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Systems

IBM Virtual Machine Facility/370: Terminal User's Guide

Release 3 PLC 8

This publication provides terminal users with information required to access VM/370 via terminal devices. Topics discussed include:

- Initializing a terminal
- Contacting VM/370 via common carrier facilities
- Gaining access to VM/370
- Logging on
- Typing conventions
- Entering command environments
- Using 3270 and 3066 Display Terminals
- Using the 3767 Communication Terminal (as a 2741)
- Handling attention interruptions
- Setting up and using the 3270 Program Function Keys
- Managing screens for display devices

A prerequisite for a thorough understanding and effective use of this publication is *IBM Virtual Machine Facility/370: Introduction*, Order No. GC20-1800.

The IBM logo is displayed in a large, bold, outlined font, consisting of the letters 'I', 'B', and 'M' stacked vertically.

Seventh Edition (October 1976)

This is a major revision of and makes obsolete GC20-1810-5. This edition corresponds to Release 3 PLC 8 (Program Level Change) of IBM Virtual Machine Facility/370 and to all subsequent releases unless otherwise indicated in new editions or Technical Newsletters. Extensive changes have been made to this manual; therefore, the user should read it in its entirety.

Changes are periodically made to the specifications herein; before using this publication in connection with the operation of IBM systems, consult the latest IBM System/370 Bibliography, Order No. GC20-0001, for the editions that are applicable and current.

Technical changes and additions to text and illustrations are indicated by a vertical bar to the left of the change.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office serving your locality.

A form for readers' comments is provided at the back of this publication. If the form has been removed, comments may be addressed to IBM Corporation, VM/370 Publications, Dept. D58, Bldg. 706-2, P.O. Box 390, Poughkeepsie, New York 12602. Comments become the property of IBM.

Preface

This manual describes the terminals supported by the IBM Virtual Machine Facility/370 (VM/370). It is for all VM/370 terminal users. Its purpose is to allow a potential user of a virtual machine to gain access to VM/370 (CP or CMS environment) via one of the terminals supported by VM/370.

Certain devices are also supported for remote spooling under the VM/370 Remote Spooling Communications Subsystem (RSCS). These devices and how you use them are described in the VM/370: Remote Spooling Communications Subsystem (RSCS) User's Guide, Order No. GC20-1816.

The 2701 Data Adapter Unit, 2702 or 2703 Transmission Control Units, and 3704 or 3705 Communications Control Units will all be called transmission control units in this manual.

Information on the IBM System/370 Models 135-3, 138, 145-3, and 148 is for planning purposes only until the availability of the product.

Unless otherwise stated, references to the System/370 Model 138 refer to the Model 135-3, and references to the System/370 Model 148 refer to the Model 145-3.

Users of terminals with keyboards as the primary mode of entry should have a basic understanding of the applicable terminal device. This device can be either a printing or a display style terminal. Additional information may be found in the following publications:

IBM 2741 Component Description, Order No. GA24-3415

IBM 1050 Data Communication System Operator's Guide, Order No. GA24-3425

IBM 1050 Data Communication System Principles of Operation, Order No. GA24-3474

IBM 3210 Console Printer-Keyboard Model 2 Component Description, Order No. GA24-3552

IBM 3215 Console Printer-Keyboard Component Description, Order No. GA24-3550

IBM System/360 Component Description and Operating Procedure 1052 Printer-Keyboard

Model 7 and 2150 Console, Order No. GA22-6877

IBM 3767 Communication Terminal Operator's Guide, Order No. GA18-2000

IBM System/370 Model 138 Functional Characteristics, Order No. GA24-3632

IBM System/370 Model 148 Functional Characteristics, Order No. GA24-3634

IBM System/370 Model 158 Functional Characteristics, Order No. GA22-7011

System/370 Model 168 Procedures, Order No. GC38-0030

Operator Guide for IBM 3270 Information Display System, Order No. GA27-2742

It is assumed that users of the 3270 terminal have read and understood the Operator's Guide for IBM 3270 Information Display System.

Additional information may be found in the publication:

IBM 2780 Data Transmission Terminal Component Description, Order No. GA27-3005, and the VM/370: Remote Spooling Communications Subsystem (RSCS) User's Guide, Order No. GC20-1816

PREREQUISITE PUBLICATIONS

IBM Virtual Machine Facility/370:

Introduction, Order No. GC20-1800

How to Use This Manual

Users of terminals should first become familiar with the appearance and physical layout of their terminals. Sections 2 and 3 discuss the operation of terminals supported by VM/370. "Section 1. Introduction" contains general information on how to log on to the VM/370 system.

Note: If a conflict is found between this publication and the IBM Virtual Machine

Facility/370: Release 3 Guide, Order No. GC20-1822, the information in the VM/370: Release 3 Guide should be regarded as the correct specification.

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3270 DATA ANALYSIS-TEXT FEATURE

New: Program Feature

The 3270 Data Analysis-Text Feature allows you to key in, display, and print all 'TN' print train special characters that are used in textual data. The Text feature is activated by the CP command, TERMINAL TEXT ON, when using a 3270 terminal equipped with the necessary features. The contents of the screen may be printed on a 3284 or 3286 printer that has the necessary features.

For information about the 3270 Data Analysis-Text Feature, see "Section 3. Display Terminals."

IBM SYSTEM/370 MODELS 135-3, 138, 145-3,
AND 148 NOW SUPPORTED

Changed: Programming and Documentation

The IBM System/370 Models 135-3, 138, 145-3, and 148 are now supported. The display consoles of the 138 and 148, together with a 3286 Printer, Model 2, are functionally equivalent to a 3215 Console Printer-Keyboard. Their display consoles are functionally equivalent to the 3277 display terminal when in display mode.

For information about these new models, see "Section 1. Introduction" and "Section 3. Display Terminals."

3275 REMOTE SUPPORT WITH DIAL FEATURE

New: Program Feature

VM/370 now supports the IBM 3275 Display Station as a remote terminal with the Dial feature. This feature allows communication over switched lines.

MISCELLANEOUS CHANGES

Changed: Documentation Only

- Correction in "VM/370 Environment Conventions"
- Addition to HOLDING and NOT ACCEPTED terminal status
- Addition to Figure 32
- Correction to Figure 38
- Correction to PF Key Inspection

IBM 3270 DATA ANALYSIS-APL FEATURE

New: Program Feature

The IBM 3270 Data Analysis-APL Feature allows the 3270 user to interact with the VS APL Program Product under CMS and manipulate files with VS APL. It provides the user with text editing by displaying "TN" train graphics, and offers the dual-case (uppercase and lowercase characters) capability as standard. When installed on a 3270 device, the feature allows the user to enter, display, or print the APL character set. The APL character set may be printed on the 3284 or 3286 printers.

The Data Analysis-APL Feature combines the standard dual-case 3270 character set with 54 APL characters that include the 19 compound (overstruck) symbols. The Data Analysis-APL Feature also includes an underscored uppercase alphabet for additional versatility.

PRINTER COPY SUPPORT FOR LOCAL 3270

Changed: Programming and Documentation

The SET PFnn COPY command can now be used to print a copy of the display screen on 3284, 3286, and 3288 printers from locally attached 3270 devices. The real printer address must be specified and, except for screen status, the entire screen is printed on the printer.

IBM 2780 DATA TRANSMISSION TERMINAL

Changed: Programming and Documentation

The IBM 2780 Data Transmission Terminal is now supported only as a remote station under the Remote Spooling Communications Subsystem (RSCS).

The IBM 2780 Standalone Spool Remote program (DMKSRP) is no longer supported.

MISCELLANEOUS

New: Documentation Only

The technical changes incorporated by Release 3 PLC 1 of VM/370, as well as technical changes brought to our attention by Reader's Comment Forms and internal programming activity are found in:

- A reference in "Attention Handling and Mode Switching" to clarify which keys on your terminal cause an attention interruption.
- Certain conditions where the #CP command may not be accepted by CP.
- A correction to "3767 Initiation Procedures - Margins and Tabs."
- Figure 19.
- Figure 20.
- Figure 21.
- Additional information about the MORE status.
- Figure 22.
- Figure 24.
- A new Figure 25.
- A new Figure 26.
- A clarification of "Display Terminal Keys and Keyboards."
- Additions to "Cursor Movement Controls."
- An addition to the explanation of the PA1 key.
- A new Figure 30.
- A new Appendix D.

Section 1. Introduction

You must use a conversational input/output device called a terminal to access the IBM Virtual Machine Facility/370 (VM/370) system. The terminal transmits information that you key in over dedicated leased lines, switched lines (telephone dialing facilities), or a local attachment to the VM/370 computer. A local attachment is the attachment of the device(s) directly to a channel of the processor without using a 2701, 2702, 2703, 3704, or 3705 transmission control unit. In addition to receiving and processing information, the system can send information and messages to the terminal. Information that you key in on the terminal keyboard is called "input." Information that the system or user program displays at the terminal is "output."

TERMINALS THAT ACCESS VM/370¹

The following terminals can access the VM/370 system:

- IBM 2741 Communications Terminal
- IBM 1050 Data Communication System
- Teletype² Model 33
- Teletype Model 35
- IBM 3210 Console Printer Keyboard, Models 1 and 2
- IBM 3215 Console Printer-Keyboard, Model 1
- IBM 2150 Console with 1052 Printer-Keyboard, Model 7
- IBM 3277 Display Station, Model 2 (Local or Remote Attachment) with an EBCDIC keyboard

¹Terminals which are equivalent to those explicitly supported may also function satisfactorily. The customer is responsible for establishing equivalency. IBM assumes no responsibility for the impact that any changes to the IBM-supplied products or programs may have on such terminals.

²Trademark of the Teletype Corporation.

- IBM System/370 Models 138 and 148 Display Consoles (in 3215 emulator mode) with the 3286 Printer, Model 2 required
- IBM System/370 Models 138 and 148 Display Consoles (in display mode)
- IBM 3275 Display Station, Model 2 (Remote Attachment) with an EBCDIC keyboard
- IBM 3066 System Console Model 2
- IBM System/370 Model 158 Display Console (in 3215 emulator mode) with the 3213 Printer, Model 1 required
- IBM System/370 Model 158 Display Console (display mode)
- IBM 7412 Console (via RPQ AA 2846) with 3215 Console Printer-Keyboard, Model 1
- IBM 2780 Data Transmission Terminal Model 2 (a remote batch spooling device)
- IBM 3767 Communication Terminal, Models 1 and 2

Any of these terminals (except the system consoles, the 3277 local and remote display stations) can connect to the computer via switched or leased line facilities. The 3277 remote display station must use leased line facilities. If the terminal uses switched or dial-up line connections, you must use a permanent communications data set attachment or an acoustic coupler. In either case, you must dial a telephone number to establish a physical connection with the computer. This procedure is described in this section under "Connection with the Computer."

This manual contains a sampling of system error messages. These messages are shown as they appear in VM/370: System Messages. They are in this text as an aid to understanding logging on and dialing procedures. Other console messages may occur because of System/370 error conditions, or CP or CMS command syntax errors. Consult the VM/370: System Messages manual on such occurrences.

The sampling of messages extracted from the VM/370: System Messages manual, as well as other messages, contain both uppercase

and lowercase characters. Lowercase characters represent situation-dependent terms or expressions while uppercase characters designate constant segments of a message.

In general, this manual shows system responses that represent actual console printout or display in uppercase characters. This manual always shows user or operator input to VM/370 in lowercase.

Note: The lowercase letters feature is not standard nor is the feature available on all VM/370 supported terminals. Therefore, examples of virtual machine input and output may appear differently in this text from the data displayed or printed at your terminal.

ATTENTION AND END-OF-INPUT LINE SIGNALING

Two functions common to all terminals are attention and end-of-input line signaling. These functions are as important to VM/370 as they are to the virtual machine. Attention signaling posts a pending interruption to the selected system -- either to CP or to the virtual machine. The end-of-input signal requests the controlling system to accept the previously keyed-in data line. The names of the keys on the associated terminal types that perform these functions are given below.

To signal attention:

Terminal or Console	Key
Type-----	
2741,3767	ATTN
1050	RESET LINE
Teletype	
Models 33,35	BREAK
3210,3215	REQUEST
S/370 Model 138,	
148, or 158	ENTER
3066,3270	ENTER

To signal end-of-input:

Terminal or Console	Key
Type-----	
2741,3767	RETURN
1050	RETURN ¹ or ALTN coding plus numeral 5 (EOB)
Teletype	
Models 33,35	CTRL plus X-OFF (or with the

¹Requires RPQ (#28235)

Terminal or Console
Type-----

Terminal or Console	Key
3210,3215	appropriate terminal control unit feature on the computer, RETURN)
3270,3066	END
S/370 Model 138,	ENTER
148, or 158	ENTER

The remainder of this text refers to attention and end-of-input signaling in the following manner:

attention signal = ATTN
end-of-input signal = ENTER

GAINING ACCESS TO VM/370

Gaining access to VM/370 requires that two separate actions occur:

1. Connecting electrically to the computer and,
2. Logging on with a LOGON command.

CONNECTION WITH THE COMPUTER

The 2741, 3767, 1050, 3210, and 3215 terminals and the 3270, 3066, 138, 148, and 158 Display Consoles attach to the System/370 processor in one of four ways:

- Integrated as part of the CPU. This method is reserved for system consoles and alternate system console devices.
- Attached by means of leased or switched lines through a transmission control unit. 2741, 3767, 1050, and Teletype terminals attached to a 2701, 2702, 2703, 3704, or 3705 control unit use this method.
- Attached locally through a 3272 control unit. This method connects 3277 Display Stations to either a selector, byte multiplexer, or block multiplexer channel.
- Attached remotely on leased lines, the 3277 is attached via a 3271 control unit. The 3275 has its own control unit.

Both leased lines and switched lines are common carrier communication facilities. The leased line is a dedicated line that contains no switching systems and

permanently links the terminal to the processor. Switched lines employ normal telephone dialing facilities to effect a temporary terminal-to-computer connection. The connection exists for as long as necessary and you or VM/370 can break it. Terminals using switched lines can use a special communications data set or a standard telephone with a special acoustic coupler arrangement.

Display Consoles

The connection for the 3066 and System/370 Models 138, 148, and 158 system consoles are similar to locally attached 3270 display terminals; that is, they attach directly to the multiplexer channel without line transmission control units. Figure 1 illustrates this connection for the 3066.

For the message "VM/370 online" to appear on the screen, VM/370 must be operational, the device must have power on, be enabled, and online to the system.

To power up the 3277, pull the ON/OFF knob located on the left of the screen.

3767 Initiation Procedures

The procedures and steps for use of a 3767 terminal (as a 2741 under VM/370) concern terminal-to-processor communication and terminal printing format. Use the following procedure if the 3767 is attached to a leased (nonswitched) line.

Place the following switches in the indicated settings making sure to turn on the power on switch last. Ignore blocked or inoperative switches. See Figure 21.

<u>Switch</u>	<u>Setting</u>
COMM/LOCAL	COMM
AUTO EOB EOM	ON
EDIT	ON
AUTO VIEW	ON
DATA TALK	DATA
DIAL DISC	OFF
LINE FEED	ONE
SDLC/S/S	S/S
PRIMARY/SECONDARY	PRIMARY
CALC	OFF
TEST	OFF
POWER ON	ON

For setup procedures that involve switched lines or acoustic couplers, refer to the 3767 Operator's Guide. Many of the

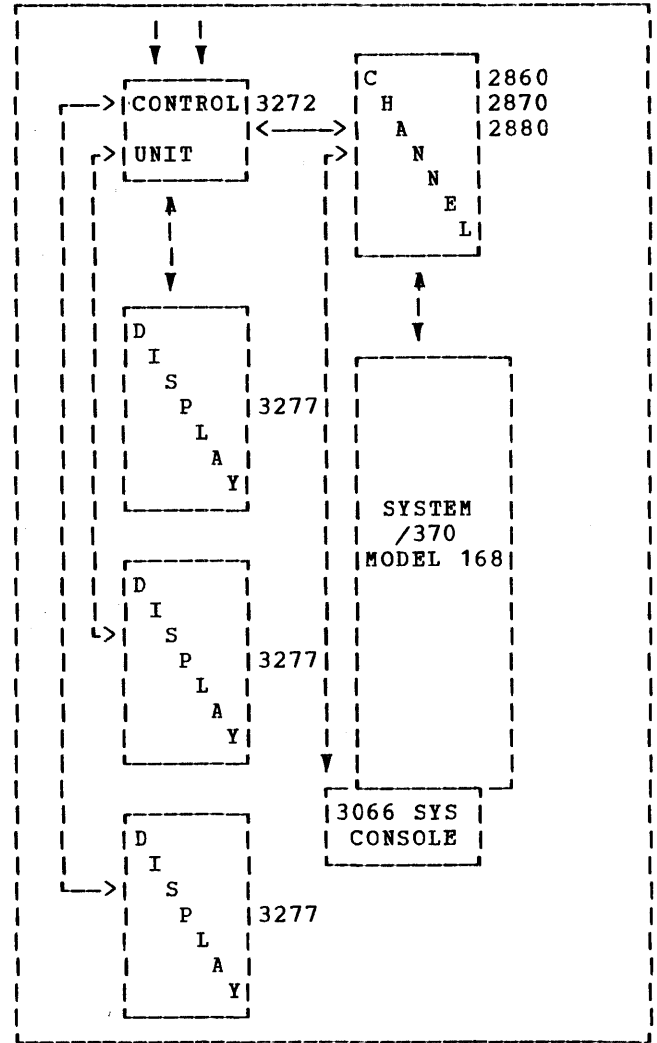


Figure 1. Local Display Attachment

switches involve features that may or may not be incorporated on your terminal. However, the absence of many of these features does not invalidate the 3767's usefulness as a VM/370 terminal.

2741/1050/3767 on Leased Lines

Figure 2 shows the leased line (nonswitched) facilities for 2741, 3767, and 1050 terminals. The 2741/3767 starting procedures are as follows:

1. Turn the COM/LCL switch to COM.

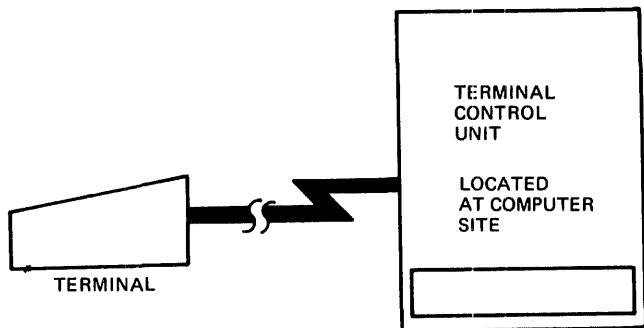


Figure 2. Leased Line Facilities

2. Turn the ON/OFF switch to ON. (If the switch is on, turn it off, then on again.) VM/370 should type out "vm/370 online" and lock or deactivate the keyboard. Then press the attention key (ATTN) to unlock or activate the keyboard and log on to the system. Successful logon can only occur after receiving the "vm/370 online" message.

The 1050 starting procedures are as follows:

1. Set the 1050 Control Panel switches as shown in Figure 11.
2. Turn the MAIN POWER switch to the ON position (it is located on the side of the 1051 Control Unit). The DATA CHECK light comes on. Press the DATA CHECK key to turn out the light. Press the RESEND key and the RESET LINE key in that order. This action resets the 1050 internal circuits to prepare for a terminal session. VM/370 should type out "vm/370 online".

3275 on Switched Lines with a Data Set

The following procedure assumes that the 3275 connects to a Western Electric 103A2 (or equivalent) data set. For other types or models of data sets, consult the common carrier for operating instructions.

If the terminal uses a switched (or dial-up) line with a common carrier data set to establish contact with the VM/370 computer, use the following procedure:

1. Pull the 3275 ON/OFF switch to the ON position.
 2. Press the TALK pushbutton on the telephone data set.
 3. Remove the handset from the cradle and dial the VM/370 system's telephone number.
 4. Wait for a high-pitched tone; if the number is busy or no answer occurs, hang up and try again. (Go to step 3.)
 5. When you hear the high-pitched tone, press the DATA pushbutton on the data set. Do this within 28 seconds after hearing the high-pitched tone or the connection will be disconnected. The DATA pushbutton should light up. When the SYSTEM AVAILABLE light comes on, the system can receive input data. If the DATA light goes off at any time during the terminal session, repeat steps 3 through 6 to restore the connection.
- Note:** Some data set models do not have lighted DATA pushbuttons.
6. Place the handset back in the cradle. The VM/370 logo should appear on the screen.

2741/1050/3767 on Switched Lines with a Data Set

Figure 3 shows the switched line (dial) facilities for 2741 and 1050 terminals using common carrier data sets.

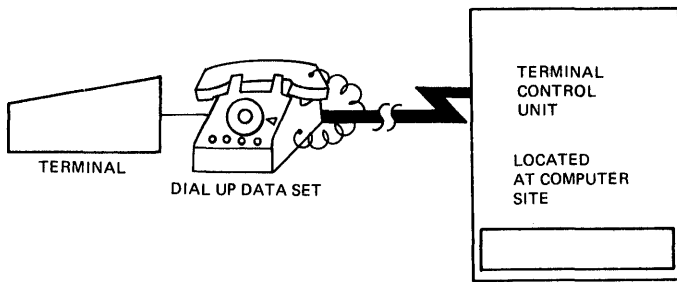


Figure 3. Switched Line Facilities

Note: The following procedure assumes that the 1050, 2741, or 3767 connects to a Western Electric 103A2 (or equivalent) data set. For other types or models of data sets, consult the common carrier for operating instructions.

If the terminal uses a switched (or dial-up) line with a common carrier data set to establish contact with the VM/370 computer, use the following procedures.

The 2741 and 3767 starting procedures are as follows:

1. Set the COM/LCL switch to the COM position.
2. Turn the ON/OFF switch to the ON position.
3. Press the TALK pushbutton on the telephone data set.
4. Remove the handset from the cradle and dial the VM/370 system's telephone number.
5. Wait for a high-pitched tone; if the number is busy or no answer occurs, hang up and try again. (Go to Step 3.)
6. When you hear the high-pitched tone, press the DATA pushbutton on the data set. Do this within 28 seconds after hearing the high-pitched tone or the connection is automatically disconnected. The DATA pushbutton should light up. When the terminal keyboard unlocks, the system can receive input data. If the DATA light goes off at any time during the

terminal session, repeat steps 3 through 6 to restore the connection.

Note: Some data set models do not have lighted DATA pushbuttons.

7. Place the handset back in the cradle. "vm/370 online" should type out on the terminal.

Note: The starting procedures for the 3767 are similar to those for the 2741. Should difficulty occur, consult the IBM 3767 Operator's Guide.

The 1050 starting procedures are as follows:

1. Set the 1052 Control Panel switches as shown in Figure 11.
2. Turn the MAIN POWER switch located on the side of the 1051 Control Unit to ON.

The DATA CHECK light comes on. Press the DATA CHECK key to turn out the light. Press the RESEND key and the RESET LINE key in that order. This action resets the 1050 internal circuits to prepare for a terminal session.

3. Press the TALK pushbutton on the telephone data set.
4. Remove the handset from the cradle and dial the VM/370 system's telephone number.
5. Wait for a high-pitched tone; if the number is busy or no answer occurs, hang up and try again. (Go to Step 3.)
6. When you hear the high-pitched tone, press the DATA pushbutton on the data set. Do this within 28 seconds after hearing the high-pitched tone or the connection is automatically disconnected. The DATA pushbutton should light. If the DATA light goes off at any time during the terminal session, repeat steps 3 through 6.

Note: Some data set models do not have lighted DATA pushbuttons.

7. Place the handset back in the cradle. "VM/370 ONLINE" should type out at the terminal.

2741/3767/1050 on Switched Lines with an Acoustic Coupler

Figure 4 shows the switched line (dial) facilities for 2741, and 1050 terminals using an acoustic coupler.

The procedures for the 3767 are similar to those for the 2741. Should difficulty occur, consult the IBM 3767 Operator's Guide. The 2741 starting procedures are as follows:

1. Set the COM/LCL switch to the COM position.
2. Turn the ON/OFF switch to the ON position.
3. Make sure that the acoustic coupler is:
 - (a) Connected to a power supply.
 - (b) Turned off.
 - (c) Connected to the terminal.
4. Remove the handset from the cradle and dial the VM/370 system's telephone number.
5. Wait for a high-pitched tone. If the number is busy or there is no answer, hang up and try again.
6. When you hear the high-pitched tone, place the handset face down in the coupler box. Make sure the cord is in the slot provided, then close and latch the cover.
7. Turn on the acoustic coupler. Do this within 28 seconds after hearing the high-pitched tone or the connection is automatically disconnected. When the keyboard unlocks, the system can receive input data. "vm/370 online" should type out at the terminal.

The 1052 starting procedures are as follows:

1. Set the 1052 Control Panel switches as shown in Figure 11.
2. Turn the MAIN POWER switch located on the side of the 1051 Control Unit to ON. The DATA CHECK light comes on. Press the DATA CHECK key to turn out the light. Press the RESEND key and the RESET LINE key in that order.

This action resets the 1050 internal circuits to prepare for a terminal session.

3. Make sure the acoustic coupler is:
 - (a) Connected to a power supply.
 - (b) Turned off.
 - (c) Connected to the terminal.
4. Remove the handset from the cradle and dial the VM/370 system's telephone number.
5. Wait for a high-pitched tone; if the number is busy or no answer occurs, hang up and try again.
6. When you hear the high-pitched tone, place the handset face down in the coupler box. Make sure the cord is in the slot provided, then close and latch the cover.
7. Turn on the acoustic coupler. Do this within 28 seconds after hearing the high-pitched tone. "VM/370 ONLINE" should type out at the terminal.

Teletype Model 33/35 On Switched Lines

To make a telephone connection between a Teletype terminal and the VM/370 computer:

1. Press the ORIG pushbutton to obtain a dial tone. The speaker volume control is under the keyboard shelf to the right. Make sure that the volume is high enough to hear the dial tone. After establishing contact, turn down the volume.
2. Dial the VM/370 system's telephone number.

Note: On the Model 35, press the "K" (keyboard) pushbutton on the left side of the panel.
3. The system should answer with a high-pitched tone. At this point, the ORIG pushbutton lights up. If the pushbutton does not light up, or goes out during the terminal session, repeat steps 1 and 2 above.

If there is no answer, or the number is busy, push the CLR pushbutton to break the connection and try again later. Otherwise, "VM/370 ONLINE" should type out at the terminal.

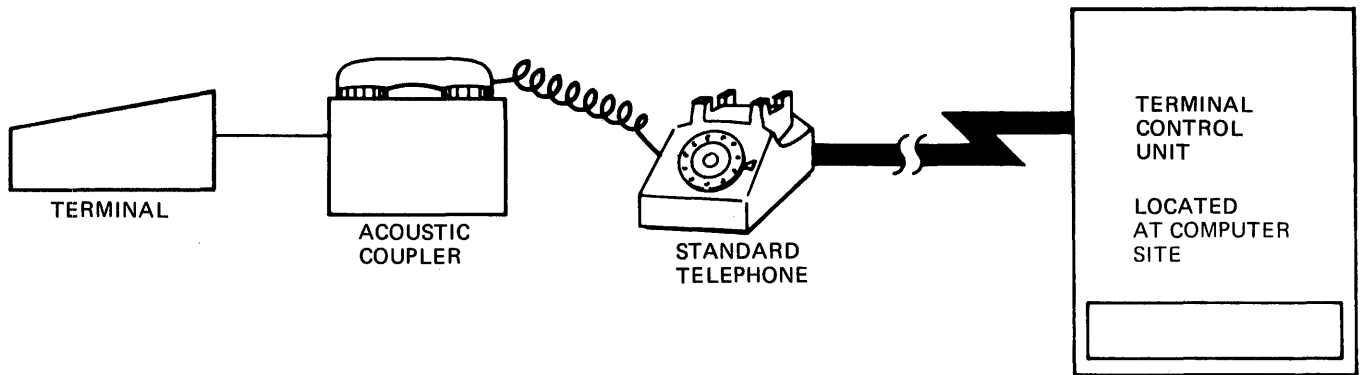


Figure 4. Switched Line with an Acoustic Coupler

VM/370 LOGON PROCEDURES

Before the facilities of the VM/370 system are made available to you, identify yourself to VM/370 by giving your user identification code word (userid) and your password (both of which are permanently assigned to you when you are originally authorized to have access to the VM/370 system). This identification procedure is called logon. When you finish logging on, use the CP IPL command to load your virtual machine with some operating system, such as DOS, OS, OS/VS1, or the Conversational Monitor System (CMS).

Before following the logon procedure outlined below, familiarize yourself with the terminal you are using and prepare it for use with VM/370. (Refer to the discussions of individual terminal devices in Sections 2 and 3.) When using this procedure, enter your input in uppercase or lowercase characters, or a mixture of both.

1. Establish a communications connection between the terminal and the computer discussed above, under "Connection with the Computer."
2. VM/370 acknowledges that communication has been established by typing a message in one of the four following formats:

vm/370 online xxxxxxx xxxxxx

This format occurs if the terminal is a 2741 or a 3767 equipped with a PTTC/EBCD character set and the terminal is attached to a 270X control unit or a 3704/3705 transmission control unit in emulator mode.

xxxxxx xxxxxx vm/370 online

This line occurs if the 2741 has a standard Selectric (or correspondence) character set or the 3767 is equipped with the correspondence keyboard and the terminal is attached to a 270X control unit or 3704/3705 transmission control unit in emulator mode.

In either of the above cases, the portion indicated by 'x's is meaningless; ignore it.

vm/370 online

This format occurs if the terminal is a 1050, a display device equipped with lowercase letters, or a 2741 attached to a 3704/3705 transmission control unit (non-emulator mode).

VM/370 ONLINE

This line occurs if the terminal is a Teletype or a display unit that is not equipped with lowercase letter display capability.

Note: If a 2741 or a 3767 terminal is connected to VM/370 via a 3704/3705 line in NCP mode, you must press the RETURN key before the "vm/370 online" message appears at the terminal. If a terminal connects to VM/370 via a 3704/3705 line in NCP mode, with the Multiple Terminal Access (MTA) feature, the "vm/370 online" message does not appear at the terminal and, after approximately 15 seconds, the terminal locks and unlocks. For such lines, a special attachment procedure must be performed before logon can be completed. See "Appendix D: Special Attachment Procedures for 3704/3705 Lines."

3. At this point, you should press the ATTN key (or equivalent) to unlock the keyboard. On all the display consoles the keyboard is already unlocked.

4. The system responds by unlocking the keyboard on the 2741 or unlocking the keyboard and turning on the PROCEED light on the 1050. On the 3767, the PROCEED lamp lights indicating that keyed in data can now be accepted. On the Teletype Model 33 or 35, VM/370 responds by typing a period (.) to indicate that you can start keying in data.

5. You identify yourself to the system by entering the LOGON command followed by your userid. This can take any of four forms, depending on whether or not terminal printing can be suppressed.

- If You Do Not Wish To Protect Your Password:

```
logon userid password
```

In the above example of the LOGON command, your directory identification and associated password appear on the console sheet or in the display device's user input area.

- If You Are Using A 2741 Or 3767 With A Print Inhibit Feature Or A Display Unit:

```
logon userid  
ENTER PASSWORD:
```

In this instance, VM/370 responds with ENTER PASSWORD: As you key in the password on a 2741 or 3767 terminal equipped with the Print Inhibit feature or on a 3270 display unit, VM/370 suppresses password displaying. The password does not appear on the console sheet.

To protect passwords, the display units function the same as a 2741 with the print inhibit feature. That is, where password prompting occurs on a display device, the keyed password is not displayed in the user input area or redisplayed in the output display area.

- If You Are Using A 2741 Or Another Terminal Which Does Not Have The Print Inhibit Feature:

```
logon userid mask  
ENTER PASSWORD:  
XXXXXXXXXX
```

In this example, the code word MASK tells VM/370 to type an 8-character print mask (by typing three different sets of letters on top of each other without advancing the paper) in the area where you want to type the password. This preserves the security of the password.

If you do not ask for masking when you type logon userid, you can press the carriage return or enter blanks after VM/370 types ENTER PASSWORD: on the terminal sheet. VM/370 then types out the masking characters.

- If You Are Using The 3210 Or 3215 Real System Console Or A 3066 Real System Console With The 3213 Printer As The VM/370 System Console

A user or system operator can re-log on but cannot automatically protect his password. After the password has been printed on the console sheet, the user must mark over it or obliterate it.

Any portion of the LOGON command line may be edited using the VM/370 logical line editing symbols, or, if you are using a display device, by using the keyboard's cursor control keys. (See "Logical Line Editing Character Usage" in Section 4.)

If you enter the LOGON command line incorrectly, an error message is displayed in one of the following four formats:

```
restart          xxxxxxxx  
xxxxxxx         restart  
restart  
RESTART
```

The situations described in item 2 cause these variations in format. Then you must reenter the LOGON command line.

6. When the system displays:

```
ENTER PASSWORD:
```

type the password, then press the ENTER key or its equivalent.

If your terminal is a 3277 equipped with the optional operator's identification card reader, the system responds with the following message:

INSERT ID CARD:

You must respond by inserting a magnetically encoded identification card into the operator's identification card reader. The reader reads data stored in the card and the value does not appear in the screen's user input area. The reader transmits this data to VM/370 where it is compared to system administrator-supplied values. If the system accepts the comparison, the logon procedure completes as it does for other terminals. The identification data does not appear in the output display area.

7. Assuming no logon errors, VM/370 displays one, two, or all of the following kinds of messages:

- LOGMSG setup time; that is, the time and date that the logon message started
- LOGMSG messages with an asterisk (*) as the first character
- FILES message (which describes the status of your unit record spool files)
- VM/370 LOGON message

If the VM/370 system operator has set up log messages preceded by an asterisk (*), they automatically appear on your terminal at this time. For example:

```
LOGMSG 09:34:54 02/15/72
*FOR CMS, IPL 190 UNTIL FURTHER NOTICE
*QUERY LOG FOR ADDITIONAL INFORMATION
```

Additional lower priority log messages can be present in the VM/370 system. You can enter the command:

```
query logmsg
```

Any remaining log messages are displayed.

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

```
FILES: xxx RDR, xxx PRT, xxx PCH
```

is displayed, where xxx indicates the number of files of each type. VM/370 omits this message if there are no spool files.

The system then responds with the LOGON message:

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

where hh:mm:ss is the time of day, yyy is the time zone (for example, EST, EDT, CST, etc.), weekday is the day of the week, and mm/dd/yy is the date. This message indicates that VM/370 accepted the password and that the VM/370 LOGON procedure finished. Your terminal is in the control program (CP) environment and you can issue any valid CP console function. To load CMS into the virtual machine, proceed to Step 9. To load any other operating system, proceed to Step 8.

During the logon procedure for dial-up terminals, VM/370 uses the Line Timeout feature when it reads the userid and password. If you fail to type any character during a 28-second period, the line times out and VM/370 disconnects the line. This feature prevents teleprocessing facilities from being inadvertently tied up by unauthorized or accidental connections to the VM/370 computer. If you are using a switched line, you must redial the computer.

Note: Issue the CP LOGOFF command when you finish using VM/370. If you turn the terminal off without logging off, you are charged with at least 15 more minutes of system connect time than you used. See "Logoff Procedures" for more details. VM/370 responds by displaying a message that indicates the duration of the terminal session and disconnects the terminal if it is on a switched line.

8. You can now load any operating system into your virtual machine. To load in CMS, proceed to Step 9. To load another operating system, issue the IPL command specifying 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 (for example, IPL CMS). If the device identified in the IPL command contains an operating system (such as, OS/VS1), the terminal becomes the system console for that virtual machine.

9. If not done automatically for your virtual machine, you invoke CMS in a typical installation by typing in:

```
ipl 190
```

```
-- or --
```

```
ipl cms
```

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

Note: CMS can reside on a device at some other address than 190, and a saved CMS system need not be named "CMS."

10. The terminal then receives a message similar to the following:

```
CMS...VERSION v.1 mm/dd/yy [other
installation dependent information]
```

The v signifies the version, l the modification level, and mm/dd/yy is the last generation date of the CMS system. The CMS system is now in control and you can issue any CMS command. For a detailed description of the CMS facilities available, see the VM/370: CMS User's Guide.

ERROR MESSAGES DURING LOGON

There are many reasons why VM/370 may reject your request for access to VM/370. Some of these are:

- Using an invalid password.
- The userid is in use by someone else.
- Using an invalid userid, or not providing a userid.
- The specified userid is not in the VM/370 directory.
- VM/370 is servicing the maximum number of users.
- An error occurred reading your VM/370 directory entry.

Error messages and other system messages always print or display on your console in uppercase letters. The following error messages are as they appear in VM/370: System Messages. Lowercase words or expressions within the message represent a variable term; for example, raddr (real address) or userid (user identification). When these expressions display or print on your console during a terminal session, they represent the real device address or your identification.

Examples of VM/370 error messages and suggested user actions follow:

```
DMKLOG050E PASSWORD INCORRECT
```

This message indicates that you specified an invalid password. The logon procedure must be repeated. Return to Step 5.

```
DMKLOG054E ALREADY LOGGED ON LINE raddr
```

This message indicates that another user with the same userid is logged on at the terminal whose real line address (raddr) is specified by 3 hexadecimal digits. VM/370 does not allow two users with the same userid to log on at the same time. Even though the second user can not log on, he can issue the CP MESSAGE command to communicate with the user who is logged on with that userid, or with the system operator.

If this conflict occurs and it is imperative that you must gain control of your virtual machine, you can request the other user to log off the virtual machine. If this does not achieve the desired results, you can send a message to the VM/370 system operator requesting that he force the other user off the system.

Both of these techniques use the CP MESSAGE command. The MESSAGE command is one of the few VM/370 commands that you can use before logging on.

You can use the following console examples of the MESSAGE command in the situations described above. Assume JONES is your user identification and that the active user of your userid knows that you may want to use your virtual machine:

--Message sent to user:

```
message jones need my virtual machine
plz logoff
```

the user of your virtual machine would receive:

```
MSG FROM LOGONxxx NEED MY VIRTUAL
MACHINE PLZ LOGOFF
```

the real line address to which your terminal is attached replaces xxx. This enables the user of your virtual machine to send a response message to you if he desires (see Note). If you receive no response and you are still unable to log on, you could contact the VM/370 system operator:

```
m op need my virtual-machine force
current user off-jones
```

The operator can not only force the active user off the system, but also disable that user's teleprocessing line to prevent subsequent logon attempts.

Note: A message sent to an active logged-on user does not guarantee that a response will be received. The user may be away from his terminal, or he may have invoked CP options that inhibit receiving of messages.

DMKLOG020E USERID MISSING OR INVALID

This message indicates that you did not specify the userid in the LOGON command line or you specified the userid incorrectly; you must repeat the logon procedure. Return to Step 5.

DMKLOG053E userid NOT IN CP DIRECTORY

This message indicates that you specified an invalid userid. Return to Step 5 and log on again. If a new logon causes the same error message, contact the system operator for an explanation.

DMKLOG051E MAXIMUM USERS EXCEEDED

This message indicates that VM/370 is servicing the maximum number of users; VM/370 terminates the logon procedure. If this happens, ask the system operator when he anticipates a lighter system load.

DMKLOG052E ERROR IN CP DIRECTORY

This message indicates that an error occurred while the system read the area in the CP user directory that contains the description of your virtual machine. Notify the system operator.

LOGOFF AT hh:mm:ss yyy weekday
mm/dd/yy BY SYSTEM

If you attempt to LOGON and are unsuccessful after four attempts, you are automatically logged off by the system. Redial if you are using a switched line.

AFTER LOGON

The commands that you use between logon and logoff, depend on your assigned privilege class or classes.

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 message:

?CP: xxxxx

occurs, where xxxxx is the command line that you entered.

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

UNKNOWN CP/CMS COMMAND

If you use the CMS command CP to prefix an invalid or unknown CP command, the following message types:

UNKNOWN CP COMMAND

Any of the following VM/370 publications indicate the category of user for each of the various privilege classes as well as the range of CP commands within each class. If you do not know the privilege class assigned to your virtual machine, you should contact the VM/370 system programmer. If you wish to know which CP commands are available to your assigned privilege class or classes, refer to the following VM/370 publications:

- VM/370: CP Command Reference for General Users

- VM/370: Operator's Guide

When the virtual machine requires a response from you, but you wish to issue one or more CP commands before responding, press attention key once or twice, depending on the mode setting, to enter the CP environment. Then enter the desired CP commands (for example: MSG OP PLEASE ATTACH A SCRATCH TAPE AS MY 181). When you finish entering commands, return to the virtual machine environment via the BEGIN command. VM/370 cancels the virtual machine's read to the terminal with a unit exception. The virtual machine operating system then reissues the read, and you can now enter the required virtual machine response. As an alternative, you could:

- Provide the required response first, which goes to the virtual machine operating system. However, instead of ending the input line in the normal manner, enter 3 blank characters followed by one or two depressions of the ATTN key, depending on the terminal mode setting.

- The virtual machine then enters the CP environment, where CP performs the function. (If the ON option of the SET RUN command is in effect, you can enter only one line of input before control returns to the virtual machine operating system.)

- Return to the virtual machine operating system via the BEGIN command. (If the ON option of the SET RUN command is in effect, control automatically returns to the virtual machine operating system after you enter the first CP function.)

VM/370 ENVIRONMENT CONVENTIONS

Each input line that you key in at the terminal is transmitted to the VM/370 system, where a routine processes

(examines, accepts or rejects) the line. The portion of the system that has control at the time of the input determines the particular processing routine. Each portion of the system into which you can enter input constitutes a unique environment, and only a part of all possible input is acceptable to any given environment. The following are the environments of the VM/370 system:

- Control Program (CP) and echo environment
- CMS command environment:
 - debug environment
 - edit environment (input or edit modes)

In addition to these specific environments, you can enter input to any other executing program that requests terminal input. These other input-processing programs fall into an additional category called the "program environment", in which the executing program determines the acceptability of an input line.

The input processing routines fall into three main categories:

- The VM/370 Control Program (CP command environment)
- A central CMS service routine (CMS command environment)
- A particular CMS command (debug, edit, or input environments)

Input lines acceptable to the CP environment are CP commands; they are sometimes referred to as console functions because, for the most part, they simulate functions that you can perform at a System/370 console. Any CMS command can be input to the CMS command environment. You can also issue CP commands from the CMS command environment.

CP enters the echo environment when you issue the CP command ECHO. All lines entered in the echo environment return unchanged to the sending terminal for the number of times you specify. This command checks out the operation of a terminal and its communication line.

The DEBUG and EDIT commands cause you to enter CMS subenvironments. Lines acceptable to the environments of these commands are subcommands, or input, depending on the particular mode that is entered when the command is issued.

The EDIT command creates a new file or makes changes to an existing file. If you

use an EDIT command with a fileid that is the same as an existing fileid, CMS enters edit mode. Edit mode allows you to examine and modify an existing file. You can enter input mode while in edit mode by typing "input." Input mode allows you to enter new lines into your file. If you use an EDIT command with a fileid different from any existing file, you can enter input mode to create the new file. Any data you now type at the terminal becomes part of the new file. CMS does not check input line validity while in input mode.

If at any time you wish to verify which environment you are in, enter a null (blank) line. Pressing the ENTER key (or equivalent) creates a null line that is a logical or physical line. The system then responds with the environment that currently has control (for example, CMS or edit). A null line entered while in input mode returns control to edit mode.

You can, at any time, cause control to pass from one environment to another. Figure 5 illustrates the transfer of control as you issue various commands and subcommands. For more detailed information consult the VM/370: CMS User's Guide.

ATTENTION HANDLING AND MODE SWITCHING

Users of virtual machines can use an attention interruption to signal CP or their program running in a virtual environment. Pressing the ATTN key on the virtual machine console causes an attention interruption to CP or the virtual machine. The interruption condition suspends the current virtual machine activity to allow you to initiate alternative action in the environment of your choice.

To determine which key on your terminal signals an attention interruption, see "Attention and End-of-Input Line Signaling."

REFLECTING THE INTERRUPTION

Every logged-on user of VM/370 has basically two operating environments:

- CP mode--the environment for initiating CP console functions.
- VM mode--the environment of the virtual machine.

When your virtual machine is in CP mode you can issue CP commands to control the system and the I/O resources of your virtual machine. The operating system

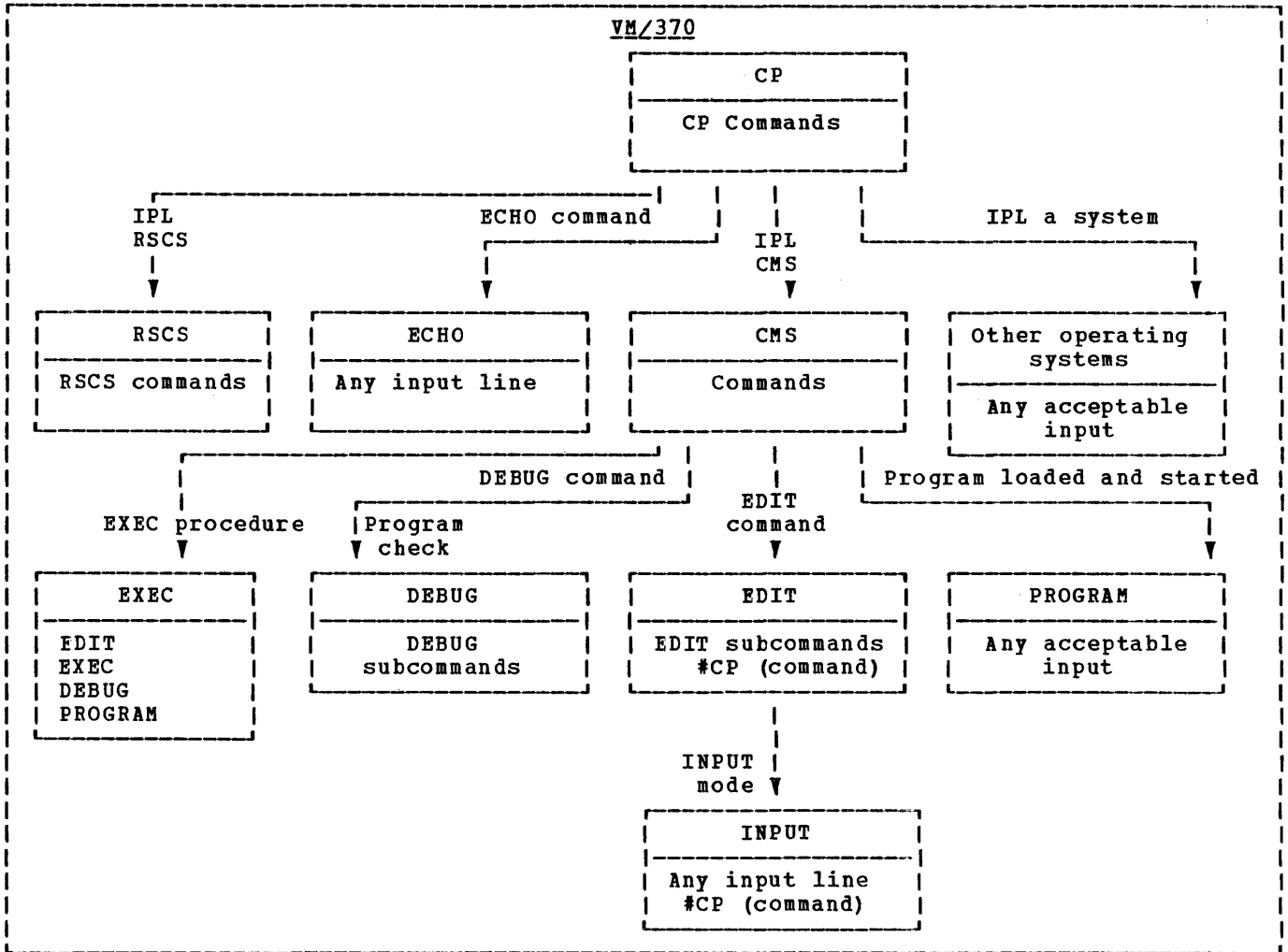


Figure 5. VM/370 Operating Environments and Commands

subsequently uses these resources in your virtual machine environment. VM mode refers to the virtual machine environment within which the Conversational Monitor System (CMS) or any other operating system can reside.

The method that you use to select the operating mode depends on:

- The current operating environment
- The current status of the terminal regarding attention signaling
- The operating mode that you want

CP is the base mode from which all other modes must operate. A logon operation puts your terminal into CP mode. Other operational modes, such as CMS, OS, or DOS, are VM modes. They are entered by the CP IPL command. Therefore, if you have not

loaded an operating system, you can only reflect attention signaling to CP. If you load an operating system into the virtual machine, then the choice of interruption reflection may be either to CP or to the virtual machine.

You can specify how you wish VM/370 to handle attention signaling using the CP `TERMINAL` command:

```
TERMINAL MODE {CP|VM}
```

If you specify `TERMINAL MODE CP`, one or more depressions of the `ATTN` key on the virtual console forces the virtual machine to CP mode for console input. CMS does not read from a 3270 terminal after each command execution. To get back to CMS, cause an attention interruption at your virtual machine by entering an `ATTN` or `REQUEST` command before entering the `BEGIN` command.

If you specify `TERMINAL MODE VM`, one depression of the `ATTN` key signals the operating system running in the virtual machine (VM mode); two quick depressions of the `ATTN` key place the virtual machine in console function mode (CP mode). If you have reset your virtual machine while in `TERMINAL MODE VM`, you must press the `ATTN` key more than once to unlock the keyboard for CP input.

Note: The `CP TERMINAL MODE` command affects only the `ENTER` key on the 3277 terminals and not the `PA1` key.

Figure 6 shows the response of CP to attention signaling when the virtual machine is running in VM mode. This design allows an escape to the CP console function level from virtual machines that may be in an I/O loop or are not recognizing an attention interruption. One exception to this is the 3210/3215 because there is no way to enter CP mode on a 3210/3215 while in VM mode without first getting a read from the virtual machine and then using the `#CP` function. VM mode is the default mode for all users of the VM/370 system except for the primary system operator, who defaults to CP mode. In some cases, the action differs depending on whether you press the `ATTN` key once or more than once; in cases where `ATTN` is 1 or more than 1 the action is the same regardless of the number of times you press the `ATTN` key.

Figure 7 shows the action CP takes when you press the terminal's `ATTN` key when the virtual machine is in CP mode. CP mode is the mode for users who have issued `TERMINAL MODE CP` and for the primary VM/370 system operator. The action is the same whether the `ATTN` key is pressed once or more than once.

OTHER MODE SWITCHING AND ATTENTION PROCESSING FACILITIES

In addition to signaling attention via a designated console key, VM/370 has other features that enhance mode switching and attention handling activity. They are:

- The `CP ATTN` or `REQUEST` command
- The `CMS CP` command
- The `CP TERMINAL ATTN ON|OFF` command
- The `#CP` function
- The `CMS SET AUTOREAD ON|OFF` command

The `ATTN/REQUEST` Command

The `ATTN` and `REQUEST` commands are functionally identical. They execute while in CP mode, creating an attention interruption pending to the operating system running in the virtual machine. This pending interruption is for or from the device acting as the system console.

The `CMS CP` Command

The `CMS CP` command allows you to invoke CP commands and execute them while in CMS.

Note: This operation is not allowed from within a CMS subsystem (for example, `edit` or `debug`).

This command is useful when you wish the system operator to mount a tape or disk pack or attach an I/O device to your system. The form of this request issued from the CMS environment would be:

```
cp msg operator mount my 384 pack asap
```

Note: If you as a CMS user, wish to enter CP mode for an extended period of time and not immediately revert back to CMS, enter:

```
cp
```

To return to the CMS environment, issue the CP command `BEGIN`.

The `CP TERMINAL ATTN ON|OFF` Command

The `CP TERMINAL ATTN ON` command (applicable only to printer terminals), provides an alternative to the normal handling of console-invoked terminal interruptions. Normally, when an attention interruption is requested from the console, VM/370 responds with a carriage return and prints the exclamation point character (or its equivalent). Thus the console sheet documents:

- The attention interruptions
- When the interruption happened, relative to other user activity
- Which operating mode you selected (CP or VM)

For example, if the terminal mode is VM, then `(!!)` indicates that you pressed `ATTN`

State	Press ATTN Key	Action
Terminal idle; keyboard entry blocked; virtual machine running	1	Attention interruption pending; virtual machine running
	>1	Keyboard activated for CP input
Terminal receiving output from virtual machine	1	Attention interruption pending; virtual machine running
	>1	Keyboard activated for CP input at completion of console I/O
Keyboard activated for input to virtual machine; no data entered or all data deleted	1	Device end (DE) and attention status pending; virtual machine running ¹
	>1	Unit exception (UE) status pending; keyboard activated for input
Keyboard activated for input to virtual machine; some data entered	1	Unit exception (UE) status pending; virtual machine running
	>1	Device end (DE) status pending; keyboard activated for CP input
Keyboard entry blocked; executing CP command	1 or >1	Attention ignored
	1 or >1	Keyboard activated for CP input
Keyboard entry blocked; in SLEEP mode entered via ATTN command	1 or >1	Virtual machine resumes execution
	1 or >1	Virtual machine resumes execution
Terminal receiving output from CP but not from user command	1	Attention interruption pending; virtual machine running
	>1	Keyboard activated for CP input
Terminal receiving output in response to CP command	1 or >1	Output line cancelled and in some cases command output cancelled
	1 or >1	Output line cancelled and in some cases command output cancelled
Keyboard activated for CP input; no data entered or all data cancelled	1 or >1	Attention interruption made pending; virtual machine running
	1 or >1	Attention interruption made pending; virtual machine running
Keyboard activated for CP input; some data entered	1 or >1	Input line cancelled; keyboard activated for CP input
	1 or >1	Input line cancelled; keyboard activated for CP input

¹To perform this function on a 3270, position the cursor one position to the left of the user input area (line 22, position 0) and press the ENTER key.

Figure 6. Attention Handling in VM Mode

State	Action
Terminal idle; keyboard entry blocked; virtual machine running	Keyboard activated for CP input
Terminal receiving output from virtual machine	Keyboard activated for CP input
Keyboard activated for input to virtual machine; no data entered or all data deleted	Unit exception (UE) status pending; keyboard activated for CP input
Keyboard activated for input to virtual machine; some data entered	Device end (DE) status pending; keyboard activated for CP input
Keyboard entry blocked; executing CP command	Attention ignored
Keyboard entry blocked; in SLEEP mode entered via command	Keyboard activated for CP input
Keyboard entry blocked; in SLEEP mode entered via DIAGNOSE instruction	Virtual machine resumes execution
Terminal receiving output from CP but not from user command	Keyboard activated for CP input
Terminal receiving output in response to CP command	Output line cancelled and in some cases command output cancelled
Keyboard activated for CP input; no data entered or all data cancelled	Attention interruption made pending; virtual machine running
Keyboard activated for CP input; some data entered	Input line cancelled; keyboard activated for CP input

Figure 7. Attention Handling in CP Mode

twice to enter CP mode while one attention (!) indicates you want to enter VM mode.

If you invoke the TERMINAL command with ATTN OFF, the historical log of your attention signaling is not recorded. The ATTN OFF is useful in virtual machine operating systems where the exclamation point (!) is reserved for special editing functions, or if formatted reports are to be typed out at your terminal.

The #CP Function

The CP escape command allows you to execute a CP console function from a virtual machine console read without first pressing the ATTN key to get to the CP environment. The format for execution is:

```
[ #CP | [console function]
```

The # character represents the logical line end character in effect for the virtual machine. In reality, any character designated as the line end symbol suffices to begin the #CP function. For this command to operate, the following conditions must be met:

- The virtual machine must be running with SET LINEDIT ON.
- The first 3 characters of the edited line must be #CP.
- At least one blank must separate the command name, #CP, from any console functions that follow.

- You must not use attention signaling to enter the #CP function line.

Under certain conditions (for example, when the virtual machine expects a short response, such as YES or NO, in answer to a prompting message) the #CP command followed by the command line is not accepted by CP.

When this occurs, the #CP command line is truncated and passed to the virtual machine for subsequent action and the expected result does not occur. To enter a CP command when this occurs, press the key on your terminal that produces an attention interruption (ATTN, ENTER, or equivalent), and then enter the CP command.

You can enter multiple console functions as operands of the #CP command line as long as you separate each command by the logical line end character. The #CP command can also be used while in EDIT and in the input mode of EDIT.

If you enter the #CP command with no operands, the virtual machine enters the CP environment. The CP command BEGIN returns the virtual machine to the environment or mode it was in before you issued #CP.

In the following examples, assume a virtual machine environment such as DOS:

```
#cp
```

The system enters CP command environment.

```
#cp query files
```

CP executes the QUERY command.

```
data#cp msg op is tape drive rdy
```

CP deletes the operator's response (data) and executes the MSG command.

```
"#cp query files
```

The line is entered as data in the virtual machine environment because the logical escape character (") caused CP to ignore the # character and consider #CP as part of the data.

```
data #cp
```

The system enters the CP command environment.

```
#cp query files#data1
```

The command environment does not change. Only data1 enters the virtual machine environment.

The CMS SET AUTOREAD ON/OFF Command

The SET AUTOREAD command exists because of differences between printer and display terminal operations when you key in input data.

For typewriter terminals, upon completion of a CMS command, CMS types a ready message at the terminal and immediately issues a read to the terminal. This read unlocks the keyboard and you can then type in your next command. While the read to the console is in effect, CP cannot send any messages to you.

On display terminals, the keyboard does not lock because the output display is separated from the user input area. Consequently, you can key into the user input area at any time. This eliminates the need for CMS to set up a read to unlock the keyboard. Therefore, CMS waits for a console interruption before issuing the read. You cause an interruption by pressing the ENTER key on the display keyboard and CMS issues a console read and processes the input area of the display. The default AUTOREAD status is OFF for display devices and ON for printer terminals.

Note: This mode of operation only applies to the CMS command environment. In other CMS environments such as edit, the console read always occurs, regardless of the console device type or AUTOREAD status.

You can determine your initial AUTOREAD status by the following terminal console performance indications:

If you disconnect from one type of terminal and reconnect on to another type of terminal, the AUTOREAD status remains unchanged. For example, if you have AUTOREAD off while running on a display terminal and you disconnect from the terminal, the AUTOREAD status remains off if you reconnect to a printer terminal.

Display Terminal: AUTOREAD is OFF if the screen status indicates RUNNING after the display of the CMS ready message. AUTOREAD is ON if the screen status is VM READ.

Printer Terminal: If the AUTOREAD is ON, the keyboard is locked during RUNNING status.

From the CMS environment you can select the desired AUTOREAD function by invoking either:

SET AUTOREAD ON

--or--

SET AUTOREAD OFF

immediately after command execution. The OFF operand causes VM/370 to wait for the console attention signal from the terminal before issuing the read (VMREAD) to the console.

CANCELLING TERMINAL OUTPUT

Certain CP console functions produce one or more lines of output at your terminal in response to specific requests. Sometimes you may want to cancel the output after a number of lines. You can do this by pressing the ATTN key. You can stop the storage display function (such as DISPLAY) and stop the output from the following QUERY functions:

	(	DASD)	
	{	TAPES	}	
	(	GRAF)	
	{	LINES	}	
QUERY	(	UR	)	class B
	{	ALL	}	
	(	raddr)	
	{	SYSTEM	}	

	(	READER)	
	{	PRINTER	}	
	(	PUNCH)	
	{	HOLD	}	
QUERY	(		)	class D

	(	VIRTUAL)	
	{	LINKS	}	
	(	READER)	
	{	PRINTER	}	
	(	PUNCH)	
QUERY	(		)	class G

QUERY	NAMES	class Any
-------	-------	-----------

For all other functions the ATTN key cancels a single line only and then continues displaying the remaining lines of output.

Section 2. Typewriter Terminals

IBM 2741 TERMINAL CHARACTERISTICS

The IBM 2741 Communication Terminal consists of a modified IBM SELECTRIC¹ (R) typewriter mounted on a base unit. The base unit includes the electronic controls needed for communication to the system.

The 2741 has two modes of operation: communicate mode and local mode. The terminal mode switch controls the mode and is located on the left side of the typewriter stand. The switch disconnects the terminal from the computer when in local mode (switch set to LCL position). The terminal then functions as a typewriter only, and neither transmits nor receives information. When in communicate mode (switch set to COM position), the terminal is connected to the communications line and the computer. You must turn on the ON/OFF switch located on the right side of the

keyboard before the terminal can operate in either communicate or local mode.

"Section 1. Introduction" describes the procedure for establishing communications with the computer.

A 2741 with either of two keyboard configurations can communicate with the VM/370 system. They are the PTTC/EBCD keyboard (Figure 8) and the standard Selectric correspondence keyboard (Figure 9).

The "Logical Line Editing Character Usage" describes the special logical line editing characters in "Section 4. General Procedures for all VM/370 Terminals." To redefine one or more of the logical line editing characters, refer to the discussion of the CP TERMINAL command in the VM/370: CP Command Reference for General Users.

EBCDIC Keyboard

(Type Element P/N 1167963)

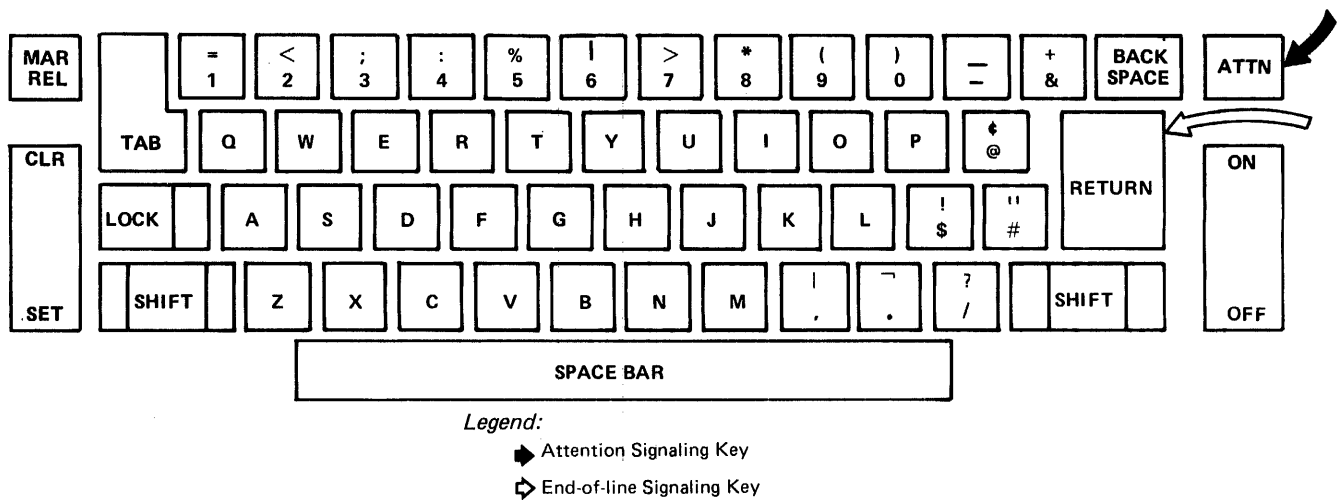
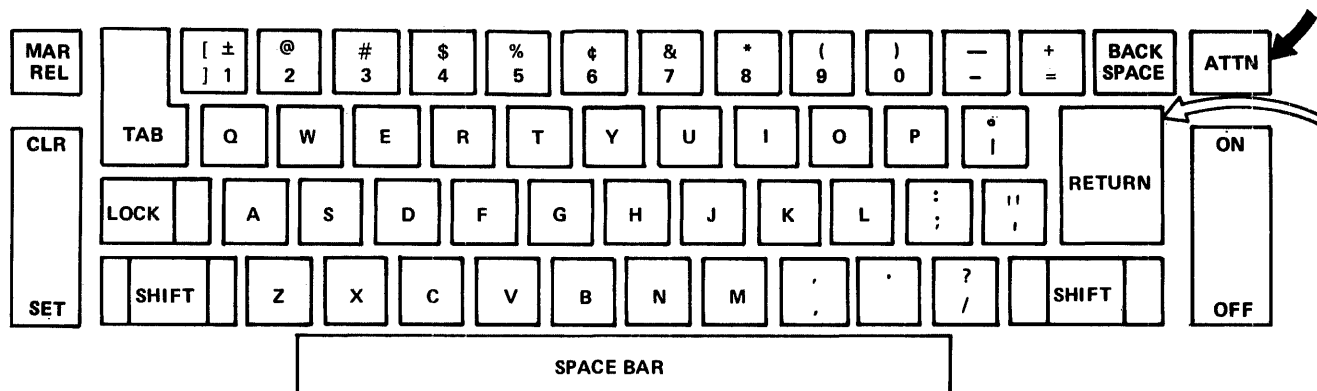


Figure 8. PTTC/EBCD Keyboard

¹Registered Trademark of IBM



Legend: When this keyboard and its associated print elements are specified, the line code assignments of the graphic characters change and are not compatible with the PTTC/BCD and PTTC/EBCD print elements and associated keyboards.

▶ Attention Signaling Key

↻ End-of-line Signaling Key

Figure 9. Correspondence Keyboard

On all 2741 keyboards, the following keys operate the same as standard Selectric typewriter keys:

- Alphameric and special character keys
- Space bar
- Power switch
- Shift lock
- Tab, tab clear, and tab set
- Margin release

On some 2741 terminals, the space bar, backspace, and hyphen-underline keys have the Typamatic feature. If you press one of these keys lightly, the operation that the key represents occurs once. Pressing harder and holding the key causes the operation to repeat until you release the key.

The RETURN and ATTN keys have special significance on the 2741 keyboard.

- Press the RETURN key to signal the termination of each input line and enter the line. When you press the RETURN key, control transfers to the system and the keyboard locks until the system can accept another input line.
- You can press the ATTN key at any time (it is not under control of the keyboard lock mechanism). The ATTN key immediately sends an interruption signal to the computer.

The 2741 paper controls (paper release lever, line-space lever, impression control lever, and so forth) are identical to the corresponding controls on an IBM Selectric Typewriter and operate in the same way.

For a further discussion of 2741 characteristics, refer to the publication IBM 2741 Component Description, Order No. GA24-3415.

The 2701, 2702, 2703, 3704 and 3705 transmission control units control 2741 terminal operation. These control units require certain special features to control the operation when used as a virtual machine console under VM/370. Refer to the VM/370: Planning and System Generation Guide for a description of these special features.

REQUIRED SPECIAL FEATURES FOR 2741 AS A VIRTUAL MACHINE CONSOLE UNDER VM/370

A 2741 communication terminal installed on either switched (dial-up telephone connection) or leased (directly attached by cable) lines must have these features:

- PTTC/EBCD (#9571, Part #1167963) or standard correspondence (#9812, Part #1167043) print elements
- Transmit Interrupt (#7900) or Transmit Interrupt Control RPQ #E40681
- Receive Interrupt (#4708)

The following are required for switched lines:

- Data Set Attachment (#9114)
- Dial Up (#3255)

One of the following are required for leased voice grade lines:

- Data Set Attachment (#9115 for facility D1), or
- Data Set Attachment (#9116 for facility B2), or
- Data Set Attachment (#9120 for facility B1 or D1), or
- IBM Line Adapter (#4635 for 4-wire limited distance line), or
- IBM Line Adapter (#4691-4694 for 4-wire shared leased line), or
- IBM Line Adapter (#4647 for 4-wire leased line)

RECOMMENDED SPECIAL FEATURES

The following features, although not required, make the terminal easier to use.

<u>Feature and Identification</u>	<u>Explanation</u>
Print Inhibit (#5501)	Prevents typing of your password as you enter it on the keyboard.
Red Ribbon Control RPQ #868019 (supported for PTTC/EBCD keyboard only)	Allows CMS error messages to be printed in red, if you have a two-color ribbon. To activate this feature,

Feature and Identification

Explanation

	enter the CMS environment and issue the SET REDTYPE ON command.
Typamatic Keys (#8341)	Pressing and holding the keys repetitively types the indicated character. The keys that can do this are: Space bar Backspace Hyphen-Underscore
Pin Feed Platen (#9509)	Allows fanfold pinfeed paper usage on the terminal.

2741 TERMINAL WITH APL KEYBOARD

2741 terminals to be used with APL should have the keyboard configuration illustrated in Figure 10. On input operations, VM/370 translates the APL graphic characters to the corresponding hexadecimal representation. For output operations, VM/370 translates the hexadecimal representation back to the corresponding APL character. For the APL graphic-hexadecimal representation, see "Appendix C: Graphic-Hexadecimal Substitution (APL) For 2741 Use." You must use the CP TERMINAL command with the APL ON operand to use the APL translation. Note that you cannot use the APL operand if the terminal connects to a 3704/3705 operating in Network Control Program (NCP) mode.

2741 Initiation Procedures--Margins and Tabs

If you use only the 2741 terminal with VM/370, you can skip these preliminary steps after the terminal has been set up once. After performing these steps, follow the logon procedure contained in the "Introduction."

1. Set the terminal mode switch located on the left side of the typewriter stand to LCL. This disconnects the terminal from the computer.
2. Turn the power on by pressing the ON portion of the terminal power switch located at the right side of the keyboard.

3. Set the margin stops, which are located on the typing guide just above the keyboard, at the desired positions (normally, 1 and 130). To reset a

margin stop, push it in and move it left or right to the desired position, then release it.

APL Correspondence Keyboard

(Type Element P/N 1167987)

APL PTTC/EBCD Keyboard

(Type Element P/N 1167988)

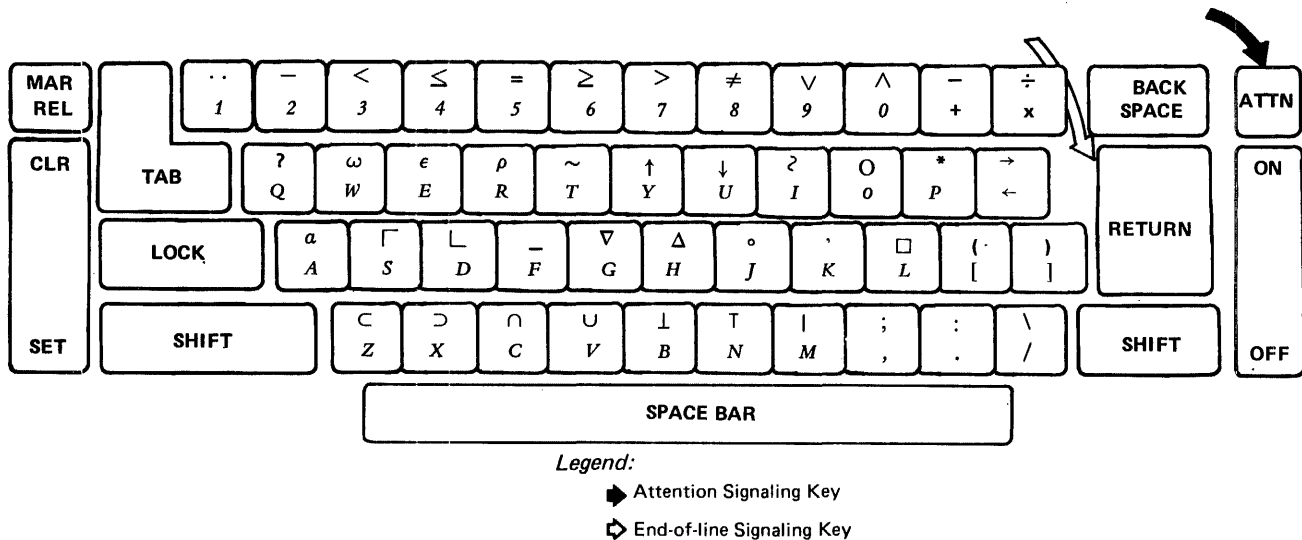


Figure 10. APL\360 Keyboard

4. Check that the physical tab stops are set at the desired intervals by tabbing an entire line using the TAB key. If the settings are satisfactory, proceed to Step 5.

Note: The physical tab stop settings have no effect on how VM/370 expands an input record. For a discussion of internal tab settings, refer to "Default Tab Settings" in "Section 4. General Procedures for All VM/370 Terminals."

If you want to reset the physical tabs, position the typing element to

the right margin, press and hold the CLR portion of the CLR/SET key, and press the RETURN key. This clears all previous tab settings. You can make new settings by spacing the typing element to the desired locations with the space bar, then pressing the SET portion of the CLR/SET key. After setting tab stops for the entire line, press RETURN to position the typing element at the left margin.

5. Set the terminal mode switch to the COM position. The terminal is now connected to the computer.

GENERAL TYPING CONVENTIONS FOR 2741
TERMINALS

Observe the following typing conventions when entering input to the VM/370 system from a 2741 terminal:

- Enter input in uppercase or lowercase, or a mixture of the two.
- When the 2741 keyboard is unlocked, the terminal can accept input.
- Correct partially entered input lines containing errors by using the VM/370 special logical line editing characters. See the discussion of "Logical Line Editing Character Usage" in "Section 4. General Procedures for all VM/370 Terminals."
- Press the RETURN key to end an input line from the 2741.
- The default line length is 130 characters; that is, 129 data characters plus the carriage return character. For information about changing the line length, refer to the CP TERMINAL command in the VM/370: CP Command Reference for General Users.

VM/370 knows the relative position of the 2741 typing element during output operations. When the typing element moves one position past the specified or default line length, VM/370 generates an automatic carriage return. Output then continues on the next line.

- In most cases, the terminal treats invalid or nonprintable output characters as blank characters. An invalid output character has no corresponding printable character and no terminal function, such as a carriage return or a tab.
- In most cases, one or more blanks can separate command names, operands, options, and keywords from each other. Exceptions are documented where appropriate.
- An exclamation point (!) prints whenever you press the ATTN key. Printing the exclamation point (!) is a selectable option of the TERMINAL ATTN command.
- On 2741 Communication Terminals with the correspondence keyboard, (see Figure 9) VM/370 translates the following special characters to provide the necessary special characters for entering certain types of programs:

- ± translates to > (greater than sign)
- ° translates to ~ (logical not sign)
- translates to | (logical or sign)

The less-than sign (<) has no corresponding translatable character on the keyboard. To enter an equivalent to this character, refer to the EDIT subcommand ALTER, discussed in the VM/370: CMS User's Guide, which provides information about entering the corresponding hexadecimal representation of the character. As an alternate technique, use the CMS SET INPUT command described in VM/370: CMS User's Guide, to equate some seldom-used character, such as a "?" to the hexadecimal digits 4C, the hexadecimal representation for a "<" sign. For example, if you want the ? character to be translated into the hexadecimal 4C as you key in the data, issue the following command at the beginning of the terminal session:

```
SET INPUT ? 4C
```

You must key in:

```
SET OUTPUT 4C ?
```

before SET INPUT ? 4C if you wish the ? to be displayed as output.

If you do not establish this kind of output translation, the system types out blanks instead of typing out the less-than characters.

- If output printing becomes inhibited during an output operation, press the ATTENTION key to resume printing.

IBM 1052 TERMINAL (PRINTER-KEYBOARD)
CHARACTERISTICS

A 1051 Control Unit and a 1052 Printer-keyboard comprise the IBM 1050 Data Communication System. The 1051 Control Unit includes the power supplies, printer code translator, data channel, and control circuitry needed for 1050 operation.

The 1052 keyboard looks like the PTT/C/EBCD configuration shown in Figure 8. The alphameric keys of 1052 printers equipped with the APL keyboard, appear as in Figure 10. Figures 11 and 12 illustrate the 1050 switch panel and keyboard.

The alphameric and special character keys, the space bar, lock, shift, and tab keys, and the paper controls operate the same as those on a standard IBM Selectric Typewriter.

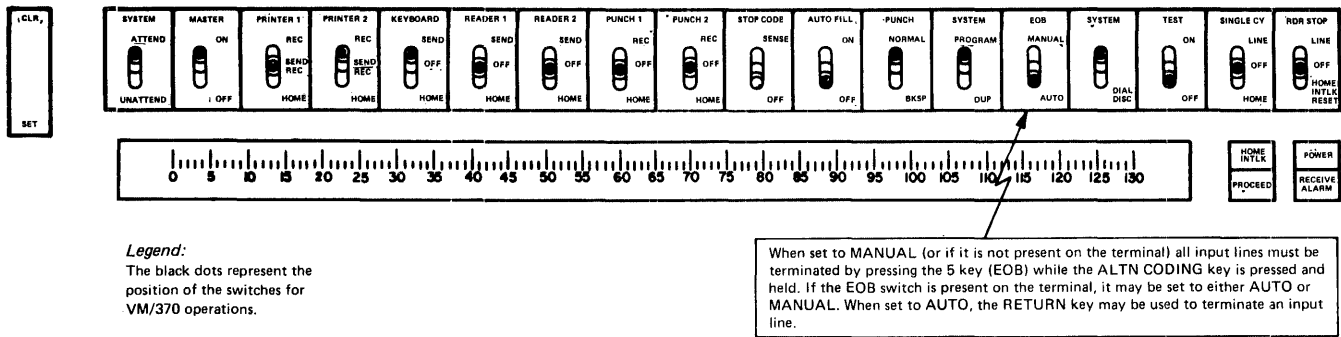


Figure 11. IBM 1052 Switch Panel and Switch Panel Settings

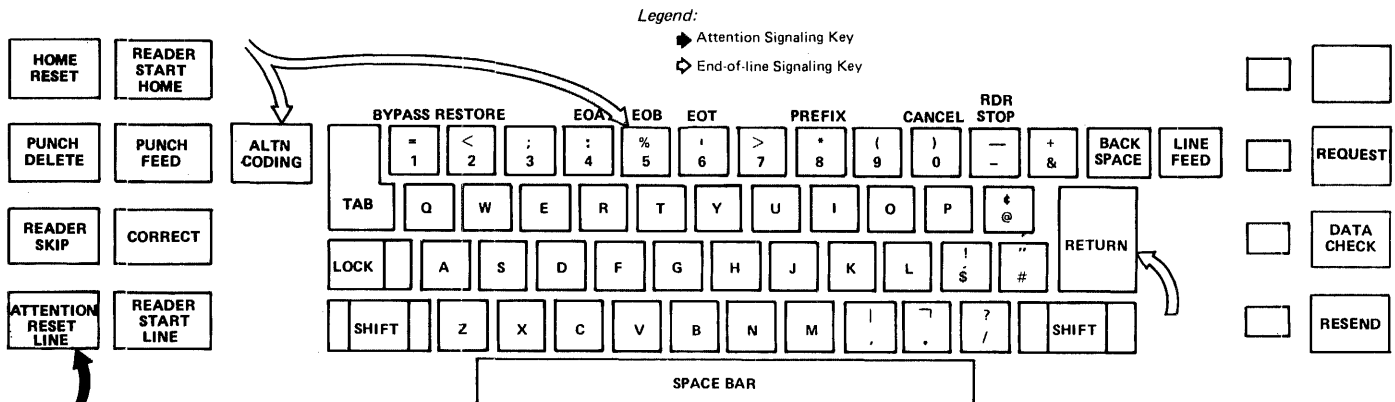


Figure 12. IBM 1052 Keyboard

The following keys are of special significance on the 1052 keyboard:

RETURN: If the 1050 terminal has the "EOB on carrier return" RPQ, and if the EOB switch on the switch panel is set to AUTO, the RETURN key can terminate an input line. Otherwise (if the "EOB on carrier return" RPQ is not available on the terminal, or if the EOB switch on the switch panel is set to MANUAL), the character transmitted when you press the RETURN key is part of the input line, and not an end of line indicator.

ALTN CODING: Pressing and holding this key while pressing one of the other keys generates a single character code such as restore, bypass, end of block (EOB), or end of transaction (EOT). The characters associated with the following keys have no special significance to VM/370:

- End of address (EOA)
- CANCEL
- PREFIX
- READER STOP

Terminate input lines from 1050 terminals not equipped with the "EOB on carrier return" RPQ by pressing and holding down the ALTN CODING key while operating the numeric 5 key (EOB). This procedure causes a carriage return at the terminal and sends an end of line indicator to VM/370.

BYPASS: Pressing this key suppresses the typing out of all subsequent data entered at the keyboard until you press the RESTORE key.

RESTORE: Pressing this key resumes printing previously suppressed by the BYPASS key.

RESET LINE: Pressing this key causes an interruption signal. The RESET LINE key may be operated at any time, because it is never locked out. For a discussion of the transfer between environments that occurs when the RESET LINE key is pressed, refer to "Attention Key Handling" in "Section 1. Introduction."

RESEND: Use this key and its associated light during block checking. The light comes on when the terminal sends an end-of-block character; it is turned off when the system acknowledges receipt. If the light remains on, indicating an error, press the RESEND key to turn off the light, and then rekey the previous input line. While the light is on, VM/370 accepts no input from the keyboard.

LINE FEED: Pressing this key moves the paper up one or two lines, according to the setting of the line space lever, without moving the typing element.

DATA CHECK: Press this key to turn off the associated data check light (to its left), which comes on whenever a longitudinal or vertical redundancy checking error occurs during the transmission of data, or when you first turn on power at the terminal.

For further information about the characteristics and handling of the 1050 terminal, refer to the publication IBM Data Communication System Operator's Guide, Order No. GA24-3125, and to the publication IBM 1050 Data Communication System Principles of Operation, Order No. GA24-3474.

REQUIRED SPECIAL FEATURES FOR 1050 USE AS A VIRTUAL MACHINE CONSOLE UNDER VM/370

The 2701, 2702, 2703, 3704, or 3705 transmission control units connect to the 1050 Data Communications System when the 1050 is a virtual machine console used with VM/370. Refer to VM/370: Planning and System Generation Guide for information about the special features required by these control units.

In addition, a 1050 Data Communication system must have these components:

- For switched or leased lines, a 1051 Control Unit (Model 1 or 2) with these features:

- Transmit Interrupt (#7900) or Transmit Interrupt Control RPQ #E26903
- Receive Interrupt (#6100) or Receive Interrupt Control RPQ #E27428
- Text Time-out Suppression (#9698)
- First Printer Attachment (#4408). This feature is required to attach the 1052 to the 1051.
- Required With Switched Lines:
 - Data Set Attachment (#9114)
 - One of the following is required for a private or leased line:
 - Data Set Attachment (#9115 for facility D1), or
 - Data Set Attachment (#9116 for facility B2), or
 - Data Set Attachment (#9120 for facility B1 or D1), or
 - IBM Line Adapter (#4691-4694 for 4-wire shared leased line), or
 - IBM Line Adapter (#4647 for 4-wire leased line).
 - The 1052 Printer-KeyBoard (Model 1 or 2) must have the following feature:
 - PTC/EBCD print element (#9571, #1167963)

RECOMMENDED SPECIAL FEATURES

The following features, although not required, make the terminal easier to use.

<u>Feature and Identification</u>	<u>Explanation</u>
Automatic Ribbon Shift and Line Feed Select (#1295)	Allows error messages to be printed in red. To activate this feature, enter the CMS environment and issue the SET REDTYPE ON command.
EOB on Carrier Return RPQ #E28235 or Automatic EOB#1313	Allows the RETURN key to terminate the input line, instead of pressing the ALTN coding key the the EOB key in sequence.

1050 Initiation Procedures--Margins and Tabs

Follow the procedure below to prepare the 1050 terminal for use with VM/370. After completing these steps, refer to the logon procedure in Section 1. Take these initial steps only when this is the first time the 1050 is used with VM/370 or, if the 1050 unit's margins, tab settings, and switch settings have been changed and are not suitable for VM/370 operations.

1. Set the panel switches as shown in Figure 11.
2. Check that the margin stops (two blue indicators visible in the transparent strip below the switch panel) are set as desired (normally at 1 and 130). If they are, proceed to Step 3.

To change margin settings, set the PRINTER1 and KEYBOARD switches to HOME. Turn terminal power on. Space or tab the type element to the center of the line. Turn terminal power off. Lift the top cover of the 1052 and tilt down the hinged portion of the front panel. Press the blue margin indicators toward the back of the 1052 and slide them to the new locations. Return the hinged panel to its original position and close the top cover.

3. Check the physical tab stop settings by setting the PRINTER1 and KEYBOARD switches to HOME, turning terminal power on, positioning the type element at the left margin, and operating the TAB key repeatedly. If the tab stop settings are satisfactory, proceed to step 4.

Note: Physical tab stop settings do not govern internal expansion of an input line in VM/370. For a discussion of internal tab settings, refer to "Default Tab Settings" in "Section 4. General Procedures for All VM/370 Terminals."

To reset the tabs, position the type element at the right margin. Lift the tab setting switch, labelled CLR/SET, and hold it while operating the RETURN key. This clears all previous tab settings. Set new tab stops by spacing the type element to the desired locations, then pressing down the SET portion of the CLR/SET switch. After setting tab stops for the entire line, operate the RETURN key to position the type element at the left margin. Turn off terminal power.

4. Reset the PRINTER1 switch to SEND REC and the KEYBOARD switch to SEND.
5. Turn the main power switch to POWER ON and proceed with the LOGON procedure as described in "Section 1. Introduction."

GENERAL TYPING CONVENTIONS FOR THE 1050 TERMINAL

Observe the following typing conventions when entering input to the VM/370 system from a 1050 terminal:

- Enter in uppercase or lowercase, or a mixture of the two.
- When the 1050 keyboard unlocks, the terminal can accept input.
- Correct partially entered input lines containing errors by using VM/370 special logical line editing characters. These characters are described under the heading "Logical Line Editing Character Usage" in "Section 4. General Procedures for All VM/370 Terminals."
- End an input line from the 1052, by pressing the numeric 5 key (EOB) while holding down the ALTN CODING key, unless the 1050 has the Automatic EOB special feature (EOB on carrier return RPQ). If this special feature is installed and the EOB panel switch is set to AUTO, end input lines by pressing the RETURN key.
- The default line length is 130 characters; that is, 129 data characters plus the carriage return (or EOB) character. For information about changing the line length, refer to the CP TERMINAL command in the VM/370: CP Command Reference for General Users.

VM/370 knows the relative position of the 1052 type element during output operations. When the type element moves one position past the specified or default line length, VM/370 generates an automatic carriage return. Output then continues on the next line. An automatic carriage return does not generate a continuation character.

- The terminal types invalid or nonprintable output characters as blank characters. An invalid output character has no corresponding printable character on the terminal and no keyboard function, such as a carriage return or tab.

- In most cases, one or more blanks separate command names, operands, options, and keywords from each other. Exceptions to this general rule are documented where appropriate.
- An exclamation point (!) prints whenever you operate the RESET LINE key. Printing the exclamation point (!) is a selectable option of the TERMINAL ATTN command.

TELETYPE MODEL 33 CHARACTERISTICS

The Keyboard Send/Receive (KSR) model of the Teletype Model 33 terminal includes a typewriter keyboard, a control panel, a data set, control circuitry for the teletypewriter, and roll paper. The Model 33 KSR keyboard contains all standard characters in the conventional arrangement, as well as a number of special symbols. All alphabetic characters are capitals. Use the SHIFT key for typing the "uppershift" special characters only. The CTRL key (Control key) is used with other keys to perform special functions. Neither the SHIFT nor CTRL key is self-locking. Figure 13 illustrates the Teletype Model 33 keyboard.

In addition to the standard keys, the keyboard contains several nonprinting keys with special functions. These keys are as follows:

LINE FEED: Generates a line-feed character and moves the paper up one line without moving the printing mechanism. When the terminal is offline, press the LINE FEED key after each line of typing to avoid overprinting.

RETURN: Causes a carriage return and signifies the physical end of the input line.

Note: Operating the CTRL and X-OFF keys normally terminates input lines. When VM/370 receives this sequence, VM/370 sends carriage return and line feed commands to the terminal. CTRL X-OFF is also the ending character for paper tape operations.

The RETURN key can also be an "end of input" character if the 2702 or 2703 Transmission Control is equipped with Pluggable End Characters (RPQ E62920 or RPQ E66707, respectively). Upon receipt of the RETURN "end of input" character, VM/370 sends an automatic line feed command to the terminal.

REPT: Repeats the action of any key pressed.

BREAK: Generates an attention interruption and interrupts program execution. On some Model 33 terminals, after interrupting program execution, you must press the ERK-RLS (Break-Release) pushbutton to unlock the keyboard.

CTRL: Used with other keys to perform special functions:

CTRL-I acts like the tab key on a typewriter.

CTRL-H acts like the backspace key on a typewriter.

CTRL-Q produces an attention interruption similar to BREAK when the terminal is in input mode.

CTRL-E produces an attention interruption similar to BREAK when the terminal is in input mode.

CTRL-S (X-OFF) acts as RETURN (see the note under RETURN).

CTRL-D (EOT) should not be used because it can disconnect the terminal.

CTRL-G (bell)

CTRL-R (tape)

All other CTRL characters are valid characters.

HERE IS: Not supported by VM/370; however, this key generates a fixed number of data characters.

RUBOUT: Ignored by VM/370.

ESC: (ALT MODE on some units) is not recognized by VM/370, but generates a valid character.

On models that have the control panel to the right of the keyboard, six pushbuttons are below the telephone dial, and two lights, a pushbutton, and the NORMAL-RESTORE knob are above the dial. The pushbuttons and lights are as follows:

ORIG: (Originate) this pushbutton obtains a dial tone before dialing. Turn up the volume control on the loudspeaker (under the keyboard shelf to the right). After establishing connection with the computer, lower the volume.

CLR: (Clear) press this pushbutton to turn off the typewriter.

ANS: (Answer) this pushbutton is not used with VM/370.

TST: (Test) this pushbutton is for testing purposes only.

Legend:

- ◆ Attention Signaling Key
- ◊ End-of-line Signaling Key

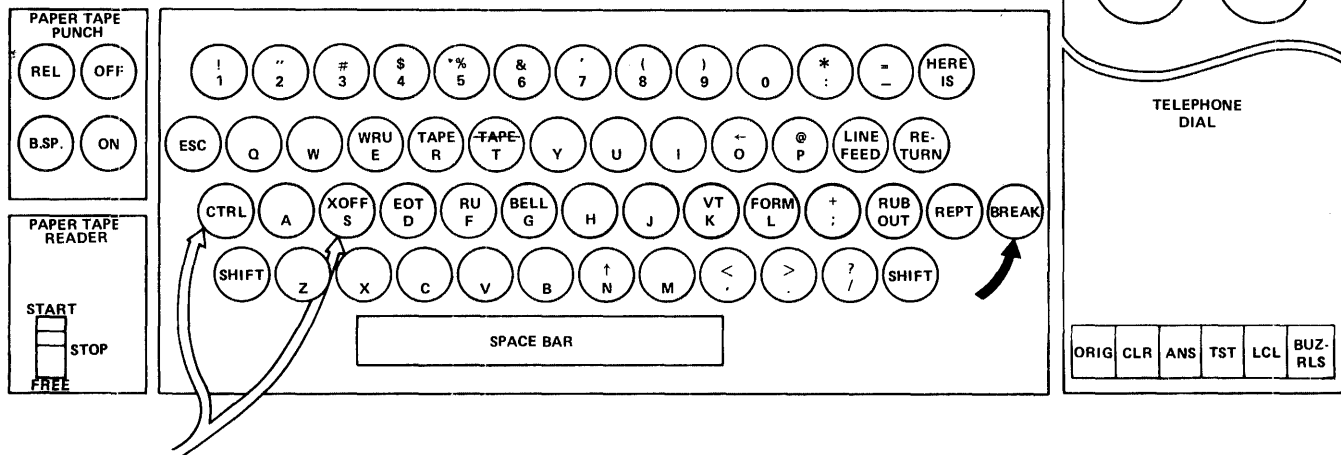


Figure 13. Teletype Model 33 Keyboard

LCL: (Local) this pushbutton turns on the typewriter for local or offline use.

BUZ-RLS: (Buzzer-Release) this pushbutton turns off the buzzer that warns of a low paper supply. The light in the BUZ-RLS pushbutton remains on until you replenish the paper.

BRK-RLS: (Break-Release) this pushbutton unlocks the keyboard after the BREAK key interrupts program execution.

REST: VM/370 does not use this light.

NORMAL-RESTORE: Set this knob to NORMAL, except to change the ribbon, in which case turn the knob to the OUT-OF-SERV light position. Then set the knob to RESTORE. Return it to NORMAL when you finish the ribbon change.

OUT-OF-SERV: (Out of Service) this light turns on when the NORMAL-RESTORE knob is pointed to it to change ribbons.

Most Teletype units have a loudspeaker and a volume control knob (VOL) located under the keyboard shelf. Turn the knob clockwise to increase the volume.

Typing conventions for Model 33 and Model 35 Teletype terminals are described following "Teletype Model 35 Characteristics."

TELETYPE MODEL 35 CHARACTERISTICS

The Keyboard Send/Receive (KSR) model of the Teletype Model 35 terminal includes a typewriter keyboard, a control panel, a data set, control circuitry for the teletypewriter, and roll paper. The Model 35 KSR keyboard contains all standard characters in the conventional arrangement, as well as a number of special symbols. All alphabetic characters are capitals. The SHIFT key is for typing the "uppershift" special characters only. The CTRL key (Control key) is used with other keys to perform special functions. Neither the SHIFT nor CTRL key is self-locking. Figure 14 illustrates the Teletype Model 35 keyboard.

In addition to the standard keys, the keyboard contains several nonprinting keys with special functions. These keys are as follows:

LINE FEED: Generates a line-feed character and moves the paper up one line without moving the printing mechanism. When the terminal is offline, press the LINE FEED key after each line of typing to avoid overprinting.

RETURN: Causes a carriage return and signifies the physical end of the input line.

Note: Operating the CTRL and X-OFF keys normally terminates input lines. When VM/370 receives this sequence, VM/370 sends

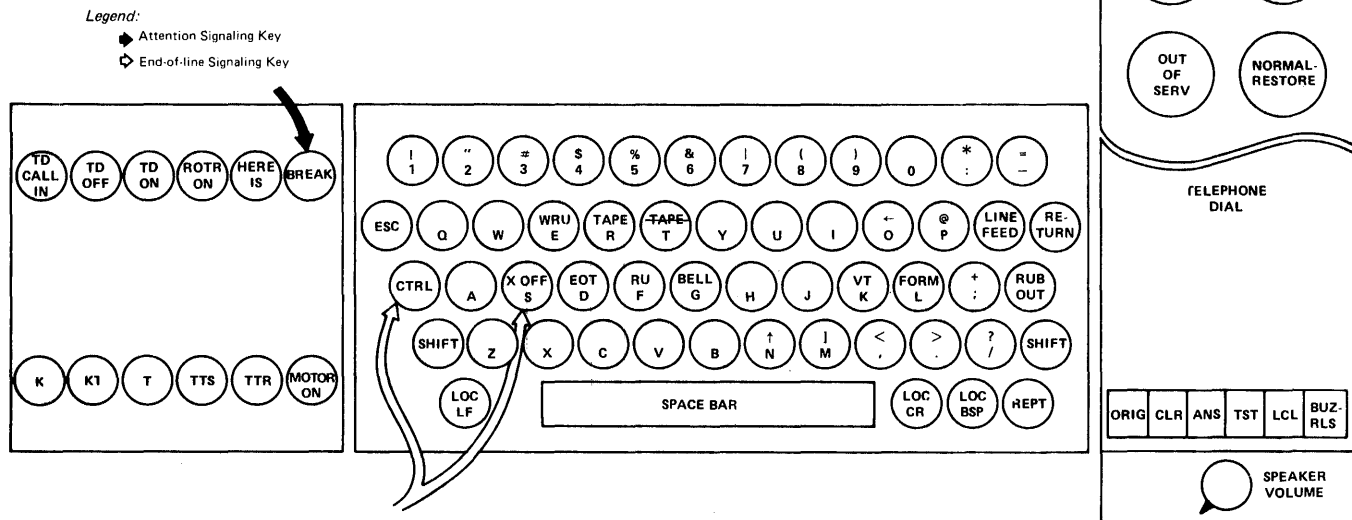


Figure 14. Teletype Model 35 Keyboard

carriage return and line feed commands to the terminal. CTRL X-OFF is also the ending character for paper tape operations.

You can specify the RETURN key as an "end of input" character if the 2702 or 2703 Transmission Control is equipped with Pluggable End Characters (RPQ E62920 or RPQ E66707 respectively).

Upon receipt of the RETURN "end of input" character, VM/370 sends an automatic line feed command to the terminal.

REPT: Repeats the action of any key pressed.

BREAK: Generates an attention interruption and interrupts program execution. On some models, after program execution is interrupted, press the BRK-RLS pushbutton and the K (keyboard) pushbutton to unlock the keyboard.

CTRL: Used with other keys to perform special functions:

CTRL-I acts like the tab key on a typewriter.

CTRL-H acts like the backspace key on a typewriter.

CTRL-Q produces an attention interruption similar to BREAK when the terminal is in input mode.

CTRL-E produces an attention interruption similar to BREAK when the terminal is in input mode.

CTRL-S (X-OFF) acts as RETURN (see the note under "RETURN").

CTRL-D (EOT) should not be used because it can disconnect the terminal.

CTRL-G (bell)

CTRL-R (tape)

All other CTRL characters are valid characters.

HERE IS: VM/370 ignores this character.

RUBOUT: VM/370 ignores this character.

ESC: (ALT MODE on some units) ignored by VM/370, but generates a valid character.

The control panel to the right of the keyboard contains six pushbuttons below the telephone dial, and contains two lights, a pushbutton, and the NORMAL-RESTORE knob above the dial. The pushbuttons and lights are as follows:

ORIG: (Originate) this pushbutton obtains a dial tone before dialing. Turn up the volume control on the loudspeaker (under the keyboard shelf to the right) to hear the dial tone. After connection with the computer has been made, the volume may be lowered.

CLR: (Clear) pressing this pushbutton turns off the typewriter.

ANS: (Answer) this pushbutton is not used with VM/370.

TST: (Test) this pushbutton is for testing purposes only.

LCL: (local) this pushbutton turns on the typewriter for local or offline use.

BUZ-RLS: (Buzzer-Release) this pushbutton turns off the buzzer that warns of a low paper supply. The light in the BUZ-RLS pushbutton remains on until you replenish the paper.

BRK-RLS: (Break-Release) this pushbutton unlocks the keyboard after the BREAK key interrupts program execution.

REST: VM/370 does not use this light.

NORMAL-RESTORE: Set this knob to NORMAL, except to change the ribbon, in which case turn the knob to the OUT-OF-SERV light position. Then set the knob to RESTORE and NORMAL when you complete the ribbon change.

OUT-OF-SERV: (Out of Service) this light goes on when you point the NORMAL-RESTORE knob to it to change ribbons.

Most Teletype units have a loudspeaker and a volume control knob (VOL) located under the keyboard shelf. Turn the knob clockwise to increase the volume.

The additional features of the Model 35 are:

LOCLF: (Local Line Feed) this pushbutton operates as the LINE FEED pushbutton does, but without generating a line-feed character. Use it with the LOC-CR pushbutton.

LOC-CR: (Local Carriage Return) this pushbutton returns the carrier as RETURN does, but without generating an end-of-line character. LOC-CR normally is used only to continue a line of input on the next line.

LOCBSP: (Logical Backspace) this pushbutton generates a character, but it has no meaning with the KSR model.

K: (Keyboard) this pushbutton unlocks the keyboard and sets the terminal for page copy only.

A column indicator at the right of the keyboard indicates the column that has just been printed. When you use the LOC-CR key, no end of line is recorded and the column indicator does not reset.

A red light to the right of the column indicator warns you that the carrier is approaching the right margin.

GENERAL TYPING CONVENTIONS FOR TELETYPE MODEL 33/35 TERMINALS

Observe the following typing conventions when entering input to VM/370 from a Teletype Model 33 or 35:

- The Teletype terminal keyboard always remains unlocked. Therefore, you should not attempt to key in anything until VM/370 types a period (.) at the left margin of the paper when VM/370 can accept input. If you start typing too soon, an interruption can occur that puts you into CP mode. If this occurs, type BEGIN to resume virtual machine operation.
- Correct partially entered input lines containing errors by using the VM/370 special logical line editing characters. These characters and their operation are described under the heading "Logical Line Editing Character Usage" in "Section 4. General Procedures for All VM/370 Terminals."
- End an input line from a Teletype terminal by operating the CTRL and X-OFF keys, or the RETURN key if the IBM 2702 or 2703 Transmission Control has the Pluggable End Characters RPQ.
- Invalid or nonprintable output characters appear as blank characters. An invalid output character, such as carriage return or tab, has no corresponding printable character on the terminal and no keyboard function.
- On Teletype terminals, the arrow translates to underscore (), the backslash translates to a logical not sign (~), and the up arrow translates to a logical or sign (|).
- In most cases, one or more blanks may separate command names, operands, options, and keywords from each other. Exceptions to this general rule are documented where appropriate.

- An exclamation point (!) prints when you operate the BREAK key. Printing the exclamation point is a selectable option of the CP TERMINAL command.
- VM/370 knows the relative position of the typing mechanism during output operations. When the typing mechanism moves one position past the default or specified line length, an automatic carriage return and line feed occurs. Output then continues on the next line. An automatic carriage return and line feed does not generate a continuation character.
- The default line length is 72 characters. For information about changing the line length, refer to the CP TERMINAL command in the VM/370: CP Command Reference for General Users.
- To establish logically equivalent characters for characters that are not present on the teletypewriter keyboard, use the CMS SET INPUT command as described in the VM/370: CMS User's Guide, and in "General Typing Conventions for 2741 Terminals."

SYSTEM OPERATOR PRINTING CONSOLES

Use the following consoles with VM/370 as either the VM/370 system console, or as a virtual machine console.

- IBM 3210 Console Printer-Keyboard, Models 1 and 2.
- IBM 3215 Console Printer-Keyboard, Model 1.
- IBM 2150 Console with 1052 Printer-Keyboard, Model 7.
- IBM System/370 Model 158 Display Console (printer keyboard)¹ with the 3213 Printer Model 1 required.
- IBM System/370 Models 138 and 148 Display Console (printer keyboard)¹ with the 3286 Printer Model 2 required.

¹You can use the IBM System/370 Models 138, 148, and 158 Display Consoles in display mode (that is, without using the attached printers). See "Section 3. Display Terminals."

- IBM 7412 Console (via RPQ AA 2846) with 3215 Console Printer-Keyboard Model 1.

Additional information may be found in the following publications:

IBM 3210 Console Printer-Keyboard Model 2 Component Description, Order No. GA24-3552

IBM 3215 Console Printer-Keyboard Component Description, Order No. GA24-3550

IBM System/360 Component Description and Operating Procedure: 1052 Printer-Keyboard Model 7 and 2150 Console, Order No. GA22-6877

| IBM System/370 Model 138 Functional Characteristics, Order No. GA24-3632

| IBM System/370 Model 148 Functional Characteristics, Order No. GA24-3634

IBM System/370 Model 158 Functional Characteristics, Order No. GA22-7011

To use printing console devices as terminals, use the REQUEST key to signal ATTN and the END key or the RETURN key to terminate and enter a line of input. The special characters used for logical line editing purposes are described under the heading "Logical Line Editing Character Usage" in "Section 4. General Procedures for All VM/370 Terminals." Console keyboards also have CANCEL keys that delete an entire input line.

Inhibiting the printing or masking of the entered password is not possible on these consoles. It is up to you to ensure the security of your password in these situations. Note, however, that if you invoke console spooling, passwords do not appear on the console spool file unless you use the LOGON command with the password specified on the same command line.

If a virtual machine is running in VM mode on a real 3210/3215, you must enter a CP command in CP mode by pressing the REQUEST key once to get VM READ status and then use the #CP function. Pressing the REQUEST key multiple times on a 3210/3215 does not place the virtual machine in CP mode.

If you are simulating a virtual 1052 console typewriter on a real 3210 or 3215 system console, the embedded 1052 control characters (which have no hardware equivalent on the real device) are not accurately reflected. The virtual 1052 line feed and idle characters type as a lowercase p or v on the 3210/3215, and no control function occurs.

Figures 15 through 20 illustrate the keyboard configurations for the 3210, 3215, and 2150 keyboards, System/370 Models 138, 148, and 158 Display Console keyboards, and the 3270 Data Analysis-Text keyboard. The 1052 keyboard is shown in Figure 12.

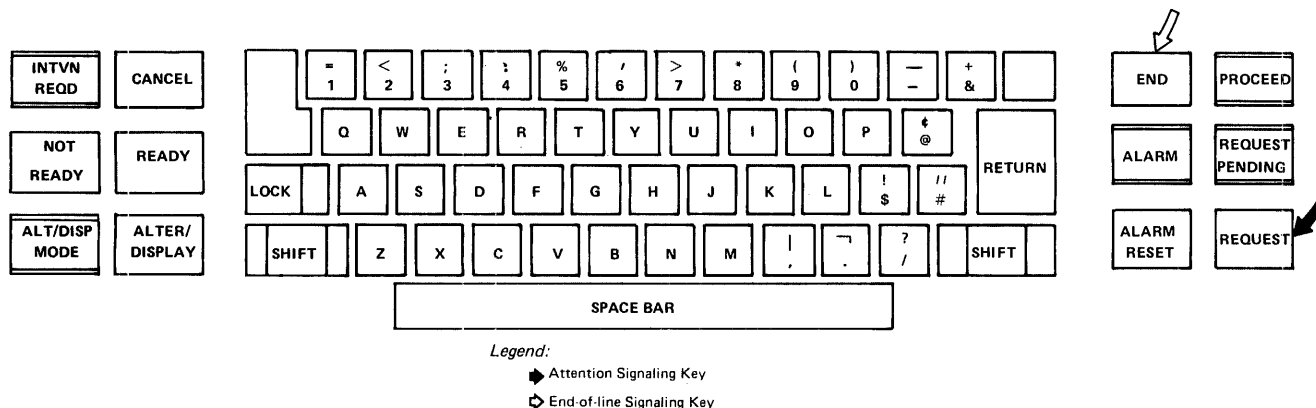


Figure 15. IBM 3210 Console Printer-Keyboard, Model 1, and IBM 3215 Console-Keyboard, Model 1

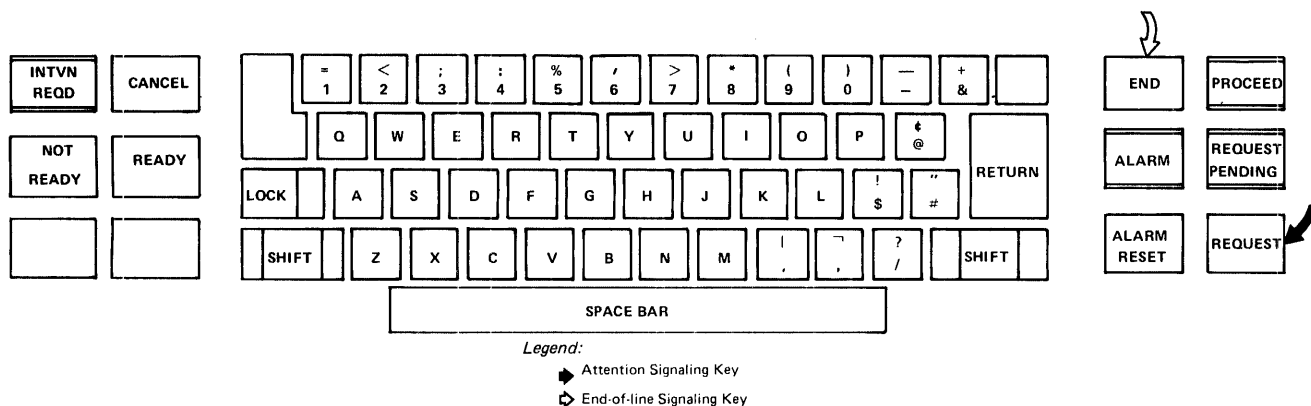


Figure 16. IBM 3210 Console Printer-Keyboard, Model 2, and 7412 Console (via RPQ AA2846) with a 3215, Model 1

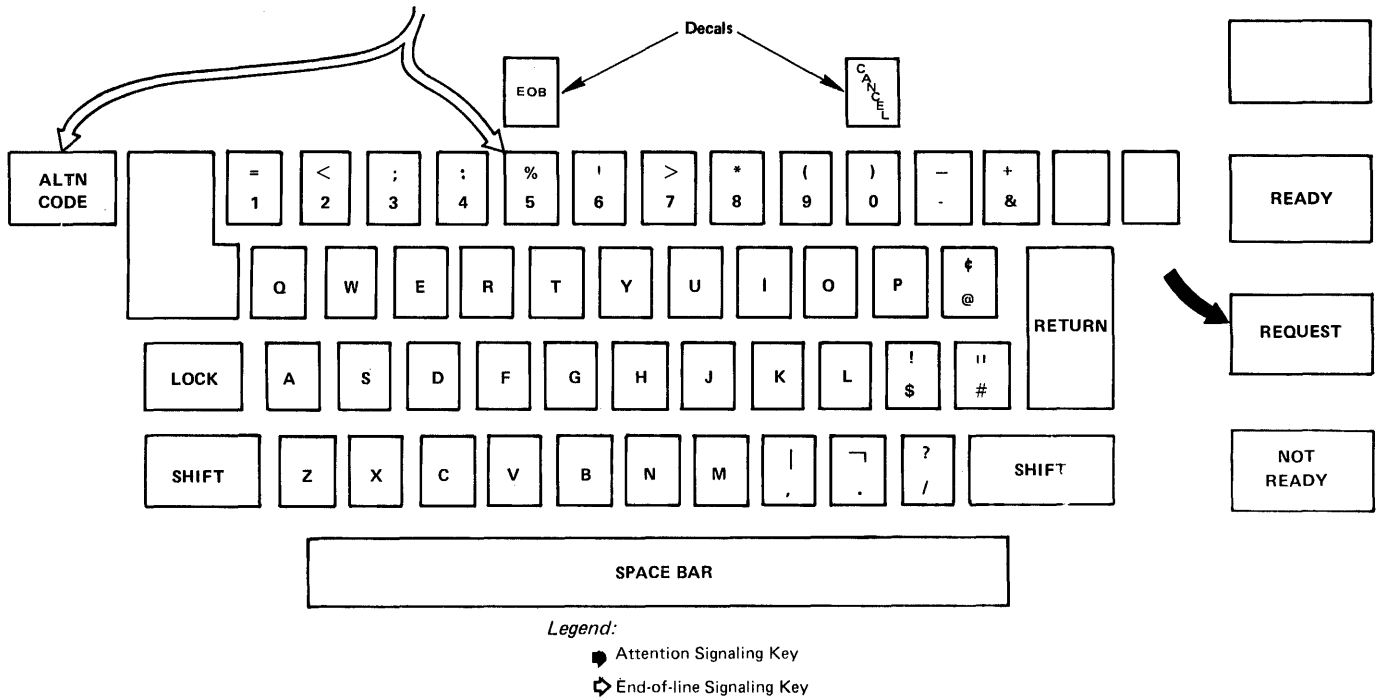


Figure 17. IBM 2150 Console with 1052 Printer-Keyboard, Model 7

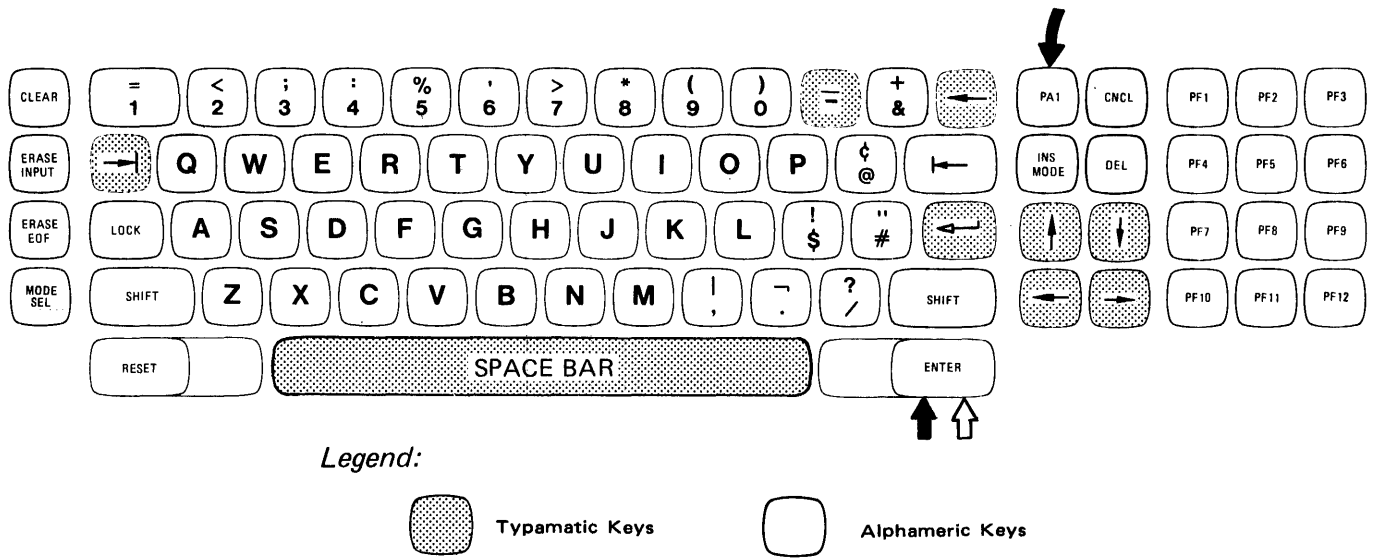


Figure 18. IBM System/370 Model 138 and 148 Display Console

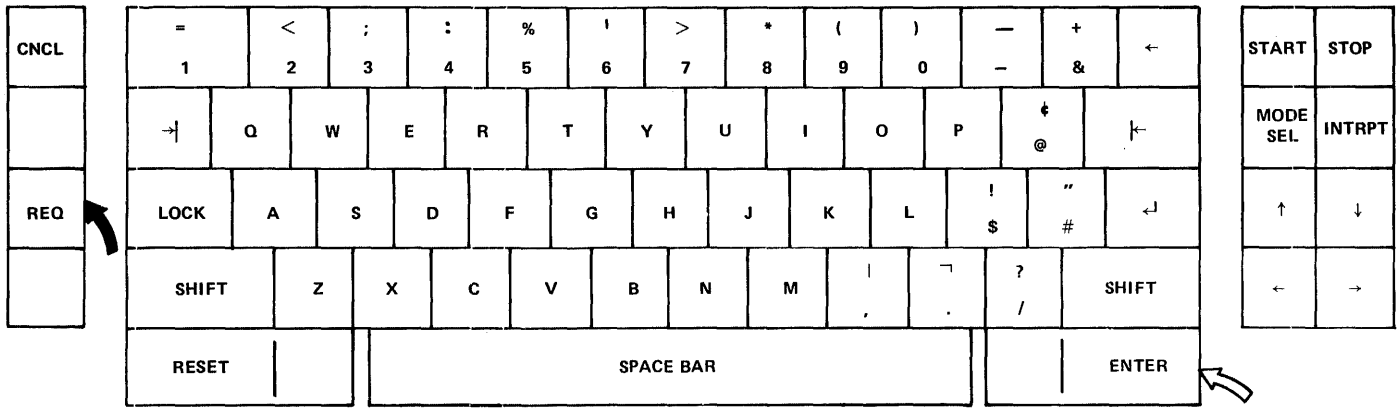


Figure 19. IBM System/370 Model 158 Display Console

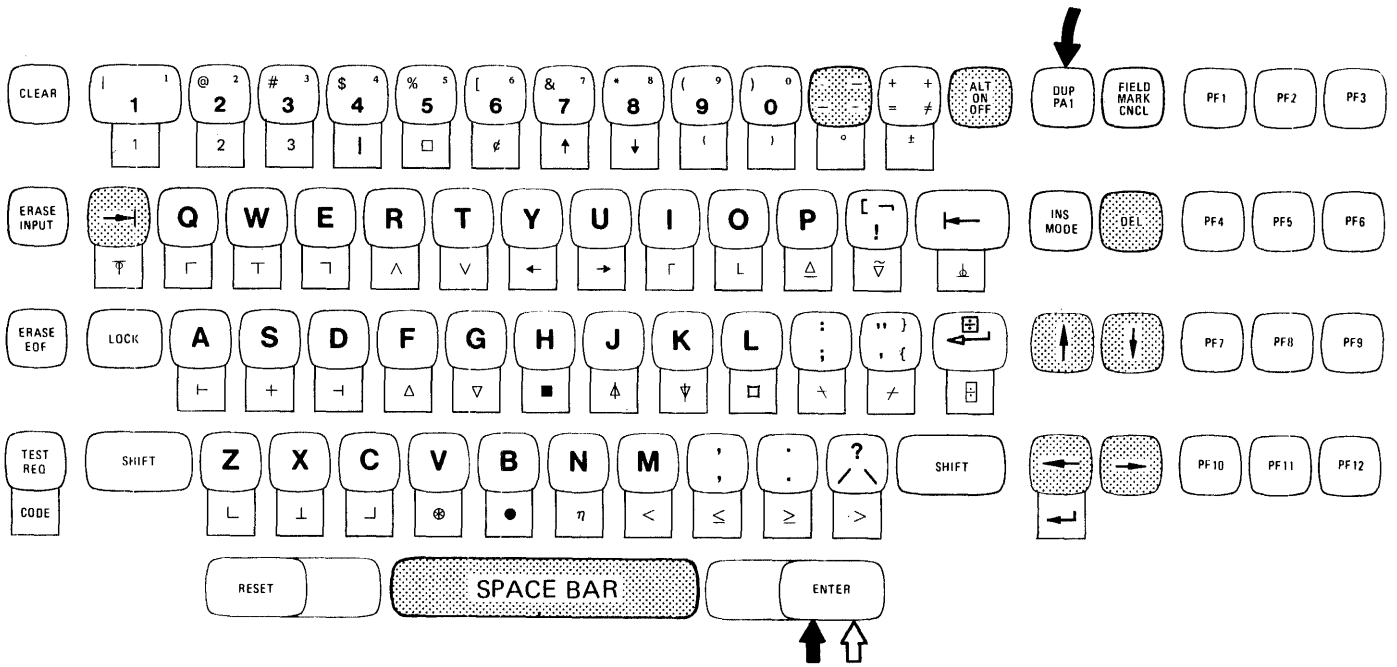


Figure 20. 3270 Data Analysis-Text Feature Keyboard

IBM 3767 COMMUNICATION TERMINAL
CHARACTERISTICS

The IBM 3767 Communication Terminal (Figure 21) is a buffered matrix printer, keyboard-driven, communication device. This device performs all the functions of a 2741 Communication Terminal, but the manner of implementing many of these functions is different from the 2741 (or the standard Selectric device). In addition, 3767 terminals offer many optional features that enhance their usefulness. For more details on these features and other functions briefly described in this section, see the IBM 3767 Communication Terminal Operator's Guide, Order No. GA18-2000.

The details given in this text on 3767 use are applicable and compatible to 2741 START/STOP operations. If no 2741 equivalency exists, that item or function, in most cases, will not be discussed.

The procedure for establishing communication with the VM/370 computer is described in Section 1.

Depending on model and feature, the 3767 can be equipped for use under VM/370 with EBCDIC or Correspondence keyboards. In addition, if the terminal is equipped with the Alternate Character Set Selection feature, the terminal user can select a secondary character set (such as APL), on an "as needed" basis, instead of the primary keyboard characters (and their related line code) by moving the PRIMARY/SECONDARY switch to the required position. Some of the significant differences between the 3767 and the 2741 terminals are as follows:

Keyboard Lock: The 3767 does not mechanically lock the keyboard to prevent input. The 3767 keyboard is electrically active only when the PROCEED lamp is on. When the lamp is out the keys can be depressed but no data is accepted.

Printing and Printing Sequence: When you key input into the 3767 terminal, printing is from left to right and is followed by a carriage return to the next line. When the terminal prints output, the data sent from the VM/370 system is either from left to right or right to left, depending on which operation takes less time. Because the current print position may be blocked from view by the matrix print mechanism when the AUTOVIEW switch is off, you can press the PRINT VIEW key to move the print mechanism to one side if you wish to see all of the last printed line.

ERROR HANDLING AND DETECTION: The 3767 terminal has incorporated data error, sequence error, and control error detection circuitry. Depending on the encountered error condition, you are informed of it in various ways. The devices that indicate the error are: audible tone, OPRN CHECK (operation check) and SYSTEM CHECK lamps, the Three-Position Alphameric indicator values, and special error print characters. Many of these errors are momentary in nature and require normal corrective action on your part. Other errors require you to press the RESET key.

PRINT POSITION INDICATOR: In addition to displaying error condition codes, the Three-Position Alphameric indicator indicates the next print position on the line. This register provides you with a positional reference for margins and tab functions. Any graphic key, backspace, TAB key, and RETURN key, plus EDIT and message function keys, affect the register value.

PAPER AND FORMS HANDLING: The 3767 terminal can be equipped to handle continuous forms, rolled paper or sheet stock. Forms controls and indicators are the FORMS READY lamp, and the end-of-forms switch. If the form control is operating and end-of-forms occurs, the 3767 does not operate until you insert and position new paper stock in the printer and press the FORMS READY key. If you want, you can disable end-of-form detection. For details, see the 3767 Operator's Guide and the 3767 Communication Terminal Setup Instructions.

For many functions, the 3767 and the 2741 operate in a similar manner. Some of these functions are described below.

TYPAMATIC KEYS: On the 3767 terminal the space bar, the backspace, and the hyphen-underscore keys have the Typamatic feature. That is, if you press the key and hold it, the key operation repeats until you release the key.

RETURN AND ATTN KEYS: Press the RETURN key to signal the end of each input line. When you press the RETURN key, control returns to the system and the keyboard is deactivated until the system is ready to accept another line of input.

During the time between input data transmission and system response, the keyboard is inoperative and the PROCEED light is out. System responses are usually followed by a carriage return and a read to the terminal. The ATTN key allows you to send an attention interruption to the processor regardless of the send or receive status of the keyboard.

Note: Required special features on the 3704 and 3705 communications control units necessary for 3767 Communication Terminal control as a 2741 terminal operating as a virtual machine console under VM/370 are described in the VM/370: System Programmer's Guide.

REQUIRED SPECIAL FEATURES FOR 3767 USE AS A VIRTUAL MACHINE CONSOLE UNDER VM/370

A 3767 Communications Terminal installed on either switched or leased lines as a 2741 must be equipped with these features:

- 2741 Start/Stop (#7113)
- EIA Interface with Clock (#3719) at 300 BPS
- Correspondence (#9381) or EBCDIC keyboard (#9391)
- Duplexed, switched or nonswitched line (#9404) for connecting to a Western Electric 103A2¹ (or equivalent) data set, or a half-duplexed, switched or nonswitched line (#9402) for connecting to any other data set.

RECOMMENDED SPECIAL FEATURES

- Acoustic Coupler (#1110) usable with 5502 or 5506 modem at 300 bps (#9540). This feature allows the linkage of the 3767 terminal to VM/370 via a standard telephone handset and its associated switched line.
- If the primary character set is Correspondence (#9381), use Alternate Character Set (#1291) plus either character subset:

- (#9382) EBCDIC
- (#9383) APL

If the primary character set is EBCDIC (#9391), use Alternate Character Set (#1291) plus either character subset:

- (#9393) APL
- (#9392) Correspondence

Use of an additional keyboard subset allows wider program application of the 3767 terminal.

¹Trademark of the Western Electric Co.

- Forms Tractor (#8731). Allows greater accuracy of printed data by means of continuous forms.

For other 3767 features, lines, and communications attachments, see the IBM 3767 Communication Terminal Operator's Guide, Order No. GA18-2000, and IBM 3767 Communication Terminal Component Description, Order No. GA27-3096.

3767 Initiation Procedures--Margins and Tabs

Margins and tabs must be set on the 3767 terminal every time you turn on the power because the 3767 relies on the electrical storage of previously set values. When the power is turned off, these values are cleared to the following preset values:

- Left margin = Left-most print position
- Right margin = Right-most print position
- Tab stops = Every print position

To set the margins and tab stops, perform the following steps:

Left Margin: With power on, set the COMM/LCL switch to the desired position, set the left-hand margin to the desired print position by using the space bar. When this print position is indicated by the value in the Three-Position Alphameric indicator, press the 9 key while pressing the CODE key.

Tab Stops: Advance the print head and the Three-Position Alphameric indicator to the desired tab stop position, and press the 7 key while pressing the keyboard CODE key. Repeat the operation for other tab stop positions.

Right Margin: Advance the print position and the Three-Position Alphameric indicator via the space bar to the desired right-hand margin position. Press the 0 key while pressing the CODE key.

To verify the initial setup, use the RETURN key, TAB key, and space bar in conjunction with the Three-Position Alphameric indicator. If you find setup errors, use the space bar, backspace key, and the appropriate procedure to override the previously set up values.

Note: An audible tone occurs, while you are typing, at the 10th print position to the left of the right margin.

3767 Keyboard

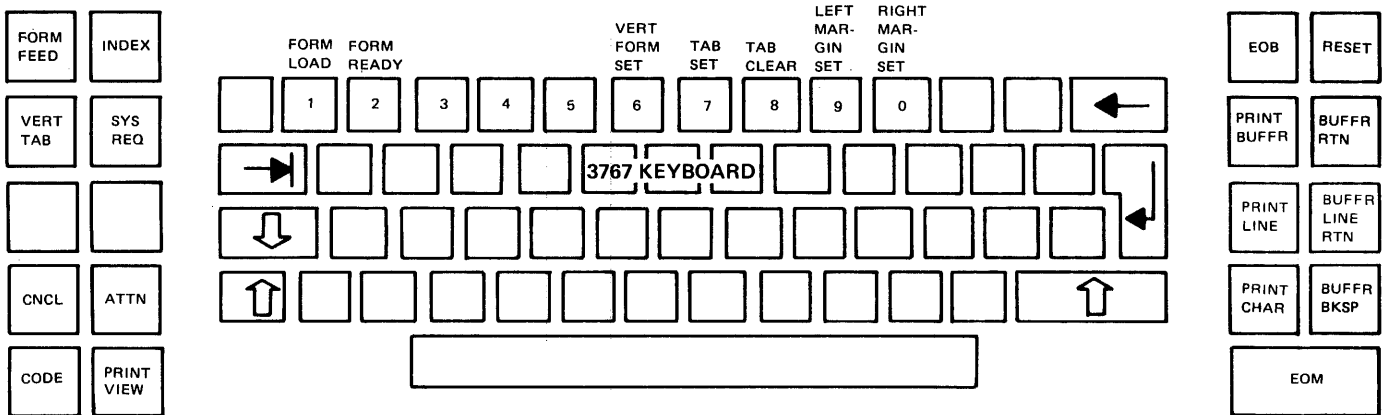
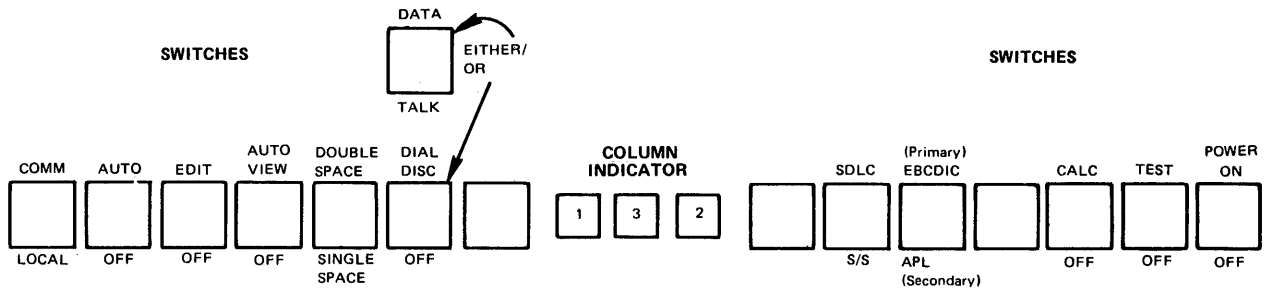
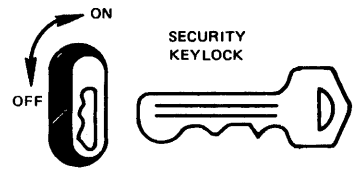
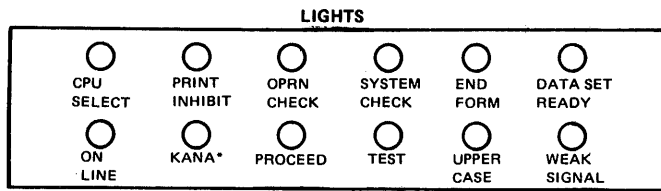


Figure 21. 3767 Communication Terminal Registers, Indicators, Switches, and Function Keys

To clear a misplaced tab stop, position the printing mechanism and the Three-Position Alphameric indicator at the tab stop location, then press the 8 key while pressing the CODE key.

GENERAL TYPING CONVENTIONS FOR 3767 TERMINALS

Observe the following typing conventions when entering input to the VM/370 system from a 3767 terminal:

- Enter input in uppercase or lowercase, or a mixture of the two.
- The 3767 keyboard is available and ready to process input when the PROCEED light is lit. Data entered prior to that is ignored.
- Correct partially entered input lines containing errors by using the VM/370 special logical editing characters. See the discussion of "Logical Line Editing Character Usage" in "Section 4. General Procedures for all VM/370 Terminals."
- Press the RETURN key (the key with the arrow pointing down and to the left) to end an input line from the 3767.
- The default line length is 132 characters; that is, 131 data characters plus the carriage return character. For information about changing the line length, refer to the CP TERMINAL command in the VM/370: CP Command Reference for General Users.

VM/370 knows the relative position of the 3767 typing element during output operations. When the typing element moves one position past the specified or default line length, VM/370 generates an automatic carriage return. Output then continues on the next line.

- The terminal treats invalid or nonprintable output characters, such as a carriage return or tab, as blank characters. An invalid output character has no corresponding printable character and no terminal function.
- In most cases, one or more blanks can separate command names, operands, options, and keywords from each other. Exceptions are documented where appropriate.

- An exclamation point (!) prints whenever you press the ATTN key. Printing the exclamation point (!) is a selectable option of the TERMINAL ATTN command.
- On 3767 Communication Terminals (see Figure 21), VM/370 translates internally the following special characters to provide the necessary special characters for entering certain types of programs:

± translates to > (greater than sign)
! translates to | (logical or sign)

The less-than sign (<) and the not sign (~) have no corresponding translatable character on the keyboard. To enter these characters, refer to the EDIT subcommand ALTER, discussed in the VM/370: CMS User's Guide, which provides information about entering the corresponding hexadecimal representation of the character. As an alternate technique, use the CMS SET INPUT command described in VM/370: CMS User's Guide, to equate some seldom-used character, such as a "?" to the hexadecimal digits 4C, the hexadecimal representation for a "<" sign. For example, if you want the ? character to be translated into the hexadecimal 4C as you key in the data, you key in issue the following command at the beginning of the terminal session:

```
SET INPUT ? 4C
```

You must key in:

```
SET OUTPUT 4C ?
```

before SET INPUT ? 4C if you wish the ? to be displayed as output.

If you do not establish this kind of output translation, system output on the correspondence terminal containing less-than characters (<) or logical not (~) characters types out blanks instead of typing out the desired characters.

SPECIAL CONSIDERATIONS FOR USING TYPEWRITER TERMINALS

KEYBOARD LOCK

Except for the 3767, the typewriter terminal is unbuffered, therefore, the printing element of the typewriter is common to both input and output operations and cannot type simultaneous input and output operations. The keyboard lock forces these two operations to be separate.

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

- Situation 1--You are keying data into your virtual machine from your typewriter terminal. In the midst of a line of entry, the virtual system queues a response to the terminal. After receiving the line end signal for the input line from the terminal, the keyboard locks to prevent you from keying in more data while the system prints the queued response message at the terminal.
- Situation 2--The virtual system is printing an extensive amount of data on the typewriter terminal, but you want to interrupt the virtual machine (see "Attention Handling") to perform alternative action. You cannot make the change because the keyboard is locked until the current operation ends. To circumvent this, signal an attention interruption via the ATTN key (or its equivalent). Note that this key is not under keyboard lock control. The current operation of the virtual machine halts (if the virtual machine accepts the interruption) and the keyboard unlocks to allow you to perform the alternate action.

TAB KEY USAGE

The following describes the procedures for using the TAB key on typewriter terminals when typing input for CMS files that have fixed-length records.

When you press the TAB key (or equivalent) on a typewriter terminal, the typing element moves to the next physical tab stop position. The tab settings on your terminal may not correspond to the internal tab settings for a particular filetype.

Note that it is not necessary that they do so: the CMS Editor, after reading a tab character generated by the pressing of the TAB key, expands the tab into the correct number of spaces.

The number of spaces to be generated for each depression of the TAB key is dependent on the tab settings made by the EDIT TABSET subcommand. If no TABSET subcommand is issued, the default tab settings are in effect. These default tab settings are listed in Section 4.

The following example illustrates tabbing on a typewriter terminal.

1. Set up physical tab stops on the terminal on columns 21, 41, 61, 81, 101, 121.
2. Use the editor's TABSET subcommand to set up identical logical tab stops.
3. Enter input mode and enter the indicated letters separated by tab key action. Note, if this is not a default filetype and record length exceeds 80 characters be sure to indicate the logical record length (LRECL) when initializing the file.

You key in:

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

The expanded record as it looks in the file and entered on the console document follows:

Columns						
1	21	41	61	81	101	121
AA	BBB	CC	DD	EE	FF	GG
AA	BB	CC	DDDD	EE	FF	GG

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

Section 3. Display Terminals

VM/370 SYSTEM OPERATOR AND VIRTUAL MACHINE CONSOLE USAGE

Use the following system operator display consoles with VM/370:

- System Display Console for the IBM System/370 Models 138, 148, or 158 in display mode or printer keyboard mode, or
- 3066 System Display Console Model 2 for IBM System/370 Model 165 II, or 168.

The 3277 Display Station Model 2, as a locally attached device equipped with any EBCDIC keyboard, can serve as either the VM/370 system operator console, the alternate VM/370 system console, or as a user terminal.

Note: Local attachment means that the device is connected to a selector, block multiplexer or multiplexer channel via a 3272 Control Unit instead of using a communications control unit such as a 2701, 2702, 2703, 3704, or 3705.

The 3277 Display Station, Model 2, and the 3275 Display Station, Model 2, connected as remote devices, can serve as VM/370 virtual machine consoles only.

The 3277 Display Station, Model 1 (480-character screen) can serve only as a dedicated device attached to a virtual machine that supports its use.

VM/370 supports the following 3277 features for virtual machine operations:

- Lowercase Display, RPQ#8K0366
- Audible Alarm Feature (#1090)

The following 3277 features, although not required by VM/370, are desirable for security:

- Operator Identification Card Reader Feature #4600
- Security Keylock Feature #6340

| IBM 3270 DATA ANALYSIS-APL FEATURE

VM/370 supports the following devices for the IBM 3270 Data Analysis-APL Feature with APL:

- 3271 Model 2 or 3272 Model 2 Control Unit
- 3277 Model 2 Display Station with either of the following APL keyboards:

- 66-character keyboard, feature #4637
- 78-character keyboard, feature # 4638

Note: The 78-character keyboard includes the 12 program function keys which are required in order to use the local copy function.

- 3284 Model 2 or 3286 Model 2 Printers

The 3270 Data Analysis-APL feature (#1066) allows the use of VS APL with any or all of the above devices. The Lowercase Display RPQ#8K0366 must be removed prior to installing the feature because the feature includes the lowercase display support.

| 3270 DEVICES THAT SUPPORT THE TEXT FEATURE

| The 3270 Data Analysis - Text Feature allows you to key in, display, and print all the specified text characters that appear on the "TN" print train.

| The 3270 Data Analysis - APL Feature (#1066) is required on the following devices if you want to use the special text characters:

- 3271 Control Unit Model 2
- 3272 Control Unit Model 2
- 3284 Printer Model 2
- 3286 Printer Model 2
- 3277 Display Station Model 2 (with the Text keyboard (#4639))

| 3270 Devices Not Supported by the Text Feature

| The following 3270 devices, although supported by VM/370, do not support the Text feature:

- 3275 Display Station
- 3284 Printer Model 3
- 3286 Printer Model 3
- 3288 Printer

Note: The term 3277 Display unit is hereinafter referred to as a 3270 unless otherwise specified. Any mention of the 3270 also applies to the system console for the System/370 Models 138, 148, or 158, unless otherwise noted.

Except where noted, the locally connected display devices mentioned can serve as virtual machine operator consoles or as dedicated devices attached to a multiple-access system. The locally connected display device can operate as a VM/370 system operator's console and as a simulated 3210/3215 console for the virtual machine. The locally connected display device cannot operate as a VM/370 system operator's console if the virtual machine is using the 3270 in native mode (that is, it is dedicated as a 3270 to the virtual machine).

The remotely connected display devices operate as virtual machine consoles only. Only the leased line that connects the remote display devices to the computer can be dedicated. Individual display stations cannot be dedicated.

Additional information about these console devices can be found in the following publications:

Operator Guide for IBM 3270 Information Display System, Order No. GA27-2742

System/370 Model 168 Procedures, Order No. GC38-0030

DISPLAY TERMINALS--FUNCTIONS AND CHARACTERISTICS

Display console usage for VM/370 and virtual machine input and output message handling is different from that of typewriter terminals. Along with the normal data entry and attention handling requirements of a terminal, you must familiarize yourself with VM/370 screen management techniques.

VM/370 supports the System/370 Models 138, 148, or 158 System Console as a 3277 Display Station in display mode, or as a 3215 typewriter terminal in keyboard-printer mode. For the 158 console, in keyboard printer mode, the console keyboard and the 3213 printer work together to operate as a 3215. The console mode is altered by using the console disk file on your System/370 Model 158. For the 138 and 148 consoles in printer/keyboard mode, the console keyboard and the 3286 printer, if attached, work together to operate as a 3215.

The 3066 and the 3277 behave similarly within a VM/370 environment. However, unique differences in keyboard layout and screen control occur between these devices. These differences are discussed under the heading "Display Terminal Keys and Keyboards."

DISPLAY SCREENS AND SCREEN MANAGEMENT

Figure 22 is a representation of the general layout of a screen used with the VM/370 control program and virtual machine. The screen has three unequal sized areas as shown in Figure 22. For other parameters of the display screen, see Figure 23.

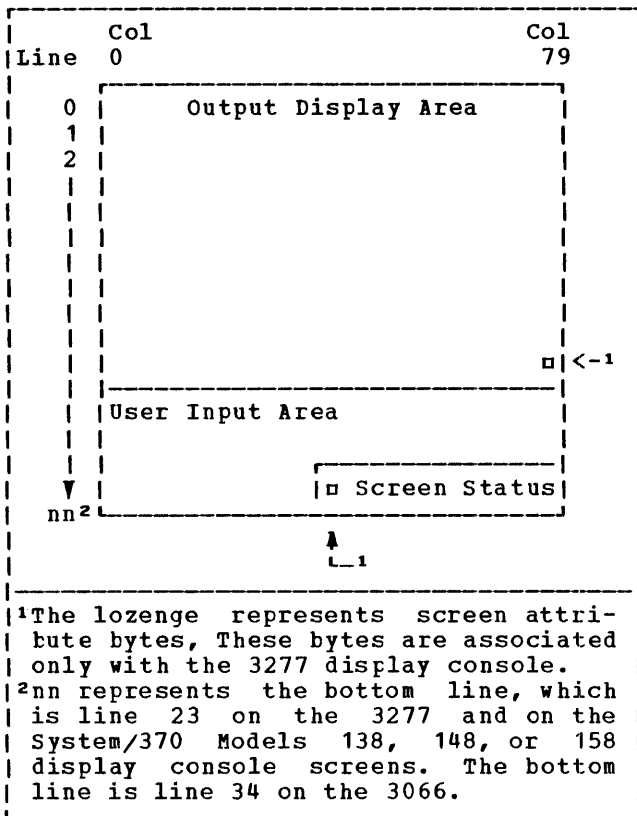


Figure 22. Display Screen Layout

Screen Statistics

The physical attributes of VM/370-supported display screens and keyboards vary according to model and system. Figure 23 shows statistics relating to the screen. Note that the screen represents a discreet series of character positions starting with the top line presented as line 0 and

progressing in sequence to the bottom of the screen. The character columns within a designated line are represented by a left-to-right numerical sequence of 0 through 79.

Output Display Area

This is the largest area. It contains all but the two bottom lines displayable on the screen. It displays the most recent activity of VM/370 system operations (if it is the VM/370 system console) or the most recent virtual machine and CP activity relating to the virtual machine. This area contains data sent to the System/370 that is keyboard entered and initially displayed in the user input area. Messages as well as responses from both the virtual machine and CP appear in this area.¹ Assuming a blank screen condition, data is displayed on the screen in horizontal rows in a left-to-right top-to-bottom arrangement beginning at the top left-hand corner of the display screen. Details of screen data handling are discussed later.

User Input Area

This area contains two lines. It has 80 characters on the first line and approximately the left two-thirds of the bottom line. This area is solely an input line assembly and editing area prior to sending the information to VM/370.¹ All keyboard data appears in this area (except for prompted passwords) in a left to right arrangement as you press the characters on the keyboard. The password does not appear in the user input area when keyed in after the prompting message "ENTER PASSWORD," nor is it redisplayed in either the output display area or copied onto the virtual console spool file. Keyboard cursor control and other text editing facilities of the keyboard can alter this data. When you press the ENTER key, data in this area disappears and reappears as the next entry in the output display area unless:

- The data is a prompted password.
- You cancelled the data with VM/370's logical line delete symbol.

¹This discussion does not include how the CMS EDIT facility uses the screen. For a discussion about CMS Editor usage, refer to the VM/370: CMS User's Guide.

- You press the CANCEL key in place of the ENTER key on the 3066, or you press the ERASE INPUT key on the 3270.

A lozenge appears in position zero of the 3270 input area when running standalone VM/370 utilities. In this case, you must press the space bar once before entering data.

Screen Status Area

This area is approximately one-third of the right hand side of the screen's bottom line. You cannot key into this area of the screen. It is for messages that indicate the status of the screen as it relates to the operation and synchronization of screen output and data input. Any one of the following six messages indicate screen status:

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

RUNNING: VM/370 or the virtual machine is operating. The screen output display area is blank or partially filled and you have not requested the system to retain the present output area image. Additionally, neither CP nor the virtual machine is waiting for you to respond to a console message (read request); you have not tried to enter data with a previously entered input buffer pending that has not been processed by CP or by your operating system. The running condition also occurs if the screen is filled and VM/370 has no additional lines to display.

CP READ: The system is waiting for you to respond to a message from CP before it displays the next line.

VM READ: The operating system running in the virtual machine issued a read request to the virtual machine console and is waiting for a reply. This occurs, for example, after a console message that requires a response.

While in VM READ, you can pass a null line attention interruption to CMS by using the cursor movement key to move the cursor one position prior to the normal input area start position and pressing the ENTER key.

MORE...: The system is in a RUNNING status but the output display area is full and more lines must be displayed on the screen.

Area	3270	3066
Output Display Area	Contains up to 22 lines of data. Lines 0 through 20 can display 80 characters (columns 0 through 79). Line 21 contains character columns 0 through 79 on the 138, 148, or 158 Display Console; and 0 through 78 plus the attribute character on the 3270. You cannot enter data into the output display area or the attribute character position.	Contains up to 33 lines of data. Lines 0 through 32 display up to 80 characters (columns 9 through 79). No hardware feature exists to prevent you from entering data in the output display area.
User Input	Line 22 contains up to 80 characters (columns 0 through 79). Line 23 contains 56 characters (columns 0 through 55).	Line 33 can contain 80 characters (columns 0 through 79). Line 34 can contain 56 characters (columns 0 through 55).
Screen Status	Line 23 starting in character columns 69 through 79.	Line 34 containing character columns 60 through 79.

Figure 23. Screen Statistics

When the screen is in a MORE... status, a one minute timeout begins. Fifty seconds later the audible alarm sounds (if the device has it) to inform you that in 10 seconds the control program (CP) will erase the current output display area unless you manually intervene and force a HOLD status with the ENTER key. At the end of the time limit, if you have not pressed the keyboard ENTER key, the output display area disappears and the screen reverts to RUNNING status with the previously pending output lines of data appearing. If the screen is in MORE... status and you press the CNCL or CANCEL key, the output display area disappears immediately without waiting for the one minute timeout period to elapse and the screen status changes to RUNNING.

The system does not stop if the screen is in a MORE... status. Those virtual machines that can run continue to run.

With remote 3270 terminals it is possible to achieve a MORE... screen status condition without a full display screen. When this occurs, press the CNCL key to change the screen status so you can use the screen again.

HOLDING: The system is running, but you have decided to retain the current output display area image.

The HOLDING condition also occurs when a screen full condition with a message displayed causes the audible alarm to sound. This image remains until you press the ENTER key or the CNCL/CANCEL key. Pressing the ENTER key causes the screen to revert to the MORE... status and the one minute timeout must end before the output

display area disappears and the RUNNING status recurs. Normally, pressing the CANCEL key or CNCL key immediately erases the output display area and the screen status changes to RUNNING.

If you press the PA1 key while the screen is in a MORE... or HOLDING status, the next line that is scheduled to appear in the output display area may be deleted.

NOT ACCEPTED: A previously stacked active input buffer (that is, a user-keyed data or command line) is still pending. The control program (CP) constructed this input buffer when you entered data and pressed the ENTER key. If you are running in VM mode the virtual machine must issue a console read or a SYSTEM RESET command to clear the input buffer. In the case where you are running in a CP environment, "NOT ACCEPTED" indicates that a previously initiated CP command has not yet completed. VM/370 inhibits input from the keyboard for 3 seconds while it displays the NOT ACCEPTED status and activates the 138, 148 or 158 display console or the 3270 audible alarm (if one is present) to inform you of the status message. When the 3-second interval expires, the screen reverts to its previous status. The rejected data stays in the user input area of the screen to allow you to retry the operation without keying it in again.

When using the SET PFnn COPY command, "NOT ACCEPTED" also occurs for 3270 remote printers that are busy or unavailable.

Figure 24 summarizes the action taken for ENTER/CANCEL under each screen status and mode condition.

INITIAL STATUS	MODE	KEY PRESSED	DATA	ACTION	RESULTING STATUS
RUNNING	CP	ENTER	NONE	Enter console function mode	CPREAD
			DATA	Execute console function	RUNNING
		CNCL	N/A	Clear output area	RUNNING
	VM	ENTER	NONE	"Attn" pending, VM run	RUNNING ¹
			DATA	"Attn" pending, stack data, VM run	RUNNING ²
		CNCL	N/A	Clear output area	RUNNING
PA2 (if APL on)		N/A	Clear output area.	RUNNING	
MORE	CP/VM	ENTER	NONE	Hold screen output	HOLDING
			DATA	Same as RUNNING	MORE
		CNCL	N/A	Clear output area, continues output	RUNNING
HOLDING	CP/VM	ENTER	NONE	Hold screen output	MORE
			DATA	Same as RUNNING	HOLDING
		CNCL	N/A	Clear output area, continues output	RUNNING ³
CPREAD	CP/VM	ENTER	NONE	"Null" line return	RUNNING ⁴
			DATA	Data return for function	RUNNING
		CNCL	N/A	Clear output area	CPREAD
VMREAD	CP/VM	ENTER	NONE	"Null" line return, VM run	RUNNING
			DATA	Data return for read, VM run	RUNNING
		CNCL	N/A	Clear output area	VMREAD
		PA2 (if APL on)	N/A	Clear output area. Present external interruption to virtual machine.	RUNNING
NOT ACCEPTED	Busy or unavailable 3270 remote printer. A previously stacked input buffer is still pending.				Returns to former status

¹The status shown is RUNNING, however, the virtual machine should respond to the Attn with a read, whereupon the status goes to VMREAD.

²If a data buffer is already stacked for a virtual machine, the terminal displays NOT ACCEPTED status before returning to the RUNNING status.

³If you are running with TERMINAL MODE CP (the default for the primary system operator), an attention return also occurs which cancels the function.

Operators at the 158 display console use this function to allow termination of certain QUERY or DISPLAY functions because the 158 console does not have a PA1 key.

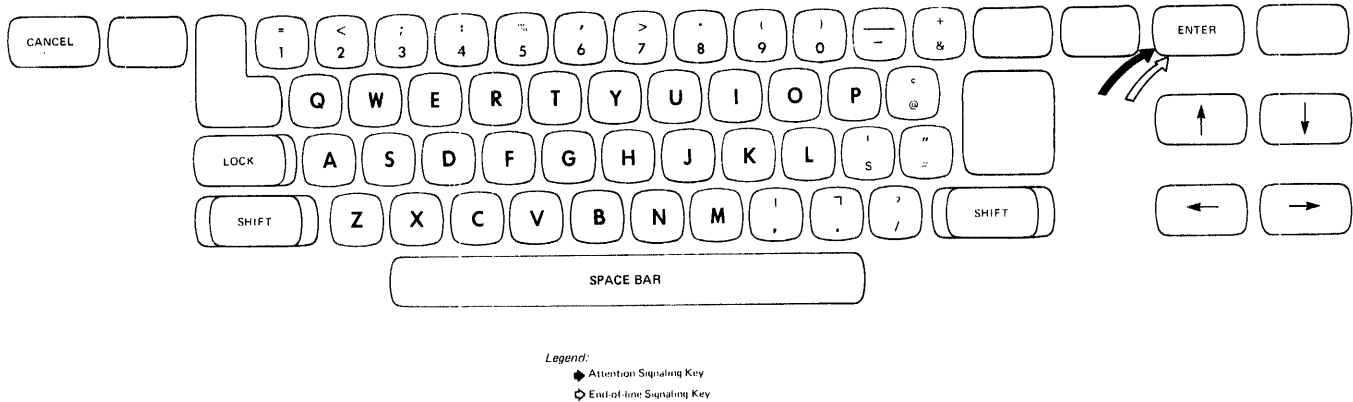
⁴Unless you are the VM/370 primary system operator or are running with the SET RUN ON option, the status returns to CP READ for another console function if the previous read was for a console function.

Figure 24. Summary of Screen Status Action

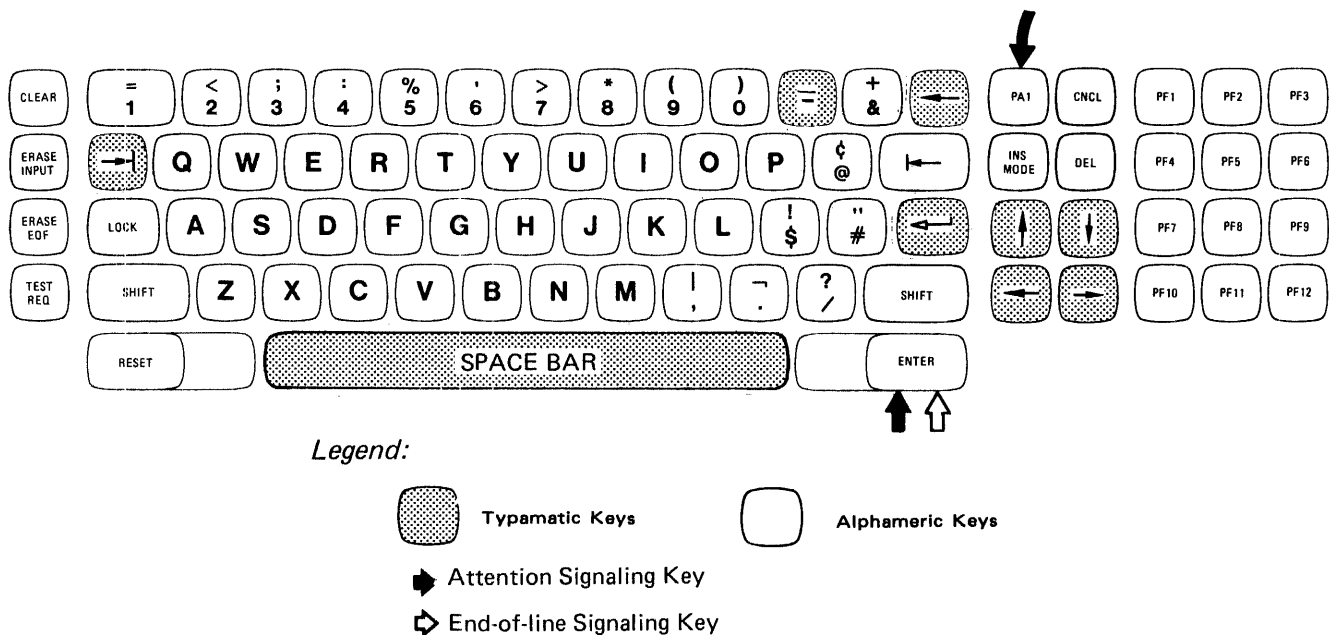
DISPLAY TERMINAL KEYS AND KEYBOARDS

The summary below shows significant control keys and their functions for 3270, 3066, and the System/370 158 display devices.

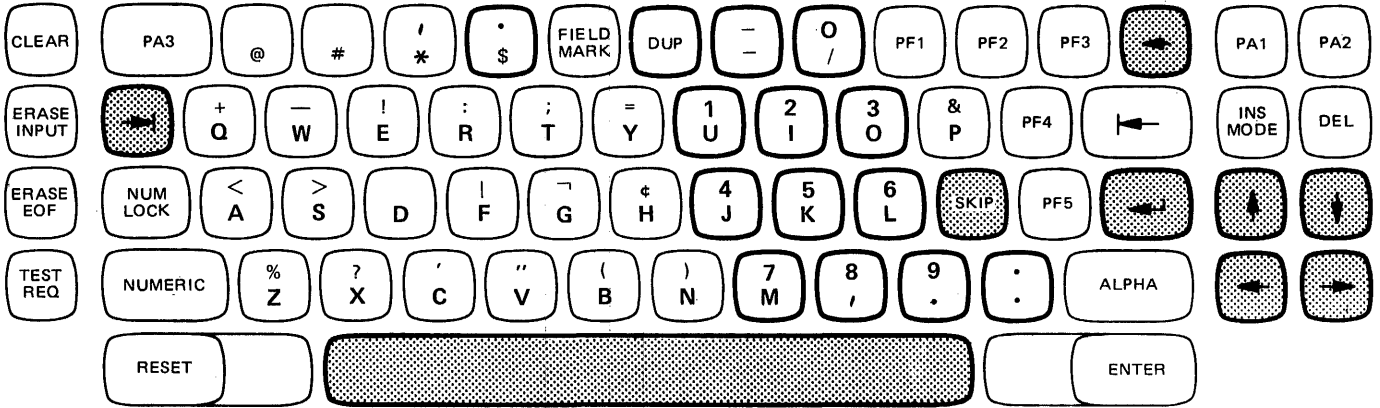
For an explanation of terminology in this summary, refer to Figures 19, 25, 26, 27, and 28, which show display screen keyboard layouts for the System/370 Model 158 Display Console, the 3066 keyboard, and the 3277 keyboard.



| Figure 25. The 3066 Keyboard



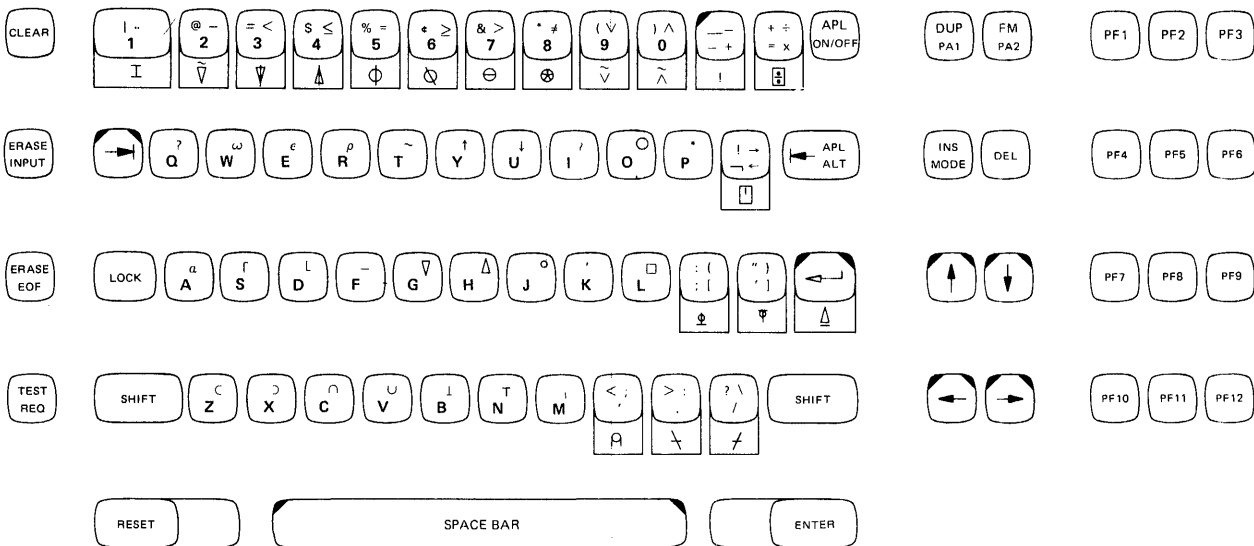
| Figure 26. The 3277 Operator Console Keyboard



LEGEND:

Shaded keys are Typamatic

Figure 27. The 3277 Data Entry Keyboard



LEGEND:

TYPAMATIC WHEN THE APL ON/OFF KEY IS OFF

TYPAMATIC WHEN THE APL ON/OFF KEY IS ON

KEY TOP
 KEY FACE

APL KEYS:

APL ON/OFF – Must be on to enter APL characters or the character to the right on double-character keys.
 APL ALT – Press and hold down to enter character on key face or to underscore APL capitals.
 APL on and SHIFT key – Enters APL characters shown on the upper right of key top.

Figure 28. The 3277 Typewriter Keyboard (EBCDIC) with APL

3066 DISPLAY CONSOLE

The ENTER key performs the following actions:

- Signals the control program to accept and process the data that was keyed into the user input area of the display screen. It determines the end of the input line.
- Signals the attention (interruption pending) to the VM/370 control program or to the virtual machine.
- Tells the system to keep the current display image on the screen when the screen is full of data and more data is forthcoming from the system.

The CANCEL key performs the following actions:

- Erases the entire output display area. The user input and the screen status are not erased.
- Releases the current screen image to allow the projection of subsequent images.

| 3270 AND THE IBM SYSTEM/370 MODELS 138, 148
| OR 158 DISPLAY CONSOLE

| The ENTER keys on the 3270 and Models 138,
| 148 or 158 Display Console perform the following functions:

- Signal the control program to accept and process the data that was keyed into the user input area of the display screen. It determines the end of the input line.
- Signal the attention (interruption pending) to the VM/370 control program or to the virtual machine.
- Tell the system to keep the current display image on the screen when the screen is full of data and more data is forthcoming from the system.

| The PA1 key (not on the Model 158) performs the following functions:

- Signals an attention interruption.
- Causes entry into CP mode if pressed while the machine is in running status.
- Signals attention to the virtual machine operating system if pressed while the machine is in CP READ.

The CNCL key performs the following functions:

- Erases the entire output display area. The user input area and the screen status are not erased.
- Releases the current screen image to allow the projection of a subsequent image.

The PA2 key on the 3277 Data Entry keyboard operates the same as the CNCL key unless APL is on. If APL is on, the PA2 key clears the output area and presents an external interruption to the virtual machine. If you press the PA2 key with a VMREAD status, the status changes to RUNNING.

SCREEN DATA HANDLING

In addition to the printable characters, display keyboards have the following features and capabilities:

- Cursor controls
- Attention signaling
- End-of-data entry signaling
- Other screen management controls
- Keyboard lock

Cursor Movement Controls

The cursor is a symbol displayed on the screen that indicates to you the placement of the next input character. The cursor keys control the vertical and horizontal movement of the cursor. The cursor, in VM/370, has only an editing role with the input data residing in the screen's user input area.

Remember that when you are editing a file, the cursor keys do not enter blanks into the input line. False blanks entered in the user input area with the cursor keys disappear when you press the ENTER key and all entered characters are compressed to the left.

Use the SPACE BAR to enter blanks in the user input area.

The cursor keys and their functions are as follows:



This key, a Typamatic key, moves the cursor up and off the screen. The cursor reappears at the bottommost line of the screen and continues

upward until you stop pressing the key.



This key, a Typamatic key, moves the cursor down and off the screen. The cursor reappears at the topmost line of the screen and continues downward until you stop pressing the key.



This key, a Typamatic key, moves the cursor to the left and off the screen. The cursor reappears one line higher at the rightmost edge of the screen and continues moving to the left until you stop pressing the key.



This key, a Typamatic key, moves the cursor to the right and off the screen. The cursor reappears one line lower at the leftmost position of the screen and continues moving until you stop pressing the key.



This key appears only on the 3277 Display Station keyboard. This key moves the cursor to the leftmost position of the other input area line no matter which line the cursor is on when you press the key.



This key appears only on the 3277 Display Station keyboard. It moves the cursor to the leftmost position of the top line of the input area.



This key appears only on the 3277 Display Station keyboard. It moves the cursor to the leftmost position of the top line of the input area.

KEYBOARD CHARACTERS

Figures 25 and 26 illustrate the characters and symbols used by VM/370. You can key in all uppercase alphabetic characters and symbols and lowercase symbols. The system does not show lowercase alphabetic characters, however, on the 3066 screen. Lowercase characters appear as uppercase characters. Lowercase letter display is a standard feature with the System/370 Model 158 Display Console. You can have the 3277 display units equipped with a lowercase display feature by means of RPQ#8K0366.

End-of-data Entry Key Function

The ENTER key generates the End-of-Data-Entry (EOD) signal. VM/370 uses the ENTER key, common to the 3066 and 3277, as a multiple function key. The ENTER key generates the EOD signal and controls the screen.

The ENTER key causes the EOD signal when you press it after entering a line of data into the user input area. VM/370 then accepts and processes the data. This action correlates with the REQUEST and END key actions on the 3210/3215.

The ENTER key controls the screen when the screen is in a MORE... status. Pressing the key when the screen is in a MORE... status, within the one minute timeout period, causes the screen status to change to HOLDING, whereupon, the current image stays on the screen until you indicate otherwise.

If the screen is already in the HOLDING status, pressing the ENTER key causes the screen to enter the MORE... status with the one minute timeout provision.

The CANCEL Keyboard Function

Different keys causes a cancel operation depending of the style of display keyboard. In addition, these keys function similarly but not identically. The keys are labeled CNCL, PA2, CANCEL, and CLEAR. Consult the keyboard layouts for the location of these keys. The CANCEL, PA2, and the CNCL keys, clear the entire screen of the current image except for the user input and screen status areas. The CLEAR key not only clears the existing output display area but it also clears the user input and screen status areas. The screen status area information, however, reappears almost immediately. The data in the user input area is gone and you must reenter it if you want it.

Other 3270 Terminal Keys and Their Functions

In addition to cursor controls, and attention and data entry keys, the 3270, 3138, and the 3148 consoles have the following keys:

Key Usage
INS MODE If you press this key, the INSERT MODE indicator lights up at the right edge of the screen. Now, pressing character keys on the keyboard inserts those characters into the line of data, displayed in the user input area, in the position indicated by the cursor. Any characters to the right of the cursor move to the right to allow room for new characters. Press the RESET key to leave INSERT MODE.

DEL If you press this key, the character located above the cursor, in the user input area, disappears and the data line is compressed to remove the resulting blank.

ERASE INPUT This key erases the entire user input area.

ERASE EOF This key erases that part of the line in the user input area that appears after the cursor, including the character above the cursor.

PF1 through PF12 These keys have either command or data capability by using the CP SET PFnn command. See "Command Execution Using the 3270 Program Function (PF) Keys" below.

PA1 This key posts an attention interruption pending to the CP command environment. The PA1 Key causes entry into CP mode if it is pressed while the screen indicates running status. If you press the PA1 key while the screen indicates CPREAD, the key signals attention to the virtual operating system. The CP TERMINAL MODE command does not affect the PA1 key, it affects only the ENTER key. The action taken for each status is shown in Figure 29.

Occasionally, on local 3277 display terminals, the PA1 key cannot restore the virtual machine to the CP environment. When this occurs, turn power off on the 3277, then turn it back on and press the PA1 key.

Key Usage
PA2 (APL off) Clears the entire screen except for the user input and screen status area.

PA2 (APL on) Presents an external interruption to the virtual machine and clears the screen.

PA3 This key acts as a PF6 key on those keyboards that have only PF1 to PF5 keys.

TESTREQ This key normally checks to determine if the display terminal works properly. Pressing this key displays data in the user input area in the next output display area line position. CP does not translate or edit the data nor does it pass the data to any virtual machine function or read request.

| Note: The PA2, PA3, and TESTREQ keys are not available on the 3138 or 3148.

State	Action	Status
RUNNING	Enter console function mode	CPREAD
MORE	Clear output area, ATTN return code continues output ²	RUNNING ¹
HOLDING	Same as MORE	RUNNING ¹
CPREAD	"attn" pending, VM run	RUNNING
VMREAD	UE status return, "attn" return code	RUNNING ¹

¹The immediate status shown is RUNNING. However, the ATTN return code may eventually place the terminal in a CPREAD status.
²The ATTN return code may cause the next output line to be deleted.

| Figure 29. PA1 Action and Status Table

USING THE 3277 WITH VS APL

Log on to VM/370 in the normal way. To use VS APL, initial program load CMS and then invoke the VS APL machine via the command name specified in the APL program product documentation. This command invokes the

VSAPL-CMS interface program. Press your APL ON/OFF key, which changes the keyboard to APL character input mode. Then press the ENTER key to notify VS APL that processing may continue. The display screen is always able to display APL or EBCDIC characters. The APL ON/OFF key does not affect this displaying ability. The TERMINAL APL ON command is automatically invoked by the APL EXEC program. The VS APL program itself is then invoked and the VSAPL ready message appears on the screen to tell you that APL is ready to be used.

Error Situations

If you do not have the 3270 Data Analysis-APL Feature installed on your 3270 and you invoked APL, the VS APL program is called in and the TERMINAL APL ON command is invoked but you are not able to communicate with VS APL, and APL characters written to the terminal appear garbled on the screen.

If you have the Data Analysis-APL Feature installed, but manually invoke APL and do not use the TERMINAL APL ON command or at some time in the VS APL program, invoke TERMINAL APL OFF, the VS APL program is activated but you are not able to communicate with VS APL.

If you want to select one of the compound overstrike characters, you must depress and hold the APL ALT key while also pressing the key that indicates the specific character you want. These characters are shown on the front face of the indicated keys on the keyboard in Figure 28. If you have set the APL ON/OFF key to ON, the APL ALT key functions in normal 3270 mode.

Note: VS APL characters may be printed on either the 3284 or 3286 printers.

Leaving the APL Environment

You return to the normal 3270 environment by invoking the APL command)OFF HOLD or)OFF to log off VM/370. The)OFF HOLD command returns to the VSAPL program mentioned before; the program then issues the TERMINAL APL OFF command, prompts you to press the APL ON/OFF key, which returns the keyboard to normal 3270 mode, and then returns to CMS.

Using DISCONNECT While in APL

If you disconnect your 3270 terminal while you are using APL:

- You must log on again using a 3270 terminal only.
- You must issue the TERMINAL APL ON command again.
- CP does not reset the PA2 flag that determines whether or not CP should reflect an external interruption to the virtual machine.

Note: The APL ON/OFF key is a key, not a switch. Each time you press the key, the hardware switches to the other mode. If you want to know what mode the keyboard is in (that is, the setting of the APL ON/OFF key), you can press a key that displays an APL character in APL ON mode, and a non-APL character in APL OFF mode. The character (APL or non-APL) that gets displayed on the screen shows you what keyboard mode the keyboard is in.

| THE 3270 TEXT FEATURE

| After you log on to VM/370 on a 3270 equipped with the 3270 Text feature, issue the following CP command:

| TERMINAL TEXT ON

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

| If you issue the TERMINAL TEXT ON command on a 3270 that does not have the necessary Text features installed, you are not able to enter, display, or print the Text characters.

| If you issue the TERMINAL TEXT ON command on a 3270 that is not equipped with the necessary 3270 Text features, enter CP READ status and issue the TERMINAL TEXT OFF command in capital letters only. The terminal is now ready for nontext processing use.

| ENTERING THE TEXT CHARACTERS

| To enter 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. See Figure
| 20 to locate the position of these three
| keys.

| SHIFT Key

| Use the normal SHIFT key, (in alternate or
| normal mode) to enter, in uppercase or
| lowercase, the characters engraved in the
| center of keytops that have one or two
| characters. These characters are:

| A through Z and , . ; :

| Use the normal SHIFT key (in uppercase)
| to enter characters engraved on the upper
| left of the keytops that have multiple
| characters. The ALT ON OFF key must be off
| to obtain these characters.

| Use the normal SHIFT key (in lowercase)
| to enter characters engraved on the lower
| left of the keytops that have multiple
| characters. The ALT ON OFF key must be off
| to obtain these characters.

| ALTERNATE ON/OFF Key

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

| Note: The ALT ON OFF key does not affect
| the following characters, which are
| engraved in the center of the keytops:

| A through Z , . ; :

| These characters can be obtained in
| uppercase or lowercase with normal SHIFT
| key operation, regardless of the setting of
| the ALT ON OFF key.

| If you have previously issued the
| TERMINAL TEXT ON command, the display
| screen is able to display all the special
| text characters, regardless of the setting
| of the ALT ON OFF key. If you set TERMINAL
| TEXT OFF, you are not able to enter,
| display, or print the Text characters even
| if the keyboard is in alternate mode.

| CODE Key

| Use the CODE key to enter characters
| engraved on the front face of the keys.
| The CODE key must be held down to enter
| these characters. When you release the
| CODE key, the keyboard resumes the original
| status (uppercase or lowercase, alternate
| or normal mode) that it had before you
| pressed the CODE key.

| LEAVING TEXT PROCESSING MODE

| You can leave text mode by issuing 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 the ALT ON OFF key once
| to switch into normal keyboard mode.

| RECONNECTING YOUR TEXT TERMINAL

| If you disconnect your 3270 terminal, text
| mode is forced off when you log on again.
| You must issue the CP command, TERMINAL
| TEXT ON, before continuing with your text
| processing.

| 3704/3705 CONSIDERATIONS

| VM/370 supports 3270 terminals equipped
| with the Text feature connected to
| 3704/3705 communications controllers in EP
| (Emulation Program) mode or in PEP
| (Partitioned Emulation Program) mode only.

| SPECIAL CONSIDERATIONS FOR USING DISPLAY | TERMINALS

KEYBOARD LOCK FEATURE

The keyboard lock (not the uppercase lock
key) on display terminals differs from a
similar feature found on some typewriter
terminals. On typewriter terminals, when
the lock operates you cannot press the
keyboard keys. In a display keyboard
exhibiting the same lock condition, you can
press the keys but they have no effect.

The display terminal is a buffered device whereas the typewriter terminal is not. Consequently, you can key data into the user input area while simultaneously the system inserts data into the output display area. Therefore, the need to lock the keyboard is far less frequent on display terminals than on typewriter style terminals.

- Situation 1--The system writes one or more lines of data in the output display area, while simultaneously, you enter data into the user input area. At the completion of the input line, you press the ENTER key and the line of data or command transfers from the user input area as console input to the virtual system, assuming the system honors the interruption. This data also appears in the output area of the screen. Note that the keyboard is not locked.
- Situation 2--This situation shows the usage of the keyboard lock on the display terminal. You have just issued a string of commands that your virtual machine is to execute. You immediately key in additional commands for the virtual machine to execute. If the system does not accept the first buffer (the first string of commands), then the system does not accept the second buffer (the data in the input display area) and the keyboard locks for three seconds and the message NOT ACCEPTED flashes on the screen. The data in the input area of the screen remains. You need only to wait a few seconds, then press the ENTER key again. The process can continue in this manner until the system accepts the input area data.

EDITING A FILE - LOCAL OR REMOTE 3270

When you issue the EDIT command to start an editing session with a file, the CMS Editor recognizes and then forces a 3270 remote display station to operate like a typewriter terminal.

As a typewriter terminal, the full screen display of data, identification, and message areas does not appear as it does on local 3270s. Instead, the screen display appears as a typewriter terminal sheet would appear. That is, the editor subcommands that you have entered in the user input area appear on the next available line of the screen above the current line after you press the ENTER key. The screen display in this case, contains a historical record of all the editing that you have done.

This mode of operation continues through the editing session, unless you issue the editor's FORMAT subcommand. The FORMAT subcommand changes the mode of operation of any 3270 display station, local or remote.

Specifying the NODISP option in the EDIT command forces the display terminal to operate like a typewriter terminal for the duration of the terminal editing session.

A 3270 remote terminal, having been switched to full screen display mode of operation (display mode) is forced to typewriter mode of operation (line mode) when you enter input mode. When the terminal leaves input mode, the editor resumes with the mode of operation (display or line mode) in effect before the terminal entered input mode.

The Editor FORMAT Subcommand

Use the editor's FORMAT subcommand to switch back and forth between full screen display (display) and single-line (line) mode of operation for 3270 display terminals.

The format of the FORMAT subcommand is:

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ FORMat | { DISPLAY } |                                                                 │
│         | { LINE }   |                                                                 │
└───────────────────────────────────────────────────────────────────────────────────┘

```

where:

DISPLAY specifies that a full screen display of data, identification, and message areas occurs.

LINE specifies that the display appears as a typewriter terminal output sheet appears. Only typewriter commands and functions are operative. That is, when in line mode, screen-oriented subcommands such as SCROLL, or subcommands that have special display functions such as CHANGE and OVERLAY do not operate. However, the PFnn TAB function is operative.

One line at a time is displayed on the screen, including subcommands that are entered into the user input area and executed.

You can use the FORMAT subcommand on any 3270 Display Station, local or remote. This gives you control over the type of display you see and the response time that you experience. The line mode of operation may

be faster if many terminal users on the same bisync line are using the system at the same time.

A remote 3270 terminal user, having switched to display mode, is forced to line mode when he enters the editor input mode. Display mode returns when he leaves input mode.

COMMAND EXECUTION USING THE 3270, 3138 OR 3148 PROGRAM FUNCTION (PF) KEYS

By using the CP SET PFnn command, you can assign VM/370 commands or data to the PF keys on the 3270 display terminal and the 3138 and 3148 display consoles. Then, when you wish to execute the desired command, press the PF key to which you have assigned that command.

The format of the SET PFnn command is:

```
SET PFnn [IMMed ] pfddata1#pfddata2#...
         [DElayed] pfdatan
```

where:

PFnn specifies one of the numbered PF keys by substituting the number of the key you want to use in place of nn. Valid numbers are 1 (or 01) through 12.

IMMED IMMEDIATE specifies that the assigned function of the key executes immediately when you press the key. **DELAYED** specifies that the assigned function appears in the user input area of the 3270 screen before execution occurs. To execute the command, you must press the ENTER key. This allows you to inspect the function before executing it. If you do not specify IMMEDIATE or DELAYED, DELAYED becomes the default.

pfddata1#pfddata2#...pfdatan specifies the data that you want to enter or the commands that you want to execute. If you want to enter more than one command or data line, you must separate the data or commands with the logical linend symbol, here shown as the pound sign (#). You can redefine it as another seldom-used character. If you specified no command or data lines, the SET PFnn command is a null command and, therefore, pressing that PF key causes no action to occur.

Note: The SET PFnn command cannot be nested within another SET PFnn command.

Using the SET PFnn Command in CMS Mode

While in CMS mode, if you want to assign functions to the PF keys, type in:

```
SET LINEDIT OFF
```

before you use the following formats:

```
SET PFnn IMMED pfddata1#pfddata2#...
               ..pfdatan
```

or

```
CP SET PFnn IMMED pfddata1#pfddata2#...
                  ..pfdatan
```

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

```
SET LINEDIT ON
```

Or, you can use the following formats without using SET LINEDIT OFF:

```
#CP SET PFnn IMMED pfddata1#pfddata2#...
                    pfdatan
```

or

```
CP SET PFn IMMED pfddata1"#pfddata2"#...
                  pfdatan
```

or

```
SET PFnn IMMED pfddata1"#PFdata2"#...
                pfdatan
```

Note: While setting the PFnn key in CP mode, the logical line end character (#) is considered a data character when CP finds it in the operand line of the CP SET PFnn command.

PF Key Set Up Example -- File Editing

Figure 30 shows how the PF keys can be set up to make file editing easier and faster. The PF keys are set to some commonly used EDIT subcommands.

An example of setting one of the PF keys to perform one of the EDIT subcommand follows:

```
#CP SET PF02 IMMED UP 5
```

Pressing the PF02 key immediately causes the current line pointer on the screen to move 5 lines toward the top of the file that is displayed on the screen.

PF1 SCROLLUP	PF2 UP 5 (BACKWARD 5)	PF3 UP 1 (BACKWARD 1)
PF4 SCROLL *	PF 5 NEXT 5 (FORWARD 5)	PF 6 NEXT 1 (FORWARD 1)
PF7 SAVE	PF8 CMS	PF9 RETURN
PF10 CP TAB 10 16 31 36 72 80	PF11 TYPE	PF12 INPUT

Figure 30. PF Keys Set Up for Editing a File

For more information about the EDIT subcommands shown in Figure 30, see the VM/370: CMS User's Guide.

You may have use for multiple PF key formats. One way that you can dynamically change formats is to assign one of the PF keys the name of an EXEC procedure that redefines some of the PF keys. To find out how you can use VM/370 EXEC procedures to do this, see the VM/370: CMS User's Guide.

PF Key Inspection

Use the CP QUERY PFnn command to find out what values you have assigned to your PF keys. The format of this command is:

CP QUERY PFnn

where:

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 the program function keys.

The following display occurs on the screen when you issue the CP QUERY PF command line, if your PF keys are defined as shown in Figure 30:

```
PF01 IMMED SCROLLUP
PF02 IMMED UP 5
PF03 IMMED UP 1
PF04 IMMED SCROLL *
PF05 IMMED NEXT 5
PF06 IMMED NEXT 1
PF07 IMMED SAVE
PF08 IMMED CMS
PF09 IMMED RETURN
PF10 IMMED CP TAB 10 16 31 36 72 80
PF11 IMMED TYPE
PF12 IMMED INPUT
```

PF KEY COPY FUNCTION

If you are using a 3270 display terminal, you can copy the full screen display currently appearing on the screen. The SET PFnn COPY command allows you to assign a copy function to a specified PF key. Pressing the PF key copies the current display on the screen by printing the display on a 3284, 3286, and 3288 printer.

If you are using a remotely connected 3270, the printer must be attached to the same control unit as the display station.

If you are using a locally connected 3270, a copy of the screen can be printed on any 3284, 3286, or 3288 printer.

The COPY function cannot be used to copy a 3138 or 3148 display screen on the 3286 console printer even if it is attached on the System/370 Models 138 or 148.

Figure 31 shows, for remotely connected 3270s, what could appear on the printer sheet. The user identification in Figure 31 is an identifying name that you can give the sheet if more than one remote terminal is using the printer. To enter this user identification, type the user identification into the user input area just before you press PF key that you have set to execute the COPY function.


```

DEFINE STORAGE 16384K
STORAGE = 16384K
ipl 190
CMS VERSION 2.2 03/30/75 01:20
...
...
...
user identification

RUNNING (status)

```

Figure 31. PFnn COPY Command Printout for Remote Terminals

Figure 32 shows, for locally connected 3270s, what could appear on the printer sheet.

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

```
SET PF11 yourname...dept no.
```

Press this PF key just before you press the PF key that you have set to execute the COPY function.

For locally attached 3270s, screen status cannot be printed.

```

DEFINE STORAGE 16384K
STORAGE = 16384K
ipl 190
CMS VERSION 2.2 03/30/75 01:20
...
...
...
user identification

```

Figure 32. PFnn COPY Command Printout for Local Terminals

The SET PFnn COPY Command

Use the SET PFnn COPY command to print the current screen display on your 3284, 3286, and 3288 printer that is attached to the same control unit as the display station.

The format of the command is:

```

SET PFnn COPY [resid]
                [cuu]

```

where:

nn is the PF key number. Numbers 1 (or 01) to 12 are valid.

COPY specifies that an exact copy of the current screen display prints on the printer when you press the associated PF key.

resid is the optional resource identification number of three hexadecimal characters of the printer on the same control unit as your display terminal.

cuu is the real channel and device address of the 3284, 3286, or 3288 printer on which you want the screen copy to print (for local 3270s only).

If you do not specify resid or cuu, the printer with the lowest resid on the same control unit as the display station prints a copy of the screen display. The printer is not selected if it is offline or dedicated.

The 3275 Display Station has only one printer. Therefore, resid is not needed. The 3275 cannot be locally connected. Refer to the VM/370: Planning and System Generation Guide for more detailed information about resid.

Note: If the COPY command is invalid or the printer is not available or busy or, in the case of remotely connected 3270s, not attached to the same control unit as your display terminal, a NOT ACCEPTED message appears in the screen status area. The request to copy the screen is not put in a queue. When the printer becomes free, you should press the PF key again.

Examples:

SET PF03 COPY 004

This command sets PF key 03 to copy the screen data on the printer with the resource identification number of 004.

SET PF12 COPY

This command sets PF key 12 to copy the screen data on the printer with the lowest resid (if remote or cuu) on the same control unit as the display station.

SET PF10 COPY 109

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

TAB KEY USAGE

The following sections describe the procedures for using the tab function on display terminals when typing input for CMS files.

When you perform the tab function on a 3066 or a 3270 display terminal, the CMS Editor uses the character generated (X'05') to determine how many character spaces to leave on output. The number of spaces to be generated for each tab character is dependent on the tab settings specified by the EDIT TABSET subcommand. If no TABSET subcommand is issued, the default tab settings are in effect. These default settings are listed in Section 4.

You must also be aware that, on display terminals, the line width is 80 characters, and therefore records or default tab settings that extend beyond column 79 (for example, into column 120) cause a record to be split into two lines on the screen. This results in confusing graphic displays.

Logical Tabbing with the 3066

No tab facilities exist for the 3066 display terminal. When you enter data after a tab simulation operation on the keyboard, you cannot see immediately the proper displacement of the input data in the record. A simulated tab occurs when you specify that a seldom-used special character is to be translated into a tab character. The example below shows how to simulate the tab operation on a 3066.

1. Use the EDIT TABSET subcommand if it is necessary to set tab stops (skip this step if the filetype is a CMS reserved filetype.)

tabs 21 41 61 81 101 121

2. With the CMS SET command, designate an infrequently-used character such as the question mark (?) as a logical tab key (the hexadecimal representation of the tab character is 05).

set input ? 05

Key in the following two lines, each followed by pressing the ENTER key.

Columns

01	20	80
AA?BBB?CC?DD?EE?FF?GG		(screen
AA?BB?CC?DDDD?EE?FF?GG		input
		area)

The above represents the way the data is entered and is displayed in the user input area. It is difficult to relate this input data to the data appearing in the screen's output display area, as illustrated below. Because the screen's line length is only 80 characters, part of the record is on the next line.

Columns

01	21	41	61	79	

81	101	121			

AA	BBB	CC	DD		
EE	FF	GG			(screen's output
					display area)
AA	BB	CC	DDDD		
E	FF	GG			

If each of the fields contain information that is not self-describing, it is difficult to differentiate between the different fields.

Logical Tabbing Using the 3270 Program Function (PF) Keys

The 3270 keyboard does not contain a tab key usable by VM/370; but CP allows you to assign the logical tab function to any program function key.

The following example shows tab operations using the 3270.

1. While in CP mode, enter the SET PFnn command using the following format:

```
SET PFnn TAB n1 n2 ... nn
```

where:

SET PFnn TAB Sets up a special 3270 logical tab function.

nn is any valid program function key number (numbers 1 to 12 are valid); 10 is the preferred PF value because the associated key is convenient to use. This number must immediately follow "PF" with no intervening blanks.

n1 n2 ... nn enter the desired tab stop columns. One or more blanks must separate each of these values.

These logical tab stops are established for the designated program function key as soon as you press the ENTER key.

For example:

```
set pf10 tab 7 10 AB 20 15 25 30 80
```

Note the sequence and the values in the above example. CP's command processor takes these values and puts them into ascending sequence while discarding invalid operands such as the "AB" shown above.

2. Use the TABSET subcommand of EDIT to set up the internal tab settings:

```
tabs 15 30 45 70
```

3. Enter data into the file, using the designated PF key in place of the TAB key:

```
1 (pf) 2 (pf) 3 (pf) 4 (pf)
```

Pressing the program function key causes CP to position the cursor on the screen at the next logical tab stop column. In storage, however, CP does not expand and pad the record with the appropriate number

of blanks but inserts a hex 05 in the data stream.

When you press the ENTER key, the data entered on the 3270 expands to produce a replica of the input line in the output display area and the ccnsol spool file (if it is invoked).

One distinct advantage of the 3270 tabbing process is that you can use different PF keys to establish different sets of logical tab stop assignments for different kinds of records.

3270--PROTECTED FIELDS AND ATTRIBUTE BYTES

You cannot alter the output display area of 3270 display units with cursor controls or data entry characters. The only unprotected data area of the 3270 screen is the user input area. This area is defined as the area between the attribute byte in column 79 of line 21 and the attribute byte that exists in column 60 of line 23. If you attempt to insert data outside this prescribed area, the input inhibit indicator that is to the right of the screen appears and the keyboard electrically locks; that is, you can press the keys but nothing happens. Proper input continues only after you press the RESET key to restore the display unit to its former condition.

Note: The position of the 3270 input area attribute byte differs when you invoke the display standalone service routines. (used during system generation). For more information on this see "3270 Display Operations in a Standalone Service Routines Environment."

3270 DISPLAY OPERATIONS IN A STANDALONE SERVICE ROUTINE ENVIRONMENT

In conjunction with VM/370 system generation and modification, VM/370 standalone service routines cause the 3270 to perform in a different manner than that previously described.

The standalone service routines do not provide all the screen control functions that an operating VM/370 system provides. Instead, a simpler multiline wraparound scheme is used. The output display, user input, and screen status areas are the same as described previously; but the HOLDING

and MORE functions are not present. Additionally the attribute byte associated with the user input area is in the left-most position of line 22.

A simple monitor for screen control in each service routine displays the next output data at the next logical line position on the screen. When the screen becomes full, the output immediately wraps around without pausing, so that the next line appears starting at line position 0 and subsequent lines successively overlay the previous data lines. Subsequent lines

continue down the screen in a similar fashion.

Data keyed into the user input area and presented to VM/370 via the ENTER key leaves the input area and reappears in the output display area in the same fashion as described previously. No virtual console spooling support exists for the 3270 console when the service routines are run standalone on a real system; however, if the service routines run under VM/370 using a simulated 3210/3215 console, the service routines provide console spooling.

Section 4. General Procedures for All VM/370 Terminals

LOGICAL LINE EDITING CHARACTER USAGE

The following paragraphs describe the default VM/370 logical line editing characters. In summary, they are:

Character	Function
@	Logical Character Delete
#	Logical Line End
⌘	Logical Line Delete
"	Logical Escape

If your system hardware configuration supports terminals whose keyboards do not contain some of these characters (such as the Teletype Models 33 or 35, or certain 3767 keyboards) you can define some other infrequently used keyboard characters to perform these functions. To establish different default values, appropriate entries can be made in the VM/370 user directory. Directory changes should be made only if you always use the same terminal. You can also redefine characters by using the CP TERMINAL command. See the VM/370: CP Command Reference for General Users for details.

The logical character delete symbol (@) allows you to delete one or more of the previous characters entered (one character per @ entered, including the ⌘ and # special characters), in the event you discover a minor typing error. For example:

```
abc#@@ results in ab
abc@d results in abd
⌘@def results in def
abc@@@ deletes the whole line
```

The logical line end symbol (#) allows you to key in multiple commands on the same line to minimize wait time between commands. Insert the # at the end of each logical command line. For example:

```
down 1#type 1#top
```

is the same as entering the following sequence of CMS Editor subcommands:

```
down 1
type 1
top
```

The logical line delete symbol (⌘) deletes the entire previous logical line back to and including the previous logical line end symbol (#). For example:

<u>Keyed data</u>	<u>System accepted data</u>
abc	abc
abc#def⌘	abc
abc#def#⌘	abc#def
abc#def#⌘ghi	abc#defghi

Use the logical line delete symbol in cases where you made multiple line entry errors, or when you desire line alteration.

The logical escape symbol (") causes VM/370 to interpret the next character as a data character, even if it is one of the special logical line editing characters (@, ⌘, ", or #). For example:

```
abc"⌘d results in abc⌘d
""abc"" results in "abc"
```

The editor ignores a single " if it appears as the last character of a line.

SPOOLING VIRTUAL MACHINE CONSOLE I/O

Complicated program execution can produce abundant output data and messages on your terminal console. If desired, you can spool this data, including CP commands and responses, to a disk device and allow the virtual machine to run with the terminal console disconnected. If you have a display terminal, for a printed record of your virtual machine activity (whether connected or disconnected), you must invoke console spooling. For more details see VM/370: CP Command Reference for General Users, and the VM/370: Operator's Guide.

TAB SETTINGS AND THEIR DEFAULT VALUES

The editor automatically adjusts input entered under the following CMS recognized filetypes to appear in the proper column if you use the physical (or simulated) tab key. The physical or hardware logic set (3767) tab settings on your terminal do not have to be in the same relative position as the internal tab settings. Below is a list of CMS accepted filetypes and their default settings.

<u>Filetypes</u>	<u>Default Tab Settings</u>
ASSEMBLE, MACRO, UPDATE, UPDTxxxx, ASM3705	1, 10, 16, 31, 36, 41, 46, 69, 72, 80
FORTTRAN	1, 7, 10, 15, 20, 25, 30, 80
FREEFORT	9, 15, 18, 23, 28, 33, 38, 81
BASIC, VSBASIC	7, 10, 15, 20, 25, 30, 80
PLIOPT, PLI	2, 4, 7, 10, 13, 16, 19, 22, 25, 31, 37, 43, 49, 55, 79, 80
COBOL	1, 8, 12, 20, 28, 36, 44, 68, 72, 80
Others	1, 6, 11, 16, 21, 26, 31, 36, 41, 46, 51, 61, 71, 81, 91, 101, 111, 121, 131

To change the tab settings, refer to the discussion of the TABSET subcommand of the EDIT command, described in the VM/370: CMS User's Guide. SCRIPT¹ files can contain SCRIPT control words that control tab settings. For this reason, the EDIT TABSET subcommand has no effect on SCRIPT files.

INDICATION OF JOB EXECUTION - CMS BLIP

As a visual indication of the progress of program execution, CMS signals you with a BLIP character for every two seconds of machine execution time except with the real timer option that reflects system time and wait state time.

On 2741 terminals, the BLIP character occurs as a shift of the print element from lowercase to uppercase and back again.

¹The SCRIPT/370 text processor is an Installed User Program, available from IBM for a license fee.

On display terminals and 3767 terminals, no counterpart to print element shifting exists; therefore, the default BLIP character (hexadecimal 3606) has no effect. You may alter the default BLIP characters of CMS via the SET command to one or more displayable characters. If you set the BLIP character to an unprintable value other than the default value (hex 3606), a null (blank) line displays on the screen. Any BLIP character string sequence occupies one new line of the output display area.

The 3767 terminal user can alter the default BLIP to any graphic character and track virtual machine execution via the Three-Position Alphameric indicator.

VM/370 supports display devices differently from typewriter terminals in that CP does not allow your responses to CP, CMS, or virtual machine messages to be displayed on the same line as the system message. On typewriter terminals, VM/370 or your operating system could type out a message with no carriage return and you could key in your response on the same line. For situations like DOS/VS where BG, F1, F2, F3, or F4, proceeds each partition message your response always displays on the screen (and writes on the console spool file) on the next line.

For the same reason, VM/370 does not allow multiple console writes to the same display line. Therefore, the BLIP characters that could be typed out many times on the same typewriter line always appear on a new line on the display screen.

VM/370 USER LOGOFF PROCEDURES

When you finish using the VM/370 system and wish to end the terminal session, log off from VM/370. If you are not already in the VM/370 control program (CP) environment at the time you wish to log off (that is, you are still using CMS, DOS, OS, or OS/VS¹ in your virtual machine), you can enter the CP environment by issuing the #CP command, or by quickly pressing the ATTN key once or twice (depending on the operational mode of the virtual machine). The keyboard, if previously locked, is unlocked and you then type LOGOFF followed by pressing the ENTER key or its equivalent. The system responds with:

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

and connection to the computer terminates if the terminal is on a switched or dial-up line. The connect time is in hours, minutes, and seconds; the virtual CPU and total CPU times are in minutes, seconds, and hundredths of a second. The logoff procedure then ends, and you may turn terminal power off.

If you want to end the terminal session, but do not want to lose the dial-up connection with the computer (so that another user may logon from the same terminal), you enter:

logoff hold

The keyword HOLD indicates to CP that it should not disconnect the terminal from the VM/370 computer, but should type out the "vm/370 online" message again, as in step 2 of the logon procedure. The next user can then log on to VM/370.

Logoff and Security

When VM/370 is confronted with telecommunication line failures, it places the virtual machine terminal in a DISCONNECT status for 15 minutes. You have 15 minutes to reestablish connection to your virtual machine before a forced logoff occurs.

Now, assume you complete your virtual machine activity and then turn off power on your 3277 terminal (instead of invoking the LOGOFF command) and walk away from the terminal. Logoff does not automatically occur. Also, a disconnected status does not occur because power off does not generate a line failure condition on the 3277. Anyone can turn on the terminal and have full access to your virtual machine. You are accountable for this security violation, as well as for the additional virtual machine time accrued. In the interest of good system security and accounting procedures, follow prescribed logoff procedures.

GAINING ACCESS TO A MULTIPLE ACCESS SYSTEM

This section describes the procedures that you can perform to access a system which provides multiple terminal support, such as APL/360-DOS, RAX, ITF, CPS, or VM/370 operating in a specific virtual machine. Two methods can connect your terminal to a previously logged on multiple-access system:

- Attach the terminal as a dedicated device to the multiple-access system virtual machine. In this way, the terminal is totally under control of the virtual machine and, while it remains attached, cannot log on to VM/370. This method is a means of using terminal devices that are supported by the multiple-access system but are unsupported by CP as virtual operator consoles.
- Use the CP DIAL command to logically connect your terminal to a previously logged on multiple-access system. The remainder of this section refers to this second method.

Note: You can use the CP DIAL command with terminals on leased lines, switched lines, and locally connected terminals such as the 3270. It is not limited to dial-up terminals. Any terminal supported by VM/370 can issue the CP DIAL command. However, restrictions exist for the use of the CP DIAL command with terminals connected to 3704/3705 lines. VM/370 does not support the DIAL command for 3704/3705 lines in NCP mode; it is supported for lines in emulator mode. If you issue the DIAL command for a line that can be varied between emulator and NCP mode, and if that line is currently in NCP mode, CP automatically varies the line to emulator mode.

The multiple-access system to be accessed must already be logged into a VM/370 virtual machine. Whether or not the multiple-access system allows your terminal to access it is a function of the types and maximum number of terminals supported by that particular multiple-access system, just as in a "standalone" teleprocessing system. For leased or switched line facilities at least one input hub must be available on the 2701, 2702, 2703, 3704, or 3705 transmission control units, the ENABLE or NETWORK ENABLE command must have activated a communications line before the connection can be made. The same rules apply to the 3272 control unit and the related 3277 display units. When the connection occurs, the terminal is under control of the system designated by the DIAL command; consequently, you cannot communicate with VM/370, and you are not known to VM/370 as a regular logged-on user, but as a user logically connected to the multiple-access system for the duration of the terminal session.

When you finish using the multiple-access system, you should log off the system in the manner required by that multiple-access system. When the multiple-access system issues a DISABLE command for the line, the terminal becomes

available for another user to log on VM/370 or to dial the same or some other multiple-access system that may be running in a virtual machine.

MULTIPLE-ACCESS SYSTEM LOGON

Use the following procedure to log on to a multiple-access system:

- 1. Specify the multiple-access system to which you wish to gain access by entering

dial userid [vaddr]

where "userid" is the name of the multiple-access system and vaddr is the virtual address of the device that the multiple-access system supports.

- 2. If the DIAL command is successful, VM/370 responds with the following message:

DIALED TO userid vaddr

This indicates that VM/370 made a connection between the terminal and the multiple-access system, and that the terminal is now completely under control of that system. Further responses are those of the multiple-access system.

Error Messages from DIAL

DMKDIA055E LINE(S) NOT AVAILABLE ON userid

No 3704, 3705, 2701, 2702, or 2703 lines, nor 3270s are available on the system. The lines or resource facilities may not be available if the virtual lines are not enabled by the multiple-access system, or if all available lines are in use.

DMKDIA045E userid NOT LOGGED ON

The system being dialed is not currently logged on as a VM/370 virtual machine.

DISCONNECTING THE TERMINAL

The terminal remains connected to the multiple-access system until one of the following events occurs in the multiple-access system itself:

- The line is disabled for that terminal. This occurs by logging off the multiple-access system in the manner prescribed by that system.
- The multiple-access system logs off VM/370.
- The multiple-access system issues the CP DETACH console function specifying this terminal address.
- In unusual situations you can be forced off the multiple-access system by the VM/370 system operator.
- If the DIAL command was issued from a 3277, the virtual system must use the CP RESET command to drop the connection.

The following message occurs at the terminal before the terminal disconnects from the multiple-access system.

LINE raddr DROP FROM userid vaddr

The terminal can now log on to VM/370, or be logically connected to some other multi-access virtual machine.

APL CONSIDERATIONS

In addition to the restrictions imposed by the various CP command privilege classes, the limitations of the terminal and the communication controller it attaches to influences your virtual machine operation. One such example is:

TERMINAL APL ON

--or--

TERMINAL APL OFF

If your terminal connects to a 3704/3705 transmission control unit, VM/370 supports the APL operand of the CP TERMINAL command:

- For the Emulation Program (EP).
- For only those lines currently in emulation mode, for the Partitioned Emulation Program (PEP).
- Only if the related virtual machine console terminal is equipped with features that support APL operations.

Note: VM/370 does not support the APL operand of the CP TERMINAL command, if your terminal connects to a 3704/3705 in Network Control Program (NCP) mode.

Appendix A: Sample Terminal Session

The following example is a sample terminal session, using the IBM 2741 on a leased line.

Note: The example is illustrative only, and does not necessarily show the best way to achieve a particular result. It is typical, but is not necessarily an exact example of system use; it has not been formally tested by IBM. You may, therefore, observe certain minor differences between this description and the printout you obtain if you enter the same commands and data yourself.

Descriptions of operations appear in the following format:

entry or COMPUTER RESPONSE

Description or Explanation

For clarity, your entries appear in lowercase, and computer responses appear in uppercase.

The operations illustrated are:

- Logging on
- Querying the virtual machine
- IPL of CMS
- Creation of a FORTRAN program
- Compilation of the program (with compilation errors)
- Using the CMS Editor to correct the first error
- Recompilation (with a second error)
- Using the EDIT facility to correct the second error
- Recompilation of the program

- Successful execution
- Logging off

You turn on your terminal:

vm/370 online xxxxxx xxxxxx

If this was a "correspondence" 2741, the "vm/370 online" message would appear on the right (and the left-hand side would be meaningless information).

logon progra

You specify the identification "progra" when logging on.

ENTER PASSWORD:

The protected password does not print when entered on a 2741 terminal equipped with the Print Inhibit feature.

LOGMSG 16:30:20 EST WEDNESDAY 01/03/74
* VM/370 IS UP 24 HOURS A DAY
* QUERY LOG FOR ADDITIONAL INFORMATION
LOGON AT 16:30:31 EST WEDNESDAY 01/03/74

The VM/370 logon message prints. The CP environment is entered upon completion of the logon procedure.

query virtual

This command asks CP to query the virtual machine, and type a list of the virtual I/O devices and storage assigned to your virtual machine.

STORAGE = 00256K
CONS 009 ON DEV 04F
RDR 00C CLS A
PUN 00D CLS A COPY 01
PRT 00E CLS A COPY 01
DEV OFF PSEUDO TIMER
DASD 130 2314 PDSK3 R/O 045 CYL
DASD 191 3330 PDSK7 R/W 015 CYL
DASD 19A 2314 CMS190 R/O 055 CYL
DASD 19C 2314 CMS190 R/O 030 CYL
DASD 19E 2314 CMS190 R/O 026 CYL
DASD 19F 2314 CMS370 R/O 050 CYL

For a detailed description of user directory entries, refer to the VM/370: Planning and System Generation Guide.

ipl cms

You invoke the Conversational Monitor System (CMS) and its nucleus is loaded into virtual storage.

CMS 01/03/74 WED 16:30:33

Informs you that the CMS command environment is entered. (The content of the message may be different from this one.)

listfile

You request a list of the files located on your primary disk. The first column represents the filename, the second column the filetype, and the third the filemode.

```
INDIAN LISTING A1
DUMPREST ASSEMBLE A1
SUPERSCR ASSEMBLE A1
MY FORTRAN A1
INDIAN TEXT A1
FORTCLG EXEC A1
LOAD MAP A1
FIN MEMO A1
TUES MEMO A1
FRST MEMO A1
AGENDA MEMO A1
INDIAN FORTRAN A1
R; T=0.12/0.33 16:30:43
```

CMS prints the list, followed by the Ready message (R;) indicating that the action requested has finished. "T" indicates the amount of time used and the time the CMS LISTFILE command finished executing. "0.12/0.33" means that 0.12 seconds of virtual CPU time, and 0.33 seconds of real CPU time were used. 16:30:43 is the time that the command finished in hours, minutes, and seconds.

edit main fortran

You use this command to instruct CMS to provide the facilities of the EDIT environment to create a FORTRAN program named MAIN.

NEW FILE:
EDIT:

The editor responds with this message after first checking to see if this file already exists.

input
INPUT:

You type the input subcommand to enter the input mode of the editor and the editor responds by telling you that you are in input mode. The first line of FORTRAN data follows this.

c main program january 3, 1974

At the end of each data line, press the RETURN key. This signals the editor to process that line of data.

>write (6,10)

Note: The greater than character (>) used in this sample terminal session indicates that you pressed the physical TAB key (which normally types out as a blank). On processing the input line, the editor replaces the TAB character with sufficient blank characters so that FORTRAN data starts where it is supposed to, in column 7 of the card image in the file. You then key in the remainder of the FORTRAN program.

```
10>format ('a=')
>read (5,20) a
20>format (8.3)
>write (6,25) a,x
>call exit
>end
```

<-----Operating the RETURN key with no data entered on the line (that is, a null line)

EDIT: The editor responds by telling you that you are in edit mode. At this time, you may inspect, correct, or delete any of the input lines or insert new lines.

file

The file command tells CMS to store the file currently being edited on your primary CMS disk.

R; T=0.22/0.96 16:30:55

The Ready message indicates that the file was stored successfully.

fortgi main

This command tells CMS to compile the FORTRAN program called MAIN.

```
G1 COMPILER ENTERED
MAI0005020  FORMAT (8.3)
                $
```

The FORTRAN G1 compiler detected source errors, and types the error statements.

The compiler indicates a syntax error by the \$.

```
01) IGI013I SYNTAX
IGI022I  UNDEFINED LABEL
      25
```

The compiler also detected an undefined label.

```
SOURCE ANALYZED
PROGRAM NAME = MAIN
* 002 DIAGNOSTICS ENTERED, HIGHEST SEVERITY
  CODE IS 8
R(00008); T=0.93/1.78 16:32:54
```

edit main fortran

To correct the errors in your FORTRAN source statements, you again issue the EDIT command. Because the editor finds an existing file named MAIN FORTRAN, it assumes that you want to edit the existing file, not create a new one.

EDIT:

The editor responds with this message to indicate that you may enter EDIT subcommands. The MAIN FORTRAN file has been placed in the editor's virtual storage area.

type 20

You request that the editor type the first 20 lines of the file at the terminal. If the file

contains less than 20 records, typing stops after the last line of the file.

```
C MAIN PROGRAM JANUARY 3, 1973
```

```
WRITE (6,10)
10  FORMAT ('A=')
   READ (5,20)A
20  FORMAT (8.3)
   WRITE (6,25) A,X
   CALL EXIT
   END
```

EOF:

The FORTRAN program appears different from what was originally entered because the editor replaced the physical tab characters (represented by the > symbol) with sufficient blanks to align all data starting in column 7. The EOF: message indicates the end of file.

locate /format/

LOCATE requests the editor to scan the entire file starting at the first record, to find the first occurrence of the character string "format" in any portion of any line.

```
10  FORMAT ('A=')
```

The editor types out the first line containing "format". This is not the line in error.

locate /format/

Because the previous line was not the desired line, you entered the command again. The editor then finds the next occurrence of the word.

```
20  FORMAT (8.3)
```

The editor types the line containing the word.

change /8/F8/

You change the "8" to "F8", using the CHANGE subcommand. The editor automatically adjusts the remainder of the line and types the modified line.

Note: The editor would have found the line in error the first time if you entered /8.3/ instead of locate /format/. instead of locate /format/.

20 FORMAT (F8.3)

The editor types the corrected line.

up 2

You tell the editor to "back up" 2 lines and type the data line.

10 FORMAT ('A=')

Is the typed record.

change /'A='/'A=?'/

You use the change subcommand to modify your original entry.

10 FORMAT ('A=?')

The changed line types out.

find 20

Tells the editor to go to the line that begins with "20".

20 FORMAT (F8.3)

Is the line that begins with "20".

input >x=a**2

You insert the information after the line beginning with "20." The greater-than sign (>), indicates depression of the physical TAB key.

type

You request the editor to type the current line, which is the last line entered.

X=A**2

Is the information, aligned via the tab character.

top

TOF:

You instruct the editor to go to the top of the file.

type 20

You request that the editor type the corrected file.

```
C MAIN PROGRAM JANUARY 3, 1973
```

```
WRITE (6,10)
10  FORMAT ('A=?')
   READ (5,20) A
20  FORMAT (F8.3)
   X=A**2
   WRITE (6,25) A,X
   CALL EXIT
   END
```

EOF:
file

The "file" command tells the editor to place the file MAIN FORTRAN on your primary disk, and to erase the old MAIN FORTRAN file. If you specified "file newmain" a new FORTRAN file called "NEWMAIN FORTRAN" would have been created, and the old "MAIN" file would still exist.

```
R; T=0.34/1.37 16:33:34
```

The Ready message types, indicating to you that the FILE subcommand completed successfully and that you returned to the CMS command environment. (The time between the FILE subcommand and the Ready message varies depending on the length of the file and the speed of the system in responding to the request.)

fortgi main

You request another compilation of MAIN.

```
G1 COMPILER ENTERED
IGI022I UNDEFINED LABEL
   25
SOURCE ANALYZED
PROGRAM NAME = MAIN
* 001 DIAGNOSTICS ENTERED, HIGHEST SEVERITY
  CODE IS 8
R(00008); T=0.95/2.17 16:35:37
```

The compiler encounters an uncorrected second error.

edit main fortran

You request the ability to edit the MAIN file again.

EDIT:

Indicates to you that you are in edit mode.

locate /25/

You request the first occurrence of "25".

WRITE (6,25) A,X

This line contains the first occurrence.

input 25> format ('a=',f8.3,2x,'x='20.3)

You insert this missing information after the line which contained the first occurrence of 25.

type

You request that the editor type the line just entered.

25 FORMAT ('A=',F8.3,2X,'X='20.3)

Is the line that types.

change /20/,F20/

You see that you made an error and change the entered line.

25 FORMAT ('A=',F8.3,2X,'X=',F20.3)

Is the type out of the corrected line.

file

You store the updated source program on your primary disk. The previous copy is erased.

R; T=0.21/0.79 16:39:37

The Ready message types upon completion of the file request.

fortgi main (list source)

G1 COMPILER ENTERED
SOURCE ANALYZED
PROGRAM NAME = MAIN
* NO DIAGNOSTICS GENERATED

You request another compilation of the FORTRAN file MAIN, an object code listing, and a source listing.

R; T=1.18/2.22 16:41:01

Is the Ready message indicating a successful compilation.

run main

You request that CMS begin executing MAIN, the FORTRAN object program.

FILE 'MAIN EXEC *' NOT FOUND.
FILE 'MAIN MODULE *' NOT FOUND.

CMS informs you that these files could not be found.

EXECUTION BEGINS...

CMS did locate a MAIN TEXT file and begins execution.

A=?
2.5

You enter the value 2.5.

A= 2.500 X= 6.250
R; T=3.19/5.34 16:41:16

The FORTRAN program executes successfully.

logoff hold

The LOGOFF command removes your terminal from the system. The communication line does not disconnect because you typed in "HOLD".

CONNECT=02:50:46 VIRTCPU=000:21:85
TOTCPU=000:54:54
LOGOFF AT 16:41:52 EST WEDNESDAY 01/03/74

The connect time, CPU times, and logoff time appear.

Some other user can now log on to VM/370 at this terminal without first dialing the computer.

Appendix B: Graphic-Hexadecimal Substitution

Graphic	Hex
SPACE	40
¢	4A
	4B
<	4C
(	4D
+	4E
|	4F
&	50
!	5A
\$	5B
*	5C
)	5D
;	5E
¬	5F
-	60
/	61
,	6B
%	6C
—	6D
>	6E
?	6F
:	7A
#	7B
@	7C
'	7D
=	7E
"	7F
a	81
b	82
c	83
d	84
e	85
f	86
g	87
h	88
i	89
j	91
k	92
l	93

Graphic	Hex
m	94
n	95
o	96
p	97
q	98
r	99
s	A2
t	A3
u	A4
v	A5
w	A6
x	A7
y	A8
z	A9
A	C1
B	C2
C	C3
D	C4
E	C5
F	C6
G	C7
H	C8
I	C9
J	D1
K	D2
L	D3
M	D4
N	D5
O	D6
P	D7
Q	D8
R	D9
S	E2
T	E3
U	E4
V	E5
W	E6
X	E7
Y	E8
Z	E9

Graphic	Hex
0	F0
1	F1
2	F2
3	F3
4	F4
5	F5
6	F6
7	F7
8	F8
9	F9

Symbol	Name
¢	Cent
.	Period, Decimal Point
<	Less Than
(	Left Parenthesis
+	Plus
|	Logical OR
&	Ampersand
!	Exclamation Point
\$	Dollar
*	Asterisk
)	Right Parenthesis
;	Semicolon
¬	Logical NOT
-	Minus, Hyphen
/	Slash
,	Comma
%	Percent
>	Greater Than
?	Question Mark
:	Colon
#	Number Sign, Pound Sign
@	At
'	Prime, Apostrophe
=	Equal
"	Quotation Mark

Appendix C: Graphic-Hexadecimal Substitution (APL) For 2741 Use

Graphic	Hex
SP	40
"	41
-	42
≤	43
≥	44
≠	45
√	46
∧	47
÷	48
X	49
.	4B
<	4C
(	4D
+	4E
|	4F
ω	51
ε	52
ρ	53
~	54
↑	55
↓	56
!	57
o	58
←	59
*	5C
)	5D
;	5E
-	60
/	61
→	62
α	63
┌	64
└	65
▽	66
Δ	67
°	68
□	69
[	6A
,	6B
—	6D

Graphic	Hex
>	6E
?	6F
|	70
C	71
⊃	72
∩	73
∪	74
⊥	75
T	76
/	77
:	7A
'	7D
=	7E
A	C1
B	C2
C	C3
D	C4
E	C5
F	C6
G	C7
H	C8
I	C9
J	D1
K	D2
L	D3
M	D4
N	D5
O	D6
P	D7
Q	D8
R	D9
S	E2
T	E3
U	E4
V	E5
W	E6
X	E7
Y	E8
Z	E9
0	F0

Graphic	Hex
1	F1
2	F2
3	F3
4	F4
5	F5
6	F6
7	F7
8	F8
9	F9

Control Symbol	Hex
New Line	15
Back Space	16
Tab	05

Appendix D: Graphic-Hexadecimal Substitution For 3270 APL

Graphic	Hex
┌	1B
┐	1C
└	1E
┘	1F
‘	20
’	21
+	22
-	23
+	2C
—	2D
0	30
1	31
2	32
3	33
4	34
5	35
6	36
7	37
8	38
9	39
T	3B
┌	3D
└	3E
┘	3F

Graphic	Hex
SP	40
<u>A</u>	41
<u>B</u>	42
<u>C</u>	43
<u>D</u>	44
<u>E</u>	45
<u>F</u>	46
<u>G</u>	47
<u>H</u>	48
<u>I</u>	49
¢	4A
·	4B
<	4C
(	4D
+	4E
|	4F
&	50
<u>J</u>	51
<u>K</u>	52
<u>L</u>	53
<u>M</u>	54
<u>N</u>	55
<u>O</u>	56
<u>P</u>	57
<u>Q</u>	58
<u>R</u>	59
!	5A
\$	5B
*	5C
)	5D
;	5E
┘	5F
·	60
/	61
<u>S</u>	62
<u>T</u>	63
<u>U</u>	64
<u>V</u>	65
<u>W</u>	66

Graphic	Hex
<u>X</u>	67
<u>Y</u>	68
<u>Z</u>	69
!	6A
,	6B
%	6C
-	6D
>	6E
?	6F
	70
^	71
..	72
1.	73
2.	74
3.	75
n.	76
•	77
v	78
\	79
:	7A
#	7B
@	7C
!	7D
=	7E
..	7F
~	80
a	81
b	82
c	83
d	84
e	85
f	86
g	87
h	88
i	89
↑	8A
↓	8B
≤	8C
┌	8D

Graphic	Hex
l	8E
→	8F
□	90
j	91
k	92
l	93
m	94
n	95
o	96
p	97
q	98
r	99
∪	9A
∩	9B
∏	9C
○	9D
±	9E
←	9F
-	A0
~	A1
s	A2
t	A3
u	A4
v	A5
w	A6
x	A7
y	A8
z	A9
∩	AA
U	AB
└	AC
┌	AD
≥	AE
o	AF
a	B0
e	B1
¿	B2
ρ	B3
ω	B4

Graphic	Hex
□	B5
X	B6
\	B7
÷	B8
•	B9
∇	BA
Δ	BB
T	BC
]	BD
≠	BE
|	BF
}	C0
A	C1
B	C2
C	C3
D	C4
E	C5
F	C6
G	C7
H	C8
I	C9
^	CA
∇	CB
	CC
Φ	CD
	CE
∅	CF
}	D0
J	D1
K	D2
L	D3
M	D4
N	D5
O	D6
P	D7
Q	D8
R	D9
I	DA
!	DB

Graphic	Hex
∇	DC
Δ	DD
□	DE
∩	DF
	E0
	E1
S	E2
T	E3
U	E4
V	E5
W	E6
X	E7
Y	E8
Z	E9
+	EA
+	EB
	EC
○	ED
⊠	EE
∅	EF
0	F0
1	F1
2	F2
3	F3
4	F4
5	F5
6	F6
7	F7
8	F8
9	F9
	FA
∇	FB
	FC
⊗	FD
⊠	FE
	FF

Appendix E: Graphic – Hexadecimal Substitution For 3270 Text Feature

Graphic	Hex
SP	40
	41
	42
	43
	44
	45
	46
	47
	48
	49
φ	4A
.	4B
<	4C
(	4D
+	4E
|	4F
&	50
₁	51
₂	52
₃	53
	54
	55
	56
	57
	58
↓	59
!	5A
\$	5B
*	5C
)	5D
;	5E
⌋	5F
—	60
/	61
	62
	63
	64
	65
	66

Graphic	Hex
	67
	68
	69
	6A
,	6B
%	6C
—	6D
>	6E
?	6F
η	70
	71
	72
	73
	74
	75
	76
	77
	78
	79
:	7A
#	7B
@	7C
'	7D
=	7E
“	7F
	80
a	81
b	82
c	83
d	84
e	85
f	86
g	87
h	88
i	89
↑	8A
{	8B
≤	8C
(	8D

Graphic	Hex
+	8E
+	8F
□	90
j	91
k	92
l	93
m	94
n	95
o	96
p	97
q	98
r	99
	9A
}	9B
π	9C
)	9D
±	9E
■	9F
—	A0
○	A1
s	A2
t	A3
u	A4
v	A5
w	A6
x	A7
y	A8
z	A9
	AA
⊥	AB
⌈	AC
[	AD
≥	AE
●	AF
°	B0
l	B1
˘	B2
˙	B3
˚	B4

Graphic	Hex
5	B5
6	B6
7	B7
8	B8
9	B9
∇	BA
⌋	BB
⌌	BC
⌍	BD
≠	BE
—	BF
	C0
A	C1
B	C2
C	C3
D	C4
E	C5
F	C6
G	C7
H	C8
I	C9
Δ	CA
⌈	CB
∧	CC
∨	CD
≠	CE
≠	CF
	D0
J	D1
K	D2
L	D3
M	D4
N	D5
O	D6
P	D7
Q	D8
R	D9
⊠	DA
△	DB

Graphic	Hex
∇	DC
⊗	DD
←	DE
→	DF
\	E0
	E1
S	E2
T	E3
U	E4
V	E5
W	E6
X	E7
Y	E8
Z	E9
⊥	EA
⊥	EB
ψ	EC
⊠	ED
⊥	EE
⊥	EF
0	F0
1	F1
2	F2
3	F3
4	F4
5	F5
6	F6
7	F7
8	F8
9	F9
|	FA
L	FB
⊥	FC
⊥	FD
	FE
	FF

Appendix F: Special Attachment Procedures For 3704/3705 Lines

Three attachment procedures are described: the 2741, 1050, and CPT-TWX attachment procedures for terminals on NCP lines with the MTA feature. Once the attachment procedure is completed, the message

vm/370 online

should appear at the terminal. Then continue the logon procedure that was interrupted for this special attachment procedure.

Note: The 3767 is not supported by NCP lines with the MTA feature because of the 300 bits per second line speed.

MTA ATTACHMENT PROCEDURE FOR IBM 2741

1. Dial the telephone number of the MTA line to be used for communicating with the controller.
2. When the keyboard unlocks, enter /".
3. Press the Return key.

If the "vm/370 online" message appears at the terminal, the attachment procedure completed successfully and you may continue with the normal logon procedure. If no message appears at the terminal but the terminal unlocks, press the Return key in an attempt to get the "vm/370 online" message. However, if the type element moves back and forth, the attachment is unsuccessful; you must repeat steps 2 and 3 of the attachment procedure.

MTA ATTACHMENT PROCEDURE FOR IBM 1050

1. Dial the telephone number of the MTA line to be used for communicating with the controller.
2. When the Proceed light comes on, enter /".
3. Press the Return key.
4. Enter EOB.

If the "vm/370 online" message appears at the terminal, the attachment procedure completed successfully and you may continue with the normal logon procedure. If no message appears at the terminal, press the Return key in an attempt to get the "vm/370 online" message. However, if the type element moves back and forth, the attachment is unsuccessful; you must repeat steps 2, 3, and 4 of the attachment procedure.

MTA ATTACHMENT PROCEDURE FOR CPT-TWX TERMINALS

1. Dial the telephone number of the MTA line to be used for communicating with the controller.
2. Press the WRU (Where Are You) key within three seconds after the audible data tone begins.

If the typing mechanism does not "jump" within a few seconds, the attachment procedure completed successfully and you may continue with the normal logon procedure. If the typing mechanism does "jump", the attachment is unsuccessful; press the WRU key again or repeat both steps of the attachment procedure.

Appendix G: IBM 2780 Data Transmission Terminal

The IBM 2780 Data Transmission Terminal (Model 2) is a remote spooling work station. The 2780 Model 2 supports card input, printed output, and punched output.

The 2780 Model 2 can be used as a remote station under the Remote Spooling Communications Subsystem (RSCS). For

information on how to use the 2780 Model 2 as a remote station, see the VM/370: RSCS User's Guide.

For a description of the various switches, lights, and controls, refer to the IBM 2780 Data Transmission Terminal -- Component Description.

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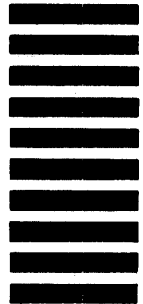
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