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Systems

OS/VS1 Storage Estimates

VS1 Release 2

IBM

Second Edition (January 1973)

This edition applies to Release 2 of OS/VS1 and to all subsequent releases until otherwise indicated in new editions or Technical Newsletters. 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/360 and System/370 Bibliography, GA22-6822, and the IBM System/370 Advanced Function Bibliography, GC20-1763, for the editions that are applicable and current.

Information on the Dynamic Support System (DSS) is included for planning purposes only until it is available. Consult your IBM Branch Office concerning the availability dates.

Level II of TCAM will not run under Release 2 of VS1. The TCAM information in this book is included for planning purposes until the availability of TCAM Level IV.

Summary of Amendments

For a list of changes made in this edition, see page 3.

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

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Summary of Amendments for GC24-5094-1 OS/VS 1 Release 2

NEW FUNCTIONS

This edition documents supports for these new functions:

- Remote entry Services (RES)
- RTAM
- I/O Load Balancing

PROGRAM ENHANCEMENTS

This edition documents the following program enhancements:

- DEB Validity Checking
- Revised BLDL and RAM lists
- Dynamic Dispatching
- Automated IPL

FOR PLANNING PURPOSES ONLY

This edition documents the following programs for planning purposes:

- Dynamic System Support (DSS)
- TCAM Level II (will not operate under Release 2 until the availability of TCAM Level IV).

Preface

This publication should enable users to estimate the virtual, real, and auxiliary storage requirements for any machine configuration, control program, and control program option of OS/VS1.

This publication is organized into 5 sections and Appendixes A and B.

Section 1	Introduction
Section 2	Estimating Virtual Storage Size
Section 3	Estimating Total Real Storage
Section 4	Access Method Storage
Section 5	Estimating the Auxiliary Storage Requirement
Appendix A	Type 3 and 4 SVC Routines
Appendix B	Access Method Modules

Section 1 describes virtual, real, and auxiliary storage and their characteristics.

Section 2 describes requirements for pageable control program virtual storage and pageable Job Entry Subsystem storage.

Section 3 describes the resident nucleus storage requirement, system queue area (SQA) storage, and options for the CTRLPROG, DATAMGT, GRAPHICS, SVC TABLE, and SCHEDULR macros. This section also includes the Input/output supervisor storage and the real storage necessary during system generation.

Section 4 describes the access methods required to process data sets.

Section 5 describes the auxiliary storage for the various system resident devices and the work space necessary for IBM-supplied control and processing programs.

Appendix A lists the storage sizes of Type 3 and 4 SVC Routines and Error Recovery Procedures.

Appendix B lists the storage sizes of all Access Method Modules for VS1.

HOW TO USE THIS PUBLICATION

These notation conventions are used in this publication:

1. A subscript after a column heading or a table entry indicates the number of a note found at the bottom of the page. For example, table entry 132 (2) refers the reader to note 2 for more information on entry 132.

2. Standard mathematical conventions regarding notation apply to all formulas in this book. For example, braces, brackets, and parentheses (when used in a formula) indicate the order in which the calculation is to be performed. That is, a quantity contained within parentheses should be calculated first and the result used to calculate a quantity within brackets. Braces are used to express a third level of nesting, if necessary.

Other publications that are referenced in this publication are:

IBM System/370, System Summary, GA22-7001.

OS/VS1 Planning and Use Guide, GC24-5090.

Contents

Figures

Introduction

OS/VS1 is a set of control program and processing modules that you can combine in various ways during system generation. The storage required by your installation depends on your machine configuration and the control program and programming options that you select.

Storage Areas

Your total storage requirements include virtual, real, and auxiliary storage.

Virtual Storage

Virtual storage is an addressing/storage concept that provides the installation with as many as 16,777,216 bytes of storage (accessible to programs). The virtual storage is contained on auxiliary storage devices (direct access storage devices) in units of 2048 bytes, referred to as pages. These pages are transferred into and out of real storage as they are needed by the system or by your programs. The process of transfer is called paging and is handled entirely by the VS1 control program. For a comprehensive discussion of virtual storage and the paging process, refer to the IBM System/370, System Summary, GA22-7001, in the section titled How Virtual Storage Works.

REAL STORAGE

Real storage is the system (hardware) storage from which the CPU directly obtains instructions and data and to which it can return results to the problem program. It corresponds to main storage in other IBM operating systems.

AUXILIARY STORAGE

Your operating system requires input/output devices to contain virtual storage, and for system residence libraries, job queues, spooled data sets, and work space used by control and processing programs. The minimum requirement is three direct access storage devices, of which at least two must be IBM 2314, 2319, or 3330 disk drives. The remaining disk can be a 2305-2.

RECOVERY MANAGEMENT STORAGE

The operating system requires storage to perform recovery management. The recovery management procedures record system environment data at the time of a machine malfunction and provide an analysis of this data to determine whether recovery is feasible. The data is arranged in a usable format and written on the LOGREC data set.

Four recovery management facilities are available in VS1:

Machine Check Handler (MCH): This program processes machine-check interruptions. Depending upon the severity of the malfunction, the machine-check handler does one of the following:

- Restores the system to normal operation.
- Terminates tasks associated with the malfunction so the system can resume processing.
- Places the system in the wait state.

In all cases, diagnostic messages and error records are written.

Channel Check Handler (CCH): This program receives control after the detection of a channel-data check, channel-control check, or interface-control check. CCH, for channel control checks and interface checks, does the following:

- Indicates the results of the analysis of the error for later use by the error-recovery procedures when they are set up for a retry of the I/O operation.
- Constructs a record of the error environment. When this record is later recorded, a message is issued to inform the operator that a channel-detected error has been recorded on LOGREC.

For channel-data checks, CCH constructs a record of the error. The error-recovery procedures do not require information from CCH to retry I/O operations on the channel where the data check occurred.

Alternate Path Retry (APR): This program allows an I/O operation that has developed an error on one channel path to be retried on another channel path (if it is assigned to the device performing the I/O operation). Alternate Path Retry also provides the capability to vary a path to a device online or offline.

Dynamic Device Reconfiguration (DDR): This program, upon receiving a system or operator request, permits a demountable volume to be moved from one device to another and repositioned if necessary. This enables you to bypass various I/O errors, and is done without abnormally terminating the affected job or performing another IPL.

Storage Characteristics

Virtual storage in VS1 is divided into two areas, pageable and nonpageable.

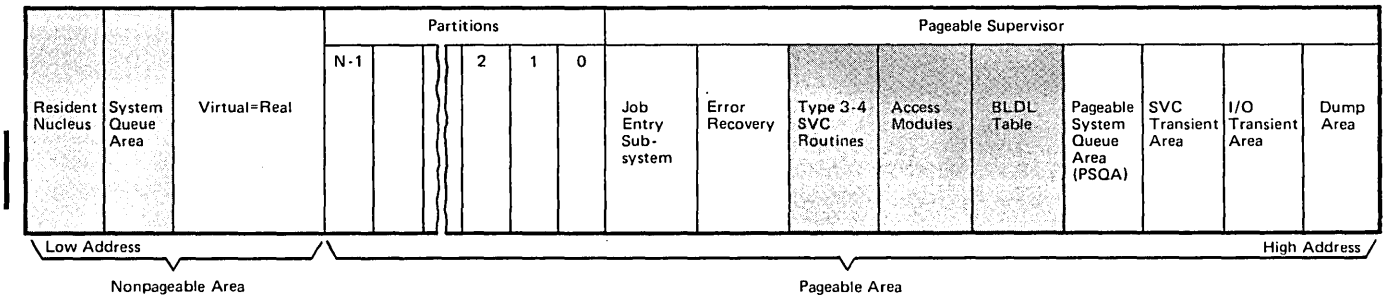

Figure 1. Virtual Storage Organization for the VS1 system.

NONPAGEABLE STORAGE

Nonpageable control program storage is virtual storage that is allocated to the control program during system generation and IPL. The size of nonpageable storage is set by the user when he specifies the location of the virtual=real line at IPL time. If the size of real storage is less than 512K, the V=R line is equal to the real storage size. For systems with greater than 512K of real storage, the lower limit (and default value) is 512K and the upper limit is the size of real storage.

PAGEABLE STORAGE

Pageable virtual storage is used by control and problem program to perform user-requested operations. In VS1, pageable virtual storage is divided (at system generation or at IPL) into a fixed number of partitions, each of a fixed size. (You can change the number and/or size of the partitions at IPL time.)

Estimating Virtual Storage Size

The virtual storage size (specified at system generation or IPL) must be as large as the sum of the pageable and nonpageable virtual requirements (see Figure 1). The nonpageable virtual storage requirement is the sum of the resident nucleus (Supervisor) and V=R space described in a later section. The pageable virtual requirement is the sum of the partition sizes specified at system generation or IPL and the pageable Supervisor including the user option area and the Job Entry Subsystem area.

Pageable Supervisor

The pageable supervisor consists of the following areas (see Figure 1):

- Dump area
- I/O transient area (for non-resident error handling routines)
- SVC transient area
- BLDL table (can be fixed in real storage)
- Access Method Modules (see OS/VS1 Planning and Use Guide listed in the Preface)
- Type 3 and 4 SVC routines (user option)
- Error recovery procedures (user option)
- Job Entry Subsystem
- Pageable System Queue Area

The pageable supervisor contains the following functions:

- ATTACH
- Communications task
- DISABLE
- Enqueue/dequeue
- EXTRACT
- FIND/BLDL/CONVTTR
- IDENTIFY
- LINK/LOAD/XCTL/FINCH
- Master scheduler
- Program FETCH, if FETCH=PC1 is not specified
- SEGLD/SEGWT
- SPIE
- SYNCH
- TIME, if only one partition is in the system

Pageable Job Entry Subsystem (JES)

The pageable Job Entry Subsystem area is a part of the pageable control program (Figure 1). All of the JES area is pageable with two exceptions. At system initialization there is one page of fixed PQA required for the job entry subsystem. A minimum of one page is fixed for the first reader and one page fixed for the first writer that is started. If additional reader(s)/writer(s) are started in the system, additional pages are dynamically fixed in real storage as required.

User Options

Certain options and specifications in the system generation process alter the virtual storage requirements. For instance, the number of concurrent system readers and writers and their control intervals (number of chained CCWs), the block size of PROCLIB, and non-unit record input/output devices, all affect the amount of pageable virtual storage.

Also, the installation may elect to integrate its own SYSOUT writers, SMF processors, remote entry subsystem (RES) or job output separator routines, all of which are part of the pageable virtual storage area and must be added to the total storage requirement.

Estimating Pageable Virtual Storage

The pageable virtual storage comprises two general areas:

- Pageable control program
- Partition requirements

The amount of JES buffer storage in the JES area of the pageable control program (Figure 1) is determined by the number and size of buffers specified in the JES macro during system generation. The optimum buffer size is determined by the block size that is most efficient for the track capacity of the SYS1.SYSPOOL devices. Another factor to consider is that larger buffers decrease the I/O frequency of access to SYS1.SYSPOOL. Figure 2 aids you in calculating the optimum number of JES buffers to specify in the pageable JES calculation, Figure 3.

Calculation	Description	Enter Values
3 x R	R = the maximum number of concurrent readers	
W	W = the maximum number of concurrent writers	
max(3P,D)	The maximum of either 3P or D where:	
	P = the maximum number of concurrent partitions.	
	D = the maximum number of SYSIN/SYSOUT data sets opened concurrently by all executing programs.	
	OPTIMUM NUMBER OF JES BUFFERS (TOTAL SUM) . .	

Figure 2. Optimum number of JES buffers required.

Although a slight underestimation of the number of buffers needed does not seriously degrade performance nor consistently put tasks into a wait state, it does cause preempting of buffers already allocated to other data sets. Those tasks whose buffers have been preempted must then reobtain buffers when they are ready to address the data sets. On the other hand, an overestimation of the number of buffers needed does not adversely affect performance at all, since extra buffers are reflected in real storage only when they are addressed. Figure 3 aids you in calculating the size of the JES pageable area of the control program.

Calculation	Description	SYSGEN Default	Enter Values
	. . . . .	83,500	85,500
(U+4.3W+6.3R) 1024	U = the total number of K-bytes of virtual storage required for any user-written writers, job-separators, or SMF processors. This number should include the module sizes and work space requirements. W = the maximum number of writers specified at system generation or in the JESPARMS member of SYS1.PARMLIB. R = the maximum number of readers specified at system generation or in the JESPARMS member of SYS1.PARMLIB.	11,162	
3B	B = ($b + b_1 + \ldots b_n$) the sum of the sizes of all procedure libraries, non unit record input and output streams that can be processed concurrently (see Note 1)	0	
240R x Y	R = see above Y = the control interval (number of CCWs chained together) used for unit record input devices.	1,200	
72R	R = see above	72	
396W x Z	W = see above Z = the control interval (number of CCWs chained together) for unit record output devices.	2,376	
72W	W = see above	72	
N x S	N = the number of JES buffers (NUMBUF) specified at system generation or in the JESPARMS member of SYS1.PARMLIB. S = the JES buffer size (BUFSIZE) specified at system generation or in the JESPARMS member of SYS1.PARMLIB rounded up to the rounded up to the next multiple of 8. The product of N and S should be rounded up to the nearest 2K.	8,192	
144N	N = see above specified at system generation or in SYS1.PARMLIB.	1,008	
	TOTAL SUM THIS CHART (Notes 2, 3) . . .	107,582	

Notes:
1. If a procedure library is blocked to 800 bytes, and it is used concurrently with two readers, then 800 must be used twice in calculating the value for B.
2. This sum is required to calculate the size of the pageable control program virtual storage in Figure 6.
3. If the JES macro is not specified at sysgen time, this default total is assumed.

Figure 3. Pageable JES storage requirements.

RTAM Program Virtual Storage

To estimate the control program virtual storage requirement for the RTAM pseudo-partition use Figure 4.

Calculation	Description	Enter Values
	. . . . .	14,356
A	A = 32,768 for multileaving and nonmultileaving support = 30,720 for nonmultileaving support only (2770 and/or 2780) = 29,696 for multileaving support only.	
2B	B = the number of line tables defined by the LINE macro at RTAM system generation.	
11C	C = the size of the terminal table defined by the TERMINAL macro at RTAM system generation.	
132D (Note 1)	D = the number of remote readers.	
144E (Note 1)	E = the number of remote printers.	
144F (Note 1)	F = the number of remote punches.	
(44 + G)M	G = the value specified by the MXINTBR parameter at RTAM system generation, rounded up to a full word.	
	M = the number of end-use devices (sum of D,E, and F above).	
162I (Note 1)	I = the value of CNMSGNO parameter specified at RTAM system generation.	
[157(J+1)+2] (Note 1)	J = the value specified by the STBUFNO parameter at RTAM system generation. The total is rounded up to the next full word.	
128 + 20N	N = the maximum number of lines defined by RTAM generation (Note 1)	
8 + L	L = the size of the parm field on the EXEC statement of the START RTAM procedure	
52M	M = the number of end-use devices (sum of D,E, and F above).	
P	P = total fixed RTAM storage requirements as calculated in Figure 16.	
Q	Q = value of EXTRA parameter if coded in SYS1.PARMLIB member.	
	TOTAL THIS CHART (Note 2, 3)	

Notes:
1. Can be overridden by a SYS1.PARMLIB member.
2. This sum is required to calculate the size of the pageable control program virtual storage in Figure 6.
3. Round total up to the next multiple of 2K.

Figure 4. Program virtual RTAM storage requirements.

Pageable Storage for 2250s

To estimate the pageable control program virtual storage for system with 2250s as a secondary console, use Figure 5.

Calculation	Description	Enter Value
48J	J = the total number of display consoles	
36K	K = the total number of defined display areas	
144+[64L_1+ 40L_2+24L_3+ 24L_4+340M]	L_1= 1 if system includes a 2250 display console; otherwise, 0 L_2= 1 if system includes a 2260 display console, otherwise, 0 L_3= 1 if system includes a 3277 Model 2 or Model 158 console; otherwise, 0 L_4= 1 if system includes a 3277 Model 1 display console; otherwise, 0 M = 1 if system includes a display console with a program function keyboard; otherwise, 0	
4+[(110N)+ 6(110N+0)÷ 307.2)]	N = the total number of program function keys 0 = the total number of display consoles with program function keys	
4736P	P = the number of 2250 display consoles	
1464Q	Q = the number of 2260 display consoles	
3072R	R = the number of 3277 Model 2 consoles or Model 158 display console	
1126S	S = the number of 3277 Model 1 display consoles	
	TOTAL SUM THIS CHART (Note 1)	

Note:
1. This sum is required to calculate the size of the pageable control program, Figure 6.

Figure 5. Pageable storage required for 2250s.

Pageable Control Program Virtual Storage

To estimate the pageable control program virtual storage use Figure 6.

Calculation	Description	Enter Values
A	A = 43,008 (21 pages) if system has only 1 partition = 45,056 (22 pages) if system has more than one partition.	
124K-A	A = see above, required for pageable SQA.	
8192 x V	V = the number of megabytes of virtual storage specified at system generation (default VIRTUAL = 1024) or IPL time . . .	
216 x U	U = the number of devices used as operator consoles from SCHEDULR/SECONSOLE sysgen macro.	
24 x W	W = the number of operator reply elements from SCHEDULR sysgen macro.	
168 x X	X = the number of WTO buffer from SCHEDULR sysgen macro.	
Z	Z = total calculated from Figure 5 if 2250s are in system; otherwise, Z=0.	
C	C = the size of user Type 2 SVC modules. . . .	
40 x D	D = the number of module names on the IEABLDxx lists in SYS1.PARMLIB rounded up to the nearest multiple of 2048 (see Note 1).	
E_1	E_1 = 4400 + the total size of all resident reenterable load modules loaded pageable by NIP, + 3072 if real storage is less than 192K, rounded up to the next multiple of 2048 (see Note 2)	
E_2	E_2 = the total size of all resident reenterable load modules loaded fixed by NIP rounded up to the next multiple of 2048 (see Note 3)	
F_1	F_1 = the total size of all resident Type 3 and 4 SVC modules loaded pageable by NIP rounded up to the next multiple of 2048 (see Note 4)	
F_2	F_2 = the total size of all resident Type 3 and 4 SVC modules loaded fixed by NIP rounded up to the next multiple of 2048 (see Note 5)	
G	G = the total size of all error recovery procedures made resident by NIP rounded up to the nearest multiple of 2048 (see Note 6)	
H	H = the size of the pageable JES (see Figure 3).	
I	I = the size of pageable RTAM (see Figure 4).	
	TOTAL THIS CHART*	

* Round up to next higher multiple of 64K.

Figure 6. Pageable control program virtual storage requirement (Part 1 of 2).

Notes:

1. If the IBM-supplied standard list IEABLD00 is specified (enter 2048). For more information on IEABLD00 refer to OS/VS1 Planning and Use Guide listed in the Preface.

2. If the IBM-supplied standard lists are used, IEAIGG00 and 02 contain the module names whose sizes should be summed for calculating E_1. For additional information on these standard lists, refer to Resident Reenterable Module Options, in the OS/VS1 Planning and Use Guide listed in the Preface.

3. If the IBM-supplied standard lists are used, IEAIGG01 and 03 contain the module names whose sizes should be summed for calculating E_2. (See Figure 94)

4. If the IBM-supplied standard list is used, IEARSV00 contains the module names whose sizes should be summed for calculating F_1. (See Figures 89, 92) For additional information on these standard lists, refer to the Resident SVC Routine Options, in the OS/VS1 Planning and Use Guide listed in the Preface.

5. If the user has standard list IEARSV01, the sum of the module sizes on this list is used for calculating F_2. (See Figure 92.)

6. If the user specified RESIDEN=ERP on CTRLPROG macro at sysgen, IBM standard list IEAIGE00. (See Figure 93.) For additional information on this standard list, refer to the OS/VS1 Planning and Use guide list in the Preface.

Figure 6. Pageable control program virtual storage requirement (Part 2 of 2).

Example: For Estimating Pageable Control Program Virtual Storage

The following example shows how the virtual storage requirement for the pageable control program was estimated for a VS1 configuration consisting of:

Number of partitions	5
Virtual storage.	2 megabytes
Real storage	512K
Number of readers and writers (maximum)	2
Reader blocksize	8000 bytes
Writer blocksize	1330 bytes
Number of Job Entry Subsystem buffers each 436	23 buffers

The system contains standard Fetch, does not have multiple console support, and has one user Type 2 SVC module. Also, the standard lists IEAIGG00 and IEARSV00 are resident and pageable. The BLDL list is also pageable.

A complete description of the system configuration can be found in the example following the section Estimating Total Real Storage. This same system configuration is also used in the example following the topic Estimating System Queue Area (SQA) Requirements.

Example (calculated from Figure 6)

Basic constant requirement	45,056 bytes
Pageable SQA (126,976-45056)	81,921 bytes
2 megabytes virtual storage.	16,384 bytes
1 operator console	216 bytes
1 Type 2 user SVC module	212 bytes
Pageable IEABLD00 list	2048 bytes
Pageable IEAIGG00 list from Figure 94 (rounded up to next 2K multiple)	20,480 bytes
Pageable IEARSV00 list from Figure 92 (rounded up to next 2K multiple)	124,928 bytes

Size of the Pageable JES (from Figure 3)

Basic JES requirement.	83,500 bytes
JES variable requirement (based on the number of readers, writers, JES buffers, blocksizes of procedure libraries etc.)	99,500 bytes
Total.	474,245 bytes
Round up factor to make requirement a multiple of 64K.	50,043 bytes
Total pageable control program virtual storage requirement.	524,288 bytes

Virtual Storage Space Available to All Partitions

The area of virtual storage available to partitions in VS1 is the space above the nonpageable area and below the pageable control program area (see Figure 1). Its size can be calculated as follows:

A-(B+C)

Where:

A = Total virtual storage size (SYSGEN or IPL variable).

B = Size of nonpageable area which is equal to the value of the VR parameter specified at IPL time; otherwise, it is equal to the lesser of 512K or the real storage size of CPU.

C = Size of pageable control program (total from Figure 6).

Example: For a medium size system:

```
Virtual storage size =     3072K (SYSGENed value)
Control program area =      512K
Real storage size of CPU =  512K

3072K - (512K + 512K) = 2048K available to problem program partitions.
```

How to Estimate the Size of a Partition in Virtual Storage

The total size of any generated partition must be large enough to meet the following requirements:

- Protected Queue Area (PQA)
- Supervisor services
- User program requirements

Protected Queue Area

In addition to the space required by problem programs, the control program requires space in each partition for functions specifically related to the active job. This space is referred to as the Protected Queue Area (PQA). Part of the total PQA requirement is fixed and must reside within real storage at all times. The other part is pageable. Figure 7 aids you in calculating the total (pageable and fixed PQA requirements for each partition). Both pageable and fixed PQA space may be dynamically extended by the VS1 system if the initial allocation is insufficient.

Calculation	Description	SYSGEN Default	Enter Values
	. . . . .		500
V	V = the number of K-bytes (1024) in the virtual size of the partition specified at system generation or IPL .		
W	W = 0 if FETCH=PCI is not specified by the CTRLPROG macro. 1600 if FETCH=PCI is specified.	0	
	INITIAL FIXED PQA THIS PARTITION (Note 1)		

Note:

1. Round up to the next multiple of 2K. The VS1 system dynamically allocates additional PQA space within a partition if this initial allocation is insufficient to meet current system requirements.

Figure 7. Size of pageable Protected Queue Areas (PQA) for all partitions.

Supervisor Storage Requirements

Storage is used by the control program while supervisor services and IBM-processing programs and utilities are being performed and also after control is returned to the program requiring these services. In VS1 the storage requirement for supervisor requirements is obtained from the partition. Therefore, the amount of storage required

must be considered to calculate the optimum size for a partition. Supervisor requirements consist of the following:

- Overlay Supervisor
- Loader

Figures 8-10 are provided to aid you in calculating the total storage required for Supervisor functions.

OVERLAY SUPERVISOR

If a load module used in a job step requires the overlay supervisor, the partition size required by the job step must be large enough to support the overlay supervisor modules. The overlay supervisor module types in VS1 are:

- Basic module (synchronous overlay without check)

- Advanced module (synchronous overlay with check)

The basic module does not check whether a request for the overlay supervisor is valid; the advanced module does. Neither the basic nor advanced types permit overlay through the SEGLD macro instruction. However, the SEGLD macro can be used and is ignored by either the basic or advanced modules without resulting in an error. The size for each module is:

Overlay Supervisor	Partition Requirement (bytes)
Basic module	436
Advanced module	512

An overlay supervisor operates through the use of tables created by the linkage editor. Because these tables are incorporated into the overlay program, their size must be considered in planning the partition size.

The types of tables created for the overlay supervisor are:

- Segment tables
- Entry tables

The segment table is a control section at the beginning of the root segment of the overlay program. Each segment of the overlay program including the root segment may contain one entry table. An entry table contains an entry for each symbol referred to by a V-type address constant except when:

- The symbol is defined in a segment in the path of the segment containing the address constant, or

- An entry table entry (ENTAB) for the symbol is in a segment path of the segment containing the address constant.

In addition to the storage allocated to the SEGTABs and ENTABs, partition storage for a NOTE list is required to execute a program in overlay. The partition storage required for Overlay Supervisor Tables and Lists is:

Description	Partition Requirement (bytes)
Segment Table (SEGTAB)	4N + 24
Each Entry Table (ENTAB)	12 (M + 1)
NOTE list	4N + 8

Where:

N = the number of segments in the program.

M = the number of entries in ENTAB.

LOADER

The amount of partition storage required by the loader depends upon:

- The size of the loader routine.
- Data Management access methods that are used by the loader.
- The size of the tables and buffers used by the loader.
- The size of the program being loaded.

The maximum amount of partition storage that the loader can obtain for its own tables and buffers, and the program is specified by the SIZE parameter.

The loader always reserves 6144 bytes of partition storage for system use (includes the access method). The amount of storage required by the loader for its tables and buffers is variable and depends upon the program being loaded and the processor used. Figure 8 aids you in calculating the pageable storage requirement for supervisor services, overlay supervisor and the loader in VS1.

Calculation	Description	Storage Required	Enter Values
SUPERVISOR SERVICES	ABEND		
	Minimum with dump.	7280	
	Minimum without dump	168	
	ATTACH		
	If floating point save area. . . .	32	
	If TQE	112	
	BLDL		
	. . . . .	496	
	DEQUEUE		
	(See Note 1)	100	
	Job Step Execution		
156+(16+4D)E +(12+4G)F	D = the average number of devices in each DD statement. E = the number of DD statements. F = the number of device pools. G = the average number of devices in each pool.		
	FIND		
	. . . . .	496	
	IDENTIFY		
	. . . . .	48	
	LINK		
	. . . . .	32	
	LOAD		
	Load module on LINK or JOB lib. .	40	
	XCTL		
	Load module in real storage . . .	0	
	Load module in RENT area.	40	

Figure 8. Storage calculations for supervisor services, overlay supervisor and loader residing in a partition (Part 1 of 3).

Calculation	Description	Storage Required	Enter Values
	RESERVE		
34 x R	R = the length or rname used to represent the serially reusable resource (1 to 255 bytes).		
	SETPRT		
	. . . . .	736	
	SPIE		
	. . . . .	48	
	STAE		
	. . . . .	16	
	STIMER with exit routine		
	. . . . .	72	
	STOW		
	. . . . .	1738	
OVERLAY SUPERVISOR	Basic		
436 x N	N = the number of modules.		
	Advanced		
512 x N	N = the number of modules.		
	TOTAL FOR OVERLAY SUPERVISOR		
OVERLAY SUPERVISOR TABLES-LISTS	SEGTAB		
24 + 4N	N = the number of segments in the program. .		
	ENTAB		
12(M+1)	M = the number of entries in ENTAB		
	NOTE list		
4N + 8	N = the number of segments in the program. .		
	TOTAL FOR OVERLAY TABLES AND LISTS . . .		

Figure 8. Storage calculations for supervisor services, overlay supervisor and loader residing in a partition (Part 2 of 3).

Calculation	Description	Enter Values
LOADER	For tables and buffers.	1506
20 x A	A = the number of external symbols.	
8 x B	B = the number of external relocation dictionary entries referring to control sections processed by the loader.	
(528(C+1))÷32	C = the number of external symbols in any one input module.	
(DxE)+24	D = SYSPRINT buffer number E = SYSPRINT blocksize.	
(FxG)+24	F = SYSLIN buffer number G = SYSLIN blocksize.	
	TOTAL FOR ALL TABLES AND BUFFERS (Note 2)	
	For control modules (Note 3).	664
	For processing modules (Note 3)	13464
	For access method modules	6144
	For system requirements	1600
	TOTAL LOADER REQUIREMENT.	

Notes:

1. This storage is required only when the shared DASD option is selected and a DEQ macro is issued to release a reserved device.
2. The minimum size required for loader tables and buffers is 2000 bytes.
3. These modules may reside in fixed real storage.

Figure 8. Storage calculations for supervisor services, overlay supervisor and loader residing in a partition (Part 3 of 3).

The partition storage for VS1 also depends upon:

- IBM-supplied processing services and programs selected (see Figure 9).
- IBM-supplied utilities and service aids selected (see Figure 10).
- Access Methods chosen (see Access Methods Section).

Calculation	Description	Enter Value
PROCESSING SERVICES	CHECKPOINT/RESTART	
	. . . . .	1164
C	C = the amount of storage required to fill an initial 2K request	
(D+48) (E-2)	D = the length of the TIOT.	
	E = the number of opened data sets.	
	TOTAL CHECKPOINT/RESTART.	
	OPEN/CLOSE	
	. . . . .	1044
1000(N-1)	N = the number of non-JES data sets opened in parallel	
1000(M-1)	M = the number of JES data sets opened in parallel.	
	TOTAL OPEN/CLOSE.	
	EOV	
	Total bytes required is 1044.	
	Catalog	
PROCESSING PROGRAMS	Total bytes required is 10K	
	OBR/MDR/RDE	
	Total bytes required is 2K	
	EREP - Total bytes required is 36K	
	Assembler XF	
	Total bytes required is 64K.	
	Linkage Editor	
	Total bytes required is 64K.	
	OLTEP	
	Total bytes required is 192K.	

Figure 9. Partition storage requirement for IBM-supplied Processing Programs.

Calculation	Description	Enter Value
SYSTEM UTILITITES	IEHATLAS	
	. . . . .	14000
R	R = the maximum logical record length, rounded up to the next multiple of 2K . .	
16 x T	T = the maximum number of records/track . . .	
	TOTAL FOR IEHATLAS.	
	IEHDASDR (Analyze/Format function)	
	. . . . .	16000
N x B	N = the number of operations to be performed (1 to 6), see Note 3 B = a buffer workarea, see Figure 11	
N x 344	N = the number of operations to be performed (1 to 6), see Note 3.	
M x 280	M = the number of copies to be made	
	TOTAL IEHDASDR Analyze/Format function. .	
	IEHDASDR (DUMP function)	
	. . . . .	19200
N x B	N = the number of operations to be performed (1 to 6), see Note 3 B = a buffer workarea, see Figure 11	
N x 360	N = the number of operations to be performed (1 to 6), see Note 3.	
M x 280	M = the number of copies to be made	
	TOTAL IEHDASDR Dump function (Note 4) . .	
	IEHDASDR (RESTORE function)	
	. . . . .	23400
2B(N-1)+B	N = the number of operations to be performed (1 to 6), see Note 3 B = a buffer workarea, see Figure 11	
N x 344	N = the number of operations to be performed (1 to 6), see Note 3.	
M x 280	M = the number of copies to be made	
	TOTAL IEHDASDR Restore function	

Figure 10. Partition storage required by IBM-supplied utility programs and service aids (Part 1 of 7).

Calculation	Description	Enter Value
	IEHMOVE	
	. . . . .	20000
B	B = the largest blocking in the job step, rounded up to the next multiple of 2K (see Note 1).	
	TOTAL IEHMOVE	
	GETALT	
	Total bytes required is 11,800.	
	LABEL	
	Total bytes required is 11,920.	
	PUTIPL	
	Total bytes required is 15,360.	
	IEHINITT	
	Total bytes required is 14,000.	
	IEHLIST	
	Total bytes required is 32,000.	
	IEHPROGM	
	Total bytes required is 28,000.	
	IFHSTATR	
	Total bytes required is 2000.	
	IEHIOSUP	
	Total bytes required is 12,000.	

Figure 10. Partition storage required by IBM-supplied utility programs and service aids (Part 2 of 7).

Calculation	Description	Enter Value
DATA SET UTILITIES	IEBCOMPR	
	. . . . .	18000
2 x L	L = 2048 if user header and trailer labels are processed; 0 otherwise.	
2 x B	B = the largest blocksize in the jobstep, rounded up to the next higher multiple of 2K. If format=VS and LRECL is less than 32K, then B is the maximum logical record length rounded up to the next highest multiple of 2K.	
E	E = the sum of the sizes of all user exit routines (see Note 2)	
	TOTAL IEBCOMPR.	
	IEBCOPY	
	. . . . .	34000
10 x A	A = the maximum number of input data sets referenced in any COPY step	
10 x B	B = the maximum number of member names, including new names. (This quantity is only required if SELECT or EXCLUDE is used)	
(4 x C)+4	C = the maximum number of new names referenced in any COPY step	
(10 x D)+80	D = the maximum number of input members referenced in the largest input data set specified in any COPY step. (This quantity is only required if EXCLUDE or full copy is used)	
N	N = the number of operations to be performed (1 to 6), see Note 3.	
2 x P	P = the maximum input or output blocksize rounded up to the next multiple of 2K, see Note 5. (The minimum value is 2000) .	
U	U = 6000 and is only used if an unload function is performed	
	TOTAL IEBCOPY	

Figure 10. Partition storage required by IBM-supplied utility programs and service aids (Part 3 of 7).

Calculation	Description	Enter Value
	IEBTCRIN	
	. . . . .	10230
2 x A	A = BUFL on SYSUT1.	
E	E = the sum of the sizes for all user exit routines (see Note 2)	
G	G = the storage made available to the user exit routines, rounded up to the next multiple of 2K.	
	TOTAL IEBTCRIN.	
	IEBDG	
	. . . . .	12000
520(H ÷ 8)	H = the number of FD statements. If H is less than or equal to 8, enter 520. . .	
512(I ÷ 18)I	I = the number of create statements. If I is less than or equal to 8, enter 512	
C	C = the sum of all field lengths on all FD statements. Each length should be rounded up to the next multiple of 8. . .	
S+(6 x J)	S = the sum of all picture lengths on all CREATE statements. Round each length up to the next multiple of 8.	
	J = the number of pictures	
8(K+90(O ÷ 8))	O = the number of user exit routines	
	K = the dynamic storage requirement for all user exit routines.	
8 x Q	Q = the logical record length of the output data set. If RECFM=U, then substitute the blocksize	
176V	V = the number of user-specified input and output data sets.	
	TOTAL IEBDG	

Figure 10. Partition storage required by IBM-supplied utility programs and service aids (Part 4 of 7).

Calculation	Description	Enter Value
	IEBGENER	
	. . . . .	26000
4 x B	B = the largest blocksize in the jobstep rounded up to the next higher multiple of 2K. If format=VS and LRECL is less than 32K, then B is the maximum logical record length rounded up to the next highest multiple of 2K.	
2 x L	L = 2048 if user header and trailer labels are processed, 0 otherwise.	
E	E = the sum of all sizes for user exit routines (see Note 2)	
F	F = 2048 for each group of MAX parameters that are less than or equal to 200. . . .	
	TOTAL IEBGENER.	
	IEBISAM	
	. . . . .	8000
R	R = the maximum logical record length rounded up to the next highest multiple of 1K	
	TOTAL IEBISAM	
	IEBPTPCH	
	. . . . .	
4 x B	B = the largest blocksize in the jobstep rounded up to the next higher multiple of 2K. If format=VS and LRECL is less than 32K, than B is the maximum logical record length rounded up to the next highest multiple of 2K.	
E	E = the sum of all sizes for user exit routines (see Note 2)	
F	F = 2048 for each group of MAX parameters that are less than or equal to 200. . . .	
	TOTAL IEBPTPCH.	

Figure 10. Partition storage required by IBM-supplied utility programs and service aids (Part 5 of 7).

Calculation	Description	Enter Value
	IEBUPDTE	
	. . . . .	22000
4 x B	B = the largest blocksize in the jobstep rounded up to the next higher multiple of 2K. If format=VS and LRECL is less than 32K, than B is the maximum logical record length rounded up to the next highest multiple of 2K.	
2 x L	L = 2048 if user header or trailer labels are processed; 0 otherwise.	
E	E = the sum of all sizes for user exit routines, see Note 2.	
	TOTAL IEBUPDTE.	
	IEBEDIT	
	Total bytes required is 12,000.	
SERVICE AIDS	HMASPZAP	
	Total bytes required is 17K	
	HMAPTFLE	
	Total bytes required is 45K	
	HMDSADMP	
	Total bytes required is 32K	
	HMDPRDMP	
	Total bytes required is 128K.	
	HMBLIST	
	Total bytes required is 64K	
	Generalized Trace	
	Total bytes required is 64K	

Figure 10. Partition storage required by IBM-supplied utility programs and service aids (Part 6 of 7).

Notes:

1. If the format specified for the data set is VS and LRECL is less than 32K, use R instead of B in the calculation (see IEHATLAS).

2. Round the size of each routine to the next higher multiple of 2K and then add.

3. If enough storage is provided, multiple operations are performed concurrently.

4. Add 1K if a permanent data check or missing address marker is encountered during a dump to SYSOUT.

5. If the operation is a compress-in-place, P is the maximum track capacity of the device being used rounded up to the next multiple of 2K. If the value of P is 2K, the maximum input or output blocksize is 700.

Figure 10. Partition storage required by IBM-supplied utility programs and service aids (Part 7 of 7).

	Device Type	
Function	2314/ 2319 Disk	3330 Disk
ANALYZE/FORMAT	8192	14336
DUMP	10240	18432
PUTIPL	8000	8000
RESTORE	12888	16384

Figure 11. IEHDASDR buffer workarea size for VS1.

Estimating Total Real Storage

Real storage in the VS1 system is organized as shown in Figure 12.

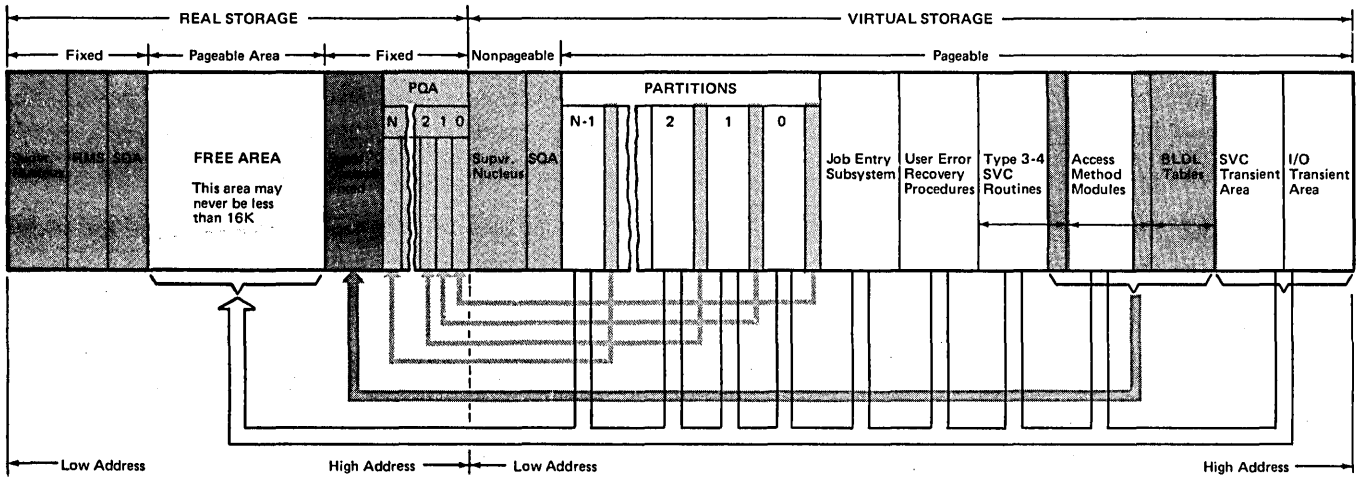

Figure 12. Real Storage Organization for the VS1 system.

The total fixed real storage requirement at any time consists of:

- Supervisor nucleus including I/O Supervisor (constant), see Figure 17.
- BLDL list, if fixed (constant), see Figure 6, item D.
- Total fixed modules (constant), see Figure 6, items E_2 and F_2.
- Recovery management support, see Figure 6, item G.
- System Queue Area (dynamic with system generation or IPL minimum), see Figure 17, item Z.
- Protected Queue Area (dynamic).
- Processing program fixed (installation and application dependent).
- RTAM fixed storage requirements.

Figure 12 shows how real storage is organized in VS1 into fixed (not pageable) and pageable sections. The relative positions occupied by areas in this figure are not necessarily the same positions occupied in all cases, except for the Supervisor nucleus and the initial SQA request. All other areas come under the control of the system paging algorithm that treats each page request separately and selects an optimum assignment in real storage. Thus, the initial PQA assignment for partitions may not be located at the high end of real storage as shown in the figure. At least 16K of real storage must be available to the system for paging although this area need not be contiguous as shown in Figure 12.

The supervisor nucleus (including the I/O Supervisor and error recovery procedures for all DASD devices) is fixed at all times and always occupies the lowest addresses in real storage. Immediately above the supervisor nucleus is the System Queue Area (SQA) used to hold control tables for system tasks. The SQA like the nucleus is always fixed in real storage. If during system operation the SQA space must be extended, the control program automatically obtains more space from the pageable area of real storage (see Figure 12). The space for the extended SQA is fixed by the control program and cannot be paged out to virtual storage.

Also, in real storage there is a Protected Queue Area (PQA) for each partition of virtual storage. The PQA contains control tables for problem program tasks, and like the SQA, these areas are always fixed in real storage. If during system operation additional space is required for the PQAs, the system dynamically extends these areas into the pageable areas of real storage. Unlike the extended SQA, an extended PQA is either fixed in real storage or made pageable by the control program.

In addition, user specified supervisor options may be permanently fixed in real storage. The remaining free areas of real storage (Figure 12) are available for user problem programs that are paged in and out of real storage as required. This area of real storage may also be used to process virtual=real jobs provided the total required storage area for these jobs is contiguous.

The pageable area of real storage must be large enough at all times to contain short duration page fixes for the largest expected I/O request (channel program and control blocks) plus 16K absolute minimum for paging.

Input/Output Supervisor Requirements

The VS1 system requires storage for the input/output supervisor. Part of this requirement is included in the fixed storage requirement. The total amount of fixed IOS storage depends upon the options selected and the I/O configuration at system generation. Figure 13 shows the various supervisor options. Figures 14 and 15 show the channel dependent and device dependent IOS fixed storage requirements for VS1.

Macro Instruction	Control Program Option	Storage Req. (bytes)	Your Req. (bytes)
CTRLPROG	PCI Fetch	3300	
	Dynamic Dispatching	1044	
	Time Slicing	432	
	Trace		
	Each trace table entry	18	
	NODAV(1)	-132	
	DDR	2380	
	DDR+DDRSYS (Note 4)	4044	
DATAMGT	BDAM	Included	
	BTAM	186	
	ISAM	168	
	TCAM	1044	
GRAPHICS	Graphic Programming Services	600	
	Each 2250 Model 1:		
	with 4K buffer	32	
	with 8K buffer	48	
SVCTABLE	User added SVC routine	24	
	Each resident Type 1 or 2 SVC routine	4	
	Each transient SVC routine:		
	No option TRSVCTBL in CTRLPROG macro	1	
	TRSVCTBL in CTRLPROG macro	6	
SCHEDULR	LOG	2136	
	SMF=Full	2300	
	ESV (Note 2)		
	Alternate console (Note 5)	120	
	LOADBAL	140	
SECONSLE	Each composite console (3)	128	
	Each console that is not a composite console (3)	64	
	Each 2740 used as a secondary console (3)	440	
	TOTAL REQUIREMENT THIS TABLE		

Notes:

1. The NODAV option cancels DASD volume serial number checking. If you use this option, the size of fixed storage for the IOS resident code is decreased by the amount shown.
2. If you specify this option and do not include SMF, add 2300 bytes.
3. For the first 2740 specified, add 3512 bytes. For each additional 2740, add 440 bytes.
4. If MCS is not specified, subtract 100 bytes.
5. See Figure 6 for pageable control program virtual storage requirements for display consoles.

Figure 13. Options for CTRLPROG, DATAMGT, GRAPHICS, SVCTABLE, SCHEDULR, SECONSLE macros.

Description	Storage Req. (bytes)	Your Req. (bytes)
Multiplexor channel:	60	
• Priority queueing	6	
• alternate selector channel	4	
Each associated logical channel	6	
Selector or block multiplexor channel:		
• Each channel - if the number of devices exceeds 240, add 12 bytes for each logical channel.	50	
• Second channel path on each chan.	50	
• Each additional channel path on each channel.	32	
• With priority queuing, each channel path on each channel requires additional storage.	6	
• First channel path with direct access devices. If you select shared DASD, add 8 bytes.	32	
• Each additional path with direct access on each channel.	12	
• Each channel switch since IOS does not provide for switching devices onto multiplexor chan.	18	
Queuing capability:		
• FIFO - first in, first out	0	
• Ordered seek queuing	264	
• Priority	104	
Each queued I/O request (Note 1)	20	
DDR	160	
TOTAL IOS REQUIREMENT THIS TABLE		

Note:

1. The maximum number of I/O requests than can be queued, pending satisfaction by the channels, is specified at system generation in the MAXIO parameter of the CTRLPROG macro instruction.

Figure 14. Input/output supervisor requirements, channel dependent.

Description	Storage Req. (bytes)	Your Req. (bytes)
Unit record capability:	0	
• Each 2250	34	
• Each display device (2250,2260)	56	
• Each 3505/3525 reader/punch	32	
• Each unit record device (Note 1)	56	
• Each 1403 printer with UCS	64	
• Each optical character reader	54	
• Each 2495 tape cartridge reader	54	
• Each magnetic character reader	48	
Graphic capability	206	
Magnetic tape capability:	102	
• Any read/write tape adapter unit	42	
• Each 2400 magnetic tape drive (Note 2)	86	
• Any 3400 tape	76	
• Any 3400 tape with FIFO queuing	8	
• Any 3400 tape with priority queuing	8	
• Each 3420 magnetic tape (Note 5)	120	
• Each 3410 magnetic tape (Note 5)	108	
Telecommunication capability:	62	
• Each telecommunications line grp.	20	
• Each telecommunications line	58	
Direct access capability:	Included	
• APR	232	
• Any 2305-2	522	
• Any 2305-2 with APR (Note 4)	544	
• Any 2305-2 with SMF	530	
• Any 2305-2 with APR and SMF	552	
• Any 3330	324	
• Each 2305-2	1986	
• Each address for a 2314/2319	234	
• Each address for a 3330	246	
• Reserve release for shared DASD		
2314/2319	492	
3330	140	
2305-2	192	
• Resident error routines: (Note 3)		
Record overflow, any number of devices (if 2314/2319s is only device this quantity is not necessary)	272	
Any 2305-2	80	
Any 3330	260	
Any RPS (rotational position sensing) device	700	
TOTAL IOS REQUIREMENT THIS CHART		

Figure 15. Input/output supervisor requirements, I/O device dependent. (Part 1 of 2)

Notes:
1. The following rules apply:
   A console is considered a unit record device.
   A 2540 card reader-punch counts as 2 unit record devices.
   A card reader and printer used as a composite console counts as 2 nonconsole devices.
2. If you select EVA, add 22 bytes plus 8 bytes for each tape drive. If you select ESV, add 22 bytes plus 16 bytes for each tape drive. If you select ESV and EVA, add 22 bytes plus 16 bytes for each tape drive. If any 3400 device is present, then only consider the device quantity (the other 22 bytes are included in the 76 bytes shown for 3400 support.
3. If a 3330 and 2305 are shared DASD, an additional 132 bytes is required.
4. Included with system if OPTCHAN is specified in the I/O device macro.
5. VES is always initiated with 3400 support.

Figure 15. Input/output supervisor requirements, I/O device dependent. (Part 2 of 2)

Fixed RTAM Real Storage

To calculate the fixed real storage requirement for RTAM use Figure 16.

Calculation	Description	Enter Values
	. . . . .	7596
112A	A = the maximum number of lines defined by RTAM generation (Note 1)	
252B	B = the number of end-use devices.	
4+12C	C = the number of buffer pages. (Note 2)	
D	D = the TP buffer size (Note 3)	
E	E = fixed PQA for RTAM pseudo-partition	2048
	TOTAL THIS CHART (Note 4).	

Notes:

1. Can be overridden by a SYS1.PARMLIB member.
2. The number of buffer pages is calculated as follows:

   (VALUE OF TPBUFSIZ+176) times the value of TPBUF specified at RTAM system generation.

   Round the result up to the next page and divide by 2K to obtain the number of pages.
3. The TP buffer size is calculated as follows:

   (VALUE OF TPBUFSIZ+176) times the value of TPBUF specified at RTAM system generation. Round the result up to the next page to obtain the number of bytes. Each page is fixed on an as needed basis.
4. This sum is required to calculate the total RTAM virtual storage requirement, Figure 4.

Figure 16. RTAM Real Storage requirements.

Supervisor Nucleus

Figure 17 aids you in calculating the size of the supervisor nucleus residing in real storage.

Calculation	Description	Enter Value
	. . . . .	59,500
S	S = 2700 if more than one partition. = 0 if only one partition.	
T	Total sum of options selected (Figure 13) Total sum for I/O tables (Figures 14 and 15) Total sum for user Type 1 SVC modules	
U ÷ 16384	U = the number of megabytes of virtual storage specified at system generation (default 1024) or IPL time.	
V = 16H 16I	. . . . .	64
	H = the number of extents in the SVCLIB. I = the number of extents in first LinkLib. (For each additional LinkLib add 32+16 times the number of extents in data set).	
W	W = 288 if CPU model is 145 = 0 if CPU model is 135	
X	X = -1,625 if only one partition = 0 if only one partition. (Note 4)	
(A ÷ 256)-360	A = the real storage size. This quantity cannot exceed 1688.	
Y = 124(J+K)	. . . . .	
	J = number of 2314/2319 page data sets. K = number of 3330 page data sets	
248L	L = number of 2305-2 page data sets	
64(M+N+Q)	M = 21 if J=8 or 6J - .5(J(J-1)) if J is less than 8. N = 7K - .5(K(K-1)) Q = 30 if L is greater than 5, or 12L - 1.5 (L(L-1)) if L is less than 6.	
Z	Z = the size of the fixed SQA (Note 1).	
P(456+G)	P = number of partitions in the system. G = 0 if SMF is not in system. = 100 if SMF is in the system.	
B	B = 480 if RTAM is in the system B = 0 if RTAM is not in system.	

Figure 17. Size of the supervisor nucleus (Part 1 of 2).

Calculation	Description	Enter Value
D	D = 1084 if real storage size is equal to or greater than 192K. = 0 if real storage size is less than 192K.	
R ÷ 128	R = the real storage size (an IPL variable and not a system generation variable)	
F	F = SUB TOTAL	
A = (R - F) ÷ 256	(See Note 2)	
F + A	TOTAL SUM (see Note 3)	

Notes:

1. For additional information refer to section Estimating System Queue Area (SQA) Requirements
2. The maximum value of A cannot exceed 2040 which is the real storage size of 510K greater than F.
3. The total sum of F + A should be rounded up to the next multiple of 2048.
4. For Planning Purposes Only. Represents DSS fixed nucleus storage.

Figure 17. Size of the supervisor nucleus (Part 2 of 2).

Example: For Estimating Fixed Real Storage Requirement

The following example shows how the fixed real storage requirement was estimated for a VS1 configuration consisting of:

Number of partitions 5
Virtual storage. . . . . 3 megabytes
Real storage 512K

The system contained graphics and teleprocessing support, full SMF facilities, standard Fetch, no log, and no multiple console support. A complete description of the System/370 configuration follows:

- Model 145 with 256K bytes of storage
- Full MCH and CCH support
- FIFO queuing with 75 I/O requests queued on the channels
- Multiplexor channel with:
  - Two 2540 card reader punches
  - Two 1403 printers with the Universal Character Set Feature
  - One 3215 Console
  - One 1287 OCR Device
  - One 2260 Display Station
  - One 2740 communications terminal (one telecommunications line group with one line)
- One Selector channel with:
  - Three 8 drive 2319 Disk Storage Units with FEATURE=SHARED
- A second Selector channel with:
  - Nine 2401 magnetic tape drives

Control Program options: (includes supervisor and scheduler options)
- NODDR, NODDRSYS

- Resident Type 3 and 4 SVCs
- Time slicing facility
- System Queue Area of 12K
- Trace Table with 500 entries
- BTAM
- ISAM
- TRSVCTBL
- GRAPHICS (no GSP)
- Five User added SVC routines
- Full SMF
- ESV and EVA
- No LOG or MCS

Example (calculated from Figures 13, 14, 15, and 17)

• Basic constant.		59,500
• More than one partition		2,700
• Sum of options selected (Figure 13)		
• Time Slicing	432 bytes	
• 500 Trace table entries 500(18).	9000 bytes	
• BTAM	186 bytes	
• ISAM	168 bytes	
• GRAPHICS	600 bytes	
• Eight User added SVC routines 8(24). . .	192 bytes	
• Four Type 1's and 2's 4(4)	16 bytes	
• Four Type 3's and 4's with TRSVCTBL 4(6)	24 bytes	
• SMF=FULL	2300 bytes	
Total Sum of options from Figure 13		12,918
• Sum of I/O Channel Options (Figure 14)		
• Multiplexor channel.	60 bytes	
• Two selector channels 2(50).	100 bytes	
• One channel path with direct access devices (SHARED DASD).	40 bytes	
• 75 I/O requests 75(20)	1500 bytes	
Total Sum of options from Figure 14		1,700
• Sum of I/O Device Options (Figure 15)		
• Seven unit record devices 7(56).	392 bytes	
• Two 1403 printers with UCS 2(64)	128 bytes	
• One optical character reader	54 bytes	
• One display device	56 bytes	
• Graphics capability.	206 bytes	
• Telecommunications capability.	62 bytes	
• One line group	20 bytes	
• One line	58 bytes	
• Magnetic tape capability (ESV+EVA) . . .	124 bytes	
• Nine 2400 magnetic tape drives 9(102). .	918 bytes	
• Direct access capability	INCLUDED	
• 24 IBM 2314 disks 24(234).	5616 bytes	
• SHARED 2314 support.	492 bytes	
Total Sum of options from Figure 15		8,132
• Three megabytes virtual storage(3072K÷16K)	192 bytes	
• One SVCLIB extent 64+16.	80 bytes	
• One LINKLIB extent	16 bytes	
• Model 145.	288 bytes	
• 512K real storage size (2048-360). . . .	1688 bytes	
• One 2314 page data set 124-6(64)	508 bytes	
• 12K System Queue Area.	12288 bytes	
• 5 partitions with SMF 5(556)	2780 bytes	
• Real storage greater than 192K	1084 bytes	
• 512K real storage (256K÷128)	4096 bytes	

Sub Total		107,970
A = (524,288-107,970)÷256.	1626 bytes	
Total Sum for Figure 17		109,596
Round up factor to make requirement a multiple of 2K		96
Fixed real storage requirement for Supervisor Nucleus		110,592 bytes

Example: For Estimating the Fixed SQA Requirement

The fixed system queue area (SQA) is used by system tasks. It is located in real storage just above the nucleus (see Figure 12). The amount of SQA is originally allocated during IPL. For a real storage size of 128K, a 4K SQA must be specified at system generation or IPL time. It is recommended that an additional 2K of SQA be specified for each additional 64K block of real storage up to a maximum of 16K for a real storage size of 512K. VS1 dynamically allocates additional pages to the SQA (anywhere within real storage) as needed if the initial specified value is insufficient. These additional pages allocated dynamically to the SQA become unavailable for subsequent paging. Figure 18 is an aid to calculating the total fixed SQA space required at any time (see Figure 12, SQA and SQA extended). The total fixed SQA includes the initial SQA value specified at system generation or IPL.

Calculation	Description	Enter Value
A	A = 160 for each active printer/keyboard console. = 280 for each active composite console. = 300 if a printer/keyboard is used as one-half of a composite console.	
180B	B = the number of active or pending commands.	
720C	C = the number of active partitions	
12D	D = the total of all classes defined for all partitions.	
32E	E = the number of consoles in the system.	
448F	F = the number of active I/O requests.	
248G	G = the number of concurrently active input/output streams, where G is equal to or greater than 1.	
12J	J = the number of JES buffers defined in JESPARMS member of SYS1.PARMLIB	
32(R+W+P+K+4)	R = the maximum number of system readers defined in JESPARMS member of SYS1.PARMLIB.	
	W = the maximum number of system writers defined in JESPARMS member of SYS1.PARMLIB.	
	P = maximum number of partitions.	
	K = 2 if SYSLOG is present; otherwise K=0.	
45+.075T+.125U	T = the number of 2314/2319 SYS1.SYSPOOL tracks.	
	U = the number of 3330/2305-2 SYS1.SYSPOOL tracks.	
(Q+S) ÷ 1024	Q = the size of real storage	
	S = the size of the pageable control program calculated in Figure 6.	
V	V = 0 if SMF is not system generated. = 148 if SMF is system generated	
	TOTAL SUM THIS CHART (see Note 2)	

Note:

1. This calculation assumes the default value of 28,672 bytes for ALCUNIT (allocation unit). If a value other than the default is specified for ALCUNIT in the JESPARMS member of SYS1.PARMLIB, see the Formula for Spool Cylinder Map Size under System Spool Data Set (SYS1.SYSPOOL) FOR THE COMPUTATION REQUIRED TO DEVELOP THIS VALUE.

2. VS1 dynamically allocates additional pages to SQA as needed if the estimate from this calculation is insufficient. Whenever additional pages are allocated to SQA, they become unavailable for paging. This total is rounded up to nearest multiple of 2K.

Figure 18. Total System Queue Area requirement.

Estimating System Queue Area (SQA) Requirements

The following example shows how the total SQA requirement was calculated for the same VS1 configuration as described in the preceding section.

At the time the example was formulated, there were a total of 10 active or pending Commands, 2 active partitions, 7 active I/O requests. There were 1000 2314/2319 SYS1.SYSPOOL tracks in the system.

The total SQA requirement is dynamic and pages are allocated by the system as they are needed. Therefore, except for the initial requirement specified at system generation or IPL time (a part of the Supervisor nucleus requirement), the total SQA requirement is not necessarily contiguous in real storage. Once SQA space has been extended, the pages remain fixed for the duration of the IPL.

Example (calculated from Figure 18)

• One active printer/keyboard console	160 bytes
• 10 active or pending commands 10(180) . . .	1800 bytes
• Two active partitions 2(720).	1440 bytes
• 7 classes defined for all partitions 7(12).	84 bytes
• One console	32 bytes
• 7 active I/O requests 7(448).	3136 bytes
• 4 concurrently active I/O streams (2 readers, 2 writers) 4(248)	992 bytes
• 23 JES buffers 12(23)	276 bytes
• 32(2+2+5+0+4) = 13(32)).	416 bytes
• 1000 2314/2319 SYSPOOL tracks 45+.075(1000)	120 bytes
• (Q+S)÷1024 = (524,288+524,288)÷1024.	1024 bytes
• SMF	148 bytes
Total sum from Figure 15	9,628 bytes
Round up factor to make the requirement a multiple of 2K	612 bytes
Total fixed real storage requirement for the System Queue Area.	10,240 bytes

Estimating Fixed PQA

The fixed Protected Queue Area (PQA) requirement for each partition is:

500 + V + W

Where:

V = number of K-bytes (1024) of virtual storage in each partition.

W = 0 if FETCH=PCI was not specified in the CTRLPROG macro during system generation.

= 1600 if FETCH=PCI was specified.

The result of the preceding calculation is rounded up to the next multiple of 2048.

If RTAM is in the system, an additional 2K fixed PQA is allocated for the RTAM pseudo-partition.

Processing Program Fixed Storage Requirement

In addition to the short duration fixed storage requirements for I/O (channel programs and control blocks) required by processing programs running in a virtual environment, there are long term fixed requirements for some processing programs. These long term fixed requirements are listed in Figure 19. Some of these programs require VIRTUAL=REAL storage.

IBM Programs	Fixed Storage	V=R
Generalized Trace (Note 1)	a minimum of 22K (for mode=INT) or 36K (for mode=EXT) plus the options selected	NO
OLTEP	4K (minimum) to 32K (maximum)	No
Recovery Management MCH, CCH for CPUs with less than 192K	6K	NO
Note 1. For additional information, refer to OS/VS Service Aids GC28-0633.		

Figure 19. Processing program fixed storage requirements.

Calculating Available V=R Space for Jobs Run V=R

The formula for calculating the amount of V=R space available at system initialization time is:

$$V = R - (A + B + C + D + E)$$

Where:

- A = the size of the resident nucleus in bytes (Figure 17) and includes storage required for SQA and RMS.
- B = the amount of fixed PQA required per partition.
- C = the fixed storage requirement for JES at IPL time rounded to next 2K multiple. 2772+96x(number of spool volumes)
- D = 4K+(32K-(M-R)) where M=real storage size.
- E = the size of the fixed control program options (the sum of D, E_2, F_2, and G in Figure 6).
- R = the V=R upper boundary. R is equal to the value specified at system initialization; otherwise, R = lesser of 512K or real storage size.

Example:

For a 128K system (1 partition, minimum I/O configuration, and no extra options):

A = 66K (includes 6K RMS and 4K SQA)
B = 2K
C = 4K
D = 36K
E = 0K
108K

V = 128K - 108K or 20K bytes

Thus, 20K is the maximum amount of V=R space available to the user at initialization time. At some later time this space may not be available because of pages permanently fixed within this 20K area.

Real Storage Requirement During System Initialization

To calculate real storage requirements for system initialization use Figure 20.

Calculation	Description	Enter Values
S	S = the size of the supervisor nucleus (See Figure 14)	
P	P = the sum of (Enter Values Column) for items A, E_2, F_2, and G in Figure 6.	
D	D = Enter Values Column for item D in Figure 6 if BLDLF was specified; otherwise, D=0.	
R ÷ 1024	R = real storage size of CPU.	
T ÷ 4096	T = virtual storage bytes	
I	I = initialization variable - one of the following: Single user Partition / Mult. User Part. Normal system without MCS 26K / 48K Normal system with MCS 28K / 50K	
	TOTAL SUM THIS CHART (see Note 1)	

Note:

1. Round total up to the next multiple of 2048.

Figure 20. Real storage requirement for system initialization.

Conversational Remote Job Entry (CRJE) Partition Requirement

CRJE allows remote access to VS1 from conversational terminals. The terminal user may prepare and update programs and data, submit them for processing, and receive the output at the terminal. CRJE jobs are processed concurrently with jobs submitted in a batched environment.

Figure 21 can help you to calculate the partition size necessary to run CRJE. Add 2K (for fixed PQA) to the partition size calculated and round up to the next multiple of 64K.

```
PARTITION = 54248 + AA' + 388B + 922C + (820)D + 104E + (1376 + F) +
            32H + 32J + 16K + L + M + N + O + P + R + 768T + U + V + W
```

Where:

- A = number of line groups.
- A' = 52 if device I/O modules are resident.
  = 332 if the device is a 1050 and the I/O modules are not resident.
  = 300 if the device is a 2740 with checking and the I/O modules are not resident.
  = 212 if the device is a 2741 and the I/O modules are not resident.
- B = number of lines.
- C = number of active users.
- D = number of users receiving job output at one time.
- E = number of START RDR's pending.
- F = maximum blocksize of an OS data set to be EDITed.
- H = number of active users projected to be in syntax checker mode at one time.
- J = number of active users projected to be using EXEC command at same time.
- K = number of active users projected to be using TABSET at the same time.
- L = syntax checker requirements.

FORTRAN = { 16384 / 19456 / 21504 } + 192

Where:

16384 bytes are required if the E level syntax table, only, is to be resident.

19456 bytes are required if the G and H level syntax table is to be resident.

21504 bytes are required if both the E level, and the G and H level syntax checkers are to be resident.

PL/I = { 17408 / 21504 / 28672 } + 300 (PLINO)

Where:

17408 bytes are required for the resident restricted checker.

21504 bytes are required for checking with partial dynamic structure.

28672 bytes are required for checking with fully dynamic structure.

PLINO is the maximum number of PL/I statement lines allowed under CRJE.

Note: If both checkers are selected, include (300 PLINO).

Figure 21. Partition requirement for CRJE (Part 1 of 2).

```
        M  = 0 if BTAM is fully resident or 6000 if BTAM is not
             resident.
        N  = size of user LOGON exit routine if included in CRJE.
        O  = size of user LOGOFF exit routine if it is included in
             CRJE.
        P  = size of user JOBCARD exit routine if it is included in
             CRJE.
        Q  = size of user specified command processors included in
             CRJE.
        R  = 0 if BTAM On-line Test is not included.
           = 2128 if BTAM On-line Test is included.
        T  = number of BTAM transmission codes used.
        U  = 0 if the RAM list of modules is resident.
           = 1800 if the RAM list of modules is not resident.
        V  = 952 if one or more 1050's on a leased line with Timeout
             Suppression feature are supported.
           = 0 if no 1050's with Timeout suppression are supported.
        W  = 0 if CRJE transient area is not larger than
             the minimum of 8K.
             2048xN where N is the number of additional 2-K
             blocks to be added to the transient area.
```

Figure 21. Partition requirement for CRJE (Part 2 of 2).

Basic Indexed Sequential Access Method (BISAM)

The virtual storage requirement for retrieving or storing a data set with the basic indexed sequential access method (BISAM) is estimated by adding the requirements for:

- buffer area
- coding area
- channel program area
- control block area

The buffer area requirement for BISAM is determined by:

For fixed-length records: Area = N(BLKSIZE + 16) + B

For variable-length records: Area = N(BLKSIZE + J) + B

Where:

N = number of buffers.

B = size of DCB (20 for alignment on a fullword boundary, and 24 for alignment on a doubleword boundary).

J = 16 if the buffers are aligned on a doubleword boundary, and 12 if the buffers are aligned on a fullword boundary.

If new logical records are not written in a data set (that is, if WRITE KN is not used), refer to Figures 22 and 23. If WRITE KN is used, refer to Figures 21 and 22. In both cases, use Figure 25. When both WRITE KN and any combination of READ K, READ KN, or WRITE K is used, use the total of Figures 20 and 22 for the channel program space estimates.

Without WRITE KN

Select one or more entries from Figure 22 for each data set stored or retrieved using BISAM without WRITE KN. Because these entries represent storage for sharable routines, no entry should be added more than once when coding space is calculated for multiple data-control blocks open at the same time.

Macro Instruction and Type Field	Record Format	Write Validity Checking	Levels of Indexing	Requirements (bytes) (6)
READ K, READ KN, or WRITE K (3, 4, 5)	Fixed	No	None (1)	4104
	Fixed	No	1 or more (2)	4304
	Fixed	Yes	None (1)	4504
	Fixed	Yes	1 or more (2)	4680
	Var			4720

Notes:

1. Assume only one level of indexing, which is in real storage.
2. Assume one or more levels of indexing, of which the highest level may be in real storage if there are two or more levels.
3. If dynamic buffering is used, add 648 bytes.
4. If CHECK macro is used to test for completion of READ or WRITE, add 136 bytes.
5. Add 3408 bytes if any data set resides on rotational position sensing devices (2305, 3330).
6. Subtract 648 bytes if running virtual=real.

Figure 22. Coding space estimate for BISAM without WRITE KN.

Select one entry from Figure 23 for each data set stored or retrieved using BISAM without WRITE KN.

Levels of Indexing Searched on Device	Storage Requirement (in bytes)
None	408M
One	408M + 88
Two or more	408M + 192

Where:
M = the value in the NCP field of the data control block.

Note: For write validity check, add 128M to the above requirement.

Figure 23. Channel program space estimate for BISAM without WRITE KN.

With WRITE KN

Select one or more entries from Figure 24 for each data set stored or retrieved using BISAM with WRITE KN. Because these entries represent storage for sharable routines, no entry should be added more than once when the coding space estimate is calculated for multiple data-control blocks open at the same time.

Record Format and Blocking	User Work Area	Write Validity Check	Storage Requirement (in bytes)	
			WRITE KN Used Alone	WRITE KN With READ K, READ KN, or WRITE K
Fixed Length Unblocked	No	No	8448	11912
		Yes	8688	12248
	Yes	No	8240	11704
		Yes	8760	12320
Fixed Length Blocked	No	No	8936	12400
		Yes	9248	12808
	Yes	No	9344	12808
		Yes	10096	13656
Variable Length	Yes	N/A	10640	14656

Note: If any level of index is searched on the device, add 288 bytes (assumed NSLD=0).

- Add 648 bytes if dynamic buffering is used.
- Add 136 bytes if the CHECK macro is used to test for completion of WRITE KN or READ and WRITE K.
- Add 3408 bytes if any data set resides on rotational position sensing device 2305,3330.
- Subtract 648 bytes if running virtual=real.

Figure 24. Coding space estimate for BISAM with WRITE KN.

Select entries from Figure 25 for each data set stored or retrieved using BISAM with WRITE KN.

Channel Program Use	Storage Requirement (in bytes)	
	Without Write Validity Check	With Write Validity Check
Levels of indexing searched on device		
• One	88	88
• Two or more	192	192
Fixed-length unblocked records		
• With user work area	888 + 40(N-1)	1208 + 24(N-1)
• Without user work area	928	1248
Fixed-length blocked records		
• With user work area	904 + 40(N-1)	1224 + 40(N-1)
• Without user work area	856	1144
Variable length records	1272	1272
Where: N = the number of physical records that fit on one track.		

Figure 25. Channel program space estimate for BISAM with WRITE KN.

Select entries from Figure 26 for each data set stored or retrieved with BISAM.

Control Block	Storage Requirement (bytes)
Data control block	236
Data event control block	26W
Input/Output block (Note 1)	56W
Data extent block	108+16E+2M=about 170
Buffer control block for dynamic buffering	24
Interruption request block	100
Work area (any BISAM DCB)	120 (Note 2)
Work area for WRITE KN (if not supplied by user)	
• Unblocked records	10 + L + R
• Blocked records	L + R + B

Where:
E = the number of extents
M = the number of modules
L = the key length
R = the record length (LRECL)
B = the block size
W = the value in NCP field of data control block

Notes:
1. Allocate an additional 16W bytes for RPS devices.
2. Subtract 40 bytes if virtual=real.

Figure 26. Control block space estimate for BISAM.

BISAM Example

In this example we read with two channel programs simultaneously and update fixed-length unblocked records. One level of indexing is searched on the device. The write validity check option is not used. The device is an RPS type and address space is virtual.

Sharable routines:	
READ K/WRITE K 4512+3408...	7,920
Two channel programs,	
408(2) + 88.....	904
Control blocks:	
Two data-event control blocks, 26(2).....	52
Two input/output blocks, 56(2) + 16(2).....	144
Data-control block.....	236
Data-extent block.....	170
Interruption-request block	100
Work area.....	120
Total....	9,646 bytes

Graphic Access Method (GAM)

The virtual storage requirement for the I/O and attention handling operations of the graphic support routines can be estimated from Figure 27. No dynamic storage is required for buffer management facilities because these are SVC routines and, as such, are executed in the SVC transient area.

S = A1 + A2 + B1 + B2
Where: A1 = size of the data control block (DCB), input/output block (IOB), and data extent block plus 4(N-1) where N=number of display units/extent block. A2 = size of macro instructions. B1 = size of sharable I/O routines. B2 = size of sharable interruption handling routines.

Figure 27. Virtual storage requirement for Graphic Access Method.

Select one entry from Figure 28 for each type of device used.

I/O Device Type	Storage Requirement (in bytes)
2250	32X + 52Y + 72Z
2260	32X + 52Y + 72Z

Where:

X = the number of data extent blocks plus 4(N-1) where N=number of display units/extent block.
Y = the number of data control blocks.
Z = the number of input/output blocks.

Figure 28. Estimate A1 for Graphic Support.

Select one or more entries from Figure 29 for each macro instruction used.

I/O Device Type	Storage Requirement (in bytes)
2250	70M + 60A + 36B + 4D
2260	70M + 60A

Where:

M = number of input/output macro instructions used.
A = number of attention handling macro instructions used.
B = number of buffer management macro instructions used.
D = number of order and data-generation macro instructions used.

Figure 29. Estimate A2 for Graphic Support.

Select one entry from Figure 30 for the particular device type used. Include this estimate only once if both devices are used.

I/O Device Type	Storage Requirement (in bytes)
2250	1,775
2260	1,775

Figure 30. Estimate B1 for Graphic Support.

Select one entry from Figure 31 for the particular device type used. Include this estimate only once if both devices are used.

I/O Device Type	Storage Requirement (in bytes)
2250	1,875
2260	1,875

Figure 31. Estimate B2 for Graphic Support.

2250 Example

An installation employs four 2250 Display Units, Model 3, attached to a 2840 Display Control. In the program being considered, the buffer management and attention handling facilities are being used with a single display unit. The program includes three input/output, two buffer management, and four attention handling macro instructions.

S = A1 + A2 + B1 + B2	
A1, control blocks (1 DEB + 1 DCB + 3 IOBs).....	300
A2, macro instructions 7C(3) + 60(4) + 36(2).....	522
B1, sharable I/O routines.....	1,775
B2, sharable attention handling routines.....	1,875
Total.....	4,472 bytes

2260 Example

An installation employs eight 2260 Display Stations attached to a single 2848 Display Control. In the program being considered, four 2260 Display Stations are associated with each of two DCBs. Attention handling is used. The program includes two input/output and eight attention handling macro instructions.

S = A1 + A2 + B1 + B2	
A1, control blocks (2 DEBs + 4(N_1-1+N_2-1) + 2 DCBs + 1 IOB).....	320
A2, macro instructions 70(2) + 60(8).....	620
B1, sharable I/O routines.....	1,775
B2, sharable attention handling routines.....	1,875
Total.....	4,590 bytes

Queued Indexed Sequential Access Method (QISAM)

To retrieve or store a data set with the queued indexed sequential access method, virtual storage is the sum of the following requirements:

- The buffer area
- Coding space
- Channel-program space
- Control-block space

Buffer-Area Requirement

The buffer-area requirement for QISAM can be determined from Figure 32.

For creating a data set:	Area = N(BLKSIZE + 8) + 8
For scanning a data set with fixed-length blocked records:	Area = N(BLKSIZE + 16) + 8
For scanning a data set with variable-length blocked records:	Area = N(BLKSIZE + H) + 8
For scanning a data set with fixed-length unblocked records or variable-length unblocked records when both key and data are to be read:	Area = N(BLKSIZE + G) + 8
For scanning a data set with fixed-length unblocked records when only data is to be read:	Area = N(LRECL + 16) + 8

Where:

N = number of buffers.
G = smallest multiple of 8 equal to, or greater than, KEYLEN + 10.
H = 16 if buffers are aligned on a doubleword boundary, or 12 if buffers are aligned on a fullword boundary.

Figure 32. QISAM buffer area requirement.

Data Set Creation

To determine the coding space required, select an entry from Figure 33 for each data set created with QISAM. Because these entries represent storage for sharable routines, no entry should be added more than once when the coding-space estimate is calculated for multiple data-control blocks open at the same time.

Record Format	Write Validity Checking	Storage Requirement (bytes) (1, 2)
Fixed-Length	Yes	6464
	No	6072
Var. Length	Yes	6832
	No	6376
Full track Index Write (fixed only)	Yes	6544
	No	6104

Notes:

1. If any data set resides on a rotational position sensing device (2305, 3330), add 1280 bytes.
2. Subtract 332 bytes if running virtual=real.

Figure 33. QISAM coding-space estimate for data-set-creation.

Select one entry from Figure 34 for each data set created.

Description	Storage Requirement (bytes) (1, 2)
Unblocked records and relative key position zero	352 + 8N
All other cases	352 + 24N

Where:

N = the number of buffers

Note:

1. For write validity check, add 144 bytes to the above requirement.
2. Add 232 bytes to the above requirement of the last track if the track index also contains data (that is, if it is a shared track).

Figure 34. QISAM channel program space estimate for data-set-creation.

Select entries from Figure 35 for each data set created with QISAM.

Control Block	Storage Requirement (bytes)
One data-control block	236
Data extent block	92 + 16E + 2M = about144
Work Area (1)	744 + 4N + 2L

Where:

E = the number of extents
M = the number of modules
N = the number of buffers
L = the key length

Note:
1. Subtract 32 bytes if running virtual=real.

Figure 35. QISAM control-block space estimate for data set creation.

Data Set Scanning

Select entries from Figure 36 for each data set referred to in the scan mode of QISAM. Because these entries represent storage for sharable routines, no entry should be added more than once when the coding space estimate is calculated for multiple data-control-blocks open at the same time.

Description	Storage Requirement (bytes)	
	Variable-Length Format	Fixed-Length Format
Reading a data set	4808	4672
Reading and updating a data set:		
• Without write validity check	5152	5016
• With write validity check	5664	5528

The starting point for sequential reference may be expressed as I, B, or K. There are additional storage requirements if the starting point for sequential reference is expressed as either I or K:

- If it is I, add 680 bytes.
- If it is K, add 2144 bytes.

If any data set resides on a rotational position sensing device (2305, 3330), add 928 bytes.

Subtract 168 bytes if running virtual=real.

Figure 36. QISAM coding space estimate for data set scanning.

Select one or more entries from Figure 37 for each data set referred to in the scan mode of QISAM.

Description	Storage Requirement (bytes)
Primary requirement	72 + 56N
Add the following if required:	
• Setting limit by I	104
• Setting limit by K	370
Where: N = the number of buffers used.	

Figure 37. QISAM channel-program space estimate for data set scanning.

Select entries from Figure 38 for each data set referred to in the scan mode of QISAM.

Control Block	Storage Requirement (bytes)
Work Area (1, 2)	456
One data-control block	236
Data extent block (3)	148+16E+2M=minimum of 172
Interruption request block	100
Where: E = the number of extents M = the number of modules Notes: (select only one) 1. Subtract 32 bytes if running virtual=real. 2. Subtract 118 bytes if virtual=real and the data set does not reside on a rotational position sensing device (2305,3330). 3. Without RPS and V=R.	

Figure 38. QISAM control block space estimate for data set scanning.

QISAM Example

A data set is created with two channel programs, two buffers, and fixed-length records with a key length of 12 bytes. The write-validity-check option is not used, and virtual=real.

```
Sharable routines:
   Primary requirement 6072-232..  5840
Channel programs:
   Fixed-length records,
    352 + 24(2) + 232.............   632
Control blocks:
   Data-control block.............   236
   Data-extent block..............   144
   Work area,
    744 + 4x2 + 12x2 -32.........   744
                          Total.. 7,596 bytes
```

Basic Telecommunications Access Method (BTAM)

The virtual storage requirement for retrieving or storing a data set with the basic telecommunications access method (BTAM) is estimated by summing the following requirements:

- coding-space area
- control-block area
- control-information area
- control-block area by lines
- channel-program area by lines

The coding-space estimate (Figure 39) includes the BTAM code required to support the READ, WRITE, REQBUF, and RELBUF macro instructions, and dynamic buffer allocation. This code is sharable across line groups and is not duplicated for multiple data control blocks open at the same time.

Description	Remote Requirement	Local 3270 Requirement
Primary requirement:		
• without buffer management	8550	4000
• with buffer pool support (REQBUF and RELBUF)	8950	4450
• with dynamic buffering	10164	(Not applicable)
Optional requirement:		
• online test	2880	660
• if ONLTST macro is used	464	(Not applicable)
• line-error print (LERPRT)	374	(Not applicable)
• line open (LOPEN)	530	530
• translate (TRNSLATE)	158	(Not applicable)
• change or local 3270 entry for Auto (CHGNTRY)	352	72
• if RESETPL macro is used with POLLING specified	256	(Not applicable)
• if RESETPL macro is used with ATTENT specified	(Not applicable)	200
• if RESETPL macro is used without operands	600	600
• World Trade Telegraph terminals	1108	(Not applicable)
• change entry for expanded ID verification (CHGNTRY)	38	(Not applicable)
• edit routine TPEDIT, IECTEDIT	2048	(Not applicable)

Figure 39. BTAM coding-space estimate.

Select the appropriate entry from Figure 40 for each type of terminal to be supported under BTAM.

Terminal Device	Virtual Storage Requirement (bytes)
IBM 1030 Data Collection System	224
IBM 1030 Data Communication System with Auto Poll	224
IBM 1050 Data Communication System	238
IBM 1050 Data Communication System on a switched network	312
IBM 1050 Data Communication System with Auto Poll	204
IBM 1060 Data Communication System	192
IBM 1060 Data Communication System with Auto Poll	200
IBM 2260 Display Unit attached as a remote terminal with a 2701 adapter	292
IBM 2740 Communication Terminal	146
IBM 2740 Communication Terminal with checking	268
IBM 2740 Communication Terminal with checking and OIU (Optical Image)	262
IBM 2740 Communication Terminal with station control	152
IBM 2740 Communication Terminal with station control and checking	216
IBM 2740 Communication Terminal on a switched network	172
IBM 2740 Communication Terminal with checking on a switched network	270

Figure 40. BTAM control-information space estimate by device type (Part 1 of 2).

Terminal Device	Virtual Storage Requirement (bytes)
IBM 2740 Communication Terminal with transmit control on switched network	186
IBM 2740 Communication Terminal with checking and OIU on a switched network	330
IBM 2740 Communication Terminal with transmit control and checking on a switched network	270
IBM 2740 Communication Terminal with station control, checking, and Auto Poll	214
IBM 2740 Communication Terminal with station control and Auto Poll	150
IBM 2741 Communication Terminal	106
IBM 2741 Communication Terminal on a switched network	138
IBM 3277 Display Station Local	135
IBM BSC Terminal on a nonswitched, point-to-point network	282
IBM BSC Terminal on switched network	424
IBM BSC Terminal on a nonswitched multipoint network	328
AT&T Model 33/35 TWX stations	170
AT&T 83B3 Selective Calling Stations	146
Western Union Plan 115A Outstation	138
World Trade Telegraph Terminals	158

Figure 40. BTAM control-information space estimate by device type (Part 2 of 2).

Use the control blocks in Figure 41 for each line group.

Control Block	Remote Virtual Storage Requirement (bytes)	Local 3270 Virtual Storage Requirement (bytes)
Data control block		56
• with binary synchronous communications	84	
• without synchronous communications	56	
Data extent block	104-120+4 per line	56+4 per device
Interruption request block	(Not applicable)	124
Interruption queue element	(Not applicable)	24

Figure 41. BTAM control block space for each line group.

Use the control blocks in Figure 42 for each line. Select and total the appropriate entries.

Control Block	Remote Virtual Storage Requirement (bytes)	Local 3270 Virtual Storage Requirement bytes
Data event control block		40
• with binary synchronous communications	48	
• without synchronous communications	40	
Input/output block with 4 CCWs minimum	96	96
Unit control block	20	20
Line error block (LERB macro instruction)	20	(Not applicable)

Figure 42. BTAM control block space for each line.

Select entries from Figure 43 for each line according to its device type.

Terminal Device Type	Virtual Storage Requirement (bytes)
IBM 1030 Data Collection System	64
IBM 1030 Data Collection System (P)	88
IBM 1050 Data Communications System	64
IBM 1050 Data Communications System (P)	80
IBM 1050 Data Communications System (A,D)	88
IBM 1060 Data Communications System	56
IBM 1060 Data Communications System (P)	80
IBM 2740 Communications Terminal	40
IBM 2740 Communications Terminal (C)	48
IBM 2740 Communications Terminal (C,O)	64
IBM 2740 Communications Terminal (A)	48
IBM 2740 Communications Terminal (D)	56
IBM 2740 Communications Terminal (A,C)	48
IBM 2740 Communications Terminal (D,C)	64
IBM 2740 Communications Terminal (D,C,O)	64
IBM 2740 Communications Terminal (A,D,T)	64
IBM 2740 Communications Terminal (A,D,T,C)	64
IBM 2740 Communications Terminal (S)	56
IBM 2740 Communications Terminal (S,P)	88
IBM 2740 Communications Terminal (S,C)	64
IBM 2740 Communications Terminal (S,C,P)	88
IBM 2741 Communications Terminal	48
IBM 2741 Communications Terminal (A)	48
IBM 3277 Display Station (Local)	24
IBM BSC Terminal on a nonswitched point-to-point network	72
IBM BSC Terminal on a switched network	80
IBM BSC Terminal on a nonswitched multipoint network	88
IBM 2260 Display Unit (R)	64
AT&T 83B3 Selective Calling Stations	48
AT&T Model 33/35 Teletypewriter Exchange terminal using the eight-bit Data Interchange Code (A)	56
AT&T Model 33/35 Teletypewriter Exchange Terminal using the eight-bit Data Interchange Code (D)	56
Western Union Plan 115A Outstations	40
World Trade Telegraph Terminals	40

Where:
A = Automatic answering
C = Checking
D = Dialing (automatic calling)
P = Auto Poll
R = Remote attachment with an IBM 2701 Type III Adapter
S = Station control
T = Transmit control
O = IBM 2760 Optical Image Unit

Figure 43. BTAM channel program space estimate by device type per line.

Figure 44 contains the storage requirement for code-translation tables (AMSTRTAB) per device type.

Description	Virtual Storage Requirement (bytes)
Input Translation (transmission code to EBCDIC)	256
Output Translation (EBCDIC to transmission code)	256

Figure 44. Storage requirement for code-translation tables for BTAM.

BTAM Example

This example shows how to estimate the dynamic storage required by a telecommunications application with Auto Poll and buffer pool support but without dynamic buffering and binary synchronous communications.

Assume a VS1 configuration of:

One line with three IBM 1050 Data Communication System Terminals and one line with two of these same terminals.

Basic system information:

- one line group
- start-stop error recovery procedures
- translation
- one DECB per line

```
BTAM coding-space estimate (8950+158+352).....9460
Control-information space by device type..... 204
Control-block space estimate for one line group....  56
Control-block space estimate for two lines..... 224
Channel-program space for two lines..... 160
Translation tables for input and output (256x2)....512
                                        Total 10616 bytes
```

Sequential Access Methods (BSAM and QSAM)

The virtual storage requirement for retrieving or storing a data set with the basic sequential or queued sequential access method (BSAM or QSAM) can be estimated from Figure 45.

$S = A_1 + A_2 + B_1 + B_2 + B_3 + B_4 + C$ + buffers + record area
Where:
A_1 = size of the data control block (DCB) and, for BSAM, the data event control blocks (DECBs).
A_2 = size of input/output blocks (IOBs), data extent blocks (DEBs) and channel programs. (Assume one extent in each DEB.)
B_1 = size of sharable, directly entered routines for macro instructions.
B_2 = size of sharable, indirectly entered routines for macro instructions.
B_3 = size of sharable interruption handling routines.
B_4 = size of sharable error recovery routines for QSAM.
C = SIO appendage size for jobs operating in a virtual=real mode.
buffers = storage required for the input and output buffers and equals P+8+(4•BUFNO)+(BUFNO•BLKSIZE), where P=8 if record area is present for QSAM; otherwise, P=0.
record area = storage required for the assembly and segmenting of a spanned record and equals: for QSAM = 32 + LRECL when the DCB specifies: BFTEK = A, RECFM = VS or VBS, and locate mode. for BSAM = 12 plus the smaller of the track capacity or blocksize when the DCB specifies: BFTEK = R, RECFM = VS, and MACRF = WL.
Note: For dummy data sets, $S = A_1 + B_1$, where B_1 = 104 bytes.

Figure 45. Virtual storage requirement for BSAM, QSAM.

Estimates A_2, B_1, B_2, B_3, and B_4represent storage that remains allocated only while the data control block is open (unless it is used concurrently with another data control block). Estimate A_1 includes storage that normally remains allocated for the duration of a job step.

Use Figures 46 through 56 to calculate estimates A_1, A_2 and B_1 through B for each data set to be retrieved or stored with BSAM or QSAM. Add together the entries in each table that correspond to the attributes of the data set.

Select one entry from Figure 46 for each data set stored or retrieved with BSAM.

I/O Device Type	Storage Requirement (in bytes)
Card reader, card punch, printer, or TSO terminal	72 + 20n
Paper tape	80 + 20n
Optical character readers (1285/1287/1288)	88 + 20n
1419 Magnetic character reader	88 + 20n
1275 Optical reader sorter	88 + 20n
Magnetic tape or direct access storage	88 + 20n
Direct access storage (Create BDAM spanned record format)	88 + 24n
Where: n = the number of data control blocks, that is, the number of channel programs (when the data control block is open for UPDAT, n ≥ 2).	

Figure 46. Estimate A_1 for BSAM.

Select one entry from Figure 47 for each data set stored or retrieved with QSAM.

I/O Device Type	Storage Requirement (in bytes)
Unit record, or TSO terminal	80
Magnetic tape	96
Direct access storage	96
Optical character readers (1285/1287/1288)	96

Figure 47. Estimate A_1 for QSAM.

Select one entry from Figure 48 for each data set stored or retrieved with either BSAM or QSAM. If BSAM is used to create a direct data set for use with BDAM, use Figure 50.

I/O Device Type	Data Control Block open for	Storage Requirement (in bytes)	
		Normal Scheduling	Chained Scheduling
Card reader	INPUT	120 + 48n	120 + 48 + 56n
Paper tape reader	INPUT	120 + 48n	N/A
Card read-punch (BSAM)	INOUT	120 + 64n	N/A
Printer or punch	OUTPUT	120 + 56n	120 + 48 + 64n
Magnetic reader (1419)	INPUT	120 + 522 + 28n	N/A
Optical sorter (1275)	INPUT	120 + 522 + 28n	N/A
Optical Character Readers	INPUT (BSAM)	160	N/A
	INPUT (QSAM)	120 + n(48 + 16r)	N/A
Direct access	UPDAT (BSAM)	132 + s + n(120 + relevant options) See Note	
	UPDAT (QSAM)	132 + s + n(128 + relevant options)	
	INPUT (non-fixed standard)	132 + s + n(88 + relevant options) See Note	132+80+s+n(64+ relevant options)
	INPUT (fixed standard)	132 + s + n(72 + relevant options) See Note	132+80+s+n(64+ relevant options)
	OUTPUT	132 + s + n(88 + relevant options)	132+80+s+n(88+ relevant options)
	INOUT OUTIN (BSAM)	132 + s + n(128 + relevant options) See Note.	132+80+s+n(112+ relevant options)
	INPUT (OFFSET READ)	132 + s + n(88 + relevant options)	N/A
SYSIN/SYSOUT	Any	168 + 412	N/A

Figure 48. Estimate A_2 for BSAM and QSAM (Part 1 of 2).

I/O Device Type	Data Control Block open for	Storage Requirement (in bytes)	
		Normal Scheduling	Chained Scheduling
Magnetic tape (BSAM)	INOUT OUTIN	120 + 56n	120 + 48 + 64n
Magnetic tape	INPUT RDBACK	120 + n(48 + relevant options)	120 + 48 + 56n
	OUTPUT	120 + n(48 + relevant options)	120 + 48 + 64n

Where relevant, include in the above storage requirements:
(exchange buffering, record overflow, and Chained scheduling are mutually exclusive)

Option	Storage Requirement (in bytes)
Record overflow (not UPDAT)	48(t - 1)
Write validity check	24 (32 if record overflow but not UPDAT)
Exchange buffering	8b - 8
Search Direct (not RPS)	8
Direct access RPS device	24 (16 if Chained scheduling)

Where:

n = the number of channel programs for BSAM, or the number of buffers for QSAM. (For chained scheduling n ≥ 2).
r = the number of lines read (BUFL/LRECL).
s = 0 for non-RPS device, 8 for RPS device, or 16 for RPS device and chained scheduling.
t = the number of tracks that a record may occupy.
b = the blocking factor for blocked, fixed-length records. (b = 1 when a unit record device is specified).

Note: If record overflow is used and the data control blocks opened for UPDAT, INPUT, INOUT, or OUTIN, add 96 bytes.

Figure 48. Estimate A_2 for BSAM and QSAM (Part 2 of 2).

Option	Record Format	Storage Requirement (in bytes)
Without record overflow	F	132+s+n(128+3s)
	U or V	132+s+n(160+4s)
With record overflow	F, U, or V	132+s+n(128+80t+5s+2st)
Write validity check without record overflow	F	132+s+n(176+5s)
	U or V	132+s+n(184+6s)
Write validity check with record overflow	F, U, or V	132+s+n(160+96t+6s+2st)

Where:

n = the number of channel programs.
t = the number of tracks that a record may occupy.
s = 8 for device with RPS and not RECFM=UT, otherwise, s = 0.

Figure 49. Estimate A_2 for BSAM when creating a Direct Data Set.

Select one or more entries from Figure 50 for each data set stored or retrieved with BSAM. Because these entries represent storage for sharable routines, no entry should be added more than once when estimate B_1 is calculated for multiple data control blocks open at the same time.

Macro Instruction	I/O Device Type	Data Control Block Open for	Storage Requirement (in bytes)	
			Normal Scheduling	Chained Scheduling
READ/WRITE	Unit record, magnetic tape, or direct access	INPUT OUTPUT INOUT RDBACK OUTIN	424	424
	Direct access	UPDAT	392	N/A
	SYSIN/SYSOUT	Any	1992	N/A
READ	Paper tape	INPUT (translate)	512	N/A
	Optical Reader	INPUT	136	N/A
	Magnetic Reader (1419/1275)	INPUT	176	N/A
READ (offset READ of a spanned direct data set)	Direct access	INPUT	152	N/A
CHECK	Unit record, magnetic tape, direct access, or SYSIN	INPUT OUTPUT INOUT RDBACK INOUT	392	392
	Direct access	UPDAT	112	N/A
	Paper tape	INPUT	240	N/A
	Optical Reader	INPUT	818	N/A
	Magnetic Reader (1419/1275)	INPUT	416	N/A
	SYSOUT	Any	0	N/A

Figure 50. Estimate B_1 for BSAM (Part 1 of 3).

Macro Instruction	I/O Device Type	Data Control Block Open for	Storage Requirement (in bytes)	
			Normal Scheduling	Chained Scheduling
CHECK (Creating a direct data set)	Direct access	OUTPUT	200	N/A
CHECK (Creating a direct data set with VS format)	Direct access	OUTPUT	360	N/A
CNTRL	Magnetic tape	Any	496	N/A
	Card reader	INPUT	168	N/A
	Printer	OUTPUT	168	N/A
	Optical Reader	INPUT	864	N/A
	Magnetic Reader (1419/1275)	INPUT	440	N/A
NOTE/POINT	Magnetic tape	INPUT OUTPUT INOUT RDBACK OUTIN	368	272
	Direct access without record overflow	INPUT OUTPUT INOUT OUTIN	368	440
	Direct access without record overflow	UPDAT	440	N/A
	Direct access with record overflow	Any	440	N/A
	SYSIN/SYSOUT	Any	0	N/A

Figure 50. Estimate B_1 for BSAM (Part 2 of 3).

Macro Instruction	I/O Device Type	Data Control Block Open for	Storage Requirement (in bytes)	
			Normal Scheduling	Chained Scheduling
WRITE (creating a direct data set with F format)	Direct access	OUTPUT	784	N/A
WRITE (creating a direct data set with U or V format)	Direct access	OUTPUT	856	N/A
WRITE (creating a direct data set with record overflow)	Direct access	OUTPUT	1288	N/A
WRITE (creating a direct data set with VS format. BFTEK=R must be specified)	Direct access	OUTPUT	1960	N/A
DSPLY	Optical Reader	INPUT	472	N/A
RESCN	Optical Reader	INPUT	592	N/A

Figure 50. Estimate B_1 for BSAM (Part 3 of 3).

For each data set stored or retrieved with QSAM, select one item either from Figure 51 if simple buffering is used or from Figure 52 if exchange buffering is used. Because these entries represent storage for sharable routines, no entry should be added more than once when estimate B_1 is calculated for multiple data control blocks open at the same time.

Macro Instruction	Mode	Record Format	Storage Requirement (in bytes)
GET	Locate	F or U	160
		V	168
		V spanned	232
		V spanned (logical record interface)	608
	Move	F or U	288
		V or D	264
		V spanned	448
	Data	V spanned	464
GET (reading backwards for magnetic tape)	Locate	F or U	160
	Move	F or U	280
GET (with CNTRL for card reader)	Move	F or U	144
GET (with PUTX function)	Data control block open for UPDAT	F, U, or V	488
		V spanned (logical record interface)	1952
GET (paper tape translate)	Move	F or U	752

Figure 51. Estimate B_1 for QSAM (Simple buffering) (Part 1 of 2).

Macro Instruction	Mode	Record Format	Storage Requirement (in bytes)
PUT (if CNTRL for printer is desired, add 168)	Locate	F or U	128
		V	312
		V spanned	296
		V spanned (logical record interface)	952
PUT (includes PUTX function; if CNTRL for printer is desired, add 168)	Move	F or U	224
		V	344
		V spanned	560
	Data	V spanned	560
GET (for Optical Readers)	Locate	F	312
		V or U	408
	Move	F	376
		V or U	456
PUT/GET (SYSIN/SYSOUT)	Any	any	1208
CNTRL (for Optical Readers)	N/A	N/A	864
RDLINE (for Optical Readers)	N/A	N/A	232

Note: Each GET macro instruction includes the corresponding RELSE macro instruction; each PUT macro instruction includes the corresponding TRUNC macro instruction.

Figure 51. Estimate B_1 for QSAM (Simple buffering) (Part 2 of 2).

Macro Instruction	Mode	Record Format	Storage Requirement (in bytes)
GET	Locate	F, U, or V	104
		F blocked	144
	Substitute	F or U	88
		F blocked	184
PUT (includes PUTX function; if CNTRL for printer is desired, add 168)	Move	F, U, or V	336
		F blocked	288
	Substitute	F or U	330
		F blocked	288

Note: Each GET macro instruction includes the corresponding RELSE macro instruction; each PUT macro instruction includes the corresponding TRUNC macro instruction.

Figure 52. Estimate B_1 for QSAM (Exchange Buffering).

Select one or more entries from either Figure 53 (without user totaling) or Figure 54 (with user totaling) for each data set stored or retrieved with either BSAM or QSAM. Because these entries represent storage for sharable routines, no entry should be added more than once when estimate B2 is calculated for multiple data control blocks open at the same time.

I/O Device Type	Data Control Block Open for	Storage Requirement (in bytes)	
		Normal Scheduling	Chained Scheduling
Card punch or printer (with hardware control character or no control character)	OUTPUT	136	184
Card punch or printer (with ASA control character)	OUTPUT	256	344
Card reader	INPUT	480	624
Paper tape reader	INPUT	480	N/A
Magnetic Reader (1419/1275)	INPUT	336	N/A
Optical Readers	INPUT	254	N/A
SYSIN/SYSOUT	ANY	1448	N/A
Magnetic tape	INPUT, OUTPUT, INOUT, or OUTIN	480	624
	RDBACK	480	N/A
Magnetic Tape or direct access without track overflow	INOUT or OUTIN and LABEL=(,,,IN) or LABEL=(,,,OUT) specified on the DD card	528	672
Direct access without track overflow	UPDAT	480	N/A
	INPUT not RECFM=FS	480	624
	INPUT RECFM=FS	624	624
	OUTPUT	624	976
	INOUT or OUTIN	1104	1600
Direct access with track overflow	INPUT	480	N/A
	OUTPUT or UPDAT	1048	N/A
	INOUT ot OUTIN	1528	N/A
	OUTIN; and LABEL=(,,,OUT) specified on the DD card	1096	N/A
	INOUT; and LABEL=(,,,IN) specified on the DD card	530	N/A

Figure 53. Estimate B_2 for BSAM and QSAM (without user totaling).

I/O Device Type	Data Control Block Open for	Storage Requirement (in bytes)	
		Normal Scheduling	Chained Scheduling
Magnetic tape	OUTPUT, OUTIN, or INOUT	240	440
	OUTIN and LABEL=(,,,OUT) specified on the DD card	288	488
Direct access without track overflow	OUTPUT	632	1000
	INOUT or OUTIN	872	1440
	OUTIN and LABEL=(,,,OUT) specified on the DD card	680	1048
Direct access with track overflow	OUTPUT	1056	N/A
	INOUT or OUTIN	1536	N/A
	OUTIN and LABEL=(,,,OUT) specified on the DD card	1104	N/A
Add for user totaling:	t(n+1) + 120 + 48		

Where:

t = 2 + length of user's totaling area rounded to halfword.
n = number of channel programs for BSAM or number of buffers for QSAM.

Note: For chained scheduling n must be equal or greater than 2.

Figure 54. Estimate B_2 for BSAM and QSAM (with user totaling).

Select one or more entries from Figure 55 for each data set stored or retrieved with either BSAM or QSAM. An entry must be selected if all attributes listed for that entry apply to the data set, no matter how many entries apply. Because these entries represent storage for sharable routines, no entry should be added more than once when estimate B_3 is calculated for multiple data control blocks open at the same time.

Scheduling	I/O Device Type	Data Control Block Open for	Record Format	Storage Requirement
Chained	Any	INPUT, OUTPUT, INOUT,OUTIN	Any	1752
	3211 printer	OUTPUT	Any	184
	Direct access	INPUT, INOUT, OUTIN	Any	216
Normal	Any except Paper tape, search direct; paper tape, SYSIN/SYSOUT; or DOS Chkpnt tapes	INPUT,INOUT, OUTIN, UPDAT	Blocked F including standard	272
			V	584
	Direct access with track overflow	INPUT,INOUT, OUTIN, UPDAT	Any	344
	Direct access with track overflow and RPS	INPUT,INOUT, OUTIN, UPDAT	U	248
	Direct access	UPDAT (QSAM only)	Any	232
	Direct access	UPDAT (QSAM only)	Any	152
	Direct access	UPDAT	Any	496
	Direct access search direct	INPUT, INOUT, OUTIN	Any (except FS, FBT,UT,VS, or VBS)	304
	Direct access Search direct	INPUT, INOUT, OUTIN	Any (except FS, FBT,UT,VS, or VBS)	272
	Direct access search direct	INPUT, INOUT, OUTIN	Any (except FS, FBT,UT,VS, or VBS)	448
	Direct access not search direct	INPUT, INOUT, OUTIN	Any (except standard F)	128
	Direct access with record overflow and not search direct	INPUT, INOUT, OUTIN	Any (except standard F)	184
	Non-3211 printer	OUTPUT	Any	64
	3211 printer	OUTPUT	Any	184
	SYSIN/SYSOUT	Any (See Note)	Any	0

Figure 55. Estimate B_3 for BSAM and QSAM (Part 1 of 2).

Scheduling	I/O Device Type	Data Control Block Open for	Record Format	Storage Requirement
Normal	Magnetic reader (1419/1275)	INPUT	Any	3616
	Paper tape	INPUT	F or U	24
	Paper tape	INPUT	Translate tables for ASCII or Burroughs	512
			Translate tables for IBM, Teletype, NCR, or Friden	768
	Direct access (creating a direct data set)	OUTPUT	VS (BFTEK=R)	184
	Direct access (offset READ of direct data set)	INPUT	VS (BFTEK=R)	328
	Magnetic tape with DOS check point records	INPUT	F or U	416
	Magnetic tape with DOS check point records	INPUT	V	424

Note: If SYSIN/SYSOUT no other entry can be choosen.

Figure 55. Estimate B_3 for BSAM and QSAM (Part 2 of 2).

Data Control Block Open For	Storage Requirement (in bytes)
INPUT	384
OUTPUT	256
UPDAT	584
UPDAT (logical record interface spanned records)	856

Figure 56. Estimate B for QSAM.

BSAM Example

Fixed-length blocked records are read from one tape and written on another. The CHECK macro instruction and normal scheduling are used. This example does not use totaling or contain DOS checkpoint records.

$S = A_1 + A_2 + B_1 + B_2 + B_3 + buffers$

A_1, DCB and DECB:
  INPUT from tape, 88 + 20(2) 128
  OUTPUT to tape, 88 + 20(2) 128
A_2, Channel programs, DEB, and IOB:
  INPUT from tape, normal scheduling, 120+2(48) 216
  OUTPUT to tape, normal scheduling, 120+2(48) 216
B_1, Sharable directly entered routines
  READ/WRITE..... 424
  CHECK..... 392
B_2, Sharable indirectly entered routines:
  Magnetic tape..... 480
B_3, Sharable interruption routine:
  Normal scheduling, fixed-length blocked records.... 272
  Total.....2256 bytes + buffers

QSAM Example

Fixed-length blocked records are read from magnetic tape and written to another tape. Move mode and normal scheduling are used.

$S = A_1 + A_2 + B_1 + B_2 + B_3 + B_4 + buffers$

A_1, Control blocks:
  INPUT from tape..... 96
  OUTPUT to tape..... 96

A_2, Channel programs, DEB, and IOB:
  INPUT from tape, normal scheduling, 120+2(48) 216
  OUTPUT to tape, normal scheduling, 120+2(48) 216

B_1, Sharable directly entered routines:
  GET, move mode, simple buffering..... 288
  PUT, move mode, simple buffering..... 224

B_2, Sharable indirectly entered routines:
  Magnetic tape..... 480

B_3, Sharable interruption routines:
  Normal scheduling, fixed-length blocked records.... 272

B_4, Sharable error routines:
  INPUT..... 384
  OUTPUT..... 256
  Total.....2528 bytes + buffers

Basic Direct Access Method (BDAM)

The virtual storage requirement for retrieving or storing a data set with BDAM can be estimated from Figure 57.

$S = A_1 + A_2 + B_1 + B_2 + B_3 + B_4 + B_5$+ Segment area for VRE
Where:
A_1 = size of the data control block (DCB), data event control blocks (DECBs), data extent block (DEB) and interruption request blocks (IRB).
A_2 = size of input/output blocks (IOBs), and channel programs.
B_1 = size of sharable routines for addressing method.
B_2 = size of sharable routines for macro instructions.
B_3 = size of sharable routines for options.
B_4 = size of dynamic buffering areas.
B_5 = 3680 for VRE, 1680 otherwise.
Segment area = the smaller of the track capacity or the maximum record size.

Figure 57. Virtual storage requirement for BDAM.

Select entries from Figure 58 for each data set stored or retrieved with BDAM.

Control Block	Storage Requirement (in bytes)
Data control block	104
Data Control block	68+(16+T) E (Note 1)
Each data event control block	28 for Non-VRE 32 for VRE
Interruption request block	96

Note

1. E = the number of extents
   T = 12 for fixed length records with relative block addressing and track overflow.
   T = 4 for fixed length records with relative block addressing without track overflow.
   T = 0 for all other cases

Figure 58. Estimate A_1 for BDAM.

Select one entry from Figure 59 for each read or write operation.

Macro Instruction and Type Field	Storage Requirement (in bytes) (1,2)					
	Without Extended Search or Write Validity Check Options		Additional Bytes With Write Validity Option		Additional Bytes With Extended Search Option	
	non-VRE	VRE	non-VRE	VRE	non-VRE	VRE
READ I	112	120(3)	N/A	N/A	N/A	N/A
READ K	112	120(4)	N/A	N/A	64	96
WRITE I	112	128	24	40	N/A	N/A
WRITE K	112	128	24	24	64	88
WRITE A (record format F)	144	N/A	24	N/A	80	N/A
WRITE A (record format U or V)	168	272	32	48	0	0

Notes:

1. If the dynamic buffering option is included, add 16 bytes for each data control block and include the total size (in bytes) of all buffer areas.
2. If the read exclusive option is used, add 80 bytes for each data control block.
3. If "next address" is requested, add 32 bytes.
4. If "next address" is requested, add 40 bytes.

Figure 59. Estimate A_2 for BDAM.

Select one entry from Figure 60 for each data set stored or retrieved with BDAM. Because these entries represent storage for sharable routines, no entry should be added more than once when estimate B_1 is calculated for multiple data control blocks open at the same time.

Addressing Method	Storage Requirement (in bytes)	
	Without Feedback Option	With Feedback Option
Relative block	296	480
Relative block with track overflow	696	936
Relative track	272	272
Actual	0	0

Figure 60. Estimate B_1 for BDAM.

Select one or more entries from Figure 61 for each data set stored or retrieved with BDAM. Because these entries represent storage for sharable routines, no entry should be added more than once when estimate B_2 is calculated for multiple data control blocks open at the same time.

Type Field of Macro Instruction	Storage Requirement (in bytes)			
	Without Extended Search Option		With Extended Search Option	
	non-VRE	VRE	non-VRE	VRE
I	360	792(1)	N/A	N/A
K	216	792(1)	608	1184
A (Record format F)	360	N/A	592	N/A
A (Record format U or V)	768	1472	976	1680

Note:

1. This number should be used only once if types I and K are being used.

Figure 61. Estimate B_2 for BDAM.

Select one or more entries from Figure 62 for each data set stored or retrieved with BDAM. Because these entries represent storage for sharable routines, no entry should be added more than once when estimate B_3 is calculated for multiple data control blocks open at the same time.

Option	Storage Requirement (in bytes)
Write validity check	392
Read exclusive	928
Extended search	184
CHECK macro instruction	240

Note: Add 232 bytes once to the total estimate if one or more of the following apply:

- Type field of macro instruction is A and record format is U or V.
- Dynamic buffering.
- Read exclusive.

Figure 62. Estimate B_3 for BDAM.

Select one entry only from Figure 63 for each DCB if dynamic buffering has been specified.

Type of Address Space	Storage Requirements (in bytes)	
	Non-VRE	VRE
REAL	336	376
VIRTUAL	1176 + 8 (d-b)	1216 + 8 (d-b)

Where:

b = number of buffers specified.

d = maximum number of dynamic buffers in use. (Dynamic buffering READs not offset by FREEDBUF or dynamic buffering WRITEs.)

Figure 63. Estimate B_4 for BDAM - Dynamic Buffering Only.

BDAM Example

Read with one channel program and write with another channel program using relative track addressing, validity checking, and key type operations. The extended search, feedback, and dynamic buffering options are not used.

$S = A_1 + A_2 + B_1 + B_2 + B_3 + B_4$

```
Constant.....................................1680
A1, Control blocks:
  Data control block.........................  88
  Data extent block..........................  112
  Two data event control blocks, 28 (2)......  56
  Interruption request block.................  96
A2, Channel programs:
  READ K without extended search option......  112
  WRITE K with validity check option.........  136
B1, Addressing method:
  Relative track without feedback option.....  272
B2, Macro instructions:
  Type K without extended search option......  216
B3, Options:
  Write validity check.......................  392
B4, Dynamic Buffering........................    0
Constant.....................................1680
                                    Total.....3160 bytes
```

Basic Partitioned Access Method (BPAM)

The virtual storage requirement for retrieving or storing a data set with the basic partitioned access method (BPAM) can be estimated from Figure 64. All estimates for BPAM are calculated from the tables used for BSAM.

$S = A_1 + A_2 + B_1 + B_2 + B_3 + buffers$

Where:

A_1 = size of data control block.

A_2 = size of input/output blocks (IOBs), data extent blocks (DEBs), and channel programs.

B_1 = size of sharable, directly entered routines for macro instructions (and include NOTE and POINT macro instructions).

B_2 = size of sharable, indirectly entered routines for macro instructions.

B_3 = size of sharable interruption handling routines.

buffers = size of input and output buffers.

Figure 64. Virtual storage requirement for BPAM.

Estimates A_2, B_1, B_2, and B_3 include storage that remains allocated only while the data control block is open (unless it is used concurrently with another data control block). Estimate A_1 includes storage that normally remains allocated for the duration of a job step.

Because BPAM uses the same sharable routines as BSAM, storage requirements for sharable routines should not be duplicated when estimates B_1, B_2, and B_3 are calculated for multiple data control blocks open at the same time.

BPAM Example

One member with fixed-length blocked records (not Standard F) is read. Two buffers and the CHECK, NOTE, and POINT macro instructions are used.

$S = A_1 + A_2 + B_1 + B_2 + B_3 + buffers$

A_1, Control blocks:
  Direct access, INPUT, 88 + 20(2) 128
A_2, Channel programs, 132 + 88(2) 308
B_1, Sharable directly entered routines:
  READ/WRITE, INPUT 424
  CHECK 392
  NOTE/POINT 368
B_2, Sharable indirectly entered routines:
  INPUT 480
B_3, Sharable interruption routines:
  Normal scheduling, fixed-length blocked records 272
  Normal scheduling, any record format except
   standard F 128
Total .....2400 bytes + buffers

Telecommunications Access Method (TCAM)

You can estimate the virtual storage requirement for TCAM by using the following formulas for the message-control requirements and the message-processing requirements.

Message Control Program

Figure 65 shows the virtual storage requirement for the message-control program.

```
S = M + L + C + P + (A+B)(K+12) + O + OC

Where:

L = the size of the message-control modules (see
    Figure 67).
C = the size of the control blocks and information (see
    Figure 68).
P = the size of the channel programs, translation
    tables, and special character tables (see
    Figure 69).
A = the value of the MSUNITS operand on the INTRO macro.
B = the value of the LNUNITS operand on the INTRO macro.
K = the value of the KEYLEN operand on the INTRO macro.
    Round the quantity (K+12) up to the nearest 8 byte
    boundary before using in formula.
O = the size of the selected TCAM options (see
    Figure 70).
OC= Operator Control = 4096 bytes.
M = the size of the message handler
    macro expansion (see Figure 66).
```

Figure 65. Storage requirement for the message-control program.

Use Figures 66-70 to calculate the storage requirements for M, L, C, P, and O in Figure 65. The storage calculated in Figures 66-70 should be rounded up to the nearest multiple of 2048 bytes.

Macro Instruction	Storage Requirements (in bytes)	
	First use of macro	Each subsequent use of macro
CANCELMG	12	8
LEVEL=BLK	12	8
with a mask	12	8
CHECKPT	8	4
CODE		
with tablename operand, in INHDR group	60	52
with tablename operand, not in INHDR group	22	18
with no operand, in INHDR group	56	48
with no operand, not in INHDR group	18	14
COUNTER	18	14
CTBFORM		
with no operand	20	16
with option field	22	18
without option field and with 'ENDCHAR=NO' and 'DVCID=NO'	18	14
CUTOFF	18	14
DATETIME	38	30
ERRORMSG	28+c	20+c
with 'EXIT' operand	32+c	24+c
ERRSET	16	16
FORWARD	26+c	22+c
with 'EXIT' operand	34+c	30+c
with 'DEST=PUT' operand	20	20
HOLD	12	8
with 'INTVL' operand	16	12
INBLOCK	0	0
INHDR	28	24
with 'PATH' operand	60	52
INBUF	0	0
with 'PATH' operand	28	28
INEND	2	2
with no 'INMSG' macro or with 'INMSG' macro that uses 'PATH' operand	22	22
INHDR	12	12
with 'PATH' operand	44	40

Figure 66. Estimate M for TCAM Message Control Program (Part 1 of 4).

Macro Instruction	Storage Requirements (in bytes)	
	First use of macro	Each subsequent use of macro
INITIATE	16	16
with characters operand	52+c	52+c
INMSG	8	8
with 'PATH' operand	36	36
LOCK	16	12
with characters operand	44+c	40+c
LOCOPT	14	14
LOG		
in INHDR, INBUF, OUTHDR, or	18	14
OUTBUF in INMSG or OUTMSG	12	8
MSGEDIT	28	14
in INBLOCK	62	42
with characters operand	34+c	20+c
in outgoing group;	32	14
in outgoing group with characters operand	38+c	20+c
in INBUF with length operand	36	18
MSGFORM	16	12
with 'BLOCK' or 'SUBBLCK' operand	18	14
with 'BLOCK' and 'SUBBLCK' operand	19	15
with 'BLOCK' and 'SENDTRP'	22	18
in OUTHDR group	26	14
with 'ENDCHAR' and 'COUNT' operands	18	14
in INBLOCK with character string	42	26
in INBLOCK with character string and option field	50	30
MSGGEN	13+c	9+c
with the fieldname operand	16	12
with the 'CODE' operand	17+c	13+c
with fieldname and 'CODE' operands	20	16
MSGLIMIT		
with integer operand	20	16
with opfield operand	46	42
MSGTYPE	4	4
with characters operand	36+c	36+c
ORIGIN	20	16
OUTBUF	0	0
with 'PATH' operand	28	28
OUTEND	2	2
with no 'OUTMSG' macro or with 'OUTMSG' macro that uses 'PATH' operand	12 14	12 14
OUTHDR	12	12
with 'PATH' operand	40	40

Figure 66. Estimate M for TCAM Message Control Program (Part 2 of 4).

Macro Instruction	Storage Requirements (in bytes)	
	First use of macro	Each subsequent use of macro
OUTMSG	16	12
with 'PATH' operand	54	54
with CTBFORM and no MSGFORM	22	14
with CTBFORM and MSGFORM with 'ENDCHAR' operand	42	22
with CTBFORM and MSGFORM without 'ENDCHAR'	30	14
with MSGFORM and 'ENDCHAR' without CTBFORM	36	20
with MSGFORM without CTBFORM and 'ENDCHAR'	32	16
PATH	24	24
with characters operand	60+c	60+c
PRIORITY	40	40
with characters operand	56+c	56+c
QACTION	22	18
RETRY	8	4
RFDIRECT (4)	12	8
with mask operand	16	12
SCREEN	16	12
with characters operand	52+c	48+c
SEQUENCE		
in INHDR group	36	32
in OUTHDR group	16	12
SETEOF	8	8
with characters operand	44+c	44+c
SETEOM	56+c	32+c
SFTSCAN	14	14
with characters operand	23+c	19+c
STARTMH	38	18
with 'LC=OUT', 'STOP=YES'	38	18
with option field	50	22
TERRSET	16	16
TGOTO	24	18
UNLOCK	16	12
with characters operand	44+c	40+c

Figure 66. Estimate M for TCAM Message Control Program (Part 3 of 4)

Where:

c = the number of characters coded in the character string operand of the macro.

Notes:

1. If the REDIRECT macro is coded before ERPOPMSG, 4 bytes can be subtracted from this value.

2. If the MSGFORM macro is coded before MSGEDIT, 8 bytes can be subtracted from this value; if MSGEDIT is in an outgoing group, 4 additional bytes can be subtracted.

3. If the MSGEDIT macro is coded before MSGFORM, 8 bytes can be subtracted from this value; if the MSGEDIT, DATETIME, ERRORMSG or SEQUENCE macros were coded in an outgoing group before MSGFORM, 4 more bytes can be subtracted from this value.

4. If the ERRORMSG macro is coded before REDIRECT, 4 bytes can be subtracted from this value.

Figure 66. Estimate M for TCAM Message Control Program (Part 4 of 4).

Select entries from the following figure. Each entry should be included only once regardless of the number of times the associated option is used in the Message Control Program. More than one entry may be included for one macro depending upon the operands coded. One entry may also encompass more than one macro. If more than one entry applies to a particular macro whose size is being determined, add the storage requirement for each applicable entry to determine the total number of bytes required for the macro.

Option	Storage Requirement (in bytes)
Non-optional modules	12097
CANCELMG macro coded with LEVEL=MSG	166
coded with LEVEL=BLK	786
CHECKPT macro coded	85
CODE macro coded in any group	336
coded only in INHDR group (additional)	130
COUNTER macro coded	105
CTBFORM macro coded	2568
CUTOFF macro coded	520
DATETIME macro coded	235
DATETIME, ERRORMSG, MSGEDIT, or MSGFORM macros for any group or SEQUENCE macro for outgoing group only	380
ERRORMSG macro coded	420
ERRORMSG or REDIRECT macro coded	290
FORWARD macro coded with any operands	690
coded without DEST=PUT (additional)	230
coded with FOA specified (additional)	524
HOLD macro coded	1520
LOCK macro coded	150
LOG macro coded in either INHDR, INBUF, OUTHDR, or OUTBUF groups	220
coded in either INMSG or OUTMSG (additional)	690
MSGEDIT macro coded with any operands	848
macro coded for any insert operation	2032
coded for remove operation using an offset (additional)	1168
coded for insert operation using an offset (additional)	308
coded for insert operation using a count (additional)	424
MSGEDIT or MSGFORM coded in INBLOCK (additional)	339
MSGFORM macro coded with ENDCHAR, SUBBLCK, BLOCK, COUNT, or no operands	516
coded in the OUTHDR group (in addition see MSGEDIT macro coded with any operands)	1520
coded in INBLOCK group with option field specified (in addition, see MSGEDIT macro coded with any operands and coded in INBLOCK)	176
MSGGEN macro coded	230
MSGLIMIT macro coded	140
ORIGIN macro coded with a concentrator specified	500
coded without a concentrator specified	138
QACTION macro coded	1400
RETRY macro coded	268
SCREEN macro coded	220
SEQUENCE macro coded in an incoming group	160
coded in an outgoing group (also see DATETIME entry above)	140

Figure 67. Estimate L for TCAM Message Control Program (Part 1 of 2).

Option	Storage Requirement (in bytes)
SETEOM macro coded	3168
SETSCAN, FORWARD, or MSGEDIT macro coded with a character string	435
SETSCAN macro coded with POINT=BACK	175
SETSCAN macro coded with an integer	0
STARTMH macro coded with any operands	1064
coded with STOP=YES, or CONT=YES	1776
TGOTO macro coded	272
TLIST macro coded for distribution list	185
TLIST macro coded for cascade list	185
TRANLIST macro coded	445
UNLOCK macro coded	40
Any macro coded with the name of an option field (that is, COUNTER, LOCOPT, PATH, STARTMH, FORWARD, REDIRECT ERRORMSG, MSGEDIT, MSGFORM or MSGLIMIT, CTBFORM, or SETEOM)	176
Operands on the INTRO macro	
DTRACE=0 (Default)	475
DTRACE≠0	575
FEATURE=(,,TIMER) (Default)	980
FEATURE=(,,NOTIMER)	15
FEATURE=(,2741) (default)	1240
FEATURE=(NODIAL,NO2741)	760
FEATURE=(DIAL,NO2741)	1040
FEATURE=(,,CONCO)	1367
INTVL≠0	665
LINETYP=BOTH (Default)	13554
LINETYP=BISC	10896
LINETYP=MINI	5880
LINETYP=STSP and ENVIRON=MIXED	7633
LINETYP=STSP and ENVIRON=TCAM	7728
MSUNITS≠0 and DISK=YES (Default)	11570
MSUNITS≠0 and DISK=NO	6980
MSUNITS=0 and DISK=NO	0
MSUNITS=0 AND DISK=YES	7820
PRIMARY≠SYSCON	580
TRACE≠0	630
Opened data control blocks with following options	
Message Queues data set	
CPB=1 on INTRO macro	1160
CPB>1 on INTRO macro	1890
OPTCD=R on DCB or (MSUNITS=0 and DISK=YES)	4096
Line Group data set	
PCI≠(N,N) on DCB macro	912
Dial lines	1032
Leased lines	500
2260 local lines	710
FEATURE=(,2741) on INTRO macro (Default)	1370
FEATURE=(NODIAL,NO2741) on INTRO macro	850
FEATURE=(DIAL,NO2741) on INTRO macro	1160
BFDELAY≠0 on TERMINAL macro	2168

Figure 67. Estimate L for TCAM Message Control Program (Part 2 of 2).

Control Blocks and Information	Storage Estimates (in bytes)
Address Vector Table INTRO macro,DISK=NO DISK=YES	 1152+G 1278+G
READY macro	50
Termname table TTABLE macro	 94+N(3+C)
Terminal Table TERMINAL macro TLIST macro PROCESS macro LOGTYPE macro	 20+On+Dn+(68+28Pn)** [20+W+[15Pn]]** 6+2T 88+H+28P 115
Station Control Block (generated as a result of OPEN macro)	(84+4R)(S+U+L+Q+V)***
Process Control Block PCB macro	 88
Line Control Block non-switched lines switched lines (generated as a result of OPEN macro)	 144 for each opened nonswitched line 152 for each opened switched line
Data Control Blocks Message Queues Data Set Checkpoint Data Set Line Group Data Set	 44 44 40+4I
Invitation Lists INVLIST macro	 9+3E+EA
Option Table OPTION macro	 10+FX
Disk Input/Output Blocks (generated as a result of OPEN macro)	52 for each extent of an opened message queues data set
Disk Channel Program Blocks (generated as a result of execution of INTRO macro)	8(84+K) Round up to the nearest 8 byte boundary
Concentrator Device ID Table (there is one device ID table for each concentrator defined)	 9+4Y+H(3+Z)

Figure 68. Estimate C for TCAM Message Control Program (Part 1 of 2).

Where:

N = the number of entries defined by TERMINAL, PROCESS, TLIST or LOGTYPE macros.
C = the number of characters in the longest entry name (as specified in the TTABLE macro).
H = the number of device IO entries that have DVCID=chars.
D = the length of device-dependent data specified on the TERMINAL macro: BUFSIZE, ADDR, BFDELAY, and NTBLKSZ (see Note 1); RETRY, LMD, DVCID, or TBLKSZ (see Note 2) operands.
P = the number of priority levels (LEVEL operand) specified on TERMINAL or TPROCESS macros.
T = the number of entries specified for a TLIST macro.
R = the value of the USERFG operand on the INTRO macro.
S = the number of TERMINAL macros specifying BFDFIAY.
T = the number of invitation lists specified on the INVLT operand of the DCB macro.
E = the number of entries defined for the INVLIST macro.
A = the length of the addressing characters defined for each entry in the INVLIST macro.
F = the number of TERMINAL or TPROCESS macros which define data for the option field.
X = the number of bytes defined by the OPTION macro (include the bytes necessary for the requested alignment).
B = the value of the CPB operand on the INTRO macro.
K = the value of the KEYLEN operand on the INTRO macro.
U = the number of lines whose TERMINAL macros do not specify BFDELAY, LMD, MB, QCNTRL, or DVCID=CONC.
G = the number of characters coded in the character string operand of the macro.
L = the number of TERMINAL macros specifying LMD=YES or MB=YES.
Q = the number of TERMINAL macros specifying QCNTRL.
V = the number of lines whose TERMINAL macros specify DVCID=CONC.
W = the length of the delimiter (3rd operand of QCNTRL).
Y = the number of device ID entries that have DVCID=NONE.
Z = the length of device ID characters.

* If outgoing messages are queued by line, (68+28P) should be included for only one terminal on the line.
** Applies if QCNTRL is specified. If QCNTRL with level is specified, add 15Pn.
*** No more than one SCB due to the DVCID=CONC entry is generated per line.

Notes:

1. Some users may use the BLOCK and SUBBLOCK operands instead of NTBLKSZ.

2. Some users may use the TRANSP operand instead of TBLKSZ.

Figure 68. Estimate C for TCAM Message Control Program (Part 2 of 2).

Use Figure 69 to estimate the value for P in Figure 65. Select one of the following entries from Figure 69 for each terminal device type associated with the opened DCB.

Terminal Device Type	Storage Requirements (in bytes)
IBM 1030 Data Collection System	80 + 64n
IBM 1030 Data Collection System with Auto Poll	80 + 96n
IBM 1050 Data Communication System	80 + 64n
IBM 1050 Data Communication Systems with Auto Poll	80 + 104n
IBM 1050 Data Communication System on a switched network	88 + 80n
IBM 1060 Data Communication System	80 + 64n
IBM 1060 Data Communication System with Auto Poll	80 + 104n
IBM 2260 Display Complex attached as a remote terminal on a switched network	80 + 64n
IBM 2260 Display Complex attached with a local configuration	80 + 48n
IBM 2265	80 + 64n
IBM 2740 Communication Terminal	
Type I: Basic nonswitched network	88 + 80n
Type II: Basic switched network	80 + 64n
Type III: Basic switched network with transmit control	40 + 80n
Type IV: Basic nonswitched network with Auto Poll	80 + 104n
IBM 2741 Communication Terminal	80 + 56n
IBM 2741 Communication Terminal or 5041 line on a switched network	80 + 72n
IBM 2760 Communication Terminal on a switched network	80 + 64n
IBM 2760 Communication Terminal on a nonswitched network	88 + 80n
IBM 2770 Communication Terminal	88 + 80n
IBM 2770 Communication terminal with Auto Poll	80 + 104n
IBM 2788 Communication Terminal	80 + 80n
IBM 2780 Communication Terminal with Auto Poll	80 + 104n
IBM 3735 Programmable Buffered Terminal on a Switched Network	80 + 96n
IBM 3735 Programmable Buffered Terminal with Auto Poll	80 + 96n
IBM 7770 Audio Response Unit	80 + 40n
AT&T Model 33/35 TWX Stations	80 + 72n
AT&T 83B3 Selective Calling Stations or Western Union Plan 115A Outstations	80 + 64n
World Trade Telegraph Terminals	80 + 56n
Where: n = the number of opened communication lines	

Figure 69. Estimate P for TCAM Message Control Program.

Use Figure 70 to estimate the value of O in Figure 65.

Name of Function	Selected Option	Storage Requirement (in bytes)
Subtask Trace Table	DTRACE=a on INTRO macro	16(a+1)
Interrupt Trace Table	TRACE=t and TREXIT=exit on INTRO macro	32(t+1)
Cross Reference Table	CROSSRF=c on INTRO macro	16(c+1)
Checkpoint/Restart	OPEN executed for checkpoint DCB	
IEDQNF Executor		354
IGG019RA-Appendage		100
Work area		296+3E+6(C+3) Where: E=value of CPRCDS operand on INTRO macro c=value of CKREQS operand on INTRO macro
Disk I/O Buffers (for Checkpoint/ Restart)		300n Where: n=1. If n is greater than 1, efficiency may be increased by overlapping I/O and processing.
Transient area		850
On Line Test (TOTE)	OLTEST=X on INTRO macro	1024X
Trap Facility	COMWRTE=m on INTRO macro	
IEDQFW-Executor		1530
Trace routine		1044
Application Program Processing	TCAM DCB opened in a TCAM application program	
Work area		(396+4R)Q Where: R=value of USEREG operand on INTRO macro Q=number of Opens
IEDQEU-Open/Close Subtask		1140
One or more schedulers:		
IEDQEC-Put Scheduler	DCB(s) for output	1500
IEDQEW-Get Scheduler	DCB(s) for input	2200
IEDQEZ-Get Scheduler	DCB(s) for input	24
IEDQE7-Retrieve Scheduler	QTAM Compatible DCB(s)	860

Figure 70. Estimate O for message control program.

TCAM Application Programs

Storage required for TCAM application programs can be estimated from the following formula:

S=810+A+W+T+408F

Where:

A = the size of the access method modules.

W = the size of the work area specified by the 'BLKSIZE' operand of the DCB macro.

T = the size of the TCAM macro expansions.

F = 0, if SYNADAF is not executed.

F = 1, if SYNADAF is executed.

Estimates A and T are obtained from Figures 71 and 72.

Option	Storage Requirements (in bytes)
SAM DCB opened for input	3000
QTAM DCB opened for input	2150
SAM DCB opened for output	1010
QTAM DCB opened for output	500
BSAM DCB opened	340
POINT MACRO is used	345
TCOPY MACRO	530
QCOPY MACRO	330
TCHNG MACRO	645
ICOPY MACRO	280

Figure 71. Estimate A for TCAM Application Programs.

Include the size of the macros in Figure 72, once for each time the macro is coded.

Macro Instruction	Storage Estimate (in bytes)
CHECK	14
CKREQ	22
GET	14
ICHNG	58
ICOPY	42
MCOUNT	10
MCPCLOSE with password	78
without password	68
MRELEASE with password	78
without password	68
POINT	16
PUT	14
QCOPY	30
QSTART	0
READ	34
RETRIEVE	24
TCHNG with password	62
without password	48
TCOPY	34
TPDATE	30
WRITE	34

Figure 72. Estimate T for TCAM Application Programs.

Fixed Real Storage Requirements

The fixed real storage requirement for the message control program can be calculated from Figure 73.

```
S = L + C + P + (A+B) (K+12) + O

Where:

L = the size of the message control module from Figure 74.

C = the size of the control blocks and information from Figure 68.

P = the size of the channel programs, translation tables, and
    special character tables from Figure 69.

A = the value of the MSUNITS operand on the INTRO macro.

B = the value of the LNUNITS operand on the INTRO macro.

K = the value of the KEYLEN operand on the INTRO macro.

O = the size of selected TCAM options from Figure 75.
```

Figure 73. Fixed Real Storage for Message Control Program.

Use Figure 74 to calculate the storage requirements for L. For C, use Figure 68 but omit storage requirements for READY, PCB, and OPTION macros. For P, use Figure 69. For O use Figure 75. All sums L, C, P, O, and (A+B)(K+12) should be rounded up to the nearest page size before being used in the preceding formula.

Operands on the INTRO macro:	
LINETYP=BOTH (Default)	11000
LINETYP=BISC	10000
LINETYP=MINI	4600
LINETYP=STEP and ENVIRON=MIXED or TSO	6400
LINETYP=STSP and ENVIRON=TCAM	5000
TREXIT≠0 and TRACE≠0	630
Opened data control blocks with following options:	
Message Queues data set	
CPB=1 on INTRO macro	1160
CPB≥1 on INTRO macro	1890
Line Group data set:	
PCI≠(N,N) on DCB macro	1030
Dial lines	970
Leased lines	500
2260 local lines	350

Figure 74. Estimate L for TCAM MCP Real Storage Requirements.

Application Program Processing Work area	TCAM DCB opened in a Message Processing Program	 192Q Where: Q=number of Opens
Interrupt Trace Table	TRACE=t and TRFXIT=exit on INTRO macro	32(1+1)

Figure 75. Estimate O for TCAM MCP Real Storage Requirements.

TCAM Example

This example contains the coding used and the storage requirement for the following telecommunications application:

- One line with two IBM 1050 data communication system terminals (RAL1&RAL2).
- One line with two IBM 2740 terminals (RTP1&RTP2).
- One direct access device (defined by the DS DISKDCB DCB macro instruction).

The TCAM code on the following page defines the terminals, lines, buffers, and data sets for the configuration used in the example, and provides for activating and deactivating the TCAM message control program.

Message Control Program Virtual Requirement=M+L+C+P+(A+B)(K+12)+O+TS

M: The size of the message handler macro expansions.

```
MCP         CSECT
            INTRO       KEYLEN=116,LNUNITS=5,CPB=3,
                        UNETYP=SYSP,FEATURE=(NODIAL,
                        NO2741),DIST=YES,OLTEST=0,
                        ENVIRON=TCAM
            OPEN        (DISKDCB,(INOUT),RALDCB,(INOUT),
                        RTPDCB,(INOUT))
            READY
            CLOSE       (RTPDCB,,RALDCB,,DISKDCB)
            L           13,4(13)
            RETURN      (14,12)

DISKDCB     DCB         DSORG=TQ,MACRF=(G,P),OPTCD=R
RALDCB      DCB         DSORG=TX,MACRF=(G,P),TRANS=105F,
                        MH=MH1050,
                        SCT=1050,PCI=(N,N) INVLIST=(INVRALI,
                        A,A,INVRAL2)
RTPDCB      DCB         DSORG=TX,MACRF=(G,P),TRANS=2740,
                        MH=MH2740,SEC=2740,PCI=(N,N)
                        INVLIST=(INVRTP,A,A)

            TTABLE      LAST=RTP2,MAXLEN=5
SWITCH      OPTION      H
LIST        TLIST       TYPE=D,LIST=(RAL1,RAL2,RTP1,RTP2)
RAL1        TERMINAL    QBY=L,DCB=RALDCB,RLN=1,TERM=1050,
                        QUEUES=DR,ADDR=6202,ALDEST=RAL1
                        SECTERM=YES,OPDATA=0,LEVEL=(241,
                        242,243)
RAL2        TERMINAL    QBY=L,DCB=RALDCB,RLN=2,TERM=1050,
                        QUEUES=DR,ADDR=6402,ALTDEST=RAL2
                        SECTERM=YES,OPDATA=Q,LEVEL=(241,
                        242,243)
```

```
RTP1      TERMINAL   QBY=T,DCB=RTPDCB,RLN=1,TERM=274I,
                     QUEUES=DR,ADDR=37E201,ALTDEST=RTP1,
                     SECTERM=YES,BFDELAY=5

RTP2      TERMINAL   QBY=T,DCB=RTPDCB,RLN=1,TERM=274I,
                     QUEUES=DR,ADDR=37E401,ALTDEST=RTP2
                     SECTERM=YES,BFDELAY=5

INVRAL1   INVLIST    ORDER=(RAL1+6215)
INVRAL2   INVLIST    ORDER=(RAL2+6415)
INVRTP    INVLIST    ORDER=(RTP1+E201,RTP2+E401)
```

This message control program is for a message-switching application. It contains two message handlers. No provision is made for an application program. The code for the message handlers is given below.

Message Control Program Virtual Requirement=M+L+C+P+(A+B)(K+12)+4026

M: The size of the message handler macro expansions.

Name	Macro	Operand	In Line Code
MHI050	STARTMH	LC=OUT	38
	INHDR		28
	CODE	1050	60
	SETSCAN	C'X'	24
	SEQUENCE		36
	FORWARD	DEST=**	26
	SETSCAN	C'/'	20
	MSGTYPE	C'P'	37
	PRIORITY		40
	MSGTYPE		4
	INBUF		0
	INMSG		10
	INEND		2
	OUTHDR		12
	SEQUENCE		16
	CODE	1050	22
	OUTEND		14
		Total for MH1050.....	389

Name	Macro	Operand	In Line Code
MH2740	STARTMH	LC=OUT	18
	INHDR		24
	CODE	2740	52
	SETSCAN	C'X'	20
	SEQUENCE		32
	FORWARD	DEST=**	22
	INEND		22
	OUTHDR		12
	SEQUENCE		12
	CODE		14
	MSGFORM		20
	OUTEND		14
		Total for MH2740.....	262
		Total M.....	651 Bytes

L: The size of the message control modules.

Non-optional modules	12097
CODE macros	466
FORWARD macros	690
MSGFORM macro	2884
SEQUENCE macros	400
SETSCAN macros	435
STARTMH macros	1064
TLIST macro	185
INTRO macro with	

```
      DTRACE=0                                  475
      FEATURE=(,,TIMER)                         980
      INTVL=0                                     0
      LINETYP=STSP,ENVIRON=TCAM                7900
      MSUNITS=0,DISK=YES                       7820
      PRIMARY=SYSCON                              0
      TRACE=0                                     0
      CPB=3                                    1890
      FEATURE=(NODIAL,NO2741)                  1070
Message Queues Disk Data Set, OPTCD=R          4096
Leased Line Data Set                            500
BFDELAY=5 on TERMINAL macro                    2330

                    Total L..............  43,632 Bytes
```

C: The size of the control blocks and information.

Name	Macro	Control Block	Operand	Requirement
	INTRO	Address Vector Table	DISK=YES,ENVIRON=TCAM	1278
	READY			50
	TTABLE	Termname Table	MAXLEN=5	134
RAL1	TERMINAL	Terminal Table	QBY=L,OPDATA=0,LEVEL=(241,242,243),ADDR=6202	
		Queue Control Block		175
RAL2	TERMINAL	Terminal Table	QBY=L,OPDATA=0,LEVEL=(241,242,243),ADDR=6402	
RTP1	TERMINAL	Terminal Table	QBY=T,BFDELAY=5,ADDR=37E201	
		Queue Control Block		95
RTP2	TERMINAL	Terminal Table	QBY=T,BFDELAY=5,ADDR=37E401	
		Queue Control Block		95
LIST	TLIST	Terminal Table	LIST=(RAL1,RAL2,RTP1,RTP2)	14
		Station Control Blocks		252
		Line Control Blocks		288
DISKDCB	DCB	Data Control Block		44
RALDCB	DCB	Data Control Block		48
RTPDCB	DCB	Data Control Block		44
INVRAL1	INVLIST	Invitation List		14
INVRAL2	INVLIST	Invitation List		14
INVRTP	INVLIST	Invitation List		19
SWITCH	OPTION	Option Table		14
		Disk Input/Output Blocks		52
		Disk Channel Program Blocks		576

Total C..... 3,139 Bytes

P: The size of the channel programs, translation tables, and special character tables.

```
Translation Table                       1,040
Special character table                   160
Channel Program                           176
                    Total P.............. 1,376 Bytes
```

(A+B)(K+12): The size of buffer units

```
                    Total (A+B)(K+12)... 640 Bytes
```

O: The size of selected options.

```
                    Total O..... 0
```

OC: The size of operator control 4096

Total dynamic requirement for Message Control Program....53,634 Bytes

Message Control Program Fixed Storage Requirement = L+C+P+(A+B)(K+12)+O

L: The size of the message control modules.

INTRO macro with	
LINETYPE=STSP,ENVIRON=TCAM	5000
CPB=3	1890
Leased Line Data Set	500
	7390

C: The size of the control blocks and information from the virtual requirement.

		3369
Minus		
Ready	50	
Option	14	64
		3305

P: The size of the channel programs, translation tables, and special character tables from the virtual requirement.

	1376

(A+B)(K+12): The size of the buffer units.

	640

Total minimum fixed storage requirement

L	= 7390	round to	8192
C	= 3305	round to	4096
P	= 1376	round to	2048
(A+B)(K+12)	= 640	round to	2048
O	= 0	round to	0
			16384

Checkpoint/Restart Work Area Requirement

When using the Checkpoint/Restart facilities, the user must provide a Checkpoint/Restart work area in his program. This work area is required only when a checkpoint is taken, and at all other times may be used for other purposes. The size of the work area can be computed using the following formula:

```
S = 1,164 + T + 48(N-2) + D + E
```

Where:

T = the size of the TIOT when a checkpoint is taken. The size is computed as:

T = 28 + 20A + 4B

Where: A = the total number of data sets defined in the job step, including JOBLIB, if one is present.
B = the sum of devices allocated to each data set, not including the first device.

N = the number of data sets that were open when the checkpoint was taken. The value for N must be at least 2 and must include the checkpoint data set, even if this data set was not open.

D = 344 for VS1 (for 3 RBs)

E = 0 if the user opens the checkpoint data set
or
the sum of the lengths of the IOBs created by the open routines, if the checkpoint/restart facility opens the checkpoint data set -- plus (for VS1) the size of the DEB.

- Increase the size of the work area by 384 bytes if all of the following conditions apply: (1) the user adds to a direct access output data set after a checkpoint is taken, (2) a new extent is required, and (3) a restart is then attempted.

Estimating the Auxiliary-Storage Requirement

VS1 uses auxiliary storage on direct-access devices for system residence, page residence, and for work space. The total auxiliary-storage requirement is the sum of its system-residence, page-residence and work-space requirements plus the auxiliary storage required for input streams and output data. This section contains illustrations and formulas to be used in estimating the direct access auxiliary-storage requirements.

System Residence

The total amount of auxiliary storage required for system residence is determined by the libraries and data sets used by the system, and on the direct-access devices selected. Figure 76 is a summary of the required and optional system data sets for VS1.

System Data	Type Sets	System Residence	Secondary Volume Allocation	Cataloged	Used For/Contents
Required System Data Sets					
SYSCTLG	seq.	required	yes	no	Pointers to all cataloged data sets
SYS1.LINKLIB[1]	PDS	optional	yes	yes	Programs and referred to by XCTL, ATTACH, LINK or LOAD macros or by EXEC statement and nonresident operating system programs
SYS1.LOGREC[2]	seq.	required	no	no	Statistical data about machine and device errors
SYS1.MACLIB	PDS	optional	yes	yes	System macro definitions
SYS1.NUCLEUS	PDS	required	no	yes	Resident portion of control program
SYS1.PAGE	seq.	optional	yes	yes	System page resident device
SYS1.PARMLIB	PDS	optional	no	yes	BLDL list and resident access methods lists
SYS1.PROCLIB	PDS	optional	yes	yes	System & user cataloged procedures
SYS1.SAMPLIB	PDS	optional	yes	optional	Independent utilities, SMF modules, installation verification procedures, IPL text, and job queue dump
SYS1.SVCLIB[1]	PDS	required	yes	yes	Nonresident SVC routines, data mgmt. access methods, and standard system error recovery procedures
SYS1.SYSJOBQE	seq.	optional	no	yes	Job scheduler work area
SYS1.SYSPOOL	seq.	optional	no	no	JECS work areas and all user input & output data sets
SWADS	seq.	optional	yes	yes	Scheduler work area & problem program tables

Figure 76. Summary of the required and optional system data sets. (Part 1 of 2)

System Data	Type Sets	System Residence	Secondary Volume Allocation	Cataloged	Used For/Contents
Optional System Data Sets					
SYS1.ACCT	seq.	optional	no	no	User accounting data
SYS1.BRODCAST[3]	dir.	optional	no	yes	RTAM messages
SYS1.DCMLIB[4]	PDS	optional	no	yes	Display console modules
SYS1.DUMP	seq.	optional	no	optional	System abend dump routines
SYS1.IMAGELIB	PDS	optional	no	yes	1403 & 3211 UCB images, 3211 FCB images, & 3525 data protection images
SYS1.MANX	seq.	optional	no	yes	SMF primary data set
SYS1.MANY	seq.	optional	no	yes	SMF alternate data set
SYS1.RMTMAC[3]	PDS	optional	yes	yes	RTAM source and macro definitions
SYS1.TELCMLIB	PDS	optional	yes	yes	TCAM load modules
SYS1.UADS[3]	PDS	optional	yes	yes	Authorized Remote Users

[1]Space should be allocated in cylinders.

[2]Space must not be allocated by the user.

[3]Required if RTAM is in the system. For storage requirements for RTAM data sets, refer to OS/VS1 RES System Programmer's Guide.

[4]Required if support for the 2250 or 3277 Model 2 display console is to be included in the system. For storage requirements for this data set refer to OS/VS1 Display Consoles.

Figure 76. Summary of the required and optional system data sets. (Part 2 of 2)

System Catalog (SYSCTLG)

The number of tracks required on the system residence volume for the system catalog is estimated from the following formula:

$$\text{Number of tracks} = \frac{\text{Number of blocks required}}{\text{Number of blocks on each track}} + 1$$

The number of blocks required is calculated as follows:

$$\text{Number of blocks} = L + 1.17X\ell + K\left(\frac{D\ell - 3X\ell}{6} + 1\right) + N + \frac{Vn}{20} + \frac{A + C}{14} + 1$$

Where:

L = the number of index levels.

$X\ell$= the number of indexes defined at level . (Each index level should be evaluated separately and the result added to the total requirement.)

$D\ell$= the number of data sets cataloged at level . (Each index level should be evaluated separately and the result added to the total requirement.)

K = 0 if $(D\ell - 3X\ell)$ is negative; otherwise, K=1.

N = the number of data sets that occupy six or more volumes.

V_n= the number of volumes occupied by the nth data set that resides on six or more volumes. (Each data set should be evaluated separately and the result added to the total requirement.)

A = the number of high level aliases.

C = the number of pointers to the control volume (CVOL).

Note: Round off all fractions to next lower integers before calculating totals.

The number of blocks on each track is as follows:

- IBM 2314/2319 Disk Storage - 17
- IBM 2305-2 Drum Storage - 26
- IBM 3330 Disk Storage - 28

RTAM Message Data Set (SYS1.BRODCAST)

The number of tracks required for RTAM messages at your installation can be estimated from the following formula:

Number of tracks = (1 + M + B + (B ÷ 25) + (U ÷ 9)) x K

Where:

B = the maximum number of notices that can be placed in the data set by the central operator.

K = the number of 129-byte keyed records on a track

- 25 for 2314/2319
- 19 for 2305-1
- 35 for 2305-2
- 40 for 3330

M = the maximum number of messages that can be sent to a user that is not logged on the system.

U = the maximum number of users for the RTAM system.

Nucleus Library (SYS1.NUCLEUS)

The number of tracks required on the system residence volume for the nucleus is estimated from the following formula:

$$(S \div (1024 \times T)) + (12 \div T) + I$$

Where:

S = the size of the nucleus in bytes and is equal to the fixed storage requirement (Figure 17 Total), plus 64K (the approximate size of NIP and pageable supervisor, less tables and dummy areas).

T = a device parameter, defined as follows:

- IBM 2314/2319 Disk Storage, T = 4
- IBM 2305-2 Drum Storage, T = 6.8
- IBM 3330 Disk Storage, T = 6.8

I = an allowance for CSECT Identification Record. Add 2 percent to the result.

When allocating space for SYS1.NUCLEUS, you must indicate in the SPACE parameter the number of 256-byte records to be allocated for a directory. In most cases, one 256-byte record is sufficient.

SVC Library (SYS1.SVCLIB)

The amount of auxiliary storage required by the SVC Library depends on the components included in the system. The actual amount of storage is the sum of all applicable entries from Figure 77 plus the number of tracks required for directory records.

Description	Number of Directory Records (1)	Number of Tracks		
		2305-2 Disk	3330 Disk	2314/2319 Disk
Primary data mgmt/ other control prog. functions for VS1 (Notes 2 - 3)	124	115	119	202
BISAM/QISAM	22	21	24	40
BTAM	18	10	10	16
Chkpt/restart	6	4	4	6
GAM	4	4	4	8
ISAM	33	25	25	40
MCS (Note 4)	2	1	1	2
DDR	2	1	1	2
Scheduler & JES	10	9	9	16
TCAM	16	13	13	24
RTAM	1	1	1	2

Notes:

1. Number of 256-byte records to be allocated for a directory when a new partitioned data set is being defined.

   The number of directory records that can be contained on a track is as follows:

   - IBM 2305-2 Disk Storage - 26
   - IBM 3330 Disk Storage - 28
   - IBM 2314/2319 Disk Storage - 17

2. These estimates include the tracks required for MCH.

3. If SMF is specified during system generation, add the following: one directory record, one track for a 2314/2319, 2305 or 3330.

4. If a 2740 is specified as a console in MCS and there is no BTAM support, add the following: 1 directory entry, and 2 tracks for a 3330 or 2305 or 3 tracks for a 2314/2319. If a 2250 is specified as a console in MCS, add the following:

   1 directory entry, and 1 track for a 3330 or 2305, or 2 tracks for a 2314/2319.

Figure 77. SVC library track requirements.

Machine/Error/Recording Data Set (SYS1.LOGREC)

You need not allocate space for this data set; however, the amount of space used must be known to estimate the total storage requirement of VS1.

The number of tracks required on the system residence volume for the LOGREC data set is estimated from the following formula:

Number of tracks = R + D ÷ S

Where:

D = the number of uniquely addressable I/O devices in the system.

R,S = device parameter defined in Figure 78.

Note: Round off fractions to the next higher integer.

The space for SYS1.LOGREC is for an average installation and may be increased or decreased depending on specific requirements. For example, if there is no dismount record recording (3410,3420) or no TCAM, the size of SYS1.LOGREC could be decreased after SYSGEN.

Device Parameters	2314 2319 Disk	2305-2 Disk	3330 Disk
R • with MCH (models 145, 155)	28	15	15
S	30	40	50

Figure 78. Device parameters for LOGREC.

SYS1.SAMPLIB

This library contains stand-alone and system utilities, IPL text, SMF routines and routines contained in the Installation Verification Procedure jobstream.

Figure 79 gives the auxiliary storage requirement for SYS1.SAMPLIB. These track requirements are for the blocked library.

The blocksize for a 2314/2319 is 7294 bytes.
The blocksize for a 3330 is 13030 bytes.
The blocksize for a 2305-2 is 14660 bytes.

Number of Directory Rec.	Number of Tracks 2314/2319	3330	2305-2
2	220	150	50

Figure 79. Auxiliary storage requirements for SYS1.SAMPLIB.

Page Data Set (SYS1.PAGE)

Auxiliary storage for the page file consists of one to eight page data sets. These data sets can be on different device types, as long as no more than two different types are used. A single extent is allocated for each data set. To improve performance, the device(s) can be dedicated to the page file. However, this is not a requirement. The page data set can reside on an IBM 2314, 2319, 2305-2, or 3330.

To estimate the auxiliary-storage requirement for SYS1.PAGE data set(s) use Figure 80.

		Result
Number of 2K blocks	virtual storage size - real-storage size 2048 (see Note 1)	
Number of tracks	number of 2K blocks X (see Note 2) (round result up to next higher integer)	
Number of cylinders	number of tracks Y (see Note 3) (round result up to next higher integer)	

Notes:

1. Real-storage size is less than, or equal to, 786,432 (768K) bytes, that is, the amount of real storage below the Virtual=Real line

2.

X	Device
3	2314/2319
5	3330
6	2305-2

3.

Y	Device
20	2314/2319
19	3330
8	2305-2

Figure 80. Auxiliary storage requirement for SYS1.PAGE.

The maximum number of pages supported is 8192 2K pages minus the lesser of 384 2K pages or the number of real storage pages. The page capacity of the various devices is indicated below.

Device	2314/2319	3330	2305-2
Page/pack	12,000	38,285	4608

Link Library (SYS1.LINKLIB)

The amount of auxiliary storage required by the link library depends on the components selected during system generation. Figure 81 gives the auxiliary-storage requirements for the Link library. The actual amount of storage required for this library is the sum of all applicable entries from Figure 81 plus the number of tracks required for directory records.

Description	Number of Directory Blocks (1)	Number of Tracks		
		2314 2319 Disk	3330 Disk	2305-2 Disk
• Control Program Modules for Job Mgmt., Supr., System Utilities, and other control program functions	86	399	222	217
• CRJE	3	15	10	10
• Graphics GSP	15	18	10	9
PORs (2)	8	9	5	5
• Basic EREP	16	25	13	12
with 3330	2	4	2	2
with 2305	1	3	2	2
with M135	1	2	1	1
with M145	1	6	3	3
with RDE	1	3	2	2
with 2715	1	2	1	1
• TCAM	21	35	22	19
• SMF	1	3	2	2
• RTAM	2	20	19	8

Notes:

1. The number of 256-byte records to be allocated for a directory when a new partitioned data set is being defined. The number of directory records that can be contained on a track is 17 for an IBM 2314/2319 Disk, 28 for an IBM 3330, and 26 for an IBM 2305-2.

2. Includes 675 bytes for the PORs ATTINQ storage requirement.

Figure 81. Track requirement for the Link Library.

System Job Queue (SYS1.SYSJOBQE)

SYS1.SYSJOBQE track requirements for VS1 scheduler work space can be estimated in Figure 82.

Calculation	Description	Enter Value
A÷B	A = the number of tracks required for Queue Control Records, where A = 37x[number of entries in QID table-1]+76 B = 53 for 2314/2319 = 63 for 2305/2 = 76 for 3330	
F	F = the number of tracks required for Job Queue data records (176-bytes/record) F = 26 for 2314 or 2319 = 40 for 2305-2 = 45 for 3330 This value for F is used in all of the following calculations.	
(LxQ) ÷ F	L = the size of logical track in 176-byte records (value specified in the sysgen parameter JOBQFMT in the SCHEDULR macro). Q = the maximum number of jobs on all input queues at any one time.	
N ÷ F	N = the sum of output queue sizes for all 36 classes, where each class output is determined by: Rn x On Rn= the maximum number of jobs on an output queue for class n at any one time. On= the average size of a job in the output for class n calculated as the number of SYSOUT data sets for that class n (plus 1 if MSGCLASS=n). If this number is less than the size of a logical track (JOBQFMT parameter), use the size of 1 track.	
(SxT) ÷ F	S = an estimate of the amount of space (in records) that system tasks (excluding initiators) would require if the table was placed on the SWADS data set. T = the maximum number of system tasks active at any one time. System tasks include readers, writers, LOGON terminals etc., and any generalized start problem programs (i.e. those programs started from the console with a START command)	
(UxV) ÷ F	U = the maximum number of initiators active at any one time. V = an estimate of the amount of space an initiator would require if the tables were put on the SWADS data set. JOBQLMT should also be added to this estimate.	
J ÷ F	J = the value of the JOBQTMT parameter specified at sysgen in the SCHEDULR macro	
	TOTAL TRACK REQUIREMENT FOR SYS1.SYSJOBQE .	

Figure 82. Track requirements for VS1 Scheduler on SYS1.SYSJOBQE.

During normal job execution, the value of JOBQLMT should be the same as SWDSLMT (in the JES system generation), plus the product of the logical track size (system generation parameter JOBQFMT in SCHEDULR macro) times the average number of SYSOUT classes used in the job.

If jobs with automatic restart may be held for operator restart, the JOBQLMT requirement must be increased because the system must maintain both the queue records and the housekeeping records for the held jobs until they have completed processing and are written.

The total JOBQLMT required when jobs may be held is:

$$JOBQLMT = (H+1)(L+S+(10xA)+C)$$

A = the number of times a job may be restarted automatically.
C = 12xA for checkpoint restart jobs only.
H = number of jobs that may be held at any one time.
L = value of JOBQLMT if automatic restart is not used.
S = the size of the SWADS data set (in records), see Figure 85.

Note 1: Queue space is not freed when the problem program ends or when a STOP command is processed. It is freed only when the output writer has finished processing all output for the job, or when the output is canceled by the CANCEL command. Therefore, the amount of space allowed must be large enough to contain the active jobs plus those waiting on the queue. The best way to prevent queue space from being tied up is to have one or more writers working at all times, thus freeing queue space more quickly.

A 2305-2 may be completely allocated for the job queue. The 2314 and 2319 are restricted to a maximum of 1,170 tracks and the 3330 is restricted to a maximum of 728 tracks.

Note 2: Requirements for OS/VS1 JOBQUE are less than or equal to the requirements for OS/MFT.

SYS1.SYSJOBQE track requirements for RTAM can be estimated in Figure 83.

Description	Jobs per physical tracks (Notes 1,2)			
	2314/2319	2305-1	2305-2	3330
• RTAM	1.5	1.3	2.3	2.5

Notes:

1. Job size was defined as follows:

   1 logical track containing DER,JMR,ACT, route table, SCD
   1 logical track for Class A output (including system messages). Space remains on track for 1 additional DSB.
   1 logical track for Class B output. Space remains on track for 4 additional DSBs.

2. These figures are based on Compile, Load and Go procedure in SYS1.PROCLIB, with a SYSABEND DD added to the Go step. Default MSGCLASS=A was used.

Figure 83. SYS1.SYSJOBQE space requirements for RTAM.

System SPOOL Data Set (SYS1.SYSPOOL)

SYS1.SYSPOOL space requirements are a function of the total volume of SPOOL data. To a lesser degree, the number of spooled data sets, the number of jobs in the system, and the number of logical cylinders in SYS1.SYSPOOL affect the space requirements. The SYS1.SYSPOOL data set is limited to a total of 64K tracks for all volumes or 10 volumes (whichever occurs first). Figure 84 can be used to determine the number of blocks required for SYS1.SYSPOOL. This number is used in the formula for the SPOOL device track capacity as defined in the appropriate component description publication. The minimum size is 20 logical cylinders, or 5 tracks on a 2314 or 2319 disk or 3 tracks on a 3330 or 2305-2 disk.

J = number of concurrent jobs in all stages of processing plus one for active system tasks, such as readers, writers, and initiators	
V = maximum number of SYSIN and SYSOUT records for all jobs plus 600 for each active system task. If the system log function is present in the system, add twice the value specified for WTLRCDS in the JES macro	
L = maximum SYSIN or SYSOUT record size. This value is the largest record size of any unit record device. (For a 1403 printer, the value would be 132)	
S = BUFSIZE specified in the JES macro.	
Substitute the above values in the following formula:	
$\frac{V \times L}{S - 16}$	
$\frac{8 \times V}{S - 16}$	
4 x J	
TOTAL BLOCKS FOR SYS1.SYSPOOL . .	

Variables (except S) are not sysgen values, but are estimates of maximum system activity.

Figure 84. SYS1.SYSPOOL space requirements.

SYS1.SYSPOOL SPACE/REQUIREMENT EXAMPLE

1. The maximum number of jobs to be run concurrently is 4. This requires 4 initiators. Also, the system uses one reader and two writers. Thus:

```
4 concurrent jobs.....  4
4 initiators.........  4
1 reader.............  1
2 writers............. _2
              J equals 11
```

2. The number of SYSIN records per job is estimated to be 2000, and the number of SYSOUT records per job is estimated to be 10,000. The WTLRCDS specification for system log is 1000, the value of V is developed as follows:

```
 2000     SYSIN estimate per job
10000     SYSOUT estimates per job
12000     total data volume per job
  x 4     number of concurrent jobs
48000     total SYSIN and SYSOUT data volume for all jobs
 4200     (600 each for 4 initiators, 1 reader, 2 writers)
 2000     twice the WTLRCDS specification
54200     the value of V
```

3. If the system uses a 1403 printer as an output device, the value of L is 132.

4. JES BUFSIZE is specified as 500.

Substituting the above values in the formula (Figure 84) yields:

$$\frac{V \times L}{S - 16} = 14{,}727$$

$$\frac{8 \times L}{S - 16} = 892$$

$$4 \times J = 44$$

B = 15,663 blocks required on SYS1.SYSPOOL

5. If the spool device type is a 2314, the number of tracks required is 1322.

FORMULA FOR SPOOL CYLINDER MAP SIZE

This formula is used in computing Protected Queue Area requirements (Figure 7) and System Queue Area requirements (Figure 18). The formula follows:

$$15 + .12(a^1 \div b^1) + (a^2 \div b^2) + (a^3 \div b^3) = \text{spool cylinder map size}$$

where:

a^1 = total number of tracks on all 2314s or 2319s.

a^2 = total number of tracks on all 3330s.

a^3 = total number of tracks on all 2305-2s.

The b^n values require the spool record size and records per track for a device type.

Record size defaults to 880 unless the BUFSIZE parameter is used in the JES sysgen macro or the BUFSIZE parameter is used in the JESPARMS member of SYS1.PARMLIB. If BUFSIZE is specified in both JES and JESPARMS, the value in JESPARMS is used.

Records per track for a device can be determined using record size (without keys) and records/track information found in any of several manuals (for example; Job Control Language User's Guide, GC28-6703).

Allocation unit defaults to 28,672 bytes unless another value is specified in the ALCUNIT parameter in the JESPARMS member of SYS1.PARMLIB.

For any a^n, b^n = $\frac{\text{allocation unit in bytes}}{\text{record size X records/track for the device}}$

Each of the fractional b^n values should be rounded up to the next integer. For example, the fraction

$\frac{6000}{5668}$ rounds up to 2.

Each of the ($a^n \div b^n$) fractions should be rounded down to the next integer.

The fraction 14005 2 rounds down to 7002.

The formula is used 'as is' for computing PQA requirements. When used in computing SQA requirements, the results of the formula should be multiplied by 3.

Work Space for the Scheduler Work Area Data Set (SWADS)

SWADS record requirements for scheduler work space can be estimated in Figure 85.

Calculation	Description	Enter Value[2]
	. . . . .	13
2A ÷ 3	A = the number of passed data sets in the job	
2B	B = the number of steps in the job.	
C ÷ 28	C = the number of volume serial numbers for all steps that use existing data sets or specific volumes	
D ÷ 176	D = the number of characters in data set names (including qualifiers) for all job steps that use the VOL=REF=dsname DD parameter (see Note 4)	
2E	E = the number of DD statements in the job. .	
(F - 5) ÷ 15	F = the number of volume serial numbers for all data sets (see Note 4).	
(2G+H) ÷ 118	G = the number of non-temporary data sets in the job. H = the total length of non-temporary data set names in the job.	
2J ÷ 11	J = the maximum number of DD cards per step .	
K ÷ 44	K = the maximum number of devices for a job step.	
L ÷ 4	L = the number of entire generated data groups used during the job.	
2M - 2L	M = the total number of data sets in all generated data groups used in the job.	
(N ÷ 28)+(N ÷ 15)	N = the number of new volumes being used in job when restarted	
P ÷ 4	P = the number of entire generated data groups per job step (required for deferred restart only).	
	TOTAL NUMBER OF RECORDS FOR SWADS DATA SET(1,3)	

Note 1. These calculations must be used for all procedures (cataloged and in-stream) used in a job.
Note 2. Round off all fractions to the next higher integer.
Note 3. If you allocate in terms of tracks, divide the result by the number of 176-byte records per physical track according to the following table:

2314,2319	26
2305-2	40
3330	45

Note 4. Evaluate each group separately and then sum.

Figure 85. SWADS track requirements.

The Procedure Library (SYS1.PROCLIB)

IBM supplies cataloged procedures to perform many routine operations. The storage required by these procedures depends on the device on which the library resides and on whether the procedure library is unblocked or blocked. These track requirements reflect the storage needed when the procedure library is unblocked. If the user supplies additional cataloged procedures for the library, the additional storage requirements must be added. If the user blocks the procedure library, the auxiliary-storage requirements must be adjusted accordingly. This is accomplished by determining the number of blocks required for logical records. Then apply the result, along with the block size you selected, to the track capacity formula in the appropriate device component description publication.

Description	Number of Directory Records	Number of Tracks		
		2314 2319 Disk	2305-2 Disk	3330 Disk
• Standard	2	8	6	6

The Parameter Library (SYS1.PARMLIB)

SYS1.PARMLIB -- This data set contains the members in the following list. The member names shown in parentheses are the standard names used by IBM.

1. The four resident access methods (RAM) lists (IEAIGG00, IEAIGG01, IEAIGG02, and IEAIGG03).

2. The resident BLDL list (IEABLD00).

3. The two resident SVC (RSVC) lists (IEARSV00 and IEARSV01).

4. The resident ERP list (IEAIGE00).

5. The PAGE parameters list (IEASYS00).

6. The list used to concatenate data sets to SYS1.LINKLIB (LNKLST00).

7. The list of permanently resident DASD volume characteristics (PRESRES).

8. The list of System Management Facility default options (SMFDEFLT).

9. The list of Job Entry Subsystem reconfiguration parameters (JESPARMS).

10. The list of Remote Teleprocessing Access Method (RTAM) default parameters (RESPARMS).

If the Automated System Initialization function is to be used, the following members may be optionally included in SYS1.PARMLIB:

1. List(s) of members of SYS1.PARMLIB to be used in Automated System Initialization.

2. NIPxxxxx member(s) for system parameters.

3. JESxxxxx member(s) for Job Entry Subsystem reconfiguration parameters.

4. DFNxxxxx member(s) for DEFINE parameters.

5. SETxxxxx member(s) for SET parameters.

6. PRExxxxx member(s) for permanently resident volume list parameters.

7. CMDxxxxx member(s) for automatic commands.

8. SMFxxxxx member(s) for System Management Facility parameters.

9. RESxxxxx member(s) for RTAM parameters.

Parameter library (SYS1.PARMLIB) track requirements on the system residence volume are:

2305-2 Fixed-Head File	3 tracks
2314 Disk	4 tracks
3330 Disk	3 tracks

The number of directory records is 2, unless the user adds many additional members to the library (for example, in support of Automated System Initialization). Each directory record holds a minimum of 5 entries and a maximum of 14 entries, depending on the length of the user data field. Normally the user data fields are not set unless specifically requested.

The system normally builds 9 members at system generation, plus one additional member if RESIDENT=ERP is specified on the CTRLPROG macro, plus two additional members if RESIDENT=TRSVC is specified on the CTLPROG macro.

For a brief description of the members of SYS1.PARMLIB, refer to the preceding discussion of SYS1.PARMLIB in this section. For information on Automated System Initialization, refer to the OS/VS1 Planning and Use Guide, listed in the Preface.

The Image Library (SYS1.IMAGELIB)

The number of tracks required on a permanently mounted volume for SYS1.IMAGELIB can be estimated from the following formula:

$$\text{Number of tracks} = \frac{280+((A+B)180)+((C+D)270)+((E+F)540)}{1024T} + 80G + \frac{12}{T} + 1$$

$$\text{Number of Directory Blocks} = \frac{(4+2(A+C+E)+B+D+F)52}{256} + 1$$

Where:

A = Number of 3211 FCB images supplied by IBM.
B = Number of expected user defined FCB images.
C = Number of 1403 UCS images supplied by IBM.
D = Number of user defined 1403 UCS images.
E = Number of 3211 UCS images supplied by IBM.
F = Number of user defined 3211 UCS images.
G = Number of expected DPI images for 3525
T =
- 4 for 2314/2319 Disk storage.
- 6.8 for 2305-2 Drum storage.
- 6.8 for 3330 Disk storage.

Macro Library (SYS1.MACLIB)

Figure 86 gives the auxiliary-storage requirement for the blocked macro library. The actual amount of storage required by the library is the sum of all applicable entries in Figure 86 plus the number of tracks required for the directory record.

Description	Number of Directory Records	Number of Tracks		
		2314 2319 Disk	2305-2 Disk	3330 Disk
• Basic system macros	10	310	181	183
• BTAM	2	40	20	24
• Graphics	7	51	29	31
• TCAM	10	179	150	117
• OCR	1	9	5	5

Figure 86. Auxiliary storage requirement for the Macro Library.

The Subroutine Libraries

Many components of VS1 have subroutine libraries. The size of any subroutine library is the sum of all applicable entries in the library plus the number of tracks required for the directory record. The auxiliary storage required for these libraries is given in Figure 87.

Description	Number of Directory Records (1)	Number of Tracks (2)		
		2305-2 Disk	2314 2319 Disk	3330 Disk
SYS1.TELCMLIB				
for BTAM	1	2	2	2
for CRJE	6	8	12	8
for TCAM	20	20	32	20

Notes:

1. The number of 256-byte directory records to be allocated for a directory when a new partitioned data set is being defined. The number of directory records that can be contained on one track is:
   - IBM 2305-2 26 records
   - IBM 2314/2319 17 records
   - IBM 3330 28 records
2. Add 2 percent to total requirement for CSECT Identification Routine.

Figure 87. Auxiliary storage requirement for the subroutine libraries.

The SMF Data Set (SYS1.MAN)

This data set resides on direct access. A primary data set (SYS1.MANX) and an alternate data set (SYS1.MANY) are required. The size of the data set depends on the size of the buffer and the number of records written within a given time interval (refer to OS/VS1 SMF Manual, GC35-0004).

The Core Image Dump Data Set (SYS1.DUMP)

This data set can reside on tape or direct access. If it resides on direct access, the number of tracks allocated for the data set must be large enough to contain all of virtual storage. Use the following chart to determine the number of tracks required:

Device	Virtual Storage Size				
	1024K	2048K	4096K	8192K	16384K
IBM 2314 Disk	171	341	682	1364	2728
IBM 3330 Disk	103	205	409	818	1656
IBM 2305-2 Fixed Head File	86	171	341	680	1364

The Data Set for Checkpoint/Restart

The checkpoint data set may be on any direct-access device or any magnetic tape unit supported by BSAM or BPAM. The size of the checkpoint data set is determined by the user. The following information can be used as a guideline in determining the size of this data set.

Figure 88 contains the size and number of records written when a checkpoint is taken. The number of tracks or the amount of tape occupied by the checkpoint data set can be determined by applying the number of records and their sizes against either the track capacities of the direct-access device or the recording density and type for the magnetic tape device.

Description	Record Size (bytes)	Number of Records
CHR (checkpoint header record)	400	1
DSDR (data set descriptor rec)	400	N/2 (1)
CIR (core image rec)	2K	A/2K (2)
SUB (supervisor rec)	200	1

Where:

N = the number of data sets defined in the job step.

A = the amount of storage required by the user-written program.

Notes:

1. Add one record for the first generation data set and a second record for each additional 4 generation data sets. Also, add one record for each data set that requires 6 to 20 volumes and one record for each additional 15 volumes. That is, if the data set requires 35 volumes, add 2 records; if 50 volumes, add 3 records, etc.

2. Add one CIR for the Page Control Table (PCT).

Figure 88. Auxiliary storage requirement for the checkpoint restart data set.

The TCAM Message Queues Data Set

If you use TCAM, you can queue messages on the IBM 3330/2314 Direct Access Storage Facility. The number of records that can be written per track on this device can be estimated by the following formula:

```
1/(.00070 KEYLEN) for 2314/2319
13165/(188+KEYLEN) for 3330
```

Where:

KEYLEN = the value specified on the KEYLEN operand of the INTRO macro instruction.

The message queues data set must begin on a cylinder boundary and it can have multiple extents on multiple volumes. The data section of each record is 6 bytes long and the key section (message) is the same length as specified on the KEYLEN operand. Figure 89 contains examples of the number of records per track on the 2314.

Records per track	17	17	18	18	19	19	20	20	21
Value of KEYLEN	255	248	247	227	226	209	208	193	178
Records per track	23	24	24	25	25	26	26	27	27
Value of KEYLEN	164	163	151	150	135	134	128	127	117
Records per track	30	30	31	31	32	32	33	33	34
Value of KEYLEN	99	91	90	84	83	76	75	70	69
Records per track	36	37	37	38	38	39	39	40	40
Value of KEYLEN	52	51	46	45	41	40	36	35	32

Figure 89. Track capacity for TCAM message queue data set on an IBM 2314/2319.

THE TCAM CHECKPOINT DATA SET

For the IBM 2314/2319 and 3330 Direct Access Storage Facility the size in bytes of the checkpoint data set is given in Figure 90.

```
Size = (101+1.05L1)+1.39AxL2+N(101 1.05L3)+(M+3) (101+1.05L4)

Where:

A = the value coded in the CPRCDS operand of the INTRO macro.

B = the total number of data bytes located in all option
    fields assigned to stations, lines, or application
    programs.

C = the sum of the number of single and group entries in the
    Terminal Table.

D = the number of single, group, and process entries in the
    Terminal Table whose destination queues are maintained on
    disk.

E = the number of destination queues maintained on disk for
    single, group, and process entries in the Terminal Table.

F = the number of priority levels specified for each
    destination (assume one priority level for each
    destination queue defined by a PROCESS macro, and Terminal
    macro having no LEVEL operand).

G = to 1 if 'I' is specified in the STARTUP operand of the
    INTRO macro, otherwise, G = 0.

H = the length of an Invitation List (LCOPY macro).

J = the length (bytes) of the maximum number of option fields
    assigned to any one entry in the Terminal Table.

K = to J if J is greater than 32; otherwise, K = 32.

L1= the length of a control record or 30 +3A.

L2= the length of an environment record or
    22+B+C+4D+5E+(21F1+22F2+...+21Fn)+(G(H1+H2+...+Hn)).

L3= the length of an incident record or 12 + K.

L4= the length of a checkpoint request record or 17+21F+J.

M = the value coded for the CKREQS operand in the INTRO macro.

N = the number of incident checkpoint records desired (N
    should be between 1 and 255).
```

Figure 90. Size of the TCAM checkpoint data set.

Work-Space Requirements

Work-space requirements for IBM-supplied programs depend on either the number of source cards or the amount of storage available to the program, or both. These estimates are for typical source programs. The following list shows where to find the work space requirements for those IBM-supplied programs that require work space:

- Assembler XF (see Figure 91).

Data Set	Number of Source Cards	Number of Tracks (Note 1)		
		2314 2319 Disk	2305-2 Disk	3330 Disk
SYSUT1	150	6	3	3
	500	10	5	5
	1000	18	8	8
SYSUT2	150	5	3	3
	500	9	5	5
	1000	17	8	8
SYSUT3	150	4	3	3
	500	6	4	4
	1000	11	6	6

Note 1. These estimates are based on the assumption that no macro instructions are used in the source program. The storage requirement for SYSUT3 increases when macro instructions are used and becomes about equal to the storage required for SYSUT1. The work-space is almost independent of real storage size used in the assembly.

Figure 91. Work-space requirement for Assembler XF.

Appendix A

Type 3 and 4 SVC Routines

The following list contains those routines that may be resident when the resident type 3 and 4 SVC routine option is selected on the CTRL PROG macro at sysgen. All of these routines reside on the SVC library. Those module names followed by -SL are the modules loaded when the IBM-supplied standard list IEARSV00 is used. All module names on the standard list IEARSV00 reside in the SYS1.PARMLIB of the generated system. The modules on this list are also contained in the pageable supervisor space, limited to four segments (256K bytes) per megabyte of defined virtual storage.

WARNING:

A system with only one megabyte of virtual storage may not run with the full default standard list. If a 1-megabyte IPL cannot be performed, increase the virtual storage to two megabytes, or reduce the size of the RAM or RSVC lists.

The IBM standard list IEARSV01 (also a member of SYS1.PARMLIB) contains entries specified on sysgen SVCLIB macro (RESIDENT=). For information on resident routine options; refer to OS/VS1 Planning and Use Guide listed in the Preface. Figure 92 is provided to aid the user in recording his system requirements.

Routine	Standard List IEARSV00 (Note 1)	Standard List IEARSV01 (Note 2)
ABEND SVC 13	4208	
ABEND SVC (DAR)		
ABDUMP SVC 51		
ASC II SVC 67		
BTAM SVC 66		
CHKPT SVC 63		
CLOSE Executors	6880	
DADSM	15,360	
Catalog management routines	2992	
DADSR SVC 82		
Display Unit status		
Graphics		
IEBTCRIN		
IEHATLAS SVC 86		
JES Request SVC		
OLTEP SVC 59		
OPEN/CLOSE/EOV	52,904	
OPEN Executors for ISAM		
OPEN Executors for BDAM	5224	
OPEN Executors for BISAM only	1024	
OPEN Executors for QISAM only		
OPEN Executors for Graphics		
OPEN Executors for BTAM		
OPEN Executors for SAM	20,512	
OPEN Executors for TCAM		
Operator SVC 72	848	
MGCR SVC 34	4632	
Set PRT SVC 81		
STAE SVC 60		
TCAM SVC 104.		
TCLOSE SVC 23		
VOLSTAT SVC 91.		
Restart SVC 52		
1287/1288 optical reader.		
Miscellaneous SVC routines.	9072	
TOTAL REQUIREMENT	123,656	

Notes:

1. This sum is required to calculate the size of the pageable control program, Figure 6.

2. Space is provided for the user to enter his requirements for future references.

Figure 92. Total storage requirement for Type 3 and 4 SVC routines.

ABEND - SVC 13

IGC0001C-SL	ABEND Control Module	1408
IGC0101C	ABEND Abnormal Purge Processing	1192
IGC0201C	ABEND I/O Purge Processing	1208
IGC0301C	ABEND Validity Check Processing	344
IGC0401C	ABEND Routing Module	680
IGC0501C	ABEND Dump Data Set Processing	1064
IGC0601C	ABEND Snap Processing	944
IGC0701C	ABEND Job Step Task End	1824
IGC0801C	ABEND Indicative Dump	640
IGC0901C	ABEND Recursion Processing	1104
IGC0A01C	ABEND Steal Core Processing	880
IGC0B01C-SL	ABEND WTO Purge Processing	1040
IGC0C01C	ABEND Subtask Processing	568
IGC0D01C	ABEND DEQ for Subtasks	664
IGC0E01C-SL	ABEND Subtask Processing	1760
	TOTAL SVC 13.....	

ABEND SVC 13 (DAR)

IGC0221C	Writes core image dump	916
IGC0321C	Attempts to reinstate recursive ABENDS and failing permanently resident system tasks	940
	TOTAL SVC 13 (DAR).....	

ABDUMP - SVC 51

IGC0005A	ABDUMP Processing	1664
IGC0105A	ABDUMP Processing	1128
IGC0205A	ABDUMP Processing	1072
IGC0305A	ABDUMP Processing	840
IGC0405A	ABDUMP Processing	648
IGC0505A	ABDUMP Processing	1264
IGC0A05A	ABDUMP Processing	1296
IGC0B05A	ABDUMP Processing	656
IGC0C05A	ABDUMP Processing	1040
IGC0D05A	ABDUMP Processing	888
IGC0E05A	ABDUMP Processing	1088
IGC0F05A	ABDUMP Processing	432
IGC0G05A	ABDUMP Processing	856
IGC0H05A	ABDUMP Processing	832
IGC0I05A	ABDUMP Processing	520
IGC0J05A	ABDUMP Processing	952
IGC0K05A	ABDUMP Processing	1584
	TOTAL SVC 51.....	

ASCII - SVC 67

IGC0010C	ASCII/EBCDIC/ASCII Translate	640
	TOTAL SVC 67.....	

MGCR - SVC 34

IGC0003D-SL	Chain Manipulator	784
IGC0006H	Statistics update - SVC 68	1024
IGC0303D	Command router	778
IGC0403D-SL	Command routine	1392
IGC0503D	Message module	1376
IGC0603D	SET Command Processor	1180
IGC0903D	Set Time of Day Processor	404
IGC1103D	VARY/UNLOAD Command Processor	1344
IGC1203D-SL	Reply Processor Routine (MCS)	1496
IGC1303D	TCAM Command Scheduler	400
IGC1403D	HALT END OF DAY Processor	1000
IGC1503D	CRJE Command Processor	576
IGC1603D	Log/Writelog Processor	820
IGC1803D	DEFINE Command Processor	1024
IGC1903D	START/MOUNT Processor	1138
IGC1B03D	Reply Message Routine (MCS)	368
IGC2303D	SMF Processor	960
IGC2903D	DISPLAY REQUESTS Processor	996
IGC3203D	VARY Router	384
IGC3303D	VARY Command Processor	586
IGC3503D-SL	DISPLAY/MONITOR Processor	960
IGC3703D	CANCEL Processor	652
IGC4303D	VARY MSTCONS (MCS)	472
IGC4403D	Vary Keyword Scan (MCS)	1924
IGC4503D	STOP/MODIFY Command Processor	1206
IGC4603D	VARY ONLINE/OFFLINE of Console (MCS)	604
IGC4703D	Process VARY HARDCPY Command (MCS)	1716
IGC4903D	Process VARY CONSOLE Command (MCS)	1728
IGC5703D	VARY Hardcopy Processor	556
IGC6503D	NS SET Command Handler	1952
IGC9703D	Message module	556
IGC9803D	Set Spool Processor	1024
IGC9903D	Write Command Processor	1288
IGCXE03D	Display Consoles Processor Processor	1044 1044

TOTAL SVC 34.....

Command Processors - SVC 109

IGX00000	Define Command Processor	880
IGX00001	Define Command Processor	1674
IGX00002	Define Command Processor	1592
IGX00003	Define Command Processor	864
IGX00004	HOLD Command Processor	1396
IGX00009	SET Command Initialization	736
IGX01000	Define Command Processor	1580
IGX01004	DISPLAY/QUEUE ALTER Processor	668
IGX02000	Define Command Processor	1348
IGX02004	Release Command Processor	948
IGX03000	Define Command Processor	1848
IGX03004	ALTER Command Processor	1110
IGX04000	Define Command Processor	1224
IGX04004	ALTER Command Processor	653
IGX05004	Cancel Command Processor	1376
IGX06004	Cancel/restart Command Processor	1332

TOTAL SVC 109.....

BTAM - SVC 66

IGC0006F	Start/Stop Control Module	1024
IGC0106F	1030 Terminal Test	842
IGC0206F	1050 Terminal Test	810
IGC0306F	1060 Terminal Test	918
IGC0406F	2740 Terminal Test	866
IGC0506F	2848/2260 Terminal Test	857
IGC0606F	2848/2260 Terminal Test	486
IGC0706F	BSC (USASCII/TRANSCODE) Test Module	712
IGC0806F	BSC (EBCDIC) Test Module	944
IGC0906F	2741 Correspondence Code Terminal Test	778
IGC0A06F	2741 PTTC Code Terminal Test	778
IGC0B06F	2760 Terminal Test	360
IGC0C06F	2740C Online Test Module	914
IGC0D06F	BSC Test Control Module	664
IGC0E06F	3270 EBCDIC Test Module	1024
IGC0F06F	3270 EBCDIC Test Module	1024
IGC1006F	Remote 3270 ASCII Test Module	1024
IGC1106F	Remote 3270 ASCII Test Module	1024
IGC1206F	Local 3270 Test Control Module	1024
IGC1306F	3270 EBCDIC Test Module	1024
IGC1406F	3270 EBCDIC Test Module	1024

TOTAL BTAM SVC 66.....

Operator Communications - SVC 72

IGC0007B-SL	Router Module	48
IGC0107B-SL	Input/Output to 1052 Console	800
IGC0907B	Message Buffer Writer (MCS)	1024
IGC0I07B	Open 1052 Console	992
IGC1107B	Input from Card Reader Console	664
IGC1I07B	Open Card Reader as Console	1008
IGC2107B	Output from Printer Console	840
IGC2I07B	Open Printer as Console	840
IGC3107B	OPEN/CLOSE Routine (MCS)	985
IGC5107B	Router Module 1	1024
IGC5207B	Write WTOs 1	1024
IGC5307B	Splits WTO's	1024
IGC5407B	Handles CANCEL and Command Entry	1024
IGC5607B	Processes Deletion of Messages	1024
IGC5707B	Handles DOM	1024
IGC5807B	Handles Deletion of Messages	1024
IGC5907B	Removes Messages	1024
IGC5A07B	Sets KS options	1024
IGC5C07B	Handles Asynchronous Errors	1024
IGC5D07B	Message Module 1 Control	1024
IGC5E07B	MSG. Module 2	1024
IGC5F07B	Handles Light Pen and Cursor Interrupts	1024
IGC5G07B	OPEN/CLOSE	1024
IGC5J07B	ROLL Mode	1024
IGC5K07B	Timer Interpreter	1024
IGC5P07B	2250 - I/O 1	1024
IGC5Q07B	2250 - I/O 2	1024
IGC5R07B	2260 - I/O 1	1024
IGC5U07B	3277 I/O Routine 1	1024
IGC5V07B	3277 I/O Routine 2	1024
IGC5W07B	3284/3286 Processor	1024
IGC5Z07B	Router Module 2	1024
IGC6107B	Transient DCM Handler 1	352
IGC6207B	Write WTO's 2	1024
IGC6A07B	PFK Handler 1	872
IGC6B07B	PFK Handler 2	1088

IGC6D07B	Message Module 3	472
IGC6G07B	Cleans Up after Device Status Change	1024
IGC6I07B	Status Display Handler 1	1024
IGC6M07B	Status Display Handler 2	1008
IGC6N07B	Status Display Handler 3	792
IGC6O07B	Status Display Handler 4	1056
IGC6P07B	Status Display Handler 5	1006
IGC6Q07B	Status Display Handler 6	1048
IGC6R07B	2260 - I/O 2	1024
IGC6T07B	Status Display Handler 7	1024
IGC6Z07B	Transient DCM Handler 2	1024
IGCXL07B	Console Switch Handler	1160
IGCXM07B	Console Switch Routine (MCS)	1000
IGCXN07B	Console Switch Routine (MCS)	1016
IGCXO07B	Console Switch Routine (MCS)	1016
	TOTAL SVC 72.....	
Display Unit Status		
IGCU103D	Unit Status Syntax Check	1024
IGCU203D	Unit Status UCB Scan	1024
IGCU303D	Unit Status Data Cell Scan and Exit	1024
IGCU403D	Unit Status UCB Search and Write-to-Operator	1024
	TOTAL DISPLAY UNIT	
DADSM Functions		
IGC0002G	Obtain	1024
IGC0002I	Scratch Initialization	1024
IGC0003[1]	Rename Initialization	1024
IGC0003B-SL	Allocate Initialization	1024
IGC0007H	LSPACE Initialization and Input Validation	1024
IGC0009H	Protect Initialization	936
IGC0107H	LSPACE Available space Totaling SMF Record 19 and Message Processing	1024
IGC0109H	Protect Request Processing	1088
IGC0209H	Protect DSCB Updating	1024
IGG020D1	Release F5 DSCB Updating	1024
IGG020P1	Release Initialization and F1 DSCB Updating	1024
IGG020P2	Release F3 DSCB Updating	1024
IGG020P3	Release F4 DSCB Updating	1024
IGG0290A-SL	Scratch Password protection interface	1024
IGG0290B-SL	Scratch F6 DSCB Updating, Split-cylinder requests	1024
IGG0290C-SL	Scratch F5 DSCB Updating	1024
IGG0290D-SL	Scratch F4 DSCB Updating	1024
IGG0290E-SL	Scratch Mount Message Building	1024
IGG0290F-SL	Scratch Volume Mounting and Verification	1024
IGG0299A-SL	Scratch DSCB Removal	1024
IGG029R1-SL	RPS Set-up Module	1024
IGG03001	Rename F1 DSCB Updating	1024
IGG03002	Rename Volume Mounting and verification	1024

---

[1] Punch a 12-0 multipunch. In EBCDIC, the 12-0 is a blank; in BCD, a question mark (?).

IGG03003	Rename SMF Record Type 18 Processing	1024
IGG0325A-SL	Allocate Duplicate F1 DSCB Search	1024
IGG0325B-SL	Non-ISAM Allocate Request Conversion	1024
IGG0325C	Non-ISAM Allocate Absolute Track Processing	1024
IGG0325D-SL	Non-ISAM Allocate Available Space Search	1024
IGG0325E-SL	Non-ISAM Allocate F1/F3 Build, Non-split cylinder Requests	1024
IGG0325F	Non-ISAM Allocate F6 DSCB Creating and Updating	1024
IGG0325G-SL	Non-ISAM Allocate F5 DSCB Updating	1024
IGG0325H-SL	Non-ISAM Allocate F4 DSCB Updating and Error Handling	1024
IGG0325J	Non-ISAM Allocate Split-cylinder Processing, Drum Device	1024
IGG0325K	Non-ISAM Allocate User Label Extent Allocation	1024
IGG0325L	Non-ISAM Allocate Split-cylinder Processing, Non-drum Device	1024
IGG0325M	Non-ISAM Allocate Suballocation: Complete F1 DSCBs	1024
IGG0325P	DOS VTOC Conversion Non-split-cylinder Data Set Processing	1024
IGG0325Q	DOS VTOC Conversion Find Split-cylinder Data Set Extents	1024
IGG0325R	DOS VTOC Conversion Multiple F5 and F6 DSCB Processing	1024
IGG0325S	Non-ISAM Allocate Suballocation: Find F1 DSCB, Build Extents	1024
IGG0325T	DOS VTOC Conversion F5 DSCB Conversion, F4 DSCB Updating	1024
IGG0325U	DOS VTOC Conversion Build F6 DSCBs	1024
IGG0325V	DOS VTOC Conversion Check for F6 Extent Overlap	1024
IGG0325W	DOS VTOC Conversion Convert F6 Extents	1024
IGG0325Z	DOS VTOC Conversion Initialization	1024
IGG032I1	ISAM Allocate Validity Checking	1024
IGG032I2	ISAM Allocate Available Space Search	1024
IGG032I3	ISAM Allocate Building F1, F2, and F3 DSCBs	1024
IGG032I4	ISAM Allocate Update an existing F1 DSCB	1024
IGG032I5	ISAM Allocate Embedded Index Processing	1024
IGG032I6	ISAM Allocate F5 DSCB	1024

	Updating	
IGG032I7	ISAM Allocate F4 DSCB Updating and Error Handling	1024
IGG032I8	ISAM Allocate Multivolume Data Set Initialization	1024
IGG0553A	Extend Initialization	1024
IGG0553B	Extend Available Space Search	1024
IGG0553C	Extend F1/F3 DSCB Build/Update	1024
IGG0553D	Extend F5 DSCB Updating	1024
IGG0553E	VTOC (F4) DSCB Updating	1024
	TOTAL DADSM Modules.....	
Catalog Management		
IGC0002F	Catalog Controller	1450
IGC0002H	Open & extend catalog data set	968
IGG0CLCA	Catalog Controller	1650
IGG0CLCB	Catalog Controller	1550
IGG0CLC0	Initialization of OS/VS Catalog	1024
IGG0CLC1	Relative GDG & alias	1116
IGG0CLC2-SL	Second load of locate	1040
IGG0CLC3	Update initialization & entry building	952
IGG0CLC4	Entry building	984
IGG0CLC5	First load of update	984
IGG0CLC6	Second load of update	1116
IGG0CLC7-SL	Second load of update & cleanup	1032
IGG0CLF2-SL	Format BPAM & catalog data set	920
	TOTAL Catalog.....	
Restart - SVC 52		
IGC0005B	Initialization	1418
IGC0205B	Builds Channel Program/ Positions Checkpoint Data Set	674
IGC0505B	Restores Problem Program Core and Rebuilds System Information	1904
IGC0605B	Rebuilds System Information	304
IGC0G05B	JFCB Processor - Table Build	558
IGC0G95B	JFCB Processor - Table Build	1055
IGC0H05B	Dummy Data Set Processors	968
IGC0I05B	JFCB Processor - Table Completion	408
IGC0J05B	TCAM Processor	354
IGC0K05B	Mount/Verification Processor - Non-Direct Access	996
IGC0L05B	SYSIN/SYSOUT Processor - Non-Direct Access	943
IGC0M05B	Mount/Verification Processor - Direct Access	1040

IGC0P05B	Positioning - Non-Direct Access	670
IGC0Q05B	SYSIN/SYSOUT Processor, Direct Access	392
IGC0R05B	Positioning Direct Access	1072
IGC0S05B	Respositioning in Parallel	984
IGC0T05B	Access Method Processor/ Restores I/O	1272
IGC0U05B	DOS Tape Positioning	840
IGC0V05B	Restart Exit Routine	928
IGC0W05B	ISAM plus BDAM Data Set Positioning	928

TOTAL SVC 52 .....

CLOSE Executors

IGG0201A-SL	SAM - Close Executor for Non-Direct Access Devices	1024
IGG0201B	SAM	1024
IGG020IN-SL	Close executor for JAM	1760
IGG0201X-SL	SAM - CLOSE Executors for non-DA devices	1024
IGG0201Y-SL	Release Work Areas and Buffers (D.A.)	1024
IGG0201Z-SL	SAM/PAM - Close Executor for Direct Access Devices	1024
IGG0202A	BISAM - Purge, Free Buffers	1024
IGG0202D	BISAM - Free Work Area	1024
IGG0202I	QISAM - Flush Buffers, Indices	1024
IGG0202J	QISAM - Write EOF	1024
IGG0202K	QISAM - Calculate for Padding	1024
IGG0202L	QISAM - Pad Track Index	1024
IGG0202M	QISAM - Pad High-Level Indices	1024
IGG02028	QISAM Load	1024
IGG02029	QISAM Close	1024
IGG0203A-SL	BDAM	1024
IGG0203M	BTAM	1024
IGG0203X	Graphics	1024
IGG0203Y	Graphics	1024

TOTAL Close Executors....

CLOSE-TCAM

IGG02030	Disk Close	1024
IGG02035	Line Close	1024
IGG02036	Line Close	2048
IGG02041	Checkpoint Close	1024
IGG02046	Message Processing Queues Open	1024
IGG02047	Message Processing Queues Close	1024

TOTAL CLOSE TCAM.....

TCLOSE - SVC 23

IGC0002C	Initial Load	1520
	TOTAL TCLOSE SVC 23.....	

STAE - SVC 60

IGC0006[1]	Create or modify a STAE Environment	336
IGC0111C	Schedule STAE Exit Routine and Test Retry Option	1088
IGC0211C	Data Set Closing	856
IGC0311C	Schedule STAE Retry Routine	712
IGC0411C	Data Set Closing for ISAM, BTAM and QTAM	720
	TOTAL SVC 60	

Graphics

IGC0007A	Buffer Management (SVC71)	904
IGC0007C	SPAR (SVC73)	752
IGC0007D	DAR (SVC74)	792
IGC0007E	DEQUEUE (SVC75)	632
IGC0107A	Buffer Management (SVC71)	912
IGC0107C	SPAR (SVC73)	392
IGC0107D	DAR (SVC74)	608
IGC0207A	Buffer Management (SVC71)	804
	TOTAL Graphics.....	

IEBTCRIN

IGE0011A	2495 ERP	992
IEBTCRIN	Driver module	4044
IEBTCR02	Message module	1082
IEBTCR03	Job file control block analyzer	928
IEBTCR04	Control card analyzer	3046
IEBTCR05	Read/edit module	4654
	TOTAL IEBTCRIN.....	

CHKPT - SVC 63

IGC0006C	Initialization	656
IGC0106C	Environment Checking	920
IGC0206C	Builds CHR	456
IGC0506C	Quiesces I/O	1024
IGC0A06C	Writes CHR on Checkpoint Data Set	320
IGC0D06C	Writes DSDRs on Checkpoint Data Set	1136
IGC0F06C	Writes CIRs and SUR on Checkpoint Data set	1064
IGC0N06C	Restores I/O	1024
IGC0Q06C	Clean Up	728
IGC0S06C	Issues console command	576

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[1] Punch a 12-0 multipunch. In EBCDIC, the 12-0 is a blank; in BCD, a question mark (?).

	TOTAL SVC 63	
SETPRT - SVC 81		
IGC0008A	UCS Load Determination	1024
IGG08101	UCS Image Retrieval	1024
IGG08102	UCS Load and Verification	1024
IGG08103	FCB Retrieval	1024
IGG08104	FCB Load and Verification	1024
	TOTAL SVC 81	
DASDR - SVC 82		
IGC0008B	Builds DEBs For New Direct Access Volumes	1024
IGC0108B	Assigns Alternate Tracks	1016
IGG019P8	Modifies Extent Limits	352
IGG019P9	Abnormal END	256
IGC0208B	Updates UCRs	672
IGC0308B	Assigns Dynamic Alternate Track On 2305	456
	TOTAL SVC 82	
IEHATLAS + ATLAS (SVC 86)		
IGC0008F	Get Address Of Alternate Track	1024
IGG0860A	Reads Format 4 DSCB & Build Channel Program	1024
IGG0860B	Execute Channel Program For Error Track	1024
IGG0860C	Obtain Storage For Largest Record On Error Track	1024
IGG0860D	Transfer Records From Error To Alternate Track	1024
IGG086AE	Chain Alternate To Primary Tracks	1024
	TOTAL SVC 86	
JES Request SVC Module		
IFGAZ016	SVC Interface to JES	440
	TOTAL JES SVC Modules....	
OPEN/CLOSE/EOV Modules		
IGC0001I-SL	Open Initial Function (OPEN and OPEN TYPE=J)	1224
IGC0002B	Open Initial Function (OPEN and OPEN TYPE=J)	920
IGC0002C	TCLOSE Initial Function	1520
IGC0002[1]-SL	CLOSE Initialization Function	1472
IGC0003A	FEOV Executor Function	1136
IGC0005E-SL	EOV Executor Function	1152
IGG0200F	Alias for IFG0200X	1024
IGG02006	Alias for IFG0200X	1024
IFG0190P	ABEND Interpretation and Recovery	1024

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[1] Punch a 12-0 multipunch. In EBCDIC, the 12-0 is a blank; in BCD, a question mark (?).

	Initialization Function	
IFG0190R	Display DSNAME WTO Function	1024
IFG0193A-SL	OPEN Initial Volume Serial Function	1384
IFG0193B-SL	Open Tape Initial Function	1024
IFG0193C	Open Tape Label Editor Function	1024
IFG0193D	Open Tape Destroy Label Function	1024
IFG0193E	Open Tape Create Label Function	1024
IFG0194A	Open Direct Access Volume Verification Function	1136
IFG0194C	Open Direct Access Volume Verification Function	1024
IFG0194D	Open Tape Volume Reference Function	1024
IFG0194E-SL	Open Direct Access Unit Selection Open Direct Access Read DSCB Function	1024
IFG0194F-SL	Open Tape Mount Verification Function	1024
IFG0194G	Open Tape Volume Mounting Function	1024
IFG0194H-SL	Open Tape Volume Verification Function	1024
IFG0194I-SL	Open Tape Final Common Function	1024
IFG0194J	Open Tape Label Editor Interface Function	1024
IFG0195A-SL	Open Direct Access Read DSCB Function	1024
IFG0195B-SL	Open Tape Standard Label Positioning Function	1024
IFG0195C-SL	Open Tape No Label Positioning Function	1024
IFG0195D	Open Tape Nonstandard Label Input Interface Function	1024
IFG0195E	Open Direct Access DISP=MOD Error Recovery Function	1086
IFG0195G	Open Direct Access Expiration Date Error Function	1024
IFG0195H-SL	Open Tape Standard Label INPUT/MOD Header Label 1 Function	1024
IFG0195J-SL	Open Direct Access Read SDCB to JFCB Merge Function	1024
IFG0195K-SL	Open Tape Standard Label INPUT/MOD Header Label 2 Function	1024
IFG0195M	Open Direct Access BPAM Concatenation Function	1168
IFG0195N	Open Tape Standard Label Input User Label Function	1024
IFG0195O	Open Direct Access Parallel Mounting Function	1200
IFG0195P	Open Direct Access Parallel Mounting	1024

	Function	
IFG0195T	Open Security Initialization Function	1208
IFG0195U	Open Security Search Function	1024
IFG0196J-SL	Open Merge JFCB to DCB Function	1024
IFG0196K	Open Merge JFCB to DCB Function	1024
IFG0196L-SL	Open Merge DCB Exit Function	1024
IFG0196M-SL	Open Merge DCB to JFCB Function	1136
IFG0196N-SL	Open Tape Standard Label Output Security Function	1024
IFG0196O	Open Tape Nonstandard Label Output Interface Function	1024
IFG0196Q-SL	Open Tape Standard Label Date Protection Function	1024
IFG0196T-SL	Open Tape Standard Label Rewrite Volume Label Function	1024
IFG0196U	Open Tape Standard Label Output User Label Function	1024
IFG0196V-SL	Open Access Method Executor Determination Function	1024
IFG0196W-SL	Open Access Method Executor Return Function	1112
IFG0196X-SL	Open Final EXCP	1024
IFG0197A-SL	Open Access Method Executor Return Function	1024
IFG0198N-SL	Open Final SYSOUT LIMIT Function	1112
IFG0199B	ABEND Interpretation and Recovery Write-to-Programmer Function	1024
IFG0199D	ABEND Interpretation and Recovery ABEND Trace Function	1112
IFG0199E	ABEND Interpretation and Recovery ABEND Exit Function	1192
IFG0199R	Optional Module Trace Initialization/Termination Function	1024
IFG019TR	Optional Module Trace Function	368
IFG0200P	ABEND Interpretation and Recovery Initialization Function	1024
IFG0200V-SL	Close Initialization Function	1184
IFG0200W-SL	Close Unit Record/ Teleprocessing Function	1024
IFG0200X-SL	Close Access Method Executor Return Function	1024
IFG0200Y-SL	Close Unit Record/ Teleprocessing Function	1296
IFG0200Z-SL	Close Tape Standard Trailer Label Function	1024
IFG0201R-SL	Close Direct Access Input User Labels Function	1024
IFG0202A	Close Tape Standard User Label Function	1024

IFG0202B	Close Tape Nonstandard Label Function	1024
IFG0202C	Close Direct Access Input User Labels Function	1024
IFG0202D	Close Direct Access User Labels Function	1024
IFG0202E-SL	Close Direct Access Write File Mark Function	1024
IFG0202F-SL	Close Tape Volume Disposition Function	1024
IFG0202G-SL	Close Tape Volume Disposition Function	1024
IFG0202H	Close SMF Data Set SMF Record Builder Function	1024
IFG0202I	Close SMF Data Set SMF Record Builder Function	1024
IFG0202J-SL	Close Final SMF Interface Function	1080
IFG0202K-SL	Close Final Restore System Function	2032
IFG0202L-SL	Close Final Termination Function	1024
IFG0230P	ABEND Interpretation and Recovery Initialization Function	1024
IFG0232D-SL	TCLOSE Direct Access Input Function	1024
IFG0232G	TCLOSE Tape Standard Trailer Label Function	1024
IFG0232J	TCLOSE Direct Access Output Trailer Label Function	1024
IFG0232M	TCLOSE Tape Standard Trailer Label Function	1024
IFG0232S	TCLOSE Tape Volume Positioning Function	1024
IFG0232Z-SL	TCLOSE Final Function	1176
IFG0550P	ABEND Interpretation and Recovery Initialization Function	1024
IFG0551B	EOV SYNAD Executor Function	1096
IFG0551D	EOV SYNAD Executor Function	1024
IFG0551F-SL	EOV Initial Read JFCB Function	1400
IFG0551H-SL	EOV Initial Work Area Initialization Function	1024
IFG0551J	EOV Initial String Determination Function	1024
IFG0551L	EOV Access Method Executor Function	1160
IFG0551N	EOV Access Method Executor Function	1024
IFG0551P	EOV Tape Output Trailer Label Function	1024
IFG0551R	EOV Tape Output Trailer (EOV2)	1024
IFG0551T	EOV Tape Output Volume Disposition Function	1024
IFG0551V	EOV Tape Output New Volume Function	1024
IFG0551X	EOV Tape Output Label Verification Function	1024
IFG0551Z	EOV Tape Output Label	1024

	Verification Function	
IFG0552B	EOV Tape Output Label Rewrite Function (VOL1)	1024
IFG0552D	EOV Tape Output Label Rewrite Function (HDR1)	1024
IFG0552F	EOV Tape Output Label Rewrite Function (HDR1, UHL)	1024
IFG0552H	EOV Tape Output Exit Function	1160
IFG0552J	EOV Tape Output Label Destroy (EMODVOL1) Function	1024
IFG0552L	EOV Tape Output Label Create Function	1024
IFG0552N	EOV Tape Output Error Recovery and Nonstandard Label Function	1024
IFG0552P	EOV Tape Output WTO Function	1024
IFG0552R-SL	EOV Tape Input Standard Trailer Label Function	1136
IFG0552T	EOV Tape Input Standard Trailer Label Function	1024
IFG0552V	EOV Tape Input Volume Positioning Function	1024
IFG0552X-SL	EOV End-of-Data Function	1216
IFG0552Z	EOV Tape Input New Volume Mounting Function	1024
IFG0553D	EOV Tape Input New Volume Mounting Function	1024
IFG0553F	EOV Tape Input Standard Header Label Function	1024
IFG0553H	EOV Tape Input Next Volume Mounting Function	1024
IFG0553P-SL	EOV Direct Access Input Initial Function	1024
IFG0553R	EOV Direct Access Input Mount Function	1024
IFG0553T	EOV Direct Access Input Mount Function	1024
IFG0553V	EOV Direct Access Input Input Mount Ahead Function	1024
IFG0553X	EOV Direct Access Input DEB Function	1192
IFG0553Z	EOV Direct Access Input Exit Function	1024
IFG0554B	EOV Direct Access Input FEOV Repositioning Function	1136
IFG0554D	EOV Direct Access Input FEOV Repositioning Function	1024
IFG0554J	EOV Direct Access Message Function	1024
IFG0554L	EOV Direct Access Input User Header/ Trailer Label Function	1168
IFG0554N	EOV 2321 and Direct Access Output FEOV Function	1024
IFG0554P	EOV Direct Access Output Get Space Current Volume Function	1112
IFG0554R	EOV Direct Access Output, GET Current Volume Function	1096

IFG0554T	EOV Direct Access Output B37 Abend Function	1096
IFG0554V	EOV Direct Access Output Next Volume Mount Function	1024
IFG0554X	EOV Direct Access Output	1024
IFG0554Z	EOV Direct Access Output Volume Disposition	1024
IFG0555B	EOV Direct Access Output User Trailer Label Interface Function	1024
IFG0555D	EOV Direct Access Output JFCB Update Function	1024
IFG0555F	EOV Direct Access Output Read DSCB Function	1024
IFG0555H	EOV Direct Access Output Construct DEB Function	1432
IFG0555J	Open Merge Direct Access Output User Header Label Function	1024
IGG0193K-SL	JES Open Executor Function	1024
IGG0203K-SL	JES Close Executor Function	1024
IGC0196M	Problem Determination	1024
IGC0199L-SL	Open Executor BDAM	1024
EMDUSRFF	IMDPRDMP Utility OPEN/CLOSE/EOV Format Appendage	1024
READPSWD	Open Security Read Password (READPSWD) Function	920
SECLOADA	Open Security Scratch - Rename Interface Function	984

TOTAL OPEN/CLOSE/EOV.....

OPEN Executors for ISAM

IGC0006G	SYNADAF (SVC 68) initial load	1024
IGC0009A	Volume statistics record routine, magnetic tape	1024
IGC0106H	SYNAD routine CSW status and CCB Post routine for SAM, DAM, and EXCP	712
IGC0109A	DASD statistics record	1024
IGG0192A	Build DEB	1024
IGG0192B	Buffers	1024
IGG0192C	Buffers add work area initialization	1024
IGG01920	Validate fields in format 2 DSCB	1024
IGG01922	Validate fields in format 2 DSCB	1024
IGC0206H	SYNAD routine for BISAM	784
IGC0306H	SYNAD routine for QISAM	584
IGC0406H	SYNAD routine for QISAM, BTAM, QTAM, and GAM	960
IGC0506H	Format SYNAD message EXCP	288
IGC0606H	Format SYNAD message for optical readers	984
IGC0706H	SYNAD routine unit check analysis	1000

TOTAL Open Executors ISAM.....

OPEN Executors for SAM

IGG0191A-SL	DEB Construction - Load 1	1024
IGG0191B-SL	Main Executor - Load 1	1024
IGG0191C-SL	Dummy Executor	1024
IGG0191D-SL	First Load Direct Access Executor	1024
IGG0191E	Input Exchange Buffering Executor	1024
IGG0191F-SL	Output Exchange Buffering Executor	1024
IGG0191G-SL	TAPE and Unit Record Executor	1024
IGG0191H	Record Overflow Executor	1024
IGG0191I-SL	Buffer Construction Executor	1024
IGG0191J-SL	Direct Access IN/OUT and OUT/IN	1024
IGG0191K	Direct Access Executor PCI	1024
IGG0191N-SL	DEB construction for Direct Access Devices	1024
IGG0191O-SL	Second Load-Direct Access Executor	1024
IGG01911-SL	IOB and Buffer Construction	1024
IGG01912	Update Load Executor - Paper Tape	1024
IGG01913	Load Executor PCI/T.O	1024
IGG01914	Exchange Buffering Load Executor	1024
IGG01915-SL	Load Executor for Variable Length Records	1024
IGG01916	Load Executor for Variable Length Records	1024
IGG01917-SL	Load Executor	1024
IGG01918	Update Load Executor - Paper Tape	1024
IGG01919	Load Executor PCI/T.O	1024
IGG0191P	Update Executor	1024
IGG0191Q	Tape/Unit Record Executor	1024
IGG0191R	TAPE, Disk IN/OUT executor	1024
IGG0191S	Record Overflow Executor	1024
IGG0191T	UCS Load Determination	1024
IGG0191U	UCS Image Retrieval	1024
IGG0191V	UCS Load	1024
IGG0191W	SAM Stage 2 Executor	1024
IGG0191X	SAM Stage 2 Executor	1024
IGG0191Y	Executor for User Totaling	1024
IGG0191Z	SAM Stage 2 Executor	1024
IGG01926	SAM Stage 3 - Open Executor	1024
IGG0193I-SL	Executor Selection	1024
IGG0196A-SL	DEB Construction - Load 2	1024
IGG0196B-SL	Main Executor - Load 2	1024
IGG0196I-SL	DEB Construction	1024
IGG0196J	Open Input Executor Exchange Buffer - DA tape	1024
IGG0196K	Open Executor Stage 2 Unit Record	1024
IGG0196L	Open Executor Stage 2 IOB Finish	1024
IGG0196P	SAM Stage 2 Executor	1024
IGG0197E	FCB Retrieval	1024
IGG0197F	FCB Load and Verification	1024
IGG0197U	UCS Verification	1120
IGG0199K	SAM Stage 2 Executor	1024
IGG01990	Exchange Buffering Load Executor	1024
IGG01991-SL	Load Executor for Variable Length Records	1024

IGG01992	Load Executor for Variable Length Records	1024
IGG01993-SL	SAM Stage 2 Executor	1024

TOTAL Open Executors SAM.....

OPEN Executors for BDAM

IGG0191L-SL	Create BDAM Date Set	1024
IGG0191M	BSAM Load Mode, Record Overflow	1024
IGG0193A-SL	Open Executor No. 1	1024
IGG0193C-SL	Open Executor No. 2	1024
IGG0193E-SL	Open Executor No. 3	1128
IGG0193F	Obtain/Format Buffer Area	1024
IGG0193G-SL	Loads Required BDAM Modules	1024

TOTAL Open Executors BDAM.....

OPEN Executors for BISAM Only

IGG0192H	Move From DSCB, Get Work Area	1024
IGG0192I	Load PMT, CP1 or CP2	1024
IGG0192J	Load Appendage, Asynchronous	1024
IGG0192K	Load NPMT, Dynamic Buffering CPU4-CP7	1024
IGG0192L	Load WRITE KN NPMT, Channel Programs	1024
IGG0192M	Set-up WRITE KN Channel Programs	1024
IGG0192N	Set-up WRITE KN Channel Programs	1024
IGG01920	Set-up WRITE KN Channel Programs	1024
IGG0192P	Read HIGH-level Index	1024
IGG0192Q	Set-up WRITE KN Channel Programs	1024
IGG0192W	Move from DSCB to DCB work area (VLR)	1024
IGG0192X	Set-up WRITE KN Channel Programs (VLR)	1024
IGG0192Z	Set-up WRITE KN Channel Programs (VLR)	1024
IGG01950	Validate Fields in Format 2 DSCB (VLR)	1024
IGG01994	SAM Stage 3 Open Executor	1024
IGG0199L	Create BDAM Spanned Records	1024
IGG01990	BDAM Search Direct on DA Exec	1024
IGG0199W-SL	SAM-JES Compatability Interface	1024

TOTAL OPEN Exec. BISAM...

OPEN Executors for QISAM Only

IGG01921	Set Up Load Mode Work Area	1024
IGG01923	Load (Scan Mode) (VLR)	1024
IGG01924	Set-up Channel Programs (VLR)	1024
IGG01928	Load (Scan Mode)	1024
IGG01929	Set-up Channel Programs	1024
IGG0192D	Calculations	1024
IGG0192E	Calculations	1024
IGG0192F	Calculations	1024
IGG0192G	Calculations	1024

IGG0192R	Load, Set-up CP18 (Write Validity Check)	1024
IGG0192S	Set-up, CP19, Pre-format	1024
IGG0192T	Set-up, CP20, CP21 (No Write Validity Check)	1024
IGG0192U	Load, Set-up CP18 (Write Validity Check)	1024
IGG0192V	Set-up CP20, CP21 (Write Validity Check)	1024
IGG0195D	Resume Load Initialization	1024
IGG0195G	Resume Load Initialization	1024
IGG0195T	Full Track Index Write Initialization	1024
IGG0195U	Full track with Resume Load Initialization	1024
IGG0196D	Resume Load Initialization - Set Up CP 31	1024
IGG0196G	Resume Load Initialization	1024

TOTAL OPEN Exec. QISAM...

OPEN Executors for Graphics

IGG0193L	Open Executor - Load 3	1024
IGG0193Y	Open Executor - Load 1	1024
IGG0193Z	Open Executor - Load 2	1024

TOTAL OPEN Exec. Graphics

OPEN Executors for BTAM

IGG0193M	Open Executor - Load 1	1024
IGG0193Q	Open Executor - Load 2	1024
IGG0193S	Open Executor - Load 3	1024
IGG0194N	Open Executor - Load 4	1024
IGG0194P	Open Executor - Load 3270	1024
IGG0194Q	Open Executor - Load 3270	1024

TOTAL OPEN Exec. BTAM....

OPEN Executors for TCAM

IGG01930	Disk Open	1024
IGG01931	Disk Open	1024
IGG01932	Disk Open	1024
IGG01933	Open error handler	1024
IGG01934	Disk Open	1024
IGG01935	Line Open	1024
IGG01936	Line Open	2048
IGG01937	Line Open	1024
IGG01938	Line Open	1024
IGG01939	Line Open	1024
IGG01940	Line Open	1024
IGG01941	Checkpoint Open	1024
IGG01942	Checkpoint Open	1024
IGG01943	Checkpoint Open	1024
IGG01944	Checkpoint Open	1024
IGG01945	Checkpoint Open	1024
IGG01946	Message Processing Queues Open	1024
IGG01947	Message Processing	2048

IGG01948	Line Open	1024
IGG01949	Checkpoint Open	1024

TOTAL OPEN Exec. TCAM....

TCAM - SVC 104

IGC0010D[1]	Operator Control Control Module - Load 0 - SVC 104	990
IGC0110D	Operator Control Control Module - Load 1	936
IGC0210D	Operator Control Control Module - Load 2	1024
IGC0310D	Operator Control Control Module - Load 3	872
IGC0410D	Operator Control Control Module - Load 4	880
IGC0510D	Operator Control Control Module - Load 5	544

TOTAL TCAM - SVC 104.....

VOLSTAT - SVC 91

IGC0009A	Magnetic tape logging RTN	1024
IGC0109A	DASD (3330,2305) logging RTN	478

TOTAL SVC 91.....

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[1]Note: Only IGC0010D is included at SYSGEN. Other SVC 104 modules are copied when TCAM Independent Release is applied.

Miscellaneous SVC Routines

IGC0001F-SL	Purge (SVC 16)	1416
IGC0001G	Restore	296
IGC0002A	BPAM Store Routine (SVC 21)	1024
IGC0002B	OPEN-JFCB in Storage (SVC 22)	1024
IGC0002E	D.A. Track Balance (SVC 25)	872
IGC0003C	SVC 33 - Halt I/O	456
IGC0003E-SL	WTO/WTOR (SVC 35)	1232
IGC0003F	WTL	608
IGC0003I	Tape ERP	1024
IGC0004C	CIRB (SVC 43)	176
IGC0004D	CHAP (SVC 44)	296
IGC0005	GTF Initialize and Terminates (SVC 109 LTA)	472
IGC0005C	RELEX (SVC 53)	248
IGC0005G	FREEDBUF (SVC 57)	128
IGC0005I	SVC 59 - OLTEP	856
IGC0006B	Detach (SVC 62)	400
IGC0006D	Read JFCB	1024
IGC0006G	SYNADAF (SVC 68) Initial Load	1024
IGC0006I	Backspace (SVC 69)	1000
IGC0007F	LOGREC Recorder	988
IGC0008C	SMF WTM (SVC 83) Buffer Control	832
IGC0008G	SVC 87 - Delete Operator Messages (MCS)	220
IGC0008H	SVC 88 - Set Emulator Mode	374
IGC0101F	Purge (SVC 16 - Second Load	1342
IGC0103E-SL	WTOR Processor (SVC 35)	896
IGC0108C	SMF Data Set	1094
IGC019C8	Write PCI Appendage	1272
IGC0201F-SL	Purge (SVC 16 - Third Load)	1328
IGC0203E-SL	WTP	1128
IGC0208C	SMF Data Set Verification	854
IGC0210A	SVC 21 BPAM STOW	1024
IGC021AB	SVC 21 BPAM STOW	1024
IGC0403	CIRB (SVC 43)	176
IGC0406H	SYNAD Routine for BISAM	584
IGC0406H	SYNAD Routine for QISAM, BTAM, QTAM, and GAM	960
IGC0505I	SVC 59 - OLTEP	776
IGC0506H	Formats Synad Message for EXCP	288
IGC0605I	SVC 59 - OLTEP	784
IGC0606H	Formats Synad Message for Optical Character Readers	1024
IGC0706H	Synad Routine Unit Check Analysis	704
IGC0905I	SVC 59 - CU TEST SVC	356
IGE0100I		1024
IGE0200I		1024
IGE0300I		1024
IGE0400I		1024
IGG0198L-SL	JES Compatability Interface	1024
IGG0199F	JES Compatability Interface	1024
IGG0199G-SL	JES Compatability Interface	1024
IGG0201W-SL	JES Compatability Interface	1024
	TOTAL Miscellaneous.....	

ERROR RECOVERY PROCEDURES

The following list contains those error recovery procedures that may be made resident when the resident error-recovery procedure option is specified on the CTRLPROG macro at system generation. For information on the error-recovery option, refer to OS/VS1 Planning and Use Guide listed in the Preface. All error-recovery routines reside on the SVC library. The IBM standard list IEAIGE00 (a member of SYS1.PARMLIB) initially contains no error recovery procedure names. The user should enter the total module sizes specified for these lists in the space provided in Figure 93.

Routine	Standard List Total From IEAIGE00
Unit-record device routines	
Common routines	
Graphics routines	
3270routines	
TCAM routines	
2955 routines	
3211 routines	
1287/1288 optical reader routines . .	
Page file error recovery.	
Direct Access Volume Verification . .	
DASD error recovery	
Tape error recovery	
BTAM error recovery	
SYS1.LOGREC Recorder-SVC 76	
TOTAL REQUIREMENT (Note 1)	

Note:

1. The contents of this standard list (and therefore the total size) can be modified at IPL time.

Figure 93. Total storage requirement for error recovery routines.

Unit Record Device Error Routines

IGE0000D	1052/2150 ERP (Console)	816
IGE0000E	2501/2520/1442 ERP (Card reader/punch)	592
IGE0000G	1403/1443 ERP (Printer)	888
IGE0001A	3505/3525 ERP	1024
IGE0001C	2540 ERP Load 1 (Card reader/punch)	616
IGE0011C	1287 ERP	904
IGE0011D	1288 ERP	904
IGE0011E	1419/1275 ERP	360
IGE0101C	2540 ERP Load 22 (Card reader/punch)	264
	TOTAL unit record.....	

Error Routines Common to all devices

IGC0003C	Halt I/O	208
IGC0007F	SVC 76	988
IGE0025C	Write-to-Operator Load 1	720
IGE0025D	Statistics Update	832
IGE0025E	I/O Purge	376
IGE0025F	Outboard Recorder (OBR)	992
IGC0105I	OLTEP I/O Routine	488

IGC0107F	SVC 76	548
IGE0125C	Write-to-Operator Load 2	432
IGE0125F	Outboard and Channel Check Recorder	928
IGC0207F	SVC 76	444
IGE0225C	Write-to-Operator Load 3	1024
IGC0307F	SVC 76	760
IGE0325C	Write-to-Operator Load 4	952
IGE0425C*	Write-to-Operator Load 5	984
IGE0625F	Statistical Data Recorder (SDR)	432

*Loaded for 3330 and 2305 devices only.

Graphic Routines

TOTAL common routines....

IGE0010A	ERP 2250	1024
IGE0010B	ERP Load 1 2260/1053	1024
IGE0110B	ERP Load 2 2260/1053	416

TOTAL Graphics.....

3270 Routines

IGE0010E	3270 ERP	1024
IGE0110E	3270 ERP	1024

TOTAL 3270.....

TCAM Routines

IGE0004G	START/STOP ERP Translator Module	480
IGE0004H	BSC ERP Translator Module	480
IGE0104G	Read/Write Unit Check Exception	816
IGE0104H	BSC Equipment Check, Lost Data, Intervention Required, and Unit Exception	910
IGE0204G	Non-operational Control Unit	776
IGE0204H	BSC Data Check, Overrun and Command Reject	970
IGE0304F	Start/Stop Control Module	1016
IGE0304G	Unit Check for Non-read, and Non-write and Non-Poll CCWs	370
IGE0404G	Auto Poll and Read Response to Poll Unit Check and Unit Exception	370
IGE0404H	BSC CCW Return Module	970
IGE0504F	BSC Control Module	1020
IGE0504G	Error Post and CCW Return	968
IGE0504H	BSC Error Post Module	748
IGE0604G	Unit Check and Unit Exception for Audio and 2260 Local Devices	340
IGE0804G	Start/Stop Channel Check	968
IGE0804H	BSC Channel Check	90
IGE0904H	OBR/SDR Interface for TPER record	632

IGE0904G	Terminal Statistics Recording	210
	TOTAL TCAM routines.....	
Error Routines for 2955		
IGE00191	Error Decoder and Recovery	872
IGE0119I	Error Decoder and Recovery	872
	TOTAL for 2955.....	
Error Routines for 3211		
IGE0000F	ERP LOAD1	992
IGE0100F	ERP LOAD2	900
	TOTAL for 3211.....	
1287/1288 Optical Reader		
IGE0011C	1287 ERP	992
IGE0011D	1288 ERP	904
IGG0197A	OPEN State II	1024
IGG0197B	OPEN Stage III	1023
IGG019VA	GET locate mode, fixed records	312
IGG019VB	Get locate mode, variable or undefined records	408
IGG019VC	Get move mode, fixed records	376
IGG019VD	Get move mode, variable or undefined records	456
IGG019VE	SYNCH module	880
IGG019VF	READ module	136
IGG019VG	CHECK module	818
IGG019VH	CNTRL module	864
IGG019VI	RDLNE module	232
IGG019VJ	DSPLY module	472
IGG019VK	RESCN module	592
	TOTAL 1287/1288.....	
Page File Error Recovery		
IGE0000B	Page File Error Routine	264
Direct Access Volume Verification		
IGE0125E	DAVV Load 1	496
IGE0225E	DAVV Load 2	888
	TOTAL for DAVV.....	
DASD Error Recovery		
IGE0000A		1016
	TOTAL DASD.....	
Tape Error Recovery		
IGE0000I	Tape ERP	1024
IGE0100I	Tape ERP	1024
IGE0200I	Tape ERP	1024
IGE0300I	Tape ERP	1024
IGE0400I	Tape ERP	1024

IGE0800I	Tape ERP	1024
IGE0900I	Tape ERP	1024
	TOTAL Tape.....	

BTAM Error Recovery

IGE0004A	Start/Stop ERP Control	544
IGE0004B	Start/Stop ERP Data Check	408
IGE0004C	BSC ERP Control	640
IGE0104A	Start/Stop ERP Data Check	536
IGE0104B	Start/Stop ERP Diagnostic Write/Read	328
IGE0104C	BSC ERP Data Check	376
IGE0204A	Start/Stop ERP Timeout	552
IGE0204B	ERP Line Error Recording	408
IGE0204C	BSC ERP Error Post	960
IGE0304A	Start/Stop ERP Intervention Required	560
IGE0304B	Start/Stop ERP Unit Exception	696
IGE0304C	BSC ERP Intervention Required	360
IGE0404A	Start/Stop ERP Lost Data	400
IGE0404B	Start/Stop ERP Read Skip Write Break	512
IGE0404C	BSC ERP Timeout	768
IGE0504A	Start/Stop ERP Post	656
IGE0504B	Start/Stop ERP Overrun	416
IGE0504C	BSC ERP Special Return	944
IGE0604A	Start/Stop ERP Bus Out Error Check	312
IGE0604B	ERP Intervention Required Message Writer	248
IGE0604C	BSC ERP Lost Data	432
IGE0704A	Start/Stop ERP Read Skip Write Break	416
IGE0704B	Remote 3270 Error Post	1024
IGE0704C	BSC ERP Bus Out & Overrun	408
IGE0804A	Start/Stop ERP Status Check	176
IGE0804B	ERP Channel Check & Interface Control Check	592
IGE0804C	BSC ERP Equipment Check & Command Reject	488
IGE0904A	Start/Stop ERP Control	248
IGE0904C	BSC ERP Unit Exception	980
	TOTAL BTAM.....	

ACCESS METHOD MODULES

The following list contains the access method modules that may be resident in any configuration when the resident reenterable load module option is selected at sysgen (CTRLPROG macro). For information on the resident routine option, refer to OS/VS1 Planning and Use Guide listed in the Preface. All of these routines are located in the SVC Library. Those module names followed by -SL are loaded when the IBM-supplied standard list IEAIGG00 is used. All module names on the standard list IEAIG00 reside in the SYS1.PARMLIB of the generated system. The modules on this list are also contained in the pageable supervisor space, limited to four segments (256K bytes) per megabyte of defined virtual storage.

WARNING:

A system with only one megabyte of virtual storage may not run with the full default standard list. If a 1-megabyte IPL cannot be performed, increase the virtual storage to two megabytes, or reduce the size of the RAM or RSVC lists.

Figure 94 aids you in determining the total storage for Access Method Routines required to calculate the size of the pageable control program, Figure 6.

Routine	PAGEABLE Standard List IEAIGG00	FIXED Standard List IEAIGG01	PAGEABLE Standard List IEAIGG02	FIXED Standard list IEAIGG03
BDAM				
BSAM/QSAM Common.	5400			
BSAM	2184			
QSAM Simple Buffering . .	3200			
QSAM Exchange Buffering .				
BSAM/QSAM for 3211. . . .				
BISAM				
QISAM				
BTAM				
Graphics.				
JAM	3232			
TCAM.				
TOTAL REQUIREMENT	14016			

Figure 94. Total storage requirement for Access Method Modules.

BASIC DIRECT ACCESS METHOD MODULES

IGG019JA	Dynamic buffering Virtual, Non-spanned	1112
IGG019JB	Dynamic buffering, Virtual Spanned Spanned	1152
IGG019KA	FOUNDATION MODULE, NON-SPANNED	1592
IGG019KC	RELATIVE TRACK	256
IGG019KE	RELATIVE BLOCK	272
IGG019KF	CONVERT RELATIVE BLOCK	696
IGG019KG	BLOCK FEEDBACK	168
IGG019KH	CONVERT TO RELATIVE BLOCK	216
IGG019KI	READ/WRITE by BLOCK KEY	192

IGG019KJ	Foundation Module for Spanned Records	3640
IGG019KK	READ/WRITE BY BLOCK ID	336
IGG019KL	Dynamic Buffering for Spanned Records	336
IGG019KM	WRITE ADD FORMAT U or V	720
IGG019KN	WRITE ADD for Spanned Records	1400
IGG019KO	WRITE ADD FORMATE F	312
IGG019KQ	WRITE verification	352
IGG019KR	READ/WRITE for Spanned Records	768
IGG019KU	CHANNEL END APPENDAGE	360
IGG019KW	KEY EXTENDED SEARCH	352
IGG019KY	SELF FORMAT EXTENDED SEARCH	176
IGG019LA	PRE-FORMAT EXTENDED SEARCH	216
IGG019LC	END OF EXTENT APPENDAGE	152
IGG019LE	DYNAMIC BUFFERING	304
IGG019LG	READ EXCLUSIVE	888
IGG019LI	CHECK MODULE	224
	TOTAL BDAM.....	

Modules Common to BSAM and QSAM

IECQBFG1	GETPOOL routine	224
IGC0106H	SYNADAF	563
IGC0806H	SYNADAF	436
IGC0906H	SYNADAF	733
IFGAAABA-SL	SYSIN/SYSOUT ACB interface	528
IGG019AH	SYSIN/SYSOUT error routine	1168
IGG019AV-SL	Dummy Data Set Return	168
IGG019AX	User Totaling Save Routine	120
IGG019B0	BUILDRCD buffer pool aquisition	128
IGG019C0-SL	CE Appendage - U Format	248
IGG019C1	ASYNCH Error return TRACK Overflow	360
IGG019C2	EOB Track Overflow	1048
IGG019C3	XCE Track Overflow/PCI QSAM Appendage	344
IGG019C4-SL	EOB Appendage - Search Direct	280
IGG019CA	CNTRL Card Reader	176
IGG019CB	CNTRL Printer	168
IGG019CC-SL	EOB PT/MT/Update/DA-IN/ TO-IN	776
IGG019CD-SL	EOB DA	672
IGG019CE	EOB Printer-Punch	416
IGG019CF	EOB Printer-Punch ASA character	624
IGG019CG	SIO Appendage - Update	496
IGG019CH-SL	EOE Appendage - DA-Input Non-Fixed	128
IGG019CI-SL	CE Appendage - Input/RDBACK Fixed	560
IGG019CJ-SL	CE Appendage - INPUT Var Length	592
IGG019CL	SIO Appendage - Printer	64
IGG019CM	Paper Tape Code Conversion TELETYPE	768
IGG019CN	Paper Tape Code Conversion ASCII	512

IGG019CO	Paper Tape Code Convers. BURROUGHS	512
IGG019CP	Paper Tape Code Conversion FRIDEN	768
IGG019CQ	Paper Tape Code Conver. IBM PTTC/8	768
IGG019CR	Paper Tape Code Conversion NCR	768
IGG019CS	CE Appendage Paper Tape Reader Fixed	24
IGG019CT	EOB routine (INOUT/OUTIN override)	48
IGG019CU	CE/XCE/PCI Appendage - Chained Sch	1760
IGG019CV	EOB DA Output Chained Sch	976
IGG019CW	EOB Tape In/Out DA Input Chained Sch	624
IGG019CX	EOB Printer/Punch Sch	184
IGG019CY	EOB ASA Printer/Punch Chained Sch	408
IGG019CZ	EOB Appendage Chained Sch	208
IGG019EI	XCE append bypass chkpnt F or U	416
IGG019EJ	XCE append bypass chkpnt V	424
IGG019EK-SL		520
IGG019FN-SL	SIO Appendage - Search Direct	304
IGG019FP-SL	CE Appendage - search Direct	440
IGG019HT-SL	Page fix appendage AOS	184
IGG019TC	EOB Routine - User Totaling Tape	472
IGG019TD	EOB Routine - User Totaling DA	632
IGG019TV	EOB Return DA Output PCI - User Total	1000
IGG019TW	EOB Rtn - Tape In/Out PCI User Total	440
IGG019T2	EOB Rtn - TRK OV - User Totaling	1056
IECBBFB1	BUILD buffer pool acquisition	88
	TOTAL BSAM/QSAM common...	
BSAM/QSAM Modules (3505/3525)		
IGG0197L	Open Stage I	1024
IGG0197M	Open Stage I	1024
IGG0197N	Open Stage II	1024
IGG0197P	Open Stage II	1024
IGG0197Q	Open Stage II	1024
IGG0201R	CLOSE	1024
IGG0201P	CLOSE	1024
IGG019FK	EOB - Punch with DPI	350
IGG019FQ	EOB - 3525 Print	900
IGG019FU	EOB - 3525 Interpret	250
IGG019FA	CNTRL - 3525 Printer Control	350
IGG019C6	Appendage-3525 Associated Data Set	186
	TOTAL BSAM/QSAM 3505/3525.....	
BSAM Modules		

IGC0002D	Device Type SVC Routine	424
IGC0002E	SVC 25 Track Balance Rotuine	845
IGC0010E	SVC 105 - Access SYS1.IMAGLIB	1090
IGG019BA-SL	READ/WRITE all Devices	448
IGG019BB-SL	CHECK all devices	528
IGG019BC-SL	NOTE/POINT disk	328
IGG019BD-SL	NOTE/POINT tape	368
IGG019BE-SL	CNTRL tape	512
IGG019BF	READ Paper Translate	576
IGG019BG	CHECK paper Tape	240
IGG019BH	READ/WRITE Update	408
IGG019BI	CHECK Update	112
IGG019BK	NOTE/POINT return DA PCI/T.C./Update	448
IGG019BL	NOTE/POINT return tape PCI	272
IGG019BM	EOE Appendage Update	144
IGG019BR	WRITE Create BDAM/VRE	1960
IGG019BS	CHECK Create BDAM/VRE	360
IGG019BT	CE Appendage Create BDAM	184
IGG019BU	Offset READ	152
IGG019BV	CE Appendage Offset READ	328
IGG019DA	WRITE Create BDAM/Fixed	792
IGG019DB	WRITE Create BDAM/Non-Fixed	864
IGG019DC	CHECK Create BDAM	200
IGG019DD	WRITE Create BDAM/Track Overflow	1288

TOTAL BSAM modules.....

QSAM Modules (Simple Buffering)

IGG019AA-SL	GET Locate Fixed/ Undefined	160
IGG019AB-SL	GET Locate Variable/ D-format	168
IGG019AC-SL	GET Move Fixed/Undefined	384
IGG019AD-SL	GET Move Variable/ D-Format	264
IGG019AE	GET Update/PUTX	528
IGG019AF	Synchronizing RTN Get Update	584
IGG019AG-SL	GET Move Fixed/Undefined with CNTRL	144
IGG019AI-SL	PUT Locate Fixed/ Undefined	128
IGG019AJ-SL	PUT Locate Variable	272
IGG019AK-SL	PUT Move Fixed/Undefined	224
IGG019AL-SL	PUT Move Variable/D- Format	328
IGG019AM-SL	GET Locate Fixed/ Undefined RDBACK	160
IGG019AN-SL	GET Move Fixed/Undefined RDBACK	280
IGG019AQ-SL	Synchronizing RTN GET Input/RDBACK	424
IGG019AR-SL	Synchronizing RTN PUT	264
IGG019AT	GET Paper Tape Character Conversion	752
IGG019AW	EOE Appendage Update	256
IGG019BN	GET Update Locate VAR LEN EXTEN	1952
IGG019BO	GET/Locate Var Length Return extension	608
IGG019BP	PUT/Locate Var Length Return extension	976
IGG019BQ	GET Update Variable Spanned	848
IGG019FB	GET Locate Variable Spanned	232
IGG019FD	GET Move Variable Spanned	448
IGG019FF	GET Data Variable Spanned	464
IGG019FG	PUT Data Variable Spanned	576
IGG019FJ	PUT Locate Variable Spanned	320
IGG019FL	PUT Move Variable Spanned	560
	TOTAL QSAM (simple buffering)...	

QSAM Modules (Exchange Buffering)

IGG019EA	GET Locate Fixed	144
IGG019EB	GET Locate F/V/U Unblocked	104
IGG019EC	GET Substitute Fixed/Undef Unblocked	88
IGG019ED	GET Substitute Fixed Blocked	184
IGG019EE	PUT/PUTX Unblocked	336
IGG019EF	PUT/PUTX Blocked	288
	TOTAL QSAM (exchange buffering)..	

BSAM/QSAM Extended Recovery for 3211

IGG019FR	Appendage	184
IGG019FS	Error Retry	976
IGG019FT		240

TOTAL BSAM/QSAM 3211.....

BSAM 1419/1275 Modules

IGG019C6	Appendages -3525 associated data set	186
IGG019FA	CNTRL - 3525 printer control	350
IGG019FK	EOB punch with DPI	350
IGG019FQ	EOB - 3525 print	900
IGG019FU	EOB - 3525 interpret	250
IGG019V1	READ	176
IGG019V2	EOB	336
IGG019V3	CHECK	416
IGG019V4	CNTRL	440
IGG019V5	Appendages	3864
IGG0197C	OPEN Stage II	1024
IGG0197D	OPEN Stage III	1024
IGG0197L	OPEN stage 1	1024
IGG0197M	OPEN stage 1	1024
IGG0197N	OPEN stage 2	1024
IGG0197P	OPEN stage 2	1024
IGG0197Q	OPEN stage 2	1024
IGG0201D	CLOSE Module	1024
IGG0201P	CLOSE	1024
IGG0201R	CLOSE	1024

TOTAL BISAM 1419/1275....

INDEXED SEQUENTIAL ACCESS METHOD MODULES

BISAM Modules

IGG019G0	Comb, WRITE KN Appendage FS	2392
IGG019G1	Comb, WRITE KN Appendage FSWC	2408
IGG019G2	Comb, WRITE KN Appendage FU	2168
IGG019G3	Comb, WRITE KN Appendage FUWC	2480
IGG019G4	Comb, WRITE KN Appendage BS	2904
IGG019G5	Comb, WRITE KN Appendage BSWC	3000
IGG019G6	Comb, WRITE KN Appendage BU	3344
IGG019G7	Comb, WRITE KN Appendage BUWC	3872
IGG019G8	Comb, READ, WRITE K Appendage (NO WC)	1376
IGG019G9	Comb, READ, WRITE K Appendage (WC)	1552
IGG019GL	WKN, NO, WC	2456
IGG019GM	WKN, WC	2672
IGG019GN	COMB, NO, WC	3752
IGG019GO	COMB, WC	4056
IGG019GV	WRITE KN Asynchronous (WC)	2352
IGG019GW	Combined Asynchronous (WC)	3536
IGG019GX	READ, WRITE K Asynchronous	1144
IGG019GY	WRITE KN Asynchronous	2344

	(NO WC)	
IGG019GZ	Combined Asynchronous (NO WC)	3320
IGG019I9	Function/Operation Routines for BISAM	1572
IGG019H3	Combined PMT (VLR)	2064
IGG019H7	READ, WRITE K PMT (VLR)	1408
IGG019HP	Channel Program WRITE KN (VLR)	1272
IGG019IM	WRITE KN Appendage (VLR)	2264
IGG019IN	WRITE KN Appendage (VLR)	3752
IGG019IO	Comb, WRITE KN Appendage (VLR)	3754
IGG019IX	READ, WRITE K Asynchronous (VLR)	1192
IGG019IY	WRITE KN Asynchronous (VLR)	3480
IGG019IZ	Combined Asynchronous (VLR)	4320
IGG019I9	READ, WRITE K Appendage (VLR)	1576
IGG019J0	Combined PMT NLSD=0	1696
IGG019J3	Combined PMT NLSD≠0	1976
IGG019J6	READ, WRITE K PMT NLSD=0	1248
IGG019J7	READ, WRITE K PMT NLSD≠0	1424
IGG019JC	CHECK	136
IGG019JG	Page Fix Appendage	808
IGG019JH	SIO Appendage for BPS Devices	3568
IGG019JI	Dynamic Buffer	712
IGG019JJ	Channel Program NLSD=2+	192
IGG019JK	Channel Program NLSD=1	88
IGG019JL	Channel Program READ, WRITE K (NO WC)	408
IGG019JM	Channel Program READ, WRITE K (WC)	536
IGG019JN	Channel Program WRITE KN FS	928
IGG019JO	Channel Program WRITE KN BS	856
IGG019JP	Channel Program WRITE KN FSWC	1248
IGG019JQ	Channel Program WRITE KN BSWC	1144
IGG019JR	Channel Program WRITE KN FU	888
IGG019JS	Channel Program WRITE KN BU	904
IGG019JT	Channel Program WRITE KN FUWC	1208
IGG019JU	Channel Program WRITE KN BUWC	1224
IGG019JV	READ, WRITE K NPMT	328
IGG019JW	WRITE KN NPMT	200
IGG019JX	WRITE KN PMT	656
IGG019P7	Page Fix for IEHDASDR	68
	TOTAL BISAM Modules.....	

QISAM Modules (Load Mode)

IGG019GA	PUT (NO WC)	4032
IGG019GB	PUT (WC)	4070
IGG019GC	PUT Appendage (NO WC)	1808
IGG019GD	PUT Appendage (WC)	2144
IGG019GE	Channel Programs (NO WC)	616
IGG019GF	Channel Programs (WC)	760

IGG019GG	SIO Appendage for BPS Devices	1336
IGG019GH	Page Fix Appendage	256
IGG019I1	PUT W/O WRITE Chk-Full Track Index Write	4040
IGG019I2	PUT W/O WRITE Chk-Full Track Index Write	4080
IGG019IA	PUT (NO WC VLR)	4312
IGG019IB	PUT (WC VLR)	4384
IGG019IE	Channel Programs (NO WC VLR)	616
IGG019IF	Channel Programs (WC VLR)	760
	TOTAL QISAM Modules.....	

QISAM Modules (Scan Mode)

IGG019HA	SIO Appendage for BPS Devices	1072
IGG019HB	GET PUTX, RELSE, ESETL, SETL B	3792
IGG019HC	Page Fix Appendage	192
IGG019HD	SETL K, SETL KC	1400
IGG019HF	SETL I	616
IGG019HG	GET Appendage and Asynchronous	832
IGG019HH	PUTX Appendage (NO WC)	344
IGG019HI	PUTX Appendage (WC)	856
IGG019HJ	SETL I Appendage	64
IGG019HK	SETL K, SETL KC APPENDAGE	720
IGG019HL	Channel Programs	632
IGG019HN	GET, PUTX, RELSE, ESETL, SETL B (VLR)	3904
	TOTAL QISAM Modules.....	

TELECOMMUNICATIONS MODULES

BTAM Modules

IGG019LP	Start I/O Page Fix Routine	1032
IGG019M0	IBM 2740 Communication Terminal with checking	268
IGG019M1	IBM 2740 Communication Terminal with station control, checking, and Auto poll	214
IGG019M2	IBM 2740 Communication Terminal with station control and Auto Poll	150
IGG019M3	IBM 2260 Display Unit (attached as a remote terminal with a 2701 Adapter Unit)	292
IGG019M4	IBM 1060 Data Communication System with Auto Poll	200
IGG019M5	IBM BSC Terminal on a nonswitched point-to-point network	282
IGG019MA	Read/Write Channel Program Generator	3354
IGG019MB	Channel End/Abnormal End Appendage	5284
IGG019MC	Program Controlled Interrupt Appendage	1234
IGG019MD	IBM 1050 Data	238

	Communication System nonswitched network	
IGG019ME	IBM 1050 Data Communication System on a nonswitched network with Auto Poll	204
IGG019MF	IBM 1050 Data Communication System on a switched network	312
IGG019MI	IBM 1060 Data Communication System	192
IGG019MJ	IBM 1030 Data Collection System	224
IGG019MK	IBM 1030 Data Collection System with Auto Poll	224
IGG019ML	AT&T 83B3 Selective Calling Stations	146
IGG019MN	Western Union Plan 115A Outstations	138
IGG019MP	AT&T Model 33/35 Teletypewriter Exchange Terminal on a switched network (using eight bit Data Interchange Code)	170
IGG019MR	Online Test Control Module	2882
IGG019MS	Request/Release Buffer Routine	288
IGG019MT	IBM 2740 Communication Terminal	146
IGG019MU	IBM 2740 Communication Terminal on a switched network	172
IGG019MV	IBM 2740 Communication Terminal with transmit control and checking on a switched network	270
IGG019MW	IBM 2740 Communication Terminal with transmit control on a switched network	186
IGG019MX	IBM 2740 Communication Terminal with checking on a switched network	270
IGG019MY	IBM 2740 Communication Terminal with station control and checking	216
IGG019MZ	IBM 2740 Communication Terminal with station control	152
IGG019PA	Channel End/Abnormal End Appendage	455
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Cover, 2	37 and 38
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A change to the text or to an illustration is indicated by a vertical line to the left of the change.

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