminal which readies the terminal for the next action. For terminals not listed, control automatically returns to CP and the VIRTUAL MACHINE/SYSTEM PRODUCT message is printed.

7. Press the ENTER key to get the BIGTOWN VIRTUAL MACHINE/SYSTEM PRODUCT message (and logo screen). Turn off the terminal.

Epilogue

At this point Joan might want to log on to her virtual machine, load the file you sent her (which probably has now arrived at her virtual reader), and use it. But that is another story. The point to this example was to demonstrate a set of nested sessions, a series of events with definite beginnings and ends. That is,

you turned on a terminal to start a *terminal session*,

you issued a DIAL command to start a *Pass-Through session*,

you logged on to your home system to start a *VM session*,

you issued an XEDIT command to start an *edit session*.

Then, you issued a FILE or QUIT subcommand to end the edit session,

you issued a LOGOFF command to end the VM session,

you ended the Pass-Through session, and

you turned off the terminal to end the terminal session.

In using a nested session, you operated in different environments, transferring control and switching modes as you proceeded. To do this, you issued a few simple commands that were interpreted by the proper environments to perform some very complex operations.

This book only begins to suggest the power of VM/SP available to you. The books listed in the Preface, Bibliography, and mentioned in the text help you put the power of VM/SP to work.

Chapter 4. Some VM/SP Terminals

Common Terminal Features

Many of the terminals described in this chapter have common features such as keyboards and video display units. In most cases, differences between the features of the terminal are relatively small, while similarities are great. Rather than repeatedly describe similar features on each terminal, each individual description of a terminal emphasizes the differences and refers you to the following charts for the similarities.

Video Display Unit

Figure 8 shows a typical video display unit. The illustrated features include switches and controls.

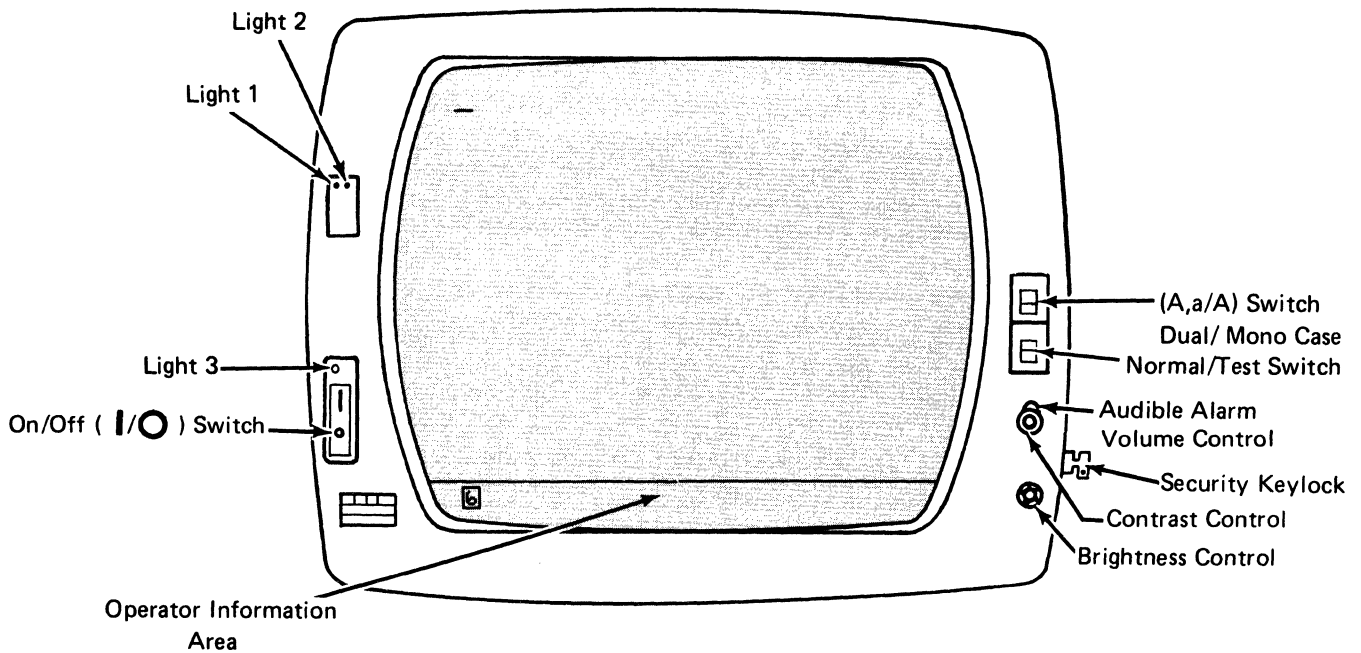





Figure 8. A Typical Video Display Unit

Switches and Controls

Labels and corresponding functions for switches and controls that are on many video display units are listed in Table 4.

| Table 4 (Page 1 of 2). Common Video Display Unit Switches and Controls | |
|--|---|
| Label | Function |
| O (Power) | An ON-OFF rocker switch; press the side of the switch to turn the terminal on, and press the O side to turn it off. |

Table 4 (Page 2 of 2). Common Video Display Unit Switches and Controls

| Label | Function |
|---|---|
|  | Contrast control. |
|  | Brightness control. |
| A,a A | Case switch. Press the A,a side of the switch to obtain mixed (both upper and lower) case; press the A side for upper case only. |
| Normal Test | (Normal/Test switch) The TEST position produces a test pattern on the screen. Use the NORMAL position for all other activities. |
|  | (Audible Signal Loudness Control) This may be a tab on the same shaft as the contrast control. Turn it clockwise to make the audible signal louder, counter-clockwise to make it quieter. |

Indicator Lamps

Table 5. Common Video Display Unit Indicator Lamps

| Label | Function |
|----------|---|
| Power On | Is lit when the power switch is ON. (May be unlabeled, or labelled "3.") |
| 1 | Light 1 -- blinks when the TEST/NORMAL switch is set to TEST. Otherwise, it is not lit. |
| 2 | Light 2 -- is lit when the TEST/NORMAL switch is set to TEST, or when your terminal is ready to communicate with the host computer. |

Keyboard

Figure 9 on page 47 shows a typical keyboard. The illustrated features include character keys, program function (PF) keys, and screen management keys.

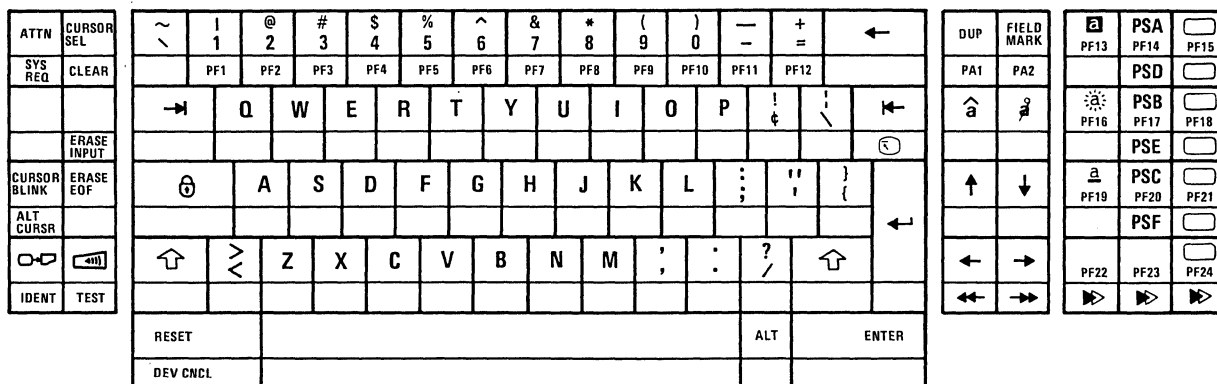




Figure 9. A Typical Keyboard

Character Keys

The character keys include:

- Alphabetic (A through Z). Alphabetic keys on some terminals are typamatic; that is, the character repeats if the key is pressed and held down.
- Numeric (0 through 9)
- Punctuation characters such as , ; ? !
- Special characters such as @, \$, %, and "
- APL characters: if your keyboard is operating in APL mode, press and hold the ALT key, then press a character key to obtain the APL function that is engraved on it.
- Text characters: if your keyboard is operating in Text mode, press and hold the ALT key, then press a character key to obtain the Text character engraved on it.

Control Keys

All the terminals discussed in this book have a space bar and SHIFT and SHIFT LOCK keys. (On some terminals the SHIFT key is labeled with a , and the SHIFT LOCK key is labeled with a .) Typewriter-like terminals also have tab control and margin control keys. These operate the same as those on an electric typewriter. In addition, most terminals have:

Program Function (PF) Keys

You can define these keys to have either command or data-input capability by using the SET PFnn command. (For information on this command, see the *VM/SP CP System Command Reference*, SC24-5402.) For examples of using PF keys see "PF Keys" on page 21.

Note that on different terminals, you may have to:

- Press the REQ (request) key before you obtain PF functions
- Press *and hold* the ALT (alternative function) key then press a PF key to obtain its function
- Press and hold the ALT key to obtain *other than* the PF function marked on a key.

Cursor Positioning Keys





There are several keys on the keyboard that let you rapidly position the cursor to any display image location on the screen. The keys are marked with directional arrows for easy identification (See Table 6).




| Key | Action | Meaning |
|-----|-----------|---|
| ↑ | Up | Moves the cursor up one line. |
| ↓ | Down | Moves the cursor down one line. |
| → | Right | Moves the cursor one character position to the right. |
| ← | Left | Moves the cursor one character position to the left. |
| ← | Backspace | Moves the cursor one character position to the left. |
| → | Tab | Moves cursor to next tab stop position or the first data character position of the next unprotected field — whichever is first. |
| ← | Back tab | Moves the cursor to the next left tab position or the first data character position (also left) in an unprotected field. The cursor skips over attribute characters as well as other tab stops. |
| ↵ | New line | Moves the cursor to the first character position of the next lower line. (On certain terminals, such as the 3101, the cursor may move to the first position of the current line, the third lower line, or the home position, depending on the setup switch settings.) |
| ↶ | Home | Moves the cursor to a position defined by the controlling program. |

Screen Management Keys

Screen management keys include control keys *other* than PF keys and cursor positioning keys. They are listed in Table 7.

| Key | Use |
|------|---|
| ATTN | (Attention) Sends an attention signal to the operating program. The response is a function of the program. |
| ALT | (Alternative Function) On certain keyboards, several functions are performed by one key. To perform the function shown on the front face — versus the top — of the key, press and hold the ALT key before pressing the character key. |

| Table 7 (Page 2 of 3). Screen Management Control Keys | |
|--|--|
| Key | Use |
| ALT CURSR --or-- Altcr | (Alternative Cursor) Different cursors are available on certain keyboards. Press the ALT CURSR or Altcr key to switch back and forth between the regular cursor and the alternative form. |
| APL ON-OFF | Switches your terminal in and out of APL mode; that is, press this key to obtain the APL functions engraved on the keys. Press it again to return to typewriter mode. |
| CLEAR | Clears entire screen -- output area, input area, and status area. |
|  | (Click Key) Activates (and deactivates) the keyboard clicker. |
| CURSR BLINK | (Cursor blink) Switches between blinking and steady cursor. |
| DEL -- or --  | (Delete) Erases the character indicated by the cursor and shifts the data line one space to the left. |
| DUP | (Duplicate) Indicates to a program repeated information. No function with VM/SP. |
| ENTER | End-of-input signal: requests the control system to accept the data or command that you typed into the user input area. On some terminals, if the user input area is blank, an attention interrupt is sent to the virtual machine or control program. (See Table 1 on page 3.) |
| ERASE INPUT --or-- Erinp | Erases the user-input area. |
| ERASE EOF | Erases from the cursor to the end of the line. |
| INS MODE -- or --  | Press this key to enter "insert mode." Then press any character key to insert the character into the line of data at the position indicated by the cursor. (Data already present in the data line is pushed to the right.) Press the RESET key to leave insert mode. |
| FIELD MARK | No function with VM/SP when in CP/CMS command mode. When in CMS (tab character) into the file. |
|  | (Print) Causes information on your screen to be printed on the printer assigned to your display station. |
| PA1 | (Program Access) Posts an attention interruption pending to the CP command environment. The PA1 key puts your terminal into CP mode if you press it while the screen indicates RUNNING or VM READ status. If you press the PA1 key while the screen indicates CP READ, the key signals attention to the virtual operating system. Note that the CP TERMINAL MODE command does not affect the PA1 key, it affects only the ENTER key. |

| Table 7 (Page 3 of 3). Screen Management Control Keys | |
|---|---|
| Key | Use |
| PA2 | <p>(Program Access) Clears the output display area. If APL is on, clears the screen and presents an interruption to the virtual machine.</p> <p>On the 3270, press the PA2 key to clear the screen and display the next sequential information.</p> <p>On other than the 3270, when you press the PA2 key while the screen is in HOLDING status and TERMINAL MODE CP is set, the screen clears and any following data is not displayed; thus, to display data on your screen:</p> <ol style="list-style-type: none"> 1. First press the ENTER key, which causes the screen to go to MORE... status. 2. Then press the PA2 (CANCEL) key, which causes the next sequence of data to appear. |
| PA3 | (Program Access) Function defined by the controlling program. |
| PSA through PSF | (Programmed Symbol Keys) Lets you to select an operator-selectable symbol set, if one is available. |
|  | (Reverse video highlighting) Causes typed characters to appear in reverse video (dark character on bright background). |
|  | (Blink Character) Causes typed characters to blink. |
|  | (Underscore Highlighting) Causes typed characters to appear with underscore highlighting. |

Chapter 5. EBCDIC Devices

All the terminals devices discussed in this section operate in EBCDIC character mode. EBCDIC is the acronym for Extended Binary Coded Decimal Interchange Code; that is, a coded character set consisting of 8-bit coded characters. Many of the devices supported by IBM are in the EBCDIC mode. Therefore, much of the information follows conforms to the common terminal features discussed earlier in Chapter 4.

The actual IBM terminals discussed in this section are:

- 3178 Display Station
- 3270 Information Display Station Terminals
- 3277 Display Station
- 3278 Display Station
- 3279 ColorDisplay Station
- 3290 Information Panel
- Personal Computer

IBM 3178 Display Station

The IBM 3178 Display Station is a general-purpose display station which uses the same commands and orders used by the IBM 3278 Model 2 Display Station. VM/SP supports Models C1, C2, C3, and C4, which differ by keyboard layout. For details on the 3178 Display Station, see the: *IBM 3178 Display Station Description*, GA18-2127 and the *IBM 3178 Display Station Operator Reference Guide*, GA18-2128.



Figure 10. IBM 3178 Display Station

The 3178 Display Station is modular and consists of three separate units: the video display unit, the logic element, and the keyboard. These units can be arranged, within limits, to let the operator select a comfortable operating position. The light-weight modular construction also lets the 3178 be easily installed and relocated. The three units are illustrated in Figure 11 on page 53.

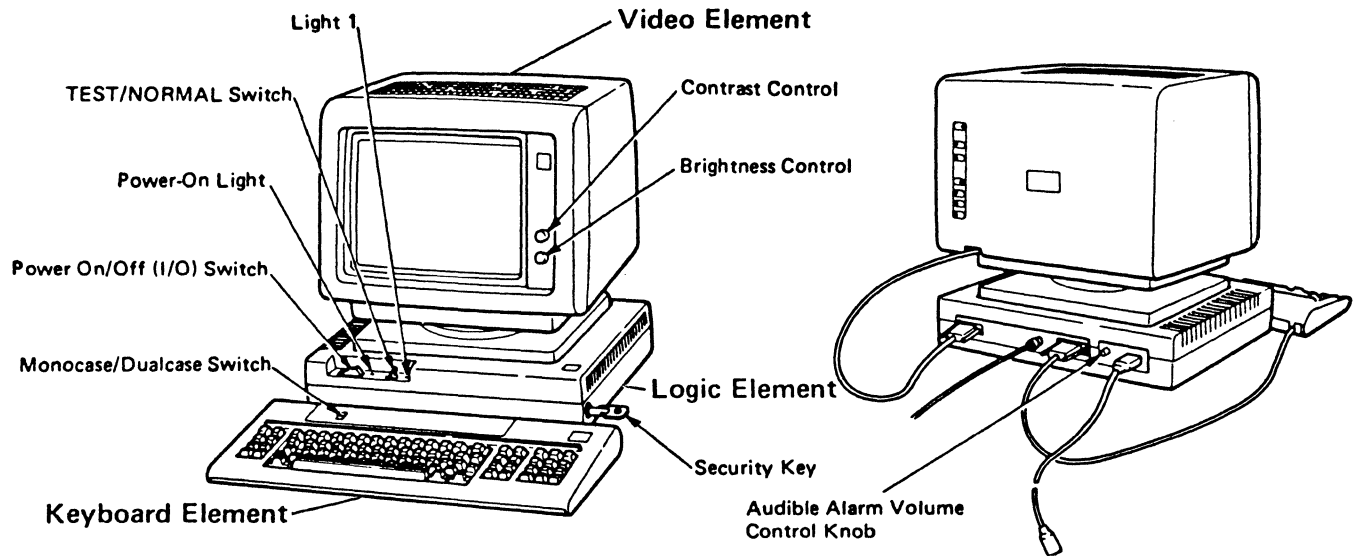


Figure 11. IBM 3178 Display Station Elements

The 3178 has a video display screen that diagonally measures about 30 centimeters (12 inches). The screen displays 24 lines of 80 characters each (1920 characters total). A separate (25th) line at the bottom of the screen displays messages to the operator, concerning such things such as operating mode, error status, and shift status. The messages are in a simple, self-explanatory language.

The next section references, the section "Common Terminal Features" on page 45.

IBM 3178 Video Display Unit

The video display unit includes a brightness control and a contrast control, which are discussed in "Switches and Controls" on page 45.

IBM 3178 Logic Element

Control Switches

In addition to the POWER and NORMAL/TEST switches as described in Table 4 on page 45, the logic element also has an Audible Alarm Loudness Control. This is on the back side of the logic element. Turn it clockwise to increase the loudness of the audible alarm.

Indicator Lamps

Indicator lamps on the logic element include the power-on light, and light "1." The power light is described in Table 5 on page 46. Light 1 for the 3178 blinks when the TEST/NORMAL switch is set to TEST. When the switch is set to NORMAL, the light stays on.

IBM 3178 Keyboard

Several different keyboards are available for the 3178, depending on the model (C1, C2, C3, or C4). Model C1 has a 75-key data-entry keyboard that only allows entry of uppercase alphabetic characters and numeric characters. The other three models have a 87-key typewriter keyboard that allow entry of both uppercase and lowercase letters, numeric characters, and comes with 12 program function (PF) keys. The program function (PF) keys on models C3 and C4 can also be used as a numeric key pad. Figure 12 on page 54 shows the 87-Key Typewriter Keyboard for the 3178

Model C2. See the *IBM 3178 Display Station Description* for an explanation of the other models and keyboards that support them.

| | | | | | | | | | | | | | | | | | | | | |
|--------------|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------|-----|------------|------|------|------|
| Attn | Cursor Sel | ~ | 1 | @ | # | \$ | % | - | & | * | { | } | _ | = | ← | Dup | Field Mark | PF13 | PF14 | PF15 |
| SysRq | Clear | | PF1 | PF2 | PF3 | PF4 | PF5 | PF6 | PF7 | PF8 | PF9 | PF10 | PF11 | PF12 | | PA1 | PA2 | | | |
| | | → | Q | W | E | R | T | Y | U | I | O | P | ↓ | ↘ | ← | â | â | PF16 | PF17 | PF18 |
| | Erinp | | | | | | | | | | | | | | | | | | | |
| Cursor Blink | Erase EOF | Ⓞ | A | S | D | F | G | H | J | K | L | : | ;" |) | | ↑ | ↓ | PF19 | PF20 | PF21 |
| AltCr | | | | | | | | | | | | | | | | | | | | |
| | | ↑ | > | Z | X | C | V | B | N | M | : | : | /? | ↵ | | ← | → | PF22 | PF23 | PF24 |
| Ident | Test | | | | | | | | | | | | | | | ↔ | ↔ | | | |
| | | Reset | | | | | | | | | | | | Alt | Enter | | | | | |
| | | DvCnl | | | | | | | | | | | | | | | | | | |

Note: Shaded keys repeat letters or functions when held down.

Figure 12. IBM 3178 Model C2 87-Key Typewriter Keyboard

Character Keys

The character keys include:

- Alphabetic (A through Z). These are displayed as uppercase (capital) when you use the Shift (⬆) or Shift Lock (Ⓞ) keys. Alphabetic keys are typamatic; that is, the character repeats if the key is pressed and held down.
- Numeric (0 through 9)
- Punctuation characters such as . , ; ; ! ?
- Special characters such as @, \$, %, and " .

Control Keys

Program Function (PF) Keys

The 3178 keyboard has 24 PF keys (except for Model C1). For Model C2, PF 1 through 12 are engraved on the front faces of the top row keys (numerals 1 - 0, hyphen, and equal sign). These are alternative function keys and are activated by pressing and holding down the Alt key before pressing the PF key. PF keys 13 through 24 are located on the right side of the keyboard. They are natural keys; that is, do not use the Shift or Alt keys to get the PF function.

Cursor Control Keys

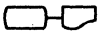



In addition to the cursor control keys listed in Table 6 on page 48, the 3178 also has:

- ←← Move cursor to the left (double speed).
- Move cursor to the right (double speed).

These are both Alt keys.

Screen Management Keys

The following screen management keys are the same as those discussed in Table 7 on page 48:

| | | |
|---------------------------------|---|--------------------|
| ALT | FIELD MARK / PA2 | |
| CLEAR | Attn | |
| ERINP | Enter | |
| CURSR BLINK / ALT Cr |  | (Print Key) |
| ERASE EOF |  | (Click Key) |
| RESET |  | (INSert MODE) |
| DUP / PA1 |  | (DElete character) |

In addition, the 3178 also has the screen management keys listed in Table 8.

| Key | Action |
|-------------------|---|
| SysRq | (System Request) Function depends on the application program. No function with VM/SP. |
| Cursor Sel | (Cursor Selection) Function depends on the application program. No function with VM/SP. |
| Ident | Function depends on the application program. No function with VM/SP. |
| Test | Prepares your terminal to run tests described in the <i>IBM 3178 Display Station Operator Reference Guide</i> . |
| DvCnl | (Device Cancel) Recovers from a print error condition. |

Compatibility with the IBM 3278 Model 2

The IBM 3178 Display Station is compatible with the IBM 3278 Model 2 discussed in Table 9 on page 56. Table 9 on page 56 compares the two terminals.

| Table 9. Comparison Between the 3178 and the 3278 Model 2 | | |
|---|----------------|--------------|
| Features and Accessories | Terminal Type | |
| | 3278 Model 2 | 3178 |
| Keyboard | X | - |
| 75-Key Data-Entry/Keypunch | X | - |
| 75-Key Typewriter (EBCDIC) | X | X (Model C1) |
| 75-Key Data-Entry (EBCDIC) | X | X (Model C2) |
| 87-Key EBCDIC Typewriter | X (RPQ 8K1038) | X (Model C3) |
| 87-Key EBCDIC Typewriter | X (RPQ 8K0932) | X (Model C4) |
| 87-Key EBCDIC Typewriter | | |
| Security Keylock | X | X |
| Audible Alarm | X | X |
| Numeric Lock | X | X |
| Selector Light Pen | X | - |
| Magnetic Slot Reader | X | - |
| Magnetic Hand Scanner | X | - |
| Extended Character Set | X | - |
| Programmed Symbols | X | - |

IBM 3270 Information Display System Terminals

VM/SP supports the following IBM 3270 Information Display System terminals:

3270 Remote Dedicated Information Display System Printer.

3275 Display Stations, Model 2 (Remote Attachment) with an EBCDIC keyboard.

3276 Control Unit Display Station, Models 2, 3, and 4 (Remote Attachment).

3277 Display Station, Model 2 (Local or Remote Attachment).

3278 Display Station, Models 2, 3, and 4 (Local or Remote Attachment).

3278 Display Station, Model 5, with wide screen and/or extended highlighting support.

3279 Display Station, Models 2A and 3A (four-color support).

3279 Display Station, Models 2B and 3B (seven-color support).

For details of the 3270 terminals see the following publications:

An Introduction to the IBM 3270 Information Display System, GA27-2739

IBM 3270 Information Display System Library User's Guide, GA23-0058

IBM 3270 Information Display System Operator's Guide:

IBM 3275 Display Station, IBM 3277 Display Station, IBM 3284 Printer, IBM 3286 Printer, IBM 3288 Line Printer, GA27-2742

IBM 3274 Control Unit, IBM 3276 Control Unit/Display Station, IBM 3278 Display Station, GA27-2890

IBM 3270 Text Feature

After you log on to VM/SP, using one of the terminals equipped with the 3270 Text feature, enter the following CP command:

TERMINAL TEXT ON

Use this command to type, display, or print any of the special Text characters.

If you enter the TERMINAL TEXT ON command on a unit that does not have the necessary Text features installed, you are unable to type, display, or print the Text characters. In this case, enter the CP command TERMINAL TEXT OFF. The terminal is now ready for nontext-processing use.

Entering the Text Characters

To type all 151 Text characters, you must use three shift keys: the standard uppercase and lowercase SHIFT key, the ALT ON/OFF key, and the CODE key.

SHIFT Key

Use the uppercase-lowercase SHIFT key (in either alternative or normal mode) to type, the characters engraved in the center of those key tops that have one or two characters. These characters are:

A through Z and , . ; :

Use **SHIFT** (in uppercase) to type characters engraved on the upper left of the key tops that have multiple characters. **ALT ON/OFF** must be off to obtain these characters.

Use **SHIFT** (in lowercase) to type characters engraved on the lower left of the key tops that have multiple characters. **ALT ON/OFF** must be off to obtain these characters.

ALT ON/OFF Key

Use **ALT ON/OFF** to type characters engraved on the right side of the key tops that have multiple characters. Press **ALT ON/OFF**. The alternative indicator light is on if the keyboard is in ALT mode. The indicator light is located on the keyboard above the keys. Press **ALT ON/OFF** once again to put the keyboard in normal operation. When the keyboard is in alternative mode, you can use the regular uppercase and lowercase **SHIFT** keys to obtain the uppercase and lowercase characters engraved on the upper and lower right of the key tops.

Note: **ALT ON/OFF** does not affect the following characters, which are engraved in the center of the key tops:

A through Z and , . ; :

These characters can be obtained in uppercase or lowercase with regular **SHIFT** operation, regardless of the setting of **ALT ON/OFF**.

If you have previously entered the **TERMINAL TEXT ON** command, the display screen displays all the special Text characters, regardless of the setting of **ALT ON/OFF**. If you set **TERMINAL TEXT OFF**, you cannot type, display, or print the Text characters even if the keyboard is in alternative mode.

CODE Key

Press and hold **CODE** to type the characters engraved on the front face of the keys. When you release **CODE**, the keyboard resumes the original status that it had before you pressed **CODE**.

Leaving Text Processing Mode

You can leave Text mode by entering the command:

TERMINAL TEXT OFF

If the red light on the keyboard is still on, indicating that the keyboard is still in Text mode, press **ALT ON/OFF** once to switch into regular keyboard mode.

Reconnecting Your Text Terminal

If you disconnect your terminal, Text mode is forced off when you log on again. You must enter the CP command, **TERMINAL TEXT ON**, before continuing with your text processing.

Security Keylock Feature

Some 3270 Information Display System Terminals are equipped with a security keylock feature. These terminals have a lock installed on the right hand side of the video display unit.

A display station with a security keylock installed cannot be operated until the key is inserted and turned clockwise. To prepare a display station equipped with this feature for operation:

1. Put the key in the lock
2. Turn the key clockwise

If the the display station is turned off:

1. Press the ON/Off switch to the *ON* position
2. Wait for the cursor to appear.

Note: When using the security keylock feature while logged on, you will be disconnected from the terminal if any data is written to the screen. To recover from this situation:

1. Turn the key to the unlocked position
2. Initiate the logon procedure to reconnect

IBM 3277 Display Station

The IBM 3277 Display Station is a 3270 Information Display System terminal that is used for system control or data entry purposes. A number of different keyboards, including Text, APL, and a variety of European languages, are available for it.

The IBM 3277 Video Display Unit

Figure 13 shows the video display unit. The illustrated features include the ON-OFF and brightness control switches, the security keylock, and the state indicators.

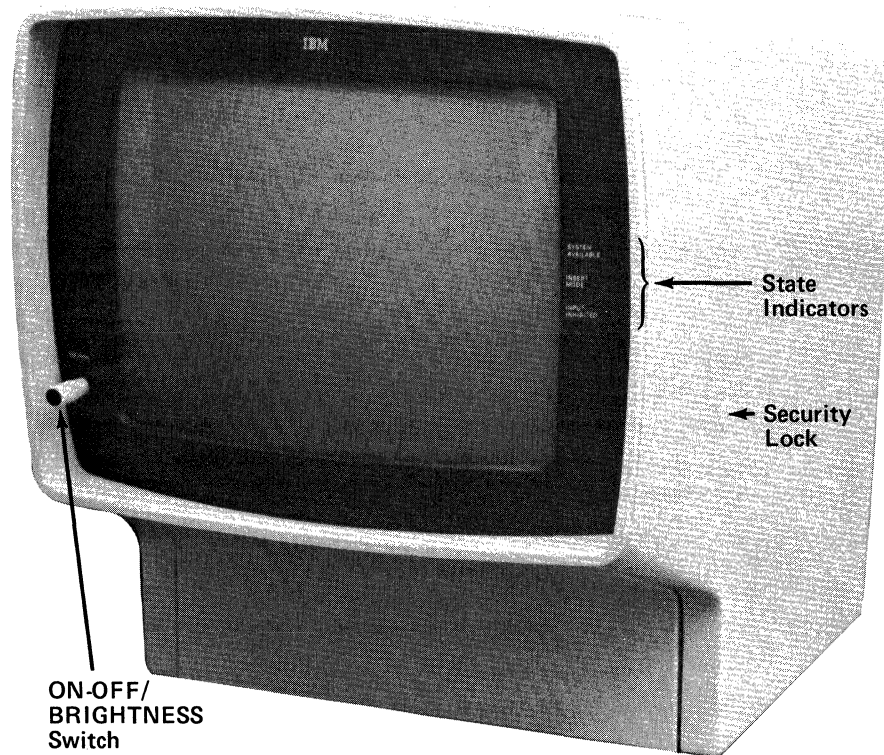


Figure 13. IBM 3277 Video Display Unit

Control Switches

The 3277 video display unit has one control, labeled OFF-PUSH. This is actually a combination power switch and brightness control. Pull to turn the terminal on, and push to turn it off. There are two rings on a common shaft. Turn either or both of these rings clockwise to brighten or dim portions of the display. The security keylock, if present, is located on the right side of the video display unit. Insert the key and turn it clockwise a quarter turn.

System State Indicators

Three phrases are printed on the right side of the frame that surround the video display screen:

While you are using the terminal, a bright spot of light appears on the screen immediately to the left of one or more of these phrases.

**SYSTEM
AVAILABLE**

**INSERT
MODE**

**INPUT
INHIBITED**

The system state indicators and their meaning are explained in the following table:

| INDICATOR | MEANING |
|-------------------------|---|
| SYSTEM AVAILABLE | The system can accept information or commands that you type in, unless the INPUT INHIBITED indicator is also on. |
| INSERT MODE | The system expects you to insert characters into the <i>middle</i> of a line. As you do this, the right side of the line is moved farther to the right, in order to make room. If you try to insert too many characters into a line, the INPUT INHIBITED appears and the system does not accept any more information. Press RESET to continue. |
| INPUT INHIBITED | The system cannot accept information. Depending on the circumstances, either wait until the system has finished what it is doing, or press RESET . |

IBM 3277 Keyboard

Figure 14 shows the IBM 3277 keyboard.

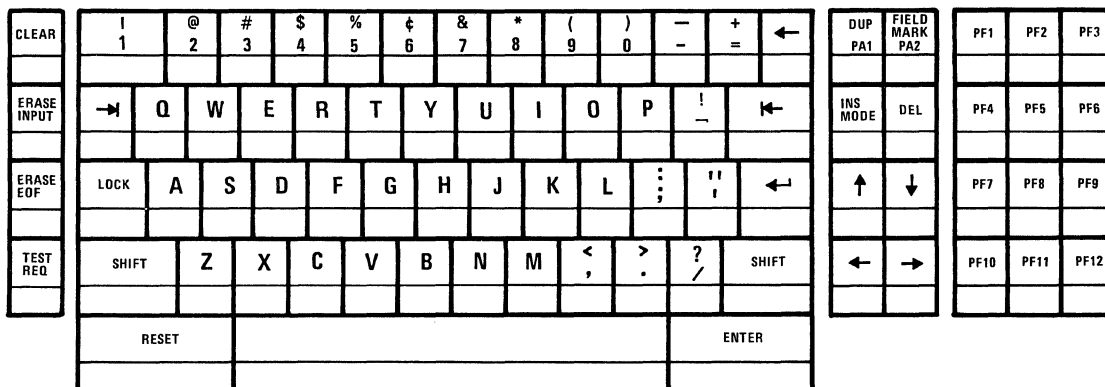


Figure 14. IBM 3277 Keyboard

Character Keys

The character keys include:

- Alphabetic (A through Z)
- Numeric (0 through 9)
- Punctuation characters such as . , ; ; ? !
- Special characters such as @, \$, %, and "
- APL characters: if your keyboard is operating in APL mode, press a character key to obtain its APL function
- Text characters: if your keyboard is operating in Text mode, press and hold the CODE key, then press a character key to obtain the Text character engraved on its front face. See "IBM 3270 Text Feature" on page 57.

Control Keys

Program Function Keys

You can define these keys to have either command or data-input capability by entering the SET PFnn command. (For information on this command, see *VM/SP CP General User Command Reference*, SC19-6211.) For examples of using the PF keys, see "PF Keys" on page 21.

Cursor Control Keys

Table 6 on page 48 explains the 3277 cursor control keys.

Screen Management Keys

The screen management keys are:

CLEAR
ERASE INPUT
ERASE EOF
DUP/PA1
FIELD MARK/PA1, or FIELD MARK/CNCL
INS MODE
DEL

Table 7 on page 48 explains their use.

In addition, the 3277 can also have the screen management keys listed in Table 10.

Indicator Lamps

The 3277 terminals that have the Text keyboard can have an unlabeled red lamp that glows when your terminal operates in alternative mode.

| Key | Use |
|-----------------------|---|
| ALT ON OFF | Switches your terminal in and out of alternative mode; that is, press this key to obtain the alternative functions engraved on the keys. Press it again to return to typewriter mode. |
| APL ON-OFF | Switches your terminal in and out of APL mode; that is, press this key to obtain the APL functions engraved on the keys. Press it again to return to "typewriter" mode. |

Table 10 (Page 2 of 2). Screen Management Control Keys of the 3277

| Key | Use |
|---------------------|---|
| APL ALT | In APL mode, press and hold this key to obtain the compound overstrike APL characters. |
| CODE | On certain keyboards, one key performs several functions. To perform the function shown on the front face — versus the top — of the key, press and hold the CODE key before pressing the character key. |
| TEST REQ | This key has no use with VM/SP. |

IBM 3278 Display Station

The IBM 3278 Display Station is a 3270 Information Display System terminal that is compatible with the IBM 3275 and 3277 terminals. It has some features in addition to those on the 3275/3277. For instance, the 3278 has variable screen formats, graphic operating and system status messages are displayed in an Operator Information Area at the bottom of the screen, and a number of keys provide specialized data entry functions. Also, you can select a variety of highlighting choices and locally defined character fonts.

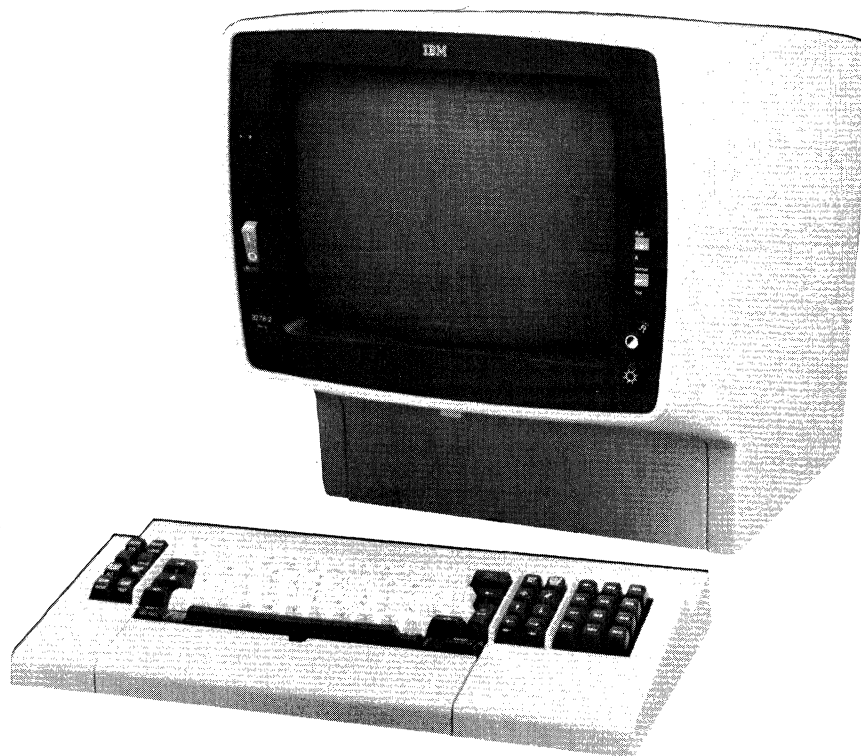


Figure 15. IBM 3278 Display Station

For details of the 3278, see the *IBM 3270 Information Display System 3278 Display Station Operator's Guide*, GA27-2890.

IBM 3278 Video Display Unit

Figure 16 on page 65 shows the video display unit. The illustrated features include control switches and indicator lamps.

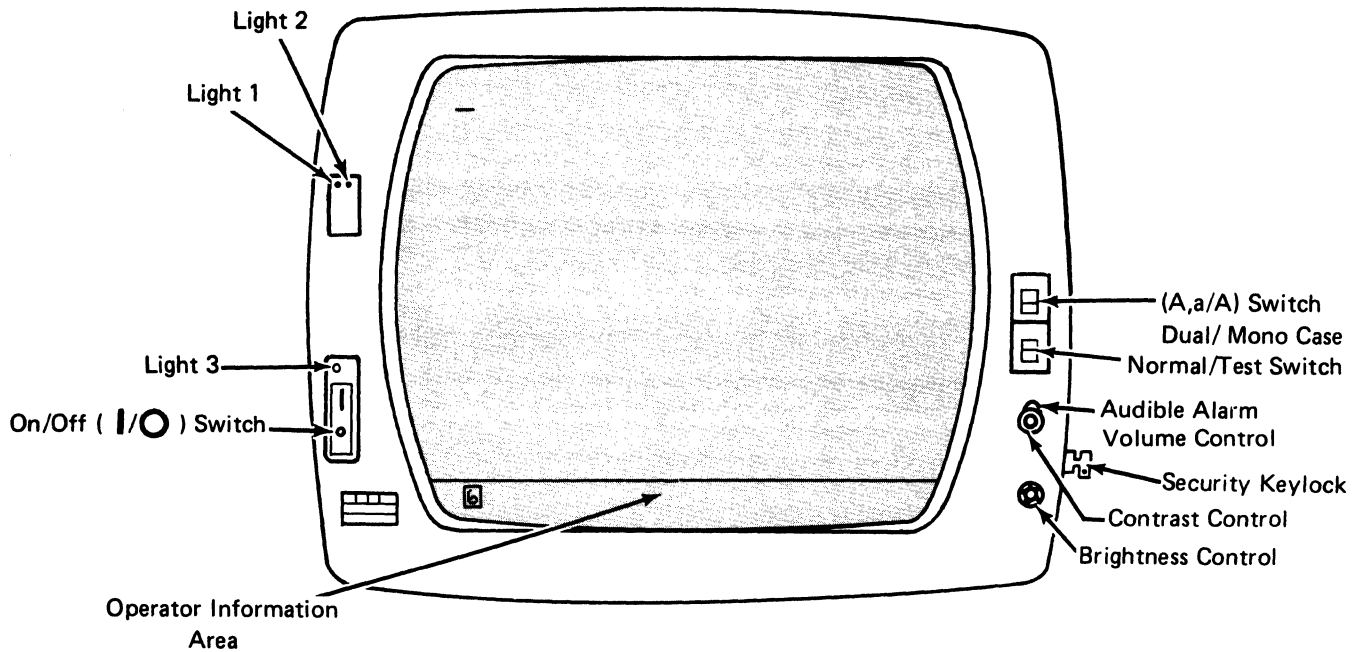


Figure 16. IBM 3278 Video Display Unit

Controls and Switches

Controls and switches on the video display unit include the:

- ON/OFF switch, security keylock
- Brightness control, contrast control
- Normal/test switch
- Dual/mono (A,a/A) case switch
- Audible alarm loudness control.

These are all described in Table 4 on page 45.

Indicator Lamps

Indicator lamps on the video display unit include Lights 1 and 2, described in Table 5 on page 46, and Light 3, which indicates that the terminal is turned on.

IBM 3278 Keyboard

A number of different keyboards are available for the 3278, including those for APL, Text, and Data Entry work. Figure 17 on page 66 shows the Attribute Select Typewriter keyboard. See the *VM/SP Operator's Guide* for descriptions of the other keyboards and the special features needed to support them.

| | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------|-----|------------|------|------|------|-----------|--|--|--|
| ATTN | CURSOR SEL | ~ | 1 | @ | # | \$ | % | ^ | & | * | (|) | - | + | ← | DUP | FIELD MARK | PF13 | PSA | PF15 | Red | | | |
| SYS REQ | CLEAR | | PF1 | PF2 | PF3 | PF4 | PF5 | PF6 | PF7 | PF8 | PF9 | PF10 | PF11 | PF12 | | PA1 | PA2 | PF14 | PSD | PF16 | Pink | | | |
| | | → | Q | W | E | R | T | Y | U | I | O | P | ! | ; | ← | ↑ | ↓ | PF17 | PSB | PF18 | Green | | | |
| | ERASE INPUT | | | | | | | | | | | | | | | | | PF19 | PSE | PF20 | Yellow | | | |
| CURSOR BLINK | ERASE EOF | Ⓞ | A | S | D | F | G | H | J | K | L | : | " | } | | | | PF21 | PSC | PF22 | Blue | | | |
| ALT CURSR | | | | | | | | | | | | | | | ← | → | | PF23 | PSF | PF24 | Turquoise | | | |
| IDENT | TEST | ↑ | > | Z | X | C | V | B | N | M | , | : | ? | / | ← | → | | PF22 | PF23 | PF24 | White | | | |
| | | | | | | | | | | | | | | | ← | → | | | | | | | | |
| | | RESET | | | | | | | | | | | | ALT | ENTER | | | | | | | | | |
| | | DEV CNCL | | | | | | | | | | | | | | | | | | | | | | |

Figure 17. IBM 3278 Keyboard

Character Keys

The character keys include:

- Alphabetic (A through Z). These are displayed as uppercase (capital) when you use the Shift (↑) or Shift Lock (Ⓞ) keys. Alphabetic keys are typamatic; that is, the character repeats if the key is pressed and held down.
- Numeric (0 through 9)
- Punctuation characters such as . , ; ; ! ?
- Special characters such as @, \$, %, and "
- APL or Text characters: if your keyboard has APL or Text characters and is operating in APL or Text mode, press a character key to obtain the APL function or Text character engraved on the key. See "IBM 3270 Text Feature" on page 57.

Control Keys

Program Function (PF) Keys

Some 3278 keyboards have 24 PF keys. PF 1 through 12 are engraved on the front faces of the top row keys (numerals 1 - 0, hyphen, and equal sign). These are alternative function keys and are activated by pressing and holding down the ALT key before pressing the PF key. PF keys 13 through 24 are located on the right side of the keyboard. They are natural keys; that is, do not use Shift or ALT to get the PF function.

APL and Text keyboards have only 12 PF keys. These are natural keys, located on the right side of the keyboard.

Cursor Control Keys

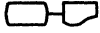






In addition to those listed in Table 6 on page 48, the 3278 also has:

- ←← Move cursor to the left (double speed).
- Move cursor to the right (double speed).



These are both ALT keys.

Screen Management Keys

The following screen management keys are the same as those discussed in Table 7 on page 48:

| | | |
|------------------|--|------------------------|
| ALT | ATTN | |
| CLEAR | ENTER | |
| ERASE INPUT |  | (Print Key) |
| CURSR BLINK |  | (Click Key) |
| ERASE EOF |  | (Reverse Highlight) |
| RESET |  | (Blink Highlight) |
| ALT CURSR |  | (Underscore Highlight) |
| DUP / PA1 |  | (INSert MODE) |
| FIELD MARK / PA2 |  | (DELEte character) |

In addition, the 3278 also has the screen management keys listed in Table 11.

| Key | Action |
|---|--|
| SYS REQ | (System Request) Function depends on the application program. No function with VM/SP. |
| CURSR SEL | (Cursor Selection) Function depends on the application program. No function with VM/SP. |
| IDENT | Function depends on the application program. No function with VM/SP. |
| TEST | Prepares your terminal to run tests described in the <i>IBM Problem Determination Guide, GA27-2839</i> . |
| DEV CNCL | (Device Cancel) Recovers from a print error condition. |
|  (PF10, 22) | (Highlight Field Inherit) Obtains programmed character highlighting, instead of highlighting that you defined. |
|  (PF11, 23) | (Symbol Set Field Inherit) Obtains programmed symbols, instead of symbols that you defined. |

IBM 3279 Color Display Station

The IBM 3279 Color Display Station is a 3270 Information Display System terminal that uses a high-resolution color display. A number of keys provide specialized data entry functions. You can select a variety of highlighting choices and locally defined character fonts. It operates in two color modes:

- Basic color mode - provides four colors that are produced by existing 3270 application programs, with little or no reprogramming
- Extended color mode - provides seven colors.



Figure 18. IBM 3279 Color Display Station

For details of the 3279, see the *IBM 3270 Information Display System 3279 Color Display Station Operator's Guide*, GA33-3057.

The next section references the section "Common Terminal Features" on page 45.

IBM 3279 Video Display Unit

Figure 19 on page 69 shows the video display unit. The illustrated features include control switches and indicator lamps.

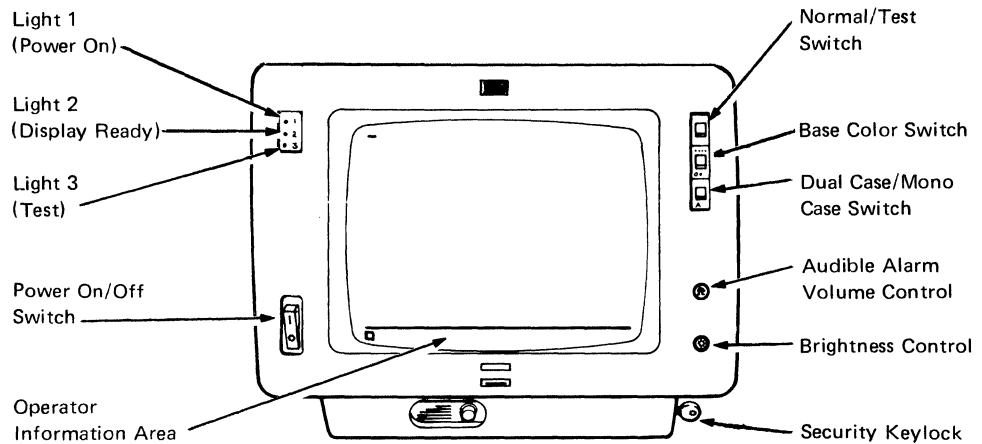


Figure 19. IBM 3279 Video Display Unit

Controls and Switches

Controls and switches on the video display unit include:

- ON/OFF switch, security keylock
- Brightness control, contrast control
- Normal/test switch
- Dual/mono (A,a/A) case switch
- Audible alarm loudness control.

These are all described in Table 4 on page 45.

Indicator Lamps

Indicator lamps on the video display unit include:

- Light 1** - power is on
- Light 2** - display is ready
- Light 3** - terminal is in test mode.

The IBM 3279 Keyboard

A number of different keyboards are available for the IBM 3279 keyboard, including those for APL, Text, and data entry work. Figure 20 on page 70 shows the Attribute Select Typewriter keyboard. See the *VM/SP Operator's Guide* for descriptions of the other keyboards and the special features needed to support them.

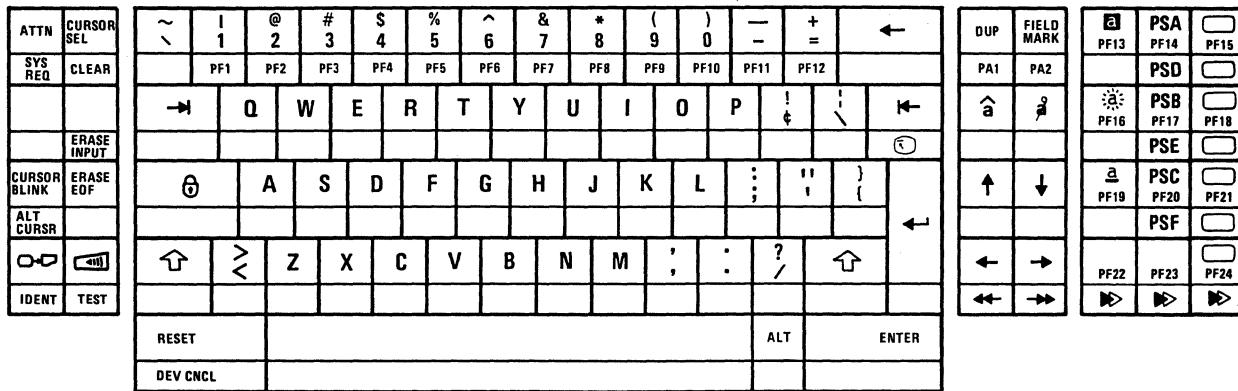




Figure 20. IBM 3279 Keyboard

Character Keys

The character keys include:

- Alphabetic (A through Z). These are displayed as uppercase (capital) when you use the Shift () or Shift Lock () keys. Alphabetic keys are typamatic; that is, the character repeats if the key is pressed and held down.
- Numeric (0 through 9)
- Punctuation characters such as , ; : ? ! .
- Special characters such as @, \$, %, ' and "
- APL or Text characters: if your keyboard has APL or Text characters and is operates in APL or Text mode, press a character key to obtain the APL function or Text character engraved on the front face of the key.

Control Keys

Program Function (PF) Keys

Some 3279 keyboards have 24 PF keys. PF 1 through 12 are engraved on the front faces of the top row keys (numerals 1 - 0, hyphen, and equal sign). These are alternative function keys and are activated by pressing and holding down ALT before pressing the PF key. PF keys 13 through 24 are located on the right side of the keyboard. They are natural keys; that is, do not use SHIFT or ALT to get the PF function.

APL and Text keyboards have only 12 PF keys. These are natural keys, located on the right side of the keyboard.

Cursor Control Keys








In addition to the cursor control keys listed in Table 6 on page 48, the 3279 also has:

- ←← Move cursor to the left (double speed).
- Move cursor to the right (double speed).



These are both ALT keys.

Screen Management Keys

The following screen management keys are the same as those discussed in Table 7 on page 48:

| | | |
|-------------------------|--|------------------------|
| ALT | ATTN | |
| CLEAR | ENTER | |
| ERASE INPUT |  | (Print Key) |
| CURSR BLINK |  | (Click Key) |
| ERASE EOF |  | (Reverse Highlight) |
| RESET |  | (Blink Highlight) |
| ALT CURSR |  | (Underscore Highlight) |
| DUP / PA1 |  | (INSert MODE) |
| FIELD MARK / PA2 |  | (DELEte character) |

In addition, the 3279 also has the screen management keys listed in Table 12.

| Table 12. Screen Management Keys of the 3279 | |
|---|--|
| Key | Action |
| SYS REQ | (System Request) Sends a unique signal to the host system. Function depends on the application. |
| CURSR SEL | (Cursor Selection) Select, using the cursor, the same as with a Selector Light Pen. |
| IDENT | Displays or changes printer ID, class, or authorization. |
| TEST | Prepares your terminal to run tests described in the <i>IBM Problem Determination Guide, GA33-3051</i> . |
| DEV CNCL | (Device Cancel) Recovers from a print error condition. |
|  (PF10, 22) | (Highlight Field Inherit) Obtains programmed character highlighting, instead of highlighting that you defined. |
|  (PF11, 23) | (Symbol Set Field Inherit) Obtains programmed symbols, instead of symbols that you defined. |

IBM 3290 Information Panel

VM/SP supports the IBM 3290 Information Panel in full compatibility with the 3278. The 3290 Information Panel has a large-screen, monochromatic, variable-format plasma (gas panel) screen that displays as many as 9920 characters (62 rows by 160 columns). Alternatively, it displays fewer characters that are much larger.

For details of the 3290, see the *IBM 3290 Information Panel Description and Reference*, GA23-0021.

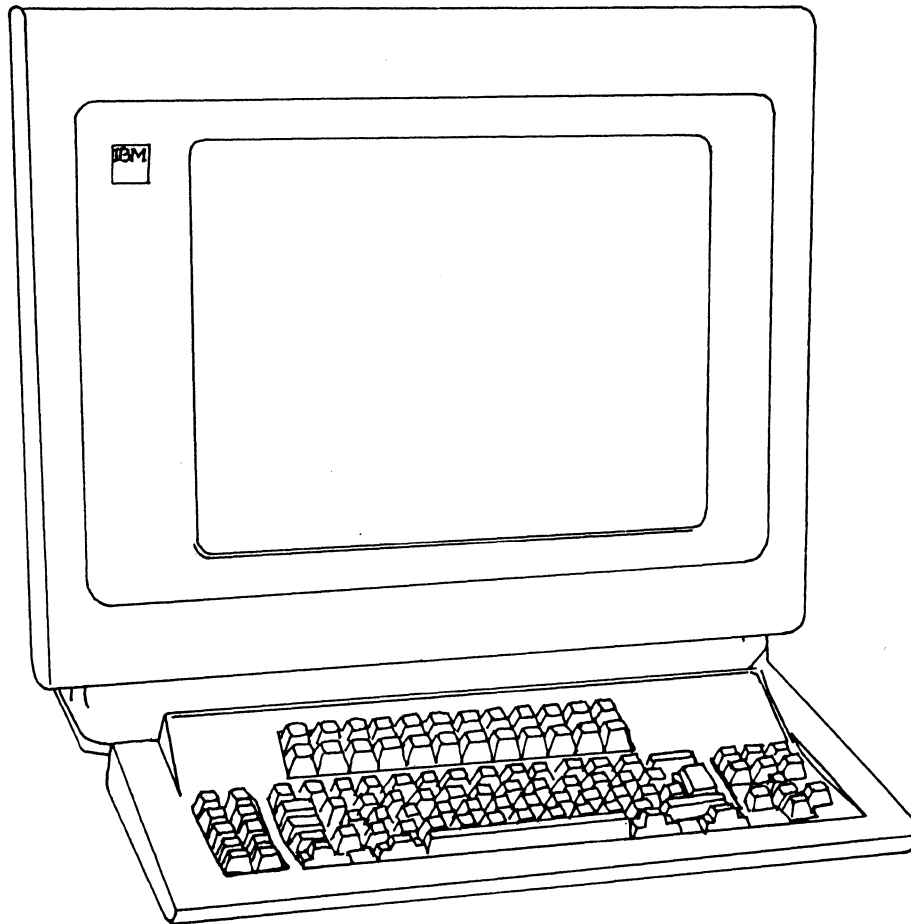


Figure 21. IBM 3290 Information Panel

Your 3290 operates simultaneously with as many as four logical terminals, each independently interacting with its own host program; that is, you divide the display screen in half, either vertically or horizontally, or in quarters. Each half (or quarter) is a logical terminal that you log on to, as though it was an individual physical terminal.

Alternatively, you can zoom a single display; that is, you increase the size of the characters, within limits, to make them easier to read.

The 3290 is composed of a display element and a keyboard. In addition, a logic element, which contains much of the electronic circuitry of the 3290, attaches out of sight on the rear of the display element. The power-on indicator lamp is located inside the top of the logic element, and glows when the 3290 is turned on. Figure 22

shows the display element and its associated switches and controls. Figure 23 on page 74 shows the keyboard.

The IBM 3290 Display Element

Figure 22 shows the display element. The illustrated features include controls, switches, and the power on indicator lamp.

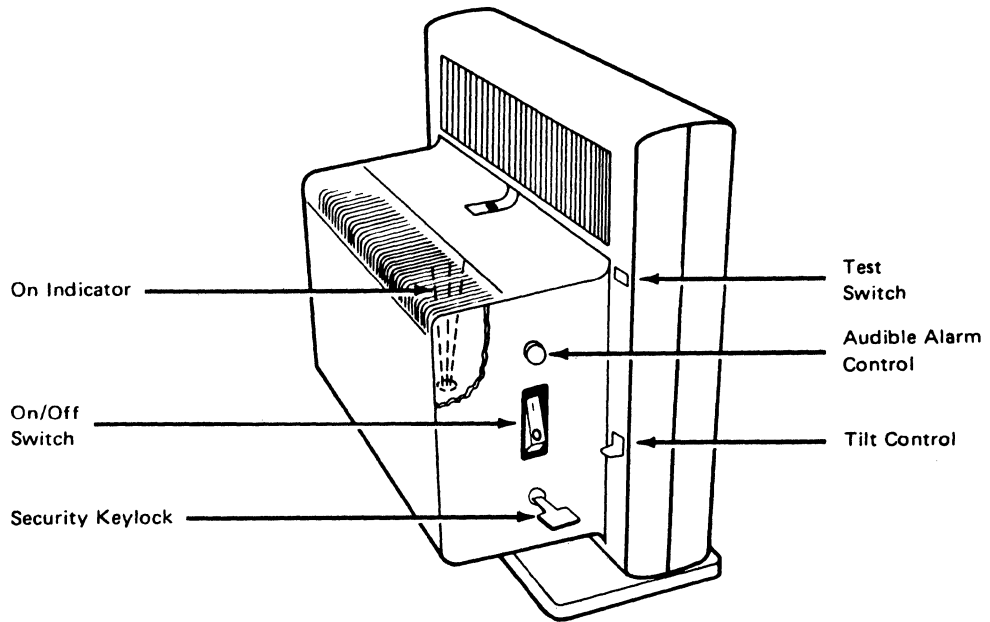



Figure 22. IBM 3290 Display Element

Switches and Controls

Switches and controls on the display element include those in Table 13 and Table 14.

| Table 13. Display Element Switches of the 3290 | |
|--|---|
| SWITCH | USE |
| <div style="text-align: center;"> ○ (Power) </div> | An ON-OFF rocker switch; press the side of the switch to turn the terminal on, and press the ○ side to turn it off. |
| Test | The test switch produces a test pattern on the screen; data that was on the screen disappears. To remove the test pattern, turn the power off, then on again. |







| Table 14 (Page 1 of 2). 3290 Display Element Controls | |
|---|---|
| CONTROL | USE |
| Tilt Control | Lift and hold the tilt control lever while you adjust the angle of the display element so it is convenient for you. |

| Table 14 (Page 2 of 2). 3290 Display Element Controls | |
|---|---|
| CONTROL | USE |
|  | (Audible signal control) Turn the control knob clockwise to make the audible signal louder, and counter-clockwise to make it quieter. |

In addition, a **Security Keylock** prevents unauthorized use of your terminal. Insert the key into the lock and turn the key a quarter-turn clockwise to enable the terminal. To secure your terminal, turn the key counter-clockwise and remove it.

The IBM 3290 Keyboard

Figure 23 shows the keyboard. The illustrated features include character keys and function keys.

| | | | | | | | | | | | |
|------|------|------|------|------|------|---|------|---|---|--|---|
| PF13 | PF14 | PF15 | PF16 | PF17 | PF18 | PF19 | PF20 | PF21 | PF22 | PF23 | PF24 |
| | | | | | | | | AltCr | CrBnk | |  |
| PF1 | PF2 | PF3 | PF4 | PF5 | PF6 | PF7 | PF8 | PF9 | PF10 | PF11 | PF12 |
| PSA | PSB | PSC | PSD | PSE | PSF |  | APL |  |  |  |  |

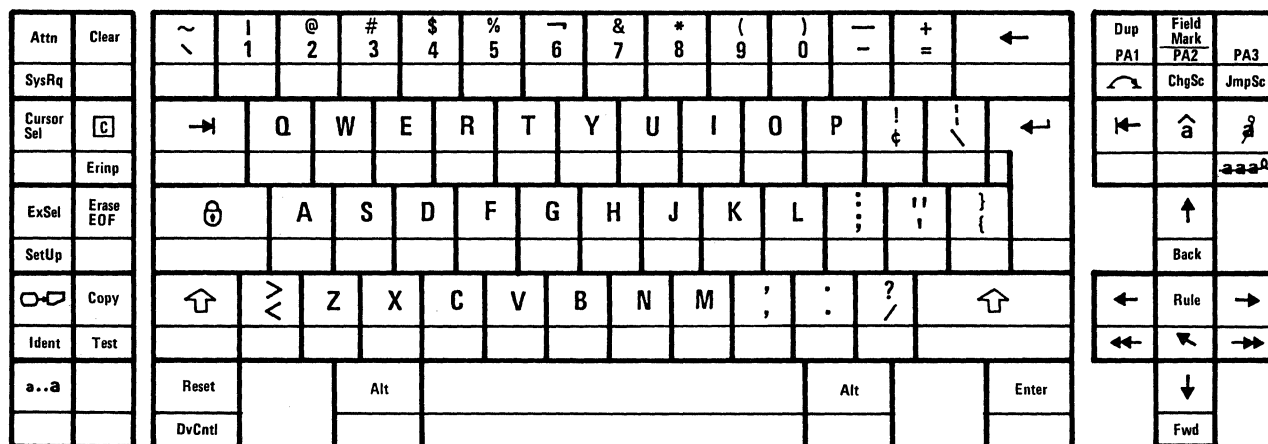




Figure 23. IBM 3290 Keyboard

Character Keys

The character keys include

- Alphabetic (A through Z). These are displayed as uppercase (capital) when you use the Shift () or Shift Lock () keys.
- Numeric (0 through 9)
- Punctuation characters such as . , ; ; ? !
- A variety of special characters such as @, \$, %, ', "
- APL characters: if your keyboard has APL characters and operates in APL mode, press a character key to obtain the APL function that is engraved on the upper right of the top face of the key.

The alphabetic, numeric, punctuation, and special characters are typamatic; that is, the character repeats if the key is pressed and held down.

Control Keys

Program Function (PF) Keys

The 3290 has 24 **Program Function (PF)** keys, in two rows of 12 each, above the main part of the keyboard. See "PF Keys" on page 21 for use of these keys. You can define these keys to have either command or data-input capability by entering the SET PFnn command. (For information on this command, see the *VM/SP CP General User Command Reference*, SC19-6211.)








Some of the PF keys have an alternative function engraved on the front surface of the keys. Press and hold ALT, then press PF to get the alternative function.

Cursor Control Keys


The cursor control keys are those shown in Table 6 on page 48.



Screen Management Keys

The following screen management keys are the same as those discussed in Table 7 on page 48.

| | | |
|------------------|---|------------------------|
| APL | PA3 | |
| ATTN | CrBnk | (Cursor Blink) |
| CLEAR |  | (Print Key) |
| ENTER |  | (Click Key) |
| ERASE EOF |  | (Reverse Highlight) |
| ERASE INPUT |  | (Blink Highlight) |
| PSA - PSF |  | (Underscore Highlight) |
| DUP / PA1 |  | (INSert MODE) |
| FIELD MARK / PA2 |  | (DELEte character) |

The 3290 has the following screen management keys unique to it:

| Key | Action |
|---|---|
| SysRq | (System Request) Changes the screen ownership in an SNA environment; transmits a test request to a program in a non-SNA environment. No function for VM/SP. |
| Cursr Sel | (Cursor select) Selects fields, notifies a program that you have selected some fields. No function for VM/SP. |
|  | (Clear partition) Erases the active partition. |
| ErInp | (Erase input) Erases the contents of all unprotected fields. |
| ExSel | This key performs no function for VM/SP. |
| SetUp | (Setup) Allows you to select a different panel configuration. |

| Table 15 (Page 2 of 2). Screen Management Keys of the 3290 | |
|---|--|
| Key | Action |
| Ident | (Identification) Function depends on the application program. No function for VM/SP. |
| Copy | Performs no function for VM/SP. |
| Test | Places your 3290 in test mode to run sub system tests. |
| a--a or ZOOM | (Zoom) Enlarges the active logical screen. |
| ChgSc | Moves the current screen to the background and the background screen to the current screen. |
| JumpSc | (Jump screen) Moves the cursor to the next clockwise screen, if you are using multiple screens. |
| Fwd | No function for VM/SP. |
| Rule | Displays a line under a single row of characters. |
| Back | No function for VM/SP. |
| AltCr (PF21) | (Alternative cursor) Changes the form of the cursor from underscore to reverse-video (and back). |
|  (PF7) | (Highlight Field Inherit) Obtains programmed character highlighting, instead of highlighting that you defined. |
|  (PF12) | (Symbol Set Field Inherit) Obtains programmed symbols, instead of symbols that you defined. |

Device-Specific Use Information

Restrictions

VM/SP CMS support of the 3290 Information Panel is limited while using the XEDIT function.

The CP function requires a minimum screen size of 5 rows by 50 columns. If you define a screen size smaller than this minimum, your screen will become the default size of 24 rows by 80 columns. The CMS full screen function requires a minimum screen size of 24 rows by 80 columns. Logical screen sizes ranging from the minimum up to 62 rows by 160 columns (the maximum for the 3290 Information Panel) are acceptable for CMS.

Many program products that run under VM/SP require running in 3278 compatibility mode. For these program products, you must use the screen size associated with the model number defined during system generation. If you are using one of these program products and you use a different screen size, unpredictable results can occur. The 3278 model numbers and associated screen sizes are:

| | |
|----------------|-----------------------|
| Model 2A or 2C | 20 rows by 80 columns |
| Model 2 | 24 rows by 80 columns |
| Model 3 | 32 rows by 80 columns |

Model 4 43 rows by 80 columns
 Model 5 27 rows by 132 columns

In the XEDIT environment, if the screen size is defined to be larger than 150 columns, the copy key will work only if the virtual printer is defined as 3800.

Users of the 3290 Information Panel should be aware that there are maximum lengths for input and output in VM/SP. In some cases, the command line of the 3290 allows more input characters than the maximum length of a command. To avoid losing part of a command due to truncation, you should make sure that your commands do not exceed the maximum lengths.

| Table 16. Maximum Character Lengths for 3290 Display Element | |
|--|----------------------|
| Environment | Number of Characters |
| CMS | |
| Input command line | 130 |
| Output | 130 |
| XEDIT | |
| XEDIT subcommand from command line | 255 |
| Input following the logical line end character when in TYPEWRITER mode | 130 |
| CP commands | 240 |
| RETRIEVE (Redisplays the last input line or lines up to the maximum number of characters.) | 255 |
| CP | |
| CP commands | 240 |
| RETRIEVE (Redisplays the last input line or lines up to the maximum number of characters.) | 240 |

IBM Personal Computer

The IBM Personal Computer (PC) or the IBM Personal Computer XT/370 (PC XT/370) can enter data on a VM/SP system. Both PCs support the attachment of the IBM Monochrome Display and the IBM Color Display to the system unit and keyboard. The keyboard enters information into the system and either display unit monitors input or display output.

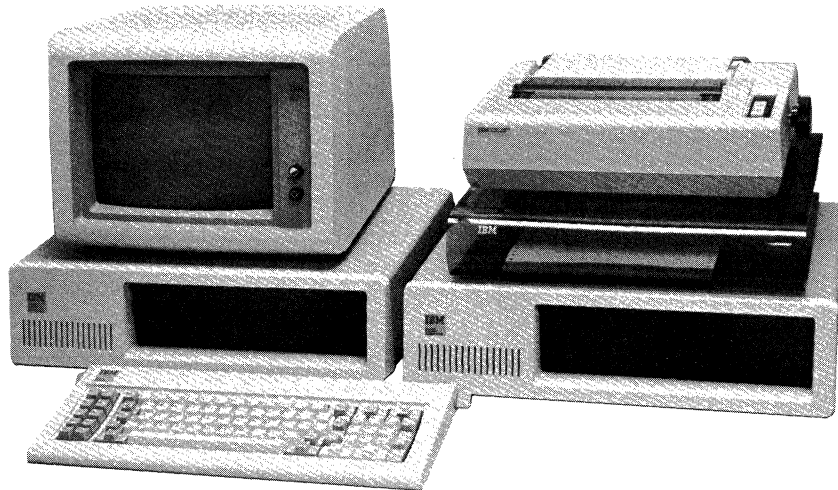


Figure 24. A Sample IBM PC Configuration

IBM PC Display Unit

Both IBM PC display units have a brightness and a contrast control. The color display unit also has a power-on control and a power-on indicator light. The location of these controls are illustrated in Figure 25 on page 79.

Controls and Indicator Lamps

Labels and corresponding functions for controls and indicator lamps that are on a typical Personal Computer video display unit are listed in Table 17 on page 79.

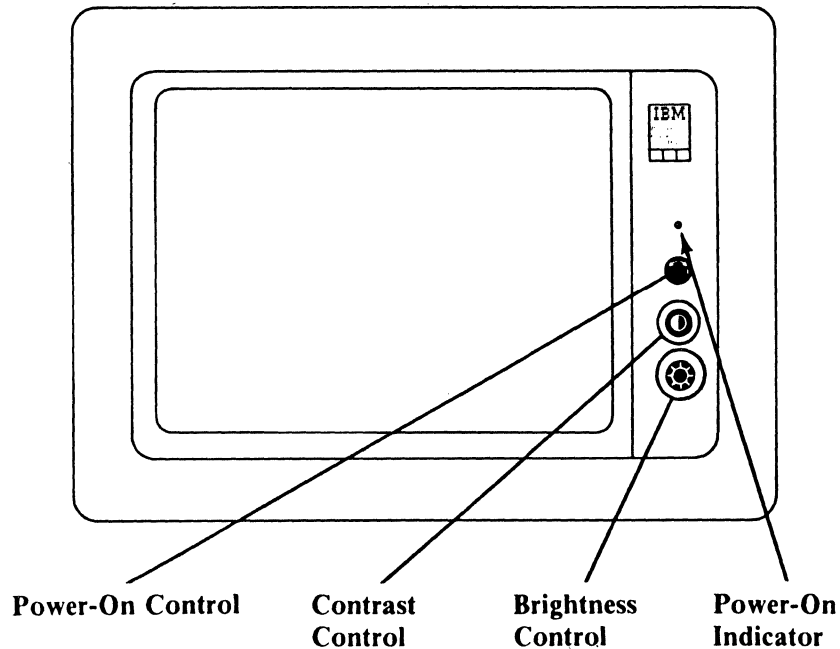






Figure 25. Common IBM PC Display Unit

| Table 17. IBM PC Display Unit Controls and Indicator Lamp | |
|---|---|
| Control | Function |
|  | (Power-On/Power-Off control) Turns the display on when turned clockwise, and turns the display off when turned counterclockwise (color display only). |
|  | (Power-on indicator light) Lit when the display is on (color display only). |
|  | (Contrast control) Increases the brightness of screen color (green on the monochrome screen and black, blue, green, cyan, red, magenta, brown, and white on the color screen), and decreases brightness when turned counterclockwise. |
|  | (Brightness control) Increases the brightness of the entire screen when turned clockwise, and decreases brightness when turned counterclockwise. |

The IBM PC Keyboard

The IBM PC keyboard is divided into three sections:

- Typewriter area
- Numeric keypad
- Function keys

Figure 26 on page 80 shows the location of these areas.

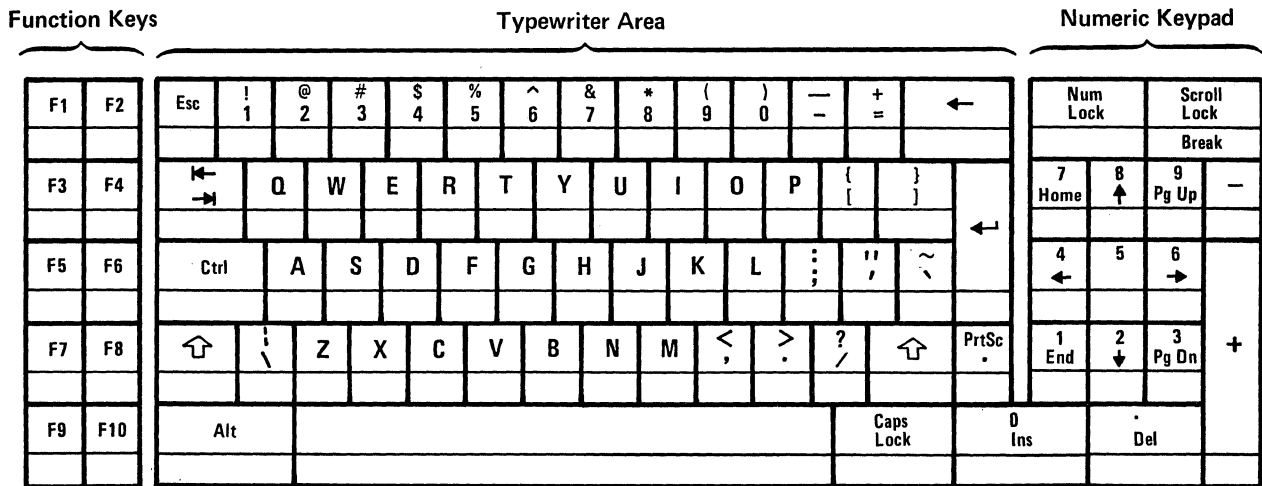


Figure 26. IBM PC Keyboard

Typewriter Area

Key positions in the typewriter area are similar to a standard typewriter. The character keys include:

- Alphabetic (A through Z). These are displayed in uppercase (capital) when you use the Shift (↑) or *Caps Lock* keys.
- Numeric (0 through 9)
- Punctuation characters such as , ; ? ! .

Besides the regular typewriter keys, the keyboard contains Cursor Control Keys and Screen Management Keys. These keys are described under "Control Keys" on page 81.

Numeric Keypad Area

The numeric keypad lets you use your PC as an adding machine. However, this capability must be supported by the operating system or application program you are running. The numeric keypad is put in numeric mode by pressing the Num Lock key. When in numeric mode, cursor control is disabled. Numbers may be entered on the screen (along with operators such as "+" and "-") using only the numeric keypad. The numeric keypad is taken out of numeric mode by again pressing the Num Lock key.

When not in numeric mode, the functions inscribed on the lower half of the keys are active. These functions are described under "Control Keys" on page 81.

Function Keys Area

The Function Keys -- F1 through F10 -- are programmable. Their functions may or may not be defined by your operating system or application program. In some environments you are able to program these keys yourself to have command or data entry capability. Refer to the appropriate manual for the operating system or application you are using to determine their function.

Control Keys

Some of the functions performed by Control Keys are tied to the operating environment you are running in your PC. These keys are noted in the following tables. To find the specific function of a control key, always refer to the appropriate manual supplied with your operating system or application program.

Cursor Control Keys

The following table (see Table 18) lists and describes the keys that control cursor movement on the IBM PC.

Screen Management Keys

The screen management keys include control keys other than Function keys and Cursor Control keys (see Table 19).

| Key | Action |
|-----|--|
| ↑ | Moves the cursor up one line. |
| ↓ | Moves the cursor down one line. |
| ← | Moves the cursor one character position to the left. |
| → | Moves the cursor one character position to the right. |
| ↩ | Position the cursor as defined by your operating system or application program. |
| ⇧ ⇩ | Move the cursor to the next or previous tab stop position; or the first data character position of the next or previous unprotected field -- whichever is first. |
| ↶ | Moves the cursor to a position defined by your operating system or application program. |

| Key | Action |
|-----|---|
| ↵ | Acts as the Enter key for some operating systems or applications; however, its function is defined by the operating system or application program you are running and can have other functions assigned to it. Refer to your operating system or application program manual to |
| Alt | (Alternate Function) With some operating systems and applications, this key lets you extend keyboard function by pressing the Alt key in combination with other keys. The Alt key is under control of the operating system or application program you are running and can have other functions assigned to it. Refer to your operating system or application environment. |

| Table 19 (Page 2 of 3). IBM PC Screen Management Keys | |
|---|--|
| Key | Action |
| Ctrl | (Control Key) With some operating systems or applications, this key lets you extend keyboard control functions by pressing the Ctrl key in combination with other keys. Like the Alt key, the Ctrl key is also under control of the operating system or application program you are running and can have other functions assigned to it. Refer to your operating system or application program manual to determine the Ctrl key's function for your operating environment. |
| Esc | (Escape) With some operating systems or application programs, the Esc key clears the screen. The Esc key is also controlled by the operating system or application program you are running and can have other functions assigned to it. Refer to your operating system or application program manual to determine the Esc key's function for your operating environment. |
| End | With some operating systems or application programs the End key performs the "Erase EOF" function; that is, it erases data from the cursor to the end of the line. However, this key's function is dependent upon the operating system or application program you are using. Refer to your operating system or application program manual to determine the End key's function for your operating environment. |
| PgUp | This key's function is defined by the operating system or application program you are running. Refer to your operating system or application program manual to determine the PgUp key's function for your operating environment. |
| PgDn | This key's function is defined by the operating system or application program you are running. Refer to your operating system or application program manual to determine the PgDn key's function for your operating environment. |
| Ins | (Insert) Press this key once to enter insert mode. You then insert characters or spaces in an input line, beginning where the cursor is positioned. Any data present on the line is pushed to the right. Press this key again to leave insert mode. |
| Del | (Delete) Erases the character indicated by the cursor and shifts the data line one space to the left. |
| Num Lock | Places keys 0 through 9 on the Numeric Keypad in numeric mode, disabling cursor control. Press this key again to leave numeric mode and return to cursor control. |
| Scroll Lock | With some operating systems or applications, this key switches you between local sessions with your PC operating system to remote sessions with a host system. This key's function is defined by the operating system or application program you are using. Refer to your operating system or application program manual to determine the Scroll Lock key's function for your operating environment. |

| Table 19 (Page 3 of 3). IBM PC Screen Management Keys | |
|---|--|
| Key | Action |
| ⇧ | (Shift) When pressed and held down, this key lets you enter alphabetic characters in uppercase (capital) mode. It also lets you enter the characters inscribed on the top half of the keys in the typewriter area. |
| Caps Lock | When pressed once, this key locks the letters A through Z in uppercase (capital) mode. Pressing the Shift key (⇧) while Caps Lock is on will allow you to type lowercase letters. You must still use the shift key to type the other characters inscribed on the top half of the keys in the typewriter area. Press the Caps Lock key again to release the keyboard from uppercase mode. |
| PrtSc | When pressed and held down in combination with the Shift key (⇧), a copy of the information displayed on the screen is sent to the printer. |

Where to Find More Information

Depending upon the Operating System or application program you are using with your PC, more specific information regarding accessing VM/SP may be required. Use the references cited in "IBM Personal Computer" on page 109 for additional information.

Chapter 6. ASCII Devices

Terminals and devices discussed in this section operate in the ASCII character mode. ASCII is the acronym for the American National Standard Code for Information Interchange. This is the standard code which uses a coded character set consisting of 7-bit coded characters (8 bits including parity check). This code is used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphic characters.

The actual IBM terminals and devices discussed in this sections are:

- 7171 ASCII Device Attachment Control Unit
- 3101 Display Terminal
- 3161/3163 ASCII Display Station

IBM 7171 ASCII Device Attachment Control Unit

The IBM 7171 ASCII Device Attachment Control Unit (IBM 7171) attaches to a variety of full duplex ASCII devices directly to IBM 43xx or 308x host processors via a block multiplexer channel. These devices may be directly connected to the IBM 7171 without modems, or via leased or switched lines using line drivers, modems, or acoustic couplers.

The 7171 also provides ASCII to 3270 protocol conversion. The 7171 appears to the host processor as one or two IBM 3274 Model 1D control units. If emulating two 3274 control units, between 16 and 64, ASCII terminals can be linked. The attached ASCII display terminals and printers appear to the host system as 3278 or 3277 terminals and 327x printers.

The 3270 emulation lets the 7171 attached devices communicate with IBM interactive packages while using existing 3270 programs without host modification. In addition to 3270 emulation, extended functions have also been included. These functions include:

- Type-ahead capability
- Enhanced null/blank handling
- XON/XOFF pacing
- Dynamically redefinable home position
- Special indentation features
- Forward and backward column tabbing

For details of the IBM 7171 ASCII Device Attachment Control Unit see the following books:

IBM 7171 ASCII Device Attachment Control Unit Reference Manual and Programming Guide, GA24-4020

IBM 7171 ASCII Device Attachment Control Unit Description and Planning Guide, GA24-4019

IBM 7171 Device Support

The IBM 7171 ASCII Device Attachment Control Unit supports a variety of ASCII terminals, printers, and plotters. It provides a full duplex asynchronous ASCII terminal interface, with electrical connection through EIA RS-232-C. Flexible communications attachment options let devices be directly connected to the 7171 without modems, or using leased and switched lines using line drivers, modems, or acoustic couplers.

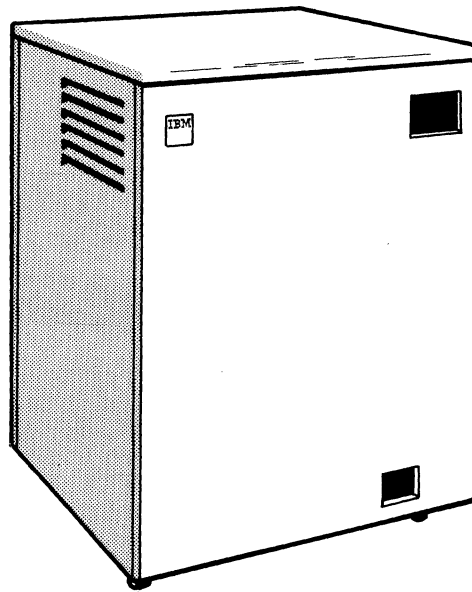


Figure 27. IBM 7171 ASCII Device Control Unit

The 7171 supports ASCII terminals, such as the 3101, for use with interactive host applications running under VM/SP or MVS. It emulates a locally attached 3274-1D control unit with 3270 terminals attached. It lets users of ASCII terminals communicate with standard IBM host interactive packages and editors operating under VM/SP or MVS. This emulation of 3270 terminals lets ASCII terminal users access a wide range of host application programs with no host modifications required.

3270 Emulation

The 7171 supports ASCII display terminals when used with interactive host applications running under VM/SP or MVS. As long as existing IBM access methods are used within VM/SP or MVS, the user need not be concerned with the details of the program interfaces to the 7171. Table 20 on page 88 lists the 3270 features that the 7171 emulates.

| Table 20. 3270 Features Emulated by the 7171 | |
|--|--|
| KEYBOARD | ENTER ERASE EOF ERASE INPUT INS DEL RESET DUP FM PA 1-3 CURSR SEL PFK 1-36 TEST REQ CLEAR |
| COMMANDS | WRITE ERASE/WRITE ERASE/WRITE ALTERNATE READ BUFFER READ MODIFIED ERASE ALL UNPROTECTED SELECT SENSE NOP |
| WRITE CONTROL CHARACTER (WCC) | Define Printer Format Start Printer Sound Alarm Keyboard Restore Reset MDT |
| ORDERS | SF SBA IC PT RA EUA GE |
| ATTRIBUTES | PROTECTED NUMERIC INTENSITY (terminal dependent) LIGHT PEN DETECTABLE (CUR SEL key) NON-DISPLAY MDT |

For more information on preparing the VM/SP system, setting up for terminal emulation, and the differences between ASCII and IBM 3270 devices, refer to the *IBM 7171 ASCII Device Attachment Control Unit Reference Manual and Programming Guide*, GA24-4020.

Operating IBM 7171 Terminals

1. Ensure that the terminal is ready. (Set up a valid baud rate, the correct number of stop bits, the correct parity.)

Note: Contact your system administrator for this information.

2. Activate the 7171 power ON switch and wait about 10 seconds for the diagnostics to complete. The Ready indicator light should come on.
3. Set the 7171 ON LINE/OFF LINE switch to ON LINE.
4. Activate the power ON switch at the connected ASCII terminal.

Note: Because the autobaud is the default in all of the delivered terminal type tables, the host operating system logon display does not appear on the screen of the ASCII terminal when it is turned on. If the default was changed to a fixed baud rate (autobaud off) and if the ASCII terminal type was predefined, the host logo immediately appears.

5. Press the key on the terminal (usually the RETURN key) that generates the carriage return (CR) character. The following message is displayed:

```
ENTER TERMINAL TYPE
```

Note: For the 3131 press the key with an arrow that points down and to the left. For the IBM PC running the 3101 Emulation program, press the key with an arrow pointing to the left. In general, the key (or key sequence) must be pressed that generates the ASCII 'CR' (X'0D') code character.

6. Enter the terminal type (for example IBM3101). If an invalid terminal type is entered, and the Terminal Definition Tables delivered with the 7171 are being used, the following display of valid terminal types is displayed:²

```
VALID TYPES ARE:  
IBM3101  
TVI912   TVI920   TVI950   TVI950R  
ADM31    ADM3A  
VT100  
DM1520   DM1521   DM3045  
TYPETERM  
ENTER TERMINAL TYPE:
```

Note: If the terminal type you desire is not on this list, refer to the *IBM 7171 ASCII Device Attachment Control Unit Reference Manual and Programming Guide*, GA24-4020, for the appropriate table.

7. Press ENTER

Note: The logo of the operating system is displayed.

8. Logon to the host system as usual.

Note: If the host log screen does not appear, press CLEAR. If this does not correct the problem, contact your system administrator.

² TVI912, TVI920, TVI950, and TVI950R are products of TeleVideo Systems, Incorporated. ADM31 and ADM3A are products of Lear Siegler, Incorporated. VT100 is a product of Digital Equipment Corporation. DM1520, DM1521, and DM3045 are products of Datamedia Corporation.

IBM 3101 Display Terminal

VM/SP supports Models 10, 11, 12, 13, 20, 21, 22, and 23, of the IBM 3101 Display Terminal as a typewriter-like terminal, using the CPT-TWX 33/35 interface. For details of the IBM 3101 Display Terminal, see the following books:

An Introduction to the IBM 3101 Display Terminal, GA18-2051

IBM 3101 Display Terminal:

Description, GA18-2033

Setup Instructions, GA18-2034

Operator Reference Information, GA18-2035

Customer Problem Analysis and Resolution Guide, GA18-2036.

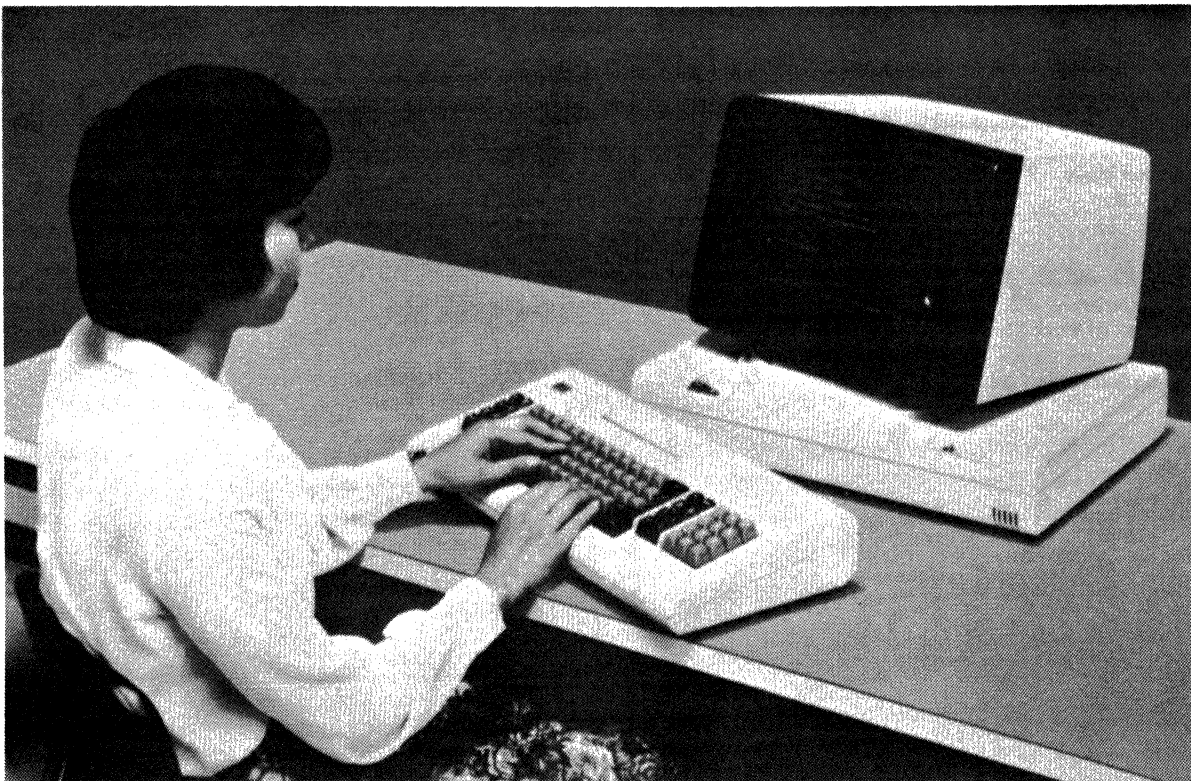


Figure 28. IBM 3101 Display Terminal

The 3101 Display Terminal is a tabletop display terminal that meets a variety of applications. The physical characteristics and environmental requirements of the 3101 let it be used in a variety of situations; from a typical home environment to a computer room.

The 3101 has a video display screen that diagonally measures about 30 centimeters (12 inches). The screen displays 24 lines of 80 characters each (1920 characters total). A separate (25th) line at the bottom of the screen displays messages to the operator, concerning such things as operating mode, error status, and shift status. The messages are in simple, self-explanatory language.

The 3101 is modular and includes three separate units: the video display unit, the logic element, and the keyboard. These units can be arranged, within limits, to let the operator select a comfortable operating position. The lightweight modular construction also lets the 3101 be easily installed and relocated. The three units, and switches and indicator lamps of the 3101, are illustrated in Figure 29.

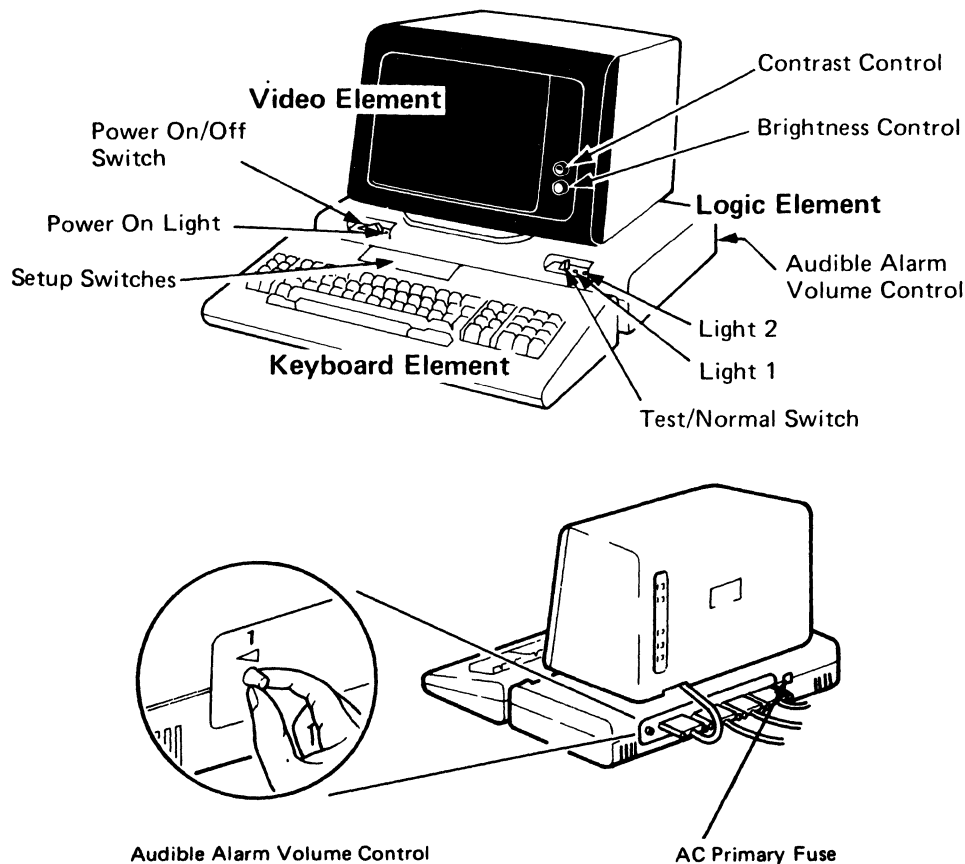


Figure 29. IBM 3101 Controls and Indicators

The next section references the section "Common Terminal Features" on page 45.

IBM 3101 Video Display Unit

The video display unit includes a brightness control and a contrast control, which are discussed in "Switches and Controls" on page 45.

IBM 3101 Logic Element

Control Switches

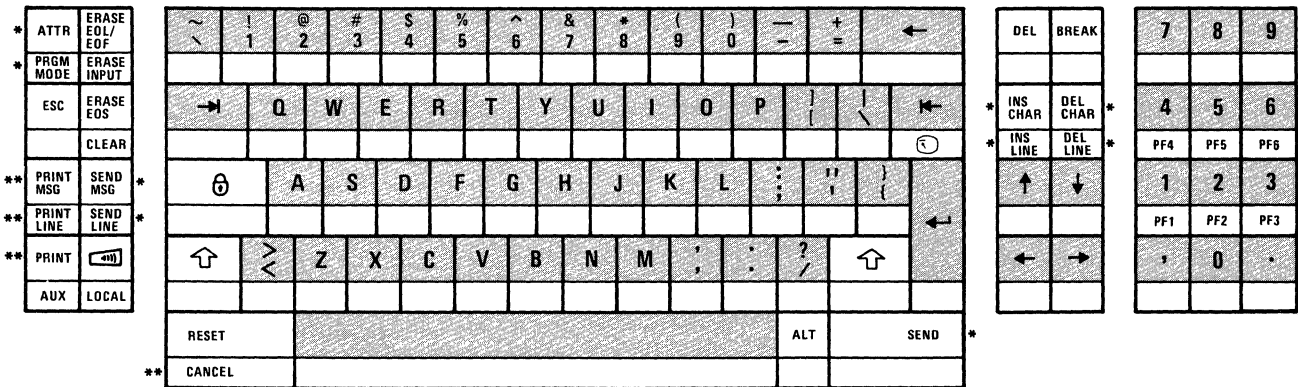
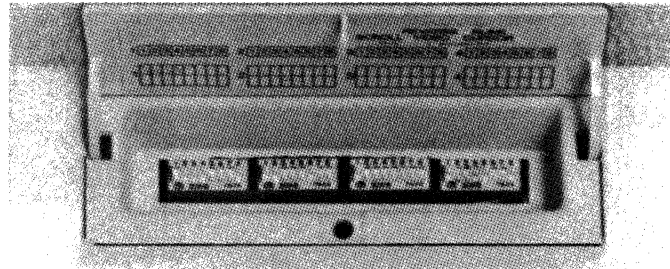
In addition to the POWER and NORMAL/TEST switches as described in Table 4 on page 45, the logic element also has an Audible Alarm Loudness Control. This is on the back side of the logic element. Turn it clockwise to increase the loudness of the audible alarm.

Indicator Lamps

Indicator lamps on the logic element include the power light, and lights "1" and "2," which are described in Table 5 on page 46.

IBM 3101 Keyboard

Figure 30 shows the IBM 3101 keyboard. The illustrated features include character keys, control keys, and setup switches.



Legend:

Typamatic Keys Non-Typamatic Keys

Figure 30. IBM 3101 Keyboard

Note: The ALT key must be pressed and held to activate functions shown on the front of the keys.

*Functional in block mode (Model 2X) only.

**Functional in block or character mode on Model 2X.


Character Keys

In addition to the character keys mentioned in "Character Keys" on page 47, numerals are included in an additional keypad. on the right side of the keyboard. Use these to type numeric-only data, or (when you also press and hold the ALT control key) as Program Function keys (see below).

Control Keys

Screen Management Keys

Certain screen management keys operate on all models of the 3101, while other keys are functional only on Models 20, 21, 22, and 23. Table 21 on page 93 lists the keys that operate on all models. Table 22 on page 94 lists the keys that operate only on Models 20, 21, 22, and 23. Some key functions are obtained when you press and hold ALT before you press the function key. These functions are marked in both figures with ALT.

| Table 21. Screen Management Keys of the 3101 (All Models) | |
|---|--|
| Key | Use |
| ALT | (Alternative Function) Press and hold ALT to obtain the alternative function engraved on the front face of a character key or control key. |
| AUX | (Auxiliary) Enables (and disables) the 3101 to transfer data to an auxiliary device to be printed or recorded. [ALT] |
| BREAK | Interrupts the host computer when it is sending data to the 3101, in order to send data to the computer. |
| CLEAR | Erases the entire screen. The cursor moves to the home position ALT. |
| DEL | (Delete) Sends an ASCII or ISO delete (DEL) character to the host computer. |
| ERASE EOL/EOF | Erases to the end of the line in an unformatted display, or erases to the end of an unprotected field in a formatted display. |
| ERASE EOS | (Erase End-Of-Screen) In an unformatted display, erases all characters to the end of the display. In a formatted display, erases all unprotected characters to the end of the display. The cursor does not move. |
| ERASE INPUT | In an unformatted display, erases all characters and the cursor moves to the home position. In a formatted display, erases all unprotected characters and the cursor moves to the first position of the first field. [ALT] |
| ESC | (Escape) Generates an ASCII or ISO escape code. (See the <i>IBM 3101 Display Terminal Description, GA18-2033.</i>) |
| LOCAL | Breaks (and remakes) communication between the 3101 and the host computer. |
| RESET | Unlocks the keyboard when an error condition has caused the keyboard to lock. |
|  | (Click Key) Activates (and deactivates) the keyboard clicker. |

Program Function (PF) Keys

When using the IBM 3101, you can designate PF keys two different ways. The keyboard has provisions for designating eight PF keys. (These will be referenced as *physical PF keys* in this discussion.) When the 3101 is used with VM/SP, you can simulate the 24 PF keys available with some other terminal types. (These will be referenced as *logical PF keys* in this discussion.) See "PF Keys" on page 21 to use the PF keys.

Physical PF Keys:

To designate the physical PF keys, press and hold the ALT key, then press a keypad numeric key to obtain the corresponding program function.

Logical PF Keys:

To designate the logical PF keys, follow the procedure in Figure 31 on page 94 to obtain the corresponding program function. Each key is pressed and released before the next key is pressed.

| To designate PF key number | Press these keys in this sequence | | |
|----------------------------|-----------------------------------|---|------------------|
| 1 | ESC | a | SEND or NEW LINE |
| 2 | ESC | b | SEND or NEW LINE |
| 3 | ESC | c | SEND or NEW LINE |
| 4 | ESC | d | SEND or NEW LINE |
| 5 | ESC | e | SEND or NEW LINE |
| 6 | ESC | f | SEND or NEW LINE |
| 7 | ESC | g | SEND or NEW LINE |
| 8 | ESC | h | SEND or NEW LINE |
| 9 | ESC | i | SEND or NEW LINE |
| 10 | ESC | j | SEND or NEW LINE |
| 11 | ESC | k | SEND or NEW LINE |
| 12 | ESC | l | SEND or NEW LINE |
| 13 | ESC ! | a | SEND or NEW LINE |
| 14 | ESC ! | b | SEND or NEW LINE |
| 15 | ESC ! | c | SEND or NEW LINE |
| 16 | ESC ! | d | SEND or NEW LINE |
| 17 | ESC ! | e | SEND or NEW LINE |
| 18 | ESC ! | f | SEND or NEW LINE |
| 19 | ESC ! | g | SEND or NEW LINE |
| 20 | ESC ! | h | SEND or NEW LINE |
| 21 | ESC ! | i | SEND or NEW LINE |
| 22 | ESC ! | j | SEND or NEW LINE |
| 23 | ESC ! | k | SEND or NEW LINE |
| 24 | ESC ! | l | SEND or NEW LINE |

Figure 31. Designating Logical PF Keys

Cursor Control Keys

The cursor control keys are those listed in Table 6 on page 48, with an important exception: the actual function performed by the TAB, BACK-TAB, NEW-LINE, and HOME keys depends on the settings of the Setup Switches.

| Key | Use |
|-----------------|--|
| ATTR | Press the ATTR key, then an appropriate character key to write an attribute character. (The ATTR key works only in block mode and in program mode. See the <i>IBM 3101 Display Terminal Description</i> .) |
| INS CHAR | See "INS MODE" in Table 7 on page 48. (The INS CHAR key works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |
| DEL CHAR | See "DEL" in Table 7 on page 48. (The DEL CHAR key works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |
| INS LINE | INS LINE inserts a blank line above the line indicated by the cursor. (INS LINE works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |

Table 22 (Page 2 of 2). Screen Management Keys of the 3101 (Models 2x)

| Key | Use |
|-------------------|--|
| DEL LINE | DEL LINE deletes the line indicated by the cursor. Following lines are moved up to take its place. (DEL LINE works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |
| PRGM MODE | Press PRGM MODE to enter (and again, to leave) program mode, in order to write an attribute character by using the ATTR key ALT. (PRGM MODE works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |
| PRINT | PRINT transfers the entire display image to an attached auxiliary device. |
| PRINT MSG | PRINT MSG transfers to an attached auxiliary device those characters between a send-mark (or the home position, if there is no send-mark) and the cursor position. |
| PRINT LINE | PRINT LINE transfers to an attached auxiliary device the line indicated by the cursor. |
| SEND MSG | SEND MSG transfers to the host computer those characters between a send-mark (or the home position, if there is no send-mark) and the cursor position. (SEND MSG works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |
| SEND LINE | SEND LINE transfers to an attached auxiliary device the line indicated by the cursor. (SEND LINE works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |
| SEND | SEND transfers the entire (unformatted) display image to the host computer. (Only portions of a formatted display image are transferred. SEND works only in block mode. See the <i>IBM 3101 Display Terminal Description</i> .) |

Setup Switches

The setup switches are four groups of eight switches that are located under a cover on the keyboard. They control a variety of terminal characteristics such as transmission mode, the kind of communication interface that is used, and how several screen features operate.

Generally, the proper switch settings are specified by the system administrator according to the requirements of the installation. See the *IBM 3101 Display Terminal Description* for a complete description of the setup switches and their use. To access VM/SP in character mode, refer to Figure 32 on page 97 for suggested settings.

Device-Specific Use Information

TERMINAL command

The following operands of the CP TERMINAL command for specific use on the 3101:

- TYPe defines the 3101 as either a display terminal or typewriter-like terminal.
- PROMpt controls the positioning of the cursor for a read operation.
- SCROll specifies the number of lines to be scrolled (moved up) on the screen.
- ASCiitbl chooses the ASCII EBCDIC translation tables you want to use.
- CNTL specifies whether CP or the user will be responsible for inserting line control characters into the data stream.

For more information, see the discussion of the TERMINAL command in the *VM/SP CP General User Command Reference*, SC19-6211.

Restrictions

When using the 3101 Display Terminal as a CPT-TWX 33/35 device, the following functions are not supported by VM/SP:

- The 3101 Read commands that are time dependent, such as Read Cursor Address, Read CSU, Read Buffer, or Read Status, (except as used with the CMS READTERM macro)
- The left brace character is not displayed when transmitted from VM/SP; however, the left brace is entered as input and stored with other user data.

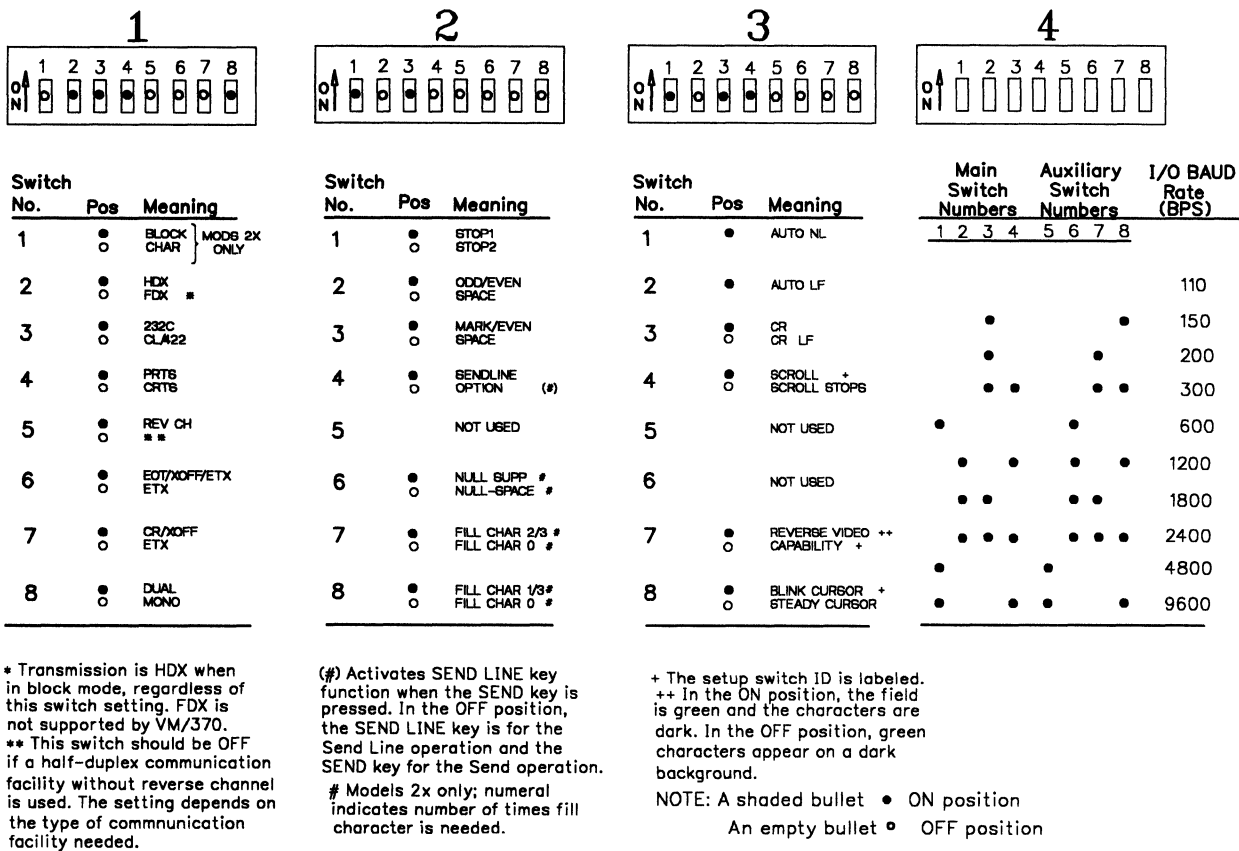


Figure 32. Suggested Settings for IBM 3101 Switch Panels

IBM 3161/3163 ASCII Display Station

The IBM 3161 and 3163 Display Stations are a family of general purpose asynchronous ASCII/ISO display stations designed to attach to both IBM and non-IBM systems. For more information on the IBM 3161/3163 Display Station see the following books:

IBM 3161/3163 ASCII Display Station:

Description, GA18-2310

Operator Reference and Problem Solving Guide, GA18-2311

Setup Instructions, GA18-2312

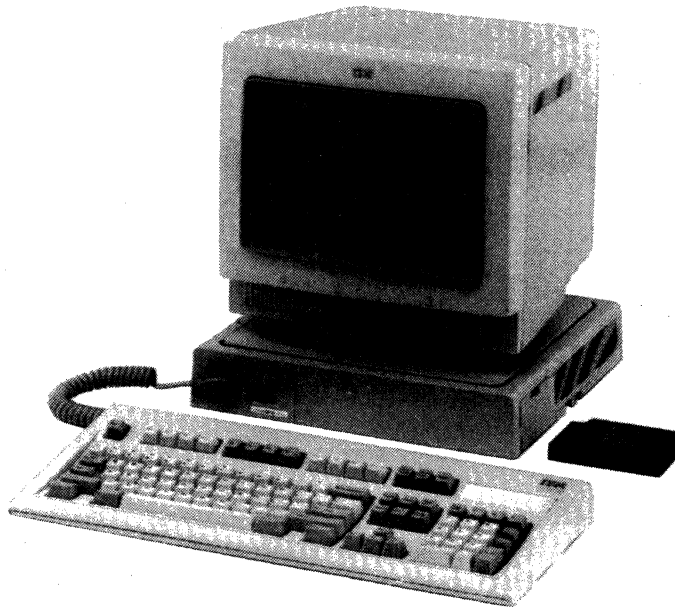


Figure 33. IBM 3161/3163 ASCII Display Station

IBM 3161/3163 Display Station

The 3161 is a high-function, ASCII work station which offers such features as menu setup, definable function keys, split-screen, and character and field attributes. It also emulates five non-IBM entry level ASCII devices (ADDS Viewpoint, Hazeltine 1500, Lear Siegler ADM 3A and ADM 5, and TeleVideo 910).

The 3163 provides more advanced functions than the 3161, such as smooth scroll, windowing, paging, redefinable keys and double-size characters. With an optional cartridge, the 3163 can emulate the DEC VT100 terminal and its VT52 emulation mode.

Both display stations emulate the 3101, which allows easy transition for users who already have a 3101.

Therefore, the user switches from one machine mode to another without changing the present software, while maintaining the advantages of the 3161 and 3163.

Emulating Other Terminals

The 3161 emulates six types of terminals without cartridge. The 3163 emulates two types of terminals; one with a cartridge element. The following is a list of emulations that do not require a cartridge element:

| Terminal | 3161 | 3163 |
|----------------|------|------|
| IBM 3101 | X | X |
| ADM 3A | X | |
| ADM 5 | X | |
| ADDS VIEWPOINT | X | |
| HZ-1500 | X | |
| TVI-910 | X | |

The 3163 uses an emulation cartridge to emulate DEC's VT-100/52 terminal. For more information on this emulation, refer to the *Using the IBM 3163 ASCII Display Station to Emulate the DEC VT-100 /52*, GA18-2313. This manual is shipped with the cartridge.

The IBM 3161/3163 Display Station Elements

The 3161 and 3163 video elements have a 12-inch screen for displaying numeric characters, alphabetic characters, and symbols keyed in from the keyboard or sent from the host system. The top 24 lines, each containing up to 80 characters, display messages from the host system or operator messages generated by the display station. The stand, which attaches to the base of the video element when you set up the display station, lets you tilt your video element up and down, and swivel it to the left and right for comfortable viewing.

There are two types of keyboards; the standard S type used on the 3161, and the luxury L type used on the 3163. Each has 102 keys, however, the L type keyboard has a few more functions than the S type keyboard. For example, you can change the function of some keys, and also replace their key caps with the accessory key caps using the key cap removal tool.

The cartridge element, when inserted into the slot of the logic element, lets you emulate the DEC VT100/52 terminal. Refer to the *Using the IBM 3163 ASCII Display Station to Emulate the DEC V-100/52*, GA18-2313, on how to use this cartridge.

The following 3161 and 3163 models are available:

| Machine Type | Model | Main Port | Auxiliary Port | Keyboard Type |
|--------------|-------|-------------|----------------|---------------|
| 3161 | 11 | RS-232 only | RS-232C | S |

| Table 24 (Page 2 of 2). IBM 3161/3163 Models | | | | |
|--|-------|---------------------|-----------------|---------------|
| Machine Type | Model | Main Port | Auxiliary' Port | Keyboard Type |
| 3161 | 12 | RS-232C and RS-422A | RS-232C | S |
| 3163 | 11 | RS-232C only | RS-232C | L |
| 3163 | 12 | RS-232C and RS-422A | RS-232C | L |

Attachment to the Host System

The IBM 3161/3163 is directly attached to the host system or indirectly by either a modem or a protocol converter. For examples of the display station in various system configurations, refer to the *IBM 3161/3163 ASCII Display Station Description*, GA18-2310.

The IBM 3161/3163 Display Station Keyboard

Figure 34 shows an S type keyboard. Note that the typamatic keys are shaded.

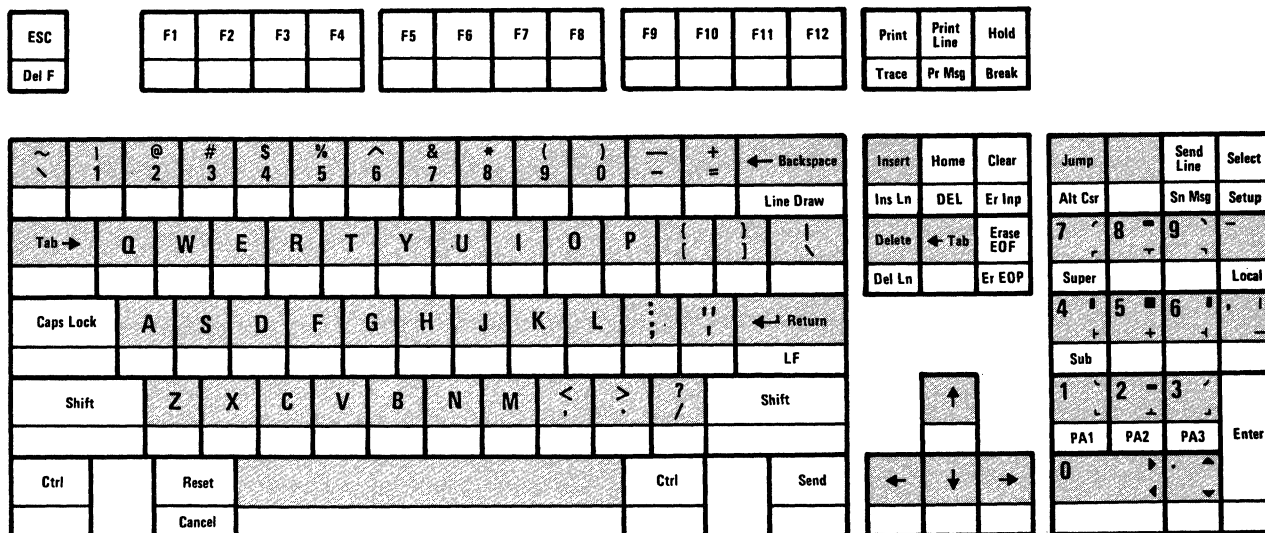


Figure 34. IBM 3161/3163 Type S Keyboard

Figure 35 on page 101 shows the L type keyboard which has the same layout as the S type except for the nonshaded portions. The typamatic keys are the same as the S type keyboard.

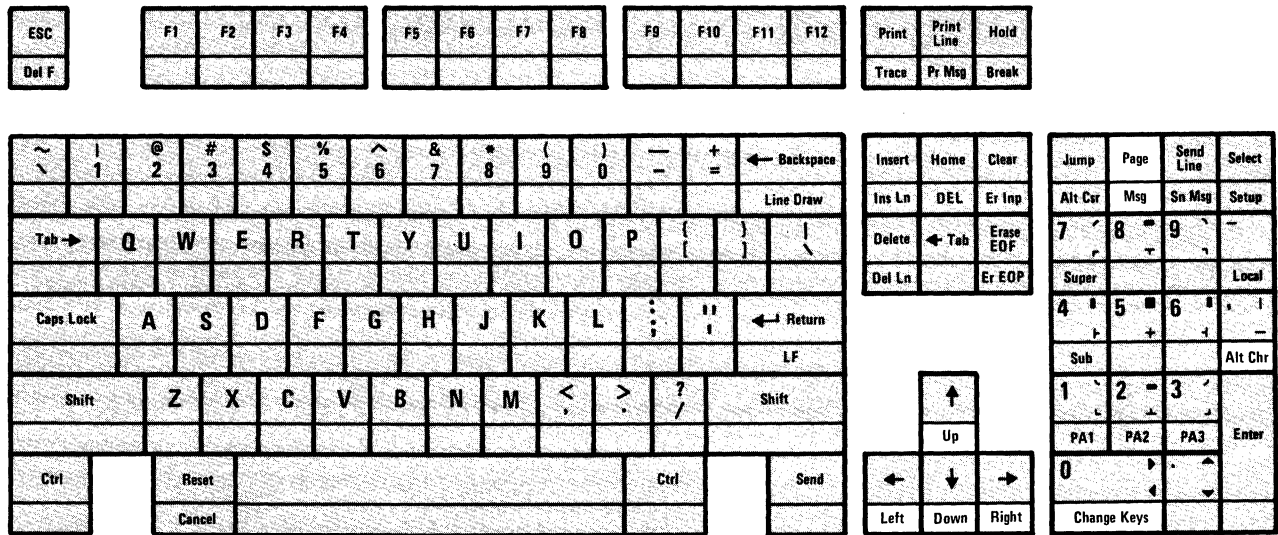


Figure 35. IBM 3161/3163 L Type Keyboard

The 12 function keys each have two functions, a function in lower shift and a function in upper shift totalling 24 functions. Keys F13 through F24 are activated on the F1 through F12 keys with the Shift key. If you have not redefined a function key yet, the following escape sequences are generated:

| Lower Shift F Key | Lower Shift Sequence | Upper Shift F Key | Upper Shift Sequence |
|-------------------|----------------------|-------------------|----------------------|
| F1 | ESC.a | F13 | ESC.!a |
| F2 | ESC.b | F14 | ESC.!b |
| F3 | ESC.c | F15 | ESC.!c |
| F4 | ESC.d | F16 | ESC.!d |
| F5 | ESC.e | F17 | ESC.!e |
| F6 | ESC.f | F18 | ESC.!f |
| F7 | ESC.g | F19 | ESC.!g |
| F8 | ESC.h | F20 | ESC.!h |
| F9 | ESC.i | F21 | ESC.!i |
| F10 | ESC.j | F22 | ESC.!j |
| F11 | ESC.k | F23 | ESC.!k |
| F12 | ESC.l | F24 | ESC.!l |

If a function key has been redefined, the function stored in the display station is performed. For details on how to redefine these function keys, refer to the *IBM 3161/3163 ASCII Display Station Description*, Chapter 4.

Appendix A. Terminals and Consoles Supported by VM/SP

There are many terminals available to the VM/SP user. Devices that are equivalent to those explicitly supported by VM/SP may also function satisfactorily. However, it is your responsibility to determine the equivalency. IBM cannot assume any responsibility for the effect that any changes to IBM-supplied products or programs may have on such terminals or consoles.

IBM 1052 Printer-Keyboard

The IBM 1050 Data Communication System includes the IBM 1052 Printer-Keyboard typewriter-like terminal. Although the 1050 Data Communication System is designed as an independent data preparation and transmission system, VM/SP also supports the 1052 Printer-Keyboard as a terminal device.

For more information on the IBM 1052 terminal see the following books:

IBM 1050 Data Communication System:

Operator's Guide, GA24-3425

Principles of Operation, GA24-3474.

IBM 2150 Console

VM/SP supports the IBM Model 2150 Console with the IBM 1052 Model 7 printer. For more information on the IBM 2150 terminal see the publication:

IBM System/360 Component Descriptions and Operating Procedures: IBM 1052 Printer-Keyboard Model 7 and IBM 2150 Console, GA22-6877.

IBM 2741 Communications Terminal

For more information on the IBM 2741 Communications Terminal, see the following books:

IBM 2741 Communications Terminal:

Component Description, GA24-3415

Operator's Guide, GA27-3001.

IBM 2780 Data Transmission Terminal

VM/SP supports the IBM 2780 Data Transmission Terminal, Model 2, which is a remote batch spooling device. For more information on the IBM 2780 Data Transmission Terminal, see the following book:

IBM 2780 Data Transmission Terminal Component Description, GA27-3005.

IBM 3031 Processor

For more information on the IBM 3031's console, see the following books:

IBM 3031 Processor Complex and IBM 3031 Multiprocessor Complex:

Functional Characteristics, GA22-7066

Configurator, GA22-7071.

IBM 3032 Processor

For more information on the IBM 3032's console, see the following books:

IBM 3032 Processor Complex and IBM 3032 Multiprocessor Complex:

Functional Characteristics, GA22-7061

Configurator, GA22-7062.

IBM 3033 Processor

For more information on the IBM 3033's console, see the following books:

IBM 3033 Processor Complex and IBM 3033 Multiprocessor Complex:

Functional Characteristics, GA22-7060

Configurator, GA22-7065.

IBM 3036 Display Console Station

VM/SP supports the IBM 3036 Display Console Station, Model 1, for the IBM 3031, 3032, and 3033 Processors. For more information, see the books listed under the appropriate processor model.

IBM 3066 System Console

VM/SP supports the IBM 3066 System Console, Model 2.

IBM 3101 Display Terminal

VM/SP supports Models 10, 11, 12, 13, 20, 21, 22, and 23, of the IBM 3101 Display Terminal as a CPT-TWX typewriter-like terminal. For more information on the IBM 3101 Display Terminal, see the following books:

An Introduction to the IBM 3101 Display Terminal, GA18-2051

IBM 3101 Display Terminal:

Description, GA18-2033

Setup Instructions, GA18-2034

Operator Reference Information, GA18-2035

IBM 3161/3163 ASCII Display Station

For more information on the IBM 3161/3163 Display Station see the following books:

IBM 3161/3163 ASCII Display Station:

Description, GA18-2310

Operator Reference and Problem Solving Guide, GA18-2311

Setup Instructions, GA18-2312.

IBM 3178 Display Terminal

The IBM 3178 Display Station is supported as a 3278 Model 2 Display Station. VM/SP supports models C1, C2, C3, and C4, which differ by keyboard layouts. For more information on the IBM 3178, see the publication:

IBM 3178 Display Station Description, GA18-2127.

IBM 3210 Console Printer Keyboard

VM/SP supports the IBM 3210 Console Printer Keyboard, Models 1 and 2. For more information on the IBM 3210, see the publication:

IBM 3210 Console Printer-Keyboard Model 2 Component Description, GA24-3552.

IBM 3215 Console Printer-Keyboard

VM/SP supports the IBM 3215 Console Printer-Keyboard, Model 1. For more information on the IBM 3215, see the following book:

IBM 3215 Console Printer-Keyboard Component Description, GA24-3550.

IBM 3232 Keyboard-Printer Terminal, Model 51

VM/SP supports the IBM 3232 Display Terminal, Model 51. For more information on the IBM 3232, see the following books:

IBM 3232 Keyboard-Printer Terminal Model 51:

Product Description and Site Preparation, GA24-3772

Operator's Guide, GA24-3778.

3270 Terminals

VM/SP supports the following 3270 Information Display System terminals:

IBM 3270 Remote Dedicated Information Display System Printer.

IBM 3275 Display Stations, Model 2 (Remote Attachment) with an EBCDIC keyboard.

IBM 3276 Control Unit Display Station, Models 2, 3, and 4 (Remote Attachment).

IBM 3277 Display Station, Model 2 (Local or Remote Attachment).

IBM 3278 Display Station, Models 2, 3, and 4 (Local or Remote Attachment).

IBM 3278 Display Station, Model 5, with wide screen and/or extended highlighting support.

IBM 3279 Display Station, Models 2A and 3A (four color support)

IBM 3279 Display Station, Models 2B and 3B (seven color support).

IBM 3290 Information Panel.

For more information on the IBM 3270 terminals see the following books:

An Introduction to the IBM 3270 Information Display System, GA27-2739

IBM 3270 Information Display System Library User's Guide, GA23-0058

IBM 3270 Information Display System Operator's Guide:

IBM 3275 Display Station, IBM 3277 Display Station, IBM 3284 Printer, IBM 3286 Printer, IBM 3288 Line Printer, GA27-2742

IBM 3274 Control Unit, IBM 3276 Control Unit/Display Station, IBM 3278 Display Station, GA27-2890.

IBM 3278 Model 2A

VM/SP supports the IBM 3278 Model 2A as the operator console for the IBM 4300 series processors in display or 3215 emulator mode. For more information on the IBM 3278, see the following books:

IBM 3274 Control Unit, IBM 3276 Control Unit/Display Station, IBM 3278 Display Station, GA27-2890

IBM 3790 Communication System Terminal Operator's Guide for 3276/2 and 3278/2 Display Station, GA27-2858.

IBM 3279 Model 2C

VM/SP supports the IBM 3279 Model 2C as the operator console for the IBM 4300 series processors in display or 3215 emulator mode. For more information on the IBM 3279, see the following book:

IBM 3270 Information Display System, 3279 Color Display Station Operator's Guide, GA33-3057.

IBM 3290 Information Panel

VM/SP supports the IBM 3290 Information Panel in full 3278-compatibility mode. For more information on the 3290, see the following book:

IBM 3290 Information Panel Description and Reference, GA23-0021.

IBM 3767 Communications Terminal

VM/SP supports the 3767 Communications Terminal, Models 1 and 2. For more information on the IBM 3767 terminals, see the following books:

IBM 3767 Communication Terminal Operator's Guide, GA18-2000

IBM 3767 Models 1 and 2 Communications Terminal Component Description, GS27-3096.

IBM 4331 Display Console

VM/SP supports the IBM 4331's console. For more information on the IBM 4331, see the following book:

IBM 4331 Functional Characteristics and Processor Complex Configurator, GA33-1526.

IBM 4341 Display Console

VM/SP supports the IBM 4341's console. For more information on the IBM 4341, see the following book:

IBM 4341 Functional Characteristics and Processor Complex Configurator, GA24-3672.

IBM 4361 Display Console

VM/SP supports the IBM 4361's console. For more information on the IBM 4361, see the following book:

IBM 4361 Functional Characteristics and Processor Configurator, GA33-1566.

IBM 4381 Display Console

VM/SP supports the IBM 4381's console. For more information on the IBM 4381, see the following book:

IBM 4381 Processor Operations Manual, GA24-3949.

IBM 5550 Multi Station

VM/SP supports the IBM 5550 Multi Station. For more information on the IBM 5550, see the following books:

IBM 5550/3270 Kanji Emulation System Reference, N:SC18-2020.

IBM 5550/3270 Kanji Emulation Operator's Guide, N:SC18-2021.

Note: The "N:" preceding the order number means the manual is written in Japanese.

IBM 7412 Console

VM/SP supports the IBM 7412 Console (via RPQ AA 2846) with 3215 Console Printer-Keyboard, Model 1.

IBM Model 138 Display Console

VM/SP supports the IBM Model 138 Display Console in either display mode, or in 3215 emulator mode with the IBM 3286 Model 2 printer. For more information on the IBM 138, see the following book:

IBM System/370 Model 138 Functional Characteristics, GA24-3632.

IBM Model 148 Display Console

VM/SP supports the IBM Model 148 Display Console in either display mode, or in 3215 emulator mode with the IBM 3286 Model 2 printer. For more information on the IBM 148, see the following book:

IBM System/370 Model 148 Functional Characteristics, GA24-3634.

IBM Model 158 Display Console

VM/SP supports the IBM Model 158 Display Console in either display mode, or in 3215 emulator mode with the IBM 3213 Model 1 printer. For more information on the IBM 158, see the following book:

IBM System/370 Model 158 Functional Characteristics, GA22-7011.

IBM Model 168 Display Console

VM/SP supports the IBM Model 168's Display Console. For more information on the IBM 168, see the following book:

IBM System/370 Model 168 Procedures, GC38-0030.

IBM Personal Computer

The IBM Personal Computer and the IBM Personal Computer XT/370 may be connected to a host VM/SP system. The way in which they interact with VM/SP is dependent upon the model, hardware configuration, and the software being used. Use the following references for further information:

For the IBM Personal Computer:

IBM Personal Computer Virtual Machine/Personal Computer Primer, Part Number 6024174

IBM Personal Computer Virtual Machine/Personal Computer Program, Part Number 6936733

IBM 3101 Emulation Program, Part Number 6024042

IBM Personal Computer 3278/79 Emulation Control Program, order number 6024134

IBM Personal Decision Series Attachment/370 Edition, Attachment/MVS, Attachment/VM General Information Manual, order number GH30-0760.

For the IBM Personal Computer XT/370:

IBM Personal Computer Virtual Machine/Personal Computer Primer, Part Number 6024174

IBM Personal Computer Virtual Machine/Personal Computer Program, Part Number 6936733

IBM Personal Computer XT/370 Guide to Operations, Part Number 6936730

IBM 3101 Emulation Program, Part Number 6024042

IBM Personal Computer 3278/79 Emulation Control Program, order number 6024134

IBM Personal Decision Series Attachment/370 Edition, Attachment/MVS, Attachment/VM General Information Manual, order number GH30-0760.

Systems Network Architecture (SNA) Terminals

Systems Network Architecture (SNA) terminals may be used with virtual machines if either the ACF/VTAM Version 3 (for VM/SP) program product, or the VTAM Communications Network Application (VM/VCNA) program product is installed at your location. For information on using SNA terminals, see the ACF/VTAM or VM/VCNA publications listed under "Supplemental Publications" in the "Preface."

Appendix B. Summary of Status Action on Display Terminals

| If the initial Status was: | and you pressed | (any data or a command?) | VM/SP does this: | and the Status becomes: |
|----------------------------|-----------------|--------------------------|---|-------------------------|
| RUNNING (CP mode) | ENTER | no | Enters console function mode. | CP READ |
| | | yes | Processes console function. | RUNNING |
| | CANCEL | don't care | Clears the Output Area. | RUNNING |
| RUNNING (VM mode) | ENTER | no | Attention pending, VM running. | RUNNING ¹ |
| | | yes | Attention pending, VM running, data stacked. | RUNNING ² |
| | CANCEL | don't care | Clears the Output Area. | RUNNING ² |
| MORE . . . | ENTER | no | Holds the Output Area display. | HOLDING |
| | | yes | Same as for RUNNING (in CP or VM mode). | MORE . . . |
| | CANCEL | don't care | Clears the Output Area, continues output. | RUNNING |
| HOLDING | ENTER | no | Holds the Output Area display. | MORE . . . |
| | | yes | Same as for RUNNING (in CP or VM mode). | HOLDING |
| | CANCEL | don't care | Clears the Output Area, continues output. | RUNNING ³ |
| CP READ | ENTER | no | "Null" line return. | RUNNING ⁴ |
| | | yes | Reads the data or command. | RUNNING |
| | CANCEL | don't care | Clears the Output Area. | CP READ. |
| VM READ | ENTER | no | "Null" line, VM continues running. | RUNNING ⁵ |
| | | yes | Reads data or command, VM continues running. | RUNNING |
| | CANCEL | don't care | Clears the Output Area. If APL is on, interrupts the virtual machine. | VM READ |

- ¹ The status shown in RUNNING; however, the virtual machine should respond to the ATTN with a read, whereupon the status goes to VM READ.
- ² If a data buffer is already stacked for a virtual machine, the terminal displays NOT ACCEPTED status before returning to the RUNNING status.
- ³ If you are running with TERMINAL MODE CP (the default for the primary system operator), an attention return also occurs that cancels the function. You can use this to terminate certain QUERY or DISPLAY functions on consoles that do not have a PA1 key.
- ⁴ Unless you are the VM/SP primary system operator or are running with the SET RUN ON option, the status returns to CP READ for another console function if the previous read was for a console function.
- ⁵ The status remains VM READ if you have SET AUTOREAD ON.

Appendix C. ASCII Translate Tables for Graphic-Hexadecimal Substitution

| Graphic | Hex | Graphic | Hex | Graphic | Hex |
|---------|-----|---------|-----|---------|-----|
| SPACE | 40 | e | 85 | } | D0 |
| ¢ | 4A | f | 86 | J | D1 |
| | 4B | g | 87 | K | D2 |
| < | 4C | h | 88 | L | D3 |
| (| 4D | i | 89 | M | D4 |
| + | 4E | j | 91 | N | D5 |
| | 4F | k | 92 | O | D6 |
| & | 50 | l | 93 | P | D7 |
| ! | 5A | m | 94 | Q | D8 |
| \$ | 5B | n | 95 | R | D9 |
| * | 5C | o | 96 | \ | E0 |
|) | 5D | p | 97 | S | E2 |
| ; | 5E | q | 98 | T | E3 |
| ¬ | 5F | r | 99 | U | E4 |
| - | 60 | ~ | A1 | V | E5 |
| / | 61 | s | A2 | W | E6 |
| ! | 6A | t | A3 | X | E7 |
| , | 6B | u | A4 | Y | E8 |
| % | 6C | v | A5 | Z | E9 |
| — | 6D | w | A6 | 0 | F0 |
| > | 6E | x | A7 | 1 | F1 |
| ? | 6F | y | A8 | 2 | F2 |
| ` | 79 | z | A9 | 3 | F3 |
| : | 7A | { | C0 | 4 | F4 |
| # | 7B | A | C1 | 5 | F5 |
| @ | 7C | B | C2 | 6 | F6 |
| ' | 7D | C | C3 | 7 | F7 |
| = | 7E | D | C4 | 8 | F8 |
| ^ | 7F | E | C5 | 9 | F9 |
| a | 81 | F | C6 | | |
| b | 82 | G | C7 | | |
| c | 83 | H | C8 | | |
| d | 84 | I | C9 | | |

| Symbol | Name | Symbol | Name | Symbol | Name |
|--------|----------------------|--------|-------------------------|--------|-----------------------|
| ¢ | Cent | , | Comma | . | Period, Decimal Point |
| % | Percent | < | Less Than | > | Greater Than |
| (| Left Parenthesis | ? | Question Mark | + | Plus |
| ` | Grave Accent | | Logical OR | : | Colon |
| & | Ampersand | # | Number Sign, Pound Sign | ! | Exclamation Point |
| @ | At | \$ | Dollar | ' | Prime, Apostrophe |
| * | Asterisk | = | Equal |) | Right Parenthesis |
| ^ | Quotation Mark | ; | Semicolon | ~ | Tilde |
| ¬ | Logical NOT | { | Open Brace | - | Minus, Hyphen |
| } | Close Brace | / | Slash | \ | Reverse Slash |
| ; | Broken vertical line | | | | |

Figure 36. Graphic-Hexadecimal Substitution

| Graphic | Hex | Graphic | Hex | Graphic | Hex |
|---------|-----|---------|-----|---------|-----|
| SP | 40 | α | 63 | H | C8 |
| .. | 41 | Γ | 64 | I | C9 |
| - | 42 | ℓ | 65 | J | D1 |
| ≤ | 43 | ∇ | 66 | K | D2 |
| ≥ | 44 | Δ | 67 | L | D3 |
| ≠ | 45 | ° | 68 | M | D4 |
| √ | 46 | □ | 69 | N | D5 |
| ^ | 47 | [| 6A | O | D6 |
| ÷ | 48 | , | 6B | P | D7 |
| x | 49 | - | 6D | Q | D8 |
| . | 4B | > | 6E | R | D9 |
| < | 4C | ? | 6F | S | E2 |
| (| 4D |] | 70 | T | E3 |
| + | 4E | ¢ | 71 | U | E4 |
| | 4F | ▷ | 72 | V | E5 |
| ω | 51 | ∩ | 73 | W | E6 |
| ε | 52 | ∪ | 74 | X | E7 |
| ρ | 53 | ⊥ | 75 | Y | E8 |
| ~ | 54 | τ | 76 | Z | E9 |
| ↑ | 55 | / | 77 | 0 | F0 |
| ↓ | 56 | : | 7A | 1 | F1 |
| ı | 57 | ' | 7D | 2 | F2 |
| o | 58 | = | 7E | 3 | F3 |
| ← | 59 | A | C1 | 4 | F4 |
| * | 5C | B | C2 | 5 | F5 |
|) | 5D | C | C3 | 6 | F6 |
| ; | 5E | D | C4 | 7 | F7 |
| - | 60 | E | C5 | 8 | F8 |
| / | 61 | F | C6 | 9 | F9 |
| → | 62 | G | C7 | | |

| Control Symbol | Hex |
|----------------|-----|
| New Line | 15 |
| Back Space | 16 |
| Tab | 05 |

Figure 37. Graphic-Hexadecimal Substitution for 2741 APL

Legend: Those hexadecimal values that have Name listed but have no Graphic(s) are included although not displayed on the 3270 screen.

| Graphic | Hex | Name | Graphic | Hex | Name | Graphic | Hex | Name |
|---------|-----|--------------------|--------------|-----|-------------------------|----------|-----|-------------------|
| | 00 | Null | (| 20 | Superscript left paren | | 40 | Space |
| | 01 | |) | 21 | Superscript right paren | <u>A</u> | 41 | Underscored A |
| | 02 | | + | 22 | Superscript plus sign | <u>B</u> | 42 | Underscored B |
| | 03 | | - | 23 | Superscript minus sign | <u>C</u> | 43 | Underscored C |
| { | 04 | Left brace | } | 24 | Right brace | <u>D</u> | 44 | Underscored D |
| | 05 | Horizontal tab | | 25 | Line feed | <u>E</u> | 45 | Underscored E |
| | 06 | | | 26 | | <u>F</u> | 46 | Underscored F |
| | 07 | | | 27 | | <u>G</u> | 47 | Underscored G |
| | 08 | | | 28 | | <u>H</u> | 48 | Underscored H |
| | 09 | | | 29 | | <u>I</u> | 49 | Underscored I |
| | 0A | | | 2A | | ¢ | 4A | Cent sign |
| | 0B | | § | 2B | Section mark | . | 4B | Dot (period) |
| | 0C | | + | 2C | Plotting cross | < | 4C | Less (than) |
| | 0D | | — | 2D | Extended dash (em-dash) | (| 4D | Left paren |
| | 0E | | | 2E | | + | 4E | Plus |
| | 0F | | | 2F | | | 4F | Vertical bar |
| | 10 | | ⁰ | 30 | Superscript 0 | & | 50 | Ampersand |
| | 11 | | ¹ | 31 | Superscript 1 | <u>J</u> | 51 | Underscored J |
| | 12 | | ² | 32 | Superscript 2 | <u>K</u> | 52 | Underscored K |
| | 13 | | ³ | 33 | Superscript 3 | <u>L</u> | 53 | Underscored L |
| | 14 | | ⁴ | 34 | Superscript 4 | <u>M</u> | 54 | Underscored M |
| | 15 | New line | ⁵ | 35 | Superscript 5 | <u>N</u> | 55 | Underscored N |
| | 16 | Back space | ⁶ | 36 | Superscript 6 | <u>O</u> | 56 | Underscored O |
| | 17 | | ⁷ | 37 | Superscript 7 | <u>P</u> | 57 | Underscored P |
| | 18 | | ⁸ | 38 | Superscript 8 | <u>Q</u> | 58 | Underscored Q |
| | 19 | | ⁹ | 39 | Superscript 9 | <u>R</u> | 59 | Underscored R |
| | 1A | | ¶ | 3A | Paragraph mark | ! | 5A | Exclamation point |
| ⌋ | 1B | Upper right corner | ⊥ | 3B | Top Tee junction | \$ | 5B | Dollar sign |
| ⌌ | 1C | Upper left corner | | 3C | | * | 5C | Star (asterisk) |
| | 1D | | ⌋ | 3D | Left Tee junction |) | 5D | Right paren |
| ⌍ | 1E | Lower left corner | ⌌ | 3E | Bottom Tee junction | ; | 5E | Semicolon |
| ⌎ | 1F | Lower right corner | ⌍ | 3F | Right Tee junction | ¬ | 5F | Logical not |

Notes:

1. The character codes represented by X'4F', X'5B', and X'5F' display as "national use" graphics, which vary on 3270s sold in some non-U.S.A. countries. See *IBM 3270 Component Description, GA22-2749*, for details.
2. The character codes represented by X'04', X'24', X'2B', and X'3A' are not defined on the 3277 unit.
3. X'04' and X'24' are the APL/TEXT equivalents of certain "national use" characters listed in the footnotes on these pages. On the 3278 and the 3279 units, these characters are distinct from the "national use" versions; they may appear slightly different on the 3270 display screen.

Figure 38 (Part 1 of 3). Graphic-Hexadecimal Substitution for 3270 APL

| Graphic | Hex | Name |
|--------------|-----|-----------------------|
| - | 60 | Bar (hyphen/minus) |
| / | 61 | Slash |
| <u>S</u> | 62 | Underscored S |
| <u>T</u> | 63 | Underscored T |
| <u>U</u> | 64 | Underscored U |
| <u>V</u> | 65 | Underscored V |
| <u>W</u> | 66 | Underscored W |
| <u>X</u> | 67 | Underscored X |
| <u>Y</u> | 68 | Underscored Y |
| <u>Z</u> | 69 | Underscored Z |
| | 6A | Broken vertical bar |
| , | 6B | Comma |
| % | 6C | Percent symbol |
| _ | 6D | Underbar |
| > | 6E | Greater (than) |
| ? | 6F | Query (Question mark) |
| | 70 | |
| ^ | 71 | And |
| ¨ | 72 | Dieresis |
| ₁ | 73 | Subscript one |
| ₂ | 74 | Subscript two |
| ₃ | 75 | Subscript three |
| _n | 76 | Subscript n |
| ° | 77 | Degree sign |
| ∨ | 78 | Or |
| ` | 79 | Accent grave |
| : | 7A | Colon |
| = | 7B | Pound sign |
| @ | 7C | At symbol |
| ' | 7D | Quote (single) |
| = | 7E | Equal |
| " | 7F | Quote (double) |

| Graphic | Hex | Name |
|---------|-----|--------------------|
| ~ | 80 | Tilde (unlike) |
| a | 81 | Lowercase |
| b | 82 | Lowercase |
| c | 83 | Lowercase |
| d | 84 | Lowercase |
| e | 85 | Lowercase |
| f | 86 | Lowercase |
| g | 87 | Lowercase |
| h | 88 | Lowercase |
| i | 89 | Lowercase |
| ↑ | 8A | Up arrow |
| ↓ | 8B | Down arrow |
| ≤ | 8C | Not greater (than) |
| ┌ | 8D | Upstile |
| └ | 8E | Downstile |
| → | 8F | Right arrow |
| □ | 90 | Quad |
| j | 91 | Lowercase |
| k | 92 | Lowercase |
| l | 93 | Lowercase |
| m | 94 | Lowercase |
| n | 95 | Lowercase |
| o | 96 | Lowercase |
| p | 97 | Lowercase |
| q | 98 | Lowercase |
| r | 99 | Lowercase |
| ⊃ | 9A | Right shoe |
| ⊂ | 9B | Left shoe |
| ◻ | 9C | Lozenge |
| ○ | 9D | Circle |
| ± | 9E | Plus-or-minus |
| ← | 9F | Left arrow |

| Graphic | Hex | Name |
|---------|-----|-----------------------|
| ¯ | A0 | Overbar |
| ~ | A1 | Tilde (unlike) |
| s | A2 | Lowercase |
| t | A3 | Lowercase |
| u | A4 | Lowercase |
| v | A5 | Lowercase |
| w | A6 | Lowercase |
| x | A7 | Lowercase |
| y | A8 | Lowercase |
| z | A9 | Lowercase |
| ∩ | AA | Cap |
| ∪ | AB | Cup |
| ⊥ | AC | Base |
| [| AD | Left bracket |
| ≥ | AE | Not less (than) |
| o | AF | Null |
| α | B0 | Alpha |
| ε | B1 | Epsilon |
| ι | B2 | Iota |
| ρ | B3 | Rho |
| ω | B4 | Omega |
| ■ | B5 | Solid square |
| × | B6 | Times |
| \ | B7 | Slope (reverse slash) |
| ÷ | B8 | Divide |
| • | B9 | Bullet |
| ∇ | BA | Del |
| Δ | BB | Delta |
| ⊤ | BC | Top |
|] | BD | Right bracket |
| ≠ | BE | Not equal |
| | BF | Stile (vertical bar) |

Notes:

1. The character codes represented by X'79', X'7C', X'7F', and X'A1' display as "national use" graphics, which vary on 3270s sold in some non-U.S.A. countries. See *IBM 3270 Component Description, GA22-2749*, for details.
2. The character codes represented by X'6A', X'79', and X'A1' are not defined on the 3277 unit.
3. X'80', X'B7', and X'24' are the APL/TEXT equivalents of certain "national use" characters listed in the footnotes on these pages. On the 3278 and the 3279 units, these characters are distinct from the "national use" versions; they may appear slightly different on the 3270 display screen.

Figure 38 (Part 2 of 3). Graphic-Hexadecimal Substitution for 3270 APL

| Graphic | Hex | Name |
|---------|-----|-------------------------|
| { | C0 | Left brace |
| A | C1 | Capital |
| B | C2 | Capital |
| C | C3 | Capital |
| D | C4 | Capital |
| E | C5 | Capital |
| F | C6 | Capital |
| G | C7 | Capital |
| H | C8 | Capital |
| I | C9 | Capital |
| ⋈ | CA | Nand (not and) |
| ⋈ | CB | Nor (not or) |
| | CC | |
| ⊘ | CD | Circle-stile |
| | CE | |
| ⊘ | CF | Circle-slope |
| } | D0 | Right brace |
| J | D1 | Capital |
| K | D2 | Capital |
| L | D3 | Capital |
| M | D4 | Capital |
| N | D5 | Capital |
| O | D6 | Capital |
| P | D7 | Capital |
| Q | D8 | Capital |
| R | D9 | Capital |
| I | DA | I-beam (base-top) |
| ! | DB | Quote-dot (exclamation) |
| ∇ | DC | Del-stile |
| Δ | DD | Delta-stile |
| ▣ | DE | Quote-quad |
| A | DF | Cap-null |

| Graphic | Hex | Name |
|---------|-----|-----------------------|
| \ | E0 | Slope (reverse slash) |
| | E1 | |
| S | E2 | Capital |
| T | E3 | Capital |
| U | E4 | Capital |
| V | E5 | Capital |
| W | E6 | Capital |
| X | E7 | Capital |
| Y | E8 | Capital |
| Z | E9 | Capital |
| / | EA | Slash-bar |
| ∖ | EB | Slope-bar |
| | EC | |
| ⊖ | EC | Circle-bar |
| ⊞ | EE | Domino (quad-divide) |
| ∇ | EF | Top-null |
| 0 | F0 | Zero |
| 1 | F1 | One |
| 2 | F2 | Two |
| 3 | F3 | Three |
| 4 | F4 | Four |
| 5 | F5 | Five |
| 6 | F6 | Six |
| 7 | F7 | Seven |
| 8 | F8 | Eight |
| 9 | F9 | Nine |
| | FA | Long vertical bar |
| ∇ | FB | Del-tilde |
| Δ | FC | Delta-underbar |
| ⊗ | FD | Log (circle-star) |
| ⊘ | FE | Base-null |
| | FF | (Eight ones) |

Notes:

1. The character codes represented by X'D0', as "national use" graphics, which vary on 3270s sold in some non-U.S.A. countries. See *IBM 3270 Component Description, GA22-2749*, for details.
2. The character code represented by X'E0' are not defined on the 3277 unit.
3. X'DB' is the APL/TEXT equivalent of a "national use" character listed in the footnotes on these pages. On the 3278 and the 3279 units, this character is distinct from the "national use" version; it may appear slightly different on the 3270 display screen.

Figure 38 (Part 3 of 3). Graphic-Hexadecimal Substitution for 3270 APL

| Graphic | Hex | Graphic | Hex | Graphic | Hex | Graphic | Hex | Graphic | Hex |
|---------|-----|---------|-----|---------|-----|---------|-----|---------|-----|
| SP | 40 | | 67 | + | 8E | 5 | B5 | ∇ | DC |
| | 41 | | 68 | + | 8F | 6 | B6 | ⊗ | DD |
| | 42 | | 69 | □ | 90 | 7 | B7 | ← | DE |
| | 43 | | 6A | j | 91 | 8 | B8 | → | DF |
| | 44 | , | 6B | k | 92 | 9 | B9 | \ | E0 |
| | 45 | % | 6C | l | 93 | ∇ | BA | | E1 |
| | 46 | - | 6D | m | 94 | .┘ | BB | S | E2 |
| | 47 | > | 6E | n | 95 | ┘ | BC | T | E3 |
| | 48 | ? | 6F | o | 96 |] | BD | U | E4 |
| | 49 | η | 70 | p | 97 | ≠ | BE | V | E5 |
| ¢ | 4A | | 71 | q | 98 | — | BF | W | E6 |
| . | 4B | | 72 | r | 99 | | C0 | X | E7 |
| < | 4C | | 73 | | 9A | A | C1 | Y | E8 |
| (| 4D | | 74 | } | 9B | B | C2 | Z | E9 |
| + | 4E | | 75 | π | 9C | C | C3 | T | EA |
| | 4F | | 76 |) | 9D | D | C4 | ⊥ | EB |
| & | 50 | | 77 | ± | 9E | E | C5 | ∇ | EC |
| 1 | 51 | | 78 | ■ | 9F | F | C6 | Δ | ED |
| 2 | 52 | | 79 | - | A0 | G | C7 | ┌ | EE |
| 3 | 53 | : | 7A | ○ | A1 | H | C8 | └ | EF |
| | 54 | # | 7B | s | A2 | I | C9 | 0 | F0 |
| | 55 | @ | 7C | t | A3 | Δ | CA | 1 | F1 |
| | 56 | ' | 7D | u | A4 | ┘ | CB | 2 | F2 |
| | 57 | = | 7E | v | A5 | ∧ | CC | 3 | F3 |
| | 58 | " | 7F | w | A6 | ∇ | CD | 4 | F4 |
| ↓ | 59 | | 80 | x | A7 | ≠ | CE | 5 | F5 |
| ! | 5A | a | 81 | y | A8 | ≠ | CF | 6 | F6 |
| \$ | 5B | b | 82 | z | A9 | | D0 | 7 | F7 |
| * | 5C | c | 83 | | AA | J | D1 | 8 | F8 |
|) | 5D | d | 84 | ┘ | AB | K | D2 | 9 | F9 |
| ; | 5E | e | 85 | ┘ | AC | L | D3 | | FA |
| ┘ | 5F | f | 86 | [| AD | M | D4 | ┘ | FB |
| - | 60 | g | 87 | ≥ | AE | N | D5 | Φ | FC |
| / | 61 | h | 88 | ● | AF | O | D6 | ⊥ | FD |
| | 62 | i | 89 | 0 | B0 | P | D7 | | FE |
| | 63 | ↑ | 8A | 1 | B1 | Q | D8 | | FF |
| | 64 | { | 8B | 2 | B2 | R | D9 | | |
| | 65 | ≤ | 8C | 3 | B3 | ⊠ | DA | | |
| | 66 | | 8D | 4 | B4 | △ | DB | | |

Figure 39. Graphic-Hexadecimal Substitution for 3270 Text Feature

Appendix D. Entry Assist

Entry Assist is a customizable feature available for 3274 control units. It provides text editing enhancements such as:

- User-defined Left/Right Margins
- User-defined Tabbing
- User-defined Bell ('end of line' signal)
- Cursor movement by word
- Word Wrapping

Entry Assist features a document mode which enhances your ability to edit text by using certain keys on the terminal. For example, there are keys to find the next word, find the previous word, and to delete a word. While in document mode, you can press the insert key and insert into a line regardless of whether that line is padded with trailing blanks or nulls. When the Word Wrap function is active, a word that will overwrite the right margin will automatically be moved to the next row if there is room.

For a complete description of Entry Assist see the *Entry Assist User's Guide* (GA23-0119).

Appendix E. ASCII Translation

The Control Program (CP) supports ASCII devices via 37x5. This section describes enhancements to VM support of ASCII in connection with line mode support.

Provision of Translate Tables

The TERMINAL command has as a new operand, ASCIITBL, that can be used on TTY type terminals. ASCIITBL lets you select the translation tables you want to use from the following:

- VM1** ASCII translate tables based on STD TTY ANSI X3.4 1977 translate tables. VM1 is the default.
- VM2** ASCII translate tables based on STD TTY ANSI X3.26 1980 translate tables.

If you find translate table discrepancies because your application uses STD TTY ANSI X3.26 1980 translate tables, you can select these translate tables with the VM2 option. If not, you can continue to use the 1977 translate tables as the default or by selecting the VM1 option.

ASCII to EBCDIC Differences

| ASCII | VM1 | | VM2 | |
|-------|--------|---------|--------|---------|
| | EBCDIC | Graphic | EBCDIC | Graphic |
| 21 | 5A | ! | 4F | |
| 5B | AD | [| 4A | ¢ |
| 5D | BD |] | 5A | ! |
| 7C | 4F | | 6A | |

EBCDIC to ASCII Differences

| EBCDIC | VM1 | | VM2 | |
|--------|-------|---------|-------|---------|
| | ASCII | Graphic | ASCII | Graphic |
| 4A | 7F | DEL | 5B | [|
| 4F | 7C | | 21 | ! |
| 5A | 21 | ! | 5D |] |

Summary of Changes

**Summary of Changes
for GC19-6206-5
for VM/SP Release 6**

Miscellaneous

Minor technical and editorial changes have been made throughout this publication.

Integration of Between-Release Support Information to VM/SP Release 6

VM Terminal Usability Enhancements, GC24-5309

**Summary of Changes
for GC19-6206-4
for VM/SP Release 5**

New ASCII Devices

The IBM 7171 ASCII device attachment control unit and the IBM 3161/3163 ASCII display station are described in this release.

Three new appendix sections have been added. One section describes the Entry Assist enhancement for 3274 control units. The second section explains the ASCII to EBCDIC and EBCDIC to ASCII differences when using ASCII in connection with line mode support. The third new appendix documents how non-displayable characters are translated.

Miscellaneous

Minor technical and editorial changes have been made throughout this publication.

**Summary of Changes
for GC19-6206-3
Terminal Reference
VM/SP Release 4**

This edition documents support included in Virtual Machine/System Product, Release 4.

This edition contains a sample SNA terminal session from signing on to signing off. In addition, information about new logon messages and prompts has been added to help terminal users successfully complete their logon procedure.

This edition describes, in addition to the existing information, the IBM 3178 Display Station. Also discussed are the IBM Personal Computer and the IBM Personal Computer XT/370, which may be used with a host VM/SP system.

Integration of Functional Enhancements Applied to Release 3.

Information for the IBM 3290 Information Panel has been integrated into this edition.

**Summary of Changes
for GC19-6206-2
Terminal Reference
VM/SP Release 3**

This edition documents support included in Virtual Machine/System Product, Release 3.

In addition, this edition contains new material on the IBM 3278 and 3279 Color Terminals, and has been completely reorganized to increase its usability. The title has been changed to reflect this reorganization.

**Summary of Changes
for GC19-6206-1
Terminal User's Guide
VM/SP Release 2**

Changes included herein have been implemented in support of the following Release 2 features:

- IBM 3232 ASCII terminal in APL operational mode
- Remote DIAL capability
- Retrieve function.

Other changes to the text include those implemented to reflect service updates to the product, as well as minor editorial changes.

Bibliography

Prerequisite Publications

You should be familiar with one or more of the following books before using this book:

Virtual Machine/System Product:

Introduction, GC19-6200
Operator's Guide, SC19-6202.
CP General User Command Reference, SC19-6211.
CMS Primer for Line-Oriented Terminals, SC24-5242.
CMS Primer, SC24-5236

Related Publications

To obtain editions of this publication that pertain to earlier releases of VM/SP, you must order using the pseudo-number assigned to the respective edition. For:

Release 5, order GT00-1979
Release 4, order GT00-1581
Release 3, order GT00-1355
Release 2, order GQ19-6206
Release 1, order GT19-6206

This book discusses only some of the functions that are available with the VM/SP system. The following books discuss them in greater detail:

Virtual Machine/System Product:

Planning Guide and Reference, SC19-6201.
Operator's Guide, SC19-6202.
System Messages and Codes, SC19-6204.
CMS Command Reference, SC19-6209.
Application Development Reference for CMS, SC24-5284.
CMS User's Guide, SC19-6210.
CP General User Command Reference, SC19-6211.
Running Guest Operating Systems, GC19-6212.
Installation Guide, SC24-5237.
System Product Interpreter User's Guide, SC24-5238.
System Product Interpreter Reference, SC24-5239.

System Product Editor

A number of references are made in this book to the System Product Editor (XEDIT), a convenient and powerful file editor. For information on XEDIT, see:

System Product Editor User's Guide, SC24-5220
System Product Editor Command and Macro Reference, SC24-5221.

Supplemental Publications

RSCS

Installations that have the Group Control System (GCS) installed with Systems Network Architecture (SNA) terminals can use RSCS Networking Version 2 to transmit and receive messages and files over the network. Information about RSCS can be found in the following publications:

Remote Spooling Communication Subsystem Networking Version 2:

General Information, GH24-5055.
Operation and Use, SH24-5058.

IPCS

VM/SP has an enhanced interactive problem control system (VM/SP IPCS) component. This component replaces the unmodified VM/370 interactive problem control system. Details of this major component are found in the *VM/SP Interactive Problem Control System Guide and Reference*, SC24-5260.

Note: VM/SP IPCS has function equivalent to the VM IPCS Extension (VM/IPCS/E) program product (5748-SA1).

APL

For users of certain other VM/370 supported devices that have APL-compatible keyboards, the following publications are useful:

VS APL for CMS: Terminal User's Guide, SH20-9067
An Introduction to the 3270 Data Analysis-APL Feature GA27-2788.

VM/Pass-Through Facility

For information about the VM/Pass-Through Facility see:

VM/Pass-Through Facility:

*** *OBSOLETE USE GC24-5373* *** , GC24-5206
*** *OBSOLETE USE SC24-5374* *** , SC24-5208.

VTAM

If the ACF/VTAM Version 3 (for VM/SP) program product (5664-280) is used to provide support for SNA terminals, the following publications are suggested:

ACF/VTAM:

VTAM General Information (for VM), GC30-3246
Network Program Products Planning, SC23-0110
VTAM Installation and Resource Definition, SC23-0111
VTAM Customization, SC23-0112
VTAM Operation, SC23-0113

If the VTAM Communications Network Application (VM/VCNA) program product (5735-RC5) is used to provide support for SNA terminals, the following publications are suggested:

VM/VCNA:

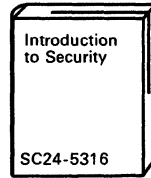
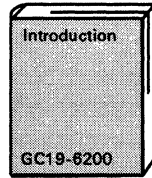
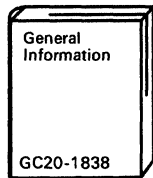
Communication Network Application General Information Manual, GC27-0501
Communication Network Application Installation, Operation, and Terminal Use, SC27-0502.

Device Publications

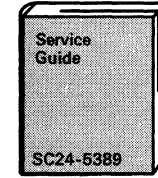
Device publications are listed in the sections where the individual devices are discussed.

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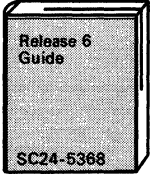
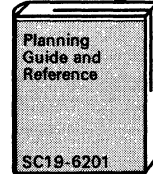
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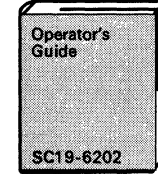
Installation and Service



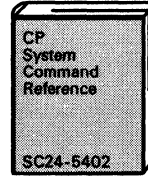
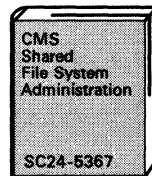
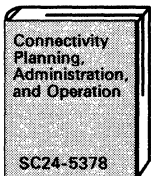
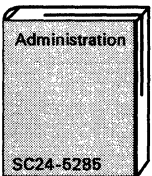
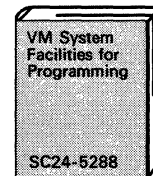
Planning



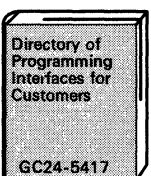
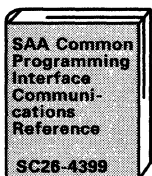
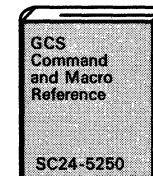
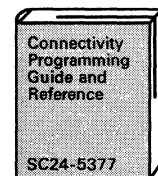
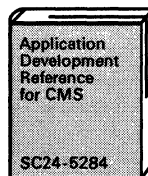
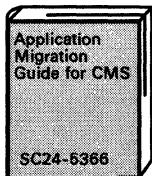
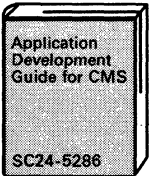
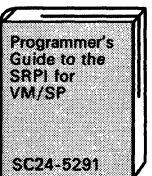
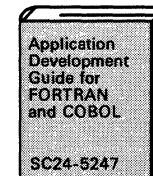
Operation



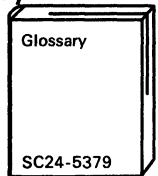
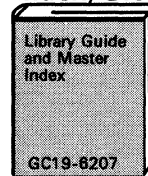
Administration



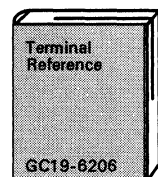
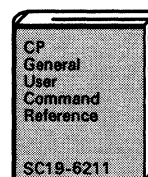
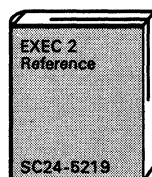
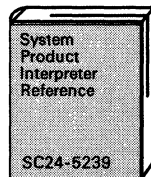
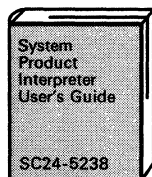
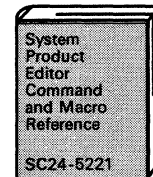
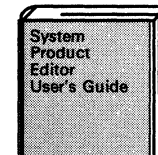
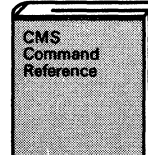
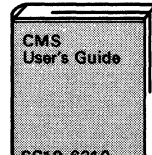
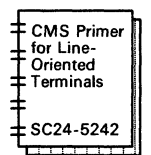
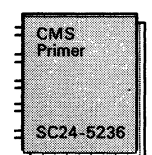
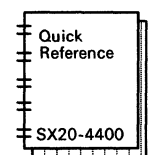
Application Development




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End Use



 one copy of each shaded manual received with product tape

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Diagnosis

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| System Messages and Codes SC19-8204 | System Messages Cross-Reference SC24-5264 | Service Routines Program Logic LY20-0890 | Interactive Problem Control System Guide and Reference SC24-5260 | Diagnosis Guide LY24-5241 | CP Diagnosis Reference LY20-0892 |
| CP Data Areas and Control Blocks LY24-5220 | CMS Diagnosis Reference LY20-0893 | CMS Data Areas and Control Blocks LY24-5221 | VM CP Trace Table (Poster) SX24-5225 | Problem Determination Summary SX24-5224 | |

Reference Summaries

| | | | | | |
|---|--|--|---|---|--|
| SP Editor Command Language Reference Summary SX24-5122 | EXEC 2 Language Reference Summary SX24-5124 | CMS Primer Summary of Commands SX24-5151 | SP Interpreter Reference Summary SX24-5126 | CMS Primer for Line-Oriented Terminals Summary of Commands SX24-5159 | |
| HELP Facility Introduction SX24-5221 | CP General User Command Reference Summary SX24-5219 | CP System Command Reference Summary SX24-5222 | CMS Command Reference Summary SX24-5220 | VM Summary of End Use Tasks and Commands (Poster) SX24-5173 | |

Auxiliary Communication Support

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|--|---|--------------------------------------|--|---|--------------------------------------|
| VTAM Installation and Resource Definition SC23-0111 | VTAM Customization SC23-0112 | VTAM Operation SC23-0113 | VTAM Messages and Codes SC23-0114 | VTAM Programming SC23-0115 | VTAM Diagnosis Guide LY30-5601 |
| VTAM Programming for LU 6.2 SC30-3400 | VTAM Data Areas (VM) LY30-5593 | VTAM Reference Summary LY30-5600 | VM/Pass-Through Facility Overview GC24-5373 | VM/Pass-Through Facility: Managing and Using SC24-5374 | RSCS Exit Customization SH24-5197 |
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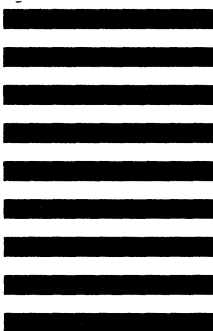
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