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File No. S370/4300-00

Program Product

**IBM Virtual Machine/
System Product
General Information
Manual**

IBM

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Program Number 5664-167

Release 2

IBM

Third Edition (April 1982)

This edition, GC20-1838-2, applies to Release 2 of IBM Virtual Machine/System Product, program number 5664-167, until otherwise indicated in new editions or Technical Newsletters.

This publication is intended for planning purposes only. It will be updated from time to time; however, the reader should remember that the authoritative sources of system information are the system library publications for VM/SP. These publications will first reflect any changes. Changes are continually made to the information contained herein; before using this publication in connection with the operation of IBM systems, consult the *IBM System/370 and 4300 Processors Bibliography*, GC20-0001, for the editions that are applicable and current.

Summary of Amendments

For a list of changes, see page iii.

Technical changes or additions to the text or illustrations are indicated by a vertical line to the left of the change. Revision bars are not used in Sections 1 and 2 because of the large amounts of information added to Release 2 and removed from Release 1.

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Summary of Amendments

Summary of Amendments for VM/SP Release 2

Programmable Operator Facility

This facility provides the capability to: log messages, suppress messages, redirect messages, execute messages, or preprogram message responses. The capabilities are under control of an editable message routine table in a CMS file.

Inter-User Communication Vehicle (IUCV) enhancements for message handling are also included.

Productivity Aids

CMS productivity aids provide the DP professional user with productivity enhancements to make system implementation easier.

CMS end-user functions assist the user in utilizing the system.

The HELP files can be placed on other than the S-DISK.

DIAL Command Support for Remote BSC 3270 Users

This support allows the BSC 3270 terminal user to issue the DIAL command to make the remote 3270 appear to be a locally attached terminal to the dialed virtual machine.

CMS Nucleus Restructured and Removal of the CMS Tokenization Eight-Byte Restriction

The restructured nucleus provides a CMS system which is more flexible and extendible for development, serviceability, and maintenance purposes.

The eight-byte tokenizer restriction has been eliminated for parameter passing.

Starter System Full Screen Support

The CMS editor can operate in full screen mode in the VM/SP Starter System.

CMS/DOS Upgrade to VSE/Advanced Functions Release 3

CMS/DOS support has been upgraded to VSE/Advanced Functions Release 3 and VSE/VSAM Release 2 including support for the 3375 DASD.

Command Retrieve Capability

The user can define a PF key for activating the retrieve function on 3101 and 3270 terminals.

CP Query Command Enhanced

The user can specify the USERID and CPLEVEL operands to the CP QUERY command.

Enhanced ASCII Support

ASCII support is enhanced to provide additional capabilities for the 3101 terminal user.

Enhanced 3800 Support

This support allows files created by a system using the NJI protocol to properly print on a 3800 controlled by VM/SP Release 2.

Trace Table Recording Facility

This facility allows service personnel and system programmers to create a chronological READER spool file of CP trace entries by type, VMBLOCK address, interrupt code, and device address.

Miscellaneous

Removed: Documentation

The lists of new and changed commands, new and changed macro instructions, and VM/SP publications for the VM/SP Release 1 items, VM/370 Basic System Extensions function contained in VM/SP, and VM/370 System Extensions function contained in VM/SP were removed from Section 1.

The module summary for VM/SP Release 1 items was removed from Section 2.

The sections containing the APAR List, VM/SP Publications, and Product Summary were removed and the remaining sections were renumbered. Information about VM/SP publications can now be found in *VM/SP Library Guide And Master Index*, GC19-6207.

Because of the nature of the removed information, the revision bar is not used to show where that information was originally located.

Changed: Documentation

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

Summary of Amendments for TNL SN25-0816

Support of the 3081 Processor Complex

New: Hardware Support

Large system installations can now take advantage of the new IBM 3081 processor complex. The processor complex features an IBM 3081 processor and 3082 processor controller. Among its facilities is a monitoring and service support facility (MSSF) that is included with each processor controller. The support provided allows virtual operating systems that support the MSSF to issue commands to obtain system information and allows the VM/SP control program to physically reconfigure the system. VM/SP also uses the new 3081 hardware instruction TEST BLOCK to validate real storage at system load and initialization.

New Processor Support

***New:* Hardware Support**

The IBM 3033 Model Group S Processor Complex offers large system installations a unique growth advantage within the 3033 processor family. The 3033-X uniprocessor features an increased instruction execution rate for additional processing capability, six channels, and four or eight megabytes of storage.

The IBM 4341 Model Group 2 offers intermediate system users expanded function and capacity. The 4341-2 features enhanced block multiplexer channel capability and increased data transfer rate. An optional Extended Control Program Support Expansion feature allows concurrent operation of ECPS:MVS and ECPS:VM/370.

Miscellaneous

***Changed:* Documentation**

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

Preface

Information in this publication is for planning purposes only until the availability of the product.

VM/SP Release 2 will support AP/MP and 3081 Model D16 in first quarter 1983.

This publication introduces and describes the features of the IBM Virtual Machine/System Product (VM/SP) Program No. 5664-167.

VM/SP is a separately orderable program package that incorporates the functions of earlier VM/370 program products, VM/370 Release 6 base (Program No. 5749-010), Basic System Extensions, Release 2 (Program No. 5748-XX8), and System Extensions, Release 2 (Program No. 5748-XE1), together with functions that are unique to VM/SP.

VM/SP has been designed for System/370, 303x, 4300 and 3081 processors operating in extended control mode and using dynamic address translation.

VM/SP provides virtual machines, virtual storage, the ability to run multiple operating systems concurrently, and a conversational time-sharing system. Additionally, VM/SP supports many different device options that are available for use in a virtual machine environment.

If you are unfamiliar with VM/370 concepts, including virtual machines and their applications, you should read *VM/SP Introduction*, GC19-6200 before using this book and the rest of the VM/SP library.

Unless otherwise noted, the term VSE refers to the combination of the DOS/VSE system control program and the VSE/Advanced Functions program product.

In certain cases, the term DOS is still used as a generic term. For example, disk packs initialized for use with VSE or any predecessor DOS or DOS/VS system may be referred to as DOS disks.

The DOS like simulation environment provided under the CMS component of the VM/System Product, continues to be referred to as CMS/DOS.

This publication contains an introduction and six sections:

“Introduction” gives you a general overview of the functions of the VM/SP program product.

“Section 1. Functional Highlights” describes the new functions of VM/SP Release 2. This section also describes the functions contained in VM/SP Release 1, VM/370 Basic System Extensions Program Product Release 2 (Program No. 5748-XX8) and VM/370 System Extensions Program Product Release 2 (Program No. 5748-XE1). Each line item for VM/SP Release 2 also has a corresponding list of the commands and macro instructions supporting that particular line item.

“Section 2. Storage Requirements and Module Summary” gives the system programmer a general idea of the scope of the VM/SP product. It gives an approxi-

mate storage size needed for VM/SP initialization. The module summary lists the new and changed modules, macro instructions and control blocks for each Release 2 line item showing the impact each line item has on the VM/SP system.

“Section 3. System Requirements and Planning Information” defines the software, hardware, and storage requirements of VM/SP in addition to giving the customer a general overview of IBM’s installation, updating and service strategies for VM/SP.

“Section 4. Compatibility/Incompatibility” describes the migration compatibilities for users migrating from VM/370 to VM/SP. Any incompatibilities a customer may encounter in his migration to VM/SP from a VM/370 system are also outlined.

“Section 5. Migration Considerations” describes particular areas that the customer should consider when installing and operating VM/SP.

“Section 6. Performance” lists any performance considerations the user needs to make in installing VM/SP.

VM/SP Publications

The diagram on the next page groups by function manuals that support VM/SP. You can find more publication information in *VM/SP Library Guide and Master Index*, GC19-6207.

Contents

Introduction 1

Section 1. Functional Highlights 2

VM/SP Release 2 Functions 2

Programmable Operator Facility 2

Productivity Aids 4

New CMS Productivity Aids 4

New CMS End-User Functions 4

Enhanced HELP File Installation 5

DIAL Command Support for Remote BSC 3270 Users 6

CMS Nucleus Restructured and Removal of the CMS Tokenization Eight-Byte Restriction 7

Starter System Full Screen Support 7

CMS/DOS Upgrade to VSE/Advanced Functions Release 3 7

Command Retrieve Capability 7

CP Query Command Enhanced 8

Enhanced ASCII Support 8

Enhanced 3800 Support 8

Trace Table Recording Facility 9

VM/SP Release 1 Functions 9

3278 Model 5 and 3279 Information Display Station Support 10

CMS OS Loader Support 11

MP Operation and Modified AP Operation 11

CMS EXEC Interpreter (EXEC 2) Support 11

System Product Editor Support 12

HELP Facility Extensions 12

Full Screen Console Enhancements 13

CP Spooling Enhancements 13

Dedicated Remote 3270 Information Display Printers to Virtual Machines 13

Systems Network Architecture (SNA) Console Communication Services Support 14

Inter-User Communication Vehicle (IUCV) 14

Single Console Image Facility 14

IPL Command Enhancement 14

3800 Printing Subsystem Support 14

Processor Support 15

Support of the 3375 Direct Access Storage 16

Support of the 3380 Direct Access Storage and the 3880 Controller Models 2 and 3 16

Reliability, Availability, and Serviceability Enhancements 17

Enhanced DASD Support 17

System Security Enhancements 17

Spool File to Tape Improvement 18

CMS Stack Enhancement 18

Dynamic Linkages Using the SUBCOM Function 18

CMS/DOS Simulation in VM/SP 18

Support of the 3081 Processor 19

VM/370 Basic System Extensions Function Contained in VM/SP 20

Resource Management Facilities Subset 20

Virtual Storage Preservation Support 21

Accounting-Records-On-Disk Support 21

Spool-Files-To-Tape Support 21

CMS Tape Label Processing Support 21

Full Screen Support Via DIAGNOSE X'58' 21

Enhanced 3270 Support 22

Addition to VM/370 Extended Control-Program Support (ECPS:VM/370) 22

Interactive HELP Facility Under CMS 22

CMS File System Extensions 22

CMS TAPE Command Improvement 22

CMS Use of CP Page Management Interfaces 22

CP Extensions 22

Small CP Option 22

APL/Text Support for the 3270 23

Display Control for the 3270 23

Support of the 3289 Model 4 Printer 23

Support of the 8809 Tape Unit 23

Support of the 3310 and 3370 Direct Access Devices 23

Logical Device Support Facility 23

- Support of the 3262 Models 1 and 11 Printers 23
- VM/370 System Extensions Function Contained in VM/SP 24
- Resource Management Facilities 24
- Shadow Table Maintenance Facility 24
- Single Processor Mode 25
- Dynamic SCP Transition to or from Native Mode 25
- MVS/System Extensions Support 25

Section 2. Storage Requirements And Module Summary 26

- Storage Requirements 26
- Module Summary (VM/SP Release 2) 26
 - Programmable Operator Facility 26
 - New CMS Productivity Aids 27
 - DIAL Command Support For Remote BSC 3270 Users 27
 - CMS Nucleus Restructured and Removal Of The CMS Tokenization Eight-Byte Restriction 28
 - Starter System Full Screen Support 28
 - CMS/DOS Upgrade To VSE/Advanced Functions Release 3 28
 - Command Retrieve Capability 29
 - Query Command Enhanced To Obtain System Identification Information 29
 - Enhanced ASCII Support 29
 - Enhanced 3800 Support 30
 - Trace Table Recording Facility 30
 - Pass-Through Hooks 30

Section 3. System Requirements And Planning Information 31

- Program Requirements 31
- Hardware Requirements 31
- Supported Hardware 32
 - Processors 32
 - Direct Access Storage Devices 33
 - Magnetic Tapes 34
 - Unit Record Devices (Readers, Punches, and Printers) 34
 - Terminals 34
 - Transmission Control Units 35
- VM/SP Minimum Configuration 35
- Configuration Supported By CMS 36
- OS/VS2 SVS Installations 36
- Distribution 36
 - Product Tapes 36
 - Starter Systems 37
- Maintenance of Your VM/SP System 38

Section 4. Compatibility/Incompatibility 39

- Migration Compatibilities 39
- Incompatibilities 40
 - IPCS Incompatibilities with VM/SP 40
 - RSCS Incompatibilities with VM/SP 40
 - Other Incompatibilities 41
 - Multiprocessor Support 41
 - CMS File System Extensions 41
 - Support of the 3262 Models 1 and 11 Printers 41
 - Support of the 3289 Model 4 Printer 41
 - Support of the 3310 and 3370 Direct Access Storage Devices 41
 - MVS/System Extensions Support 42
 - Single Processor Mode 42
 - CMS Tape Label Processing Support 42

Section 5. Migration Considerations 43

- VM/SP 43
- Restrictions - Channel Program 43
- Dynamically Modified Channel Programs 43
- Minidisk Restrictions 44
- Timing Dependencies 46
- Processor Model-Dependent Functions 47
- Channel Model-Dependent Functions 47
- Virtual Machine Characteristics 48
- MSS Restrictions 51
- CMS Restrictions 52

Miscellaneous Restrictions 54

Section 6. Performance 57

Introduction

VM/SP is a separately orderable program package that incorporates the functions of earlier VM/370 program products, VM/370 Release 6 base (Program No. 5749-010), Basic System Extensions, Release 2 (Program No. 5748-XX8), and System Extensions, Release 2 (Program No. 5748-XE1), together with functions that are unique to VM/SP.

VM/SP is a functional operating system that provides extended features to the control program (CP) and conversational monitor system (CMS) components of VM/370 Release 6. VM/SP adds no additional functions to Remote Spooling Communications Subsystem (RSCS) and Interactive Problem Control System (IPCS) components of VM/370 Release 6. However, you can appreciably expand the capabilities of these components in a VM/SP system by installing both the RSCS Networking program product (5748-XP1) and the VM/IPCS Extension program product (5748-SA1).

Throughout this publication, the term "VM/SP" refers to the VM/SP program package when used in conjunction with VM/370 Release 6. The terms "CP" and "CMS" refer to the VM/370 components enhanced by the functions included in the VM/SP package. Any referral to "RSCS" and "IPCS," unless otherwise noted, is to the VM/370 components unchanged by the VM/SP package.

Section 1. Functional Highlights

This section describes VM/SP program package functions which include: VM/SP Release 2 functions, VM/SP Release 1 functions, VM/370 Basic System Extensions Program Product, and VM/370 System Extensions Program Product features. VM/SP Release 2 functions are described first followed by descriptions of VM/SP Release 1 functions, VM/370 Basic System Extensions, and VM/370 System Extensions items.

Highlights of VM/SP Release 2 line items include a discussion of related commands and macros.

VM/SP Release 2 Functions

The VM/SP Release 2 unique functions are:

- Programmable operator facility (including IUCV enhancements)
- Productivity aids
- DIAL command support for remote BSC 3270 users
- CMS nucleus restructured and Removal of the CMS tokenization eight-byte restriction
- Starter system full screen support
- CMS/DOS upgrade to VSE/Advanced Functions Release 3
- Command retrieve capability
- CP Query command enhanced
- Enhanced ASCII support
- Enhanced 3800 support
- Trace table recording facility

Programmable Operator Facility

The programmable operator facility can be used in a VM/SP system to reduce or eliminate system operator messages. This facility provides the capability to:

- log messages
- suppress messages
- redirect messages
- execute commands
- preprogram message responses

all under the control of an editable message routing table in a CMS file.

The programmable operator facility can be used by a stand-alone VM/SP system or it can allow the operation of a remote VM/SP system to be controlled by an operator at a host VM/SP system.

Included Inter-User Communication Vehicle (IUCV) changes:

- Message length is no longer restricted to 32K.
- Message id is unique for system IPL.
- Message system service (trap messages via IUCV as specified by SET commands).

New and Changed Commands

CMD: The CMD command allows the message sender to execute selected VM commands to the PROP's virtual machine.

FEEDBACK: The FEEDBACK command allows the user to log messages on the PROP feedback file.

LOG: The LOG command allows the user to log messages on the PROP log file.

GET: The GET command allows an authorized user to retrieve one of the PROP files.

SET: The SET command when issued with the DEBUG option allows authorized users to enter or exit the PROP's DEBUG mode.

LOADTBL: The LOADTBL command allows an authorized user to load a new Routing Table.

QUERY: The QUERY command allows an authorized user to query the current Routing Table.

STOP: The STOP command allows an authorized user to terminate execution of the PROP.

New and Changed Macro Instructions

IUCV: The IUCV macro is changed to eliminate the 32K length restriction on messages and replies.

New and Changed Control Statements

ALLOW Option on IUCV Control Statement: The directory authorization has been expanded to allow the system programmer to specify the ALLOW option on the IUCV directory control statement for use with service type virtual machines. If a service virtual machine has this option, virtual machines connecting to it do not need any authorization in their own directory. The current CP system service, *CCC, does not use this option.

Productivity Aids

New CMS Productivity Aids

CMS now provides the DP professional user with productivity aids to make system implementation easier. These include:

- A CMS facility to allow I/O between a device and an EXEC program.
- The ability to dynamically extend the CMS nucleus.
- A routine to display at the console or stack virtual reader file characteristics.
- An enhanced CMS QUERY command to display CMSLEVEL information such as product name, release information, service level, and information regarding virtual disks that are accessed. In addition, QUERY command results can be stacked.
- A GLOBALV command which allows a user to maintain a collection of named values whose lifetime is either within a single IPL, within a session, or across sessions.
- The ability to specify the portions of a line that should be displayed, highlighted, protected, and/or masked using the VM/SP editor.
- The ability to directly access EXEC 2 variables from a program. Variables may then be inspected and/or set.

New CMS End-User Functions

New end-user functions that enhance system usability and improve user productivity are provided to assist users in utilizing the system. The functions are:

- New VM/SP SENDFILE and RECEIVE commands which may be used in conjunction with the TSO/E Interactive Data Transmission Facility TRANSMIT and RECEIVE commands to exchange files between VM/SP Release 2 and MVS/TSO Systems connected through an NJE/NJI network.
- Enhanced full screen capability to display information about reader spool files which allows the ability to review/browse through files, to discard files, or initiate other actions such as to copy the file to other media.
- A full screen capability to display file information and issue CMS commands that perform some type(s) of action on the file(s) being displayed. Program function keys are also assigned to useful functions such as XEDIT, SORT, or HELP.
- Enhanced command capability such as:
 - Header option on print.
 - DISK LOAD extended to allow sequence verification and the ability to load a file and retain its original date/time.

- Ability to specify "=" for any file identifier in the fileid2 operand on the COMPARE command.
- LISTFILE enhanced to allow STACK, ARGS, BLOCK, TRACE, FIFO, LIFO and extended pattern matching options.
- UPDATE extended to keep a record of missing PTF files.
- A new command to display environmental status such as userid, nodeid, date, time, zone.

Enhanced HELP File Installation

The HELP files can be placed on disks other than the S-DISK.

New and Changed Commands (CMS Productivity Aids)

EXECIO: The EXECIO command is used to do I/O operations between a device and the program stack.

GLOBALV: The GLOBALV command is used to set, maintain, and retrieve a collection of named variables.

NUCXDROP: The NUCXDROP command is used to delete specified nucleus extensions.

NUCXLOAD: The NUCXLOAD command is used to load a nucleus extensions.

NUCXMAP: The NUCXDROP command is used to identify existing nucleus extensions.

QUERY CMSLEVEL: The CMSLEVEL operand of the QUERY command returns the feature or program product, release, and the service level of CMS.

RDR: The RDR command is used to generate a return code and either display or stack a message that identifies the characteristics of the next file in your virtual reader.

SET CTLCHAR: The SET CTLCHAR command is used to specify protected/nonprotected files which may be highlighted using the VM/SP editor.

New and Changed Commands (CMS End-User Functions)

COMPARE: The COMPARE command provides the ability to specify "=" for any file identifier in the fileid2 operand.

DEFAULTS: The DEFAULTS command is used to set or display default options for the commands; FILELIST, NOTE, RDRLIST, RECEIVE, PEEK, and SEND-FILE.

DISCARD: The DISCARD command is used in RDRLIST, FILELIST, and PEEK to erase files from disk or to purge files in the virtual reader.

DISK: The DISK LOAD command is extended to allow sequence verification and the ability to load a file and retain its original date/time.

EXECUTE: EXECUTE is an XEDIT macro which allows users to issue commands on the lines displayed by the RDRLIST and FILELIST commands.

FILELIST: The FILELIST command is used to list information about CMS disk files, with the ability to edit and issue commands from the list.

IDENTIFY: The IDENTIFY command is used to display or stack userid, nodeid, rscsid, date, time, time zone, and day of the week.

LISTFILE: The LISTFILE command is enhanced to allow ARGS, BLOCK, STACK, TRACE, FIFO, LIFO and extended pattern matching options.

NAMEFIND: The NAMEFIND command is used to display/stack information from a NAMES file.

NAMES: The NAMES command is used to display a menu to create, display or modify entries in a 'userid NAMES' file.

NOTE: The NOTE command is used to prepare a 'note' for one or more computer users, to be sent via the SENDFILE command.

PEEK: The PEEK command is used to display a file that is in your virtual reader without reading it onto disk.

PRINT: The PRINT command allows you to specify the HEADER option in conjunction with the CC option which places the filename, filetype, and filemode at the top of the first printed page.

RDRLIST: The RDRLIST command is used to display information about files in your virtual reader with the ability to issue commands from the list.

RECEIVE: The RECEIVE command is used to read onto disk a file or note that is in your virtual reader.

SENDFILE: The SENDFILE command is used to send files or notes to one or more computer users, attached locally or remotely, by issuing the command or by using a menu.

TELL: The TELL command is used to send a message to one or more computer users who are logged on to your computer or to one attached to yours via RSCS.

UPDATE: The UPDATE command is extended to keep a record of missing PTF files.

New and Changed Commands (Enhanced HELP File Installation)

HELP: The HELP command searches any disk which has been specified as containing the system HELP files.

DIAL Command Support for Remote BSC 3270 Users

This support provides the ability for remote Binary Synchronous Communication (BSC) 3270 terminal users to issue the DIAL command. The DIAL command establishes the connection of the terminal to a multiple-access virtual machine. The remote 3270 appears to be a locally attached terminal to the dialed virtual machine.

The maximum number of remote communication lines is 256.

New and Changed Commands

DIAL: The DIAL command establishes the connection of a 3270 terminal to a multiple-access virtual machine. The remote dialed 3270 appears to be a locally attached terminal to the dialed virtual machine.

RESET: The RESET command is used to break the dialed connection and restore it to a VM terminal.

CMS Nucleus Restructured and Removal of the CMS Tokenization Eight-Byte Restriction

The CMS nucleus has been restructured to provide a CMS system which is more flexible and extendible for development, serviceability, and maintenance purposes.

The eight-byte tokenizer restriction has been eliminated for parameter passing.

New and Changed Commands

CMDCALL: The CMDCALL command converts EXEC 2 extended plist function calls to CMS extended plist command calls.

FILEDEF: The FILEDEF command is modified to recognize and build the dsname parameter from the extended plist if it is present.

DLBL: The DLBL command is modified to recognize and build the dsname parameter from the extended plist if it is present.

LISTDS: The LISTDS command is modified to recognize and build the dsname parameter from the extended plist if it is present.

ASSEMBLE: The ASSEMBLE command is modified to recognize and build the SYSPARM parameter from the extended plist if it is present.

Starter System Full Screen Support

The System Product Editor (XEDIT) can operate in full screen mode in the VM/SP Starter System.

CMS/DOS Upgrade to VSE/Advanced Functions Release 3

CMS/DOS support has been upgraded to VSE/Advanced Functions Release 3 and VSE/VSAM Release 2 including support for the 3375 DASD.

Command Retrieve Capability

The SET PFnn command is enhanced to include the option RETRIEVE. This allows the user to define a PF key for activating the retrieve function on 3101 or 3270 terminals. Once the RETRIEVE program function key is defined, VM/SP starts remembering each input line entered at the terminal. When the PF key is pressed, VM/SP redisplay the input line in the screen input area, so that the user can modify and reenter the data. The saved input lines are redisplayed in the reverse sequence of entry when the specified program function key is pressed. The number of saved lines depends upon buffer size and input line length.

New and Changed Commands

SET PFnn RETRIEVE: The RETRIEVE option of the SET PFnn command is used to designate which key is used for the retrieve function.

CP Query Command Enhanced

The CP QUERY command is enhanced to allow the user to specify the operands USERID or CPLEVEL.

New and Changed Commands

New operands are added to the QUERY command.

USERID operand: The USERID operand of the QUERY command causes a response that includes the userid and the system identifier of the system that the user is logged on to.

CPLEVEL operand: The CPLEVEL operand of the QUERY command causes a response that includes information relative to the program product's name, release number, service level number, nucleus creation date and time along with the IPL date and time. Time zone information is also included.

Enhanced ASCII Support

ASCII support has been enhanced to provide the 3101 terminal user with the following capabilities:

- Screen management - controlled scrolling of output.
- Improved communication line utilization - compression of contiguous blanks.
- Program function key support (1-8).

In addition, support for other ASCII terminal users has been enhanced with the following:

- Prompting - line feed prompting can be selected to allow data to be entered starting in column 1.
- Read operations can be command-chained to write operations.
- Line size control option has been added.

New and Changed Commands

TERMINAL: The TERMINAL command is used to modify console functions.

New and Changed Macro Instructions

RDTERM: The RDTERM macro instruction is used by the CMS program to read a line from the terminal into an I/O buffer.

Enhanced 3800 Support

This enhancement allows the RSCS Networking, Release 3, program product to pass the 3800 attributes to CP as they are defined in an NJI header created by a system using the NJI protocol. This also allows files created in these systems to

properly print on a 3800 controlled by VM/SP Release 2. Copy group and burst attributes remain unsupported.

New and Changed Commands

SPOOL: The CHARS and MODIFY options are provided for the SPOOL command.

The CHARS option is used to specify the name of the character arrangement table used when printing a file.

The MODIFY option is used to specify the copy modification module to be used when printing a file on the 3800.

CHANGE: The CHARS and MODIFY options are provided for the CHANGE command.

The CHARS option is used to specify the name of the character arrangement table used when printing a file.

The MODIFY option is used to specify the copy modification module to be used when printing a file on the 3800.

Trace Table Recording Facility

This facility gives service personnel and system programmers the ability to create a chronological READER spool file of:

- CP trace entries by type.
- VMBLOK address.
- Interrupt code.
- Device address.

In addition, user-generated information from a virtual machine and CP can be included.

A utility program, TRAPRED, can be used to reduce data.

New and Changed Commands

CPTRAP: The CPTRAP command enables the user to spool the desired trace items.

TRAPRED: A utility program, TRAPRED, uses the Reader Spool file as input and allows you to select either a spooled print file or an interactive terminal display for output.

VM/SP Release 1 Functions

The VM/SP Release 1 functions are:

- 3278 model 5 display station support
- 3279 color display station support

- CMS OS loader support
- MP operation
- Modified AP operation
- New CMS EXEC interpreter (EXEC 2) support
- New System Product Editor
- HELP facility enhancements
- Full screen console enhancements
- CP spooling enhancements
- Dedication of remote 3270 display printers to virtual machines
- Systems Network Architecture (SNA) Console Communication Services support
- Inter-user communication vehicle (IUCV)
- Single console image facility
- IPL command enhancement
- New Processor Support
- Support of the 3800 Printing Subsystem as a virtual spooling device
- Support of the 3375 Direct Access Storage
- Support of the 3380 Direct Access Storage and the 3880 Storage Controller Models 2 and 3
- Reliability, Availability and Serviceability Uplevels
- CMS STACK enhancement
- System Security enhancements
- Enhanced DASD Support
- Dynamic Linkage using the CMS SUBCOM function
- CMS/DOS Simulation in VM/SP
- Support of the 3081 Processor
- Improved system generation procedure and documentation

3278 Model 5 and 3279 Information Display Station Support

The IBM 3278 Model 5 Information Display Station can display 27 lines per screen, with a maximum of 132 characters on a line (3564 character screen).

The IBM 3279 Information Display Station Models 2A, 2B, 3A, and 3B support an extended data stream having extended field and character attributes. This extended data stream support allows use of:

- Programmable symbols (program-controlled shapes).
- Extended highlighting, which includes:
 - Reverse video
 - Character underscore
 - Blinking character.
- Extended color facilities.

By issuing a CP command you can manipulate the extended highlighting and color values for the user input area, the system status area, and the output area. The output area consists of CP output, virtual machine output, and the input redisplay area.

CMS OS Loader Support

The CMS OS loader enables you to use OS relocatable load modules under CMS. You may load a member from a CMS simulated load library (filetype LOADLIB) or from an OS load library onto an OS formatted disk. A CMS command lists, copies, and compresses CMS load library members, and merges CMS load libraries. This support also allows you, by issuing the LKED command, to use the OS/VS linkage editor to create a CMS LOADLIB or LOADLIB member.

MP Operation and Modified AP Operation

Multiprocessor (MP) support allows a full MP configuration on the 158MP, 168MP, and 3033MP in MP mode. There is a maximum of:

- 16 channels per processor
- 32 channels per MP configuration.

VM/SP does not simulate multiprocessing for virtual machines other than under single processor mode. A virtual machine is dispatched by VM/SP on only one of the two processors in a MP configuration unless the single processor mode of the VM/SP is in effect.

Attached Processor (AP) functions improve the VM/SP system locking protocol.

CMS EXEC Interpreter (EXEC 2) Support

EXEC 2 coexists with the present EXEC processor to allow easier migration. Some features are:

- Accepts words up to 255 characters each.
- Allows commands to be issued either to CMS or to specified subcommand environments, such as the CMS editor or the System Product Editor.
- Provides new string manipulation functions.
- Provides arithmetic functions for multiplication and division.

- Provides debugging facilities.
- Supports user-defined functions and subroutines.

System Product Editor Support

The System Product Editor provides full screen support for 3270 display stations. This editor provides language expansion and flexibility through the EXEC 2 processor. In addition, the System Product editor provides macro instructions to help you migrate from the Display Editing System IUP (Program No. 5796-PJP) and the former CMS editor. VM/SP also supports typewriter terminals with a subcommand language consistent with the full screen language.

The major highlights of the System Product Editor include:

- Multiple views of the same file or of different files.
- Selective column viewing.
- Automatic wrapping of lines that are larger than the screen.
- Ability to issue selected commands directly from the displayed line.
- Ability to define screen format according to individual preferences.
- Extended string search facilities to improve text processing.
- Functions to handle program development including automatic update generation and packed file handling.
- Support of the CMS HELP facility.
- Column pointer for intraline editing.
- Functions to join and split lines.
- Facilities to import and export data.
- A macro to assist the EDIT user to migrate to the SP editor.
- A macro to assist the Display Editing System user to migrate to the SP editor.

HELP Facility Extensions

The VM/SP HELP facility is extended beyond that provided by the online HELP informational display facility contained in VM/370 Basic System Extensions Release 2. This facility allows you to display command and subcommand descriptions directly from menus by moving the cursor to the selected command and hitting a program function (PF) key. You can issue editor, CP and CMS commands and subcommands from a HELP menu screen. PF keys provide additional functions. The HELP facility interfaces with the System Product Editor providing improved scrolling and locate facilities to retrieve information.

Full Screen Console Enhancements

Full screen console support enables a virtual machine and CP to share a locally-attached display terminal controlled by CP. The virtual machine can use a display terminal as a graphics device in full screen mode, while CP shares the terminal as a line device. A Start I/O instruction is the interface for this support. A guest virtual machine can use either the existing DIAGNOSE interface to get full screen support or the SIO interface. Both methods cannot be used simultaneously. This function is not supported for remote terminals or for SNA terminals.

CP Spooling Enhancements

CP spooling enhancements allow the general user to manipulate spool files by form name.

An output file has two form names associated with it; a user form name and an operator form name. Each form name is a one-to-eight byte alphanumeric name. The form can have a meaningful name such as TAXFORM for a preprinted tax sheet. Form name TAXFORM is defined during system generation time by the installation's system programmer and is specified by the user using CP commands.

CP scans a command line for a form specification. If it finds a form name, CP scans a table defined by the installation at system generation time. This table maps user form names to operator form names. When CP finds the operator form name corresponding to the user form name, CP assigns the operator form name to the spool file.

The spooling operator, using CP commands, can specify that particular output devices process spool files of a particular operator form name. In this way, CP can direct a spool file via its form name to a specific output device (either printer or punch) that has been loaded by the operator with a predefined form.

This CP spooling enhancement allows the general user, by issuing CP commands, to close, change, order, purge, spool, and transfer spool files using form names. The spooling operator can now associate output devices with particular form names. This alleviates the need of changing printer paper between jobs requiring different preprinted forms.

Other CP spooling enhancements allow the general user to specify virtual forms control buffer (FCB) images for his spool file. When CP loads the file into a real printer, CP uses the virtual FCB image specified by the user. In addition, CP assists the operator in aligning preprinted forms. The separator pages of printed output now include both the file's sequence number and its distribution code. CP spool enhancements provide trailer pages on output as well.

Dedicated Remote 3270 Information Display Printers to Virtual Machines

This support provides a generalized interface that allows a remote 3270 Information Display printer to be dedicated to a virtual machine. It also allows a virtual machine to access a 3270 Information Display printer via a SIO instruction. For example, the Remote Spooling Communications Subsystem Networking program product can spool and print VM/SP files on a remote 3270 Information Display printer.

Systems Network Architecture (SNA) Console Communication Services Support

Systems Network Architecture (SNA) provides full VM/SP console interface capabilities for SNA terminal users. SNA Console Communications Services is the necessary interface between Virtual Machine/VTAM Communications Network Application (VM/VCNA) program product and CP for guest virtual machines. VM/SP console interface capabilities provided are:

- Full CP and CMS command processing capabilities.
- Full processing capabilities using either the CMS editor or the System Product Editor.
- VM/SP full screen support for 3270 display stations via DIAGNOSE interface.

For more information about VM/VCNA program product (Program No. 5735-RC5) refer to *VM/VTAM Communication Network Application General Information Manual*, GC27-0501.

Inter-User Communication Vehicle (IUCV)

The Inter-User Communication Vehicle (IUCV) facilitates the transfer of messages, either among virtual machines or between CP and a virtual machine. The principal features of this support are:

- All IUCV interfaces are provided at a macro level.
- The ability to selectively establish and terminate communication paths.
- The ability to establish multiple paths between virtual machines and CP.
- A virtual machine can receive messages and reply either synchronously without an interrupt or asynchronously via an external interrupt.
- An installation can restrict the number of messages outstanding on each communication path.
- A receiver can selectively reject messages.
- IUCV coexists with the Virtual Machine Communication Facility (VMCF).

Single Console Image Facility

The Single Console Image facility enables a virtual machine operator to control multiple virtual machines from one physical terminal. This capability is available for use by any virtual machine.

IPL Command Enhancement

The IPL command enhancement allows you to activate OS/VS1 virtual machines without operator intervention.

3800 Printing Subsystem Support

VM/SP supports the IBM 3800 Printing Subsystem as a virtual spooling device. This support allows a virtual machine user to issue the CP DEFINE command to add a spooling 3800 to his virtual machine configuration. He can then create spool

files destined for printing on a real printer. This can be a 3800 if one is available, or any other real printer that VM/SP supports.

The user can issue the new CMS SETPRT command to select the characteristics for a 3800 spool file. These characteristics include:

- Forms overlay
- Forms control buffers (FCB)
- Number of copies to be printed
- Character arrangement tables.

The SETPRT command generates 3800 Load channel command words (CCWs) that CP includes in each spool file. In addition, the CP START command allows the operator to accept spool files that have 3800 LOAD CCWs imbedded throughout the file. You can mix character sets on the same line and/or page, using DCF commands or user written application programs.

A virtual operating system (such as MVS) running in a virtual machine can run application programs that create 3800 spool files. The installation must define a 3800 printer. In this way, a real 3800 can be shared among many virtual machines using VM/SP spooling techniques.

Processor Support

IBM 3033 Attached Processor Model 2 Processor Support

VM/SP supports I/O on both sides of a 3033 attached processor when the complex includes a 3042 Model 2 attached processor.

The 3042 Model 2 offers a standard group of 6 channels. An optional feature adds another group of six, for a configuration of 18, 22, 24 or 28 channels in a 3033 attached processor Model Group 2 complex when that processor is generated as a multiprocessor.

3033 Model Group S Processor Support

The 3033 Model Group S processor allows a 3031 processor user to migrate to the 3033 processor to gain more processing capabilities. The features of this new processor complex include a maximum of eight megabytes of processor storage, up to six channels including two with high speed capability, and increased internal processing speed. In addition, you can choose to install the Data Streaming Feature, and a Channel-to-Channel Adapter allowing the installation to attach the 3033 Model Group S with any other System/360, System/370, or 4341 processor.

IBM 4321 Processor

The IBM 4321 processor is an entry-level 4300 processor with the same internal performance as a 4331 Model Group 1. The 4321 processor is available in one model with one megabyte of main storage. Under control of VM/SP, the processor is recommended for operation in a CMS only environment.

4331 Model Group 2 Processor Support

The IBM 4331 Model Group 2 processor combines System/370 compatibility with large scale integration (LSI) technology. The features of this processor include:

- A maximum of four megabytes of processor storage
- A high speed channel
- An additional file tape adaptor
- Greater internal speed.

4341 Model Group 2 Processor Support

The IBM 4341 Model Group 2 processor combines System/370 compatibility with large scale integration (LSI) technology. Processor features include a maximum of eight megabytes of processor storage, six channels including high speed channels, and a greater internal processor speed. The installation may also choose an optional Expanded Control Program Support (ECPS) Expansion feature that allows the concurrent operation of both ECPS:MVS and ECPS:VM/370. 4341 Model Group 1 processors can be field upgraded to 4341 Model Group 2 performance and capability.

Support of the 3375 Direct Access Storage

The 3375 Direct Access Storage uses a standard count-key-data track format. It may be used for:

- Spooling
- Paging
- Minidisks
- Directories
- System resident
- User data.

The DIRECTORY program accepts 3375 as a valid device type on the DIRECTORY and MDISK statements. The DASD DUMP/RESTORE program accepts 3375 as a valid device type on the INPUT and OUTPUT statements.

Support of the 3380 Direct Access Storage and the 3880 Controller Models 2 and 3

The 3380 Direct Access Storage is a large capacity, count-key-data direct access storage unit. The 3380 supports all the traditional DASD functions. This includes spooling and paging facilities, providing temporary minidisk space, directory space, and system residence space and containing large amounts of user data.

The IBM 3880 Controller Models 2 and 3 provides direct attachment of the 3330, 3340, 3344, 3350, 3370, 3375, and 3380 to channels that conform to standard System/370 architecture. In addition, the 3880, when attached to a VM/SP system by the 3880 controller Models 2 and 3, uses the high speed channels available on the 303X, 4341 Model Group 1 and Model Group 2 processors and 3081 processors. Use of these high speed channels, in combination with the machine-implemented instructions within the 3880 controller Models 2 and 3, decreases data access and retrieval time and provides more reliable online data storage.

Reliability, Availability, and Serviceability Enhancements

VM/SP supports the following RAS enhancements for DASD:

- The option to allow an installation to reserve DASD space for system dumps allocated to certain DASD after CP initialization.
- Expansion of the spool file checkpoint limit from 2048 to 9900. It also checks for duplicate spool file ID numbers.
- Use of the SIOF instruction in CP. CP now uses the SIOF instruction to initiate all paging operations, spooling, local terminal I/O operations, simulation of I/O from DIAGNOSE execution, and simulation of guest virtual machine SIOF instructions.
- Detection of I/O interrupts pending for a device.

Note: Since a majority of the enhancements to reliability, availability, and serviceability is supported by logic internal to the VM/SP Control Program, you may not see all of these enhancements reflected in external characteristics such as commands, macro instructions, and system generation options.

Enhanced DASD Support

VM/SP supports the following enhancements for direct access storage devices:

- Designation, by macro instruction, of preferred paging areas and nonpreferred paging areas on the same DASD volume. Using the same macro instruction, a system programmer can also specify that CP should use the same volume for paging and spooling overflow operations. The system programmer can also change the order in which CP searches DASD for preferred and nonpreferred paging areas.
- Utilization of full track reads for the 3330, 3340, 3344, 3350, and 3380 when the DASD Dump Restore (DDR) Utility is running and the Full Track Read (FTR) feature is installed. The Full Track Read feature decreases by one-half the number of I/O operations CP needs to read the contents of a DASD track.
- Fixed head support for the 3340, 3344, 3350, and 3380 allowing zero access time for preferred paging areas and CP owned volumes. CP schedules on the same volume, I/O paging requests for fixed head cylinders before it schedules I/O requests for moveable head cylinders.
- Page migration support for the 3380 allowing installations to control when CP should migrate preferred moveable head pages to nonpreferred paging areas. Migration of pages from moveable head preferred paging areas to nonpreferred paging areas takes place when an installation defined percentage of all moveable head preferred pages is reached.

System Security Enhancements

These enhancements include:

- Security protection of the system operator's virtual machine following an abend and consequent automatic system restart. If the CP operator is logged off, disconnected, or not logged on the primary system console at the time of the

abend, an automatic initial program load does not cause an automatic logon of the system operator.

- Data integrity of temporary minidisk space using a system generation option. This option automatically clears any user data residing on temporary disk space.

Spool File to Tape Improvement

A spool file to tape improvement allows CP to spool to tape a system dump file residing on a reader queue.

CMS Stack Enhancement

The CMS stack is split into two stacks:

1. Console input buffer (formerly the console input stack).
2. Program stack.

CMS places lines entered at the terminal into the console input buffer. You can enter up to 130 characters per line. CMS handles these terminal entries as fixed length records, padding them with hexadecimal zeroes if they are less than the maximum length.

CMS places lines transmitted through programs either by the CMS ATTN function or through a CMS EXEC into the program stack. CMS treats lines it places in the program stack as variable length entries with a maximum of 255 characters per line. This allows program flexibility because programs running under CMS can exchange data streams without limitation to program content. Entries placed in the program stack are not edited by CMS.

Dynamic Linkages Using the SUBCOM Function

A CMS user can make known to CMS the name of a program already loaded from disk. Do this by issuing the create function of SUBCOM. SVC 202 can then dynamically call this program rather than having to search the CMS function table (FUNCTAB) entries built at system generation time. The SUBCOM function allows you to dynamically name a program you want to link to before issuing an SVC 202. SUBCOM also makes it possible for a program that has become dynamically known to CMS (through SUBCOM) to make other programs dynamically known if the former program knows the entry points of those programs.

CMS/DOS Simulation in VM/SP

CMS/DOS support is upgraded in VM/SP to support the VSE/VSAM Release 2 program product (5746-AM2) and the VM/Interactive File Sharing program product (5748-XXC). DOS/VSE and the VSE/Advanced Functions program product are not required for VSE/VSAM Release 2 and Interactive File Sharing support. However, CMS/DOS facilities that access VSE/Advanced Functions libraries, such as high level language compilers, require the installation of both DOS/VSE and the VSE/Advanced Functions Release 2 program product.

Support of the 3081 Processor

VM/SP Release 2 will support AP/MP and 3081 Model D16 in first quarter 1983.
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VM/SP supports the 3081, a System/370 compatible, high end processor. The 3081 is designed to coexist with other System/370 processors and products in a standalone or loosely coupled configuration. It consists of two instruction processing units sharing a common, sixteen megabyte processor storage. The Monitoring and Service Support Facility (MSSF) is a 3081 processor component. VM/SP communicates with the MSSF via a new DIAGNOSE X'80'. The MSSF signals completion of the MSSFCALL DIAGNOSE using external interrupt X'2401'. VM/SP uses this interface to vary a processor online or off-line. For a V=R virtual machine, VM/SP executes the MSSF SCPINFO command to reflect to the V=R guest information about system configuration. For V=V guest machines, VM/SP simulates this command using machine-implemented information.

When the 3081 processor is installed, the system programmer or the customer engineer must run a standalone input/output program (IOCP) to define I/O configuration data to the 3081 processor. The standalone version of this program is shipped with the processor. The installation must rerun IOCP after any changes to the I/O configuration.

The 3081 processor can have two or three channel groups. A group consists of eight channels. These channels can be configured into two channel sets, with a maximum of sixteen channels in one channel set. The Two channel groups (sixteen channels) are standard on the 3081. An additional group may be added, totaling a maximum of 24 channels when the 3081 is running in MP mode.

The standard 3081 channel set switching feature allows a set of channels to be switched from one processor to another in a 3081 attached processor or multiprocessor system.

VM/SP implements the channel set switching feature when the 3081 is generated as an attached processor. Channel set switching occurs during automatic processor recovery routines or when the main processor is varied off-line. When either of these situations occurs in a 3081 attached processor system, CP switches all active channels on the main processor to the attached processor, and processing continues in uniprocessor mode on the attached processor. If the 3081 is generated as a multiprocessor, CP disables both the failing processor (or the processor varied off-line) together with its active channels, and processing continues in uniprocessor mode on the other processor.

The 3081 processor appears to VM/SP as a multiprocessor. However, unlike a multiprocessor, the 3081 cannot be configured into two independent processors.

Other VM/SP supported features of the 3081 include:

- CP support of the MSSF for VARY commands.
- Support of noncontiguous real storage.
- Validation of real storage via the TESTBLOCK instruction.

The 3081 processor supports the 3278 Model 2A display station as its system console.

VM/370 Basic System Extensions Function Contained in VM/SP

The following features, now a part of VM/SP function, were originally offered in VM/370 Basic System Extensions Program Product Release 2 (Program No. 5748-XX8):

- Resource management facilities subset
- Virtual storage preservation support
- Accounting-records-on-disk support
- Spool-files-to-tape support
- CMS tape label processing support
- Full screen support via DIAGNOSE X'58'
- Enhanced 3270 support
- APL/Text support for the 3270
- Display control for the 3270
- Addition to the VM/370 Extended Control Program Support
- Interactive HELP facility under CMS
- CMS file system extensions
- CMS TAPE command improvement
- CMS use of CP page management interfaces
- CP extensions
- Small CP option
- Support of the 3289 Model 4 printer
- Support of the 8809 tape unit
- Support of the 3310 and 3370 direct access devices
- Logical device support facility
- Support of the 3262 Models 1 and 11 printers

Resource Management Facilities Subset

This facility helps to improve system performance by correlating the use of available storage to the changing system environment. By modifying the control program of VM/SP, it allows the revised scheduler to more equitably share system

resources and improve the ability of the system to respond by distinguishing between trivial and nontrivial interactive transactions. A new priority queue called Q3, handles users running for long periods of time without needing terminal interaction with the operating system.

The SET FAVORED command allows several virtual machines to have a specified percentage of processor time.

The internal monitor of CP has been modified to reduce the time needed to tune the system by dynamically adjusting scheduling decisions. These adjustments optimize throughput and control paging.

Virtual Storage Preservation Support

With this facility, the system programmer can specify, during VM/SP system generation time, that the contents of specific virtual machines be saved automatically if either the virtual machine is terminated by VM/SP or VM/SP itself abnormally terminates. At the time of abend, CP saves the contents of these virtual machines on DASD space previously allocated by the system programmer during system generation. Virtual storage preservation protects security and privacy by clearing the V=R storage area when a complete system failure occurs, or when a different V=R user is loaded into storage; and by preserving the V=R storage area when a warm start is possible.

Accounting-Records-On-Disk Support

This function supports the spooling of accounting records to disk. These records are collected on disk and at a later time, they can be read into a virtual machine for billing and usage analysis report generation. This support allows installations without a real card punch to process their accounting information.

Spool-Files-To-Tape Support

Spool-files-to-tape support frees DASD spooling space by allowing the spooling operator to dump to tape those spool files that cannot be immediately processed by real unit record devices. Later, the spooling operator can also load the spool files back into the same or different VM/SP system for processing to an I/O device.

CMS Tape Label Processing Support

This support is added to CMS to read IBM standard labels on input and to write IBM standard labels on output. A facility is included to specify user exits for processing nonstandard label tapes during execution of CMS macro simulations and some CMS tape operation commands. Another facility specifies user written routines to process standard user labels during DOS and OS macro simulation under CMS. The CMS TAPE command is modified to display the VOL1 label when one exists on a read operation, and to write a new VOL1 label during a write operation. The user can also select to bypass tape label processing or to process tapes without labels.

Full Screen Support Via DIAGNOSE X'58'

The user can have full screen console support by issuing DIAGNOSE X'58'. If the user chooses to gain full screen support by issuing the DIAGNOSE, the virtual machine is responsible for processing all control information to the terminal; control information makes most display station facilities (the program function keys, audible alarm, and display intensity) available to the virtual machine.

Enhanced 3270 Support

The support for enhanced 3270 devices is similar to that provided by VM/SP for 3270 displays. The 3274, 3275, and 3276 control units have the same VM/SP support as that of the 3271 and 3272. Also, the 3287 and 3289 printers are handled like the 3284, 3285 and 3288 printers. The 3276 and 3278 display stations are supported as virtual consoles. Features of these display stations include various screen sizes (1920, 2560, and 3440 characters); an optional set of 12 program function (pf) keys for a total of 24; and six new national usage characters.

Addition to VM/370 Extended Control-Program Support (ECPS:VM/370)

ECPS:VM/370 on the 135-3,138, 145-3, and 148 processors has been enhanced to accelerate the processing of the DIAGNOSE instruction used to communicate between a virtual machine and CP. This support is also available on the 4300 processors.

Interactive HELP Facility Under CMS

The HELP Facility is an online informational display service available at the CMS terminal that guides the user in the general user class of CP and CMS commands. It also helps him in responding to CP and CMS messages. When invoked by the CMS user, the HELP facility displays a description of the CP/CMS command requested and its syntax, parameters and message explanations.

CMS File System Extensions

This feature removes the limitation of a maximum of 65,533 items in a CMS file, increases the number of CMS disks that can be accessed to 26, and supports physical block sizes of 800, 1024, 2048, and 4096 bytes for CMS disks.

CMS TAPE Command Improvement

This command modification allows the CMS user to choose a block size of either 4K (4096 bytes) or 800 bytes. A 4096 block size provides greater data transfer efficiency.

CMS Use of CP Page Management Interfaces

Page frames that are released by CMS storage management become available immediately for CP page in activities, avoiding unnecessary CP page out operations.

CP Extensions

The CP extensions modify the storage management algorithm to improve the return of free storage allocation, provide a technique to keep a specified user on top of the runlist via dispatching priority, and modify DIAGNOSE X'18' so that CMS disk I/O CCW translation can be processed more efficiently by ECPS:VM/370.

Small CP Option

The small CP option provides pageable storage to virtual machines. It does this by reducing the size of the resident nucleus. With this option, systems having one megabyte or less of available processor storage may be able to support additional interactive users.

APL/Text Support for the 3270

APL/Text support enhances VM/SP support of the functions provided by the 3270 Information Display System. This system has several optional features that enable display stations and printers to display and print APL and Text character sets as well as the EBCDIC character set.

Display Control for the 3270

This support allows an application program to control intensification or suppression of all or part of a line on a 3270 display station. The cursor can be positioned within a line to the desired location.

Support of the 3289 Model 4 Printer

This support closely parallels the VM/SP support of the 3203 Model 4 printer except that unique buffer images are required.

Support of the 8809 Tape Unit

This support enables the installation to use the 8809 tape unit, which is a two speed tape drive that runs at 12.5 IPS and 100 IPS and uses standard nine-track 1,600 BPI tape. The tape unit is supported at 12.5 IPS by VM/SP and attaches to the 4300 processors in native mode as a channel attached tape drive. The 8809 is supported at 100 IPS by a standalone dump/restore utility to provide high speed system backup capability.

Support of the 3310 and 3370 Direct Access Devices

These devices employ fixed block (512 byte block) mode. Support for these devices provides every aspect of traditional DASD usage in CP on the 4300 processors.

Logical Device Support Facility

The logical device support facility allows an application program running in a virtual machine to create within CP one or more logical 3270 Information Display devices. CP is unaware of the fact that the 3270 terminals have no physical existence and that they are controlled by the application program. CP sees the logical device as a local 3270 display station. The application program communicates with the logical device support facility in CP by means of a new DIAGNOSE X'7C' and a new external interruption code X'2402'.

The VM/Pass-Through Facility program product is one example of an application program that can utilize the logical device support facility. The VM/Pass-Through Facility uses logical device support to allow VM/SP users with display terminals physically connected to their own operating system configuration to gain access to and use the facilities of another VM/SP system.

Support of the 3262 Models 1 and 11 Printers

The 3262 Model 1 is a 650 lines per minute printer; the 3262 Model 11 is a 325 lines per minute printer. These printers are similar to the 3289 Model 4 printer except that the new printer support requires a unique Universal Character Set (UCS) buffer image.

VM/370 System Extensions Function Contained in VM/SP

The following line items are also included in the VM/SP package; these items (along with the Basic System Extensions items above) were originally packaged as VM/370 System Extensions Program Product Release 2 (Program No. 5748-XE1).

- Resource management facilities
- Shadow table maintenance facility
- Single processor mode
- Dynamic SCP transition to or from native mode
- MVS/System Extensions support

Resource Management Facilities

In addition to the function contained in the Basic System Extensions Resource Management Subset, other resource management facilities include a page migration facility and a swap table migration facility. The page migration facility allows CP to migrate inactive pages from the primary, high performance, paging devices to secondary paging devices. By keeping the more active pages on high performance paging devices, page waits are reduced, and better management of the high performance paging devices and preferred paging areas results. The swap table migration facility enables better system use of real storage. Virtual storage segments that remain unused throughout a specific duration have their swap tables copied to secondary storage. The real storage previously occupied by the copied swap tables and their associated page tables is then available to the system.

Shadow Table Maintenance Facility

This enhancement reduces the maintenance overhead associated with maintaining shadow page and segment tables and improves the performance of production virtual storage operating systems running under VM/SP. This facility should be used only for fully tested virtual storage operating systems.

The enhanced facility improves the performance of the virtual operating system run under VM/SP by the following support:

- Multiple shadow table support reduces the number of shadow tables purged when a virtual machine dispatches a new address space.
- Selective invalidation reduces the number of shadow table entries purged when CP steals or releases a page of storage from a virtual machine. CP processing selectively invalidates pages in a shadow table for a virtual machine instead of invalidating the entire shadow table and having to reestablish the pages as a result of a virtual machine request.
- Shadow table bypass for virtual=real users eliminates shadow tables for the virtual=real user by the use of a CP command.
- Shadow table bypass for virtual=virtual users reduces the overhead associated with maintaining shadow tables by the use of a CP command.

Single Processor Mode

The operator can allow an operating system to have exclusive use of one processor. This option is called single processor mode.

Normally, when an MVS AP or MP system runs in a virtual machine under VM/SP, MVS runs uniprocessor mode. That is, VM/SP restricts MVS to one processor that MVS must share with VM/SP. An MVS AP or MP system running in a virtual machine cannot attain the same level of throughput it can attain running in MP mode.

To improve the throughput of an MVS AP or MP system running in a virtual machine, VM/SP provides single processor mode which provides MVS use of one processor while in the V=R virtual machine running under VM/SP. Therefore, single processor mode improves throughput for MVS by running MVS on two processors. The CP command enables the operator to request exclusive control or relinquish exclusive control of a processor for the V=R virtual machine.

Dynamic SCP Transition to or from Native Mode

Provides a way to switch a system control program (SCP) running in a V=R virtual machine to or from native mode. The operator need only issue the CP class A QVM command to deactivate the VM/SP system. He does not need to stop or reload the SCP again. To return the SCP to the VM/SP environment, the operator stops the processor, stores a byte of data into real storage for VM/SP's use, and then restarts the processor using the restart procedure for his particular processor model. For smooth transitions the operator needs to deactivate certain CP operations of the SCP prior to returning to VM/SP.

MVS/System Extensions Support

Allows a user who runs an MVS system in a virtual machine to use the MVS/System Extensions program product (Program Number 5740-XE1). The MVS/System Extensions program product uses the System/SP Extended Facility that is part of the 303x processors or the System/370 Extended Feature that is available on the System/370 models 158 and 168. VM/SP support of the MVS/System Extensions facilitates the use of this hardware facility or feature by an MVS system running in a virtual machine; however, VM/SP does not use this facility for itself or other users. A CP command allows the VM/SP operator to enable and disable all virtual machines to use the MVS/System Extensions program product, provided that the hardware support is present. Additionally, a CP command allows the operator or general user to display whether or not the MVS/System Extensions program product is enabled.

Section 2. Storage Requirements And Module Summary

Storage Requirements

VM/SP requires a minimum of 512K bytes of available processor storage when you implement the small CP option. Mixed mode environments (that is, CMS running concurrently with another virtual operating system) require a minimum of 768K bytes of available processor storage.

With the small CP option, the minimum resident nucleus size of VM/SP Release 2 is approximately 204K which is 12K to 16K larger than the minimum size of the small CP nucleus of VM/SP Release 1.

With full CP, the minimum resident nucleus size of VM/SP Release 2 is approximately 272K which is 20K to 24K larger than the minimum size of the full CP nucleus of VM/SP Release 1.

Note: The nucleus size approximations for VM/SP are for planning purposes only and may vary by several K bytes depending on your installation's configuration.

Module Summary (VM/SP Release 2)

New and changed modules, control blocks, and macros are listed for planning purposes only.

Programmable Operator Facility

New and Changed Modules

DMKCFE	DMKCSU	DMKDIR	DMKIUG	DMKVDD
DMKCFJ	DMKCSV	DMKIUA	DMKMSG	DMSPOP
DMKCFE	DMKDEF	DMKIUC	DMKPSA	DMSPOR
DMKCQR	DMKDEG	DMKIUE	DMKQCN	

Split Modules

None

New and Changed Control Blocks and Macros

EQU	IUCV	PROP	VMBLK	VMBLOK
IPARML	IUCVBLOK	PSA		

New CMS Productivity Aids

New and Changed Modules

DMSABN	DMSDLB	DMSFNS	DMSINI	DMSPRY
DMSACM	DMSDOS	DMSFOR	DMSINS	DMSQRY
DMSASM	DMSDSK	DMSFRE	DMSINT	DMSRDR
DMSASN	DMSDSV	DMSGLO	DMSITS	DMSRNM
DMSBRD	DMSEIO	DMSHLB	DMSLDR	DMSROS
DMSBTB	DMSERS	DMSHLD	DMSLDS	DMSSCN
DMSBWR	DMSEXE	DMSHLE	DMSLST	DMSSTG
DMSCIT	DMSEXI	DMSHLI	DMSNAM	DMSSTT
DMSCMP	DMSFCH	DMSHLL	DMSNUC	DMSSYN
DMSCPF	DMSFLD	DMSHLP	DMSNXD	DMSUPD
DMSCRD	DMSFLE	DMSHLS	DMSNXL	DMSVLT
DMSDDL	DMSFNC	DMSIDE	DMSNXM	DMSXSE
DMSDIO				

Split Modules

None

New and Changed Control Blocks and Macros

CMSLEVEL	NUCON	SCBLOCK	SHVBLOCK	SVCSECT
HLPSECT				

DIAL Command Support For Remote BSC 3270 Users

New and Changed Modules

DMKACO	DMKCQP	DMKDIA	DMKNET	DMKSPL
DMKBLD	DMKCQQ	DMKDIB	DMKPSA	DMKUSO
DMKCFC	DMKCQR	DMKGRF	DMKQCN	DMKVCH
DMKCFM	DMKCSP	DMKHVD	DMKQCO	DMKVCN
DMKCFP	DMKCSQ	DMKLOG	DMKQVM	DMKVCP
DMKCFR	DMKCST	DMKLOH	DMKRGV	DMKVDC
DMKCKP	DMKDAD	DMKMSG	DMKRGK	DMKVDR
DMKCPV	DMKDAS	DMKNEA	DMKRNH	DMKVDS
DMKCQG	DMKDAU	DMKNES	DMKSCN	DMKVSP

Split Modules

None

New and Changed Control Blocks and Macros

ACCTOFF	CLUSTER	NICBLOK	RIOGEN	VBLOKS
ACCTON	NETWORK	RDEVICE	TERMINAL	VDEBLOK

CMS Nucleus Restructured and Removal Of The CMS Tokenization Eight-Byte Restriction

New and Changed Modules

DMSACM	DMSERS	DMSINI	DMSLST	DMSSCN
DMSALP	DMSEXI	DMSINS	DMSNUC	DMSSET
DMSASM	DMSFCH	DMSINT	DMSOME	DMSSIG
DMSBRD	DMSFLD	DMSITS	DMSOSR	DMSSTG
DMSCPF	DMSFLE	DMSLDR	DMSQRY	DMSSTT
DMSDLB	DMSFNC	DMSLDS	DMSRNM	DMSUPD
DMSDSK	DMSFRE			

Split Modules

DMSFLD now split into DMSFLD and DMSFLE.

New and Changed Control Blocks and Macros

EPLIST	NUCON	SYSNAMES
--------	-------	----------

Starter System Full Screen Support

New and Changed Modules

DMKSSP

Split Modules

None

New and Changed Control Blocks and Macros

None

CMS/DOS Upgrade To VSE/Advanced Functions Release 3

New and Changed Modules

DMSAMS	DMSDLB	DMSFCH	DMSOPT	DMSSRV
DMSASN	DMSDLK	DMSFET	DMSPRV	DMSSSTG
DMSBAB	DMSDMP	DMSINS	DMSQRY	DMSSYN
DMSBOP	DMSDSV	DMSITP	DMSRRV	DMSVLT
DMSCLS	DMSEND	DMSLLU	DMSSET	DMSVSR
DMSCVH	DMSETR	DMSOPL	DMSSMN	DMSXCP
DMSDAS				

Split Modules

None

New and Changed Control Blocks and Macros

BGCOM	DTFX	SYSKOM	SUBSID
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Command Retrieve Capability

New and Changed Modules

DMKBLD	DMKCPI	DMKGRF	DMKQCO	DMKUSO
DMKCFJ	DMKCQY	DMKGRT	DMKRET	DMKVCP
DMKCF5	DMKDIA	DMKLOH	DMKRGC	DMKVCR
DMKCFY	DMKDIR	DMKPSA	DMKSEP	

Split Modules

None

New and Changed Control Blocks and Macros

CALL	PSA	SNARBLOK	VMBLK	VMBLOK
PFKTABLE	RETBUF			

Query Command Enhanced To Obtain System Identification Information

New and Changed Modules

DMKCPI

Split Modules

None

New and Changed Control Blocks and Macros

PSA

Enhanced ASCII Support

New and Changed Modules

DMKBLD	DMKTTY	DMSCIT	DMSEXT	DMSSOP
DMKCF5	DMKUSO	DMSCP5	DMSINS	DMSSQS
DMKCNS	DMKVCN	DMSCRD	DMSINT	DMSSVN
DMKCQR	DMKVDR	DMSCWR	DMSNUC	DMSSVT
DMKQCN	DMKVDS	DMSCWT	DMSSBD	DMSSVU
DMKQCO	DMSABN	DMSDBG	DMSSBS	
DMKTBL	DMSARK	DMSEXC	DMSSCT	
DMKTBN	DMSASM	DMSEXI	DMSSEB	

Split Modules

Some code moved from DMKTBL to DMKTBN

New and Changed Control Blocks and Macros

CONTASK	IO	NUCON	RDTERM	VCONCTC
EQU	IOBLOKS	RBLOKS	RDEVBL0	VMBLOK

Enhanced 3800 Support

New and Changed Modules

DMKCPI	DMKCST	DMKDRD	DMKSPL	DMKVDR
DMKCQG	DMKCSU	DMKEMB	DMKTCS	DMKVDS
DMKCQH	DMKCSV	DMKRSP	DMKTCT	DMKVSP
DMKCSP				

Split Modules

None

New and Changed Control Blocks and Macros

HLDAREA	RBLOKS	SPOOL	VBLOKS
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Trace Table Recording Facility

New and Changed Modules

DMKCFC	DMKDRD	DMKPRG	DMKTRP	DMKTRT
DMKCKV	DMKDSP	DMKSPS	DMKTRR	DMKUSO
DMKDIR	DMKEMB			

Split Modules

None

New and Changed Control Blocks and Macros

CPTRAP	PSA	SETCC	TRTDATA	VMBLOK
OTABDATA				

Pass-Through Hooks

New and Changed Modules

DMKCFP	DMKGRF	DMKHPT	DMKPSA	DMKUSO
DMKDIA	DMKHPS	DMKIOT	DMKSCN	DMKVSI
DMKDSP				

Split Modules

None

New and Changed Control Blocks and Macros

VMPSCOM

Section 3. System Requirements And Planning Information

This section discusses VM/SP:

- Program and hardware requirements
- Configuration information
- Distribution and installation procedures

Program Requirements

VSE/VSAM Release 2 program product support and CMS/DOS services for VSE/Advanced Functions Release 3 are supported by VM/SP Release 2. VM/SP High Performance Option Release 3 is supported by VM/SP Release 2.

Support under CMS/DOS of VSE/VSAM or interactive file sharing requires the VSE/VSAM Release 2 program product (5746-AM2) or the VM/Interactive File Sharing program product (5748-XXC) respectively. VSE/VSAM support and interactive file sharing support in VM/SP do not require the installation of DOS/VSE or the VSE/Advanced Functions program product.

The CMS/DOS environment does not support the following new functions provided by the VSE/VSAM Release 2 program product:

- DASD Sharing.
- VSE/VSAM Space Management for the Sequential Access Method (SAM) Feature.
- Backup/Restore Feature.

CMS/DOS facilities (such as high level language compilers) that access VSE/Advanced Functions libraries require the installation of DOS/VSE and VSE/Advanced Functions Release 2 or 3 program product.

Hardware Requirements

VM/SP has the following hardware requirements:

- Single processor mode requires the multiprocessor feature on one of the following System/370 processors: 158AP, 158MP, 168AP, 168MP, 3031AP, 3033AP, 3033MP, 3033 Model Group S, 3033 Model Group N, and the 3081.
- Extended Control-Program Support (ECPS:VM/370) requires the following engineering change (EC) levels:

MODEL	EC LEVEL
135-3	149136 and later
138	149136 and later
145-3	356901 and later
148	147710 and later
4331MG1	364290 and later
4331MG2	364415 and later
4341MG1	154315 and later
4341MG2	856093 and later
3031	276270 and later
3031AP	274276 and later

ECPS:VM/370 support for the 4300 processors is included in the initial shipment of these processors.

EC levels 154325/866871 (and later) on the 4341MG1 and EC level 856095 (and later) on the 4341MG2 provide an update to ECPS:VM/370. This update provides an enhanced free storage algorithm and removes an incompatibility in the simulation of the TCH instruction.

The EC Level for shadow table bypass (a feature of the Shadow Table Maintenance Facility) on the 3031 and 3031AP processors is 276271 and later.

The remaining VM/SP functions operate on any hardware configuration VM/SP supports.

- MVS/System Extensions support and MVS/System Product support require
 - the IBM System/370 Extended Feature on a System/370 Model 158, 168, 158AP, 158MP, 168AP or 168MP; or
 - the System/370 Extended Facility on the Model 3031, 3031AP, 3032, 3033, 3033AP, 3033AP-2, 3033MP, 3033 Model Group S, 3033 Model Group N, 3081; or
 - the ECPS:MVS Facility on the 4341 Model Group 2 processor.

Supported Hardware

Processors

VM/SP supports the following processors:

System/370 Model 135
 System/370 Model 135-3
 System/370 Model 138
 System/370 Model 145
 System/370 Model 145-3
 System/370 Model 148
 System/370 Model 155-II
 System/370 Model 158
 System/370 Model 158-3
 System/370 Model 158AP
 System/370 Model 158MP

System/370 Model 165-II
System/370 Model 168
System/370 Model 168-3
System/370 Model 168AP
System/370 Model 168MP
IBM 3031 Processor
IBM 3031AP
IBM 3032 Processor
IBM 3033 Processor
IBM 3033AP
IBM 3033 Model Group S Processor
IBM 3033 Model Group N Processor
IBM 3033MP
IBM 3033AP-2
IBM 4321 Processor
IBM 4331 Processor
IBM 4331 Model Group 2 Processor
IBM 4331 Model Group 11 Processor
IBM 4341 Processor
IBM 4341 Model Group 2 Processor
IBM 4341 Model Group 10 Processor
IBM 4341 Model Group 11 Processor
IBM 3081 Processor Complex

VM/SP Release 2 will support AP/MP and 3081 Model D16 in first quarter 1983.

Direct Access Storage Devices

VM/SP supports the following direct access storage devices:

2305, Models 1 and 2
2314
2319
3310
3330
3333
3340
3344
3350
3370
3375
3380

Notes:

1. The 2305 Model 1 can be used with only the 168 and 165-II processors.
2. The 3310 and 3370 employ fixed block architecture. The 3310 applies only to the 4321 and 4331 processors. The 3310 and 3370 apply to the 4300 processors.
3. The 3850 Mass Storage System 3330V volumes are supported as 3330 devices.

VM/SP supports all of these direct access devices as VM/SP system residence, spooling, and paging devices (except 3850 MSS 3330V volumes) and as virtual devices for use by virtual machines. VM/SP supports all of these devices as dedicated devices. VM/SP supports all these devices as system resident devices except for the 2305, 2314, 2319, or 3340-35 DASDs. CMS supports all of them except the 2305.

Magnetic Tapes

VM/SP supports the following magnetic tape devices:

- 2401
- 2402
- 2403
- 2415 Models 1,2,3,4, and 5
- 2420 Models 5 and 7
- 3410/3411 Models 1,2, and 3
- 3420 Models 3,4,5,6,7, and 8
- 8809

Note: The 8809 magnetic tape device is applicable to the 4331 processor only.

Unit Record Devices (Readers, Punches, and Printers)

VM/SP supports the following unit record devices:

- Card Readers
 - 2501, Models B1 and B2
 - 2540, Model 1
 - 3505, Models B1 and B2
- Card Punches
 - 2520, Models B2 and B3
 - 3525, Models P1,P2, and P3
- Printers
 - 1403, Models 2,3,7, and N1
 - 1443, Model N1
 - 3203, Models 4 and 5
 - 3211
 - 3213
 - 3262, Models 1 and 11
 - 3289, Model 4
 - 3800 Printing Subsystem

Terminals

VM/SP supports the following system consoles/terminals:

- 1050
- 2150
- 2250
- 2741
- 3036 (for 303x processors)

3066, Models 1 and 2
3101
3210, Models 1 and 2
3215
3250
3275, Model 2
3276, Models 2,3, and 4
3277, Model 2
3278, Models 2,3,4, and 5
3278, Model 2A (for the 4300 processors)
3279, Models 2A, 2B, 3A and 3B
3767, Models 1 and 2
7412
TTY 33/35

Note: The VM/VCNA program product required for SNA support in VM/SP supports 3790 controller attached 3270s or 8100 controller attached 3270s and 8775s in 3270 data stream compatibility mode only.

Transmission Control Units

VM/SP supports the following transmission control units:

2701
2702
2703
3704
3705-I
3705-II
a Communications Adapter (CA #1601) on the 4331 processor

VM/SP Minimum Configuration

- One of the processors listed previously with at least 384K bytes of available processor storage.¹
- One system console device.
- One printer.
- One card reader.²
- One card punch.²
- Two disk drive units.
- One 9-track magnetic tape unit.
- One multiplexer channel.

¹ VM/SP requires a minimum available processor storage of 512K bytes when you implement the small CP option. The minimum available processor storage requirement to support a VM/SP mixed mode environment (that is, CMS running concurrently with another virtual operating system) is 768K.

² This device is not needed for a cardless system. To generate a cardless system, refer to *VM/SP Planning and System Generation Guide*.

- One selector or block multiplexer channel.

The requirement for one selector or block multiplexer channel can be eliminated when the file tape adapter is used with the 8809 tape unit.

Configuration Supported By CMS

- The minimum virtual storage size for CMS for the shared system version is 256K bytes and for the nonshared system version is 2M bytes. Virtual storage can be as large as 16 megabytes added in multiples of 4K bytes.
- Any terminal supported by VM/SP as a virtual operator's console can be used by CMS.
- CMS can use as a spooling device, any virtual (nondedicated) card reader, card punch (except the 2520), and printer that VM/SP supports.
- CMS supports up to 26 virtual 2314, 2319, 3310, 3330, 3333, 3340, 3344, 3350, 3370, 3375 and 3380 direct access storage devices, as well as 3850 Mass Storage System 3330V volumes, as 3330 devices. The recommended minimum size of each virtual disk is one cylinder or 12 FBA blocks. The CMS system disk is required and reduces the number of user disks that can be accessed at any given time to 25.
- CMS supports up to four 2400, 2415, or 3420 (7 or 9 track), or 8809 and 3410 (9 track only) magnetic tape units.

OS/VS2 SVS Installations

Installations that use OS/VS2 SVS must install PTF UY77566 after installing VM/SP.

Distribution

VM/SP is a separately orderable program package that incorporates the functions of earlier VM/370 program products, VM/370 Release 6 base (Program No. 5749-010), Basic System Extensions, Release 2 (Program No. 5748-XX8), and System Extensions, Release 2 (Program No. 5748-XE1), together with functions that are unique to VM/SP.

Product Tapes

Customers order the VM/SP package by feature number; the correct order number depends on:

- The tape density the customer needs -- either 1600 bpi or 6250 bpi tapes.
- Whether the customer ordering the VM/SP package is a user of an IBM processor.
- Whether the user wants to order a starter system.

Depending on the tape density you need, you receive VM/SP on one or more product tapes:

- If you request a tape density of 1600 bpi, you receive three product tapes.

- If you request a tape density of 6250 bpi, you receive one combined product tape.

The text tape contains six files.

TEXT TAPE
Prep Exec
EOF/TM
Samples
EOF/TM
CP Text
EOF/TM
HELP textfiles
EOF/TM
EREP TXTLIB(s)
EOF/TM
CMS Text
EOF/TM

The CMS source tape contains source code and macro instructions:

CMS SOURCE TAPE
(Source code, macro instructions)
EOF/TM

The CP source tape contains source code and macro instructions:

CP SOURCE TAPE
(Source code, macro instructions)
EOF/TM

Starter Systems

In addition, users may order starter systems for the VM/SP product tapes. For details on generating VM/SP, refer to *VM/SP Planning and System Generation Guide*.

Note: Customers who order a starter system will automatically receive the VM/SP product tape(s).

The format of the VM/SP starter system tape is:

DMKFMT (Format Service Program)
EOF
DMKDDR (DASD Dump Restore Service Program)
EOF
CP Nucleus CMS System CMS Libraries
EOF

¹The CMS libraries do not include HELP files or EREP files; these are shipped as part of the VM/SP product tape(s).

Maintenance of Your VM/SP System

VM/SP maintenance is done by the application of service from a Program Update Tape (PUT) distributed periodically by IBM. The PUT is customized to a user's order profile. It may contain more than one tape volume. The PUT contains cumulative service for the system control program and/or service for associated program products for which the user has a license. The cover letter that accompanies the PUT identifies how to print the machine readable PUT document. This document describes what the PUT contains and how to apply service to the system.

There are instances, however, when your installation may need to apply an update to an individual module or apply a fix that is not included in the PUT. In addition, you may wish to modify your system to suit your own specifications. *VM/SP Planning and System Generation Guide* provides procedures you can follow to manually update your system using VM/SP service routines.

Section 4. Compatibility/Incompatibility

VM/SP Release 2 is compatible with VM/SP Release 1, VM/370 Release 6 and its extensions, VM/370 Basic System Extensions program product (Program Number 5748-XX8), and VM/370 System Extensions program product (Program Number 5748-XE1).

Migration Compatibilities

For easier migration several existing items are maintained and supported by VM/SP.

- 800 byte blocksize for CMS files
- Coexistence of the CMS Editor and the VM/SP System Product Editor

For ease of migration, the existing CMS editor is supported by VM/SP. However, CMS Editor commands are executed under the control of the System Product editor using compatibility macros, in CMS Editor compatibility mode. In this mode, the user can issue existing CMS Editor subcommands as well as any new System Product Editor subcommands. If the user desires, he can invoke the CMS Editor instead of the System Product Editor in EDIT compatibility mode by specifying OLD as an option on the EDIT command.

The System Product Editor also provides a Display Editing System (DES) compatibility mode for those installations having the Display Editing System IUP (5796-PJP). The user can issue most DES subcommands as well as System Product Editor subcommands in DES mode. The display format of the screen is similar to the DES display screen format. If the user desires he can also invoke DES instead of the System Product Editor in DES compatibility mode by specifying OLD as an option on the EDGAR command. To invoke DES rather than the System Product Editor, the EDGAR modules must reside on an accessed disk.

- Coexistence of the EXEC and EXEC 2 language processors

For ease of migration, VM/SP supports the current EXEC processor. Existing EXEC programs execute unchanged under the old EXEC processor. The user may have to rewrite and rename existing CMS EXECs to execute properly under the new EXEC 2 processor.

- Application programs that currently execute under the VM/370 Basic System Extensions program product or the VM/370 System Extensions program product and are not dependent on internal CP or CMS structure and/or control blocks should also run on the VM/System Product.
- An application program that executed successfully in the CMS/DOS environment of previous releases of VM/370 Basic System Extensions and VM/370 System Extensions program products, also executes successfully in a VM/SP CMS/DOS environment if the application program:
 - Interfaces with the CMS/DOS environment through VM/SP provided macro instructions or through high level language statements of compilers supported by VM/SP.

- Does not alter its DASD Sequential Access Method (SAM) DTF blocks.

Incompatibilities

IPCS Incompatibilities with VM/SP

The installation should not use the IPCS component of VM/370 in a VM/SP environment for:

- Analysis, formatting, and printing of CP dumps taken when the system runs in MP mode
- Analysis of CP dumps with an abend code added since VM/370 Release 6

In addition, the user should be aware that control blocks are formatted by the IPCS component in the Release 6 format. If a block is extended for VM/SP, IPCS does not format the control block extensions. Since the pointer path to RECBLOK has changed for VM/SP, the information that the IPCS component formats to represent the RECBLOK is unpredictable.

The following control blocks are formatted by the IPCS component of VM/370. Those marked with an asterisk indicate that they are extended to accommodate VM/SP code. The extensions to these control blocks are not formatted by the IPCS component:

CONTASK	*RSPLCTL
*ECBLOK	*SFBLOK
*IOBLOK	*VCHBLOK
IOERBLOK	*VCONCTL
RCHBLOK	VCUBLOK
*RCUBLOK	*VDEVBLOK
*RDEVBLOK	*VMBLOK
*RECBLOK (not formatted)	VSPLCTL

To implement the full capabilities of the VM/SP product, installations should consider a migration to the Release 2 level of the VM/Interactive Problem Control System (VM/IPCS) Extension program product (Program Number 5748-SA1).

RSCS Incompatibilities with VM/SP

The RSCS component of VM/370 has not been modified to support the new function contained in VM/SP that has been added since VM/370 Release 6. The unmodified RSCS component shipped as part of VM/SP does not:

- Handle virtual 3800 spool files.
- Use a system disk formatted in 1K, 2K, or 4K block sizes.
- Use a system disk residing on a 3380 or FBA (3310/3370) device.
- Support remote 3270 Information Display printers, dedicated to virtual machines.

Installations wishing to implement the full capabilities of VM/SP should consider a migration to the Release 2 level of the RSCS Networking program product (5748-XP1) that supports new VM/SP function.

Other Incompatibilities

Multiprocessor Support

VM/SP does not support virtual MP (multiprocessor) mode. That is, you cannot run MVS in multiprocessor mode as a guest operating system running under VM/SP. However, you can utilize the facilities of single processor mode to emulate an MVS multiprocessor configuration.

CMS File System Extensions

Introduction of an extended disk format causes incompatibilities between the physical disk formats of the current CMS file system and the enhanced disk formats of CMS disks. Conversion of CMS disks from current file system disk format to the extended disk format is not required but the installation can do it easily. Normally, the fastest means of conversion for the entire CMS disk file system is to use the CMS COPYFILE command. This command reads from the current format disks and writes to extended format disks. With the CMS FORMAT command, you can create an appropriately sized minidisk to receive the converted data. Then, using the generic option of COPYFILE (COPYFILE * * a, for instance), you can copy an entire CMS disk to the extended format disk. Finally, you can use the CMS DDR command to place the new format CMS disk back on the original disk, if you prefer.

The extended file system maintains compatibility with user programs written at a macro instruction level (that is, the parameter list level). The design of the extended file system requires changes to several major CMS internal control blocks including NUCON, ADT, AFT, FVS, and FST. Consequently, user programs that modify internal control blocks may require compilation and/or recoding.

The extended CMS file system can produce and read tapes in current blocksize. Slight format differences of TAPE and DISK DUMP records produced by the extended CMS file system cannot be distinguished by the VM/SP system and are processed normally.

Support of the 3262 Models 1 and 11 Printers

System programmers must be sensitive to any system macro instruction changes resulting from 3262 Models 1 and 11 support. Operators must be certain that the correct UCS buffer image is loaded for the 3262 printer.

Support of the 3289 Model 4 Printer

System programmers must be sensitive to any system macro instruction changes resulting from 3289 Model 4 printer support. Operators must be certain that the correct UCS buffer image is loaded for the 3289 printer.

Support of the 3310 and 3370 Direct Access Storage Devices

Conversion to the 3310 and 3370 devices requires significant changes at system generation time. The RDEVICE macro instructions must be provided for the new devices, as must the SYSRES macro if the SYSRES pack is to reside on a 3310 or 3370. Savedbsystems and discontinuous shared segments to be kept on a 3310/3370 require NAMESYS macro instruction changes, and 3704/3705 control programs require NAMENCP macro instructions that reflect 3310/3370 device characteristics (such as fixed block formatting). User programs written to perform their own DASD I/O (providing their own CCW string) do not function properly

unless they perform that I/O to a non-3310/3370 device. User programs that use the CMS file management routines continue to function properly despite the conversion to 3310 and 3370 devices.

MVS/System Extensions Support

The MVS/System Extensions program product support does not include support for an MVS operating system running under a VM/SP system that is itself running under VM/SP.

On the Model 158 and the I/O processor of the 158AP, Virtual Machine Assist Feature and the System/370 Extended Feature are mutually exclusive. Both may be installed together on the non-I/O processor of the 158AP; however, the user of the feature that is not installed on the I/O attached processor must establish affinity to the non-I/O attached processor. RPQ #MK3272 allows co-residence of Virtual Machine Assist and System/370 Extended on the 158-3.

Single Processor Mode

Use of single processor mode requires no changes to existing application programs.

A VM/SP system running in a V=R virtual machine cannot use single processor mode. If VM/SP is loaded into the V=R area with single processor mode active, VM/SP runs in uniprocessor mode.

CMS Tape Label Processing Support

There are some minor incompatibilities between CMS standard label processing for DOS and OS macro instruction simulation and the actual processing when OS or DOS is running in a real or virtual machine. For example, there is no end of volume support. Refer to *VM/SP CMS User's Guide* for a complete list of incompatibilities.

Section 5. Migration Considerations

VM/SP

A virtual machine created by VM/SP is capable of running an IBM System/360 or System/370 operating system as long as certain VM/SP restrictions are not violated. Virtual machine restrictions and certain execution characteristics are stated in this section.

Two components, CP and CMS, have been extensively modified and integrated into a VM/370 Release 6 base. This collective package (CP and CMS) is referred to as VM/SP. However, there are recommended program products (Remote Spooling Communication Subsystem (RSCS) Networking, program number 5748-XP1) and Interactive Problem Control System (IPCS) Extension, program number 5748-SA1) available that have been technically advanced to function supportively with VM/SP.

Restrictions - Channel Program

Looping channel programs should be avoided. Execution of a backward transfer in channel CCW to an I/O CCW that will present channel end and device end concurrently could result in locking out the device as well as the channel. Users attempting to access devices on the channel will also be locked out. To recover from this situation, the CP HALT command must be issued to the device or have the operator issue a system reset.

Dynamically Modified Channel Programs

In general, virtual machines may not execute channel programs that are dynamically modified (that is, channel programs that are changed between the time the START I/O (SIO) is issued and the time the input/output ends, either by the channel program itself or by the processor).

Exceptions (that is, dynamically modified channel programs given special consideration by CP) are:

- Those generated by the Indexed Sequential Access Method (ISAM) running under OS/PCP, OS/MFT, and OS/MVT
- Those generated by ISAM running in an OS/Virtual=real partition
- Those generated by the OS/Virtual=real Telecommunications Access Method (TCAM) Level 5, with the VM/SP option
- Those containing polling sequences

The self-modifying channel programs that ISAM generates for some of its operations receive special handling if the virtual machine using ISAM has that option specified in its VM/SP directory entry. There is no such restriction for DOS ISAM, or for ISAM if it is running in an OS/Virtual=virtual partition. If ISAM is to run in an OS/Virtual=real partition, you must specify the ISAM option in the VM/SP directory entry for the OS/Virtual machine.

Virtual machines using OS/Virtual=real TCAM (Level 5, generated or invoked with the VM/SP option) issue a DIAGNOSE instruction when the channel program is modified. This instruction causes CP to reflect the change in the virtual CCW string to

the real CCW string being executed by the channel. CP is then able to execute the dynamically modified channel program properly.

When a virtual machine starts a channel program containing a polling sequence, the CCW translation sets a PCI bit in the real CCW string. Each time the real CCW string is executed, the resulting PCI interruption causes CP to examine the corresponding virtual CCW string for changes. Any changes to the virtual CCW string are also made to the real CCW string while it is executing.

The restriction against dynamically modified channel programs does not apply if the virtual machine has the virtual=real performance option and the NOTRANS option has been set on.

Minidisk Restrictions

The following restrictions exist for minidisks:

1. In the case of read home address with the skip bit off, VM/SP modifies the home address data in user storage at the completion of the channel program because the addresses must be converted for minidisks; therefore, the data buffer area may not be dynamically modified during the input/output operation.
2. In the case of read device characteristics to an FB-512 device with the skip bit off, VM/SP modifies the data in user storage at completion of the channel program so the data reflects the true minidisk size and characteristics. Therefore, the data buffer area cannot be dynamically modified during the input/output operation.

Note: The user should not attempt to use this data during the I/O operation.

3. On a minidisk, if a CCW string uses multitrack search on input/output operations, subsequent operations to that disk must have preceding seeks or continue to use multitrack operations. There is no restriction for dedicated disks.
4. OS/PCP, MFT, and MVT ISAM or OS/VS ISAM running virtual=real may be used with a minidisk only if the minidisk is located at the beginning of the physical disk (that is, at cylinder 0). There is no such restriction for DOS ISAM or OS/VS ISAM running virtual=virtual.

Note: Because the VS1 system does no paging, any ISAM programs run under VS1 are treated by VM/SP as though they are running in an ADDRSPC=REAL partition.

5. VM/SP does not return an end-of-cylinder condition to a virtual machine that has a virtual 2311 mapped to the top half (that is, tracks 0 through 9) of 2314 or 2319 cylinders.
6. If the user's channel program for a count-key-data minidisk does not perform a seek operation, then to prevent accidental accessing, VM/SP inserts a positioning seek operation into the user's channel program. Thus, certain channel programs may generate a condition code (CC) of 0 on a SIO instead of an expected CC of 1, which is reflected to the virtual machine. The final status is reflected to the virtual machine as an interrupt.
7. A DASD channel program directed to a 3330, 3340, 3350, 3375, or 3380 device may give results on dedicated drives which differ from results on mini-

disks having non-zero relocation factors if the channel program includes multiple-track operations and depends on a search ID high or a search ID equal or high to terminate the program. This is because the record 0 count fields on these devices must contain the real cylinder number of the track on which they reside. Therefore, a search ID high, for example, based on a low virtual cylinder number may terminate prematurely if a real record 0 is encountered.

Note: Minidisks with non-zero relocation factors on 3330, 3340, 3350, 3375, or 3380 devices are not usable under OS and OS/VS systems. This is because the locate catalog management function employs a search ID equal or high CCW to find the end of the VTOC.

8. If the DASD channel programs directed to 3330/3340/3350 devices include a write record R(0), results differ depending on whether the 3330/3340/3350/3375/3380 is dedicated (this includes a minidisk defined as the entire device) or nondedicated. For a dedicated 3330/3340/3350/3375/3380, a write R(0) is allowed, but the user must be aware that the track descriptor record may not be valid from one 3330/3340/3350/3375/3380 to another. For a nondedicated 3330/3340/3350/3375/3380, a write record R(0) is replaced by a read record R(0) and the skip flag is set on. This could result in a command reject condition due to an invalid command sequence.
9. When performing DASD I/O, if the record field of a search ID argument is zero when a virtual Start I/O is issued, but the search ID argument is dynamically read by the channel program before the search ID CCW is executed, then the real search ID uses the relocated search argument instead of the argument that was read dynamically. To avoid this problem, the record field of a search ID argument should not be set to binary zero if the search argument is to be dynamically read or if a search ID on record 0 is not intended.
10. On FB-512 devices, the use of the CE area is different for dedicated devices and minidisks. Any user with a dedicated device can use the CE area. However, only class F users can use the CE area for minidisks.
11. FB-512 diagnostic commands are also handled differently for dedicated devices and minidisks. Any user with a dedicated device can issue diagnostic CCWs. For minidisks, however, only users with a minidisk equal to the size of the entire pack can issue a diagnostic control command. Because diagnostic sense commands must be chained from a diagnostic control command, this restriction indirectly applies to those commands also.
12. **DIAGNOSTIC READ HOME ADDRESS** and **DIAGNOSTIC WRITE HOME ADDRESS** commands are supported only for:
 - Dedicated devices
 - Minidisks that start at cylinder 0 (real)Use of **DIAGNOSTIC WRITE HOME ADDRESS** is restricted to class F users.

13. Refer to *Device Support Facilities, GC35-0033*, for procedures for formatting 3375 and 3380 direct access storage for use in an OS/VS operating system running in a virtual machine.

Timing Dependencies

Timing dependencies in input/output devices or programming do not function consistently under VM/SP:

1. The following telecommunication access methods (or the designated option) violate the restriction on timing dependency by using program-controlled interrupt techniques and/or the restriction on dynamically modified channel programs:
 - OS Basic Telecommunications Access Method (BTAM) with the dynamic buffering option.
 - OS Queued Telecommunications Access Method (QTAM).
 - DOS Queued Telecommunications Access Method (QTAM).
 - OS Telecommunications Access Method (TCAM).
 - OS/VS Telecommunications Access Method (TCAM) Level 4 or earlier, and Level 5 if TCAM is not generated or invoked with the VM/SP option.

These access methods may run in a virtual=real machine with CCW translation suppressed by the SET NOTRANS ON command. Even if SET NOTRANS ON is issued, CCW translation will take place if one of the following conditions is in effect:

- The channel program is directed at a nondedicated device (such as a spooled unit record device, a virtual CTCA, a minidisk, or a console).
- The channel program starts with a SENSE operation code.
- The channel program is for a dialed terminal invoked by the DIAL command.
- START I/O tracing is in effect.
- The CAW is in page zero or beyond the end of the virtual=real area.

(OS BTAM can be generated without dynamic buffering, in which case no virtual machine execution violations occur. However, the BTAM reset poll macro will not execute under VM/SP if issued from third level storage. For example, a reset poll macro has a NOP effect if executed from a virtual=virtual storage under VS1 which is running under VM/SP.)

2. Programming that makes use of the PCI channel interrupt for channel program modification or processor signalling must be written so that processing can continue normally if the PCI is not recognized until I/O completion or if the modifications performed are not executed by the channel.
3. Devices that expect a response to an interrupt within a fixed period of time may not function correctly because of execution delays caused by normal VM/SP

system processing. An example of such a device is the IBM 1419 Magnetic Character Reader.

4. The operation of a virtual block multiplexer channel is timing dependent. For this reason, the channel appears available to the virtual machine operating system, and channel available interrupts are not observed. However, operations on virtual block-multiplexing devices should use the available features like Rotational Position Sensing to enhance utilization of the real channels.
5. Devices that experience extreme performance penalties if not reinstructed within a fixed interval may experience this penalty during every I/O operation. An example is the 8809 tape drive. Setting the mode to “streaming” may actually result in a slower data rate than running in nonstreaming mode. Execution delays, caused by normal VM/SP processing, prevent a timely reinstruct and the 8809 tape drive may sustain a 1.2 second delay on every I/O operation. The result is that the effective data rate is 12.5 IPS. The user must decide (based mainly on the size of the I/O buffers) between running at 100 IPS with continuous delays and running at 12.5 IPS; then set the mode accordingly.

Processor Model-Dependent Functions

On the System/370 Model 158 only, the virtual machine assist feature cannot operate concurrently with the 7070/7074 compatibility feature (#7117).

Programs written for processor model-dependent functions may not execute properly in the virtual machine under VM/SP. The following points should be noted:

1. Programs written to examine the machine logout area do not have meaningful data since VM/SP does not reflect the machine logout data to a virtual machine.
2. Programs written to obtain processor identification (via the Store CPUID instruction, STIDP) receive the real machine value. When the STIDP instruction is issued by a virtual machine, the version code contains the value 255 in hexadecimal (“FF”) to represent a virtual machine.
3. No simulation of other processor models is attempted by VM/SP.
4. Since an operating system’s channel error recovery procedures may be processor model- and channel model-dependent, operating systems that will run in a virtual machine may have to be generated for the same model of processor that VM/SP will be running on.

Channel Model-Dependent Functions

Channel checks (channel data check, channel control check and interface control check) no longer cause the virtual machine to be reset. They are reflected to the virtual machine as other I/O errors are. This provides the operating system or other programs in the virtual machine with the opportunity to attempt recovery or close out its operation in an orderly manner. To take full advantage of this the virtual machine should comply with the following requirement:

Each virtual channel should map to real channels of a single type. In other words, the virtual devices on a virtual channel should all map to real devices on real channels of a single type and model. These real channels should all be the same as each other, but not necessarily the same as the virtual channel.

If the I/O configuration of a virtual machine does not meet the above requirement, no warning message is issued and the virtual machine will run successfully until a channel check occurs. In this case, when a channel check occurs, there is a possibility that the channel extended logout data may be inconsistent with the data provided by the store channel id (STIDC) instruction.

Note: Virtual machines running CMS do not need to comply with these requirements. Here, only unit record spooling and diagnose I/O are performed. For unit record spooling there are no channel checks and for diagnose I/O, CP attempts to perform the error recovery itself.

When the store channel id instruction (STIDC) is executed in a virtual machine, it returns information from an arbitrary channel, one of several the specified virtual channel may map to. The type, model, and logout length data returned by the STIDC are the same as the real channel except that when a real channel is a block multiplexer and the virtual channel is a selector, the type field returned by STIDC indicates a selector channel.

Since the STIDC returns identifying data from the real channel, channel model-dependent error recovery procedures can use STIDC to identify the channel.

Channel extended logouts are reflected to the virtual machine in a manner that is processor model- and channel model-dependent and consistent with the data returned by STIDC (provided that the virtual-to-real channel mapping complies with the requirement stated previously).

A deviation in the handling of channel extended logouts occurs if the virtual machine uses the bit in control register 14 to mask out channel extended logouts. In a virtual machine, any channel extended logouts that are masked out by control register 14 are lost rather than kept pending, and the logout pending bit (bit 5) in the CSW is never set. However, channel extended logouts will not be lost when they are kept pending along with their associated I/O interrupts by the channel masks in control register 2 and the PSW. Regardless of whether or not the setting of the virtual machine's control register 14 causes it to lose the channel extended logout, CP will still successfully record the logout in its own error recording cylinders.

Virtual Machine Characteristics

Other characteristics that exist for a virtual machine under VM/SP are as follows:

1. If the virtual=real option is selected for a virtual machine, input/output operations specifying data transfer into or out of the virtual machine's page zero, or into or out of storage locations whose addresses are greater than the storage allocated by the virtual=real option, must not occur. The storage-protect-key mechanism of the IBM System/370 processor and channels operates in these situations but is unable to provide predictable protection to other virtual machines. In addition, violation of this restriction may compromise the integrity of the system. The results are unpredictable.
2. A two-channel switch can be used between the IBM System/370 running a virtual machine under VM/SP and another processor.
3. The DIAGNOSE instruction cannot be issued by the virtual machine for its normal function. VM/SP uses this instruction to allow the virtual machine to communicate system services requests. The Diagnose interface requires the

operand storage addresses passed to it to be real to the virtual machine issuing the DIAGNOSE instruction. For more information about the DIAGNOSE instruction in a virtual machine, see the *VM/SP System Programmer's Guide*.

4. A control unit normally never appears busy to a virtual machine. An exception exists when a forward space file or backward space file command is executed for a tape drive. Subsequent I/O operations to the same virtual control unit result in a control unit busy condition until the forward space file or backward space file command completes. If the real tape control unit is shared by more than one virtual machine, a control unit busy condition is reflected only to the virtual machine executing the forward space file or backward space file command. When a virtual machine attempts an I/O operation to a device for which its real control unit is busy, the virtual machine is placed in I/O wait (nondispatchable) until the real control unit is available. If the virtual machine executed a SIOF instruction (rather than SIO) and was enabled for block-multiplexing, it is not placed in I/O wait for the above condition.
5. The CP IPL command cannot simulate self-modifying IPL sequences off dedicated unit record devices or certain self-modifying IPL sequences off tape devices.
6. The VM/SP spooling facilities do not support punch-feed-read, stacker selection, or column binary operations. Detection of carriage control channels is supported for a virtual 3211 only.
7. VM/SP does not support count control on the virtual 1052 operator's console.
8. Programs that use the integrated emulators function only if the real computing system has the appropriate compatibility feature. VM/SP does not attempt simulation. The DOS emulator running under OS or OS/VSE is not supported under VM/SP.
9. The READ DIRECT and WRITE DIRECT instructions are not supported for a virtual machine.
10. The System/370 SET CLOCK instruction cannot be simulated and, hence, is ignored if issued by a virtual machine. The System/370 STORE CLOCK instruction is a nonprivileged instruction and cannot be trapped by VM/SP; it provides the true TOD clock value from the real processor.
11. The 1050/1052 Model 2 Data Communication System is supported only as a keyboard operator's console. Card reading, paper tape I/O, and other modes of operation are not recognized as unique, and hence may not work properly. This restriction applies only when the 1050 system is used as a virtual machine operator's console. It does not apply when the 1050 system is attached to a virtual machine via a virtual 2701, 2702, or 2703 line.
12. The pseudo-timer (usually device address 0FF, device type TIMER) does not return an interrupt from a Start I/O; therefore, do not use EXCP to read this device.
13. A virtual machine device IPL with the NOCLEAR option overlays one page of virtual machine storage. The IPL simulator uses one page of the virtual machine to initiate the IPL function. The starting address of the overlaid page is either the result of the following formula:

$$\frac{\text{virtual machine size}}{2} = \text{starting address of the overlaid page}$$

or the hexadecimal value 20000, whichever is smaller.

14. To maintain system integrity, data transfer sequences to and from a virtual system console are limited to a maximum of 2032 bytes. Channel programs containing data transfer sequences that violate this restriction are terminated with an interrupt whose CSW status indicates incorrect length and a channel program check.

Notes:

- a. A data transfer sequence is defined as one or more read or write CCWs connected via chain data. The introduction of command chaining defines the start of a new data transfer sequence.
 - b. Data chained seek CCWs with counts of less than four are inconsistent with the data security of VM/SP and therefore will give an inconsistent error when attempting to use.
15. When an I/O error occurs on a device, the System/370 hardware maintains a contingent connection for that device until a SENSE channel command is executed and sense data is recorded. That is, no other I/O activity can occur on the device during this time. Under VM/SP, the contingent connection is maintained until the SENSE command is executed, but I/O activity from other virtual machines can begin on the device while the sense data is being reflected to the virtual machine. Therefore, the user should be aware that on a shared disk, the access mechanism may have moved during this time.
 16. The mode setting for 7-track tape devices is maintained by the control unit. Therefore, when a virtual machine issues the SET MODE channel command to a 7-track tape device, it changes the mode setting of all 7-track tape devices attached to that control unit.

This has no effect on virtual machines (such as OS or DOS) that issue SET MODE each time a CCW string is to be executed. However, it can cause a problem if a virtual machine fails to issue a SET MODE with each CCW string executed. Another virtual machine may change the mode setting for another device on the same control unit, thereby changing the mode setting of all 7-track tape devices attached to that control unit.
 17. A shared system or one that uses discontinuous saved segments cannot be loaded (IPL) into a virtual machine running in the virtual=real area.
 18. The DUMMY feature for VSAM data sets is not supported and should not be used at program execution time. Specifying this option on the DLBL command will cause an execution-time OPEN error.
 19. The 3066 is supported as a 3215. It is not supported as a graphics editor; therefore, it is recommended that the NODISP option of the EDIT command be used when editing in a 3066.
 20. The Program Controlled Interruption (PCI) FETCH option for load module retrieval is not supported for OS/MFT or VS1.

21. 3081 processors do not permit use of one-megabyte segments for virtual machines. Any attempt by a relocatable virtual machine using 1Mb segments to invoke the DAT facility for address translation, results in a translation exception.
22. The Input/Output Configuration Program must not be executed while single processor mode is active on the system. Undesirable results may occur.
23. Use the following virtual machine operating versions on hardware which used single storage keys:
 - MVS/SP Version 1, Release 3
 - The CMS component of VM/SP Release 1 and Release 2
 - VM/SP Release 2.
24. OS/VS2 is supported in uniprocessor mode only.

MSS Restrictions

1. There are two OS/VS system data sets associated with a Mass Storage System; the mass storage volume inventory and the mass storage volume control journal. There is one copy of each data set per Mass Storage System, not necessarily one per operating system. If more than one OS/VS system (running on either native mode or in a virtual machine) is connected to a common Mass Storage System, then the OS/VS systems must share a common inventory and journal.
2. When a real 3330V device is dedicated to a virtual machine as a virtual 3330V, the programming support in the virtual machine must recognize and access the virtual device as a 3330V.
3. The following must be compatible; the definition of 3330V addresses in the MCS tables; the DMKRIO module; and the IOGEN for any OS/VS system running in a virtual machine with a dedicated MSC port. The reason for this, and the way to ensure it, is explained in the *VM/SP System Programmer's Guide*.
4. Each active volume in the MSS must have a unique volume number. If you wish to have two or more user volumes having the same volume serial (such as different versions of an OS/VS2 system residence volume both having a volume serial of VS2037), then create two MSS volumes having different volume serials and allocate the user volumes as minidisks.
5. Mass Storage System volumes may not be used for VM/SP residence, paging, spooling, or temporary disk space.
6. You must not change the volume of a real 3330V volume (the volume serial as known by the MSC) except by using the OS/VS access method services utilities. If, for example, cylinder 0 of a 3330V is dedicated to a virtual machine and that virtual machine alters the volume serial using DDR, then the volume cannot be mounted.

CMS Restrictions

The following restrictions apply to CMS, the conversational subsystem of VM/SP:

1. CMS executes only on a virtual IBM System/370 provided by VM/SP.
2. The maximum sizes (in cylinders or blocks) of CMS minidisks are as follows:

Device Type	Model(s)	CMS/VSAM	CMS 800-byte Format	CMS 1K, 2K, or 4K Format
2314/2319	-	200 cyls.	203 cyls.	203 cyls.
3310	-	126,016 blocks	not supported	126,016 blocks
3330	1 or 2	404 cyls.	246 cyls.	404 cyls.
3330	11	808 cyls.	246 cyls.	808 cyls.
3333	1	404 cyls.	246 cyls.	404 cyls.
3333	11	808 cyls.	246 cyls.	808 cyls.
3340	35	348 cyls.	348 cyls.	348 cyls.
3340	70	696 cyls.	682 cyls.	696 cyls.
3350	native mode	555 cyls.	115 cyls.	555 cyls.
3370	-	558,000 blocks	not supported	558,000 blocks
3375	-	959 cyls.	182 cyls.	959 cyls.
3380	-	not supported	121 cyls.	885 cyls.

3. If CMS cannot calculate a valid time, it will display *.* in place of n.nn or x.xx.
4. Programs that operate under CMS are encouraged to use documented interfaces. Those programs which modify DMSNUC or other CMS control blocks in order to accomplish their interfaces with the CMS system, may hamper the performance and reliability of the system.
5. CMS employs the spooling facilities of VM/SP to perform unit record I/O. However, a program running under CMS can issue its own SIOs to attached dedicated unit record devices.
6. Only those OS and VSE facilities that are simulated by CMS can be used to execute OS and VSE programs produced by language processors under CMS.
7. Many types of object programs produced by CMS (and OS) languages can be executed under CMS using CMS's simulation of OS supervisory functions. Although supported in OS and VSE virtual machines under VM/SP, the writing and updating of non-VSAM OS data sets and VSE files are not supported under CMS.
8. CMS can read sequential and partitioned OS data sets and sequential VSE files, by simulating certain OS and VSE system services.

The following restrictions apply when CMS reads OS data sets that reside on OS disks:

- Read-password-protected data sets are not read unless they are VSAM data sets.
- BDAM and ISAM data sets are not read.

- Multivolume data sets are read as single-volume data sets. End-of-volume is treated as end-of-file and there is no end-of-volume switching.
- Keys in data sets with keys are ignored and only the data is read, except for VSAM.
- User labels in user-labeled data sets are bypassed.

The following restrictions apply when CMS reads VSE files that reside on DOS disks:

- Only VSE sequential files can be read. CMS options and operands that do not apply to OS sequential data sets (such as the MEMBER and CONCAT options of FILEDEF and the PDS option of MOVEFILE) also do not apply to VSE sequential files.
- The following types of VSE files cannot be read:
 - VSE DAM and ISAM files.
 - Files with the input security indicator on.
 - VSE files that contain more than 16 extents.

Note: User labels occupy the first extent; therefore, the file can hold only 15 additional data extents.

- Multivolume files are read as single-volume files. End-of-volume is treated as end-of-file. There is no end-of-volume switching.
 - User labels in user-labeled files are bypassed.
 - Since VSE files do not contain BLKSIZE, RECFM, or LRECL parameters, these parameters must be specified via FILEDEF or DCB parameters; otherwise, defaults of BLOCKSIZE=32760 and RECFM=U are assigned. LRECL is not used for RECFM=U files.
 - CMS does not support the use of OS/VS DUMMY VSAM data sets at program execution time, since the CMS/DOS implementation of the DUMMY statement corresponds to VSE implementation. Specifying the DUMMY option with the DLBL command will cause an execution-time error.
9. Assembler program usage of VSAM and the ISAM Interface Program (IIP) is not supported.
 10. CMS/DOS support is based on the VSE/Advanced Functions program product. With VSE, prior releases of VSAM are not supported under CMS/DOS.
 11. System logical units (SYSIN, SYSRDR, SYSIPT, SYSLST, and SYSPCH), are not supported for VSE formatted FB-512 devices because the SYSFIL function (SVC 103) of VSE is not supported under CMS/DOS.

12. Programs compiled using CMS/DOS are not recommended for transfer directly to a VSE machine. The following explanations support this restriction:
 - The CMS/DOS VSE linkage editor is designed to link edit VSE programs under CMS/DOS only.
 - Programs compiled using the CMS/DOS assembler may have incorrect ESD's. In this situation, the OS assembler is used. The OS assembler is *not* compatible with VSE.
 - Some VSE macros and SVC's are simulated. The code generated is not complete under CMS/DOS.
13. Setting the PSW EC mode bit on is not recommended because CMS handles interrupts in BC mode only.

Miscellaneous Restrictions

1. The number of pages used for input/output must not exceed the total number of user pages available in real storage. Violation of this restriction causes the real computing system to be put into an enabled wait state.
2. If you intend to define more than 64 virtual devices for a single virtual machine, be aware that any single request for free storage in excess of 512 doublewords (a full page) can cause an error message to be issued if storage cannot be obtained. Tables for virtual devices for a virtual machine must reside in contiguous storage. Therefore, two contiguous pages of free storage must be available in order to logon a virtual machine with more than 64 virtual devices, (three contiguous pages for a virtual machine with more than 128 virtual devices, etc.). Contiguous pages of free storage are sure to be available only immediately after IPL, before other virtual machines have logged on. Therefore, a virtual machine with more than 64 devices should be the first to logon after IPL. The larger the real machine size, the lesser the possibility of this occurring.
3. For remote 3270s, VM/SP supports a maximum of 256 binary synchronous lines minus the number of 3704/3705 Communication Controllers.
4. If an I/O device (such as a disk or tape drive) drops ready status while it is processing virtual I/O activity, any virtual machine users performing I/O on that device are unable to continue processing or to log off. Also, the LOGOFF and FORCE commands are not effective because they do not complete until all outstanding I/O is finished. The system operator should determine which I/O device is involved and make that device ready once more.
5. Any modifications to local OPTIONS COPYFILE, unless otherwise specified in existing documentation, is not supported.
6. If an installation is using an IBM 3031, 3032, or 3033 processor, it must dedicate the service record file (SRF) device to VM/SP. Thus, the channel on which the SRF is located cannot be dedicated to any virtual machine.
7. When using the SPOOL, DEDICATE, and SPECIAL directory control statements to define virtual devices, specify virtual addresses that do not conflict or contend with the virtual control unit interface. This conflict or contention occurs because devices can require special I/O interface protocol from control

units such as shared and nonshared subchannel operations. Putting devices that require different real control units on the same virtual control unit can result in a hung or busy condition. To avoid this problem, users must define (and separate) devices within their own control unit range. For example, if the directory entry specifies:

```
SPOOL 102 3211
SPECIAL 103 3270
```

The control unit 0 on channel 1 controls both a nonshared device (the 3211 printer) and a shared device (the 3270 display unit). Processing of channel programs involving these two devices can result in a hung or busy condition.

8. If you are using an 8809 tape device, it is required to have a tape mounted with the drive in ready status before issuing a CP DETACH command. This allows the tape drive mode to be returned to the default mode when execution of the command completes.
9. Logical device support is not designed to simulate all aspects of real device support. Some instances are:
 - Logical device support always passes channel end and device end to the virtual machine together
 - The PCI bit in the CCW is not handled by logical device support
 - Ending status on I/O only is passed back to the virtual machine (not initial).
10. When using two channel-to-channel adapters (dedicated to virtual machines and the CTCAs) are operating on the same channels on each CPU, then the virtual machines should use the control CCW to prevent locking out the channel.
11. If using conmode 3270 with a guest SCP such as MVS, SCRNSAVE ON must be specified; otherwise, unpredictable results may occur.
12. If the number of virtual devices exceeds the formula (7FFF divided by VDEVBLOK size) unpredictable results may occur. This is due to the design usage of the virtual control block structure.
13. When TERMINAL CONMODE 3270 is invoked, tracing should not be done at the same console; as unpredictable results may occur.
14. When using the 3081 processor, V=V users can no longer utilize 1 Mb (mega-byte) segments for constructing shadow tables.
15. If a terminal has an inhibited (non-display) read up and either a delayed PF key or an undefined PF key is used, the input area will be rewritten without the inhibited attribute byte, therefore displaying any data typed in at that point. The clear key can be used following the PF key to rewrite the inhibited read.
16. If an ENABLE or NETWORK ENABLE is issued to a device with advanced features and an ATTACH or NETWORK ATTACH is issued prior to powering the device on, then the advanced features will be non-operational. The

device must be powered on and enabled prior to the ATTACH or NETWORK ATTACH.

Section 6. Performance

- Virtual Machine/System Product Release 2 performance in unconstrained storage environments should not differ significantly from the performance of VM/SP Release 1 running in the same type of environment. However, VM/SP Release 2 does require more storage as a result of CP nucleus growth, and increased CMS working set size. Therefore, existing VM/370 environments that are constrained by either storage or paging activities should assess the performance implications before installing VM/SP Release 2.
- Use of the small CP nucleus option in building the VM/SP system is a way to reduce its resident nucleus size since it eliminates certain CP functions. Installations whose real storage configurations are one megabyte or less might consider implementing the small CP nucleus option if the installation does not require the full function of VM/SP.
- Any system control program (SCP) running in an IBM System/370, 303X, 4300 and 3081 processor in native mode, generally offers better performance than that same SCP under VM/SP. This is true because two control programs (the guest SCP and VM/SP) are in contention for the resources of one system. In native mode, however, there is a one to one correspondence between the system resources and the SCP.

Some systems employ a handshaking facility that provides a communications interface between VM/SP and the guest SCP making each system control program aware of the capabilities and requirements of the other. The handshaking facility eliminates guest SCP and VM/SP duplication of function. When the handshaking facility is used in the VM/SP environment, throughput performance may approach native operation levels.

- Performance of any virtual machine operation is based on its contention with other virtual machines and VM/SP itself for system resources. Performance of any virtual machine is also relative to the power of the installation's processor, its main storage size, the speed of its I/O devices, and the number of defined channel paths to those devices.
- When sending a large graphics data stream, a user may incur a performance degradation.



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