V70/620
VORTEX & VORTEX II
INSTALLATION MANUAL

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VORTEX INSTALLATION MANUAL

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TO THE

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RELEASE OF VORTEX/VORTEX II

TABLE OF CONTENTS

SECTION 5 SYSTEM GENERATION

SECTION 6 SGL MAINTENANCE

SECTION 7 TROUBLESHOOTING

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION 1

INTRODUCTION

The purpose of this manual is to provide explicit directions for the software installation of a VORTEX or VORTEX II operating system and the accompanying software. Reference manuals for the software provide adequate technical information to perform these procedures, and this manual supplements that information with step-by-step procedures and special data.

For more efficient use of this manual, the thorough reading and understanding of the reference manuals provides the best background. In fact, the pertinent reference manuals are useful to have available while following the procedures described here.

This manual supplements the following manuals:

VORTEX Reference Manual	98 A 9952 10x
VORTEX II Reference Manual	98 A 9952 24x
VTAM Reference Manual	98 A 9952 22x
HASP/RJE Operator's Manual	98 A 9952 21x

where x represents the current revision of the manual.

Section 1.2 gives the current documentation levels with this revision of the Installation Manual.

This manual offers greater support than the reference manuals to the user for specific systems configuration. In this manual, some of the variations possible with the VORTEX and VORTEX II operating systems are presented for the first time.

This publication is more dynamic and likely to be revised more frequently than the reference manuals. This represents continuing software development and increasing needs in support. These revisions will include replacements and additional pages. This manual corresponds with the release level of software given on the back of the title page.

1.1 REFERENCES IN THIS MANUAL

Here references to other Varian Data Machines software manuals are indicated in parentheses. In the parentheses, the short form of a title of a manual is followed by the section, table or figure number referenced. For example, (VORTEX, 3.4) refers to section 3.4 of the VORTEX Reference Manual, and (VORTEX II, figure 13-2) refers to figure number 13-2 (consult the list of illustrations for the page number on which figures appear). When a reference is the same in both the VORTEX and VORTEX II Reference Manuals, it is given as (VORTEX, VORTEX II, 13.2).

Reference in Text	Manual
VORTEX	V70/620 VORTEX Reference Manual
VORTEX II	V70 VORTEX II Reference Manual
VTAM	V70 VTAM Reference Manual
HASP/RJE	V70 HASP/RJE Operator's Manual
without title	V70/620 VORTEX Installation Manual

Reference	Meaning
Table n-n	Table in manual mentioned
Figure n-n	Figure in manual mentioned
Section n	Entire section is pertinent
n.n or n.n.n	Subsection within manual mentioned

Numbers: A number with a leading zero is octal, one without a leading zero is decimal, and a number in binary is specifically indicated as such.

1.2 SUPPORTING DOCUMENTATION

These manuals and Software Performance Specifications (SPSs) are the ones available at the time of the publication of this manual.

VORTEX:

VORTEX Reference Manual plus Addenda 1 and 2
(98 A 9952 102)

VORTEX External
(89A0203 E)

VORTEX Internals
(89A0231 C, 89A0232 C, 89A0233 D, 89A0304 A)

VORTEX II:

VORTEX II Reference Manual plus Addendum 1
(98 A 9952 241)

VORTEX II External
(89A0273 A)

VORTEX II Internal Supplement
(89A0289 A)

Related Customer Acceptance Test Programs:

VORTEX, 92 (J,G,R,S,U,W)1605-011G

VORTEX II, 92 (J,R,G,S,U,W)1605-010G

SECTION 2

MEMORY CONFIGURATION

This section describes procedures for calculating the central memory requirements for VORTEX and VORTEX II systems. Section 2.1 gives tables and procedures for VORTEX systems. Section 2.2 gives similar tables and procedures for VORTEX II systems. Care should be taken not to confuse the VORTEX and VORTEX II requirements.

The specific memory requirements given here are for a particular release of the VORTEX/VORTEX II system. The numbers are subject to change from release to release. The release level for these numbers is given on the second page.

Before calculating the memory requirements, the user should know the following information:

a. peripherals -- number of each type and their model numbers

b. VTAM and HASP/RJE use for data communications

c. VORTEX foreground and background tasks to be run

d. Sizes of application tasks to run as foreground tasks concurrently

e. Size of the largest background task to run with concurrent foreground tasks determined in the preceding step.

The minimum hardware configuration as well as optional enhancements for VORTEX are defined in the reference manuals (VORTEX, VORTEX II, 1.1). Optional hardware supported by VORTEX and VORTEX II is described in an appendix in the reference manuals (VORTEX, VORTEX II Appendix F).

Memory considerations for the basic system and some options are defined in this manual in sections 2.1 and 2.2. For data pertinent to optional hardware, see section 3.2 of this manual.

2.1 VORTEX MEMORY REQUIREMENTS

This section describes the procedure to determine the central memory requirements for various parts of the VORTEX operating system. By selecting values from these tables in the manner described in this selection, the central memory requirements needed for different configurations and tasks are calculated.

Memory is specified here in words and multiples of words. Following the designation of an amount of memory, K means 1024 words, e.g., 2.5K would be 2560 words and 64K is 65,556 words.

To determine the VORTEX nucleus size, select entries from Tables 2-1 through 2-6 and enter the results into the worksheet (figure 2-1) in the following manner:

a. Select driver and controller table sizes from tables 2-1 through 2-4. Each type of device requires only one driver, even though there may be more than one of the same device in the system. However, for each master device there is one controller. Thus, if a system has two master teletypes, it needs one TTY driver and two controller tables. Slave units do not require a controller, so if a system has one master disc with one slave disc, it needs one appropriate disc driver and a single controller table.

b. Select the executive components size from table 2-6.

c. Select other tables and low memory linkage from table 2-5. A minimum system consists of three devices, one PIM, eight partitions, one empty TIDB, no foreground common and no retry stack.

d. Add the results of steps a, b, and c for the total size of the VORTEX nucleus.

e. For VTAM systems, add the central memory requirements in table 2-7.

f. Add central memory requirements for the various foreground and background tasks from table 2-8. These requirements are necessary only if the requested programs are loaded and active at the same time. Central memory requirements for foreground are cumulative, i.e., if three foreground programs are to be loaded and active, then the central memory required is the sum of the program's individual central memory requirements. The central memory requirements for background are not cumulative, because only one background task can be resident at one time.

Note: JCP must be resident to load any background program and is overlayed during the loading. 2.5K for JCP is the minimum background, if any background is used.

The OPCOM overlay (.5K) will always be resident.

Table	Function	Device	Memory Required: Driver	Memory Required: Controller Table	Driver	Controller	Subtotal	Table Total
2-1	Keyboard Devices (one or more needed)	TTY (70-6104) or CRT (E2250)	901	21				
2-2	RMDs (one or more needed)	DOA (70-770x) DOB (70-7600, -7610) DOC (70-7500) DOD (70-7510)	868 974 1234 1130	160 162 170 167				
2-3	High-Speed Input Devices (one or more, or 2 RMDs)	MT (70-7100, -7102, -7103) CR (70-6200) PT (70-6320)	531 408 483	18 98 20				
2-4	Optional Devices	LPOA (70-6701) CP (70-7601) LPOD (70-6602, -6608) LPOE (70-6602/ -6608 with 31-152) LPOG (70-6602/ -6608 with 31-142 & 152 LPOH (70-6641/ -6642 with 31-152 LPOJ (70-6611, -6613, -6615 -6617, -6621 -6623, -6625 -6627)	328 491 1424 879 879 879 879	44 101 136 136 136 136 177				
2-5	VORTEX Tables and Low Memory Area Additional Devices (in addition to minimum system)	Minimum System I/O Tables TIDBs (empty) PIM PST Foreground Common Retry Stack	1038 12/extra device 25/TIDB 40/extra PIM 3/extra partition Varies Varies					
2-6	Executive Components	System Tasks (I/O Control, RTE) SPOOL subsystem WCS Process Input Process Output Reentrant FORTRAN	3758 1333 + 349/stream 71 283 + 16/controller 146 + 25/controller 3266					
2-7	VORTEX/VTAM System (Only VTAM systems need this memory)	CCM Components Line Tables DCM Multiplexor TCM Components Terminal Tables	3275 17/line 512 2600 17/terminal					
							Nucleus Total	

Figure 2-1. Worksheet for Calculating Nucleus Memory Requirements

Table 2-8. VORTEX Memory Requirements for Library Routines

Table 2-8. VORTEX Memory Requirements for Library Routines

Function	Program	Memory Required	Calculation
Foreground Tasks Memory required is the sum of all FL tasks resident at one time.	JPDUMP RAZI OPCOM MIUTIL VTAM overlays WCSRLD HASP/RJE	.5K 6.5K .5K 3.0K 1.5K .5K 8.0K	Total Foreground
Background Tasks Only one BL task may be resident at one time.	JCP DASMR FORTRAN RPGC RPGRT LMGEN FMAIN SMAIN CONC IOUTIL SEDIT MICSIM MIDAS NDM (VTAM) VSORT	2.5K 8.5K+symbol table 10.0K+symbol table 6.5K+symbol table 6.5K+symbol table 7.5K 8K 7.5K 7.5K 4K 8.5K 9K - 15K 8.0K 8.5K 4.0K	+ Required Background
		+ Nucleus	
		Total Memory Required	

VTI1-2154

To calculate the total memory required, the following procedure is used:

a. Calculate the size of the nucleus which is always resident.

b. Calculate the largest total required foreground central memory for the foreground programs which must be resident at a given time. Table 2-8 gives memory sizes for library routines.

c. Calculate the total required background memory, central memory for the largest background program which must be or is desired to be resident while the foreground programs from step b are resident.

d. Add the results from steps a, b, and c for the minimum memory required.

Note: With this limit from step d, larger programs can be loaded and executed if some of the foreground programs from step b are not loaded and active.

VORTEX Configuration Examples: Calculate the memory required for the nucleus of a minimum VORTEX system. A minimum system must consist of a console device, an RMD, and a high-speed input device. Also, it must use memory equal to the minimum values from tables 2-5 and 2-6. For this example, let the system consist of the following:

a. TTY

b. RMD model number 70-770x

c. Card Reader

d. PIM

The actual calculation is as follows:

a. From table 2-1, one TTY driver and one controller table.

b. From table 2-2, one RMD driver (70-770x) and one controller table.

c. From table 2-3, one card reader driver and one controller table.

d. From table 2-4, no optional devices

e. From table 2-5, no additional devices, and use minimum

f. From table 2-6, use precalculated total, for system tasks, without process I/O, reentrant FORTRAN, WCS or SPOOL.

Figure 2-2 shows the calculation.

The nucleus size is 7152 words, the total from the above. Dividing the total by 1024 gives the memory requirement in units of K words. Table 2-8 may be used to determine if sufficient memory remains for various library tasks.

For this system with 7.0K nucleus with the required foreground consisting of OPCOM (.5K), an application program (1.0K), and running the FORTRAN compiler with a minimum symbol table (10.0K), the required memory would be 18.5K if the compiler is to be run while the application program is running, or 17.5K if the compiler is to be run only when the application program is not running.

Figure 2-3 shows memory calculation for running the application program and the FORTRAN compiler at different times.

Figure 2-2. Worksheet for Calculating Nucleus Memory Requirements

Table	Function	Device	Memory Required		Driver	Controller	Subtotal	Table Total
			Driver	Controller Table				
2-1	Keyboard Devices (one or more needed)	TTY (70-6104) or CRT (E2250)	901	21	901	21	922	922
2-2	RMDs (one or more needed)	DOA (70-770x) DOB (70-7600, -7610) DOC (70-7500) DOD (70-7510)	868 974 1234 1130	160 162 170 167	868	160	1028	1028
2-3	High-Speed Input Devices (one or more, or 2 RMDs)	MT (70-7100, -7102, -7103) CR (70-6200) PT (70-6320)	531 408 483	18 98 20	408	98	506	506
2-4	Optional Devices	LPOA (70-6701) CP (70-7601) LPOD (70-6602, -6608) LPOE (70-6602/ -6608 with 31-152) LPOG (70-6602/ -6608 with 31-142 & 152 LPOH (70-6641/ -6642 with 31-152 LPOJ (70-6611, -6613, -6615 -6617, -6621 -6623, -6625 -6627)	328 491 1424 879 879 879 879	44 101 136 136 136 136 177	0	0	0	0
2-5	VORTEX Tables and Low Memory Area Additional Devices (in addition to minimum system)	Minimum System I/O Tables TIDBs (empty) PIM PST Foreground Common Retry Stack	1038 12/extra device 25/TIDB 40/extra PIM 3/extra partition Varies Varies				1038	1038
2-6	Executive Components	System Tasks (I/O Control, RTE) SPOOL subsystem WCS Process Input Process Output Reentrant FORTRAN	3758 1333 + 349/stream 71 283 + 16/controller 146 + 25/controller 3266				3758	3758
2-7	VORTEX/VTAM System (Only VTAM systems need this memory)	CCM Components Line Tables DCM Multiplexor TCM Components Terminal Tables	3275 17/line 512 2600 17/terminal				0	0
							Nucleus Total	7252

Function	Program	Memory Required	Calculation
Foreground Tasks Memory required is the sum of all FL tasks resident at one time.	JPDUMP RAZI OPCOM MIUTIL VTAM overlays WCSRLD HASP/RJE	.5K 6.5K .5K 3.0K 1.5K .5K 8.0K	Total Foreground .5
Background Tasks Only one BL task may be resident at one time.	JCP DASMR FORTRAN RPGC RPGRT LMGEN FMAIN SMAIN CONC IOUTIL SEDIT MICSIM MIDAS NDM (VTAM) VSORT	2.5K 8.5K+symbol table 10.0K+symbol table 6.5K+symbol table 6.5K+symbol table 7.5K 8K 7.5K 7.5K 4.0K 8.5K 9K - 15K 8.0K 8.5K 4.0K	+ Required Background 10.0
		+ Nucleus	7.0
		Total Memory Required	17.5K

VTI1-3008

Figure 2-3. Sample VORTEX Memory Requirements for Library Routines

The total nucleus size determined from the steps above is added to the library requirements to determine the total memory requirements.

VORTEX EXAMPLE 2

Calculate the central memory required for the nucleus of a VORTEX system containing the following:

(one each unless specified otherwise)

a. TTY
b. CRT
c. RMD model number (70-7500) with ten partitions
d. RMD (70-7610) with ten partitions
e. Two magnetic tape devices (both master units)
f. Card reader
g. Paper-tape unit
h. Card punch
i. Line printer (70-6701)
j. Two PIMs
k. Process I/O
l. Reentrant FORTRAN
m. Six empty TIDBs
n. 0200-word common area
o. 100-word retry stack

The calculation, shown in figure 2-3, for this sample system is as follows:

a. From table 2-1, one TTY/CRT driver, one controller table for TTY and one for CRT

b. From table 2-2, one 70-7500 driver and its controller table, and one 70-7610 driver and its controller table

c. From table 2-3, one magnetic-tape driver and two controller tables, one card reader driver and its controller table, and one paper-tape driver and its controller table.

d. From table 2-4, one line printer driver and its controller table and one card punch and its controller table

e. From table 2-5, add
   7 additional I/O tables
   13 additional empty TIDBs (6 empty and 7 for devices)
   1 additional PIM
   12 additional PSTs
   Foreground common
   Retry stack

f. From table 2-6, use the total for system tasks plus the values for process I/O and reentrant FORTRAN.

Figure 2-4. Worksheet for Calculating Nucleus Memory Requirements

Table	Function	Device	Memory Required: Driver	Memory Required: Controller Table	Driver	Controller	Subtotal	Table Total
2-1	Keyboard Devices (one or more needed)	TTY (70-6104) or CRT (E2250)	901	21	901	42	943	943
2-2	RMDs (one or more needed)	DOA (70-770x)	868	160				
		DOB (70-7600, -7610)	974	162	974	162	1136	
		DOC (70-7500)	1234	170	1234	170	1404	2540
		DOD (70-7510)	1130	167				
2-3	High-Speed Input Devices (one or more, or 2 RMDs)	MT (70-7100, -7102, -7103)	531	18	531	36	567	
		CR (70-6200)	408	98	408	98	506	1576
		PT (70-6320)	483	20	483	20	503	
2-4	Optional Devices	LPOA (70-6701)	328	44	328	44	372	
		CP (70-7601)	491	101	491	101	592	964
		LPOD (70-6602, -6608)	1424	136				
		LPOE (70-6602/ -6608 with 31-152)	879	136				
		LPOG (70-6602/ -6608 with 31-142 & 152	879	136				
		LPOH (70-6641/ -6642 with 31-152	879	136				
		LPOJ (70-6611, -6613, -6615 -6617, -6621 -6623, -6625 -6627)	879	177				
2-5	VORTEX Tables and Low Memory Area	Minimum System	1038				1038	
	Additional Devices (in addition to minimum system)	I/O Tables	12/extra device				84	
		TIDBs (empty)	25/TIDB				325	
		PIM	40/extra PIM				40	
		PST	3/extra partition				36	
		Foreground Common	Varies				128	
		Retry Stack	Varies				100	1751
2-6	Executive Components	System Tasks (I/O Control, RTE)	3758				3758	
		SPOOL subsystem	1333 + 349/stream					
		WCS	71					
		Process Input	283 + 16/controller				340	
		Process Output	146 + 25/controller					
		Reentrant FORTRAN	3266				3266	7364
2-7	VORTEX/VTAM System (Only VTAM systems need this memory)	CCM Components	3275					
		Line Tables	17/line					
		DCM Multiplexor	512					
		TCM Components	2600					
		Terminal Tables	17/terminal				0	0
							Nucleus Total	15138

2.2 VORTEX II MEMORY REQUIREMENTS

This section describes the procedures to determine the central memory requirements for various parts of the VORTEX II operating system. By selecting values from the following tables in the manner described in this section, the central memory requirements needed for different configurations and tasks are calculated.

To determine the VORTEX II nucleus size, select entries from tables 2-9 through 2-15 and enter the results into the worksheet (figure 2-5) in the following manner:

a. Select driver and controller table sizes from tables 2-9 through 2-12. Each type of device requires only one driver, even though there may be more than one of the same device in the system. However, for each master device there is one controller. Thus, if a system has two master teletypes, it needs one TTY driver and two controller tables. Slave units do not require a controller, so if a system has one master disc with one slave disc, it needs one appropriate disc driver and a single controller table.

b. Select the executive components size from table 2-14.

c. Select other tables and low memory linkage from table 2-13. A minimum system consists of three devices, one PIM, eight partitions, no foreground common and no retry stack.

d. Add the results of steps a, b, and c for the total size or the VORTEX nucleus.

e. For VTAM systems, add the central memory requirements in table 2-15.

f. Add central memory requirements for the various foreground and background tasks from table 2-16. These requirements are necessary only if the requested programs are loaded and active at the same time. Central memory requirements for foreground are cumulative, i.e., if three foreground programs are to be loaded and active, then the central memory required is the sum of the program's individual central memory requirements. The central memory requirements for background are not cumulative, because only one background can be resident at one time.

NOTE: JCP must be resident to load any background program and is overlayed during the loading. 2.5K for JCP is the minimum background, if any background is used.

OPCOM must be resident in order to schedule any foreground or background task.

Table	Function	Device	Memory Required: Driver	Memory Required: Controller Table	Driver	Controller	Subtotal	Table Total
2-9	Keyboard Devices (one or more needed)	TTY (70-6100, -6102, -6104) or CRT (E2250)	1049	22				
2-10	RMDs (one or more needed)	DOA (70-770x) DOB (70-7600, -7610) DOC (70-7500) DOD (70-7510)	1026 1142 1390 1282	170 172 180 177				
2-11	High-Speed Input Devices (one or more, or 2 RMDs)	MT (70-7100, -7102, -7103 CR (70-6200) PT (70-6320)	573 448 535	18 98 20				
2-12	Optional Devices	LPOA (70-6701) CP (70-6201) LPOD (70-6602, -6608) LPOE (70-6602/ -6608 with 31-152 LPOG (70-6602/ -6608 with 31-142 & 152 LPOH (70-6641/ -6642 with 31-152) LPOJ (70-6611, -6613, -6615 -6617, -6621 -6623, -6625 -6627)	357 452 1557 930 930 930	44 101 136 136 146 177				
2-13	VORTEX II Tables and Low Memory Area Additional Devices (in addition to minimum system)	Minimum System I/O Tables PIM PST Foreground Common Retry Stack	1038 12/extra device 40/extra PIM 3/extra partition Varies Varies					
2-14	Executive Components	System Tasks (I/O Control, RTE) SPOOL subsystem WCS Process Input Process Output Reentrant FORTRAN	6043 1349 + 349/stream 75 331 + 16/controller 198 + 25/controller 3126					
2-15	VORTEX II/VTAM System (only VTAM systems need this memory)	CCM Components Line Tables DCM Multiplexor TCM Components Terminal Tables	3225 17/line 512 2775 17/terminal					
							Nucleus Total	

Figure 2-5. Worksheet for Calculating Nucleus Memory Requirements for VORTEX II

Table 2-16. VORTEX II Memory Requirements for Library Routines

Function	Program	Memory Required	Calculation
Foreground Tasks Memory required is the sum of all FL tasks resident at one time.	JPDUMP RAZI OPCOM MIUTIL VTAM overlays WCSRLD HASP/RJE	.5K 6.5K .5K 3.0K 1.5K .5K 8.0K	Total Foreground
Background Tasks Only one BL task may be resident at one time.	JCP DASMR FORTRAN RPGC RPGRT LMGEN FMAIN SMAIN CONC IOUTIL SEDIT MICSIM MIDAS NDM (VTAM)	2.5K 8.5K+symbol table 10.0K+symbol table 6.5K+symbol table 6.5K+symbol table 7.5K 8K 7.5K 7.5K 4K 8.5K 9K - 15K 8K 8.5K	+ Required Background
		+ Nucleus	
		Total Memory Required	

VTI1-3093

VORTEX II Configuration Examples: Calculate the memory required for the nucleus of a minimum VORTEX II system. A minimum system must consist of a console device, an RMD, and a high-speed input device. Also, it must use memory equal to the minimum values from table 2-13 and 2-14. For this example, let the system consist of the following:

a. TTY
b. RMD model number 70-770x
c. Card reader
d. PIM

The actual calculations are as follows:

a. From table 2-9, one TTY driver and one controller table

b. From table 2-10, one RMD driver (70-770x) and one controller table

c. From table 2-11, one card reader driver and one controller table

d. From table 2-12, no optional devices

e. From table 2-13, no additional devices, use minimum

f. From table 2-14, use precalculated total for systems tasks, without process I/O or reentrant FORTRAN.

Figure 2-6 shows the calculation. Dividing the total by 1024 gives the memory requirement in units of K words.

Table	Function	Device	Memory Required: Driver	Memory Required: Controller Table	Driver	Controller	Subtotal	Table Total
2-9	Keyboard Devices (one or more needed)	TTY (70-6100, -6102, -6104) or CRT (E2250)	1049	22	1049	22	1071	1071
2-10	RMDs (one or more needed)	DOA (70-770x) DOB (70-7600, -7610) DOC (70-7500) DOD (70-7510)	1026 1142 1390 1282	170 172 180 177	1026	170	1196	1196
2-11	High-Speed Input Devices (one or more, or 2 RMDs)	MT (70-7100, -7102, -7103 CR (70-6200) PT (70-6320)	573 448 535	18 98 20	448	98	546	546
2-12	Optional Devices	LPOA (70-6701) CP (70-6201) LPOD (70-6602, -6608) LPOE (70-6602/ -6608 with 31-152 LPOG (70-6602/ -6608 with 31-142 & 152 LPOH (70-6641/ -6642 with 31-152) LPOJ (70-6611, -6613, -6615 -6617, -6621 -6623, -6625 -6627)	357 452 1557 930 930 930	44 101 136 136 146 177				0
2-13	VORTEX II Tables and Low Memory Area Additional Devices (in addition to minimum system)	Minimum System I/O Tables PIM PST Foreground Common Retry Stack	1038 12/extra device 40/extra PIM 3/extra partition Varies Varies					1038
2-14	Executive Components	System Tasks (I/O Control, RTE) SPOOL subsystem WCS Process Input Process Output Reentrant FORTRAN	6043 1349 + 349/stream 75 331 + 16/controller 198 + 25/controller 3126					6043
2-15	VORTEX II/VTAM System (only VTAM systems need this memory)	CCM Components Line Tables DCM Multiplexor TCM Components Terminal Tables	3225 17/line 512 2775 17/terminal					0
							Nucleus Total	9894

Figure 2-6. Worksheet for Calculating Nucleus Memory Requirements for VORTEX II

VORTEX II EXAMPLE 2

Calculate the central memory required for the nucleus of a VORTEX II system containing the following:

(one each unless specified otherwise)

a. TTY
b. CRT
c. RMD model number (70-7500) with ten partitions
d. RMD (70-7610) with ten partitions
e. Two magnetic tape devices (both master units)
f. Card reader
g. Paper-tape unit
h. Card punch
i. Line printer (70-6701)
j. Two PIMs
k. Process I/O
l. Reentrant FORTRAN
m. Six empty TIDBs
n. 0200-word common area
o. 100-word retry stack
p. Writable control store

The calculation, shown in Figure 2-7, for this sample system is as follows:

a. From table 2-9, one TTY/CRT driver, one controller table for TTY and one for CRT

b. From Table 2-10, one 70-7500 driver and its controller table, and one 70-7610 driver and its controller table

c. From Table 2-11, one magnetic-tape driver and two controller tables, one card reader driver and its controller table, and one paper-tape driver and its controller table.

d. From Table 2-12, one line printer driver and its controller table and one card punch and its controller table

e. From table 2-13, add
   7 additional I/O tables
   1 additional PIM
   12 additional PSTs
   Foreground common
   Retry stack

The number of TIDBs is not necessary for VORTEX II memory determination.

f. From table 2-14, use the total for system tasks plus the values for writable control store, process input with 2 controllers, process output with 2 controllers and reentrant FORTRAN.

The total nucleus size determined from the steps above is added to the library requirements (see figure 2-8) to determine the total memory requirements.

Table	Function	Device	Memory Required: Driver	Memory Required: Controller Table	Driver	Controller	Subtotal	Table Total
2-9	Keyboard Devices (one or more needed)	TTY (70-6100, -6102, -6104) or CRT (E2250)	1049	22	1049	44	1093	1093
2-10	RMDs (one or more needed)	DOA (70-770x) DOB (70-7600, -7610) DOC (70-7500) DOD (70-7510)	1026 1142 1390 1282	170 172 180 177	1142 1390	172 180	1314 1570	2884
2-11	High-Speed Input Devices (one or more, or 2 RMDs)	MT (70-7100, -7102, -7103 CR (70-6200) PT (70-6320)	573 448 535	18 98 20	573 448 535	36 98 20	609 546 555	1710
2-12	Optional Devices	LPOA (70-6701) CP (70-6201) LPOD (70-6602, -6608) LPOE (70-6602/ -6608 with 31-152 LPOG (70-6602/ -6608 with 31-142 & 152 LPOH (70-6641/ -6642 with 31-152) LPOJ (70-6611, -6613, -6615 -6617, -6621 -6623, -6625 -6627)	357 452 1557 930 930 930	44 101 136 136 146 177	357 452	44 101	401 553	954
2-13	VORTEX II Tables and Low Memory Area Additional Devices (in addition to minimum system)	Minimum System I/O Tables PIM PST Foreground Common Retry Stack	1038 12/extra device 40/extra PIM 3/extra partition Varies Varies				1038 74 40 36 128 100	1416
2-14	Executive Components	System Tasks (I/O Control, RTE) SPOOL subsystem WCS Process Input Process Output Reentrant FORTRAN	6043 1349 + 349/stream 75 331 + 16/controller 198 + 25/controller 3126				6043 75 611 3216	9945
2-15	VORTEX II/VTAM System (only VTAM systems need this memory)	CCM Components Line Tables DCM Multiplexor TCM Components Terminal Tables	3225 17/line 512 2775 17/terminal				0	0
							Nucleus Total	18002

Figure 2-7. Worksheet for Calculating Nucleus Memory Requirements for VORTEX II

Function	Program	Memory Required	Calculation
Foreground Tasks Memory required is the sum of all FL tasks resident at one time.	JPDUMP RAZI OPCOM MIUTIL VTAM overlays WCSRLD HASP/RJE	.5K 6.5K .5K 3.0K 1.5K .5K 8.0K	Total Foreground
			9.5
Background Tasks Only one BL task may be resident at one time.	JCP DASMR FORTRAN RPGC RPGRT LMGEN FMAIN SMAIN CONC IOUTIL SEDIT MICSIM MIDAS NDM (VTAM) VSORT	2.5K 8.5K+symbol table 10.0K+symbol table 6.5K+symbol table 6.5K+symbol table 7.5K 8K 7.5K 7.5K 4K 8.5K 9K - 15K 8.0K 8.5K 4.0K	+ Required Background
			15
		+ Nucleus	17.8
		Total Memory Required	42.3

VTI1-3012

Figure 2-8. VORTEX II Memory Requirements for Library Routines

SECTION 3

HARDWARE CONFIGURATION CONSIDERATIONS

3.1 MINIMUM HARDWARE CONFIGURATIONS

Figure 3-1 shows the minimum VORTEX system configuration. Figure 3-2 shows the minimum VORTEX II system configuration. Figure 3-3 shows the minimum requirements for system running particular applications such as VTAM.

3.2 FEATURES OF PERIPHERAL DEVICES

Table 3-1 gives the operating and transfer speed, and storage capacities, where applicable, of peripheral devices.

Table 3-1. Features of Peripheral Devices

Model Number	Device Name	Operating Speed	Transfer Speed	Storage Capacity
70-6310	Paper Tape Punch	60/120 CPS		---
70-6300	Reader	300 CPS		
70-6201	Card Punch	35 CPM	1 Character = 21 ms 57.2 CPS	---
70-6200	Card Reader	300 CPM		---
70-7500	Disc Memory	12.5 ms Track Access (average)	156K words per second	14.6M
70-7510	Disc Memory	12.5 ms Track Access (max.)	156K words per second	46.7M
70-7600	Disc Memory	60 ms Track Access	92K words per second	2,338K
70-7611	Disc Memory	60 ms Track Access	92K words per second	1,170K

CPS = Characters per second
CPM = Cards per minute

3.3 INTERRUPTS FROM PERIPHERAL DEVICES AND PIMS

Table 3-2 shows the relations between interrupts and peripheral devices or PIMs (VORTEX, VORTEX II, Appendix F, for complete hardware configuration information).

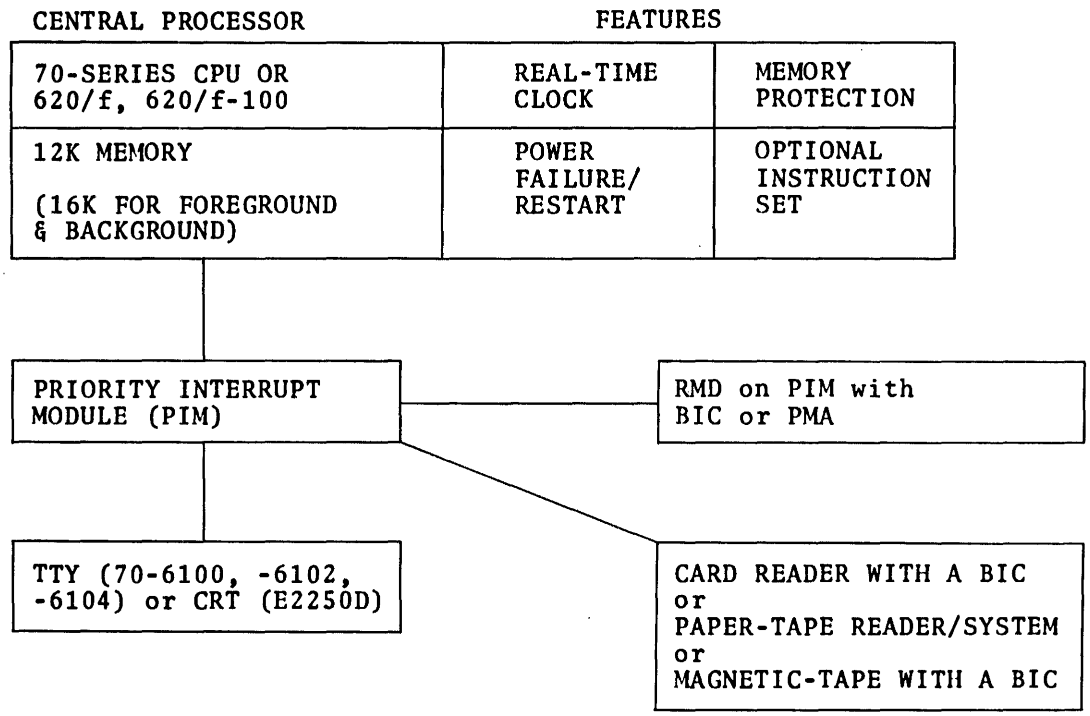
INTERRUPT

Device	BIC COMPLETE	SEEK COMPLETE	CHARACTER READY	MOTION COMPLETE	STATOS NOT BUSY	PAPER CONTROLLER NOT BUSY	READ	WRITE
Disc-Except 70-7610	X	X						
Disc 70-7610	X	1 Per Platter						
PT	No		X					
MT	Never			X				
CR	X							
LP 70-6701	X							
70-6603 STATOS	X				X	X		
70-6602 STATOS	X					X		
TTY							X	X

DIRECTLY CONNECTED INTERRUPTS

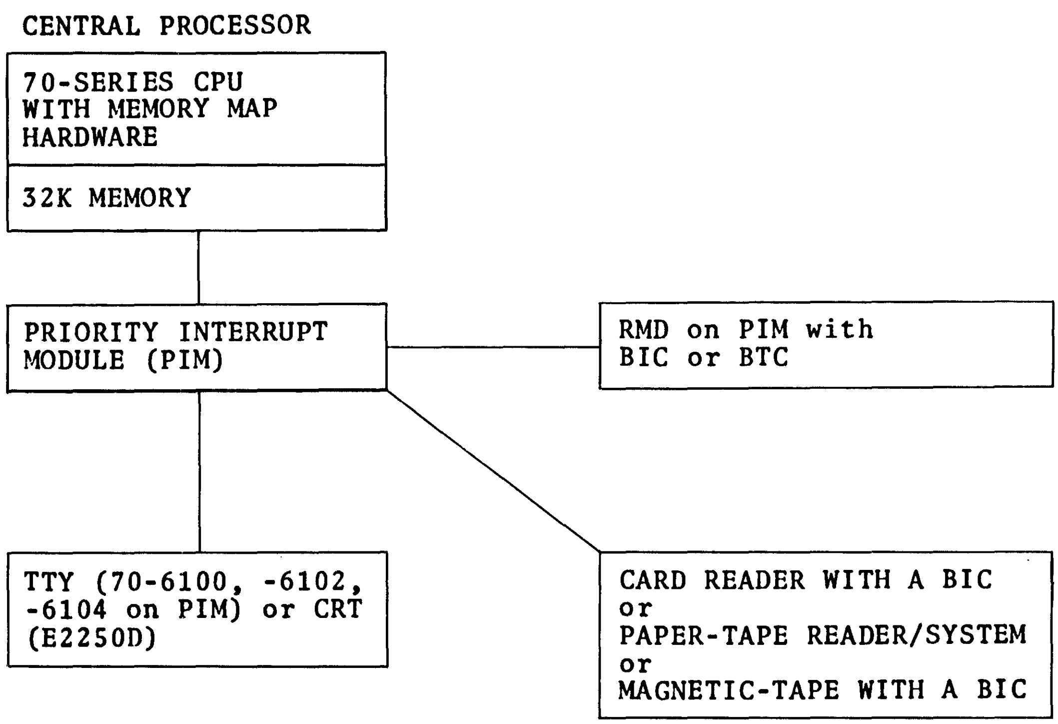
Device	Input Byte Count=0	Output Byte Count=0	Line Error	Status Change	Control Character Detected	Control		
DCM	X	X	X	X	X	X		

Table 3-2. Relationships of Interrupts and Peripheral Devices or PIMs



VTI1-2147

Figure 3-1. Minimum VORTEX System



VTI1-2148

Figure 3-2. Minimum VORTEX II System

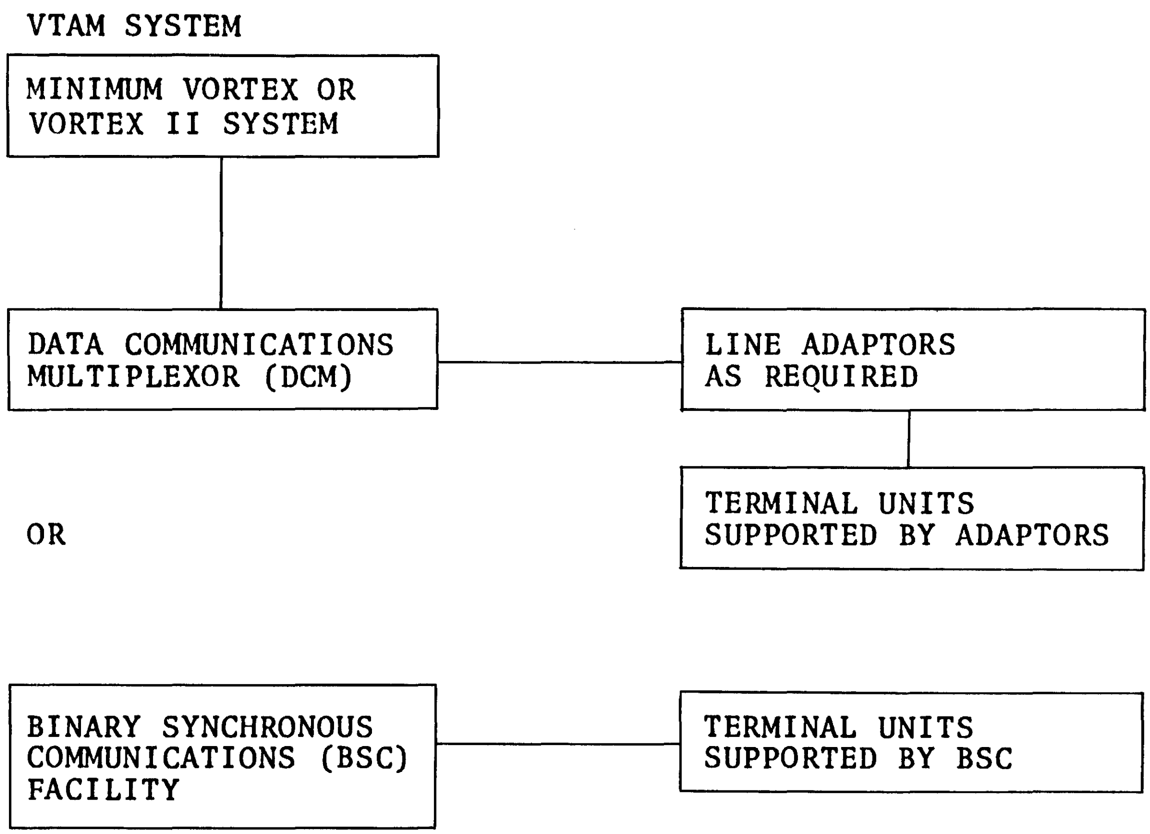


Figure 3-3. Other Minimum Requirements

3.4 SHARING MEMORY UNDER VORTEX AND VORTEX II

Sharing memory between multiple processors may be accomplished in two ways. One of these, sharing foreground common, is available under both VORTEX and VORTEX II. The other method is available only under VORTEX II.

Sharing Foreground Blank Common: The shared memory is a part of the area which is the foreground blank common. VORTEX allocates foreground blank common at the top of its available memory as specified by the memory parameter of the MRY directive during system generation. VORTEX II allocates foreground common at the top of its available memory in the first (lowest address) physical 32K, also as specified in the MRY directive at system generation. In either VORTEX or VORTEX II, the "common" parameter of the MRY directive must include all the shared memory.

For example, in the VORTEX configuration shown in figure 3-4 the 24K memory module on CPU 1 has physical addresses 0 through 057777 and the shared 8K module has physical addresses 060000 through 077777. On CPU 2, the 16K module has physical addresses 0 through 037777 and the shared 8K module has physical addresses 040000 through 057777. The system generation MRY directive for CPU 1 is

```
MRY,077777,020000
```

The MRY directive for CPU 2 is input as follows:

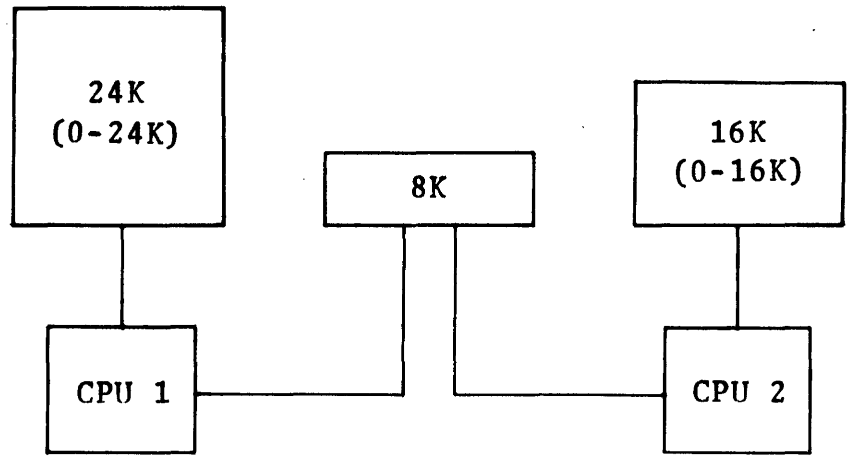
```
MRY,057777,020000
```

A similar example for VORTEX II would be the configuration shown in figure 3-5. The first 32K addressing would be the same as the preceding example. The added 16K module on CPU 1 would have physical addresses 0100000 through 0137777 and the additional 32K module on CPU 2 would have physical addresses 0100000 through 0177777. The system generation MRY directive for CPU 1 would be

```
MRY,077777,020000,48
```

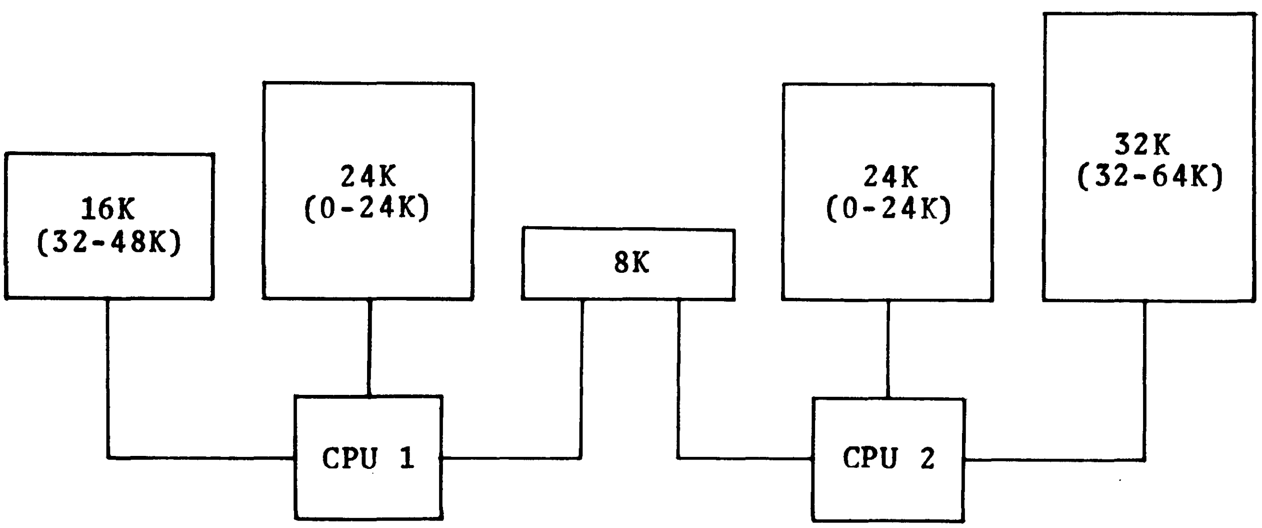
The MRY directive for CPU 2 would be

```
MRY,077777,020000,64
```



VTI1-2150

Figure 3-4. Shared Memory Configuration under VORTEX



VTI1-2151

Figure 3-5. Shared Memory Configuration under VORTEX II

In either of the examples, the memory could have been reserved for AID, BLD or DCM requirements by modifying the "memory" and "common" parameter values on the MRY directives. For example, if 512 words were to be reserved for DCM use in the VORTEX configuration the MRY directive for CPU 1 would be

```
MRY,076777,017000
```

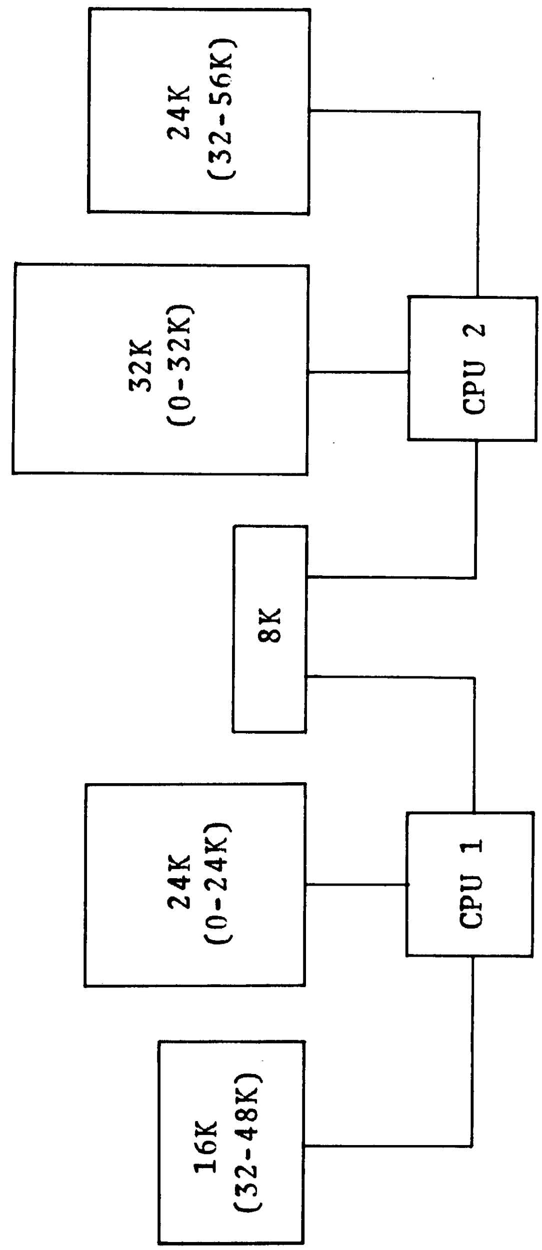
The MRY directive for CPU 2 would be

```
MRY,056777,017000
```

Sharing Memory by Tasks (VORTEX II only): The second method available only under VORTEX II provides memory sharing by withholding memory from system use and providing the RTE request, MAPIN, which allows the user to assign the withheld memory dynamically to the executing tasks. Management of the shared memory is entirely under the control of, and the responsibility of the tasks. The shared memory must have physical address at the top of the first 32K or at the top of available memory.

For example, in the VORTEX II configuration shown in figure 3-6, the 24K module on CPU 1 would have physical address 0 through 057777 and the shared 8K module would have physical addresses 060000 through 077777. The 16K module would have physical addresses 0100000 through 0137777.

On CPU 2, the first 32K would have physical addresses 0 through 077777, the 24K module would have physical addresses 0100000 through 157777 and the shared 8K module would have physical addresses 0160000 through 177777.



VTI1-2152

Figure 3-6. Shared Memory Configuration under VORTEX II (Sharing by Tasks)

In the system generation with no foreground common allocated in CPU 1 and 128 words of foreground common allocated in CPU 2, the MRY directive for CPU 1 would be

```
MRY,057777,0,48
```

In the same situation for CPU 2 the memory directive would be

```
MRY,077777,0200,64
```

If CPU 2 required 512 words to be reserved for a DCM, its MRY directive would be

```
MRY,076777,0200,64
```

Memory withheld by this method is never assigned or otherwise modified by VORTEX II. An executing task accesses the shared areas by use of the VORTEX II RTE request, MAPIN. The MAPIN request allows a task to assign physical memory pages to a task's logical memory. For example, a task executing in CPU 1 in this example, requesting access to the first three pages of shared memory, makes the following request:

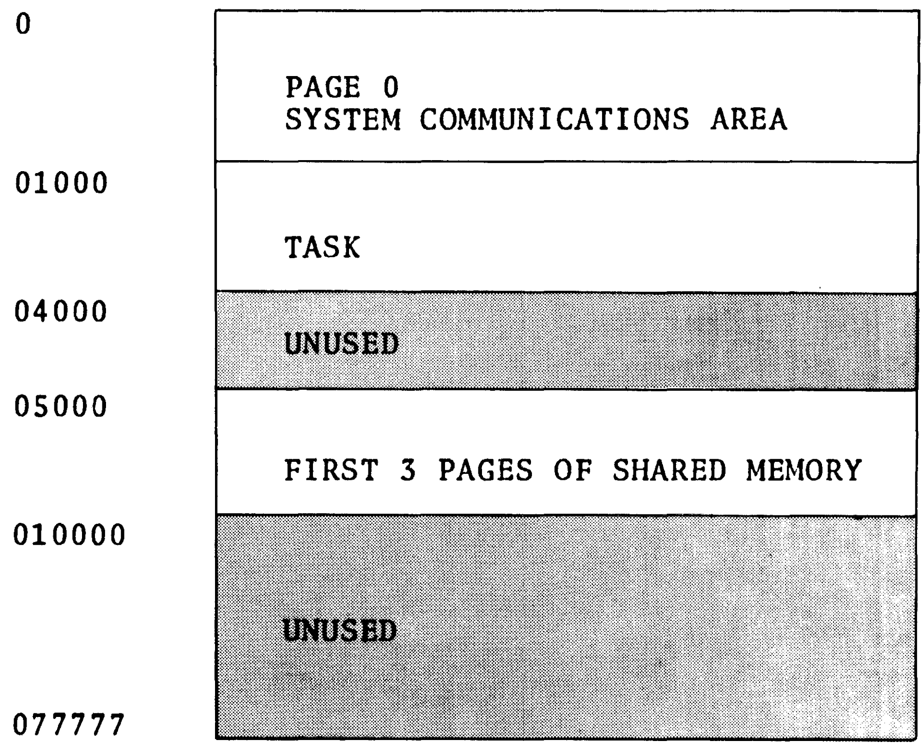
```
MAPIN     3,05000,48,ERR
```

Execution of this request causes the VORTEX II Executive to assign physical pages 48, 49, and 50 to the task's logical addresses 05000 through 07777. In this configuration CPU 1's reserved memory is physical pages 0 - 47 and 64 - 95; its shared memory is physical pages 48 - 63. CPU 2 has reserved memory from physical page 0 to 111 and shared memory from physical pages 112 through 127.

The same task as above executing in CPU 2 would make the following request:

```
MAPIN     3,05000,112,ERR
```

If the load module of the above task required three pages of memory, the task's logical memory after execution of the MAPIN request would be as in figure 3-7. The entire 8K of shared memory could have been mapped in if 16 pages were requested instead of 3.



VTI1-2153

Figure 3-7. Example Task's Logical Memory After MAPIN Request

3.5 REQUIRED HARDWARE REVISION LEVELS

For 620/f and 620/f-100 systems, the following revision levels are suggested for a highly reliable system:

Module	Part Number	Revision
Power Failure/Real-Time Clock	44P0483	P
Memory Protection	44P0480	L
Optional Instructions	44P0444	H
CPU Connector Board (620/f)	44P0452	AR
CPU Connector Board (620/f-100)	44P0581	P
I/O Control	44P0442	V
I/O Data	44P0443	G
DL 12-15	44P0448	K
DL 8-11	44P0447	P
DL 4-7	44P0446	L
DL 0-3	44P0445	L
Control 1	44P0449	M
Control 2	44P0450	P
Clock Board	44P0440	J
TTY/ABL	44P0451	J
BIC	44P0026 or 44P0689	S A
7-track Magnetic Tape	44P0243	J
	44P0245	D
9-track Magnetic Tape	44P0232	P
	44P0233	E
VRC Drum (620-47,-48 and -49)	44P0294	C*
PIM	44P0172 or 44P0683	S A

*with modification for CPU power off

SECTION 4

SYSTEM GENERATION LIBRARY (SGL)

The system generation library (SGL) is a collection of programs on magnetic tape, punched cards, or disc pack. It includes all the programs, except the key-in loader (VORTEX, VORTEX II, 13.3), and 70-7500/7510 RMD formatter, for generating a VORTEX or VORTEX II system on an RMD.

4.1 CONTENTS OF SYSTEM GENERATION LIBRARIES

With the release of revision D of the VORTEX/VORTEX II SGLs, the contents of the various files are described in tables 4-1 and 4-2.

Table 4-1. Contents of Magnetic-Tape and Card SGLs

File number	Contents
1	SGL
2 and 3	Basic OM library job stream (without WCS)
4 and 5	Software OM library job stream
6 and 7	Accelerator OM library job stream
8 and 9	Floating-Point Processor (FPP) OM library job stream
10 and 11	FPP with accelerator OM library job stream
12 and 13	Floating-Point firmware supplement to software OM
14 through 28	VTAM job streams
29 and 30	Basic Dataplot II OM job stream
31 and 32	VORTEX compatible Dataplot II OM job stream
33 and 34	MOS compatible Dataplot II OM job stream

All job streams terminate immediately before their last file mark, i.e. the basic OM stops before file mark 3.

The driver for the card reader has been modified to handle skip file and skip record requests.

The SGL and OM libraries on a disc pack occupy two partitions of 100 tracks each. SGL uses partition A and the OM libraries use partition B. The OM libraries do not have job streams (object only).

Table 4-2. Contents of Disc-pack SGLs

File Name	Contents
BSCOM	Basic OM
SFTOM	Software OM
ACLOM	Accelerator OM
FPPOM	Floating-Point Processor OM
FPAOM	FPP with Accelerator OM
FPFOM	Floating-point firmware OM
several*	VTAM OM
BDPOM	Basic Dataplot II OM
VDPOM	VORTEX Compatible Dataplot II OM
MDPOM	MOS Compatible Dataplot II OM

* consists of several files as described on the VTAM B release bulletin.

4.2 SYSTEM GENERATION (SGEN)

System generation (SGEN) is the creation of an operating system in main memory and on an RMD. To configure the system for VORTEX or VORTEX II, SGEN does the following:

a. gives information to VORTEX or VORTEX II about peripherals are in the system, and where they are in terms of their devices addresses

b. partitions the RMDs to accomodate the system, its library, scratch areas, etc.

c. assigns the priorities of the peripherals

d. configures the software to the user's requirements through ADD, DELETE and/or REPLACE directives

e. builds the nucleus in main memory and copies it to the system RMD

f. creates load modules for the system foreground and background tasks

g. loads and executes the system initializer

Figure 4-1 is a flowchart of the SGEN routines and functions.

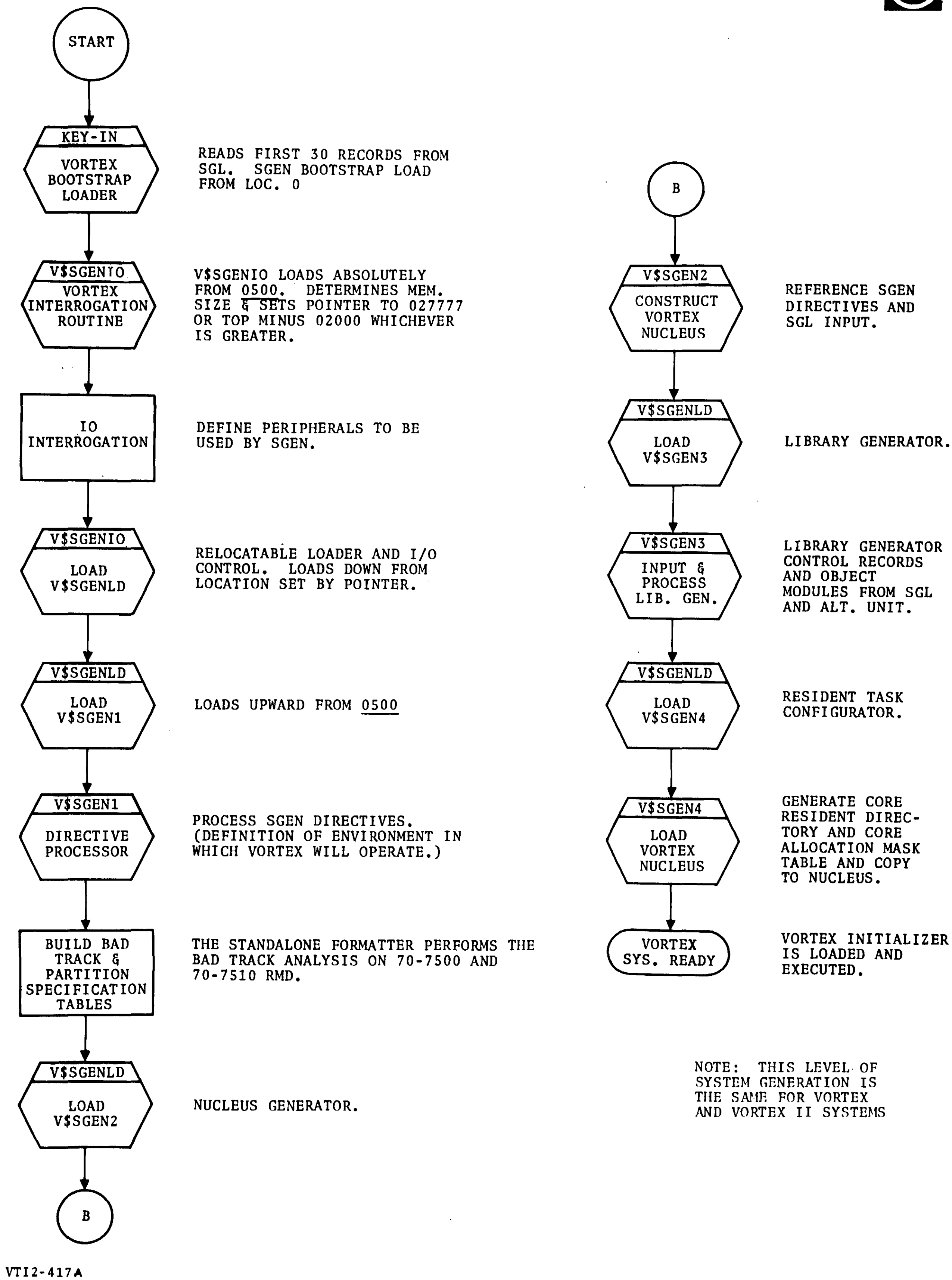


Figure 4-1. Flowchart of System Generation

4.3 RMDs for SGEN

At least one RMD (disc or drum) is required for storage of the operating system components. The RMD is divided into a fixed number of variable-length areas called partitions. These are defined during system generation (VORTEX, VORTEX II, Section 13).

The following reside on the RMD:

a. System initializer, loader, and nucleus in absolute format

b. Checkpoint file, normally associated with CU

c. GO file, normally associated with GO

d. Foreground library, normally associated with FL

e. Transient files, normally associated with PO, SS,SW

f. Relocatable object-module library, normally associated with OM

g. Background load-module library, normally associated with BL

Table 4-3 is a partial list of the RMDs supported by VORTEX and VORTEX II and their sizes.

Table 4-3. Sizes of VORTEX RMDs

Model Number	Tracks	Sectors	Words (16-bit) Per Sector
70-7500	4060	24	120
70-7510	8120	24	120
70-7600	204	48	120
70-7610			
70-7702	128	16	120

For information on partitioning RMDs, see the PRT directive in section 6.4.

4.4 ACCEPTANCE TEST PROGRAM (ATP)

The Customer Acceptance Test Program (ATP) is designed to function within the normal VORTEX hardware and software configuration without additional requirements, except for an applicable input medium for the ATP job stream. Presently, the ATP job stream is available on paper tape, cards, or magnetic tape.

The procedure to execute the ATP is described in the documentation accompanying the test (see section 1.2 for software part numbers).

4.5 HARDWARE SUPPORTED BY SGL

This section gives combinations of master and slave devices allowed and also the permissible mnemonics for peripheral devices.

In the following table, an asterisk before a device name indicates that the device is available during system generation. Master units are unit 0 and slave unit start with unit 1.

Combinations of Master and Slave Devices

Device	Device Name Master 1	Master 2	Master 3	Master 4
RMDs				
70-7600	*D00B	*D10B	*D20B	*D30B
Slave 1	*D01B	*D11B	*D21B	*D31B
Slave 2	*D02B	*D12B	*D22B	*D32B
Slave 3	*D03B	*D13B	*D23B	*D33B
70-7500	*D00C	*D10C	*D20C	*D30C
Slave 1	*D01C	*D11C	*D21C	*D31C
Slave 2	*D02C	*D12C	*D22C	*D32C
Slave 3	*D03C	*D13C	*D23C	*D33C
70-7510	*D00D	*D10D	*D20D	*D30D
Slave 1	*D01D	*D11D	*D21D	*D31D
Slave 2	*D02D	*D12D	*D22D	*D32D
Slave 3	*D03D	*D13D	*D23D	*D33D
70-7702	*D00A1	*D10A1	*D20A1	*D30A1
70-7703	*D00A2	*D10A2	*D20A2	*D30A2
620-49	*D00A5	*D10A5	*D20A5	*D30A5
Magnetic Tapes				
70-7100 through -7103	*MT00A	*MT10A	MT20A	MT30A
Slave 1	*MT01A	*MT11A	MT21A	MT31A
Slave 2	MT02A	MT12A	MT22A	MT32A
Slave 3	MT03A	MT13A	MT23A	MT33A

The following table shows the permissible mnemonics for peripheral devices. An asterisk before the name indicates that the device is available during system generation.

Model Numbers	Names			
Line Printers 70-6701	*LP0A	LP1A		
Statos Printer/plotters 70-6602 & -6608	*LP00D	LP10D	LP20D	
70-6602 & -6608 with 31-152	LP00E	LP10E	LP20E	
70-6602 & -6608 with 31-142 & 31-152	LP00G	LP10G	LP20G	
70-6641 & -6642 with 31-152	LP00H	LP10H	LP20H	
70-6611, -6613, -6615, -6617, -6621, -6623, -6625 & -6627	LP00J	LP10J	LP20J	
Teletypes 70-6100 through -6104	*TY00A	TY10A through TY60A		
CRTs 70-6400, -6401	CT00A through CT60A			
Card Reader 70-6200	*CR00A			
Card Punch 70-6201	CP00A			
Paper Tape 70-6300 through -6320	*PT00A	PT10A		
DCM 70-6201 through -5213	MX0A	MX1A	MX2A	MX3A
Process Output	CO0A	CO1A	CO2A	CO3A
Process Input	CI0A	CI1A	CI2A	CI3A
Spool	SP00A through SP70A			

SECTION 5

SYSTEM GENERATION

This section provides supplementary information and suggestions for performing system generation, (VORTEX, VORTEX II, Section 13). VORTEX II procedures are the same as these for VORTEX unless specifically stated otherwise.

5.1 FORMATTING AND BAD-TRACK ANALYSIS

Before a 70-7500/7510 disc pack can be used in any function under VORTEX or VORTEX II, it must be formatted. This is a stand-alone program (requiring approximately 8 minutes (70-7500) or 12 minutes (70-7510) per pack to run), which formats the disc to 120-word sectors (16-bit words) grouped 24 sectors per track. It also performs the bad-track analysis and creates the bad track table.

RMD Model Number	Part Number	Bad-Track Table
70-7500	92()0205-025B	Sectors 0-2
70-7510	92()0205-026A	Sectors 0-4

5.2 LOADERS

There are two types of loaders, SGEN key-in loaders (VORTEX, VORTEX II, 13.3) and system bootstrap loaders (VORTEX, VORTEX II, 16.2).

To facilitate reloading, these loader routines may be dumped onto paper tape using the AID II utility program. The resulting paper tape bootstrap may be loaded using BLD II.

5.3 SYSTEM GENERATION DIRECTIVES

To execute system generation, load in the appropriate bootstrap (VORTEX, VORTEX II, 13.3). The locations specified for RMDs do not include model 70-7500 or 70-7510.

The bootstrap causes the loading of the VORTEX bootstrap from the SGL, which in turn loads V$SGENIO. When this is accomplished, OC will print or display: I/O INTERROGATION

After this the SGEN peripherals are specified by inputting on the OC unit the five I/O directives. Always specify the first master unit of a particular device as being on controller 0, the second master unit on controller 1, etc., regardless of their specifications in the EQP directives. The format for the device is the complete hardware name including model code. For example,

Directive	Specifies
DIR=CR00A,030	SGEN directive input unit
LIB=MT00A,011	SGL input device
LIS=LP00A,035	System list output device. This cannot be a dummy device.
ALT=CR00A,030	Alternate input device. Device from which modules to modify the system will be input.
SYS=D00C,015,020	RMD onto which the VORTEX system will be generated, usually referenced as the system RMD.

5.3.1 SYS Directive for Multiple RMDs

Every RMD in the system must be included in the SYS directive with the system RMD first, such as SYS=D00C,015,070;D10B,016,020;...

A colon at the end of the line indicates that the RMD string continues on the next input line.

Each RMD must have an EQP directive and at least one PRT directive. The system RMD must have at least seven PRTs.

SGEN continues requesting I/O directives until valid input for all five functions has been completed. Then SGEN will input the SGEN directives and perform bad-track analysis. Then V$SGENIO loads V$SGENLD (relocatable loader) which begins loading the VORTEX drivers.

NOTE: There are no expected halts in this process except for I/O interrogation; the most common causes for failure here are:

a. Wrong Bootstrap Routine
b. LIB unit (SGL input) not at beginning of file
c. Wrong track or density (magnetic tape SGL)
d. Required peripheral off-line
e. Key-in errors on I/O interrogation, especially zeros and letter O.
f. Failure to include all RMDs in SYS directive

5.4 SGEN DIRECTIVES

The first step in preparing for system generation is to set up the input directives (VORTEX, VORTEX II, 13.5). Through these directives, the software system knows exactly the kinds of peripherals on the system, their locations, and their priorities. This is the software counterpart of hardware configuration, which is specified in the System Memo.

The following sections describe the individual directives.

5.4.1 MRY Directive for VORTEX

The memory directive is usually the first card. It specifies

a. the amount of memory available to the system (to allow AID II and BLD II to remain at the top of central memory, use the form 0n<u>x</u>777)

b. the size of the foreground blank common area, which is near the top of memory and used as a shared storage area among foreground tasks.

<u>FORMAT:</u> <u>MRY,0nx777,yyy</u>

where

<u>n</u> is 3 for 16K, 5 for 24K, and 7 for 32K.

<u>x</u> is 5 to save AID II and BLD II or 7 to overlay AID II and BLD II

<u>yyy</u> is the size of the blank common area (in words), (Customer ATP requires at least ten words; 200 words will preserve both AID II and BLD II)

5.4.2 MRY Directive for VORTEX II

In addition to the functions for VORTEX, the memory directive in VORTEX II systems specifies the total physical memory size in units of 1024 words (1K).

<u>FORMAT:</u> <u>MRY,0nx777,yyy,size</u>

The permissible range of values for <u>size</u> is from 32 through 256 inclusive.

5.4.3 MRY Directive for VTAM

The memory directive on a VTAM system must reflect the DCM's use of a 512 words of memory for hardware control words, and must start at a multiple of 512, i.e., 74000,75000.

Example: For a 32K system, saving AID II and BLD II with LCB at 075000.

```
MRY,074777,200
```

5.4.4 CLK Directive

This directive specifies all the parameters related to the real-time clock.

FORMAT: CLK,xxx,yyy,zz

where xxx is the number of microseconds in the basic clock interval

yyy is the number of microseconds in the free-running counter increment period.

zz is the number of microseconds in the user interrupt interval; this value must be from 5 to 50, inclusive,

The most common form is CLK,100,100,20.

5.4.5 EQP Directive

The EQP directive defines the peripherals on the system. Each peripheral -- line printer, card reader, RMD, etc. -- must have an EQP card describing it for VORTEX. (VORTEX, VORTEX II, Table 13-8, for specific model codes)

FORMAT: EQP,name,address,bic,retry,alg,mul

The parameters alg and mul are only applicable to process I/O (VORTEX, VORTEX II, 13.5.2).

Examples: For Teletype at device address 01:

```
EQP,TY0A,01,1,0,0
         ↑  ↑ ↑ ↑
         |  | | no retries
         |  | |
         |  | no BIC address
         |  |
         |  only peripheral on this controller
         |
         device address: for VORTEX there will always be
         a teletype at device address 01.
```

For RMD:

```
EQP,DOB,016,1,020,5
        |   |  | |  |
        |   |  | |  number of retries
        |   |  | |
        |   |  | BIC #1.  Must be in OCTAL with leading zero
        |   |  |
        |   |  There is only one disc in use.  This would be
        |   |  the fixed pack, on 70-7610
        |   |
        |   Device address 016.  Must be OCTAL with leading
        |   zero
        |
        Designates the 70-7600/-7610 type of RMD

EQP,DOB,016,4,020,5
            |
            Same as above, except configuring for four
            discs.  For example, the 70-7610 has a
            removable and a fixed pack, which each count
            as one unit.  This system then has two 70-7610
            on one controller.
```

For four CRTs on four separate controllers, 0-3, at addresses 02 through 05:

```
EQP,CT0A,02,1,0,0
EQP,CT1A,03,1,0,0
EQP,CT3A,04,1,0,0
EQP,CT3A,05,1,0,0
```

For two magnetic tapes in a master/slave configuration:

```
EQP,MT0A,010,2,024,3
```

For standard line printer:

```
EQP,LP0A,035,1,022,0
```

For 70-6602,Statos-31:

```
EQP,LP0D,035,1,022,0
```

For a 70-6603, Statos-31 with hardware character generator:

```
EQP,LP0E,035,1,022,0
```

SPOOL Subsystem: To realize greater efficiency from the SPOOL subsystem, use at least two RMDs. Basically, one is for the VORTEX or VORTEX II system and includes PO file. The other is for the SPOOL files and additional storage.

An EQP directive is required for each SPOOL file to be created. For example,

```
EQP,SP0A,1,1,0,0
```

VTAM: VORTEX VTAM requires EQP directives and DEF directives for each DCM and TCM. The first DCM must be unit 0:

```
EQP,MX0A,074,1,0,0
DEF,V$LCW0,075000 (for LCB at 075000)
EQP,TC0A,00,1,0,0
```

VORTEX II VTAM EQP directives are the same as VORTEX.

5.4.6 PRT Directive

The partition directive specifies the size of each partition on an RMD.

FORMAT: PRT,Dcup,s,k

where

- c is the number of the controller, 0,1,2, or 3
- u is the number of the unit on the controller, 0,1,2, or 3
- p is the letter of the partition, A through T inclusive
- s is the number (octal or decimal) of tracks in the partition
- k is the protection code (a single alphanumeric character, including $) for the partition, or * to indicate the partition is unprotected

Partition directives are required for every partition on every RMD in the system with the system RMD having a minimum of seven paritions. Each RMD must have at least one PRT card.

Examples: Typical PRT cards for various RMDs are:

70-7500:

```
PRT,D00A,50,C;D00B,200,F;D00C,200,E;D00D,200,D;D00E,200,S
PRT,D00F,500,B;D00G,500,*;D00H,1300,*;D00I,500,*;D00J,50,*
PRT,D00K,250,*
```

For 70-7600 or 70-7610

```
PRT,D00A,2,C;D00B,14,F;D00C,34,E;D00D,12,D;D00E,4,S
PRT,D00F,6,B;D00G,5,*;D00H,81,*;D00I,30,*;D00J,3,*;D00K,6,*
```

For 70-7510:

```
PRT,D00A,5,C;D00B,60,F;D00C,50,E;D00D,20,D;D00E,8,S
PRT,D00F,21,B;D00G,15,*;D00H,80,*
```

The above examples of partitions are operating on actual systems. They may be used as standards. This will avoid confusion and will help gain a measure of confidence in the directives.

To partition more than one disc on the same controller, use the following format:

```
PRT,D01A,xxx,*;D01B,xxx,*     (Disc number 2)
PRT,D02A,xxx,*;D02B,xxx,*     (Disc number 3)
PRT,D03A,xxx,*;D03B,xxx,*     (Disc number 4)
```

where xxx is the number of tracks in the partition.

The total number of tracks of all partitions plus the VORTEX nucleus must not exceed the RMD's track capacity. The size of the nucleus is equal to the memory size divided by the product of the number of sectors per track and 120. For this calculation memory will always be less than or equal to 32K.

Example: Calculate the number of tracks for a system with a 70-7500 disc:

$$\frac{32K}{24(120)} = \frac{32768}{2880} = 11.5$$ rounds off to 12 track for the nucleus

Calculate the number of tracks for a 32K system with a 70-7600 disc:

$$\frac{32K}{48(120)} = \frac{32768}{5760} = 5.5 \text{ rounds to 6 tracks}$$

The first partition specified by a PRT directive will list in the bad-track table as the first sequential track number outside the nucleus area.

The first partition listed in the bad-track table for the first example will begin at track 13, and in the second example this will be track 7.

Determining Partition Size: For partitions to contain object modules (OM library, GO partitions), calculate

$$\frac{b}{2(z)}$$

where b = the number of 60-word binary records
z = sectors per track

For partitions to contain load modules (in the background and foreground library) calculate

$$\frac{k}{120(z)}$$

where k = memory required for module
z = sectors per track

Partitioning for the SPOOL Subsystem: The SPOOL subsystem requires a partition on which output data is held waiting for the peripheral to become ready. This partition must have the protection key S, and correspond to logical unit number 107.

FORMAT: PRT,Dnna,t,S

where t = number of tracks in the partition (in octal or decimal)
Dnna = the name of the partition (this corresponds to the ASN directive for logical unit number 107)

To determine the optimum size for SPOOL output partitions, calculate:

$$(a - p)\ t = \text{output lines} = \text{sectors}$$

where a = the maximum number of lines per minute a program (application, assembler, etc.) is capable of outputting unimpaired by the printer

p = printer speed in lines per minute

t = maximum time (in minutes) a program would be outputting

Example: Calculate the sectors required to spool output from an assembly expected to generate a thousand lines per minute for ten minutes, where the printer speed is 600 lines per minute.

a = 1000, p = 600 and t = 10

1000 - 600 = 400

400(10) = 4000 lines of output will backup onto the SPOOL file

NOTE: The SPOOL files can be any size, but naturally the larger the better up to a point. If the SPOOL file becomes full, OC displays IO60, this is only an indicator and can be ignored. However, if it occurs frequently, the file sizes should be increased if that is at all possible.

5.4.7 ASN Directive

The assign directive makes the logical unit number and name assignments for physical devices.

FORMAT: ASN,lun(1)=dev(1),lun(2)=dev(2),...,lun(n)=dev(n)

where each

lun is a logical unit number (1 through 100 or 107 through 255, inclusive) which can be followed by an optional two-character logical unit name, e.g., 107:Y7

dev is a four-character physical-device name, e.g., TY00,D00G,etc.

VORTEX requires that logical unit numbers 1 through 12 be assigned.

A physical device can be assigned to more than one logical unit but a logical unit, name or number, cannot be assigned to more than one physical device.

Table 5-1 indicates the peripherals these may be assigned and their pre-set logical unit names. These are the default assignments.

Table 5-1. Logical Units, Pre-set Names and Permissible Peripheral Device Assignments

		Permissible Physical Unit				
Logical Unit	Pre-Set Logical Name	Teletype or CRT	RMD or MT	Line Printer	Other Output (CP,PT)	Other Input (PT,CR)
1	OC	X				
2	SI	X	X			X
3	SO	X				
4	PI	X	X			X
5	LO	X	X	X	X	
6	BI		X			X
7	BO		X		X	
8	SS		X			
9	GO		X			
10	PO		X			
11	DI	X				X
12	DO	X		X		

Examples:

```
ASN,1=TY00          ASN,13:CR=CR00
ASN,2=TY00          ASN,14:CP=CP00
ASN,3=TY00          ASN,15:LP=LP00
ASN,4=CR00          ASN,16:AD=DUM
ASN,5=LP00          ASN,17:CT=TY00
ASN,6=CR00          ASN,18:M0=MT00
ASN,7=CP00          ASN,19:M1-MT10
ASN,8=D00H          ASN,20:M2=MT20
ASN,9=D00G          ASN,21:DF=D01A
ASN,10=D00H         ASN,22:DE=D01B
ASN,11=TY00         ASN,23:SD=D00I
ASN,12=TY00         ASN,24:PP=LP10
```

VORTEX requires the following logical unit/RMD relationships. These are inherent in VORTEX and VORTEX II and do not require ASN directives, however PRT directives are required.

Table 5-2. Pre-Set Logical-Unit/RMD Partition Relationship

Logical Unit Name	Logical Unit Number	Partition Name	Protection Key	Minimum VORTEX Sector Allocation
CL	103	D00A	C	025
FL	106	D00B	F	0106
BL	105	D00C	E	01135
OM	104	D00D	D	0417
CU	101	D00E	S	0310
SW	102	D00F	B	0310

Restrictions: Any attempt to change one of the preset logical unit name number or name-number-partition relationships given in Table 5-2 will cause an error to be flagged.

Table 5-3. Optional Logical Unit and RMD Partition Relationships

Logical Name	Logical Unit Number	Partition Name	Minimum VORTEX Sector Allocation
GO	9	D00G	0310 (see note 1)
SS	8	D00H	varies
PO	10	D00H	0515 (see note 2)
BI	6	D00I	varies
BO	7	D00I	varies

These files must not have protection keys.

NOTES:

1. GO file must be larger than the largest task run in load-and-go mode. If the system is foreground only or all tasks will be entered in libraries before execution, this partition may be eliminated.

2. PO file must be large enough for source images of the largest task to be assembled or compiled. Source images are stored three card images per sector (above assumes 1000 cards). If this function is assigned to magnetic tape, this partition may be eliminated.

Logical units 13, 14 and 15 are used by RPG as CR, CP and LP, respectively and should be assigned (if RPG is to be used).

NOTE: It is advisable to include extra logical unit numbers assigned to dummy units, for example:

```
ASN,39:DD=DUM
ASN,53:BP=DUM
```

This makes these numbers available for temporary assignment through OPCOM and JCP.

VORTEX SPOOL Subsystem: The only permissible changes to the preset logical unit numbers and names are when generating the VORTEX system with the SPOOL subsystem. In this case, the following is an example of possible changes:

Standard VORTEX	SPOOL Subsystem	
ASN,5=LP00	ASN,5=SP00	(list output)
ASN,7=CP00	ASN,7=SP10	(punched card BO)
ASN,xx=MT00	ASN,xx=SP20	(magnetic tape)

Each of the SPnn assignments is then associated with a logical unit 180-187, to which the output is written.

```
ASN,180:S0=LP00
ASN,181:S1=CP00
ASN,182:S2=MT00
```

The RMD partition created for the SPOOL files must be assigned to logical unit 107, with the logical name SX with the protection key S.

SGEN does not permit file creation, the SPOOL file will be created using FMAIN after the system generation is complete. Section 5.6 describes the SPOOL subsystem file creation.

VORTEX VTAM: An ASN directive is required for each multiplexor and each terminal controller. For example,

```
ASN,27:MC=MX00
ASN,28:TT=TC00
```

5.4.8 PIM Directive

The PIM, Priority Interrupt Module, directive defines the interrupt system architecture by specifying the number of priority interrupt modules (PIMs) in the system, (the System Memo describes the specifications of a particular system), the interrupt levels to be enabled at system initialization, and the interrupts to be manipulated by interrupt handlers coded by the user.

FORMAT: PIM,p(1),q(1),r(1),s(1);p(2),q(2),r(2),
s(2);...;p(n),q(n),r(n),s(n)

where each

p — is an interrupt line number comprising two <u>octal</u> digits with the first being the PIM <u>number</u> (PIM 1 = 0, 2 = 1), and the second is the line number within the PIM (0 through 7). The two digits must be preceded by a zero, e.g., 002, 011.

q — is the name (1 to 6 characters) of the task handling the interrupt. The format of the name is TBxxxx, where xxxx is the hardware code name given in the EQP directive.

r — is the content of the interrupt event word in octal notation (VORTEX, VORTEX II, Appendix F for non-zero values for standard hardware).

s — is 0 for an interrupt using the common interrupt-handler, 1 for a directly connected interrupt option 1, or 2 for a directly connected interrupt option 2.

If an interrupt line is to use the common interrupt handler, a TIDB is generated for the related interrupt-processing routine, which can be in the VORTEX nucleus or in the foreground library.

If an interrupt line is to have a direct connection, the interrupt-processing routine must be added to the nucleus. Failure to do so results in an error message.

<u>Example</u>: Specify two interrupt lines, one handled by the common interrupt handler, the other directly connected.

```
PIM,002,TBMT0A,01,0;003,TBLP0B,01,1
```

<u>NOTES</u>:

1. The only interrupt used by the magnetic-tape I/O driver is the motion complete (see section 3.3 for interrupts used by peripherals).

2. The RMD which contains the VORTEX system must be on the highest priority BIC in the system

3. RMDs, 70-7500 and -7600, require two PIM lines, BIC complete and seek complete. 70-7610 requires BIC complete and two seek completes (one for each platter).

4. When more than one peripheral is connected to a BIC, a PIM directive for any one of them will result in all being identified. Therefore, only one PIM directive is required for the group.

For VTAM systems, each DCM defined by an EQP directive must have six PIM directives, see section 3.3 (and VTAM,11.7).

For VORTEX these are handled by the common interrupt handler, and for VORTEX II by a directly connected handler.

STATOS: The Statos-31 with hardware character generator requires three PIM directives, (see section 3.3).

Examples: Typical examples of PIM directive using the common interrupt handler are

For BIC complete on 70-7500 RMD:	PIM,000,TBD0C,01,0
For card reader:	PIM,001,TBCR0A,01,0
For seek complete:	PIM,002,TBD0C,01,0
For paper tape:	PIM,005,TBPT0A,01,0
For TTY Read, PIM 2, Line 6:	PIM,016,TBTY0A,01,0
For TTY Write, PIM 2, Line 7:	PIM,017,TBTY0A,02,0

5.4.9 EDR Directive

The EDR, End Redefinition, directive must be the last SGEN directive. It specifies all special system parameters, and terminates SGEN directive input. If only a redefinition of resident tasks is required, the EDR directive is of the form EDR,R.

If a full SGEN is necessary, the EDR directive has the general format.

FORMAT: EDR,S,tidb,stack,part,list,kpun,map,analysis

where

tidb	in VORTEX II systems, is ignored (as all TIDBs are dynamically assigned) in VORTEX systems, is the number (01 through 0777, inclusive) of 25-word empty TIDBs allocated.
stack	is the size (0 through 037777, inclusive) of the storage and reentry stack allocation, which is equal to the number of words per reentrant subroutine multiplied by the number of levels calling the subroutine
part	is the maximum number (7 through 20, inclusive) of partitions on an RMD in the system (the minimum of 7 is for the system RMD)
list	is the number of lines per page for the list output (LO) device, with typical values of 44 for line printer and 61 for Teletype
kpun	is 26 for 026 keypunch (Hollerith code), or 29 for 029 keypunch
map	is L if map information is to be listed, or 0 if it is to be suppressed
analysis	is 0 or blank if a complete bad-track analysis is desired on all RMDs, or 1 if the bad-track tables from the last SGEN are to be used. If this parameter is omitted, a full analysis is performed. A value of 1 may be entered only when an analysis has been made on a previous SGEN.

When analysis is specified, SGEN will bypass any 70-7500 or -7510 RMDs, the Bad Track Table written by the formatter is accepted for these and analysis will be performed on all other RMDs.

Analysis for bad tracks in RMD partitioning is performed following the input of the EDR directive. When that process is complete, the nucleus or resident-task processor is loaded into main memory.

Examples: Specify the redefinition of resident tasks only.

```
EDR,R
```

Specify full system generation with no empty TIDBs, no stack area, a maximum of seven partitions per RMD, 44 lines per page on the list output, 026 keypunch, a list of the map, and no bad-track analysis.

```
EDR,S,0,0,7,44,26,L
```

Specify full system generation with 12 empty TIDBs, 0500 addresses in the stack area, a maximum of 20 partitions per RMD, 30 lines per page on the list output, 029 keypunch mode, and suppression of the listing of a map. Assume the bad-track tables from the last SGEN are still good, and reuse them.

```
EDR,S,12,0500,20,30,29,0,1
```

5.5 PERFORMING SGEN

This section describes the procedures for executing the job streams in the SGL. Section 5.5.1 is for SGLs on either magnetic tape or cards. Section 5.5.2 describes the SGL from an RMD.

5.5.1 SGL on Magnetic Tape or Cards

The SGL is the first file of the SGL medium. Execution of the system generation programs is initiated by loading the appropriate system generation bootstrap. The choice of job streams depends upon the firmware options Floating-Point Processor (FPP) and Dataplot II use on the system. (VORTEX, VORTEX II, Section 18 for firmware description; VORTEX, Section 12 for Dataplot II).

Basic OM Library Job Stream: The basic OM library job stream is the second and third files of the SGL medium. To execute this job stream, position to the second file and assign SI to the SGL medium. The basic job stream must always be executed in addition to one or more of the following depending upon satisfying the conditions in the following table:

Conditions			
Accelerator?	Floating-point Firmware*?	Floating-point Processor (FPP)?	File Numbers
No	No	No	4 and 5
Yes	No	No	6 and 7
No	Yes	No	4 and 5, 12 and 13
No	No	Yes	8 and 9
Yes	No	Yes	10 and 11

* 256-word (half page) WCS

Other combinations of these options are not feasible.

Dataplot II OM Library Job Streams: If Dataplot II is to be used, two additional job streams must be executed. One of these must always be the basic Dataplot II OM library job streams in files 29 and 30. For VORTEX compatible Dataplot II, the job streams in files 31 and 32 are used in addition to the basic Dataplot II. For MOS compatible Dataplot II, the job streams in files 33 and 34 must be executed in addition to the basic Dataplot II.

5.5.2 SGL on an RMD

The SGL is located on the first partition of the SGL disc pack. The OM libraries in the second partition are in the form of object code (not job streams). Choice of the OM libraries to use depends upon the options on the system: floating-point processor, accelerator, floating-point firmware (256-word WCS), VTAM and Dataplot II. The files are used in the manner described for card and magnetic-tape SGLs. The procedures for executing the OM libraries from a disc pack SGL are described in the E Release Bulletin.

5.6 SPOOL SUBSYSTEM FILE CREATION

When the system is first activated after the complete SGEN procedure, OC will return IO10 SPnn, where nn is the SPOOL name on the ASN directives. This message can be ignored and taken as an indication to create the files being requested.

The procedure to create SPOOL files is as follows:

a. From OC, key-in

```
/FMAIN
INIT,SX,S
CREATE, SX,S,SPOOLn,120,records
```

where
n is the value from the SPnA specified on the EQP directive
records is the number of 120-word logical records to be spooled (Section 5.4 gives more information on SPOOL file sizes)

b. After all required SPOOL files have been created, i.e., one for each SPnA EQP directive.
From OC, key-in

```
/FINI
```

Boot the system in (Loaders sec. 5.2) and VORTEX with the SPOOL subsystem will be in operation.

SECTION 6

SGL MAINTENANCE

6.1 UPDATING SGL

This section provides the user with the basic information needed to maintain a VORTEX or VORTEX II SGL. This information along with the SGL organization in Section 4 will aid the user in modifying and copying the SGL.

The VORTEX or VORTEX II SGL consists of several components. The first component is the collection of programs used to create the nucleus, and foreground and background libraries. In the following procedures, this component is referred to as the "system generator". The subsequent components consist of job streams to create various OM libraries and add modules for various application programs such as VTAM. In the following procedures, these components are referred to as the "system job streams".

The system generator is an ordered set of ASCII Control records mixed with binary object records. As a result, the standard COPYF directive of IOUTIL cannot be used to copy this component. There are two ways that this component can be copied. First, the system program SMAIN is specifically designed for this purpose and must be used whenever any modifications are made to the system generator. Second, IOUTIL can be used to copy the system generator if the special record-length mode of the COPYF directive is used. To use COPYF, both input and output must specify a record length of zero and a read/write mode of ASCII. Further description is given in the following sections referring to the various SGL media.

The system job streams are a collection of ASCII control and binary object records. These job streams may have several EOFs distributed throughout the job streams. Therefore, it is necessary that SGL organization information be carefully examined before any attempt is made to copy or modify these components. The system program SMAIN cannot effectively be used to copy or modify these components since it accepts only certain ASCII control records, must terminate with the specific control record, CTL,ENDOFSGL, will not accept any imbedded EOFS, and does a rewind at the beginning of any operation. Therefore, if a simple copy is all that is needed then IOUTIL should be used, but, if a deletion or replacement is needed, then SMAIN should be used in the following manner:

a. Separate the desired system job stream from the SGL medium by using IOUTIL

b. Terminate the system job stream temporarily with the control record, CTL,ENDOFSGL

c. Remove any imbedded EOFs from the job stream noting their position so that they may be restored later.

d. Remove any ASCII control records from the job stream, they can be replaced with a valid control record such as ESB or END so that they can be reinserted

e. Use SMAIN to add, delete, or replace the desired object modules

f. Restore the job stream to its original state by replacing the proper control records and EOFs

Because this procedure is involved and error prone, it is suggested that the user does not attempt to modify SGL system job streams but rather creates subsequent job streams of his own that make use of FMAIN and LMGEN features to modify libraries created by the system job streams.

Where a simple copy is all that is needed, then IOUTIL may be used in the same manner for the system generator (with zero record length and ASCII mode).

6.2 COPYING SGL NOT USING AN RMD

To copy SGL from a device other than an RMD to another non-RMD, the system program IOUTIL may be used. SMAIN should be used to copy the system generator part and IOUTIL to copy the system job streams. The system generator portion is separated from system job stream portion by an EOF. Therefore, upon completion of SMAIN an EOF should be written to the output and an EOF skipped on the input before continuing with the system job stream portion. Care should be taken to note the number of EOFs involved and that the SGL medium terminate with a double EOF.

6.3 COPYING TO AN RMD FROM ANOTHER TYPE OF DEVICE

To copy from another form of SGL to an RMD is an involved process which requires special partitioning of the RMD and the creation of special files on that medium. The following procedure is provided to aid the user in creating an RMD SGL from a non-RMD SGL. It is not intended to be used when the RMD serves only as a temporary storage for a modified SGL. The RMD which is the destination must not contain the VORTEX or VORTEX II System. The procedure is as follows:

a. Partition the RMD as described in the SGL organization for RMD, (section 4.1), either at system generation time or by using the system program RAZI.

b. Copy the system generation portion to the first partition of the RMD. This partition does not need a file name. It must contain at least 3000 sectors, because SMAIN does not pack SGL records.

c. Execute the job streams and note the number and positions of the control records. Then, use IOUTIL to skip over these control records, so that the SGL medium is positioned to the binary object modules. System job streams cannot be merely copied to the RMD but must have their ASCII control records separate from their object modules.

d. Create files using FMAIN on the various partitions which are large enough to contain the binary object modules. Refer to the SGL organization information in section 4, for the suggested sizes and partitions to be used.
<u>NOTE</u>: The binary object modules will be packed as two 60-word records per sector on the RMD, but each object module must begin on a sector boundary so the size of the file must be slightly greater than half the number of object records on the non-RMD medium. A useful formula for this is

$$\frac{records}{2} + \frac{modules}{2}$$

where <u>records</u> is the number of 60-word records and <u>modules</u> is the number of object modules.

e. Use the IOUTIL directive PACKB to copy the binary object modules from the source to the selected file. A PFILE directive must be used to open the file. A CFILE with update directives must be used to close the file upon completion. The PACKB directive automatically handles the rules for object module packing. The input record length should be 60 words and the output record length, 120 words. The read/write mode should be system binary.

f. Repeat steps d and e for each desired system job stream.

g. Modify the system job stream directives which were skipped over, to use the new input medium. Refer to the various system program descriptions in the Reference Manual (VORTEX, VORTEX II). Generally, it may be necessary to add a protection key and a file name, and, possibly, a PFILE directive. Note: PFILE can only be used for a global logical unit.

h. Copy the modified directives onto the SGL medium using IOUTIL, (or keep the directives separate from the SGL medium). Copy the directives into a file named SI, which is unpacked ASCII and has a record length of 40 words. There can be only one file named SI on each partition. Remove any imbedded FINI directives.

This procedure is not simple. The description here assumes that the user is quite familiar with the components of the SGL and how they function. If any portion of the system job stream procedures appears to be beyond the capability of the user, it is suggested that system job stream portion of this procedure not be attempted. In this case the user can use SMAIN to create a disc SGL which contains only the system generator, and can continue to use the system job stream from another medium for those functions.

SECTION 7

TROUBLESHOOTING

This section provides descriptions of useful troubleshooting techniques:

Trapping through SGEN
Trapping through System Boot
General VORTEX Troubleshooting aids

(The Error Messages section in VORTEX and VORTEX II gives the meanings and solutions for common error messages)

7.1 TRAPPING THROUGH SGEN

To locate the SGEN Driver For Any Peripheral: Memory location 0600 is the start of the physical unit table (PUT). This table has a two-word entry for each peripheral. The first word contains the device address in bits 0-5. The second word contains the DST address associated with the device. The DST address plus 7 (base 0) points to the STATUS routine in the driver for the device. The STATUS routine usually begins at the first location of the driver.

To locate the driver, find the device address in the PUT for the desired peripheral. In the case of master/slave units, several device addresses for the desired peripheral will be in the PUT. Any one of these entry can be used. The second word of the entry contains the DST address. This address plus 7 is the address containing the driver address.

Trapping through SGEN: The following procedure may be used for trapping through SGEN:

a. Load the appropriate SGEN key-in but do not execute (i.e. LO with AID II)

b. Change the key-in location containing 01106 (location 2 or 3) to the address of AID II (i.e. x6000 where x=3, 4, 5, 6, or 7)

c. Execute the modified key-in (i.e. GO). Machine will go to AID II

d. At this point SGENIO has been loaded. Set a trap at the location in SGENIO which contains the instruction JMP $XEQ (just prior to label LDP10).

Note: SGENIO is an absolute program. Now execute SGENIO (i.e., Txxxxxx, 1106, where xxxxxx is the above address.)

e. IO Interrogation will be conducted now. Upon completion of the interrogation the SGEN drivers will be loaded and the machine will execute the trap at xxxxxx (see step d).

f. Set a halt in SGENLD at the location which contains the instruction JMP 0 (just prior to label $XEQ) and continue from the last trap point. (i.e., Gxxxxxx. where xxxxxx is last trap address). Note: SGENLD loads down from the top of main memory (less AID II and BLD II; for 32K, it loads down from 075777)

g. When the halt is executed, the SGEN module will be loaded. (The modules are loaded sequentially, i.e. SGEN1, SGEN2, SGEN3, and SGEN4). All SGEN modules load at location 03000. Each module handles a part of SGEN as follows:

SGEN1 - directive processor
SGEN2 - nucleus processor
SGEN3 - library processor
SGEN4 - resident task processor

Manually go to AID II at this point. Each SGEN module starts at location 03000.

h. At this point the SGEN module has not executed. If the particular SGEN module is to be debugged then the appropriate traps can be made. If the module is to run normally or its debugging is complete, then enter one of the following:

1. G xxxxxx, where xxxxxx is the last trap address or 03000 if no module traps were made.

2. C zzzzzz to 01000, where zzzzzz is the address set to halt in step f, then do step h (1).

G xxxxxx is used to load the next SGEN component. This returns to step g of above. Czzzzzz causes SGEN to continue normally until completion.

7.2 TRAPPING THROUGH THE SYSTEM BOOT

The following procedure may be used for trapping through the system boot and initializer. This procedure is useful in making patches to the nucleus.

a. Load the appropriate system boot, but do not execute (i.e. L0 with AID II).

b. Change the boot location containing 0600 to the address of AID II.

c. Execute the modified boot (i.e. G1130). Machine will go to AID II.

d. At this point the system initializer has been loaded but has not executed. (Initializers have a name in the form I$Da where a is the model code for the sytem RMD) . The initializer loads starting at memory location 0600.

e. To load the nucleus but not activate the clock and PIMs, a trap should be set at the location of the label V$SCV in the appropriate initializer and execution continued at the start of the initializer. (i.e. Txxxxxx,600 where xxxxxx is the above label address).

f. At this point the nucleus is loaded but VORTEX has not been activated. Patches may be made to the nucleus at this time.

g. To activate VORTEX enter Gxxxxxx where xxxxxx is the address from step e.

7.3 TIPS FOR SYSTEM DEBUGGING

The interrupt jump locations (0100-0277) for the PIM lines provide a good patch area. The locations for PIMs not in the system can be used and will not be destroyed except by rebooting the sytem.

At times it is useful to do steps a through f (in 7.2) and then to use AID II to dump memory to magnetic tape, then perform step g. Doing this allows a copy of the patch nucleus to be saved. The tape can then be read into main memory and step g performed directly.

AID II traps can only be performed in areas where the clock and PIMs are disabled after VORTEX is activated. In order to continue to use AID II for debugging the following patches can be made. These cause the PIMs and clocks to be disabled upon reaching a trap location.

a. Change locations 0X6545 and 0X6546 to 01000 and zzzzzz.

   Where X = memory size, (i.e. X=7 for 32K, 6 for 28K, etc.) and zzzzzz, the starting address of a four-word block in scratch area of memory. (see note 1 of above)

b. Change zzzzzz from above to 0100747, 0100444, 01000, 0X6505 where X is as above.

NOTES:

1. These patches should be made at step f of the nucleus trap procedure and then step g can be replaced by using the trap command.

2. This change alters two locations in AID and thus these must be restored or AID reloaded after rebooting or when attempting to use AID without VORTEX.

7.4 DEBUGGING AIDS

The DEBUG program is resident on the OM library and can be cataloged with any task when debugging capabilities are required, (VORTEX, VORTEX II, 6.2.1, for cataloging with other tasks; VORTEX, VORTEX II, Section 7 for description of DEBUG use).

When DEBUG is appended to a task which has no overlays, it is the last object module loaded. When the task has overlays, DEBUG will be the last object module of the root segment.

DEBUG can be copied to another library as a load module, with the following procedure:

Under LMGEN enter:

```
TIDB,DEBUG, type,0,DEBUG        type=1, 2, or 3
LD,SI
(end-of-file, multipunched 2-7-8-9 or CONTROL-G, if SI
                              is a keyboard device)
LIB
END,lun,key
```

To catalog on SW only, delete lun,key

The task will execute at level 0 upon entering /EXEC.

Under VORTEX, DEBUG in the foreground may access all memory, and in the background, may access only background memory.

Under VORTEX II, DEBUG in either foreground or background may access only the memory within its memory map.

NOTE: A trap cannot be set within a memory area which has the clock or PIMs disabled.

7.5 DEBUGGING FORTRAN PROGRAMS

Debugging VORTEX or VORTEX II FORTRAN programs is best done in source language, in segments, by checking out one module at a time, in the order in which they are executed. Source language debugging can usually locate a problem, or at least localize it so that the object language debugging can be minimized.

The FORTRAN source language features most useful in debugging are the WRITE, READ and PAUSE statements. Additional statements of these types can be added, and then deleted when debugging is completed. Test parameters can be entered with the READ statement and intermediate values output with the WRITE statement. The PAUSE statement is useful in detecting synchronization problems; for example, by putting a WRITE statement in a subprogram and a PAUSE statement in the main program, to examine the listing output by the WRITE statement after the PAUSE has been executed, then verify that the subprogram has been called the right number of times with the right input parameters and produced the right output parameters.

If the source language debugging does not locate the problem, object language debugging is available through the DEBUG program (VORTEX, VORTEX II, Section 7) or the Dump option of the JCP /EXEC directive (VORTEX, VORTEX II 4.2.22). These produce absolute octal information and are used with three listings:

a. SGEN map lists the absolute location of all nucleus external labels.

b. LMGEN map lists the location (absolute for all VORTEX II programs and for VORTEX background programs) of all external labels in or referenced by the module being tested. The main program should be given a name with the NAME directive, so that its location will be listed.

c. FORTRAN compile-time source listing and map give the relative locations of all variables, arrays, constants and statement labels. Program locations are given relative to the first executable statement (see figure 7-1). Sizes of the program module and all COMMON modules are listed.

Figure 7-1. FORTRAN Main Memory Load Module

	1
Blank Common (Background Only)	
Other Common Blocks	
(First instruction is always an unconditional jump forward over the program data block) Program Data Block (all non-common arrays, all variables which appear in EQUIVALENCE or DATA statements)	2
Main Program Executable Code	3
Main Program Postprogram Data Block (all variables and constants which do not appear in the program Data Block)	
Other User and Library subprograms	
	4

NOTES:

1. Beginning of module (01000) for all VORTEX II modules, and VORTEX background modules

2. First executable instruction. If program is assigned a name by the NAME directive, its location is here

3. Program size, which will appear on compile-time source listing

4. This location will be given the label $PED on LMGEN map

SECTION 8

VORTEX SYSTEM MAINTENANCE

VORTEX is subject to constant evaluation by the customer and in-house programming and operations personnel. As the need arises, new programs are added or existing ones modified. At the present time, VORTEX undergoes an interim revision every six months, with a major revision at alternating quarters.

The interim revision is indicated by a decimal number following the revision letter, as in C.1. These are incremental editings to the VORTEX source of that change letter, so the source is not available. However, the edit listings are included so the user may update his existing source.

The major revision is indicated by a new revision letter. In a major revision a new source is created to include all modifications to date.

The current release bulletin accompanies each VORTEX shipment. This bulletin defines the programs which have been changed, the number of the SMR (if applicable) which caused the change (SMR policy, section 10), and what changes were actually made. It also defines the SGL format and its file usage.

SECTION 9

SOFTWARE MAINTENANCE REQUESTS

The Software Maintenance Request form provides a means of formally documenting a reported software malfunction. The purpose of the form and the maintenance procedure is to provide a controlled way of correcting errors which may exist in our software. This procedure is specifically not applicable to requests for software modification, additions of features, etc. The latter requests are properly the subject of a Special Engineering Request. A failure to perform according to its written VDM specifications and descriptions is the basis upon which the software maintenance is performed.

The success of this software maintenance procedure is directly dependent upon the quality of the inputs. The following guidelines pertain to the Software Maintenance Request.

a. Fill out only the side headed SOFTWARE MAINTENANCE REQUEST.

b. Do not fill in the lines DATE and LOG NO.

c. Complete the entries in the block headed CUSTOMER as completely as possible in order to limit the number of communication channels to one, namely between Software Support and the source of the request.

d. Complete the entries in the block headed VDM with the requested information.

e. Complete the entries in the block headed PROGRAM. These are absolutely necessary for software support to know the exact software which has the alleged problem.

f. Complete the entries in the block headed HARDWARE CONFIGURATION. The exact configuration on which the software was executed aids in efficient analysis of the problem.

g. Describe the problem in the block headed SYMPTOMS/DESCRIPTION OF PROBLEM.

h. Supply diagnostic information and indicate the type supplied in the block headed DIAGNOSTIC EXHIBITS SUPPLIED.

i. The person who fills in the form should enter his name on the line titled AUTHOR. The author should be the individual who encountered the problem.

The cognizant VDM salesman or field application engineer should provide guidance and assistance to provide the useful pertinent information.

When the form arrives in the APPLICATIONS ENGINEERING group, the form is screened by Software Support personnel. Those requests containing sufficient information to act upon are forwarded to the Systems Programming group where the problem is analyzed and resolved. Requests which do not contain sufficient information are returned to the submitter.

SOFTWARE MAINTENANCE REQUEST

VARIAN DATA MACHINES
APPLICATIONS ENGINEERING
2722 MICHELSON DRIVE
IRVINE, CALIFORNIA 92664

DATE ____________________

LOG NO. ____________________

CUSTOMER

NAME ____________________
ADDRESS ____________________
LOCATION ____________________
PHONE ____________________
CONTACT ____________________

VDM

SALES OFFICE ____________________
SALESMAN ____________________
APPL. ENGR. ____________________
SALES ORDER NUMBER ____________________

PROGRAM

NAME ____________________
VDM PART NO./VERSION ____________________ REVISION ____________

HARDWARE CONFIGURATION

- ☐ 620/__ ____________________ MEMORY SIZE
- ☐ V7__ ____________ MEMORY SIZE ☐ CORE ☐ SC
- ☐ BIC ____________________
- ☐ PMA/BTC ____________________
- ☐ PIM ____________________
- ☐ WCS ____________________
- ☐ MAP ____________________
- ☐ MEMORY WRAP-AROUND ____________________
- ☐ FPU ____________________
- ☐ PERIPHERAL(s) ____________________
- ☐ OTHER ____________________

SYMPTOMS/DESCRIPTION OF PROBLEM

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DIAGNOSTIC EXHIBITS SUPPLIED:

- ☐ MEMORY DUMP
- ☐
- ☐ OUTPUT LISTING
- ☐ USER SOURCE TAPE
- ☐ USER SOURCE LISTING
- ☐ USER OBJECT TAPE

AUTHOR ____________________

96A0060-000C