StorageTek™ Virtual Tape Control System
Software

32 RTDs/Stacked Migrates Support Guide

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English translation: This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take adequate measures.

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The following is the Internal Code License Agreement from StorageTek:

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Preface

Virtual Tape Control System 6.2.0 (VTCS 6.2.0, hereafter referred to as “VTCS”) is MVS host software, which together with the portions of NCS 6.2.0 that support VTCS and the Virtual Tape Storage Subsystem (VTSS), comprises Virtual Storage Manager (VSM).

Audience

This guide is for StorageTek or customer personnel who are responsible for implementing the 32 RTDs and/or Stacked Migrates Features.

Prerequisites

To perform the tasks described in this guide, you should already understand the following:

- MVS or OS/390 operating system
- JES2 or JES3
- System Management Facility (SMF)
- System Modification Program Extended (SMP/E)
- Nearline Control Solution (NCS)

About This Book

VTCS 32 RTDs/Stacked Migrates Support Guide is not a part-numbered book; rather, it is a collection of information from other VTCS books on the subject of VTCS support for 32RTDs and Stacked Migrates. Each section has an opening note that credits the source VTCS book for the information. 32 RTDs/Stacked Migrates support, which applies to only VSM5s, has the requirements described in TABLE P-1.

TABLE P-1 32 RTDs/Stacked Migrates Support Requirements for VTCS/NCS 6.2

32 RTDs/Stacked Migrates Support requires...	..the following VSM4/VSM5 microcode...	...and the following VTCS/NCS 6.2 PTFs...	...and CDS level...
FICON RTDs and FICON ports for the CLINKs	D02.05.00.00 or higher	L1H13ZF (SOS6200) L1H13ZG (SWS6200	"F" or higher

Contents

CHAPTER 1

Reference Information

VTCS 6.2 source documents:
VTCS Command and Utility Reference, Installing and Configuring VTCS

VTCS Considerations to Correctly Specify MVC Media

TABLE 1-1 describes the values required to specify the desired media and recording technique on the HSC VOLATTR statement and HSC STORCLAS statement to correctly specify the desired MVC media.

Note – 9840D support requires the following PTFs:

- NCS/VTCS 6.1- L1H13QK (SOS6100) and L1H13Y (SWS6100).
- NCS/VTCS 6.2- L1H13QK (SOS6200) and L1H13Y (SWS6200).

TABLE 1-1 RTD Model/MVC Media Values

Transport Model	TAPEREQ/ VOLATTR MEDIA	RECTECH	STORCLAS MEDIA	Cartridge Type - Specified by STORCLAS MEDIA	Density	Encrypted?
4490	STANDARD	STANDARD	STANDARD	standard length 3480 cartridge	single	N/A
9490, 9490EE	ECART	ECART	ECART	3490E cartridge	single	N/A
9490EE	ZCART	ZCART	ZCART	3490EE cartridge	single	N/A
9840	STK1R	STK1RA	STK1RAB	T9840A or T9840B cartridge	single	N/A
T9840B		STK1RB	STK1RAB	T9840A or T9840B cartridge	single	N/A
T9840C		STK1RC	STK1RC	T9840C cartridge	double	N/A
T9840D - T9840D Non-Encrypting Transport		STK1RD	STK1RD	T9840D cartridge	triple	no
T9840DE - T9840D Encrypting Transport		STK1RDE	STK1RDE	T9840D cartridge for encryption	triple	yes

TABLE 1-1 RTD Model/MVC Media Values

Transport Model	TAPEREQ/ VOLATTR MEDIA	RECTECH	STORCLAS MEDIA	Cartridge Type - Specified by STORCLAS MEDIA	Density	Encrypted?
T9940A	STK2P	STK2PA	STK2PA	T9940A cartridge	single	N/A
T9940B		STK2PB	STK2PB	T9940B cartridge	double	N/A
T1A34 - T10000A Non-Encrypting Transport	T10000T1	T1A34	T1A000T1	T10000 full capacity cartridge	single	no
T1AE34 - T10000A Encrypting Transport		T1AE34	T1A000E1	T10000 full capacity cartridge for encryption	single	yes
T1A34 - T10000A Non-Encrypting Transport	T10000TS	T1A34	T1A000TS	T10000 sport cartridge	single	no
T1AE34 - T10000A Encrypting Transport		T1AE34	T1A000ES	T10000 sport cartridge for encryption	single	yes

Use TABLE 1-1 as a guideline to:

- Create VOLATTR statements that segregate single/double density media or encrypted/non-encrypted media.
- Specify the correct STORCLAS MEDIA values to assign the desired cartridge type and recording technique to MVCs.
- Determine which transport models can write to/read from which media. A higher capability transport (double density vs. single, or encryption vs. non-encryption) can read from media written by a lower capability transport, but can only write to that media from the beginning of the tape. A lower capability transport, however, cannot read from media written by a higher capability transport but can write to that media from the beginning of the tape.

Examples

- If you are adding T9840D encrypting transports and new media to encrypt, create VOLATTRs for the new media and STORCLAS statements to allow VTCS to select this media. For example:

```
VOLATTR VOLSER(MVC900-MVC999) MEDIA(STK1R) RECTECH(STK1RDE)
STORCLAS NAME(4DENCRYPT) MEDIA(STK1RDE)
```

- If you are adding T9840D encrypting transports and want to convert existing media to encryption media, change existing VOLATTRs to specify encryption and change existing STORCLAS statements to request encryption. For example:

```
VOLATTR VOLSER(MVC800-MVC899) MEDIA(STK1R) RECTECH(STK1RDE)
STORCLAS NAME(9840) MEDIA(STK1RDE)
```

  Here's how it works: If I have MVCs that already contain data, I cannot add "encrypted" VTVs to these MVCs. I can, however, encrypt data on initialized MVCs that do not contain data. To make this strategy work, therefore, ensure that you have sufficient free T9840 MVCs and also consider doing demand drains on MVCs that do contain data to free them up.

Using the STORclas MEDIA Parameter for MVC Media Preferencing

By default, in mixed-media VSM systems, VTV automatic and demand migrations (and consolidations) attempt to go to MVCs by media type in this order:

1. Standard length 3480 cartridge
2. 3490E cartridge
3. 3490EE cartridge
4. T9840A/B cartridge
5. T9840C cartridge
6. T9940A cartridge
7. T9840D cartridge
8. T10000 sport cartridge
9. T9940B cartridge
10. T10000 full capacity cartridge

By default, for automatic and demand space reclamations, VSM attempts to write VTVs to output MVCs by media type in this order:

1. T10000 full capacity cartridge
2. T9940B cartridge
3. T10000 sport cartridge
4. T9840D cartridge
5. T9940A cartridge
6. T9840C cartridge
7. T9840A/B cartridge
8. 3490EE cartridge
9. 3490E cartridge
10. Standard length 3480 cartridge

The `MEDIA` parameter of the `STORclas` statement specifies a preference list of MVC media types. This list supersedes the default media selection list. **Note that** for reclamation, VTCS attempts to write VTVs back to MVCs in the **reverse** of the order specified on the `MEDIA` parameter.

For example, if you specify the following on the `MEDIA` parameter of the `STORclas` statement...

```
MEDIA(STK1RAB,STK1RC,STK2PB)
```

- ...to select an MVC for migration to this Storage Class, VTCS searches for a usable MVC in the order `STK1RAB`, `STK1RC`, `STK2PB`.

- ...to select an MVC for the output of reclaim to this Storage Class, VTCS searches for a usable MVC in the order STK2PB, STK1RC, STK1RAB.

You can specify the media and ACS preferencing via the Storage Class(es) specified on the MIGpol parameter of the MGMTclas control statement.

To optimize recall processing in mixed-media systems, ensure that your MVC pool has at least one media type compatible with each RTD type.

RTD/CLINK Addresses - Maximum 32 RTDs

VSM5 is available **only** with 8 VCF (FICON) cards in the configuration shown in FIGURE 1-1.

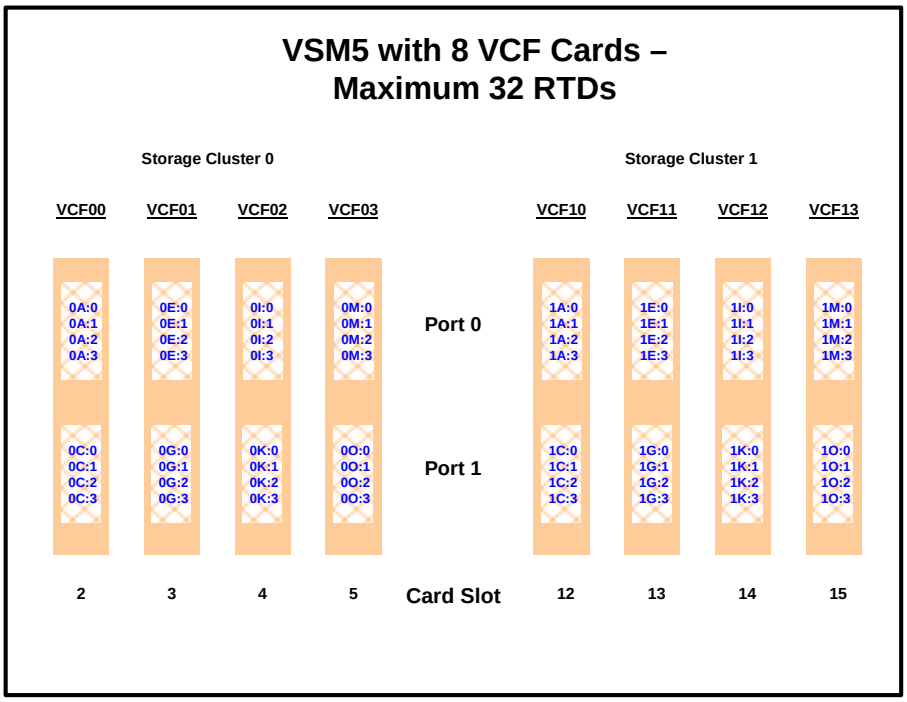


FIGURE 1-1 VSM5 with 8 VCF cards - Max 32 RTDs

As FIGURE 1-1 shows, with the requirements described in TABLE P-1 on page x, each FICON interface supports 4 devices attached via FICON directors. **Note that** while 64 **potential** addresses are shown, you can only attach a **maximum** of 32 RTDs.

Also note that the addressing scheme used by VTCS **is different** from that used for support of 2 devices per interface. The device addresses are now in the format *CI*:*R*, where:

- *C* is the cluster number (0 or 1)
- *I* is the interface number (A, C, E, G, I, K, M, or O)
- *R* is the device number on the interface (0, 1, 2, or 3).

TABLE 1-2 on page 9 shows the “old” address (maximum 16 RTDs) and its corresponding “new” address (maximum 32 RTDs).

Note – If you upgrade an existing configuration from maximum 16 to maximum 32 RTDs, you have to change the addresses in your CONFIG deck on your RTD statements, your CLINK statements, or both.

TABLE 1-2 RTD/CLINK Addresses - Maximum 32 RTDs

Cluster Number	Interface	RTD/CLINK	Old Address (Maximum 16 RTDs)	New Address (Maximum 32 RTDs)
0	A	0	0A	0A:0
0	A	1	0B	0A:1
0	A	2	-	0A:2
0	A	3	-	0A:3
0	C	0	0C	0C:0
0	C	1	0D	0C:1
0	C	2	-	0C:2
0	C	3	-	0C:3
0	E	0	0E	0E:0
0	E	1	0F	0E:1
0	E	2	-	0E:2
0	E	3	-	0E:3
0	G	0	0G	0G:0
0	G	1	0H	0G:1
0	G	2	-	0G:2
0	G	3	-	0G:3
0	I	0	0I	0I:0
0	I	1	0J	0I:1
0	I	2	-	0I:2
0	I	3	-	0I:3
0	K	0	0K	0K:0
0	K	1	0L	0K:1
0	K	2	-	0K:2
0	K	3	-	0K:3
0	M	0	0M	0M:0
0	M	1	0N	0M:1
0	M	2	-	0M:2
0	M	3	-	0M:3
0	O	0	0O	0O:0
0	O	1	0P	0O:1
0	O	2	-	0O:2
0	O	3	-	0O:3
1	A	0	1A	1A:0
1	A	1	1B	1A:1
1	A	2	-	1A:2
1	A	3	-	1A:3

TABLE 1-2 RTD/CLINK Addresses - Maximum 32 RTDs

1	C	0	1C	1C:0
1	C	1	1D	1C:1
1	C	2	-	1C:2
1	C	3	-	1C:3
1	E	0	1E	1E:0
1	E	1	1F	1E:1
1	E	2	-	1E:2
1	E	3	-	1E:3
1	G	0	1G	1G:0
1	G	1	1H	1G:1
1	G	2	-	1G:2
1	G	3	-	1G:3
1	I	0	1I	1I:0
1	I	1	1J	1I:1
1	I	2	-	1I:2
1	I	3	-	1I:3
1	K	0	1K	1K:0
1	K	1	1L	1K:1
1	K	2	-	1K:2
1	K	3	-	1K:3
1	M	0	1M	1M:0
1	M	1	1N	1M:1
1	M	2	-	1M:2
1	M	3	-	1M:3
1	O	0	1O	1O:0
1	O	1	1P	1O:1
1	O	2	-	1O:2
1	O	3	-	1O:3

CONFIG Utility GLOBAL Statement

The CONFIG utility GLOBAL statement specifies VTCS global values. This statement is required.

Syntax

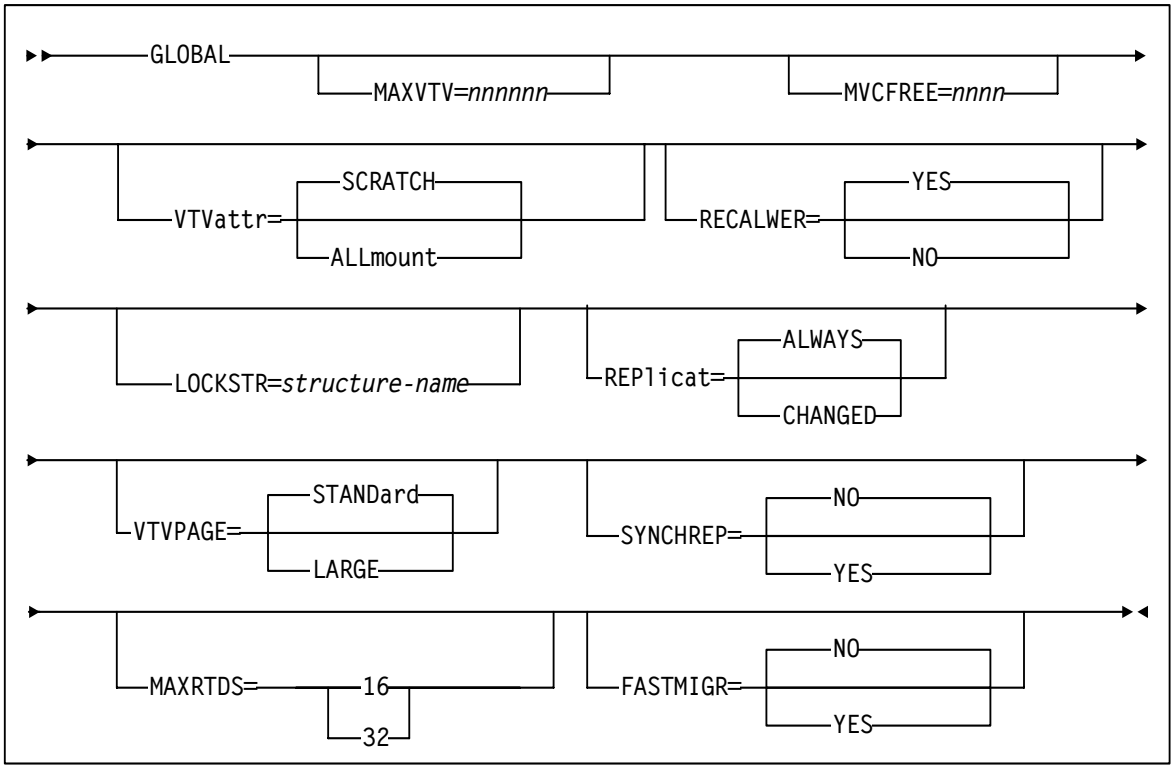


FIGURE 1-2 GLOBAL statement syntax

Parameters

MAXVTV=*nnn*

specifies the maximum number of VTVs that can be migrated to a single MVC. The default is 32001 for a D, E, or F level CDS and 65000 for a G level CDS. Valid values are:

- 4 to 32001 for a D, E or F level CDS.
- 4 to 65000 for a G level CDS.

Note – For compatibility purposes, a hard limit of 32001 VTV copies will be enforced upon a 'G' level CDS if the MAXMIG parameter has a value of <=32000. This is to automatically inhibit the generation of MVCs that will cause problems with regressing the CDS back to a D, E or F level.

MVCFREE=*nnn*

specifies the minimum number of free MVCs in the MVC pool. A free MVC has 100% usable space and does not contain any migrated VTVs. Valid values are 0 to 255. The default is 40.

If free MVCs is equal or less than this value, VTCS issues message SLS6616I and starts an automatic space reclamation.

Note – If you set MVCFREE=0, VTCS actually uses the default value (40).

VTVattr=SCRATCH | ALLmount

specifies when VTCS assigns a Management Class to a VTV.

SCRATCH

Assign a Management Class only when VTCS does a scratch mount of the VTV (the default).

ALLmount

Assign a Management Class whenever VTCS mounts the VTV.

Caution – If you specify that VTCS assigns a Management Class whenever VTCS mounts a VTV, these attributes can change, which can cause undesirable or unpredictable results.

For example, if an application writes data set PROD.DATA to VTV100 with a Management Class of PROD, then writes data set TEST.DATA to VTV100 with a Management Class of TEST, then the VTV (and both data sets) has a Management Class of TEST. Similarly, it is possible to write TAPEREQ statements or SMS routines that assign different Management Classes to the same data set (for example, based on jobname), which can also cause a VTV's Management Class to change.

RECALWER

specifies whether VTCS recalls VTVs with read data checks (applies to recall and drain operations).

YES

recall VTVs with read data checks (the default).

NO

Do not recall VTVs with read data checks.

LOCKSTR=*structure-name*

specifies the Coupling Facility Structure that holds VTCS Lock Data. The Structure Name must be 16 characters or less and conform to IBM's standard for naming Coupling Facility Structures. For more information, see *Installing and Configuring VTCS*.

Caution – CONFIG RESET **is required** to add LOCKSTR=*structure-name* to a CDS that did not previously use LOCKSTR=*structure-name* and to remove LOCKSTR=*structure-name* from a CDS. CONFIG RESET is **not** required to change lock structure names (for example, going from LOCKSTR=VTCSL1 to LOCKSTR=VTCSL2).

REPlicat

specifies when VSM replicates the VTV.

ALWAYS

The replicate request is added to the VTCS replication queue every time the VTV is dismounted, regardless of whether the VTV was changed while it was mounted (the default).

CHANGED

The replicate request is added to the VTCS replication queue if the VTV:

Was changed while it was mounted **or**

Was only read while mounted but less than the expected number of MVC copies of the VTV exist.

Note – **Regardless** of the CONFIG GLOBAL REPlicat setting, replication **also** requires that:

- The VTV must be dismounted in a VTSS that supports replication **and** there cannot be an identical copy of the VTV in the other VTSS in the Cluster.
- In addition to the CONFIG GLOBAL REPlicat value, you **must** specify REPlicat(YES) on a VTV's Management Class for replication to occur. For more information, see"REPlicat" on page 216.

VTVPAGE

specifies the page size used to store VTV data in the VTSS and on the MVCs. This setting only applies to 400 and 800 MB VTVs. If VTVPAGE is not specified on either the MGMTclas statement or the CONFIG GLOBAL statement, the default is STANDard.

STANDard

Standard page size, which is compatible with all VSM3/VSM4/VSM5 models and microcode levels.

LARGE

Large page size, which can provide improved performance within the VTSS and for migrates and recalls. Large page size requires a G level CDS.

Note – For 2 and 4 GB VTVs (MAXVtvsz 2000 or 4000) a VTVPAGE setting of LARGE is always used.

Caution –

- The page size of a VTV can only be changed by a VTV scratch mount. Additional restrictions may also apply for scratch VTVs that were previously resident in a VTSS.
- VTVPAGE **does not** apply to VSM2s. The VSM3/VSM4 microcode requirements are as follows:
- For VSM3s: microcode level N01.00.77.00 and above.
- For VSM4s/VSM5s: microcode level D02.02.00.00 and above.
- If you specify LARGE and the CDS level and/or VTSS microcode **do not** support LARGE, VTCS issues warning messages and VTVPAGE defaults to STANDard.
- Specifying LARGE automatically sets MAXTVTV to 65,000.
- Creating VTVs with large pages makes these VTVs **unreadable** in configurations that do not support large VTV pages.

SYNCHREP

specifies whether VTV synchronous replication feature is enabled.

NO

Synchronous replication is not enabled (the default).

YES

Synchronous replication is enabled.

Note – SYNCHREP=YES merely enables synchronous replication. To actually implement synchronous replication, you must create a Management Class that specifies REPLicat= YES_SYNC.

MAXRTDS

specifies the maximum number of RTDs supported.

16

up to 16 RTDs supported.

32

up to 32 RTDs supported.

Note – MAXRTDS = 32 has the prerequisites described in TABLE P-1 on page x.

FASTMIGR

Specifies if the stacked migrates feature is enabled for all VTSSs that support this feature.

YES

Enable stacked migrates.

No

Disable stacked migrates (the default).

Note – FASTMIGR=YES has the prerequisites described in TABLE P-1 on page x. For this feature to be enabled, **all hosts** must be running the prerequisites, otherwise:

- If a host is active that does not support or tolerate stacked migrates, this will cause the CONFIG utility to return an error.
- If a host is started and does not tolerate or support this feature, the host will shut down.

CONFIG Utility RTD and CLINK Statements

The CONFIG utility RTD statement defines the RTDs connected to the VTSS. Specifically, the CONFIG RTD CHANIF parameter specifies the channel interface on the VTSS that communicates with the RTD.

Similarly, the The CONFIG utility CLINK statement defines the channel interface for a CLINK originator via the CONFIG CLINK CHANIF parameter.

Code values for the CHANIF parameter as follows:

- Regardless of whether the Maximum 32 RTDs feature is enabled, if you do not have a total of greater than 16 (RTDs, CLINK originators, or a combination of RTDs and CLINK originators) on that VTSS, you can use the “old” addressing scheme on the CHANIF parameters.
- If, however, the Maximum 32 RTDs feature is enabled and you have total of greater than 16 (RTDs, CLINK originators, or a combination of RTDs and CLINK originators) on that VTSS, you must use the “new” addressing scheme on the corresponding CHANIF parameters.

For more information, see “RTD/CLINK Addresses - Maximum 32 RTDs” on page 8.

Display CONFIG Output

FIGURE 1-3 shows an example of Display CONFIG output.

```
MAXVTV          MVCFREE     VTVATTR     RECALWER    SYNCHREP    REPlicat    VTVPAGE     MAXRTDS
4000            10          SCRATCH     YES         YES         ALWAYS      LARGE       32
FASTMIGR
YES
LOCK DATA IS HELD IN COUPLING FACILITY STRUCTURE STK_VTCS_LOCKS


CDS LEVEL       V5/5.1      V6          V6.1        V6.2
SUPPORT:
                                        *           *


RECLAIM:        THRESHOLD   MAXMVC      START       CONMVC
                30          10          10          2


VTSSNAME        AUTO MIGR THR           MIGR TASKS  DEFAULT     VSM         2 GB/4 GB   PAGE
                                                                                        SIZE
                LOW         HIGH        MIN   MAX   ACS         MODEL
HBVTSS16        60          80          1     1     FF          4           Y           LARGE
HBVTSS17        60          80          1     4     02          4           Y           LARGE
HBVTSS18        60          80          4     4     01          4           Y           LARGE
HBVTSS19        60          80          1     1     01          4           Y           LARGE


DEVNO           RTD TYPE    ACS         RETAIN      VTSSNAME    RTD NAME    CHANIF
2A00            STK1RC      00          10          HBVTSS16    SS162A00    0A:0
2A01            STK1RC      00          10          HBVTSS16    SS162A01    0E:0
2A02            STK1RC      00          10          HBVTSS16    SS162A02    0A:0
2A0C            STK1RC      02          10          HBVTSS16    SS162A0C    0M:0
```

FIGURE 1-3 Example output from Display CONFIG

MAXVTV

the GLOBAL MAXVTV setting.

MVCFREE

the GLOBAL MVCFREE setting.

VTVATTR

the GLOBAL VTVattr setting (**SCRATCH** or **ALLmount**).

RECALWER

the GLOBAL RECALWER setting (**YES** or **NO**).

SYNCHREP

the GLOBAL SYNCHREP setting (**YES** or **NO**).

REPLicat

the GLOBAL REPLicat setting (**ALWAYS** or **CHANGED**).

VTVPAGE

The VTV page size (STANDARD or LARGE).

MAXRTDS

the GLOBAL MAXRTDs setting (16 or 32).

FASTMIGR

the GLOBAL FASTMIGR setting (**YES** or **NO**).

LOCK DATA IS HELD IN...

Name of VTCS Lock Structure, if it exists.

CDSLEVEL SUPPORT

the VTCS level(s) that can access the active CDS. For more information, see *Installing and Configuring VTCS*, "Reconfiguring NCS," "Converting the Formatted CDS to VSM Extended Format."

THRESHOLD

the RECLAIM THRESHLD setting.

MAX MVC

the RECLAIM MAXMVC setting.

START

the RECLAIM START setting.

CONMVC

the RECLAIM CONMVC setting.

VTSSNAME

the VTSS identifiers (VTSS NAME settings).

AUTO MIGR THR, LOW

The low automatic migration threshold setting (LAMT) for the VTSS.

AUTO MIGR THR, HIGH

The high automatic migration threshold setting (HAMT) for the VTSS.

MIGR TASKS, MIN

The minimum number of concurrent automatic migration tasks setting (MINMIG) for the VTSS.

MIGR TASKS, MAX

The maximum number of concurrent automatic migration tasks setting (MAXMIG) for the VTSS.

DEFAULT ACS

The default ACS setting (DEFLTACS) for the VTSS.

VSM MODEL

2, 3, or 4.

2GB / 4GB

VTSS configured for 2 GB / 4GB VTV sizes (Y or N).

PAGE SIZE

VTV page size (STANDARD or LARGE).

DEVNO

the RTD MVS device numbers for the VTSS (RTD DEVNO settings).

RTD TYPE

the RTD type.

ACS

the ACS that contains the RTD.

RETAIN

the VTSS RETAIN setting.

VTSSNAME

the VTSS identifiers (VTSS NAME settings) of the VTSSs connected to the RTD.

RTD NAME

the RTD names for the VTSS (RTD NAME settings).

CHANIF

the RTD channel interface (RTD CHANIF settings). For more information, see “RTD/CLINK Addresses - Maximum 32 RTDs” on page 8.

Display CLINK Output

FIGURE 1-4 shows an example of Display CLINK output.

VTSS	CLINK	STATUS	USAGE	HOST
HBVTSS19	0C:0	ON-SYNC	REPLICATING	EC21
	0C:1	ON-SYNC	FREE	
	0E:0	ON-SYNC	FREE	
	0E:1	ON-SYNC	FREE	

FIGURE 1-4 Example output from Display CLINK

VTSS

the Primary or Sending VTSS name.

CLINK

the link ID. For more information, see “RTD/CLINK Addresses - Maximum 32 RTDs” on page 8.

STATUS

one of the following link statuses:

Maint

The link has failed or it has been varied into maintenance mode.

Offline

The link is offline and unavailable to all hosts and VTSSs.

On-Sync

Available for synchronous replication.

On-Async

Available for asynchronous replication.

P_offlne

The link is pending offline

P_online

The link is pending online

Recovery

The link is being reset following an error or a vary online operation.

Unusable

Not available for replication due to hardware errors or assigned-elsewhere conditions.

USAGE

one of the following link usages:

Assigned

Link is assigned to the host in the HOST field but is not currently replicating. This usage occurs when VTCS is starting or terminating link use or is attempting error recovery on the link after a replication failure.

Free

Link is idle (not doing replications).

Replicating

Link is actively doing replications.

HOST

the host that the link is assigned to.

DECOM Utility and XML Changes

The DECOM utility now outputs the global setting for MAXRTDs and FASTMIGR.

XML output of the CONFIG utility, DECOM utility and the QUERY CONFIG command now includes the following tags:

```
<global_fast_migrate>nnn</global_fast_migrate>
```

SMF Record Changes

SLSSMF16 - VTCS SMF Subtype 16 Record

Function

Records an RTD mount request.

TABLE 0-1 SLSSMF16 Record Format

Decimal Offset	Hexadecimal Offset	Type	Length	Label	Description
0	0	start of record		SMF16VTS	VTCS SMF record subtype 16
0	0	character	8	SMF16VTS	VTSS ID
8	8	hexstring	2	SMF16RID	RTD ID (0-1F)
10	A	character	6	SMF16MID	MVC volser ID
16	10	character	6	SMF16AID	actual volser from VOL1 label
22	16	bitstring	2	SMF16RWS	read/write state (thumbwheel)
		X’0001’		SMF16RRO	read only state
		X’0002’		SMF16RRW	read/write state
24	18	bitstring	2	SMF16MT	mount request type
		X’0001’		SMF16MTM	migrate
		X’0002’		SMF16MTR	recall
		X’0003’		SMF16MTL	reclaim
		X’0004’		SMF16MTD	drain
		X’0005’		SMF16MTA	audit
		X’0006’		SMF16MTC	consolidate
		X’0007’		SMF16MTX	export
26	1A	hexstring	32	SMF16SNS	RTD sense data (all zeros or all X’FF’s unless RTD errors occur)
58	3A	hexstring	8	SMF16MST	mount start timestamp (TOD), where mount start occurs when HSC receives a successful request to load the requested MVC
66	42	hexstring	8	SMF16MET	mount end timestamp (TOD), where mount end occurs when the VTSS receives a successful ECAM-T request to mount the requested MVC on an RTD
74	4A	character	8	SMF16SCL	MVC Storage Class
76	4C	character	2	SMF16INF	RTD Channel Interface ID
80	50	character	4	SMF16ADR	MVS address of RTD

SLSSMF17 - VTCS SMF Subtype 17 Record

Function

Records an RTD dismount request.

TABLE 0-2 SLSSMF17 Record Format

Decimal Offset	Hexadecimal Offset	Type	Length	Label	Description
0	0	start of record		SLSSMF17	VTCS SMF record subtype 17
0	0	character	8	SMF17VTS	VTSS ID
8	8	hexstring	2	SMF17RID	RTD ID (0-1F)
10	A	hexstring	64	SMF17BLD	RTD buffered log data
74	4A	hexstring	32	SMF17SNS	RTD sense data (all zeros or all X'FF's unless RTD errors occur)
106	6A	character	8	SMF17SCL	MVC Storage Class
114	72	character	6	SMF17MVC	MVC volser
120	78	character	2	SMF17INF	RTD Channel Interface ID
122	7A	character	4	SMF17ADR	MVS address of RTD

SLSSMF18 - VTCS SMF Subtype 18 Record

Function

Records a migrate VTV request.

TABLE 0-3 SLSSMF18 Record Format

Decimal Offset	Hexadecimal Offset	Type	Length	Label	Description
0	0	start of record		SLSSMF18	VTCS SMF record subtype 18
0	0	character	8	SMF18VTS	VTSS ID
8	8	hexstring	2	SMF18RID	RTD ID (0-1F)
10	A	character	6	SMF18VID	VTV volser ID
16	10	character	6	SMF18MID	MVC volser ID
22	16	hexstring	4	SMF18VPO	VTV position on this MVC (block ID)
26	1A	character	6	SMF18AID	actual volser from VOL1 label
32	20	hexstring	4	SMF18MSZ	uncompressed size of the VTV in bytes
36	24	hexstring	4	SMF18BCM	the number of virtual tape pages in 32K increments required to migrate the VTV to an RTD
40	28	hexstring	4	SMF18TIM	the last time the VTV was successfully mounted on a VTD (ttime format, seconds since 1/1/70)
44	2C	bitstring	2	SMF18MT	migrate request type
		X’0001’		SMF18MTA	auto
		X’0002’		SMF18MTI	immediate
		X’0003’		SMF18MTD	demand
		X’0004’		SMF18MTR	reclaim
		X’0005’		SMF18MTC	consolidate
		X’0006’		SMF18MTX	export
46	2E	bitstring	2	SMF18CTP	cartridge type
		X’0000’		SMF18SCT	S-cart (max 400MB size)
		X’0001’		SMF18ECT	E-cart (max 800MB size)
		X’0002’		SMF182GB	2000MB

TABLE 0-3 SLSSMF18 Record Format

Decimal Offset	Hexadecimal Offset	Type	Length	Label	Description
		X’0003’		SMF184GB	4000MB
48	30	hexstring	4	SMF18NPO	next MVC position (block ID)
52	34	hexstring	32	SMF18SNS	RTD sense
84	54	hexstring	8	SMF18MST	migrate start timestamp (TOD)
92	5C	hexstring	8	SMF18MET	migrate end timestamp (TOD)
100	64	character	8	SMF18MGT	VTV Management Class
108	6C	character	8	SMF18SCL	MVC Storage Class
116	74	character	2	SMF18INF	RTD Channel Interface ID
118	78	character	4	SMF18ADR	MVS address of RTD

SLSSMF19 - VTCS SMF Subtype 19 Record

Function

Records a recall VTV request.

TABLE 0-4 SLSSMF19 Record Format

Decimal Offset	Hexadecimal Offset	Type	Length	Label	Description
0	0	start of record		SMF19VTS	VTCS SMF record subtype 19
0	0	character	8	SMF19VTS	VTSS ID
8	8	hexstring	2	SMF19RTD	RTD ID (0-1F)
10	A	character	6	SMF19VID	VTV volser ID
16	10	character	6	SMF19MID	MVC volser ID
22	16	hexstring	4	SMF19VPO	VTV position on this MVC (block ID)
26	1A	bitstring	2	SMF19RE	recall with error
		X’0000’		SMF19REN	no
		X’0001’		SMF19REY	yes
28	1C	character	6	SMF19AID	actual volser from VOL1 label
34	22	hexstring	4	SMF19MSZ	VTV media size
38	26	hexstring	4	SMF19BCM	number of bytes currently recalled
42	2A	hexstring	4	SMF19TIM	the last time the VTV was successfully mounted on a VTD (ttime format, seconds since 1/1/70)
46	2E	bitstring	2	SMF19RT	recall request type
		X’0001’		SMF19RTA	auto
		X’0002’		SMF19RTN	drain
		X’0003’		SMF19RTD	demand
		X’0004’		SMF19RTR	reclaim
		X’0005’		SMF19RTC	consolidate
		X’0006’		SMF19RTX	export
48	30	bitstring	2	SMF19CTP	cartridge type
		X’0000’		SMF19SCT	S-cart (max 400MB size)
		X’0001’		SMF19ECT	E-cart (max 800MB size)
		X’0002’		SMF192GB	2000MB

TABLE 0-4 SLSSMF19 Record Format

Decimal Offset	Hexadecimal Offset	Type	Length	Label	Description
		X’0003’		SMF194GB	4000MB
50	32	hexstring	32	SMF19SNS	RTD sense
82	52	hexstring	8	SMF19RST	recall start timestamp (TOD)
90	5A	hexstring	8	SMF19RET	recall end timestamp (TOD)
98	62	character	8	SMF19MGT	VTV Management Class
106	6A	character	8	SMF19SCL	MVC Storage Class
114	72	character	2	SMF19INF	RTD Channel Interface ID
116	74	character	4	SMF19ADR	MVS address of RTD

SLSSMF21 - VTCS SMF Subtype 21 Record

Function

Records a vary RTD.

TABLE 0-5 SLSSMF21 Record Format

Decimal Offset	Hexadecimal Offset	Type	Length	Label	Description
0	0	start of record		SLSSMF21	VTCS SMF record subtype 21
0	0	character	8	SMF21VTS	VTSS ID
8	8	hexstring	2	SMF21RTD	RTD ID (0-1F)
10	A	bitstring	2	SMF21STA	new device state
		X’0001’		SMF21OFF	offline
		X’0002’		SMF21ON	online
		X’0003’		SMF21MAI	maintenance

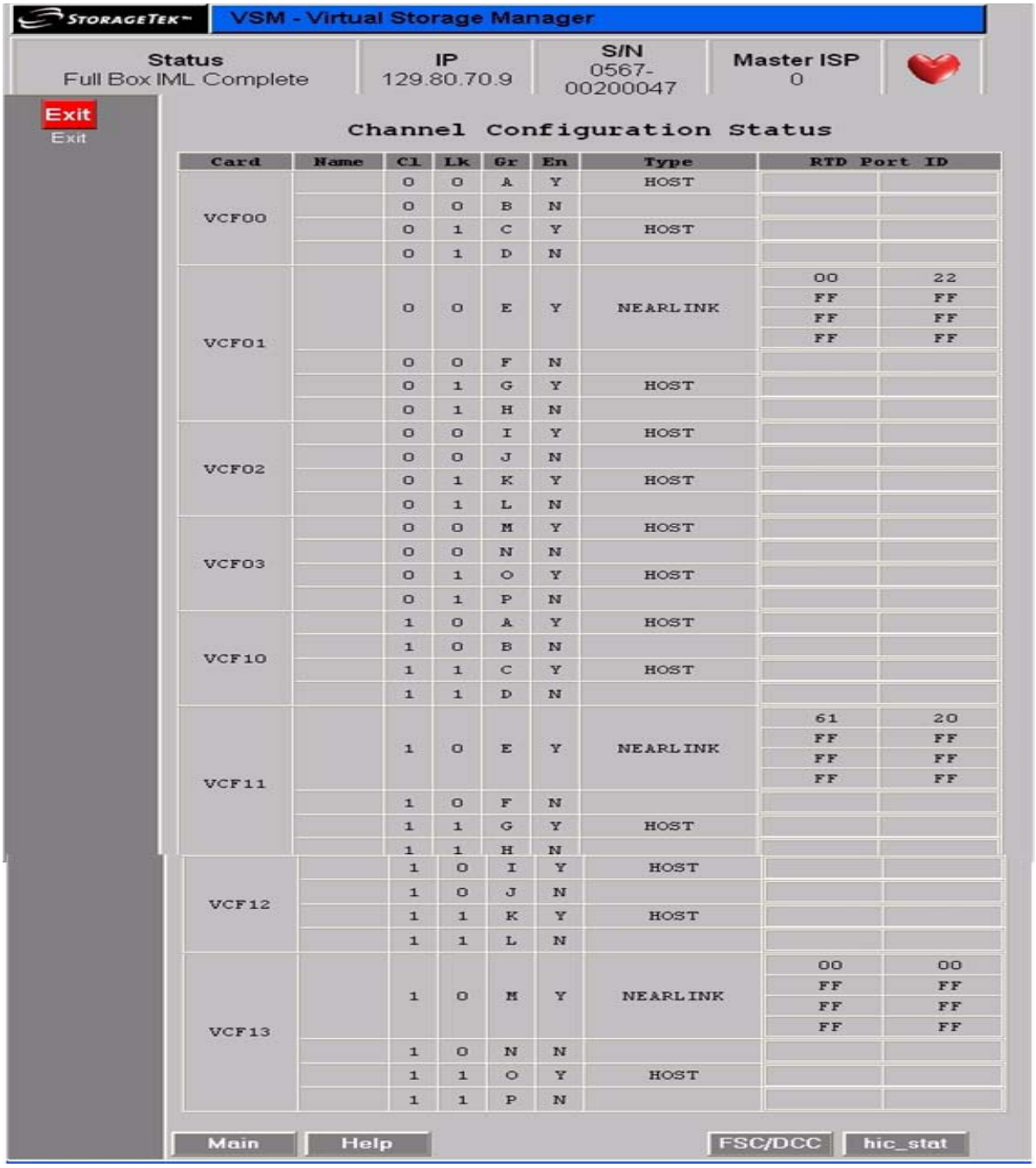
CHAPTER **2**

Changed VSM5 DOP Panels

VTSS source document:
VSM5 Installation and Maintenance Guide

Channel Configuration Status Screen

To access the *Channel Configuration Status* screen, click the active Channel Status text field on the *Configuration / Status Menu* screen.



Card	Name	Cl	Lk	Gr	En	Type	RTD Port ID	
VCF00		0	0	A	Y	HOST		
		0	0	B	N			
		0	1	C	Y	HOST		
		0	1	D	N			
VCF01		0	0	E	Y	NEARLINK	00	22
							FF	FF
							FF	FF
							FF	FF
		0	0	F	N			
		0	1	G	Y	HOST		
		0	1	H	N			
VCF02		0	0	I	Y	HOST		
		0	0	J	N			
		0	1	K	Y	HOST		
		0	1	L	N			
VCF03		0	0	M	Y	HOST		
		0	0	N	N			
		0	1	O	Y	HOST		
		0	1	P	N			
VCF10		1	0	A	Y	HOST		
		1	0	B	N			
		1	1	C	Y	HOST		
		1	1	D	N			
VCF11		1	0	E	Y	NEARLINK	61	20
							FF	FF
							FF	FF
							FF	FF
		1	0	F	N			
		1	1	G	Y	HOST		
		1	1	H	N			
VCF12		1	0	I	Y	HOST		
		1	0	J	N			
		1	1	K	Y	HOST		
		1	1	L	N			
VCF13		1	0	M	Y	NEARLINK	00	00
							FF	FF
							FF	FF
							FF	FF
		1	0	N	N			
		1	1	O	Y	HOST		
		1	1	P	N			

Figure 2-1. Channel Configuration Status Screen

Channel Configuration and RTD Path Validation Screen

To access the *Channel Configuration and RTD Path Validation* screen, click on a VCF card shown on the *Channel Configuration Status* screen.

To set the configuration of a VCF card channel for host or Nearlink use, select the channel (0 or 1) and type from the pull-down lists, then click Continue to display a subscreen with the message **Success**, indicating the configuration change completed successfully. Click Cancel to undo changed settings and return to the *Channel Configuration Status* screen.

To validate a RTD path, select a validation path (0 or 1) from the pull-down list, then click Validate RTD Path to display a subscreen with the message **Channel path *n* was successfully validated**, indicating the selected RTD path is operational.

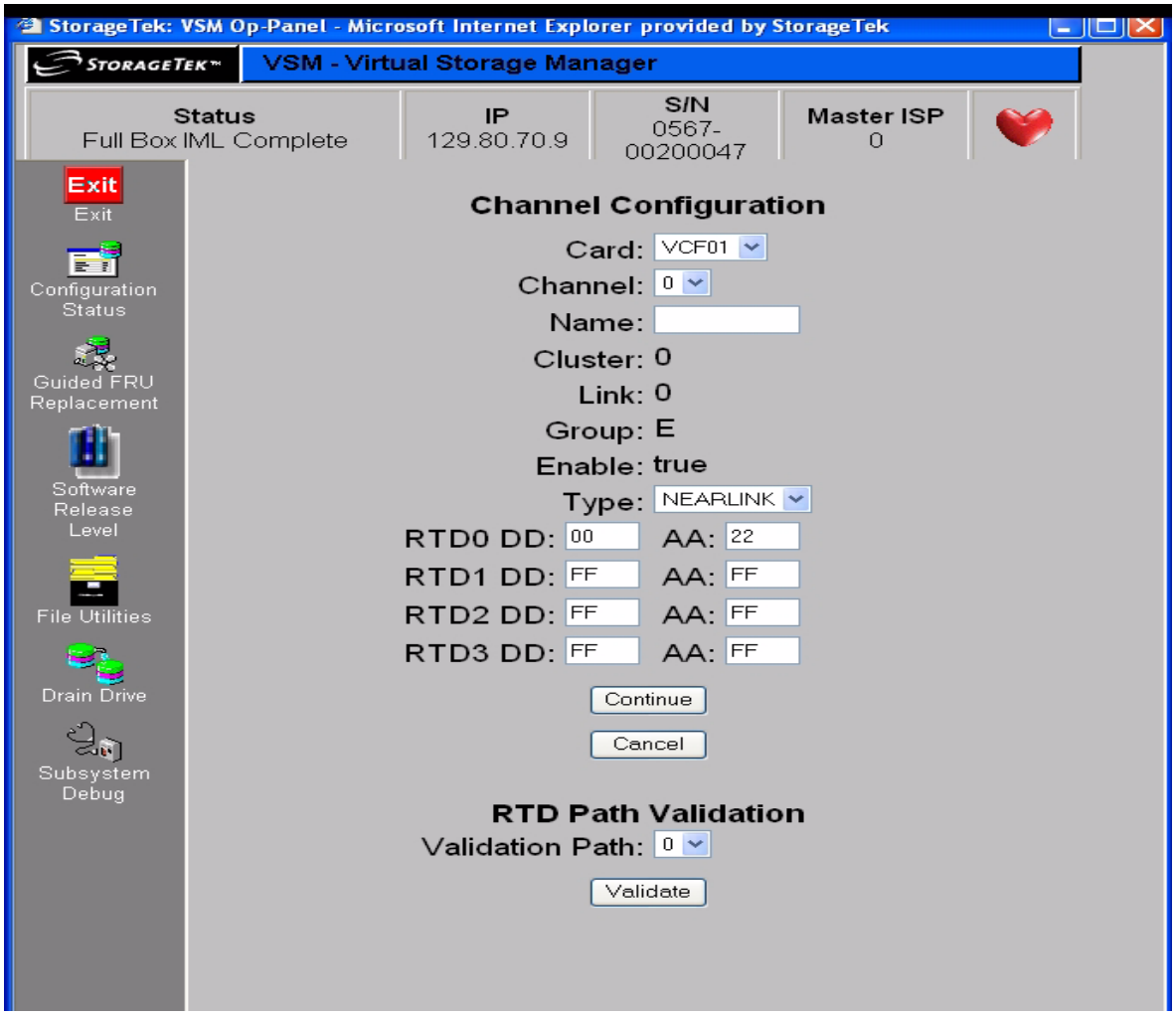


Figure 2-2. Channel Configuration and RTD Path Validation Screen

Real Tape Drive Status Screen

To access the *Real Tape Drive Status* screen, click the active Real Tape Drive Status text field on the *Configuration / Status Menu* screen, FIGURE 2-1. To validate a real tape drive (RTD), click the active button in the Valid column for the RTD. The VTSS support facility validates the RTD, then displays a subscreen with the message **RTD *n* was successfully validated. See hic_stat for details**.

Note: RTD configuration is preserved/restored across cold IML (EPO or CPD), but the links are reset and RTDs are offline until you vary them online with the VTCS VARY RTD ONLINE command.

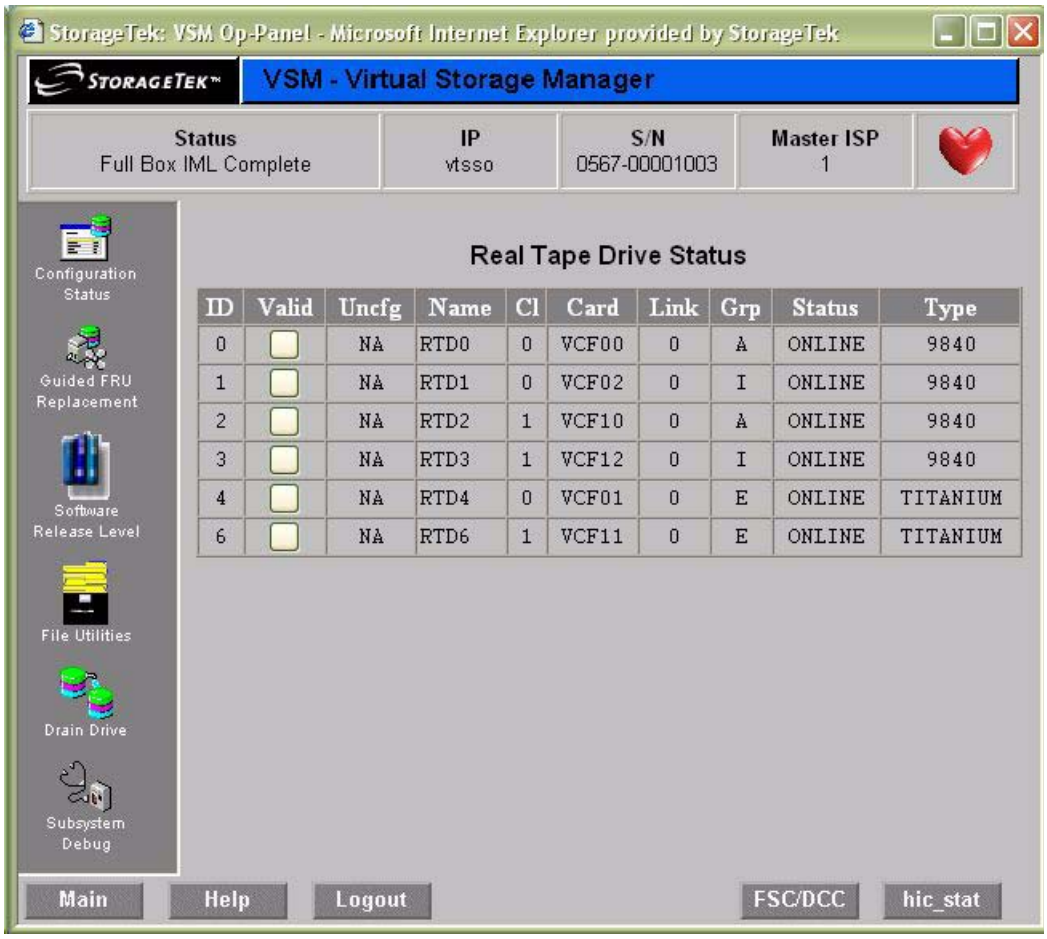


FIGURE 2-1 Real Tape Drive Status Screen

CHAPTER **3**

New VTSS Policies

VTCS 6.2 source document:
Installing and Configuring VTCS

Maximum RTDs per VTSS Policy

VTCS 6.2 source document:
Installing and Configuring VTCS

With the prerequisites described in TABLE P-1 on page x, you can connect up to 32 RTDs per VTSS.

TABLE 3-1 Maximum RTDS per VTSS - 16 or 32

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the maximum RTDs per VTSS.	16, 32	16	CONFIG GLOBAL MAXRTDs

Usage Notes

- For maximum 32 RTDs support, you must fulfill the requirements described in TABLE P-1 on page x.
- The VTCS addressing scheme for maximum 32 RTDs is different than that for maximum 16 RTDs. For more information, see "RTD/CLINK Addresses - Maximum 32 RTDs" on page 8.

Stacked Migrates Policy

VTCS 6.2 source document:
Installing and Configuring VTCS

With the prerequisites described in TABLE P-1 on page x, you can enabled stacked migrates. Enabling the stacked migrates feature can improve migration performance by allowing multiple migrations concurrently to an RTD.

TABLE 3-2 Stacked Migrates Policy

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies whether stacked migrates is enabled	YES, NO	NO	CONFIG GLOBAL FASTMIGR

CHAPTER 4

Implementing Support for New VTSS Features

VTCS 6.2 source document:
Installing and Configuring VTCS

▼ Implementing Support for Maximum of 32 RTDs

1. **Ensure that your system has the Maximum 32 RTDs requirements described in** TABLE P-1 on page x**.**
2. **Use CONFIG GLOBAL to enable support for maximum of 32 RTDs.**

   ```
   CONFIG GLOBAL MAXRTDS=32
   ```

   Note – Enabling support for a maximum of 32 RTDs **does not** require CONFIG RESET. However, regressing from 32 RTDs supported to 16 RTDs supported **does** require CONFIG RESET.

3. **Update your CONFIG RTD and CONFIG CLINK statements as required.**

   For more information, see"VSM5 Configuration" on page 43.

4. **Use the VSM5 DOP to reenter your RTD device addresses.**

   See "Changed VSM5 DOP Panels" on page 33.

▼ Implementing Support for Stacked Migrates

1. **Ensure that your system has the Stacked Migrates requirements described in** TABLE P-1 on page x**.**
2. **Use CONFIG GLOBAL to enable support for Stacked Migrates.**

   ```
   CONFIG GLOBAL FASTMIGR=YES
   ```

   Note – Enabling support for Stacked Migrates **does not** require CONFIG RESET. However, disabling Stacked Migrates **does** require CONFIG RESET.

APPENDIX **A**

VSM5 Configuration

VTCS 6.2 source document:
Installing and Configuring VTCS

The VSM5, provides greater capacity and throughput than the VSM4, while retaining its advantages over the VSM3. TABLE A-1 summarizes the VSM5 features.

TABLE A-1 VSM5 Features

Feature	Description
Host/Nearlink Interfaces	Up to 16 (FICON only)
RTDs supported	Up to 32 via FICON directors (in 3490-emulation mode only), can be a mixture of the following: 9840A, 9840B, 9840C, 9840D, 9840A, 9940B, T10000.
LSMs supported	9740, 9360, 4410, 9310, SL8500
Host Software	NCS/VTCS 6.0 and above
Maximum VTDs per VTSS	256
Maximum VTVs per VTSS	300,000
Note: 9840D support requires the PTFs described in "VTCS Considerations to Correctly Specify MVC Media" on page 1.	

VSM5 FICON VCF Card Options - Maximum 16 RTDs

VSM5 is available **only** with VCF (FICON) cards in the following configurations for a maximum of 16 RTDs:

- FIGURE A-1 shows a VSM5 with 8 VCF cards.
- FIGURE A-2 on page 45 shows a VSM5 with 6 VCF cards, 2 empty card slots.
- FIGURE A-3 on page 46 shows a VSM5 with 4 VCF cards, 4 empty card slots.

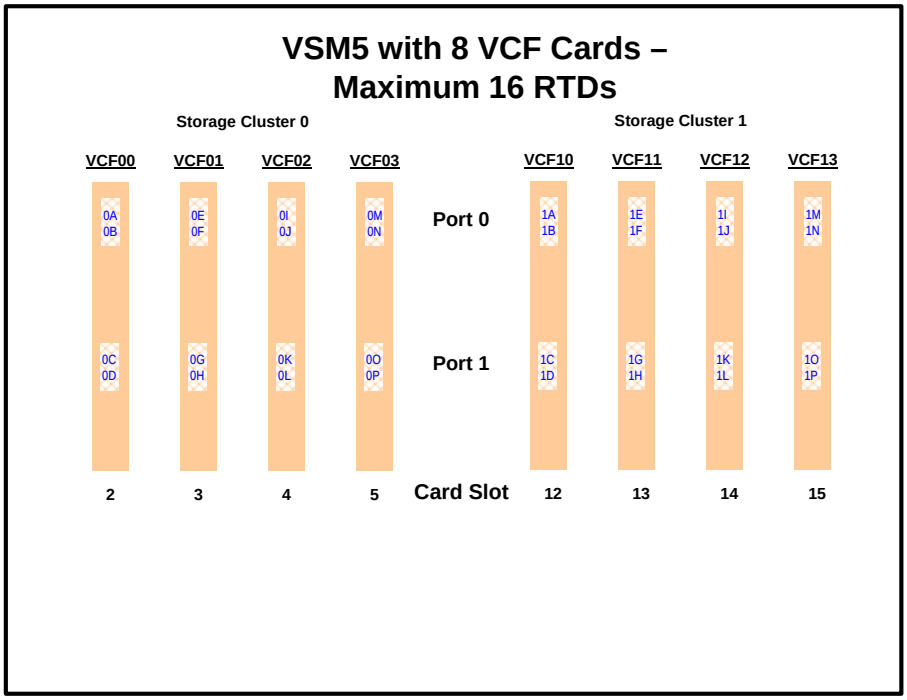


FIGURE A-1 VSM5 with 8 VCF cards - Max 16 RTDs

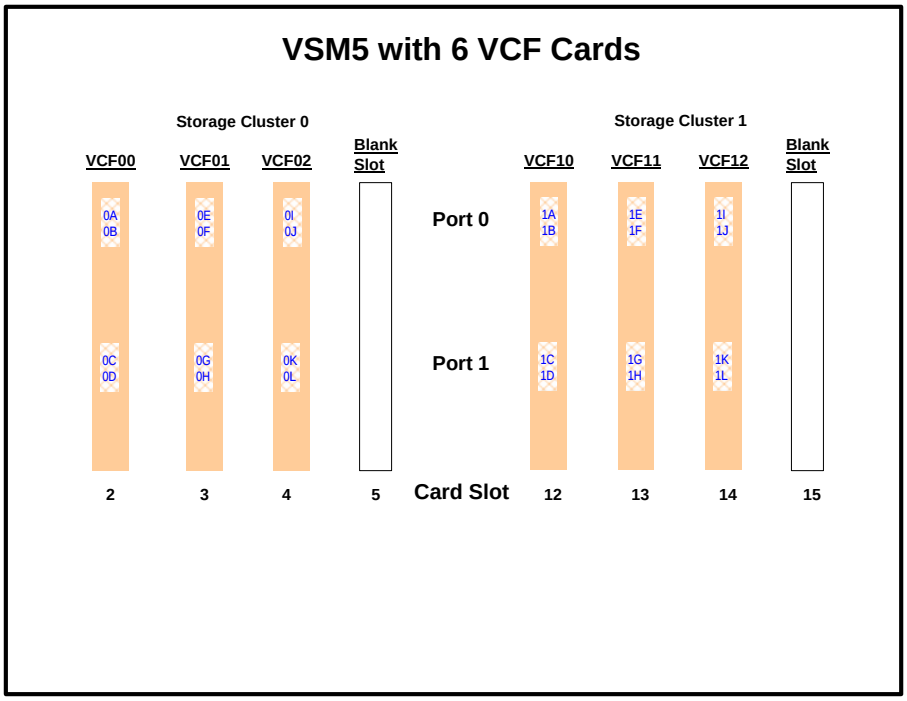


FIGURE A-2 VSM5 with 6 VCF cards, 2 empty card slots

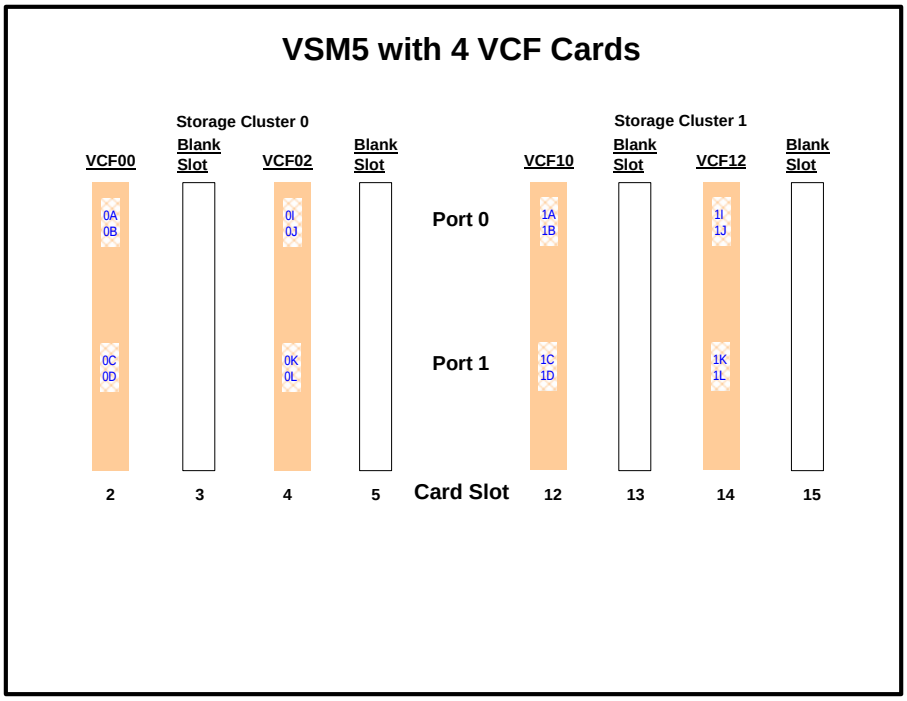


FIGURE A-3 VSM5 with 4 VCF cards, 4 empty card slots

Note –

- In FIGURE A-1 on page 44 through FIGURE A-3 on page 46, the VCF cards must go in:
  - All slots in an eight-VCF card configuration.
  - Slots 2, 3, 4, 13, 14, and 15 in a six-VCF card configuration.
  - Slots 2, 4, 14, and 15 in a four-VCF card configuration.

VSM5 FICON VCF Card Options - Maximum 32 RTDs

VSM5 is available **only** with 8 VCF (FICON) cards in the configuration for a maximum of 32 RTDs shown in FIGURE A-4. For more information on device addressing, see “RTD/CLINK Addresses - Maximum 32 RTDs” on page 8.

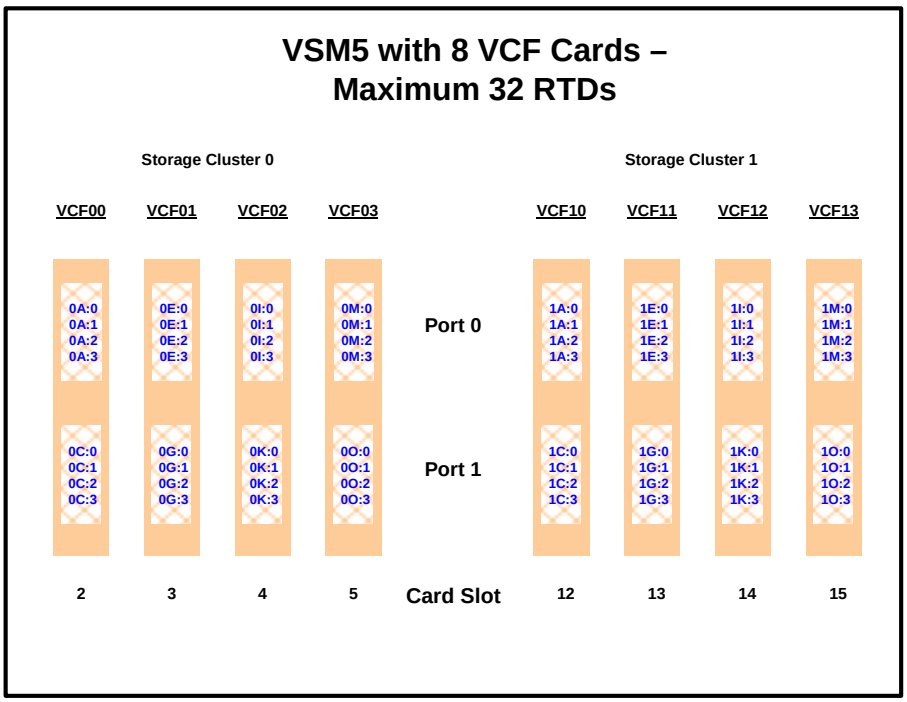


FIGURE A-4 VSM5 with 8 VCF cards - Max 32 RTDs

FICON Port Processing

Note the following:

- FICON ports are controlled by a FICON Interface processor (FIP) and there can be only a total of 14 Nearlink FIPs (for maximum of 16 RTDs supported) or 28 Nearlink FIPs (for maximum of 32 RTDs supported).
- For a VSM5, each FIP can operate with only *one* of two “personalities”, which is set at the VTSS DOP:
  - *Host Mode*. In Host Mode, ports can connect to the host CPU channels, including via Director(s) or channel extenders. A port in Host Mode can also serve as a CLINK terminator.
  - *Nearlink Mode*. In Nearlink Mode, ports can connect to an RTD. A port in Nearlink Mode can also serve as a CLINK originator.
  - **For clustering**, you need an originator port in Nearlink mode on one VTSS connected via a CLINK to a terminator port in Host mode on the other VTSS.
- In FIGURE A-1 on page 44 through FIGURE A-4 on page 47, the ports are shown with their channel interface identifiers where **all ports are enabled**. For more information on device addressing, see “RTD/CLINK Addresses - Maximum 32 RTDs” on page 8.

  Each FICON port can attach to up to 4 RTDs, or up to 4 CLINKs, or up to 4 RTD/CLINK combinations via a FICON director or supported switch (in FICON mode). **Note that**, as shown in these figures, each FICON port has multiple device addresses **only if** the port is connected to a FICON director which is then connected to multiple devices. Multiple Nearlink device connections via a FICON switch or director on the same port dynamically alternate between devices for atomic operations such as mount, migrate VTV, recall VTV, etc. See also TABLE A-2 on page 51.
- Each host FICON channel supports 64 logical paths (times 16 logical units). However, in HCD:
  - From a single MVS host, you can only define 8 channels (CHPIDs) running to a single control unit (single VSM5).
  - You use the CNTLUNIT statement to define each VSM5 as 16 3490 control unit images.
  - You use the IODEVICE statement to define the 16 VTDs that are associated with each 3490 control unit image.

CLINK Port Assignments for Uni-Directional Clustering

FIGURE A-5 shows 2 CLINK ports on each VTSS configured for Uni-Directional Clustering. On the Primary VTSS (VTSS1), the CLINK FIPs are configured in **Nearlink Mode**, while on the Secondary VTSS (VTSS2), the FIPs are configured in **Host Mode**.

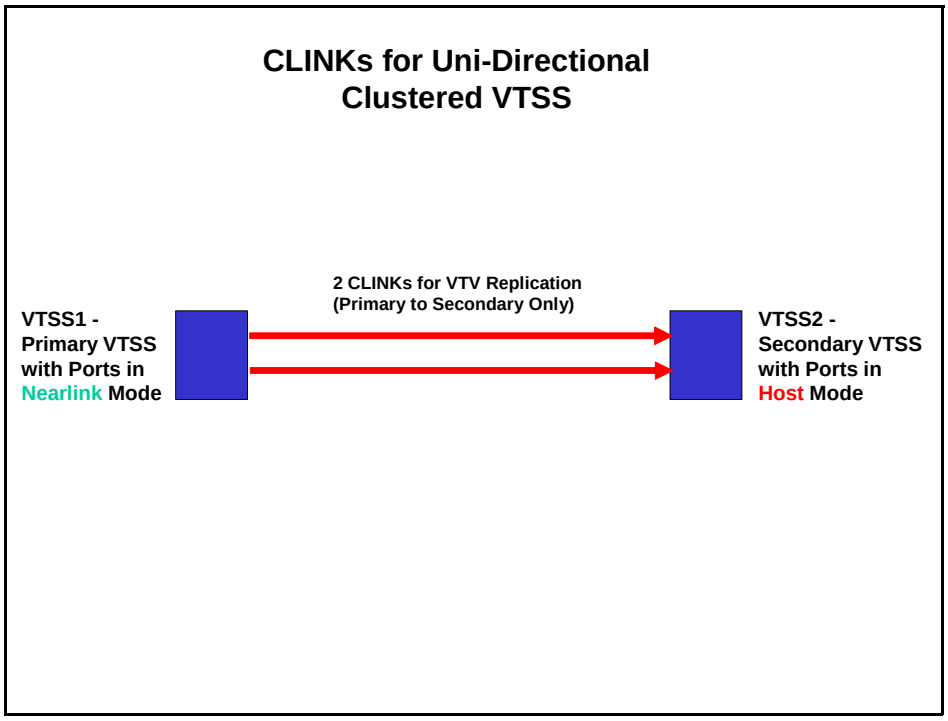


FIGURE A-5 CLINKs for Uni-Directional Clustered VTSS

CLINK Port Assignments for Bi-Directional Clustering

FIGURE A-6 shows 2 CLINK ports on each VTSS configured for Bi-Directional Clustering. **Each** Peer VTSS (VSMPR1 and VSMPR2), must have **both** of the following:

- **One** CLINK FIP configured in **Nearlink Mode** for replicating to the Peer.
- **One** CLINK FIP configured in **Host Mode** for receiving replicated VTVs from the Peer.

Bi-Directional Clustering, therefore, requires pairs of Uni-Directional CLINKs with the FIPSs configured so that the data flows in **opposite directions** on the CLINKs. **Also note** that connections for Bi-Directional Clustering must be made from **different** Storage Clusters on the VTSSs as shown in FIGURE A-6.

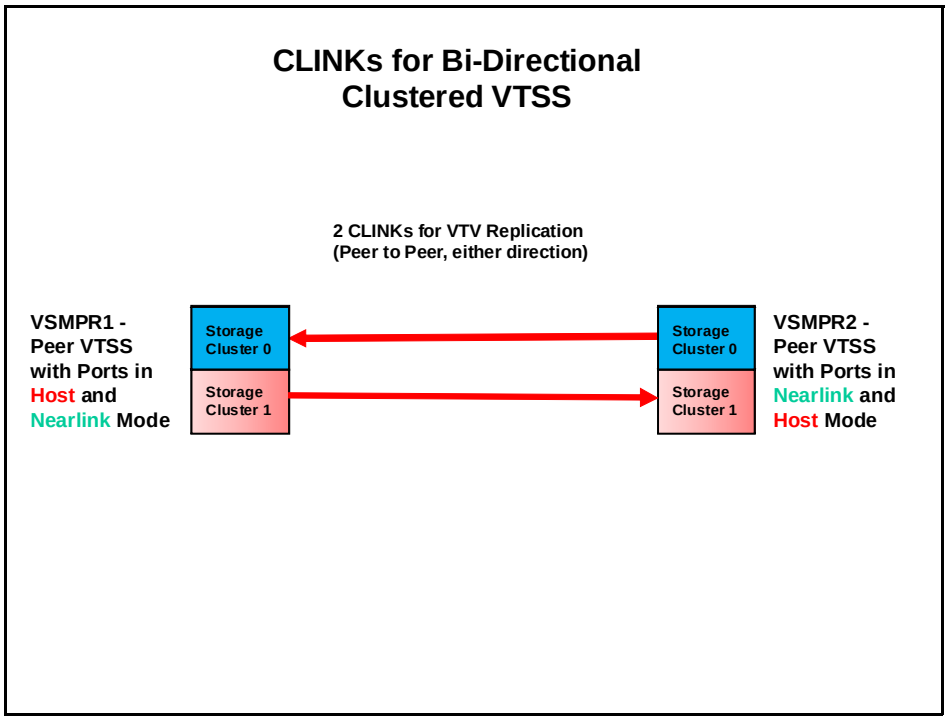


FIGURE A-6 CLINKs for Bi-Directional Clustered VTSS

FICON Port Operations Best Practices

For FICON, what are Best Practices for optimizing port operations? See TABLE A-2...

TABLE A-2 Optimizing VSM5 FICON Port Operations

Configuration - FICON port attached to a FICON Director	Best Practices
Multiple CLINKs (up to 4)	**Don't use**....because only one port can be active at a time. If you're doing Clustered VTSS, you want all CLINK connections to be active all the time.
CLINK and RTD combinations	**An advantage** in Degraded Cluster Mode. For example, in uni-directional clustering, you normally have fewer RTDs on the Primary VTSS because the Secondary is doing most of the migrations. If you have an offline RTD on the same FIP as an active CLINK, if the Secondary fails you can vary the CLINK offline and bring the RTD online to handle more workload on the Primary. **Note that** while the CLINK is active, the RTD is unavailable and is reported as suspended via DISPLAY RTD.
Up to 4 RTDs	**An advantage** for the following: **Optimize use of local and remote RTDs**. During busy shifts, use only local RTDs on the FIP. During quiet periods, switch to remote RTDs for deep archive and DR work. **Optimize use of different drive technologies**. As described in the previous bullet, use a T9840 as a local RTD, then switch to a T9940 for deep archive. You can also use this feature to migrate from older drive technology (such as 9490) to newer technology (such as 9840). Use Management and Storage Classes to read in data from older media, then switch to the newer technology drive to place data on new media. This technique effectively gives you greater physical connectivity to different drive technologies without incurring the overhead of full time, real time FICON connections to each drive type. **Note that** Because of the "only one active" rule, if an RTD on one port is migrating or recalling a VTV, the RTD on the second port cannot be accessed until the operation on the first port completes (the RTD on the second port is in "suspend" mode, as shown by the D RTD command/utility). Best Practices suggests, therefore, that RTDs that **must** be active simultaneously should connect to different FIPs.

VSM5 FICON Front-End and Back-End Configuration Examples

For VSM5s, let's look at two examples of VCF card configurations and implementation:

- "VSM5 Configuration Example: 8 VCF Cards, FICON Directors, 32 RTDs" on page 53
- "VSM5 Configuration Example: 8 VCF Cards, 2 CLINKs, FICON Directors for 24 RTDs" on page 55

For a VSM5 host gen example, see "IOCP Example for Single MVS Host Connected to a VSM5 Via FICON Directors" on page 59.

VSM5 Configuration Example: 8 VCF Cards, FICON Directors, 32 RTDs

FIGURE A-7 shows CONFIG channel interface identifiers for a VSM5 with 8 VCF cards and the Maximum 32 RTDs feature enabled. In this configuration, we've allocated 8 ports to RTDs and 8 ports to host connections. The RTD ports are all connected to FICON directors, each of which is attached to 4 RTDs, so the CHANIF identifiers for all 4 RTDs are shown on each port. This allows Back-End connection to 32 RTDs, although only one RTD per port/Director can be active at a time.

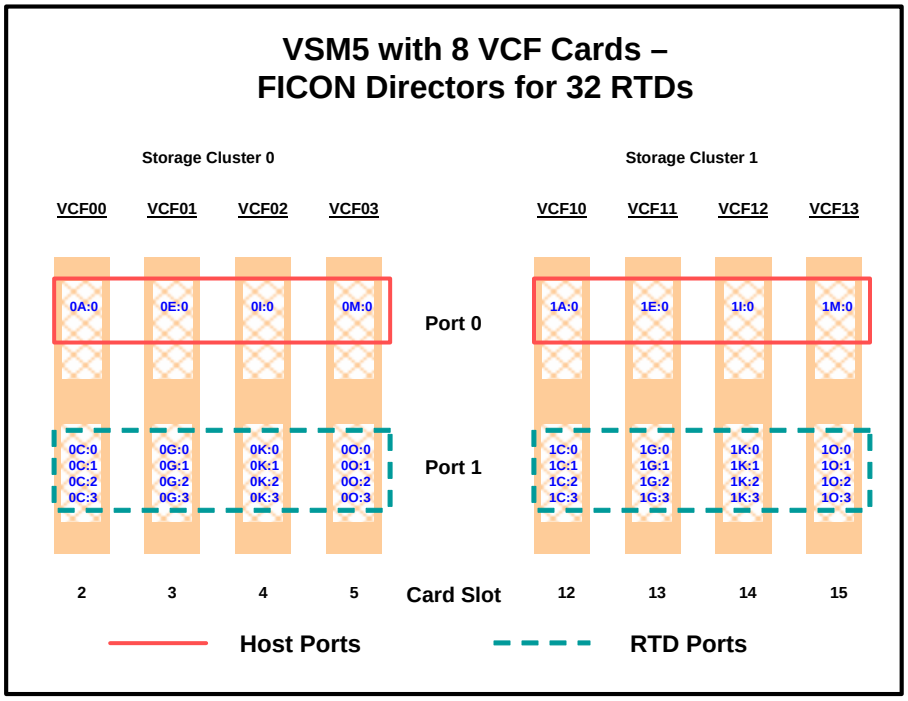


FIGURE A-7 VSM5 with 8 VCF Cards, FICON Directors for 32 RTDs

CONFIG Example for VSM5 FICON with 8 VCF Cards, FICON Directors, 32 RTDs

FIGURE A-8 shows example CONFIG JCL to define the VSM5 configuration shown in FIGURE A-7 on page 53.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG
GLOBAL MAXVTV=32000 MVCFREE=40 VTVATTR=SCRATCH RECALWER=YES LOCKSTR=VTCS_LOCKS
REPLICAT=ALWAYS VTVPAGE=LARGE SYNCHREP=YES MAXRTDS=32
 RECLAIMTHRESHLD=70 MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSM501 LOW=70 HIGH=80 MAXMIG=8 RETAIN=5
 RTD  NAME=VSM52A00 DEVNO=2A00 CHANIF=0C:0
 RTD  NAME=VSM52A01 DEVNO=2A01 CHANIF=0C:1
 RTD  NAME=VSM52A02 DEVNO=2A02 CHANIF=0C:2
 RTD  NAME=VSM52A03 DEVNO=2A03 CHANIF=0C:3
 RTD  NAME=VSM52A04 DEVNO=2A04 CHANIF=0G:0
 RTD  NAME=VSM52A05 DEVNO=2A05 CHANIF=0G:1
 RTD  NAME=VSM52A06 DEVNO=2A06 CHANIF=0G:2
 RTD  NAME=VSM52A07 DEVNO=2A07 CHANIF=0G:3
 RTD  NAME=VSM52A08 DEVNO=2A08 CHANIF=0K:0
 RTD  NAME=VSM52A09 DEVNO=2A09 CHANIF=0K:1
 RTD  NAME=VSM52A0A DEVNO=2A0A CHANIF=0K:2
 RTD  NAME=VSM52A0B DEVNO=2A0B CHANIF=0K:3
 RTD  NAME=VSM52A0C DEVNO=2A0C CHANIF=0O:0
 RTD  NAME=VSM52A0D DEVNO=2A0D CHANIF=0O:1
 RTD  NAME=VSM52A0E DEVNO=2A0E CHANIF=0O:2
RTD  NAME=VSM52A0F DEVNO=2A0F CHANIF=0O:3
RTD  NAME=VSM53A00 DEVNO=3A00 CHANIF=1C:0
 RTD  NAME=VSM53A01 DEVNO=3A01 CHANIF=1C:1
RTD  NAME=VSM53A02 DEVNO=3A02 CHANIF=1C:2
 RTD  NAME=VSM53A03 DEVNO=3A03 CHANIF=1C:3
 RTD  NAME=VSM53A04 DEVNO=3A04 CHANIF=1G:0
 RTD  NAME=VSM53A05 DEVNO=3A05 CHANIF=1G:1
 RTD  NAME=VSM53A06 DEVNO=3A06 CHANIF=1G:2
 RTD  NAME=VSM53A07 DEVNO=3A07 CHANIF=1G:3
 RTD  NAME=VSM53A08 DEVNO=3A08 CHANIF=1K:0
 RTD  NAME=VSM53A09 DEVNO=3A09 CHANIF=1K:1
 RTD  NAME=VSM53A0A DEVNO=3A0A CHANIF=1K:2
 RTD  NAME=VSM53A0B DEVNO=3A0B CHANIF=1K:3
 RTD  NAME=VSM53A0C DEVNO=3A0C CHANIF=1O:0
 RTD  NAME=VSM53A0D DEVNO=3A0D CHANIF=1O:1
 RTD  NAME=VSM53A0E DEVNO=3A0E CHANIF=1O:2
 RTD  NAME=VSM53A0F DEVNO=3A0F CHANIF=1O:3
 VTD LOW=9900 HIGH=99FF
```

FIGURE A-8 CONFIG example: VSM5 with 8 VCF cards, FICON Directors, 32 RTDs

VSM5 Configuration Example: 8 VCF Cards, 2 CLINKs, FICON Directors for 24 RTDs

FIGURE A-9 shows CONFIG channel interface identifiers for a VSM5 with 8 VCF cards and the Maximum 32 RTDs feature enabled. In this configuration, we've allocated:

- 8 Host ports.
- 6 ports for RTDs. The RTD ports are all connected to FICON directors, each of which is attached to 4 RTDs, so the CHANIF identifiers for all 4 RTDs are shown on each port. This allows Back-End connection to 24 RTDs, although only one RTD per port/Director can be active at a time.
- 2 ports (one Nearlink for the originator, one host mode for the terminator) for CLINK connections to form a Bi-Directional VTSS Cluster. To form the clustered VTSS, we'll have two VSM5s (VSMPR1 and VSMPR2) configured identically as shown in FIGURE A-9. As shown in FIGURE A-6 on page 50, Bi-Directional Clustering requires pairs of Uni-Directional CLINKs with the FIPSs configured so that the data flows in **opposite directions** on the CLINKs. To make that happen, let's make 0O:0 the sending (Nearlink Mode) port on both VTSSs and 1O:0 the receiving (Host Mode) port on both VTSSs.

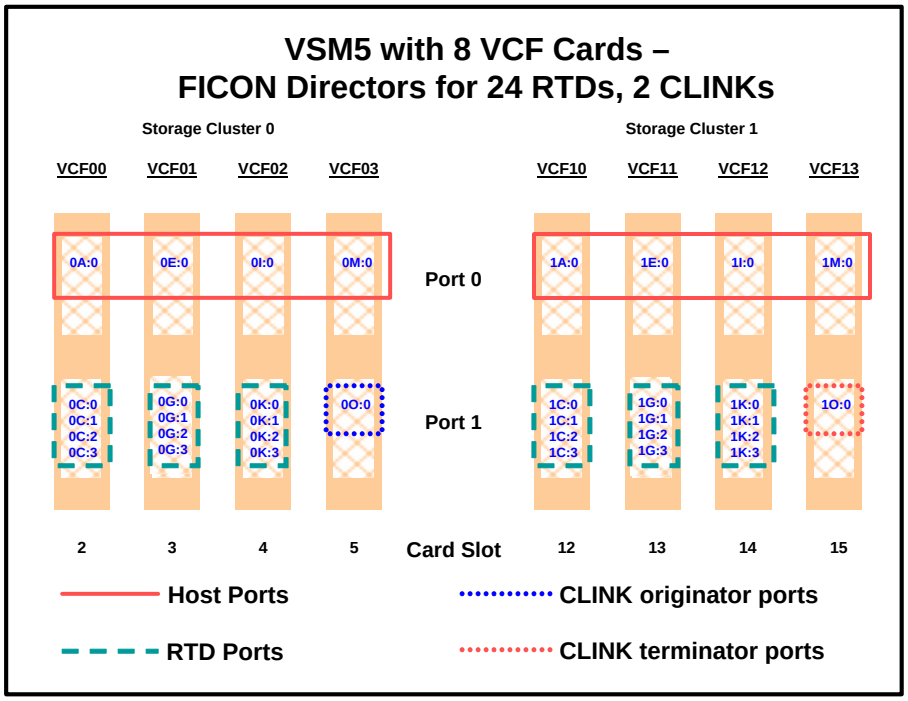


FIGURE A-9 VSM5 with 8 VCF Cards, 8 Host Ports, FICON Directors for 24 RTDs, 2 CLINK Ports

CONFIG Example for Bi-Directional Clustered VSM5 FICON Back-End

FIGURE A-10 shows example CONFIG JCL to define a Bi-Directional Cluster of two VSM5s (VSMPR1 and VSMPR2) with identical VCF card configurations shown in Figure FIGURE A-9 on page 55.

Caution – Bi-Directional Clustering **requires** VTCS 6.1! You **cannot** configure a Bi-Directional Cluster at releases lower than VTCS 6.1! **Also note** that the Clustered VTSSs require the Advanced Management Feature.

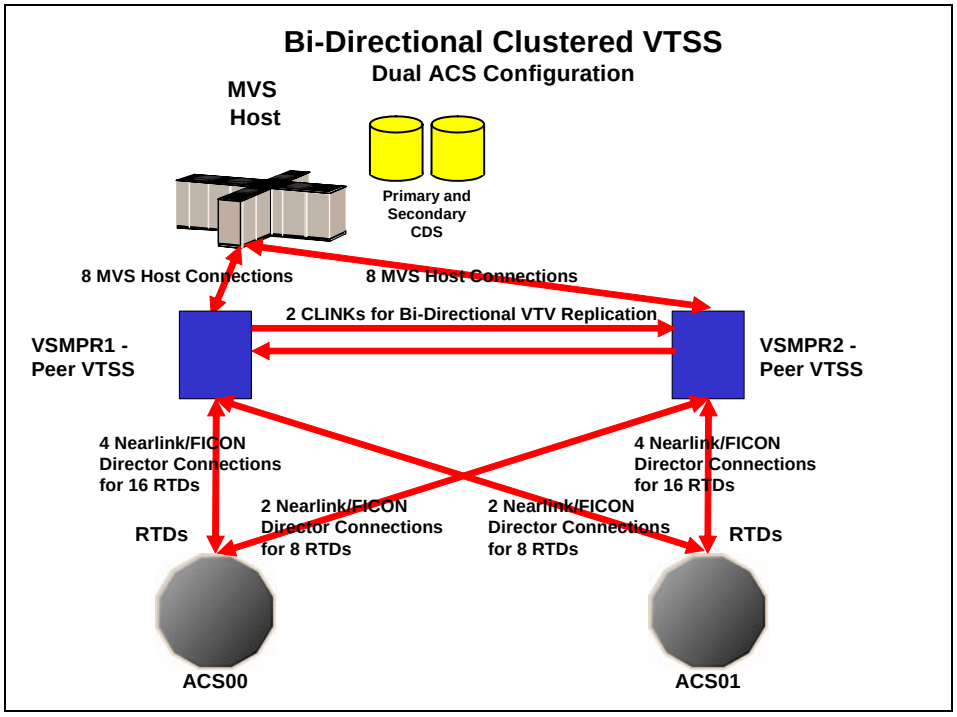


FIGURE A-10 Dual ACS Bi-Directional Clustered VTSS Configuration

FIGURE A-11 and FIGURE A-12 on page 58 show example CONFIG JCL to define a Bi-Directional Cluster of two VSM5s (VSMPR1 and VSMPR2) as shown in Figure 69 on page 203. **Note that**:

- The CLUSTER statement defines the Cluster as consisting of VSMPR1 and VSMPR2.
- There are CLINK statements using the sending (Nearlink Mode) ports of **both VTSSs** to enable the Cluster as Bi-Directional. As described, the Nearlink ports are 0O:0 on both VTSSs.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG RESET CDSLEVEL(V61ABOVE)
GLOBAL MAXVTV=32000 MVCFREE=40 VTVATTR=SCRATCH RECALWER=YES LOCKSTR=VTCS_LOCKS
REPLICAT=ALWAYS VTVPAGE=LARGE SYNCHREP=YES MAXRTDS=32
RECLAIMTHRESHLD=70 MAXMVC=40  START=35
RECLAIMTHRESHLD=70MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSMPR1 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
 RTD  NAME=VPR12A00 DEVNO=2A00 CHANIF=0C:0
 RTD  NAME=VPR12A01 DEVNO=2A01 CHANIF=0C:1
 RTD  NAME=VPR12A02 DEVNO=2A02 CHANIF=0C:2
 RTD  NAME=VPR12A03 DEVNO=2A03 CHANIF=0C:3
 RTD  NAME=VPR12A04 DEVNO=2A04 CHANIF=0G:0
 RTD  NAME=VPR12A05 DEVNO=2A05 CHANIF=0G:1
 RTD  NAME=VPR12A06 DEVNO=2A06 CHANIF=0G:2
 RTD  NAME=VPR12A07 DEVNO=2A07 CHANIF=0G:3
 RTD  NAME=VPR12A08 DEVNO=2A08 CHANIF=0K:0
 RTD  NAME=VPR12A09 DEVNO=2A09 CHANIF=0K:1
 RTD  NAME=VPR12A0A DEVNO=2A0A CHANIF=0K:2
 RTD  NAME=VPR12A0B DEVNO=2A0B CHANIF=0K:3
 RTD  NAME=VPR13A00 DEVNO=3A00 CHANIF=1C:0
 RTD  NAME=VPR13A01 DEVNO=3A01 CHANIF=1C:1
 RTD  NAME=VPR13A02 DEVNO=3A02 CHANIF=1C:2
 RTD  NAME=VPR13A03 DEVNO=3A03 CHANIF=1C:3
 RTD  NAME=VPR13A04 DEVNO=3A04 CHANIF=1G:0
 RTD  NAME=VPR13A05 DEVNO=3A05 CHANIF=1G:1
 RTD  NAME=VPR13A06 DEVNO=3A06 CHANIF=1G:2
 RTD  NAME=VPR13A07 DEVNO=3A07 CHANIF=1G:3
 RTD  NAME=VPR13A08 DEVNO=3A08 CHANIF=1K:0
 RTD  NAME=VPR13A09 DEVNO=3A09 CHANIF=1K:1
 RTD  NAME=VPR13A0A DEVNO=3A0A CHANIF=1K:2
 RTD  NAME=VPR13A0B DEVNO=3A0B CHANIF=1K:3
 VTD LOW=9900 HIGH=99FF
```

FIGURE A-11 CONFIG example: Dual ACS Bi-Directional Clustered VTSS System, VSM5 FICON Back-End (Part 1)

```
VTSS NAME=VSMPR2 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
RTD  NAME=VPR22B00 DEVNO=2B00 CHANIF=0C:0
RTD  NAME=VPR22B01 DEVNO=2B01 CHANIF=0C:1
RTD  NAME=VPR22B02 DEVNO=2B02 CHANIF=0C:2
RTD  NAME=VPR22B03 DEVNO=2B03 CHANIF=0C:3
RTD  NAME=VPR22B04 DEVNO=2B04 CHANIF=0G:0
RTD  NAME=VPR22B05 DEVNO=2B05 CHANIF=0G:1
RTD  NAME=VPR22B06 DEVNO=2B06 CHANIF=0G:2
RTD  NAME=VPR22B07 DEVNO=2B07 CHANIF=0G:3
RTD  NAME=VPR22B08 DEVNO=2B08 CHANIF=0K:0
RTD  NAME=VPR22B09 DEVNO=2B09 CHANIF=0K:1
RTD  NAME=VPR22B0A DEVNO=2B0A CHANIF=0K:2
RTD  NAME=VPR22B0B DEVNO=2B0B CHANIF=0K:3
RTD  NAME=VPR23B00 DEVNO=3B00 CHANIF=1C:0
RTD  NAME=VPR23B01 DEVNO=3B01 CHANIF=1C:1
RTD  NAME=VPR23B02 DEVNO=3B02 CHANIF=1C:2
RTD  NAME=VPR23B03 DEVNO=3B03 CHANIF=1C:3
RTD  NAME=VPR23B04 DEVNO=3B04 CHANIF=1G:0
RTD  NAME=VPR23B05 DEVNO=3B05 CHANIF=1G:1
RTD  NAME=VPR23B06 DEVNO=3B06 CHANIF=1G:2
RTD  NAME=VPR23B07 DEVNO=3B07 CHANIF=1G:3
RTD  NAME=VPR23B08 DEVNO=3B08 CHANIF=1K:0
RTD  NAME=VPR23B09 DEVNO=3B09 CHANIF=1K:1
RTD  NAME=VPR23B0A DEVNO=3B0A CHANIF=1K:2
RTD  NAME=VPR23B0B DEVNO=3B0B CHANIF=1K:3
VTD LOW=9900 HIGH=99FF
CLUSTER NAME=CLUSTER1 VTSSs(VSMPR1,VSMPR2)
CLINK VTSS=VSMPR1 CHANIF=0O:0
CLINK VTSS=VSMPR2 CHANIF=1O:0
```

FIGURE A-12 CONFIG example: Dual ACS Bi-Directional Clustered VTSS System, VSM5 FICON Back-End (Part 2)

IOCP Example for Single MVS Host Connected to a VSM5 Via FICON Directors

FIGURE A-13 shows a configuration diagram for a single MVS host connected to a VSM5 via FICON Directors, and FIGURE A-14 on page 60 shows example IOCP statements for this configuration. **Note that**:

- From MVSA, you define 8 CHPIDs, with each path switched in the FICON Director, for a total of 8 channels running to the VSM5.
- You code 16 CNTLUNIT statements to define the VSM5 as 16 3490 images.
- You code IODEVICE statement to define the 16 VTDs that are associated with each 3490 image.
- If ESCON and FICON channels are configured to the same logical control unit, MVS issues message CBDG489I, which indicates that mixing ESCON and FICON channel paths on a logical control unit should be used only for the migration from ESCON to native FICON, but should not be used permanently. This is a warning message only, and does not indicate an error.

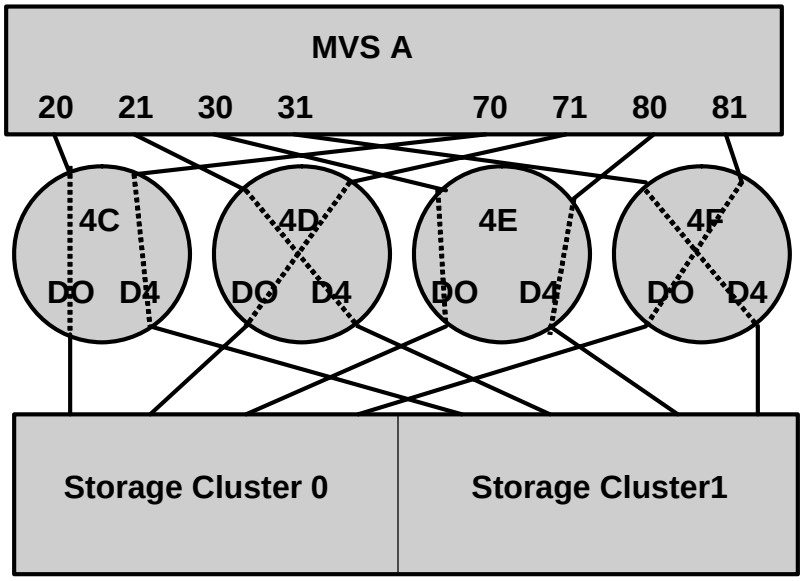


FIGURE A-13 Configuration Diagram: Single MVS Host Connected to a VSM5 via FICON Directors

```
ESCD4CCHPID PATH=(20,70),TYPE=FC,SWITCH=4C
ESCD4DCHPID PATH=(21,71),TYPE=FC,SWITCH=4D
ESCD4ECHPID PATH=(30,80),TYPE=FC,SWITCH=4E
ESCD4F CHPID PATH=(31,81),TYPE=FC,SWITCH=4F

CU1CNTLUNIT CUNUMBR=001,
                PATH=(20,21,30,31,70,71,80,81),
                LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
                UNIT=3490,CUADD=0,
                UNITADD=((00,16))

STRING1  IODEVICE ADDRESS=(0500,16),
           CUNUMBER=(001),
      UNIT=3490,
UNITADD=00,STADET=Y

CU2CNTLUNIT CUNUMBR=002,
                PATH=(20,21,30,31,70,71,80,81),
                LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
                UNIT=3490,CUADD=1,
            UNITADD=((00,16))

STRING2  IODEVICE ADDRESS=(0510,16),
                 CUNUMBER=(002),
        UNIT=3490,
UNITADD=00,STADET=Y
.
.
.
CU15CNTLUNIT CUNUMBR=015,
                PATH=(20,21,30,31,70,71,80,81),
                LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
                UNIT=3490,CUADD=E,
                  UNITADD=((00,16))

STRING15  IODEVICE ADDRESS=(05E0,16),
                 CUNUMBER=(015),
       UNIT=3490,
UNITADD=00,STADET=Y

CU16CNTLUNIT CUNUMBR=016,
                PATH=(20,21,30,31,70,71,80,81),
                LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
                UNIT=3490,CUADD=F,
                  UNITADD=((00,16))

STRING16  IODEVICE ADDRESS=(05F0,16),
              CUNUMBER=(016),
        UNIT=3490,
UNITADD=00,STADET=Y
```

FIGURE A-14 IOCP Example: Single MVS Host Connected to a VSM5 via FICON Directors

Tip – Unlike ESCON, FICON supports multiple active I/Os per channel. If the number of active VTDs is less than the number of channels configured to the VTSS, the I/Os to those VTDs may not be evenly spread across all the channels. As the number of active VTDs increases to be greater than the number of channels configured to the VTSS, the channel subsystem will spread the I/Os across all the channels. If it is desired to spread the I/Os across all of the channels even when only a few VTDs are active, it is necessary to use the preferred path feature to force the channel subsystem to spread the I/Os across the channels. The preferred path feature is specified via the PATH= parameter on the IODEVICE statement. When you specify preferred path on the IODEVICE statement, the channel subsystem always tries the preferred path first. If it is busy or unavailable, the channel subsystem next tries the channel path following the preferred path in the rotation order, and so on.

FIGURE A-14 on page 60 (repeated in FIGURE A-15) shows IODEVICE statements for STRING1 **without** using preferred pathing.

```
STRING1  IODEVICE ADDRESS=(0500,16),
           CUNUMBER=(001),
       UNIT=3490,
UNITADD=00,STADET=Y
```

FIGURE A-15 IODEVICE Statements for STRING 1 without Preferred Pathing

FigureFIGURE A-16 shows IODEVICE statements for STRING1 **using** preferred pathing. If you're using preferred pathing, you need to use these kind of IODEVICE statements for **all** paths, such as STRING2 through STRING16 in FIGURE A-14 on page 60.

```
STRING10 IODEVICE ADDRESS=(0500,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=20

STRING12 IODEVICE ADDRESS=(0502,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=21

STRING14 IODEVICE ADDRESS=(0504,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=30

STRING16 IODEVICE ADDRESS=(0506,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=31

STRING18 IODEVICE ADDRESS=(0508,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=70

STRING1A IODEVICE ADDRESS=(050A,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=71

STRING1C IODEVICE ADDRESS=(050C,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=80

STRING1E IODEVICE ADDRESS=(050E,2),
CUNUMBER=(001),
UNIT=3490,
UNITADD=00,STADET=Y,
PATH=81
```

FIGURE A-16 IODEVICE Statements for STRING 1 Using Preferred Pathing

APPENDIX **B**

Additional Information

Conventions for Reader Usability

Conventions are used to shorten and clarify explanations and examples within this book.

Typographic

The following typographical conventions are used in this book:

- **Bold** is used to introduce new or unfamiliar terminology.
- Letter Gothic is used to indicate command names, filenames, and literal output by the computer.
- `Letter Gothic Bold` is used to indicate literal input to the computer.
- *Letter Gothic Italic* is used to indicate that you must substitute the actual value for a command parameter. In the following example, you would substitute your name for the "username" parameter.
- Logon *username*
- A bar (|) is used to separate alternative parameter values. In the example shown below either username or systemname must be entered.
- Logon *username*|*systemname*
- Brackets [ ] are used to indicate that a command parameter is optional.
- Ellipses (...) are used to indicate that a command may be repeated multiple times.
- The use of mixed upper and lower case characters (for non–case sensitive commands) indicates that lower case letters may be omitted to form abbreviations. For example, you may simply enter **Q** when executing the **Quit** command.

Keys

Single keystrokes are represented by double brackets [[ ]] surrounding the key name. For example, press [[ESC]] indicates that you should press only the escape key.

Combined keystrokes use double brackets and the plus sign (+). The double brackets surround the key names and the plus sign is used to add the second keystroke. For example, press [[AL]] + [[C]] indicates that you should press the alternate key and the C key simultaneously.

Enter Command

The instruction to "press the [[ENTER]] key" is omitted from most examples, definitions, and explanations in this book.

For example, if the instructions asked you to "enter" **Logon pat**, you would type in **Logon pat** *and* press [[ENTER]].

However, if the instructions asked you to "type" **Logon pat**, you would type in **Logon pat** and you would *not* press [[ENTER]].

Warnings, Cautions, and Notes

The following are used in this book.

Warning. Information necessary to keep you from damaging your hardware or software.

Caution – Information necessary to keep you from corrupting your data.

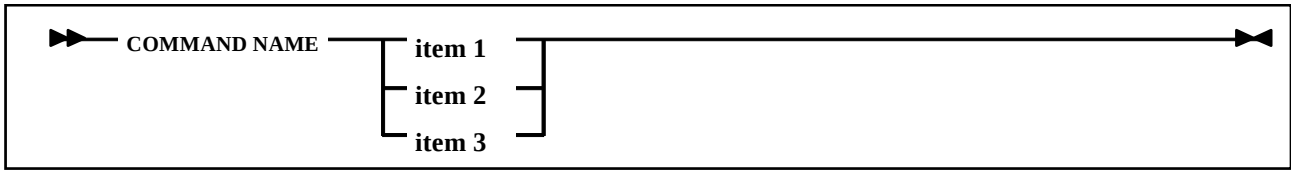
Tip – Information that can be used to shorten or simplify your task or they may simply be used as a reminder.

Note – Information that may be of special interest to you. Notes are also used to point out exceptions to rules or procedures.

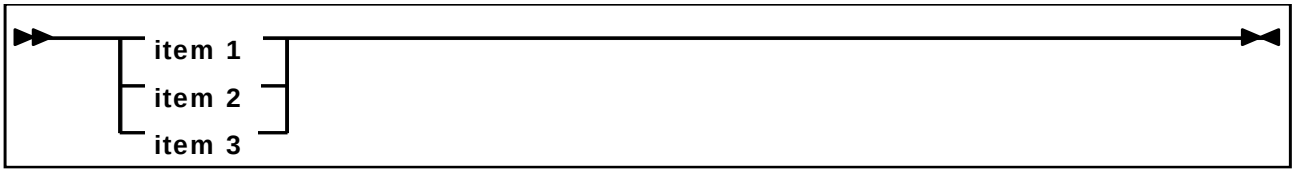
Syntax

Syntax flow diagram conventions include the following:

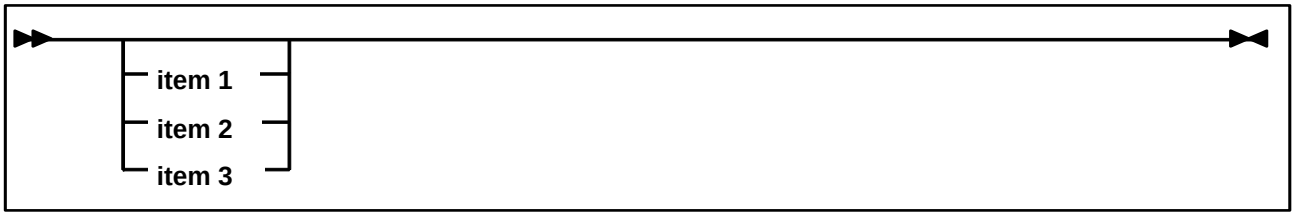
Flow Lines—Syntax diagrams consist of a horizontal baseline, horizontal and vertical branch lines and the command text. Diagrams are read left to right and top to bottom. Arrows show flow and direction.



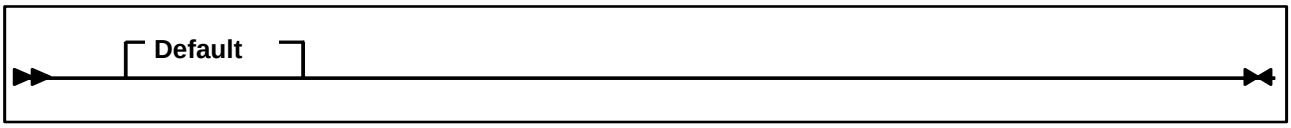
Single Required Choice—Branch lines (without repeat arrows) indicate that a single choice must be made. If one of the items to choose from is on the baseline of the diagram, one item must be selected.



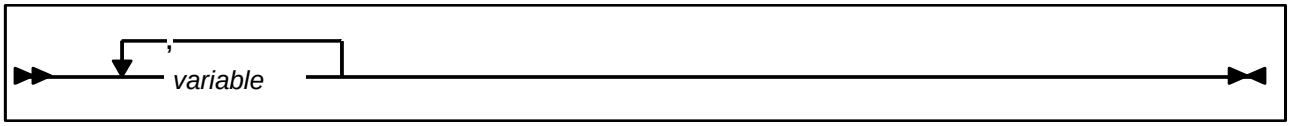
Single Optional Choice—If the first item is on the line below the baseline, one item may optionally be selected.



Defaults—Default values and parameters appear above the baseline.



Repeat Symbol—A repeat symbol indicates that more than one choice can be made or that a single choice can be made more than once. The repeat symbol shown in the following example indicates that a comma is required as the repeat separator.



Keywords—All command keywords are shown in all upper case or in mixed case. When commands are not case sensitive, mixed case implies that the lowercase letters may be omitted to form an abbreviation.

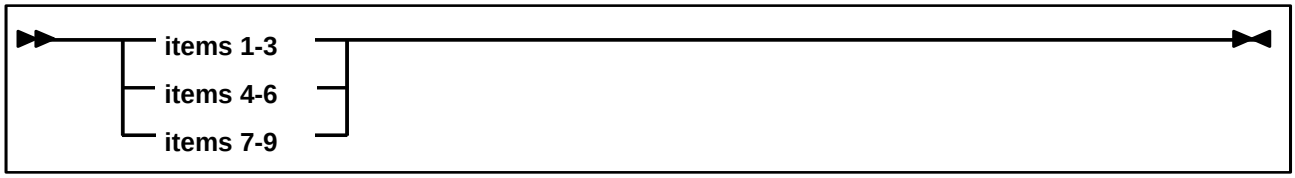
Variables—Italic type is used to indicate a variable.

Alternatives—A bar (|) is used to separate alternative parameter values.

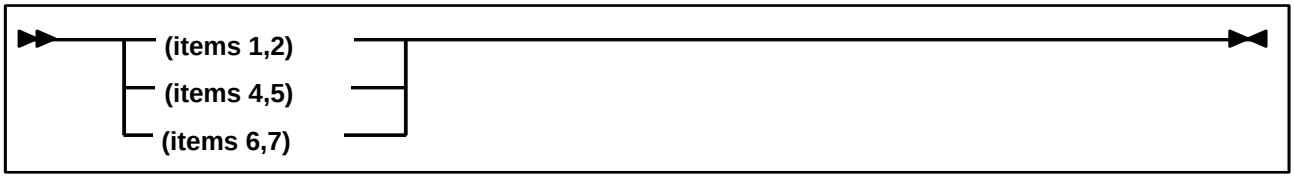
Optional—Brackets [ ] are used to indicate that a command parameter is optional.

Delimiters—If a comma (,), a semicolon (;), or other delimiter is shown with an element of the syntax diagram, it must be entered as part of the statement or command.

Ranges—An inclusive range is indicated by a pair of elements of the same length and data type, joined by a dash. The first element must be strictly less than the second element.



Lists—A list consists of one or more elements. If more than one element is specified, the elements must be separated by a comma or a blank and the entire line must be enclosed by parentheses.



Additional Information for Sun Products

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Sun's External Web Site

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The URL for Sun StorageTek™ brand-specific information is:
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Customer Resource Center

The Sun StorageTek product Customer Resource Center (CRC) is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation for StorageTek brand products. CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, addenda to product documentation books, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page. Sun employees may enter the CRC through the SunWeb PowerPort.

The URL for the CRC is http://www.support.storagetek.com

Partners Site

The StorageTek Partners site is a Web site for partners with a StorageTek Partner Agreement. This site provides information about products, services, customer support, upcoming events, training programs, and sales tools to support StorageTek Partners. Access to this site, beyond the Partners Login page, is restricted. On the Partners Login page, Sun employees and current partners who do not have access can request a login ID and password and prospective partners can apply to become StorageTek resellers.

The URL for the StorageTek Partners site is:
http://members.storagetek.com

The URL for partners with a Sun Partner Agreement is:
http://www.sun.com/partners/

Third-Party Web Sites

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Hardcopy Publications

Contact a Sun sales or marketing representative to order additional paper copies of this publication or to order other StorageTek brand product customer publications in paper format.

Customer Support

Customer support is available 24 hours a day, seven days a week, to customers with Sun or StorageTek maintenance contracts and to Sun employees. You can find additional information about customer support on the Customer Resource Center (CRC) Web site at:
http://www.support.storagetek.com

Customer-initiated Maintenance

Customer-initiated maintenance begins with a telephone call from you to Sun Microsystems StorageTek Support. You receive immediate attention from qualified personnel, who record problem information and respond with the appropriate level of support.

To contact Sun Microsystems StorageTek Support about a problem:

1. Use the telephone and call:

   800.872.4786 (1.800.USA.4Sun)

   800.722.4786 (Canada)

   For international locations, go to
   http://www.sun.com/service/contacting/solution.html
   for the appropriate telephone number

2. Describe the problem to the call taker. The call taker will ask several questions and will either route your call to or dispatch a support representative.

   If you have the following information when you place a service call, the process will be much easier:

Account name	
Site location number	
Contact name	
Telephone number	
Equipment model number	
Device address	
Device serial number (if known)	
Urgency of problem	

Fault Symptom Code (FSC)	
Problem description	

Sun’s Worldwide Offices

You may contact any of Sun’s worldwide offices to discuss complete storage, service, and support solutions for your organization. You can find address and telephone number information on ’s external Web site at:
http://www.sun.com/worldwide/

VTCS™

32 RTDs/Stacked Migrates Support Guide

CRC Posting Only

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