IBM

MVS/DFP Version 3 Release 2

SC26-4674-0

Device Support Reference

IBM

MVS/DFP Version 3 Release 2

SC26-4674-0

Device Support Reference

First Edition (December 1989)

This edition applies to Version 3 Release 2 of MVS/DFP™, Program Number 5665-XA3, and to any subsequent releases until otherwise indicated in new editions or technical newsletters.

The changes for this edition are summarized under "Summary of Changes" following the table of contents. Specific changes are indicated by a vertical bar to the left of the change. A vertical bar to the left of a figure caption indicates that the figure has changed. Editorial changes that have no technical significance are not noted.

Changes are made periodically to this publication; before using this publication in connection with the operation of IBM systems, consult the latest *IBM System/370, 30xx, 4300, and 9370 Processors Bibliography*, GC20-0001, for the editions that are applicable and current.

Requests for IBM publications should be made to your IBM representative or to the IBM branch office serving your locality. If you request publications from the address given below, your order will be delayed because publications are not stocked there.

A Reader's Comment Form is provided at the back of this publication. If the form has been removed, comments may be addressed to IBM Corporation, Department J57, P. O. Box 49023, San Jose, California, U.S.A. 95161-9023. IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Contents

Chapter 1. Planning 1
Establishing a Base for MVS/DFP 1
  Devices 1

Chapter 2. Storage Management 3
ACS Language Reference 3
  Statements 3
  EXIT 3
  Sample ACS Routine 5
ISMF Track and Cylinder Conversion to Bytes 6

Chapter 3. Data Management 7
DASD and Tape Devices Supported by Utility Programs 7
Storage Requirements for IEBIMAGE Utility Program 8
  For SYS1.IMAGELIB 8
Defining, Altering, and Deleting a Catalog 10
  Estimating Space 10
  Selecting Index Options 11
Using the DEFINE Command for VSAM Catalogs 12
  How Space is Assigned to a VSAM Catalog 12
  Estimating the VSAM Catalog's Space Requirements 12
Data Control Block Operands 15
  DCB—Construct a Data Control Block (BDAM) 15
  DCB—Construct a Data Control Block (BPAM) 15
  DCB—Construct a Data Control Block (BSAM) 16
  DCB—Construct a Data Control Block (QSAM) 16
Data Control Block Symbolic Field Names 17
  Data Control Block—BPAM, BSAM, QSAM 17
  Data Control Block—ISAM 20
Device Capacities 21
  Card Readers and Card Punches 21
  Printers 21
  Magnetic Tape Units 21
  Direct Access Storage Devices 22
  Track Capacity Determination 23
  Track Capacity Calculation Examples for 3380 (All Models and Track Compatibility Mode) 27
  Track Capacity Calculation Examples for 3390 Mode 30
Defining a VSAM Data Set 34
  Allocating Space for a Data Set 34
Processing Control Intervals 35
  Opening an Object for Improved Control Interval Access 35
System Macro Instructions 36
  Obtaining I/O Device Characteristics 36
Interpreting LISTCAT Output Listings 36
  Device Type Translate Table 36

Chapter 4. Program Management 37
Specifying JCL to Run a Linkage Editor Job 37
  Space Allocation Options 37
Linkage Editor Requirements and Capacities 40

Capacities 40
Intermediate Data Set 41

Index 43

Special Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates.

Any references to an IBM licensed program or other IBM product in this publication is not intended to state or imply that only IBM's program or other product may be used.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Commercial Relations, IBM Corporation, Purchase, NY 10577.

Trademarks and Service Marks

The following term, used in this publication, is a registered trademark or service mark of the IBM Corporation in the United States or other countries:

IBM

The following terms, used in this publication, have been adopted by the IBM Corporation as trademarks or service marks in the United States or other countries:

MVS/DFP
MVS/ESA
MVS/SP
MVS/XA

Summary of Changes

First Edition, December 1989

This publication is new with MVS/DFP Version 3 Release 2.

New Device Support for Release 2.0

Support has been included for the following device:

- The IBM 3390 Direct Access Storage Device, Models 1 and 2.

Preface

About This Book

This book is intended to provide current device-specific information associated with certain MVS/DFP tasks.

Unless specifically stated otherwise, the information in this book must not be used for programming purposes. However, this book also provides the following type of information, which is explicitly identified where it occurs:

Product-Sensitive Programming Interface

Installation exits and other product-sensitive interfaces are provided to allow your installation to perform tasks such as product tailoring, monitoring, modification, or diagnosis. They are dependent on the detailed design or implementation of the product. Such interfaces should be used only for these specialized purposes. Because of their dependencies on detailed design and implementation, it is to be expected that programs written to such interfaces may need to be changed in order to run with new product releases or versions, or as a result of service.

End of Product-Sensitive Programming Interface

Any MVS/DFP user that needs the information in this book will be directed to this book by a cross reference at the appropriate place in another MVS/DFP book. In other words, this book is not designed to be used alone, nor does it present any MVS/DFP task in its entirety. Rather, this book provides only device-specific information, such as capacity or other device characteristics pertinent to an MVS/DFP task.

To find the information you need when directed to this book from another MVS/DFP book, look in the table of contents under the appropriate global task for the heading that matches the heading in the book that directed you here.

Related Publications

Some publications from the MVS/SP Version 3 library are referenced in this book. *MVS/ESA Library Guide for System Product Version 3*, GC28-1563, contains a complete listing of the MVS/SP Version 3 publications and their counterparts for the prior version.

MVS/DFP Version 3 Release 2: Guide and Master Index, GC26-4553, contains both an index to the MVS/DFP library and a summary of the changes made to the library. You can use it to:

- Find information in other MVS/DFP publications
- Determine how new programming support changes information in the MVS/DFP library
- Determine which MVS/DFP publications have been changed.

Referenced Publications

Within the text, references are made to the following publications:

Short Title	Publication Title	Order Number
IBM 3390 Direct Access Storage Reference Summary	*IBM 3390 Direct Access Storage Reference Summary*	GX26-4577
MVS/DFP: Access Method Services	*MVS/DFP Version 3 Release 2: Access Method Services for the Integrated Catalog Facility*	SC26-4562
	MVS/DFP Version 3 Release 2: Access Method Services for VSAM Catalogs	SC26-4570
MVS/DFP: ISMF User's Guide	*MVS/DFP Version 3 Release 2: Interactive Storage Management Facility User's Guide*	SC26-4563
MVS/DFP: Linkage Editor and Loader	*MVS/DFP Version 3 Release 2: Linkage Editor and Loader*	SC26-4564
MVS/DFP: Macro Instructions for Non-VSAM Data Sets	*MVS/DFP Version 3 Release 2: Macro Instructions for Non-VSAM Data Sets*	SC26-4558
MVS/DFP: Managing Catalogs	*MVS/DFP Version 3 Release 2: Managing Catalogs*	SC26-4555
MVS/DFP: Managing VSAM Data Sets	*MVS/DFP Version 3 Release 2: Managing VSAM Data Sets*	SC26-4568
MVS/DFP: Planning Guide	*MVS/DFP Version 3 Release 2: Planning Guide*	SC26-4561
MVS/DFP: Storage Administration Reference	*MVS/DFP Version 3 Release 2: Storage Administration Reference*	SC26-4566
MVS/DFP: System Programming Reference	*MVS/DFP Version 3 Release 2: System Programming Reference*	SC26-4567
MVS/DFP: Utilities	*MVS/DFP Version 3 Release 2: Utilities*	SC26-4559

Short Title	Publication Title	Order Number
3380 DAS Reference Summary	*IBM 3380 Direct Access Storage Reference Summary*	GX26-1678

Chapter 1. Planning

Establishing a Base for MVS/DFP

Devices

A working MVS/ESA operating system requires at least one processing unit, printer, console, and system input device, in addition to adequate DASD and tape devices for storage.

Figure 1 on page 2 summarizes the most common IBM I/O devices. Some devices may require a specific level of hardware maintenance to operate correctly on an MVS/ESA system. If you have a question about support for a device not listed here or want information about hardware maintenance levels, contact your IBM marketing representative.

MVS/ESA supports up to 4096 attached devices. The hardware configuration of your processors and I/O devices determines how many devices you can attach to your system.

DASD

2305 Fixed Head Storage Model 2
3330 Disk Storage Models 1, 2, 11
3333 Disk Storage and Control Models 1, 11
3340 Disk Storage
3344 Disk Storage
3350 Direct Access Storage
3375 Direct Access Storage
3380 Direct Access Storage
3390 Direct Access Storage Models 1, 2

Storage Control Unit

3880 Storage Control Models 1, 2, 3, 4
3880 Storage Control Model 3 with 3380 AJ4/AK4 Attachment (feature 3005)
3990 Storage Control Models 1, 2

Cache Storage Control Unit

3880 Storage Control Models 11, 13, 21, 23
3880 Storage Control Model 23 with 3380 AJ4/AK4 Attachment (feature 3010)
3990 Storage Control Model 3

Console

2250 Display Unit Model 3
3251 Display Station
3277 Display Station Models 1, 2
3278 Display Station Models 1, 2, 2A, 3, 4
3279 Color Display Station Models 2A, 2B, 2C, 3A, 3B
5080 High Function Graphics System

Tape

3420 Magnetic Tape Unit Models 3, 4, 5, 6, 7, 8
3422 Magnetic Tape Subsystem
3424 Magnetic Tape Subsystem[1]
3430 Magnetic Tape Subsystem
3480 Magnetic Tape Subsystem[2]

Printer

1403 Printer Models 2, 7, N1
3203 Printer Model 5
3211 Printer
3262 Line Printer Model 5
3284 Printer Models 1, 2
3286 Printer Models 1, 2
3800 Printing Subsystem Model 1
3800 Printing Subsystem Model 3[3]
4245 Line Printer
4248 Printer

Other

2501 Card Reader Models B1, B2
2540 Card Read Punch Models 1, 2
3505 Card Reader
3525 Card Punch
3705 Communications Controller
3838 Array Processor
3848 Cryptographic Unit
3851 Mass Storage Facility
3890 Document Processor
MVS/ESA Direct Attachment RPQ 8B6004[4]
9246 Optical Library Unit RPQ 8B6001[4]
9247 Optical Disk Drive RPQ 8B6003[4]

Figure 1. Common IBM I/O Devices Supported by MVS/ESA

1 The 3424 Magnetic Tape Unit is available only in Brazil, S.A.
2 The 3480 Magnetic Tape Subsystem is supported both in full function and in 3420 compatibility modes.
3 The 3800 Printing Subsystem Model 3 is supported both in full function (all-points-addressable) and in compatibility mode.
4 This feature or device is supported by the object access method.

Note: Storage Management Subsystem data sets can reside only on DASD, specifically all 3330 models, 3340/3344, 3350, 3375, 3380 (with and without cache storage control 3880 and 3990), and 3390.

For more information on establishing a base for MVS/DFP, see *MVS/DFP: Planning Guide*.

Chapter 2. Storage Management

ACS Language Reference

Statements

This section describes the function and syntax of the ACS language statements that you can use when writing ACS routines.

The continuation characters "+" and "-" allow you to extend literal constants to the next line. To ignore the leading blanks on the following line, use "+". If you want to include the leading blanks on the next line as part of a literal, then use a "-". You cannot continue masks, numbers, KB or MB numerics, or keywords.

The maximum number of nesting levels for any combination of ACS statement types is thirty-two. (For example, a nested IF statement is one that appears within an IF statement.)

Comments begin with a slash-asterisk pair, "/*", and the end with an asterisk-slash pair, "*/". You can place comments anywhere within an ACS routine.

The statement types are defined as follows:

Statement	Description
EXIT	Causes immediate termination of the

ACS routine and can be used to force allocation failures.

EXIT

The EXIT statement immediately terminates the operation of an ACS routine.

Syntax

EXIT <CODE(*n*)>

- CODE is an optional keyword.
- *n* is an exit code. A nonzero value for *n* causes the subsequent ACS routines to be skipped and the allocation to fail with no explicit value assigned to the read-write variable in the ACS routine. If you do not specify a value for *n*, it assumes the default value of zero.

Examples

```
PROC STORCLAS
  FILTLIST SECVOL INCLUDE(PAY*, REC*) EXCLUDE('PAYR20', 'REC195')
  FILTLIST VALID_UNITS  INCLUDE('3330','3330V','3340','3350','3375',
                                            '3380','3390','SYSDA','')
  IF &UNIT ¬= &VALID_UNITS THEN

     DO
        SET &STORCLAS = ''
        EXIT
     END

  IF &ALLVOL ¬= &SECVOL THEN EXIT CODE(22)

END
```

If the first IF statement is *true* (&UNIT does not match any unit named in the VALID_UNITS filter criteria), then execution of this ACS routine terminates immediately. Allocation proceeds, because the exit code is zero, the default.

If the second IF statement is *true* (none of the input volumes match the SECVOL FILTLIST criteria), then execution of this ACS routine terminates immediately and the allocation fails. The value for CODE, 22, is set and displayed as part of the 'allocation failed' error message written to the end user.

Sample ACS Routine

The following example illustrates some reasonable techniques for properly using the ACS routines.

```
PROC STORCLAS

/**************************************************************************/
/*                                                                        */
/* THIS IS THE PRODUCTION SELECTION SPECIFICATION FOR SETTING STORCLAS */
/*                                                                        */
/**************************************************************************/

FILTLIST DBVOLS INCLUDE(IMS*,DB2*)          /* ALL DATA BASE VOLUMES */
                EXCLUDE('IMS053','DB2007')

FILTLIST DBJOBS INCLUDE(IMS*,PROD*,ACCT*)       /* ALL DATA BASE JOBS */

FILTLIST VALID_UNITS INCLUDE('3330','3330V','3340','3350','3375',
                      '3380','3390','SYSDA')    /* VALID UNITS FOR SMS */

IF &UNIT ¬= &VALID_UNITS

   THEN DO
           SET &STORCLAS = ''
           WRITE 'INVALID UNIT TYPE FOR SMS ALLOCATION'
           EXIT
        END

SELECT

       WHEN (&DSN = SYS1.**)                              /* SYSTEM DATA */
            SET &STORCLAS = 'SYSTEM'

       WHEN (&ALLVOL = &DBVOLS) && (&JOB = &DBJOBS)  /* DATA BASE DATA */
            SET &STORCLAS = 'DBPOOL'

       WHEN (&DSN(3) = 'CLEAR') | (&ANYVOL ¬= TSO*)    /* NON-SMS DATA */
            SET &STORCLAS = ''

       WHEN (&DEF_STORCLAS ¬= '')                  /* IF DEFAULTS EXIST */
            SET &STORCLAS = &DEF_STORCLAS

       OTHERWISE SET &STORCLAS = 'COMMON'             /* ALL OTHER DATA */

END                                                /* END STORCLAS PROC */
```

Figure 2. Production ACS Routine for Storage Class

For more information on ACS routines, see *MVS/DFP: Storage Administration Reference*.

ISMF Track and Cylinder Conversion to Bytes

Device	Tracks per Cylinder	Bytes per Track	Bytes per Cylinder
3390	15	56 664	849 960
3380	15	47 968	719 520
3375	12	36 000	432 000
3350	30	19 254	577 620
3340	12	8 535	102 420
3330	19	13 165	250 135

For more information on using ISMF, see *MVS/DFP: ISMF User's Guide*.

Chapter 3. Data Management

DASD and Tape Devices Supported by Utility Programs

Except where noted, all the following DASD and tape devices are supported by all utility programs. Restrictions and peculiar device support are noted in the individual utility sections.

The table below indicates specific devices supported. The term **DASD** includes all direct access storage devices listed below.

Figure 3. Utility Programs-Supported DASD and Tape Devices

	Devices
DASD	2305-2
	3330-1, 3330-2, 3333 and 3350 in 3330-1 compatibility mode
	3330-11, 3333-11 and 3350 in 3330-11 compatibility mode
	3850 MSS Virtual Volumes
	3340, 3344 (both 35 and 70 megabyte models)
	3350 Native mode
	3375
	3380 (all models)
	3390 (all models)
Tape	3420 (all models), 3422, 3424 and 3430
	3480 (with or without Improved Data Recording Capability)

Note: The 3424 Magnetic Tape Unit is available only in Brazil, S.A.

For more information on using utilities, see *MVS/DFP: Utilities*.

Storage Requirements for IEBIMAGE Utility Program

For SYS1.IMAGELIB

The auxiliary storage requirement in tracks for SYS1.IMAGELIB is:

```
Number of tracks = (A + B) / T
```

where:

A is the number of 1403 UCS images, 3211 UCS images, 3211 FCB images, 3525 data protection images, 3890 SCI programs, 3800 FCB modules, 4248 FCB images, 3262 Model 5 FCB images, and 3800 character arrangement tables (including images or modules supplied by you or IBM).

If the appropriate printer is in the system, IBM supplies twelve 1403 UCS images, five 3211 UCS images, four 3211 FCB images, one 3800 FCB image, one 4245 UCS image table, one 4248 UCS image table, and fourteen 3800 character arrangement tables. According to the TABLE parameter coded on the DATAMGT system generation macro, IBM supplies the following number of additional character arrangement tables:

- 5 if T3211 is specified
- 13 if T1403 is specified
- 10 if TOCR is specified
- 3 if TKAT is specified
- 3 if TFMT is specified

If TABLE = ALL is coded, add all the above numbers. If ALL, T3211, or T1403 is coded, add two more tables for the GRAFSPC1 and GRF2SPC1 graphic character modification modules.

Note that IBM supplies no 4245 or 4248 UCS images in SYS1.IMAGELIB. The 4245 and 4248 printers load their own UCS images into the UCS buffer at power-on time. IBM does supply 4245 and 4248 FCB images, which may be used. For more information on printer-supplied UCS or FCB images, see *MVS/DFP: System Programming Reference*.

B is **(V + 600) / 1500** for each 3800 graphic character modification module and library character set module, each 3800 copy modification module, 4245 UCS image table, 4248 UCS image table, and each 3890 SCI program that is more than approximately 600 bytes. **V** is the virtual storage requirement in bytes for each module. The virtual storage requirements for the IBM-supplied 3800 graphic character modification module containing the World Trade National Use Graphics are 32420 bytes for Model 1 and 55952 bytes for Model 3. The virtual storage requirements for the IBM-supplied 3800 library character sets for the Model 1 are 4680 bytes and 8064 bytes for the Model 3.

T is the approximate number of members per track, depending on type of volume. Because of the overhead bytes and blocks in a load module, the difference in space requirements for an 80-byte module and a 400-byte module is small. These constants assume an average member of 8 blocks, including a file mark, with a total data length of 800 bytes. For example, on a 3380 with 523 bytes of block overhead, the assumed average is 4984 bytes. If a different average member data length and average number of blocks per member are anticipated, these constants should reflect the actual number of members per track. To determine the number of members per track, divide the average member length, including block overhead, into the track capacity for the device. (Track capacity for DASD is discussed in *MVS/DFP: Macro Instructions for Non-VSAM Data Sets*.)

```
T = 6 for a 2305-2
    7 for a 3330 or a 3330-11
    4 for a 3340 or 3344
    8 for a 3350
    8 for a 3375
    9 for a 3380, all models
    9 for a 3390, all models
```

The result, **(A + B) / T**, is the track requirement.

The number of directory blocks for SYS1.IMAGELIB is given by the formula:

Number of directory blocks = (A + C + D) / 6

where:

A is the same value as **A** in the track requirement calculation.

C is the number of modules used to calculate B, when calculating the track requirement.

D is the number of aliases. The IBM-supplied 1403 UCS images have four aliases and the IBM-supplied 3211 UCS images have six aliases. If you are not going to use these aliases, you can scratch them after system generation.

For more information on storage requirements for the IEBIMAGE utility program, see *MVS/DFP: Utilities*.

Defining, Altering, and Deleting a Catalog

Estimating Space

Estimating Space Requirements for the BCS

The control area size for the data component is effectively controlled by the secondary allocation quantity. If the secondary allocation quantity is:

- One track or less (allocation is records), the control area size is 1 track.
- Greater than 1 track but less than 1 cylinder, the control area size is the same as the secondary allocation quantity.
- One cylinder or greater, the control area size is 1 cylinder.

The control area size should be large enough to contain a maximum length record; the default maximum record length for the BCS (a spanned record data set) is 32400 bytes. The following list shows the smallest data control area sizes that can contain a default maximum length spanned record for a 4096-byte data control interval size:

Device Type	Data Control Area (tracks)
IBM 3390	1
IBM 3380[1]	1
IBM 3375	1
IBM 3350	3
IBM 3340	6
IBM 3330	3

If a smaller control area size is selected, the maximum record size must be reduced to fit in a control area by specifying the RECORDSIZE parameter with the DEFINE USERCATALOG command.

For more information on estimating space, see *MVS/DFP: Managing Catalogs*.

[1] IBM 3380, all models

Selecting Index Options

Replication of Index Records

You can specify that each index record be replicated (written on a track of a direct access volume as many times as it will fit). Replication reduces the time lost waiting for the index record to come around to be read (rotational delay). Average rotational delay is half the time it takes for the volume to complete one revolution. Replication of a record reduces this time; for example, if 10 copies of an index record fit on a track, average rotational delay is only 1/20th of the time it takes for the volume to complete one revolution.

On an IBM 3340, the time usually is reduced by 50%. On an IBM 3390, the time is reduced to 1/n, where n is the number of times the index is replicated on the track.

Because there are usually few control intervals in the index set, the cost in terms of direct access storage space is small. Because its cost is small and it is an attribute that cannot be altered, you may want to choose this option.

For more information on selecting index options, see *MVS/DFP: Managing Catalogs*.

Using the DEFINE Command for VSAM Catalogs

How Space is Assigned to a VSAM Catalog

Catalog space is allocated in tracks even when you specify cylinders or records. The number of tracks is a multiple of an allocation unit. An allocation unit is the size of a control area. In each allocation unit, one track contains the control area's replicated sequence set record. For example, the size of an allocation unit is:

- 3 tracks for an IBM 3330, 3330 Model 11, 3350, or 2305 Model 2 (2 tracks for the control area and 1 track for the sequence set record)
- 5 tracks for an IBM 3340/3344 (4 tracks for the control area plus 1 track for the sequence set record)
- 2 tracks for an IBM 3380 or 3390 (1 track for the control area and 1 track for the sequence set).

When the amount of space specified is not a multiple of the device's allocation unit, the amount of space is rounded downward and the additional tracks are not used. If less than the minimum allocation unit is specified, the amount of space is rounded upward and a minimum-sized catalog is allocated.

Estimating the VSAM Catalog's Space Requirements

Before you define a catalog, you should estimate the amount of space needed for the catalog's data component. To determine the approximate number of records required for the low-key range of the catalog, use the worksheet in Figure 4.

Figure 4. Worksheet for Estimating a VSAM Catalog's Space Requirements		
Variable Quantities	**Formulas**	**Estimates**
Basic requirement = 10 records		10
A = number of key-sequenced clusters	Ax3	
A^1 = number of key-sequenced clusters with alternate indexes to be upgraded	A^1x4	
B = number of entry-sequenced clusters	Bx2	
B^1 = number of entry-sequenced clusters with alternate indexes to be upgraded	B^1x3	
C = number of relative-record clusters	Cx2	
D = number of alternate indexes	Dx3	
E = number of path entries	E	
F = number of non VSAM data set entries	F	
G = number of generation data group entries	G	
H = number of alias entries	H	
I = number of pagespaces	Ix2	
J = number of volumes, depending on device type, owned by the catalog:		
J^1 = number of 2305 volumes	J^1x2	
J^3 = number of 3330, 3340/3344, 3375, and 3380 Models A04, AA4, B04, AD4, BD4, AJ4, BJ4, and CJ2	J^3x4	
J^4 = number of 3330 Model 11 and 3350 volumes	J^4x6	
J^5 = number of 3380 Models AE4 and BE4, and 3390 Model 1	J^5x8	
J^6 = number of 3380 Models AK4 and BK4, and 3390 Model 2	J^6x12	
K = for each key-sequenced cluster and alternate index (KSDS) with space on more than two volumes, add "1" for each additional group of one to five volumes:		
K^1 = number of KSDSs with 3 to 7 volumes	K^1	
K^2 = number of KSDSs with 8 to 12 volumes	K^2x2	
K^3 = number of KSDSs with 13 to 17 volumes	K^3x3	
L = for each entry-sequenced cluster and relative-record cluster (ESDS) with space on more than five volumes, add "1" for each additional group of one to eight volumes:		
L^1 = number of ESDSs with 6 to 13 volumes	L^1	
L^2 = number of ESDSs with 14 to 21 volumes	L^2x2	
M = for each group of four data spaces on a volume, add "1"	M	
N = number of entry records required for the catalog's data component (total of A through M above)	N	

To define the catalog's space parameters, use one of the formats shown below:

1. To assign all the space to the catalog itself, specify:

```
DEFINE USERCATALOG -
(TRACKS(prim secn)...)
```

   where:

   - prim = the amount of space for the primary extent (allocation) of the catalog's data space. Calculate the minimum value of prim as:

     ```
     prim = (aN + b) tracks
     ```

where N is the value derived from the worksheet (Figure 4 on page 13) and the values of a and b are derived from the table below:

Catalog resides on:	a	b
2305 Model 2	0.09	3
3330 or 3330-11	0.09	3
3340 or 3344	0.125	5
3350	0.0667	3
3375	0.03	2
3380 (all models)	0.023	2
3390 (all models)	0.015	2

The calculated value of prim should be rounded upward to a whole number of tracks.

- secn = the amount of space for each secondary extent of the catalog's data space.

  This example of defining a catalog's space parameters shows the space specification in terms of TRACKS using the worksheet in Figure 4 on page 12. The value for prim and secn as subparameters of CYLINDERS may also be specified.

2. To have other VSAM objects in the catalog's data space, specify:

```
DEFINE USERCATALOG -
(TRACKS(prim secn)...) -
DATA -
(RECORDS(prec srec ...)
```

where:

- prim = the total amount of space for the primary extent of the catalog's data space. The amount of space assigned to the catalog itself is taken from the prim space as calculated by VSAM from the value specified by prec. To determine the amount of space that VSAM calculates for the catalog itself, use the following algorithm:

  `(aN + b) tracks`

  When specifying a value for prim larger than the requirements for the catalog itself, the remainder of the space is available for the suballocation of other VSAM objects. Using this format, the value for prim as a subparameter of CYLINDERS rather than TRACKS may also be specified.

- secn = the amount of space to be used for each secondary extent of the catalog's data space.

- prec = the number of catalog entry records in the low-key range, or the value of N from the worksheet (Figure 4 on page 12). VSAM uses this value to calculate the total primary allocation requirements for the catalog itself.

- srec = the number of catalog-entry records to be used by VSAM to calculate the catalog's secondary-extent allocation.

For more information on VSAM catalog space, see *MVS/DFP: Managing Catalogs*.

Data Control Block Operands

DCB—Construct a Data Control Block (BDAM)

RECFM Operand

RECFM={U|V[S|BS]|F[T]}

specifies the record format and characteristics of the data set being created or processed. The following describes the characters that can be coded (if the optional characters are coded, they must be coded in the order shown above):

T

specifies that track overflow is to be used with the data set. Track overflow allows a record to be partially written on one track and the remainder is written on the following track (if required).

Note: Track overflow is not supported on DASD models 3375, 3380, or 3390.

DCB—Construct a Data Control Block (BPAM)

RECFM Operand

RECFM={{U[T][A|M]}
{V[B[T]|T][A|M]}
{F[B[T]|T][A|M]}}

specifies the record format and characteristics of the data set being created or processed.

T

specifies that track overflow is used with the data set. Track overflow allows a record to be written partially on one track of a direct access storage device and the remainder of the record written on the following track (if required).

Note: Track overflow is not supported on DASD models 3375, 3380, or 3390. Track overflow is ignored for PDSEs.

DCB—Construct a Data Control Block (BSAM)

RECFM Operand

RECFM={{**U**[**T**][**A**|**M**]}
{**V**[**B**][**S**][**T**]|[**A**][**M**]}
{**D**[**B**][**S**][**A**]}
{**F**[**B**|**S**|**T**|**BS**|**BT**][**A**|**M**]}}
specifies the record format and characteristics of the data set being created or processed.

T

specifies that track overflow is used with the data set. Track overflow allows a record to be written partially on one track of a direct access storage device and the remainder of the record to be written on the following tracks (if required).

Note: Track overflow is not supported on DASD models 3375, 3380, or 3390. Track overflow is ignored for PDSEs.

DCB—Construct a Data Control Block (QSAM)

RECFM Operand

RECFM={{**U**[**T**][**A**|**M**]}
{**V**[**B**][**S**][**T**]|[**A**][**M**]}
{**D**[**B**][**S**][**A**]}
{**F**[**B**|**S**|**T**|**BS**|**BT**][**A**|**M**]}}
specifies the record format and characteristics of the data set being created or processed.

T

specifies that track overflow is used with the data set. Track overflow allows a record to be written partially on one track and the remainder of the record on the following track (if required).

Note: Track overflow is not supported on DASD models 3375, 3380, or 3390. Track overflow is ignored for PDSEs.

For more information on data control block operands, see *MVS/DFP: Macro Instructions for Non-VSAM Data Sets.*

Data Control Block Symbolic Field Names

Data Control Block—BPAM, BSAM, QSAM

Direct Access Storage Device Interface

Offset	Bytes and Alignment	Field Name	Description
0(0)	4	DCBRELAD	For partitioned data sets: TTRN (beginning address) of a member.
4(4)	1	DCBKEYCN	Keyed block overhead.
5(5)	8	DCBFDAD	Direct access address.
16(10)	1	DCBKEYLE	Key length of the data set.
17(11)	.1	DCBDEVT	Device type.
		0010 0111	2305 Disk Storage Facility, Model 2.
		0010 1001	3330 Disk Storage, Model 1, or Mass Storage System (MSS) virtual volume.
		0010 1101	3330 Disk Storage, Model 11.
		0010 1010	3340/3344 Disk Storage.
		0010 1011	3350 Direct Access Storage.
		0010 1100	3375 Direct Access Storage.
		0010 1110	3380 Direct Access Storage.
		0010 1111	3390 Direct Access Storage.
18 (12)	2	DCBTRBAL	Current track balance.

Magnetic Tape Interface

Offset	Bytes and Alignment	Field Name	Description	
16(10)	1	DCBTRTCH	Tape recording technique for 7-track tape.	
			Code	
		0010 0011	E	Even parity.
		0011 1011	T	BCD/EBCDIC translation.
		0001 0011	C	Data conversion.
		0010 1011	ET	Even parity and translation.
			Tape recording technique for 3480 Tape Subsystem with Improved Data Recording Capability.	
			Code	
		0000 1000	COMP	Record data in compacted format.
		0000 0100	NOCOMP	Record data in standard 3480 format.
17(11)	.1	DCBDEVT	Device type.	

Offset	Bytes and Alignment	Field Name	Description			
		1000 0011	3400 series magnetic tape unit.			
		1000 1000	3480 Magnetic Tape Subsystem.			
18(12)	..1	DCBDEN	Tape density—3400 series magnetic tape units.			
			Code	**7-track**	**9-track**	**18-track**
		0100 0011	1	556 BPI	N/A	N/A
		1000 0011	2	800 BPI	800 BPI	N/A
		1100 0011	3	N/A	1600 BPI	N/A
		1101 0011	4	N/A	6250 BPI	N/A

Card Reader, Card Punch Interface

Offset	Bytes and Alignment	Field Name	Description	
16(10)	1	DCBMODE, DCBSTACK		
			Code	
		1000	C	Column binary mode.
		0100	E	EBCDIC mode.
		 xxxx		Stacker selection.
		 0001	1	Stacker 1.
		 0010	2	Stacker 2.
		 0011	3	Stacker 3.
17(11)	.1	DCBDEVT	Device type.	
		0100 0001	2540 Card Reader	
		0100 0010	2540 Card Punch	
		0100 0100	2501 Card Reader	
		0100 0110	3505 Card Reader	
		0100 1100	3525 Card Punch	

Printer Interface

Offset	Bytes and Alignment	Field Name	Description	
16(10)	1	DCBPRTSP	Number indicating normal printer spacing.	
			Code	
		0000 0000	0	No spacing.
		0000 0001	1	Space one line.
		0001 0001	2	Space two lines.
		0001 1001	3	Space three lines.
17(11)	.2	DCBDEVT	Device type.	

Offset	Bytes and Alignment	Field Name	Description
		Byte 0	1403 Printer
		0100 1000	3211 Printer
		0100 1001	3203 Printer
		0100 1011	Look at UCB DEVTYPE field or issue the
		0100 1101	DEVTYPE macro for the actual type of printer.
		0100 1110	3800 Printing Subsystem
			Test-for-printer-overflow mask (PRTOV mask). If printer overflow is to be tested for, the PRTOV macro instruction sets the mask as follows:
		Byte 1	**Code**
		0010 0000	9 Test for channel 9 overflow.
		0001 0000	12 Test for channel 12 overflow.
19(13)	...1	DCBPRBYT	
		xxxx xx..	Reserved.
		11	Bits to identify currently active table reference character when 3800 printer is operating under **OPTCD=J**.

Data Control Block—ISAM

Offset	Bytes and Alignment	Field Name	Description
17(11)	.1	DCBDEVT	Device type.
		0010 0111	2305 Disk Storage Facility, Model 2.
		0010 1001	3330 Disk Storage, Model 1, or Mass Storage System (MSS) virtual volume.
		0010 1101	3330 Disk Storage, Model 11.
		0010 1010	3340 Disk Storage.
		0010 1011	3350 Direct Access Storage.
		0010 1100	3375 Direct Access Storage.
		0010 1110	3380 Direct Access Storage, all models.
		0010 1111	3390 Direct Access Storage, all models.
197(C5)	.1	DCBOVDEV	Device type for independent overflow.
		0010 0111	2305 Disk Storage Facility, Model 2.
		0010 1001	3330 Disk Storage, Model 1, or Mass Storage System (MSS) virtual volume.
		0010 1101	3330 Disk Storage, Model 11.
		0010 1010	3340/3344 Disk Storage.
		0010 1011	3350 Direct Access Storage.
		0010 1100	3375 Direct Access Storage.
		0010 1110	3380 Direct Access Storage.
		0010 1111	3390 Direct Access Storage, all models.

For more information on data control blocks, see *MVS/DFP: Macro Instructions for Non-VSAM Data Sets*.

Device Capacities

The following information provides a guide to coding the block size (BLKSIZE) and logical record length (LRECL) operands in the DCB macro. You can use these values to determine the maximum block size and logical record length for a given device, and to determine the optimum blocking factor when records are to be blocked.

Card Readers and Card Punches

Format F, V, or U records are accepted by readers and punches, but the logical record length for a card reader or card punch is fixed at 80 bytes. If the optional control character is specified, the logical record length is 81 (the control character is not part of the data record). If card image mode is used, the buffer required to contain the data must be 160 bytes.

Printers

The following table shows the record length that can be specified for the various printers. In some cases, two values are shown; except for the 3800, the larger of the two values requires that an optional feature be installed on the printer being used. If the optional control character is specified to control spacing and skipping, the record length is specified as one greater than the actual data length (the control character is not part of the data record).

Printer	Record Length
1403 Printer	120 or 132 bytes
3203 Printer	132 bytes
3211 Printer	132 or 150 bytes
3525 Card Punch, Print Feature	64 bytes
3800 Printing Subsystem	136 bytes for 10 pitch 163 bytes for 12 pitch 204 bytes for 15 pitch
4245 Printer	132 bytes
4248 Printer	132 or 168 bytes
3262 Model 5 Printer	132 bytes

Magnetic Tape Units

Tape	Capacity
3410 Magnetic Tape Units (7 track and 9 track)	32 760 bytes
3420 Magnetic Tape Units (7 track and 9 track)	32 760 bytes
3430 Magnetic Tape Units	32 760 bytes
3480 Magnetic Tape Subsystem (with or without compaction mode)	32 760 bytes

Direct Access Storage Devices

Figure 5 lists the physical characteristics of direct access storage devices. Use the largest block size that wastes the least amount of space on the track. For example, the half-track block size of 23 476 bytes would use 98.9% of the space on a 3380 track. The most efficient block size for the 3390 would be 27 998 bytes; two of these blocks would fit on a 3390 track.

Figure 5. DASD Physical Characteristics

DASD Characteristics

Type	Trk/Cyl	Cyl/Vol	Maximum Block Size/Track	Maximum Record Size/Track	Track Capacity (Bytes)[1]
2305-2	8	96	14 660	14 660	14 858
3330-1	19	404	13 030	13 030	13 165
3330-11	19	808	13 030	13 030	13 165
3340/3344	12	348	8 368	8 368	8 535
3350	30	555	19 069	19 069	19 254
3375	12	959	32 760[2]	35 616	36 000
3380[3]	15	885	32 760[2]	47 476	47 968
3380[4]	15	1770	32 760[2]	47 476	47 968
3380[5]	15	2655	32 760[2]	47 476	47 968
3390[6]	15	1113	32 760[2]	56 664	58 786
3390[7]	15	2226	32 760[2]	56 664	58 786

Notes:

1 This value includes an overhead for the device.
2 The largest block size supported by the access methods is 32 760.
3 3380 single capacity Models A04, AA4, B04, AD4, BD4, AJ4, BJ4, and CJ2.
4 3380 double capacity Models AE4 and BE4.
5 3380 triple capacity Models AK4 and BK4.
6 3390 Model 1.
7 3390 Model 2.

Figure 6 shows the number of equal-length physical records that can fit on a track for various devices. Use this table only if the block size is 512, 1024, 2048, or 4096 bytes, and the records do not have keys. Otherwise, see the track capacity tables in *3380 DAS Reference Summary* and *IBM 3390 Direct Access Storage Reference Summary*.

Figure 6. Number of Physical Blocks per Track (KL = 0)

DASD Type	**Block Size**			
	512	**1024**	**2048**	**4096**
2305-2	20	12	6	3
3330 (Model 1 or 11)	20	11	6	3
3340/3344	12	7	3	2
3350	27	15	8	4
3375	40	25	14	8
3380 (all models)	46	31	18	10
3390 (all models)	49	33	21	12

Track Capacity Determination

Each record written on direct access storage devices requires some "device overhead." The term device overhead means the space required by the device for address markers, count areas, gaps between the count, key, and data areas, and gaps between blocks. Use the following calculations to compute the number of bytes required for each data block including the space required for device overhead. Note that any fraction of a byte must be ignored. For example, if the calculation results in 15.644 bytes, use 15 bytes to determine track capacity.

Space Calculation Formulas for Models 2305 through 3375

Figure 7. Space Calculation Formulas (Models 2305 – 3375)

Device	**Blocks with Keys**	**Blocks without Keys**
2305-2	289+KL[1]+DL[2]	198+DL
3330/3333 (Model 1 or 11)[3]	191+KL+DL	135+DL
3340/3344	242+KL+DL	167+DL
3350	267+KL+DL	185+DL
3375	224+((KL+191)/32)(32)+((DL+191)/32)(32)	224+((DL+191)/32)(32)

Notes:

1 KL is key length.
2 DL is data length.
3 The Mass Storage System (MSS) virtual volumes assume the characteristics of the 3330/3333, Model 1.

When track overflow is used or variable-length spanned records are written, the size of a data block or logical record can exceed the capacity of a single track on the direct access storage device used.

Note: Track overflow is not available on DASD models 3375, 3380, or 3390.

3380 (All Models and 3380 Track Compatibility Mode)

The *3380 track compatibility mode* acts just like the other 3380 models. Each 3380 track is divided into 1499 user data cells (with IBM standard R0) or 1515 user data cells (without an IBM standard R0 record). A record can occupy from 16 to 1515 of these cells. The number of cells (*Space*) occupied by a record is a function of the key length (*KL*) and data length (*DL*) as specified in the count area of the record. The following formula applies to both blocked and unblocked records.

Space Calculation Formula for 3380: The space, in cells, occupied by a record can be calculated from the following formula:

$Space = C + K + D$

where:

$C = 8$

If $KL = 0$, then $K = 0$

If $KL \neq 0$:

$K = 7 + \frac{KL + 12}{32}$, rounded up to an integer value.

$D = 7 + \frac{DL + 12}{32}$, rounded up to an integer value.

Track Capacity: A track can hold a given set of records if the sum of the *Space* values for all records is less than or equal to the maximum value.

> The maximum value for the sum is 1499 if an IBM standard R0 record is used and the sum of *Space* values does not include R0.
>
> The maximum value for the sum is 1515 if the sum of *Space* values includes R0.

A standard end-of-file record has a *Space* value of 16.

If standard R0 is not used and all records on a track are of equal *KL* and *DL*, each of which occupies *Space* cells, the maximum number of records which can fit on a track is:

$\frac{1515}{Space}$, rounded down to an integer value.

If an IBM standard R0 is used and all the other records on a track are of equal *KL* and *DL*, each of which occupies *Space* cells, the maximum number of records (other than R0) that can fit on a track is:

$\frac{1499}{Space}$, rounded down to an integer value.

See *3380 DAS Reference Summary* for more information.

3390 Mode

Each 3390 mode track is divided into 1729 user data cells (with IBM standard R0) or 1749 user data cells (without an IBM standard R0 record). A record can occupy from 20 to 1749 of these cells. The number of cells (*Space*) occupied by a block is a function of the key length (*KL*) and data length (*DL*) as specified in the count area of the record. The following formula applies to both blocked and unblocked records.

Space Calculation Formula for 3390: The space, in cells, occupied by a record can be calculated from the following formula:

$Space = C + K + D$

where:

$C = 10$

If $KL = 0$, then $K = 0$

If $KL \neq 0$:

$K = 9 + \frac{KL + (6 \times KN) + 6}{34}$, rounded up to an integer value,

where:

$KN = \frac{KL + 6}{232}$, rounded up to an integer value,

$D = 9 + \frac{DL + (6 \times DN) + 6}{34}$, rounded up to an integer value,

where:

$DN = \frac{DL + 6}{232}$, rounded up to an integer value.

Track Capacity: A track can hold a given set of records if the sum of the *Space* values for all records is less than or equal to the following maximum value.

The maximum value for the sum is 1729 if an IBM standard R0 record is used and the sum of *Space* values does not include R0.

The maximum value for the sum is 1749 if the sum of *Space* values includes R0.

A standard end-of-file record has a *Space* value of 20.

If an IBM standard R0 is not used and all records on a track are of equal *KL* and *DL*, each of which occupies *Space* cells, the maximum number of records that can fit on a track is:

$\frac{1749}{Space}$, rounded down to an integer value.

If an IBM standard R0 is used and all the other records on a track are of equal *KL* and *DL*, each of which occupies *Space* cells, the maximum number of records (other than R0) that can fit on a track is:

$\frac{1729}{Space}$, rounded down to an integer value.

See *IBM 3390 Direct Access Storage Reference Summary* for more information.

Track Capacity Calculation Examples for 3380 (All Models and Track Compatibility Mode)

Equal Length Records

The examples of track capacity calculation with equal length records use a data set consisting of 45 000 records of 80 bytes, both unblocked and blocked as 900 blocks of 4000 bytes each. All tracks use an IBM standard R0.

Unblocked Records: Using the calculations shown in "Space Calculation Formula for 3380" on page 24 with $KL=0$ and $DL=80$:

$C=8$

$K=0$

$$D=7+\frac{DL+12}{32}\text{, rounded up to an integer value,}$$
$$=7+\frac{80+12}{32}\text{, rounded up to an integer value,}$$
$$=10$$

$$Space=C+K+D$$
$$=8+0+10$$
$$=18$$

The maximum number of records (other than R0) that can fit on a track is:

$$\frac{1499}{Space}\text{, rounded down to an integer value,}$$
$$=\frac{1499}{18}\text{, rounded down to an integer value,}$$
$$=83$$

At 83 records per track, the 45 000 record data set would require 543 tracks, or 36 cylinders and 3 tracks.

Blocked Records: Using the calculations shown in "Space Calculation Formula for 3380" on page 24 with $KL=0$ and $DL=4000$:

$C=8$

$K=0$

$$D=7+\frac{DL+12}{32}\text{, rounded up to an integer value,}$$
$$=7+\frac{4000+12}{32}\text{, rounded up to an integer value,}$$
$$=133$$

$$Space = C + K + D$$
$$= 8 + 0 + 133$$
$$= 141$$

The maximum number of records (other than R0) that can fit on a track is:

$$\frac{1499}{Space}\text{, rounded down to an integer value,}$$
$$= \frac{1499}{141}\text{, rounded down to an integer value,}$$
$$= 10$$

At 10 blocks per track, the 900 block data set would require 90 tracks, or 6 cylinders.

Note: For unblocked records, more tracks were required to hold the example data set in 3390 mode than in 3380 mode. For very short records, 3380 mode can use space more efficiently than 3390 mode. However, blocking the short records saves space and results in fewer tracks being required in 3390 mode than in 3380 mode. Use longer records to take advantage of the greater track capacity of 3390 mode over 3380 mode.

Unequal Length Records

As an example of calculating track capacity for unequal length records, consider a partitioned data set with the following records:

- A directory, consisting of 25 records, each with $KL=8$ and $DL=256$
- A number of members, blocked into 4096-byte blocks
- End-of-file records between blocks which contain different members.

All tracks contain an IBM standard R0.

Space Calculations: The space occupied by the different types of records is first calculated.

Directory Records: Using the calculations shown in "Space Calculation Formula for 3380" on page 24 with $KL=8$ and $DL=256$:

$$C = 8$$

$$K = 7 + \frac{KL + 12}{32}\text{, rounded up to an integer value,}$$
$$= 7 + \frac{8 + 12}{32}\text{, rounded up to an integer value,}$$
$$= 8$$

$$D = 7 + \frac{DL + 12}{32}\text{, rounded up to an integer value,}$$
$$= 7 + \frac{256 + 12}{32}\text{, rounded up to an integer value,}$$
$$= 16$$

$$Space = C + K + D$$
$$= 8 + 8 + 16$$
$$= 32$$

Member Blocks: Using the calculations shown in "Space Calculation Formula for 3380" on page 24 with $KL=0$ and $DL=4096$:

$C=8$

$K=0$

$$D = 7 + \frac{DL + 12}{32}, \text{ rounded up to an integer value,}$$
$$= 7 + \frac{4096 + 12}{32}, \text{ rounded up to an integer value,}$$
$$= 136$$

$$Space = C + K + D$$
$$= 8 + 0 + 136$$
$$= 144$$

End-of-File Records: An end-of-file record in 3380 mode has a *Space* value of 16.

Track Capacity

First Track: In 3380 mode, all tracks have an available *Space* value of 1499 cells. The directory consists of 25 records, each occupying 32 cells. Hence, $1499 - (25 \times 32) = 699$ cells are available for member blocks and end-of-file records. Each member block occupies 144 cells. Hence, in addition to the directory, the first track can contain 4 member blocks with 123 cells left over for end-of-file records. Since an end-of-file record occupies 16 cells, there is enough space for up to 4 end-of-file records which is the maximum required for 4 member blocks.

In this example, the first track of the data set would contain the directory and 4 or fewer member blocks, with end-of-file records as required.

Subsequent Tracks: The available *Space* of 1499 cells on subsequent tracks could hold 10 member blocks of 144 cells each. The remaining space of $1499 - (10 \times 144) = 59$ cells would hold up to 3 end-of-file records occupying 16 cells each. If more end-of-file records were necessary, the number of member blocks would have to be decreased to 9 to accommodate them.

In this example, tracks other than the first track of the data set would contain either:

10 member blocks and 3 or fewer end-of-file records, or

9 or fewer member blocks and 9 or fewer end-of-file records.

Track Capacity Calculation Examples for 3390 Mode

Equal Length Records

The examples of track capacity calculation with equal length records use a data set consisting of 45 000 records of 80 bytes, both unblocked and blocked as 900 blocks of 4000 bytes each. All tracks use an IBM standard R0.

Unblocked Records: Using the calculations shown in "Space Calculation Formula for 3390" on page 25 with $KL=0$ and $DL=80$:

$C=10$

$K=0$

$$DN=\frac{DL+6}{232}\text{, rounded up to an integer value,}$$
$$=\frac{80+6}{232}\text{, rounded up to an integer value,}$$
$$=1$$

$$D=9+\frac{DL+(6\times DN)+6}{34}\text{, rounded up to an integer value,}$$
$$=9+\frac{80+(6\times 1)+6}{34}\text{, rounded up to an integer value,}$$
$$=12$$

$$Space=C+K+D$$
$$=10+0+12$$
$$=22$$

The maximum number of records (other than R0) that can fit on a track is:

$$\frac{1729}{Space}\text{, rounded down to an integer value,}$$
$$=\frac{1729}{22}\text{, rounded down to an integer value,}$$
$$=78$$

At 78 records per track, the 45 000 record data set would require 577 tracks, or 38 cylinders and 7 tracks.

Blocked Records: Using the calculations shown in "Space Calculation Formula for 3390" on page 25 with $KL=0$ and $DL=4000$:

$C=10$

$K=0$

$$DN=\frac{DL+6}{232}\text{, rounded up to an integer value,}$$
$$=\frac{4000+6}{232}\text{, rounded up to an integer value,}$$
$$=18$$

$$D=9+\frac{DL+(6\times DN)+6}{34}\text{, rounded up to an integer value,}$$
$$=9+\frac{4000+(6\times 18)+6}{34}\text{, rounded up to an integer value,}$$
$$=130$$

$$Space=C+K+D$$
$$=10+0+130$$
$$=140$$

The maximum number of records (other than R0) that can fit on a track is:

$$\frac{1729}{Space}\text{, rounded down to an integer value,}$$
$$=\frac{1729}{140}\text{, rounded down to an integer value,}$$
$$=12$$

At 12 blocks per track, the 900 block data set would require 75 tracks, or 5 cylinders.

Unequal Length Records

As an example of calculating track capacity for unequal length records, consider a partitioned data set with the following records:

- A directory, consisting of 25 records, each with $KL=8$ and $DL=256$
- A number of members, blocked into 4096-byte blocks
- End-of-file records between blocks that contain different members.

All tracks contain an IBM standard R0.

Space Calculations: The space occupied by the different types of records is first calculated.

Directory Records: Using the calculations shown in "Space Calculation Formula for 3390" on page 25 with $KL=8$ and $DL=256$:

$C=10$

$$KN=\frac{KL+6}{232}\text{, rounded up to an integer value,}$$
$$=\frac{8+6}{232}\text{, rounded up to an integer value,}$$
$$=1$$

$$K = 9 + \frac{KL + (6 \times KN) + 6}{34}\text{, rounded up to an integer value,}$$

$$= 9 + \frac{8 + (6 \times 1) + 6}{34}\text{, rounded up to an integer value,}$$

$$= 10$$

$$DN = \frac{DL + 6}{232}\text{, rounded up to an integer value,}$$

$$= \frac{256 + 6}{232}\text{, rounded up to an integer value,}$$

$$= 2$$

$$D = 9 + \frac{DL + (6 \times DN) + 6}{34}\text{, rounded up to an integer value,}$$

$$= 9 + \frac{256 + (6 \times 2) + 6}{34}\text{, rounded up to an integer value,}$$

$$= 18$$

$$Space = C + K + D$$
$$= 10 + 10 + 18$$
$$= 38$$

Member Blocks: Using the calculations shown in "Space Calculation Formula for 3390" on page 25 with $KL=0$ and $DL=4096$:

$C=10$

$K=0$

$$DN = \frac{DL + 6}{232}\text{, rounded up to an integer value,}$$

$$= \frac{4096 + 6}{232}\text{, rounded up to an integer value,}$$

$$= 18$$

$$D = 9 + \frac{DL + (6 \times DN) + 6}{34}\text{, rounded up to an integer value,}$$

$$= 9 + \frac{4096 + (6 \times 18) + 6}{34}\text{, rounded up to an integer value,}$$

$$= 133$$

$$Space = C + K + D$$
$$= 10 + 0 + 133$$
$$= 143$$

End-of-File Records: An end-of-file record in 3390 mode has a *Space* value of 20.

Track Capacity

First Track: In 3390 mode, all tracks have an available *Space* value of 1729 cells. The directory consists of 25 records, each occupying 38 cells. Hence, 1729 – (25 x 38)=779 cells are available for member blocks and end-of-file records. Each member block occupies 143 cells. Hence, in addition to the directory, the first track can contain 5 member blocks with 64 cells remaining for end-of-file records. Because an end-of-file record occupies 20 cells, there is enough space for up to 3 end-of-file records. If more end-of-file records were required, the number of member blocks would have to be reduced from 5 to 4.

In this example, the first track of the data set would contain the directory and one of the following:

- 5 or fewer member blocks and 3 or fewer end-of-file records
- 4 member blocks and 4 end-of-file records.

Subsequent Tracks: The available *Space* of 1729 cells on subsequent tracks could hold 12 member blocks of 143 cells each. The remaining space of 1729 – (12 x 143)=13 cells would not hold an end-of-file record. If end-of-file records were necessary, the number of member blocks would have to be decreased to 11. This decrease results in a remaining space of 1729 – (11 x 143)=156 cells, which would be adequate for 7 end-of-file records. If more end-of-file records were required, the number of member blocks would have to be reduced to 10.

In this example, tracks other than the first track of the data set would contain one of the following:

- 12 member blocks and no end-of-file records
- 11 member blocks and 7 or fewer end-of-file records
- 10 or fewer member blocks and 10 or fewer end-of-file records.

Defining a VSAM Data Set

Allocating Space for a Data Set

Direct Access Device Characteristics

Figure 8 lists the physical characteristics and information about DASD capacity in terms of the number of physical blocks per track and the number of tracks per cylinder.

Figure 8. DASD Physical Characteristics

DASD Characteristics			**Block Size**			
			512	**1024**	**2048**	**4096**
Type	**Trk/Cyl**	**Cyl/Vol**	**Number of Physical Blocks/Track**			
2305-2	8	96	20	12	6	3
3330-1	19	404	20	11	6	3
3330-11	19	808	20	11	6	3
3340/3344	12	348	12	7	*	2
3350	30	555	27	15	8	4
3375	12	959	40	25	14	8
3380[1]	15	885	46	31	18	10
3380[2]	15	1770	46	31	18	10
3380[3]	15	2655	46	31	18	10
3390[4]	15	1113	49	33	21	12
3390[5]	15	2226	49	33	21	12

Notes:

* Not selected for this device.

[1] 3380 single capacity Models A04, AA4, B04, AD4, BD4, AJ4, BJ4, and CJ2.
[2] 3380 double capacity Models AE4 and BE4.
[3] 3380 triple capacity Models AK4 and BK4.
[4] 3390 Model 1.
[5] 3390 Model 2.

For more information on allocating space for a data set, see *MVS/DFP: Managing VSAM Data Sets*.

Processing Control Intervals

Product-Sensitive Programming Interface

This chapter is intended to help you process contol intervals. It contains product-sensitive programming interfaces provided by MVS/DFP. Installation exits and other product-sensitive interfaces are provided to allow your installation to perform tasks such as product tailoring, monitoring, modification, or diagnosis. They are dependent on the detailed design or implementation of the product. Such interfaces should be used only for these specialized purposes. Because of their dependencies on detailed design and implementation, it is to be expected that programs written to such interfaces may need to be changed in order to run with new product releases or versions, or as a result of service.

Opening an Object for Improved Control Interval Access

The following table identifies the direct access devices for which the physical record size equal to the control interval size is selected for a data component. The physical record size is always equal to the control interval size for an index component.

Device	**Control Interval Size (Bytes)**			
	512	**1024**	**2048**	**4096**
2305-2	X	X	X	X
3330	X	X	X	X
3330-1	X	X	X	X
3340	X	X		X
3344	X	X		X
3350	X	X	X	X
3375	X	X	X	X
3380[2]	X	X	X	X
3390[3]	X	X	X	X

End of Product-Sensitive Programming Interface

For more information on processing control intervals, see *MVS/DFP: Managing VSAM Data Sets.*

[2] 3380, all models

[3] 3390, all models

System Macro Instructions

Obtaining I/O Device Characteristics

Use the DEVTYPE macro instruction to request information relating to the characteristics of an I/O device and to cause this information to be placed into a specified area. (The results of a DEVTYPE macro instruction executed before a checkpoint is taken should not be considered valid after a checkpoint/restart occurs.) The IHADVA macro maps the data returned by the DEVTYPE macro.

Device information can be retrieved by using the DEVTYPE or TRKCALC macros. For the IBM 3390 Direct Access Storage Device, use the TRKCALC macro to determine the number of equal-size blocks that will fit on a track. The DEVTYPE macro does not return sufficient information to determine that number for the IBM 3390. For information on using the TRKCALC macro, see "Performing Track Calculations" in *MVS/DFP: System Programming Reference*.

Interpreting LISTCAT Output Listings

Device Type Translate Table

LISTCAT Code	Device Type
3010 200C	3375
3010 200E	3380, all models
3010 200F	3390
3040 200A	3340 (35M/70M)
3050 2007	2305-2
3050 2009	3330
3050 200B	3350
3050 200D	3330-1
3058 2009	3330V
30C0 8003	3420, models 3, 5, and 7
3200 8003	3420, models 4, 6, and 8 (9 track, 6250 BPI)
3210 8003	3420, models 4, 6, and 8 (9 track, 1600/6250 BPI)
3300 8003	3420C (3480 compatibility mode)
3400 8003	3430, 9 TRK, 1600/6250 BPI TAPE
7800 8080	3480 magnetic type unit not in compatibility mode

For more information on interpreting LISTCAT output listings, see *MVS/DFP: Access Method Services*.

Chapter 4. Program Management

Specifying JCL to Run a Linkage Editor Job

Space Allocation Options

SIZE Option

Figure 9 lists the direct access devices that may contain data sets that are the source of input load module text, the intermediate data set, and the output load module data set, and lists the maximum record size used for each device by the linkage editor. These maximum record sizes may always be used in specifying *value2* or, if the programmer can determine them, exact sizes can be used.

Figure 9. SYSUT1 and SYSLMOD Device Types and Their Maximum Record Sizes

Device	Device Maximum Record Size (Bytes)	SYSUT1 or SYSLMOD Maximum Record Size (Bytes)
2305-2	14660	13312
3330-1	13030	12288
3330-11	13030	12288
3340	8368	7680
3344	8368	7680
3350	19069	18432
3375	32760	32760
3380[1]	32760	21504
3390[2]	32760	25600

Notes:

[1] 3380, all models.

[2] 3390, all models.

Figure 10 shows the record sizes used for compatibility between every combination of device types for the intermediate and output load module data sets.

Figure 10 (Page 1 of 2). Load Module Buffer Area and SYSLMOD and SYSUT1 Record Sizes

SYSLMOD Record Size		**SYSUT1 Record Size**		
Device Used	**Maximum Record Size Produced**	**Device Used**	**Maximum Record Size Produced**	**Minimum Load Module Buffer Area (Value2)**
IBM 2305-2	13K	2305-2	13K	26K
	12K[1]	3330,3330-11	12K	24K
	7.5K[1]	3340,3344	7.5K	15K
	13K	3350	13K[2]	26K
	13K	3375	26K[2]	26K
	13K	3380[3]	26K[2]	26K
	13K	3390[4]	26K[2]	26K
IBM 3330	12K	2305-2	12K[2]	24K
IBM 3330-11	12K	3330,3330-11	12K	24K
	7.5K[1]	3340,3344	7.5K	15K
	12K	3350	12K[2]	24K
	12K	3375	24K[2]	24K
	12K	3380[3]	24K[2]	24K
	12K	3390[4]	24K[2]	24K
IBM 3340	7.5K	2305-2	7.5K[2]	15K
IBM 3344	7.5K	3330,3330-11	7.5K[2]	15K
	7.5K	3340	7.5K	15K
	7.5K	3350	15K[2]	15K
	7.5K	3375	30K[2]	15K
	7.5K	3380[3]	30K[2]	15K
	7.5K	3390[4]	30K[2]	15K
IBM 3350	13K[1]	2305-2	13K	26K
	12K[1]	3330,3330-11	12K	24K
	15K[1]	3340,3344	7.5K	30K
	18K	3350	18K	36K
	18K	3375	18K[2]	36K
	18K	3380[3]	18K[2]	36K
	18K	3390[4]	18K[2]	36K
IBM 3375	26K[1]	2305-2	13K	52K
	24K[1]	3330,3330-11	12K	48K
	30K[1]	3340,3344	7.5K	60K
	18K[1]	3350	18K	36K
	32760	3375	32760	64K
	32760	3380[3]	32760	64K
	32760	3390[4]	32760	64K

Figure 10 (Page 2 of 2). Load Module Buffer Area and SYSLMOD and SYSUT1 Record Sizes

SYSLMOD Record Size		SYSUT1 Record Size		
Device Used	**Maximum Record Size Produced**	**Device Used**	**Maximum Record Size Produced**	**Minimum Load Module Buffer Area (Value2)**
IBM 3380[3]	13K[1]	2305-2	13K	26K
	12K[1]	3330,3330-11	12K	24K
	15K[1]	3340,3344	7.5K	30K
	18K[1]	3350	18K	36K
	21K	3375	21K[2]	42K
	21K	3380[3]	21K[2]	42K
	21K	3390[4]	21K[2]	42K
IBM 3390[4]	13K[1]	2305-2	13K	26K
	24K[1]	3330,3330-11	12K	48K
	15K[1]	3340,3344	7.5K	30K
	18K[1]	3350	18K	36K
	25K	3375	25K[2]	50K
	25K	3380[3]	25K	50K
	25K	3390[4]	25K	50K

Notes:

[1] The SYSLMOD record size is reduced to less than the maximum to make it compatible with the SYSUT1 record size.

[2] The SYSUT1 record size is reduced to less than the maximum to make it compatible with the SYSLMOD record size.

[3] 3380, all models.

[4] 3390, all models.

For more information on specifying JCL to run a linkage editor job, see *MVS/DFP: Linkage Editor and Loader*.

Linkage Editor Requirements and Capacities

Capacities

The minimum storage requirement and processing capacities of the linkage editor program are described in Figure 11. To increase the capacity for processing external symbol dictionary records, intermediate text records, relocation dictionary records, and identification records, increase *value1* and/or decrease *value2* of the SIZE option. Output text record length can be increased by increasing the SIZE option values, but in no case may the record length ever exceed the track length for the device or 32760 bytes, whichever is smaller. The number of overlay segments and regions that can be processed is not affected by increasing the storage available.

Figure 11. Linkage Editor Capacities for Minimal SIZE Values (96K bytes, 6K bytes)

Function	Capacity (Bytes)
Virtual storage allocated (in bytes)	96K
Maximum number of entries in composite external symbol dictionary (CESD)	558
Maximum number of intermediate text records	372
Maximum number of relocation dictionary (RLD) records	192
Maximum number of segments per program	255
Maximum number of overlay regions per program	4
Maximum blocking factor for input object modules object modules (number of 80-column card images per physical record)	5
Maximum blocking factor for SYSPRINT output (number of 121-character logical records per physical record)	5
Output text record length (in bytes), for the devices supported by this system: 2305-2 Fixed Head Storage, 3330 Disk Storage, 3330-11 Disk Storage, 3340 DASD, 3344 DASD, 3350 DASD, 3375 DASD, 3380 DASD[2], 3390 DASD[3].	3072[1]

Notes:

[1] The maximum output text record length is achieved when *value2* of the SIZE parameter is at least twice the record length size. For example, on a 3330, 12288 byte records are written when *value2* is at least 24576.

[2] 3380, all models.

[3] 3390, all models.

Intermediate Data Set

The intermediate data set (SYSUT1) is used by the linkage editor to hold intermediate data records during processing. The linkage editor places intermediate data in this data set when storage allocated for input data or certain forms of out-of-sequence text is exhausted.

The following direct access devices, if supported by the system, can be used for this data set:

IBM 2305-2	Fixed Head Storage
IBM 2314	Storage Control
IBM 2319	Disk Storage
IBM 3330	Disk Storage
IBM 3330-11	Disk Storage
IBM 3340	Direct Access Storage
IBM 3344	Direct Access Storage
IBM 3350	Direct Access Storage
IBM 3375	Direct Access Storage
IBM 3380[1]	Direct Access Storage
IBM 3390[2]	Direct Access Storage

[1] 3380, all models.

[2] 3390, all models.

For more information on linkage editor requirements and capacities, see *MVS/DFP: Linkage Editor and Loader*.

Index

A
ACS language reference
  statements
    EXIT 3
ACS routine
  statements 3
  storage class
    production sample 5

B
BCS size estimating 10
BISAM (basic indexed sequential access method)
  symbolic field names in DCB 20
BSAM (basic sequential access method)
  symbolic field names for DCB 18

C
capacities, linkage editor 40

D
DASD (direct access storage device)
  capacity 21—24, 34
  interface in DCB 17
data control area size 10
DCB (data control block)
  interface 17
device
  capacities 21—24
device type translate table 36
devices
  supported by MVS/XA and MVS/ESA 1
devices supported by utilities 7
DEVTYPE macro 36

I
IEBIMAGE program
  storage requirements
    SYS1.IMAGELIB data set 8
index
  record replication 11
installing MVS/DFP 1
intermediate data set (SYSUT1)
  devices supported 41
ISAM (indexed sequential access method)
  symbolic field names in DCB 20
I/O device characteristics 36

L
linkage editor
  capacities 40
  storage requirements 40

M
magnetic tape
  interface in DCB 17
maximum record size for device types 37—38
MVS/ESA
  common IBM I/O devices 1

O
output text record length 40

P
planning
  installation of MVS/DFP 1
printer
  types supported by MVS/XA and MVS/ESA 2

Q
QISAM (queued indexed sequential access method)
  symbolic field names in DCB 20

R
RECFM operand (DCB macro)
  BDAM 15
  BSAM 16
record format
  BDAM 15
  BSAM 16
RLD (relocation dictionary)
  number of entries 40

S
storage class
  ACS routine
    production sample 5
storage control unit
  types supported by MVS/XA and MVS/ESA 1
SYS1.IMAGELIB data set
  storage requirements 8

T
tape
  device types supported by MVS/XA and
    MVS/ESA 2

track and cylinder conversion 6
track overflow
BDAM 15
BPAM 15
BSAM 16
QSAM 16
translate table, device type 36

V

virtual storage requirements
linkage editor 40

MVS/DFP Version 3 Release 2
Device Support Reference

SC26-4674-0

Reader's Comment Form

This manual is part of a library that serves as a reference source for system analysts, programmers, and operators of IBM systems. You may use this form to communicate your comments about this publication, its organization, or subject matter, with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you. Your comments will be sent to the author's department for whatever review and action, if any, are deemed appropriate.

Note: Do not use this form to request IBM publications. If you do, your order will be delayed because publications are not stocked at the address printed on the reverse side. Instead, you should direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.

If you have applied any technical newsletters (TNLs) to this book, please list them here: ____________________

Comments (please include specific chapter and page references) :

If you want a reply, please complete the following information:

Name ____________________ Date ____________________

Company ____________________ Phone No. (____) ____________________

Address ____________________

____

Thank you for your cooperation. No postage is necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments or you may mail them directly to the address in the Edition Notice on the back of the title page.)

SC26-4674-0

Reader's Comment Form

Fold and tape **Please do not staple** **Fold and tape**

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 40 ARMONK, NY

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
Department J57
P.O. Box 49023
San Jose, CA 95161-9945

Fold and tape **Please do not staple** **Fold and tape**

IBM ®

IBM®

Program Number
5665-XA3

File Number
S370-34

SC26-4674-0

Printed in U.S.A.