VAXCLUSTER SYSTEM REVISION F1

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VAXCLUSTER SYSTEMS - VAXCLUSTER SYSTEM REVISION F1

TO: FIELD SERVICE UNIT MANAGERS

FIELD SERVICE BRANCH MANAGERS

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SOFTWARE PRODUCT SERVICES BUSINESS MANAGERS

SUBJECT: VAXCLUSTER SYSTEMS - VAXCLUSTER SYSTEM REVISION F1

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CHAPTER 1

INTRODUCTION

Over the past quarter the VAXcluster environment has had new products added, and changes implemented to current products. Of significance is the addition of the VAX 8200, VAX 8300, VAX 8500, VAX 8800, and the CIBCI. Currently the VAXcluster revision is E4. With the changes outlined in this document, the revision will become F1.

The remainder of this document provides the detailed information for you to deliver effective service to your customer. Reference Chapter 3 for information on benefits to your customer from upgrading to revision F1.

Maintaining VAXcluster systems at the current revision level is very important to both you and your customer. It allows customers to operate their systems with a minimum amount of interruption caused by known problems, and it means fewer service calls to you. Therefore, please take the time to understand the content of this document and ensure the information is made available to the proper people in your organization.

CHAPTER 2

VAXCLUSTER SYSTEMS REVISION F1

2.1 REQUIREMENTS

The changes required to support VAXcluster systems at revision F1 involve VMS V4.4. New products supported in the VAXcluster systems include the VAX 8200, VAX 8300, VAX 8500, and VAX 8800. The changes/additions detailed here are final and all items have been released.

2.1.1 VAX 8200

The single-processor VAX 8200 is a mid-range VAX with a system performance equal to the 11/780, a price equal to the 11/750, and a footprint equal to the 11/730. The processor interfaces to the new VAXBI Bus and runs full VMS, ULTRIX, and VAXELN. A single CPU provides a performance rating of approximately 1.0 of the 11/780.

The VAXBI Bus has been designed to replace the UNIBUS and will be licensed for use by other vendors. It has a bandwidth of 13.3 MB/sec and will support up to 16 nodes.

A new set of adapters are being developed to interface the BI bus to peripherals and to other interconnect architectures. One of those available at FRS is the UNIBUS Adapter (DWBUA) which will allow initial configurations to use UNIBUS options. It will be phased out in favor of native-BI configurations as more peripheral adapters become available.

The architecture of the BI Bus and the new technology being used in product design have allowed for significant improvements is system reliability and maintainability to be achieved.

2.1.2 VAX 8300

The VAX 8300 is an asymetric dual-processor, mid-range VAX with 1.8 times the performance of a VAX-11/780 on job loads which take advantage of the dual processor. The processor interfaces to the VAXBI Bus and runs full VMS.

2.1.3 VAX 8500

The VAX 8500 is a bounded mid-range performance GENERAL PURPOSE system which features 20MB of memory and two VAXBI channels for I/O. This system will be particularly successful in footprint and cost sensitive applications which can use this performance level. Typical applications include workstation compute engine, factory automation, VAXcluster compute engine, database manipulation, and simulation. Many volume buyers will find the VAX 8500 a cost effective system. It is not expandable to a VAX 8800 System. This system will complete the phase-out of the VAX-11/785 by offering more than twice the performance at a constant price and in the footprint of a VAX750.

2.1.4 VAX 8800

The VAX 8800 is DIGITAL's highest throughput VAX. In compute intensive environments (Scientific, Engineering, Artificial Intelligence and Simulation applications), the VAX 8800 can deliver the throughput of between 2-3 VAX 8600 processors. Two high speed ECL CPU's share up to 32MB of main memory via a 60 MB/s private bus. Up to four VAXBI channels can be connected to this bus, providing the largest total I/O capability of any VAX.

All VAX 8800 kernels include as standard: 32MB memory, hot floating point, BBU, Ethernet port and VAXcluster port in the same footprint as an 8600.

Product Strategy and Objectives:

The VAX 8800 is the first product of a family of products emanating from the Nautilus design effort. The announcement and pricing of the VAX 8800 meets the following strategic objectives:

* Improve corporate profitability (achieve >60% margins, 1987 and beyond)

* Improve DIGITAL's competitive posture in TECHNICAL markets vs. both the established "high MIP" vendors as well as the newer "point solution" niche vendors

* Extend VAX solutions to substantially higher performance markets

* Protect ongoing revenue stream generated by VAX 8650

* Establish the "reference plane" consistent with future pricing.

The VAX 8800 will be positioned as DIGITAL's highest performance VAX system for the compute intensive environments. Particular focus will be given to Laboratory, Scientific, Engineering, Simulation and Artificial Intelligence and Commercial batch applications which benefit most from this performance.

2.1.5 VAX/VMS/MicroVMS V4.4

VAX/VMS and MicroVMS Version 4.4 have begun new customer shipments. These are remastered releases and do include new functionality.

This article provides a brief overview of the changes and new features, concentrating on those items which may impact field organizations. For details on most of the new features, see the VMS and MicroVMS V4.4 Release Notes and new and enhanced documentation.

New Features

The following is a brief list of some of the new features of special interest.

- New CPU support

  - VAX 8200.
  - VAX 8300.
  - VAX 8500.
  - VAX 8800.

  VMS V4.4 includes multiprocessing enhancements which are described in an article in The Buffer. Note that the VAX 8300 and VAX 8800 multiprocessing support is provided through the installation of a product "key" which is only included with VMS/8300 (Q7001) and VMS/8800 (QM001) media kits. Refer to the article on VMS multiprocessing in The Buffer for more details.

- New device support

  - DRV11-WA - Q-bus version of the DR11-W for MicroVAX II systems.

The V4.4 XADRIVER assumes that the DRV11-WA is at CS Revision Level B and Etch Revision Level D or earlier.

- DMB32 - Backplane interconnect (BI) support for eight asynchronous terminal lines, one line printer, and one 64 KB synchronous line.

  The synchronous line is supported by a separate layered product.

- KLESI-B - Low-End Storage Interconnect (LESI) controller for the BI.

- CIBCI - Computer interconnect (CI) port for BI machines.

o VAXcluster systems enhancements

- Clusterwide DECnet node name/address.

  Refer to the article on "New Features in DECnet-VAX Version V4.4" in The Buffer for more detail.

- Shared DECnet permanent node database.

  Refer to the article on "New Features in DECnet-VAX Version 4.4" The Buffer for more detail.

- Clusterwide MONITOR.

  All monitor displays can now be performed for any node in the VAXcluster system. There is also a MONITOR CLUSTER display which provides a brief summary of CPU, disk I/O, and memory and lock activity on all nodes (up to six) across the VAXcluster system. The disk activity count provides a VAXcluster system aggregate count of disk I/O operations per drive for the six most active disks.

  Note that MONITOR communicates with remote nodes through DECnet.

- Capabilities have been added to allow the system manager to protect layered product images and other files from use by processes on selected nodes through access control lists (ACLs). A new identifier has been added which incorporates the name of the node on which a process is executing. This identifier is of the form SYS$NODE_nodename.

See the Release Notes for hints on using this capability to allow restricting the use of layered products on a common system disk to the subset of nodes which are licensed for the use of the layered product.

- o DIGITAL command language (DCL)
  - New subroutine CALL and GOSUB constructs.
  - Symbol table enhancements.
  - SHOW DEFAULT changes.

- o Batch and print
  - Enhanced handling of forms on print queues.

    Includes the ability to specify a default form type for print queues. Thus, a print job specifying no form type will use the printer specific default form, rather than being forced to use the systemwide DEFAULT.

  - New /RESTART qualifier.

    The queue manager will automatically restart on recovery from a job controller abort. Batch and output queues will be restored to the status that existed prior to the interruption of service.

  - User defined I/O routines for symbionts.

- o Record Management Services (RMS)
  - Descending key support.
  - Fully shared sequential support (read/write and fixed/variable length sequential files).
  - Hyphens in file names.

- o Run-Time Library (RTL)

  The Run-Time Library includes a new package to facilitate programming for DECtalk.

- o Security
  - System services - $GETUAI, $SETUAI, $CHECK_ACCESS.
  - Allows addition and removal of identifiers from process and/or systems rights list.
  - New ACL editor.

- o DEBUG enhancements
  - Shareable image debugging.
  - New display/window features.

New Documentation

The VMS V4.4 document set is being changed considerably from the V4.2 set. Approximately 9000 pages of new or modified documentation will be included for a page count of approximately 15,000. Some portions of the document set are being considerably reorganized. The Reference Shelf will include 19 binders, three more than V4.2. Some of the Guides are being moved into the Reference Shelf. The Automatic Distribution System (ADS) kits will include the three extra binders.

MicroVMS will have 2000 new and changed pages.

Refer to the article on "VAX/VMS Version 4.4 Documentation Changes" in

The Buffer for more detail.

New Release Notes

- o Release Notes information

  Generally, point release (for example, V4.1, 4.2, 4.3) Release Notes are considered cumulative. That is, everything in all previous Release Notes, as far back as V4.0, applies, unless specifically superseded. The V4.4 Release Notes are intended to supersede all previous Release Notes.

- o New upgrade procedure

  The VMS V4.4 Release Notes has a completely rewritten section on the upgrade procedure. The new section is complete, especially in the area of various VAXcluster systems upgrade techniques. Please read this carefully.

- o Miscellaneous V3 information

  Various information taken from the VMS V3 documentation set which was found in the appendixes of the V4.0 Release Notes is now included in various manuals in the V4.4 set.

New Upgrade Procedure

As a remastered upgrade, V4.4 can be either installed onto a new system disk or applied to upgrade an existing V4.3 or V4.2 system disk.

Also revised, though largely similar to earlier versions, is the upgrade procedure itself, which takes a substantial amount of time. Plan on at least 2 to 3 hours for a VAX-11/780. One portion, in particular, announces that it will take 30 minutes. Do not be disturbed if this section runs for an hour or more.

VAX/VMS V4.4, whether installed or applied as an upgrade to V4.3, includes a mandatory update. The mandatory update must be applied immediately after the installation/upgrade.

A mandatory update is generally planned for most releases involving significant new functionality, especially those with kits involving large media. They are planned in advance; they are not afterthoughts to fix some disastrous problem found at the last minute. They are included in the planning process to allow VMS engineering to fix those problems discovered in the testing of the final kit submitted to the Software Distribution Center (SDC). Generation and testing of the SDC kit takes several weeks, and the planned mandatory update avoids the need to regenerate the entire kit when last minute problems are discovered.

Both the Release Notes section on the upgrade and the installation guides have been revised.

Version 4.4 "Gotchas"

- Mixed V4.3/V4.4 VAXcluster systems

  As explained in the Release Notes, VMS V4.4 will coexist with one or more V4.3 nodes in the same VAXcluster system. This is intended only to allow VAXcluster systems to be upgraded gradually, without the need to bring down the entire VAXcluster system for the upgrade. There are restrictions to running in this mixed fashion.

  - In a VAXcluster system, V4.4 can coexist with V4.3 for the period of the upgrade. It will not coexist with versions earlier than V4.3.

  - MAIL.

    The format of the mail file has changed slightly under V4.4. If a user on a V4.3 node attempts to send mail to a user whose mail file has been created by a V4.4 node, an error will result.

- RMS shared sequential files.

  As discussed in the Release Notes, the use of shared sequential RMS files is restricted in a mixed VAXcluster system. If you are running a mixed VAXcluster system, you must set SYSGEN parameter VMSD1 on all V4.4 nodes to a value of 1. This informs V4.4 RMS that V4.3 nodes exist in the VAXcluster system, and RMS thus uses a more conservative sharing algorithm. The mixed VAXcluster system algorithm forces the use of a multiblock count of 1, which is less efficient than the normal value. Also, if a V4.3 node finds a multiblock count greater than 1, it returns a RMS$_FLK (file locked by another user) message. Thus, RMS is protected from data corruption should a V4.4 node not have VMSD1 set to 1.

  Remember to set VMSD1 back to 0 when the last V4.3 node is upgraded to V4.4.

o MicroVMS multiuser license kit must be reinstalled

  Because MicroVMS V4.4 is packaged as an upgrade that replaces all system executable images, the multiuser license kit must be reinstalled after upgrading your current MicroVMS system to V4.4. If you initially purchased MicroVMS V4.1M or V4.2, the existing multiuser license kit will not install correctly on MicroVMS V4.4. It must be upgraded using a conversion procedure supplied with MicroVMS V4.4.

  After completing the installation of MicroVMS V4.4, invoke the conversion procedure from the SYSTEM account with the command:

```
$ @SYS$UPDATE:CVTLICENSE
```

  The procedure will prompt you for a device on which to read your present license kit. It will read the kit, make the necessary changes, and write a new copy of the converted kit, which you may then install using VMSINSTAL.

  The conversion is necessary only for multiuser license kits that were shipped with MicroVMS V4.1M and V4.2. License kits shipped with V4.3 and V4.4 do not require conversion.

o Text Processing Utility (TPU)

  - The default file type for section files is now .TPU$SECTION instead of .GBL.

  - The format of section files has changed. Thus, users who have created their own section files or tailored the standard files must recompile their section files.

Those creating tailored section files should always keep their modifications in the form of a source file, since TPU may be expected to require recompilations from time to time.

- Section files are now installable as shared images.

VMS Layered Products

Most layered products are unaffected by the upgrade to VMS V4.4. However, a few layered products do require reinstallation, and existing versions of a few layered products are incompatible with VMS V4.4

Products which require reinstallation after the upgrade to VMS V4.4 include:

- o VAX-11 RSX

  VAX-11 RSX must be reinstalled to reset the alias directory names which are broken by the VMS upgrade.

- o Professional Host Tool Kit

- o VAX Encryption

  VAX Encryption must be reinstalled because the base VMS system has a dummy shareable image for Encryption which is linked to facilities, such as BACKUP. The reinstallation of VAX Encryption installs the "real" shareable image for Encryption, plus DCL command and HELP texts.

- o VAX RPG II

- o DECnet-VAX

  The DECnet-VAX V4.0 key is still used.

See the SSOT (System Software Order Table) for a listing of the versions of these layered products to be installed. The latest SSOT is available on the EASYNET at SQM::SYS$SPD:SSOT.mmyy, where mm is the current month and yy is the current year.

The following product versions are known to be incompatible with VMS V4.4. Newer versions must be used instead:

- o VAX ACMS V1.2 Version 1.2 of ACMS must not be used under V4.4 of VMS. If ACMS is to be used, V2.0 must be installed. See important additional information in the Release Notes.

- o VAX LISP/VMS V1.2

- VAX DECreporter V1.0
- VAX PSI and PSI Access V3.2
- VAX DEC/Shell V1.1

Again, see the latest SSOT for the latest information on which versions are applicable.

2.1.6 VAX Volume Shadowing V1.0

This article discusses several aspects of Volume Shadowing, such as its operation, use, installation, and impact on applications and system management.

What Is Volume Shadowing?

VAX/VMS Volume Shadowing is a new VMS product that is designed to help eliminate a dependency on a single disk drive. It performs this function by maintaining several identical copies of a given disk. Several physical disk drives known as "shadow set members" or "member units" are associated with a software created "virtual unit" to form a "shadow set." When the shadow set is first created, the member units are made to contain exactly the same data by a copy process that is described later in this article. All accesses by software to the shadow set are directed to the virtual unit, rather than to the individual member units. The controller then translates these accesses to the virtual unit into accesses to the individual member units. In doing this, read operations can be directed to any member unit that is available in a fashion that optimizes performance. Write operations are automatically performed on all member units to ensure that they all contain exactly the same data. In the event that a member unit fails, the remaining member unit can still supply the requested data, since it contains the same data.

Shadowing is a joint effort between the hierachical storage controller (HSC)50 or HSC70 storage controller and VMS. As such, the HSC must be present for shadowing to take place. The member units must be a type that is supported by the HSC, such as RA80s, RA60s, and RA81s. Additionally, the member units of a given shadow set must also be the same type of disk drive. For example, a shadow set can not be formed by mixing RA60s and RA81s. All of the member units are accessed through the same HSC whenever they are acting as a shadow set.

Additionally, the proper revision of software is required. The HSC must be at revision V3.00 and VMS must be at revision V4.4. The Volume Shadowing product consists of a manual and product key. The installation of the software key on a VMS V4.4 system turns on the shadowing functionality.

Where Can I Get More Information?

VMS Volume Shadowing Manual, Order No. AI-HI90A-TE

Sales Update, May 5, 1986, Volume 17, No. 22
VAX Volume Shadowing V1.0 Software Product Description (SPD) No. 27.29.xx

Computer Design, "Shadowing Boosts System Reliability," April 1985

What Are the Current Limitations and Restrictions?

The current restrictions are that there can be no more than two members in any given shadow set and that the number of shadow sets is limited to four per HSC (or per pair of HSCs, as in the case where the shadow set members are dual ported). The two-member limit was a very last-minute restriction and, unfortunately, the documentation was already completed when it was imposed. The choices were to delay the shipment of the product until more members could be supported or to ship in a limited form. The later was selected. This means that many of the examples in the documentation show more than two members. A future release of the product is expected to ease this restriction. It must be noted that this restriction is enforced. Attempting to add a third member results in a INCSHAMEM (Incompatible shadow set member) message.

What Is Volume Shadowing Useful For?

The obvious benefits to be gained from Volume Shadowing result from elimination of the dependency on a singe disk to contain data or programs. In accomplishing this, a customer gains the ability to continue uninterrupted operations while a broken or degraded disk is repaired and, subsequently, restored to service. The customer also gains some measure of protection against the sudden or gradual deterioration of a disk that normally results in the occurrence of forced errors that indicate uncorrectable errors have occurred while attempting to read existing data from the disk. This protection results from the shadowing product's ability to access another copy of the same data on another disk drive to replace the unrecoverable data with good data from another source.

There are also some benefits that are not so obvious. When a read operation is requested on a shadowed disk, the HSC is free to optimize the access between any of the shadow set members. This means there are some potential performance benefits to be derived from shadowing whenever the characteristic I/O generated by an application includes a high ratio of reads to writes. A common system disk with secondary page and swap files located on another disk is a good example of this type of application. The performance aspects of shadowing allow more systems to use the same system disk than are otherwise possible. This allows the customer to take advantage of the ease of management aspects of a common system disk while, at the same time, the data availability aspects of shadowing eliminate a potential single point of failure for the VAXcluster System. Another example is a database where the read to write ratio is high.

Yet another benefit is the ability to reduce down time for critical applications while performing backups of data. Prior to the advent of Volume Shadowing, it was necessary to stop all access by an application to a data disk while the disk was being backed up to have complete assurance that the data was in a consistent state. This meant that the data was unavailable for a potentially long period of time while the actual backup operation was performed. With Volume Shadowing, it is still necessary to stop application access and dismount the disks being backed up, but since there are multiple copies of the disk, the shadow set can be immediately remounted with all but one member and the application restarted. The disk that was not included in the shadow set can be backed up concurrently with application access to the reformed shadow set. This means that the critical application is only down for as long as it takes to run down activity, dismount the disk, remount the disk, and restart the application.

How Complicated Is Volume Shadowing to Use?

From the user's or application's point of view, as long as the disk is mounted as an ODS2 structure, it is no more complicated to use Volume Shadowing than to use a single disk. The only obvious change is that the name of the disk changes when it becomes shadowed. For example, an RA81 that was called DUA1 may become known as DUS25. The "S" indicates that the unit is a "virtual unit" and a shadow set. The unit number "25" is assigned by the system manager. Once a disk is part of a shadow set virtual unit, it can no longer be accessed by its old physical name. Users and applications writers must use the name of the virtual unit. If they avoided the use of physical device names as was always recommended, this change of names should present no problem.

From the system manager's perspective, shadowing has only slightly more impact. Since the device names change, the system manager should be prepared to listen to the complaints of the people that have ignored all warnings and continued to use physical device names. This aside, all management commands for Volume Shadowing are an extension to the existing commands MOUNT, DISMOUNT, and SHOW DEVICE. There are no new commands to learn. When initially installing Volume Shadowing, the system manager should plan out what disks make sense to shadow, what the virtual unit numbers should be, and be prepared to dismount the disks clusterwide. This is required because the formation of shadow sets is accomplished using the Mount commands and changes name by which the devices are accessed. Users can not create a shadow set that contains physical drives that are mounted somewhere else in the VAXcluster System. Also, when creating a shadowed system disk, users must be prepared to shut down all systems that boot from that disk for the same reason. The system manager should also be prepared to ensure that the latest copy of VMB.EXE is located on the systems console media and must make modifications to the default boot command file. The system manager should also be aware that a significant amount of work is needed for an application to use foreign mounted shadow sets. If such an application exists, then it is probably safe to assume that the disk being used by the application is not a candidate to become a shadow set at this point in time.

From the application designer's perspective, shadowing may range anywhere from no impact to great impact. If the application does not attempt to mount or dismount disks explicitly, then there should be no impact at all, providing that device names are not hard coded into the application. If the application does perform Mounts and Dismounts directly using the existing system services, then shadowing has only a slight impact, since control of shadow sets is given through extensions to the existing $MOUNT, $DISMOU, and $GETDVI system services.

If, on the other hand, the application designer uses foreign mounted disks, then the impact of Volume Shadowing is rather significant. While the Volume Shadowing product does nothing to hinder the use of foreign mounted disks, it also does little to help use them. Control of a foreign mounted disk is still allowed using the normal system services, but several of the features that are provided with ODS2 mounted disks are absent by necessity. These features are the algorithm that selects initial members of a shadow set and assigns copy operations as needed. The applications designer who uses foreign mounted disks must provide the equivalent algorithm. While the Mount system service allows copy operations to be assigned, it is the responsibility of the application to decide what disks to copy to and from. The application must also provide algorithms for any type of error recovery which may be required in the VAXcluster System. This in itself can present a nontrivial design problem.

How Does Volume Shadowing Function?

Volume Shadowing maintains multiple copies of the data contained on a disk transparently to a user application. When a shadow set is initially created, the Volume Shadowing product ensures that all disks contain identical data. This is accomplished by selecting at least one disk to be the initial full member of the shadow set. The Mount command entered by the user specifies one or more physical disks that are potential members of the shadow set. The Volume Shadowing software examines each of these disks and selects the disk or disks that are to become the initial member or members of the shadow set. In the case where a shadow set is initially formed from a nonshadowed disk, there can be only one initial member. This is the disk with a volume label that matches the one specified in the Mount command. Given that two or more of the disks have the same label and that none were previously part of a shadow set, the disk whose name appears first on the command line and has a label that matches the label on the Mount command is chosen to become the first member. In the case where the shadow set previously existed at one time and is now being reformed, several disks may be chosen to be initial members if the shadowing software determines that they all contain exactly the same data. This can be the case when the previous shadow set is properly dismounted.

Whatever the case, the software first selects the initial membership of the shadow set. Once this is accomplished, the software initiates copies from a full member of the shadow set to all members that are determined to be different from the full members. In the process of selecting initial members and adding members with copy operations, all the disks are brought online to the same HSC controller. While these copies are in progress, users and applications may freely access the data that is on the full members. The Volume Shadowing product ensures that any changes made to the full members are also propagated to the members that are undergoing a copy operation.

Once a shadow set is created, additional disks can be added at any time. The Mount command is also used to add a new member to the shadow set. A copy is always initiated from a full member of the shadow set to a newly added member to ensure that both disks contain identical data.

Individual members may be removed from a shadow set at any time using the Dismount command. The shadow set can even function with a single member, but of course there is no data redundancy. It should be noted that the removal of a single disk from a shadow set does not ensure that the removed disk is left in a consistent state. No attempt is made to close open files and write operations may be in progress. The best way to remove a disk from a shadow set and ensure that data is in a consistent state is to dismount the entire shadow set and then remount it minus the member that is to be removed. Since the entire shadow set is properly dismounted, all files are closed.

What Role Does VMS Play and What Role Does the HSC Play?

Both VMS and the HSC play a key role in the total product. During shadow set formation, VMS decides whether or not disks contain identical information. In doing this, it selects the initial members of the shadow set and assigns the proper copy operations to the remainder.

When shadow sets are formed, dissolved, or simply have their membership changed; VMS marks the disks that are currently in the set with a shadow generation number. This ensures that each of the member disks in the set that contain identical data can be clearly distinguished from disks that are not in the set or from disks that are undergoing copy operations.

Also, since the restoration of an image backup creates a disk that has the same data as the source disk but located in different places because of compression, a mechanism was developed to allow the shadowing product to distinguish between the two disks. This is accomplished by storing a Backup Revision Number on the disk. This number is changed by VMS BACKUP during the restoration process to allow the restored disk to be distinguished from the source disk. When given a choice between the restored disk and the source disk, VMS chooses the restored disk to become the initial member of the shadow set. Note that the STANDALONE BACKUP that existed prior to VMS V4.4 does not implement this feature. You must rebuild STANDALONE BACKUP after the installation of VMS V4.4, just as the VMS V4.4 Release Notes suggest.

VMS also plays a key role in failure recovery. When an HSC is rendered inoperative, VMS attempts to rebuild the shadow set on the same or an alternate HSC. This is accomplished by locating as many member units as can be found and then reconstructing the shadow set from them. If the drives are dual ported between two HSCs, the shadow set is rebuilt on the alternate. If only one HSC is present, the shadow set is rebuilt on the HSC when it is finally restored to service, unless mount verification has timed out.

The HSC, on the other hand, is called on to ensure that disks containing dissimilar data are made to contain the same data. VMS may instruct the HSC to copy from one disk to another, but the HSC does the actual copy internally to itself. If a read operation is directed to the shadow set while a copy is in progress, the HSC satisfies that read from any of the full members, and it is free to optimize the access in any way that it deems appropriate. If a write is directed to the shadow set, the HSC ensures that both the full members and the sources of a copy contains the same data when the copy is complete. The actual write command does not complete until all members of the shadow set are written.

The HSC is also called on to repair disks that deteriorate as a result of uncorrectable errors. For example, if an uncorrectable error occurs in a block on a disk that is a full member of a shadow set,

then the HSC accesses the same block on another full member to obtain a copy of the good data. It then copies the data onto the disk that originally had the problem. Of course, if no full members are available to supply the corrected data, the HSC must ensure that all drives contain identical data and that the forced error indicator is set for that block on all drives.

What Are the Limitations of Volume Shadowing?

While Volume Shadowing can be used as tool to help perform backups of data, it does not in any sense replace the need for those backups, nor does it eliminate the need for proper transaction journaling. For example, if a write operation with incorrect data is directed to the shadow set because of a software or hardware error, the Volume

Shadowing product correctly performs its function and ensures that all members of the shadow set contain the same incorrect data.

What Considerations Should Be Made with Regards to Performance?

For optimal performance, it is recommend that each member of a shadow set be located on a different disk data channel module (K.sdi) in the HSC. This is because each disk data channel can only perform one data transfer at a time. Using separate disk data channels allows parallel transfers on multiple disks. This is especially important to write performance where the same data must be written on each member of the shadow set. Instead of doing the writes sequentially, they can be performed in parallel. In the case of read performance, several disks can be read at the same time at different locations. Also, reads to one disk can be overlapped with writes to another if permitted by file locking operations. Note that the assumption of a gain in read performance assumes that enough reads are outstanding at the same time to permit parallel transfers.

Before predicting the effect of shadowing on performance, one must understand the ratio of reads to writes and the number of commands that are outstanding at the same time. This is demonstrated by the following conclusions extracted from a study of shadow set performance by the VMS Performance Group.

- For most systems, optimal performance is obtained with a two-member shadow set split across K.sdi channels.

- The best shadow set performance relative to a single RA81 for a typical system is in an environment with a high read I/O to write I/O ratio, little seeking, two shadow members on separate K.sdis, and sustained disk queues of greater than 0. Performance is typically 70 to 100% better than a single RA81 in the same environment.

- The poorest shadow set performance relative to a single RA81 for a typical system is in an environment with a high write I/O to read I/O ratio, little seeking, two or more shadow set members on the same K.sdi, and sustained disk queues less than 1. Performance for a two-member shadow set is typically 30% below a single RA81 in the same environment. Performance degrades further for shadow sets with more than two members.

What Can Be Done Regarding Troubleshooting Failures?

As always, one of the best things to do when faced with a problem is to get an accurate description of the problem. This includes a detailed description of the sequence of events and/or operator actions that resulted in the failure. The best description is one that allows reproduction of the problem, since the first step to solving a problem is finding a reliable way of reproducing it. Things to look for when faced with a problem with Volume Shadowing are as follows:

Console Printouts from All Systems

On VAX nodes, some of the more interesting messages are in the form of %SYSTEM-I-MOUNTVER. These messages describe when copy operations start and stop. They also indicate when mount verification aborts. In general, the OPCOM messages are a restatement of the MOUNTVER messages and, as such, can generally be ignored.

On the HSC nodes, the consoles may describe errors that occurred on the disk or controller at the time of the problem.

Operators Logs

Operators logs contain the OPCOM messages that result from the MOUNTVER messages and, as such, can be useful if the console printouts are unavailable.

Error Logs

There are at least two reasons to look at the error log:

- Many problems result from a disk error. This information can be found in the error logs.

- Many of the actions taken by VMS with regards to shadowing occur in the context of mount verification. When VMS is faced with an error condition that it can not handle and is not severe enough to warrant crashing the system, it aborts mount verification. This results in a nonfatal INVDSKCONFG bugcheck and an entry in the error log. The values in R0, R1, and R2, that are displayed in the bugcheck entry are significant and can be used to isolate the problem. A chart located in module DUMNTVER.LIS of DSDRIVER can be used to interpret these values. Save the error log for analysis by the appropriate people. Nonfatal bugchecks can also be converted to fatal errors and generate crash dumps when the SYSGEN parameter BUGCHECKFATAL is set to a 1.

Crash Dumps

If an error is so severe that VMS can not recover or does not trust the integrity of the system, a fatal bugcheck is generated. For shadowing, this is a INVDSKCONFG bugcheck and, as was the case with the nonfatal version previously mentioned, the values in R0, R1, and R2 may be significant. Save the crash dump for analysis. It is beyond the scope of this article to give a detailed method for analyzing the crash dumps.

What Are the More Obvious Things to Look for When Troubleshooting?

Problems when booting from a shadowed system disk:

- Is the latest version of VMB on all of the consoles? For a quick check, it should be at least 55 blocks in length. The older VMBs do not support booting from a shadowed system disk.

- Is the SYSGEN parameter VMS7 set to a 1? This causes DSDRIVER, the disk class driver that contains shadowing support, to be loaded rather than DUDRIVER, the disk class driver without shadowing support. Attempting to boot from a shadowed system disk with VMS7 set to a 0 results in a DISKCLASS bugcheck when the normal disk class driver, DUDRIVER, is instructed to perform operations on a shadowed system disk. For a quick check, conversationally boot and check the value of the VMS7.

- Is the shadowing key installed? The system bugchecks when the nonshadowing disk class driver is instructed to perform operations on a shadowed system disk while booting. For a quick check, see if SYS$SYSTEM:DSDRIVER.EXE exists on the system. If the shadowing key was not installed, this file is not present.

Problems with quorum disks and shadow sets:

A shadow set or a disk that is a member of a shadow set can not be used as a quorum disk. Attempting to do so means that the quorum file is not used and that the votes that would be contributed by the quorum file are not present. If a quorum file is required, it must be located on a nonshadowed disk. Also, a quorum file need not be located on the system disk so one may have a shadowed system disk and still have a quorum disk, as long as they are different disks.

Problems when booting VMS V4.3 in the presence of Volume Shadowing:

VMS V4.3 hangs when booting from an HSC that has virtual units on it because of VMS V4.4 systems running shadowing. To prevent this hang, copy SYS$SYSTEM:DUDRIVER.EXE from the VMS V4.4 system to the VMS V4.3 system.

Problems after installing shadowing:

- Was the system rebooted after the installation of the key to load the proper shadowing driver?

- Was the SYSGEN parameter VMS7 set to a 1 to cause the proper driver to be loaded? Also, was MODPARAMS.DAT edited to reflect the new value of VMS7?

Operational problems:

Are members not being found when a shadow set is formed during a system boot? Since the time when RA-type disks were first supported on HSC controllers, it states that it can take some number of seconds to configure the devices. Site specific startup command files should take this delay into account when mounting disks and wait as needed for the drive to be configured.

NOTE

Do not use an F$GETDVI to determine if a virtual unit exists, as can be done with a physical unit, before mounting it. This is because the virtual unit never exists until after the first time it is mounted.

Configuration problems:

- Are the configuration restrictions being exceeded? Attempting to add a third member to a shadow set results in an INCSHAMEM error. Attempting to exceed the number of shadow sets supported by the HSC results in an REMRSRC (Insufficient system resources at remote node) error. Note that while the supported limit of shadow sets is currently four, the HSC, at the time of this writing, actually allows eight shadow sets to be formed before returning an error when its limits are exceeded. These limits are expected to be raised in a future version of the product.

- Are all the disks that form a shadow set dual ported between the same two HSCs? Not doing so can cause problems during shadow set formation and controller failover.

- Are the configuration restrictions being exceeded by mounting more than the maximum supported number of shadow sets on a combination of two HSCs? If one of the HSCs fails, some of the shadow sets can not be formed on the other because the limits of a single HSC is exceeded.

Quick Reference of Selected Topics for the System Manager

Command to mount a single FILES-11 volume:

```
$ MOUNT DJS23: -
$_    /SHADOW = ( $1$DJA9:, $1$DJA5: ) -
$_    MYVOLUME     DISK$MYVOLUME
```

Command to mount a FILES-11 volume set:

```
$ MOUNT DUS23: -
$_   /SHADOW = ( $1$DUA9:,  $1$DUA5: ), -
$_   DUS51: -
$_   /SHADOW = ($1$DUA12:, $1$DUA3:) -
$_   WORK1,WORK2    WRKD$
```

Qualifiers to the Mount command:

/NOCOPY Qualifier - Provides protection against user error by only creating a shadow set from the disks that do not require copy operations.

/CONFIRM Qualifier - Provides the greatest control of interactive mounts. VMS interrogates all volumes and presents a summary of actions that are performed. The user can say yes or no to the entire mount request.

/CLUSTER Qualifier - Shadow sets can be mounted clusterwide or on a subset of VAXcluster nodes, such as nonshadowed disks.

Shadow set membership appears the same to every node in the VAXcluster System that has it mounted. The shadow set can only be accessed from nodes which have the Volume Shadowing license applied.

Dismounting a Shadow Set:

DISMOUNT 2DUS1 - Dismounts the shadow set on a single node.

DISMOUNT/CLUSTER 2DUS1 - Dismounts the shadow set clusterwide.

Adding and removing members from a shadow set:

To add the disk 2DUA7: to the shadow set 2DUS1:

MOUNT/SYSTEM 2DUS1:/SHADOW=2DUA7: VOL_NAME DISK$VOL_NAME

When adding a disk to a shadow set, the Volume Shadowing software updates the shadow set membership on every node that has it mounted.

To remove the disk 2DUA7: from the shadow set 2DUS1:

DISMOUNT 2DUA7:

When removing a disk from a shadow set, the Volume Shadowing software removes the disk from shadow set membership on every node that has the shadow set mounted.

Mounting previous members outside a shadow set:

Former shadow set members mounted outside of a shadow set are write locked by default by VMS V4.4. This behavior can be overridden by using the MOUNT /OVERIDE=SHADOW_MEMBERSHIP. The action of this qualifier is to zero the shadow generation number and ensure that the volume is always the target of copy when added back into a shadow set.

Restoring shadow sets from backup:

Volumes restored by VMS BACKUP from /IMAGE backup have the backup revision number updated by VMS V4.4 BACKUP so that the restored copy is clearly different from the source copy of the disk.

Considerations with rolling upgrades where VMS Versions 4.3 and 4.4 are mixed in the same VAXcluster System:

Since VMS V4.3 backup does not provide these protective mechanisms, do not mount previous shadow set members with VMS V4.3 and be sure to rebuild STANDALONE BACKUP on system disk and console media after the VMS V4.4 installation.

VMS V4.3 hangs when booting from an HSC that has virtual units on it because of VMS V4.4 systems running shadowing. To prevent this hang, copy SYS$SYSTEM:DUDRIVER.EXE from the VMS V4.4 system to the VMS V4.3 system.

2.1.7 KNOWN VOLUME SHADOWING PROBLEMS IN VMS VERSION 4.4

The VAX/VMS Volume Shadowing product is starting to ship to customers. As with most first release products, Volume Shadowing has some bugs. Based on experience at customer field test sites, it is believed that these bugs will not cause very many complaints. However, if enough things go wrong at the same time, system crashes and/or other forms of confusion will almost certainly occur.

Therefore, this document has been prepared to make support groups aware of the known problems and to inform you that the support strategy for Volume Shadowing is business as usual utilizing standard escalation processes that exist in each geography. Escalation of problems into corporate support groups is also business as usual.

In addition, a copy of the volume shadowing software that will be distributed to VMS V4.5 field test sites has been packaged in a SPR installation kit, and is available to you for distribution to customers. The field test V4.5 shadowing software corrects the most significant problems found in V4.4. Exactly which problems are corrected by the V4.5 shadowing software will be indicated in the problem descriptions which follow. However, please remember that the V4.5 software is basically field test quality software. Although it is known to be superior to the V4.4 software in many respects, it has not yet been tested by real customers.

The V4.5 SPR installation kit goes by the VMSINSTAL name VMSSHD V94.4. It can be found in BULOVA::SYS$PUBLIC. The kit is actually composed of three files:

VMSSHD944.A;1
VMSSHD944.B;1
VMSSHD944.C;1

One very important warning about the field test V4.5 shadowing software kit: The kit installs a protected copy of the shadowing software and renames all existing copies of DSDRIVER.EXE to DSDRIVER.V44EXE. Because of this, installation of the field test V4.5 shadowing software kit MUST be followed by reinstallation of the volume shadowing license key. In addition, sites that are shadowing their system disk should read Section 4.4 of the VAX/VMS Volume Shadowing Manual before installing the field test V4.5 shadowing software kit. (Note: The message printed by the kit indicates that Section 4.3 should be read; this is incorrect). After the kit and the license key have both been installed, all nodes must be rebooted.

It is realized that this represents a significant amount of disruption for customers. Until better software licensing tools are available, however, we must distribute volume shadowing software updates in this way so that unlicensed customers do not obtain free use of the product simply by installing an appropriate update kit.

Remember, there is a limit of two members per shadow set. This limit is enforced by the VMS shadowing software. The V4.5 field test shadowing software provided on the kit described above does NOT alter the two members per shadow set limit.

PROBLEM LIST FROM VMS ENGINEERING

1. Symptoms

While processing a shadow copy operation, probably during shadow set failover attempt, the system crashes with an "INVALID EXCEPTION" bugcheck. The current stack is the interrupt stack and the IPL is 8. Examination of the dump shows the failing instruction is a "MOVL (R1), R1" at DSDRIVER+5Bxx, and R1 contains a small positive number or zero.

Fixed in 4.5

Yes.

Cause

A bad branch destination that is taken only when an attempt to remove a shadow set member fails because that member is the target of a copy operation.

Workaround

None.

2. Symptoms

When a shadow set that is undergoing a merge copy operation loses the member that is the source of the copy data, sometimes the member that is the target of the copy will be incorrectly promoted to a full shadow set member. When this happens, the shadow set hangs in mount verification until MVTIMEOUT expires.

Fixed in 4.5

Yes.

Cause

This is caused by a subroutine call that leaves member generation information unprotected in registers that the subroutine sometimes corrupts.

Workaround

Dismount and remount the shadow set. The member that was previously acting at the source of the copy operation is still valid and should be used to perform a full copy operation when the shadow set is remounted.

3. Symptoms

After a shadow set is dismounted, attempts to examine one or both of the member drives with the SHOW DEVICE command cause an access violation and stack dump on the terminal that executed the command. A later attempt to use the drive that causes SHOW DEVICE to take an access violation will crash the system with a "DISK CLASS DRIVER DETECTED FATAL ERROR" bugcheck. The bugcheck occurs at DSDRIVER+4Cxx and the bugcheck instruction is followed by a "CMPB #11, 0A(R0)".

Fixed in 4.5

Yes.

Cause

If an HSC dissolves a shadow set but otherwise remains operational and mount verification executes an IO$_PACKACK for that shadow set, the IO$_PACKACK function incorrectly clears the UCB$V_LCL_VALID flag for the shadow set virtual unit. This is a time-bomb. When the shadow set is dismounted, this time-bomb prevents proper cleanup of the shadow set members information in the I/O database. The residual information in the I/O database causes SHOW DEVICE to take the access violation and the future mount command to crash the system.

Note

An HSC does not usually dissolve a shadow set without instructions from VMS. The only instance where this can happen is reduction of the shadow set to zero working members. This can be caused by a hardware failure of a shadow set member that is acting as the source for a copy operation or hardware failures in both shadow set members.

Workaround

Do not attempt to build a shadow set using a drive that causes SHOW DEVICE to take an access violation. Reboot the system at the first convenient opportunity.

4. Symptoms

Shadow sets timeout (or abort) mount verification long before MVTIMEOUT has expired. Examination of the error log shows a non-fatal "INVALID DISK CONFIGURATION" bugcheck at the time that the shadow set aborted mount verification. The non-fatal bugcheck entry shows R0=1A4 and R1=4. If BUGCHECKFATAL is set to 1, the system crashes.

Fixed in 4.5

Yes.

Cause

A shadowing I/O operation performed by mount verification resulted in an error that mount verification considers to be fatal, even though it is a perfectly reasonable error under the circumstances. If one VAXcluster host fails to properly handle a shadow set failure, many of the other VAXcluster hosts are likely to trip over this bug.

Workaround

Keep BUGCHECKFATAL set at its default value, 0. Dismount, check for problem number 3, and remount shadow sets that abort mount verification.

5. Symptoms

Attempts to mount a non-shadowed volume report the "INCONSISTENT SHADOW SET MEMBER" error. This has been reported exactly twice during the 6 months plus life of the bug. Both times the error occurred on a BACKUP command executed as a part of trying to build VMS layered product kits. Theoretically, occurrence of this error is not limited to systems that have volume shadowing installed.

Fixed in 4.5

Yes.

Cause

This is caused by an incorrect register reference in the disk class driver's IO$_PACKACK processing.

Workaround

None.

6. Symptoms

Normally the HSC is expected to remove disks with serious problems from a shadow set. If however a failing disk can cause the HSC to crash or be host cleared, there is nothing to prevent that disk from being added back into the

shadow set when it is rebuilt on the alternate HSC. This can then cause that HSC to crash or be host cleared. Note that this problem exists even without shadowing. Since almost the entire disk must be accessed when rebuilding a shadow set, this problem tends to be aggravated by shadowing.

Fixed in 4.5

No. Additional MSCP architecture work plus implementation by both the HSC and VMS is required to prevent this problem.

Cause

The exact cause for the failure to remove broken disks from a shadow set is unknown to VMS.

Workaround

Remove the disk from service and get it repaired.

7. Symptoms

Actual, functional members are removed from a shadow set during a failover. After an HSC fails, the VMS waits up to 45 seconds from the time that it finds the first previous member of a shadow set until if finds all previous members, or gives up. When this timer expires, the shadow set is reconstructed with those members that were found. Members that were not found are removed from the shadow set. Sometimes a disk will take more time than VMS waits to become available on the alternate HSC, resulting in its removal from the shadow set.

Fixed in 4.5

Yes and no. This problem tends to aggravate problem 2 (described above) under multiple failure conditions. Problem 2 is fixed in V4.5. However, the root problem -- failure of drives to become available on the alternate HSC -- requires changes in the HSC and/or the drives themselves.

Cause

The exact cause for disks not becoming available on their alternate path in a timely fashion is unknown to VMS. The current time-out times for the HSC/ Drive is 255 seconds, according to the specifications.

Workaround

Add the removed disk back into the shadow set using the MOUNT utility either manually or automatically from a batch job.

8. Symptoms

Problems combining processors running Volume Shadowing with processors running versions of VMS prior to V4.4 in the same VAXcluster. The problems are exhibited as a hang when booting a processor running an early version of VMS from an HSC where a shadow set exists or as a heavy load being placed on an HSC where a shadow set exists from continuous disk unit polling by the early version of VMS. This problem has also been seen causing a high rate of receiver ready collisions on RA60s.

Cause

The older version of the disk class driver loops continuously, polling for disk unit status, when it encounters a virtual unit upon establishing a connection to the HSC.

Fixed in 4.5

No. The problem exists in the early versions VMS and can not be fixed by a new version.

Workaround

For VMS 4.3 systems -- the disk class driver, DUDRIVER.EXE, from the VMS 4.4 system can be used on the VMS 4.3 system. The Volume Shadowing Reference Manual, section 4.7, describes a procedure to accomplish this.

Note

Coexistence of V4.3 and V4.4 systems on a single CI is supported only during the "rolling upgrade" process. Most customers should not start using shadow sets until the "rolling upgrade" process is complete.

For VMS 4.2 and below -- Versions of VMS prior to V4.3 are not supported in the same VAXcluster as VMS 4.4. Please note that this problem is independent value of the SYSGEN parameter VAXCLUSTER. That is, systems with VAXCLUSTER=0 (not a recommended setting) also exhibit the problem.

2.1.8 CIBCI

The CIBCI is a VAX CI (Computer Interconnect) port for DIGITAL's new bus, the VAXBI. It will provide VAX8200/8300 and VAX8800/8500 systems that utilize the VAXBI with an interim means of connecting to a VAXcluster. The CIBCI is an interim product providing these systems with a CI connection.

The CIBCI is the fifth implementation of the VAX-11 CI Port Architecture, the first four being the CI780, CI750, HSC50, and the HSC70.

The CIBCI totals five modules. They are two newly designed modules, BI adapter control (BAC) and BI adapter data (BAD), and the existing CI750 port processor (CDP), CI packet buffer (IPB), and CI LINK (ILI) modules. Like the CI750, the CDP, IPB, and ILI modules will be contained in a dedicated 10.5" rack mountable box.

The CIBCI initially shipped on some VAX 8800 systems at revision A1. Currently, the latest supported revision is B1. Since updates to the hardware are happening between diagnostic releases, there is a possibility that you will end up with some "out of rev" diagnostics on your site. The two charts below show the compatibility between old and new CIBCI hardware and diagnostics.

CIBCI	A1	B1
T1017 (BAC)	B1	C1,D1
T1018 (BAD)	B1	C1
L0400 (CDP)	B1,C1	B1,C1
L0101 (IPB)	H1	J1
L0100 (ILI)	D1	D1

The diagnostics listed under hardware revision A1 were shipped in conjunction with CIBCI hardware.

HARDWARE REVISION	A1	B1	
- EVCKA	1.5	1.6	
- EVCKB	1.4	1.4	
- EVCKC	1.4	1.4	
- EVCKD	1.12	1.12	
- EVCKE	1.9	1.9	(minor problem described below)
- EVCKF	1.6	1.6	
- EBSAA	9.1	10.0	
- EZSAA	9.1	9.1	
- EVGAA	3.5	3.5	
- EVGAB	3.5	3.5	

When running revision A1 CIBCI's, the diagnostics listed under A1 run without error. If you receive a CIBCI with hardware at B1 you will experience difficulties when attempting to run some of the diagnostics listed under hardware rev A1. Here is a list of the problems.

Supervisor problems - If you have a T1017 at rev C1 or D1 you will find out that the VAX8200/8300 supervisor EBSAA rev 9.1 will not work with the revision 5 BIIC installed into the CIBCI. You will need EBSAA revision 10.0.

When using supervisor EBSAA rev 10.0, diagnostic EVCKA rev 1.5 fails test 18 on a VAX8200/8300 EVCKA rev 1.6 solves this problem.

When running EVCKE rev 1.9 on a VAX8800/8500 it fails test one (1) approximately once every 5 passes.

All of the corrected diagnostics with the exception of EVCKE, will be available in diagnostic release 24. The date of SDC submission for release 24 is 19-MAY-1986.

This is explained, along with other CIBCI anomalies, in the July VAXSTUFF.

2.2 SUMMARY OF REQUIRED CHANGES

The following summarized the revision level of the major components for upgrading to VAXcluster Revision F1:

ITEM	REVISION LEVEL	MFG. BREAK-IN
****	**********	********
VMS	V4.4 FOR ALL CPU NODES	05/86
CI750	E1 (HARDWARE), V7.0 (MICROCODE)	07/15/86
CI780	F1 (HARDWARE), V7.0 (MIRCOCODE)	07/15/86
HSC50	E1 (HARDWARE), V3.0 (MICROCODE)	07/86
HSC70	B1 (HARDWARE), V3.0 (MICROCODE)	07/86
11785	REVISION 02	10/18/85
TA81	REVISION B1	03/01/86

The following provides a summary of the required FCO EQ kits for revision F1:

OPTION	FCO NUMBER	FCO NUMBER	EQ KIT NUMBER	AVAILABILITY
******	**********	**********	**********	**********
CI750	CI750 REV E1	CI750-E1-1-004	EQ-01421-01	07/15/86
CI780	CI780 REV F1	CI780-F1-1-005	EQ-01422-01	07/15/86

The above EQ kits are available through Stockroom 17.

2.3 CONTACTS FOR ASSISTANCE

Any questions concerning information contained in this document should be directed to:

US AREA - REGIONAL VAXCLUSTER CORE GROUP MEMBER (ref. list in Appendix A.1)

EUROPE - ATHOL HARRISON, 41-22-969191, GVA04::HARRISON

GIA - STEVE EDDLESTON, AKOV04::EDDLESTON, DTN 244-6679, 1-617-264-6679

CHAPTER 3

ADDITIONAL INFORMATION

3.1 VAXCLUSTER SYSTEMS OPERATING WITH MULTIPLE VERSIONS OF VMS

VAXcluster Rolling Upgrade Policy

It is essential that customers upgrade their VAXcluster to the latest revision as soon as possible. We recognize that some customers may have to run mixed revisions while they work to install one revision across all VAXcluster nodes. During the period in which they run mixed revisions, new functionality provided by the latest release will not be supported.

This position is taken based on the inability to provide complete regression testing for all components that could possible be included in the VAXcluster System. For more information see 2.1.5 VMS V4.4.

3.2 CUSTOMER BENEFITS IN UPGRADING TO REVISION F1

The VAXcluster verification testing for the new BI-based processors, the VAX 8200, the VAX 8300, the VAX 8500 and the VAX 8800, is now complete. With the completion of this testing, VAXcluster Engineering announces full support for the broadest range of processing and storage power within a common architecture in the industry. From the 0.6 MIPS VAX-11/750 to the 12 MIPS VAX 8800, from DEC's oldest VAX technology to our newest, this support gives your customer more flexibility, capacity and growth potential within a single system management domain than ever before.

FEATURES AND BENEFITS FOR VAXcluster RELEASE F1

- Extremely broad capacity range - VAXcluster customers may now configure incremental growth patterns without the need to overconfigure processor power.

- Include BI components in the VAXcluster System - The new system bus technology on the newly supported VAXes in the VAXcluster provides better interfaces into the system than ever before.

- VAX/VMS V4.4 - VMS V4.4 provides your customer with several VAXcluster System level benefits. These include

  - VAXcluster DECnet node name and addressing. This allows a VAXcluster to act as a single node address within a local area network, or wide area network, enhancing the single system management domain of VAXclusters.

  - VAX/VMS MONITOR utility - All monitor displays can now be performed for any node in the VAXcluster System from any other node in the system. The new MONITOR CLUSTER display provides a summary of CPU, disk I/O and memory and lock activity on up to six VAX nodes across the entire VAXcluster System.

  - Access Control Lists (ACLs) - ACLs allow your customer's system manager to control access to shared files, layered products and programs, giving an additional level of control over secured or licensed files in the VAXcluster System.

3.3 CONSOLE MEDIA AND MICROCODE CHANGE

VAX DIAGNOSTIC RELEASE-24 CONSOLE MEDIA AND CI780/CI750/CIBCI MICROCODE CHANGE

!!!!!!!!!!! IMPORTANT WARNING !!!!!!!!!!!!!

Starting with VAX Diagnostic Release #24 (15-JUL-86), all VAX CONSOLE Media for all VAX CPU types will have CI7*0/CIBCI Microcode V7.0 as the default "CI780.BIN" CI microcode file. This version (V7.0) of CI780.BIN is not compatible with older CI780s or CI750s containing V3.0 CI microcode PROMS (used with V3.0-V5.0) on the Revision "H1" L0101 Packet Buffer module.

!!!! CI WILL NOT BOOT !!!!

THEREFORE, THESE NEW VAX CONSOLES WILL NOT BOOT CI7x0/CIBCIs RUNNING V3.0, V4.0, OR V5.0 CI MICROCODE (V3.0 L0101 PROMS), WITHOUT COPYING V5.0 CI780.BIN FILE FROM OLDER CONSOLE MEDIA, OR OTHERWISE UPGRADING L0101 TO REVISION "J1" (V7.0 PROMS: DEC P/N 23-***F3, WHERE *** = 296-301) VIA CI FCOs.

As of 15-JUL-86, all new CI780s and CI750s will begin shipping with Revision "J1 or K1" L0101 (V7.0 PROMs) modules, coinciding with Diag. Release #24 distribution from SDC: thus the need for use of V7.0 CI780.BIN as default. Field CI750/CI780s will upgrade to V7.0 microcode via FCOs included in this document to be released JUL/AUG-86: CI780-F1-1-005 Rev. "F1"; CI750-E1-1-004, Rev. "E1".

VAX780/785/750: There typically is no need to upgrade CONSOLE (i.e., use REL-24 console) until a CPU-processor or CI7x0 microcode upgrade FCO is being performed. These FCOs would provide details for managing CI780.BIN. However, if REL-24 CONSOLE media must be used with Rev-"H1" L0101 (V3.0 CI microcode PROMs), then V5.0 CI780.BIN must be copied from old CONSOLE Media with EXCHANGE in order to boot CI. Various Tech-Tips, VAXSTUFF articles, and older CI7x0 FCOs detail CI780.BIN "EXCHANGE copying" and CI780.BIN file version identification.

VAX8600/8650: These CONSOLEs are routinely updated from UPDATE Magtape, which in Rel-#24 will contain V7.0 CI780.BIN as default, and CI780_V50.BIN and CI780_V60.BIN for use with Rev-"H1" (V5) or Rev-"HH1" (V6) L0101 if necessary. Procedures for using V5/V6 CI780.BIN are in VAX86*0 CONSOLE RELEASE Notes, as well as HPS-CSSE VAX86*0 CONSOLE/MICRO-DIAG BLITZ and memo to be included with Rel-24 CONSOLE media.

VAX8200/8300/8500/8800: Most Field CIBCIs have been upgraded and all new CIBCIs have shipped with Rev. "J1" L0101 (V7.0 PROMs) modules since APR-86, and will not be affected by the default CI microcode version change. Please note from previous BLITZes that VAXclusters with BI-based VAXs (8200, 8800, etc.) should already have all CI7x0/CIBCIs upgraded to V7.0 CI microcode.

3.4 REV 7 MICROCODE BENEFITS

CI780 / CI750 / CIBCI MICROCODE VERSION V7.0 BENEFITS

Version V7.0 of CI microcode was completed in FEB-86, ECO'd into CIBCI in APR-86, and pre-released for VAXclusters with severe CI problems since APR-86. Several hundreds of clustered VAXs have been running V7.0 since APR-86. V7.0 fixes several major CI errors caused by CI microcode, each problem of which is described in detail below. V7.0 also implements a "variable SANITY TIMER", to vastly improve VAXcluster detection and transition time for a "hung or halted" CPU. Incidental changes in V7.0 are:

- Removal of the CI "Maintenance commands", to simplify Engineering support and create additional patch space;
- Removal of MESSAGE & DATAGRAM FREE QUEUE caching, so avoid VMS memory loss when CI_PORT is re-initialized;
- CI Microcode listing documentation clean-up to improve Engineering microcode supportability.

VARIABLE CI7X0/CIBCI "SANITY TIMER"

This is the most significant of all the V7.0 changes to most customers, especially those not currently having CI Errors. The CI Sanity Timer, formerly fixed at 99 seconds, is a mechanism for the CI_Port to "watchdog" VMS and the CPU: in the event of a software or hardware "halt or hang", the CI_Port will shut itself down preventing its automatic response to other node's CONFIGURATION POLLER "REQUEST IDENTIFICATION" commands. Thus, formerly, a 99-second period was required for other nodes to detect that a given CPU-node had abnormally stopped; it should be noted that normal VMS Shutdown and BUGCHECK operations circumvent this 99-second timeout.

With the new "Variable Sanity Timer", starting with VMS-4.4, VMS will use the effective value of VMS SYSGEN parameter "PASTIMOUT" (on CI_ports running V7.0 only) to control the CI Sanity Timout period: by default, this is ten (10) seconds. Please refer to VMS-4.4 Release Notes on "PADRIVER CHANGES" for more information.

CI_PORT ERRORS FIXED IN V7.0 MICROCODE

1. CI_PATH ARBITRATION TIMEOUT (ARB_TO) EXTENDED: The CI microcode formerly allowed insufficient time (1.5 ms.) for the CI Link Module (L0100) to arbitrate for the CI_path, resulting in PATH ARB_TO errors on large, busy VAXclusters. VMS will automatically recover from this error during the next VAXcluster PAPOLLINTERVAL (typically 5 seconds), thus never impacting VAXcluster availability.

This error was primarily aggravated by weaknesses in the LO100 CI architectual implementation, which is currently under ECO review, that caused frequest CI_Node collisions on the CI_path. This timeout is now extended to 26.6 milliseconds, eliminating the ARB_TO error even in the most rigorous testing. Note however that the LO100 problems on very large VAXclusters may still cause inexplicable PATH Losses, or Virtual Circuit closures, requiring special CI configuration treatment: refer to VAX FOCUS PRODUCT REPORT.

2. CI BUFFER DATA-TRANSFER-SERVICE ERRORS/LOSSES: A problem with the CI microcode's caching (in CI Local Store) of the CI_PORT BUFFER DESCRIPTOR TABLE entries, would occasionally allow use of a "stale" BUFFER_DESCRIPTOR entry in transferring a memory buffer to/from a disk or another node. This error may only occur on VAXclusters with 3 or more HSC50s, and more that 12 MIPs (Mega-Instructions-per-Second) of CPU power, and only under rare aggravated conditions involving CI_path or Virtual Circuit closures. The net result could be as severe as transfer of the wrong memory buffer (typically only 1-2 pages) to a disk file, with no CI hardware or VMS Error Log indications of a problem. Another related readily visible CI_Port error to this problem is the CI BUFFER_LENGTH_VIOLATION "Response Packet" error status.

In V7.0 CI microcode, this problem is fixed by additional BUFF_DESC_CACHE integrity checks, through use of a "Valid Bit" and an improved cache tagging scheme.

3. CI BUFFER LENGTH VIOLATION PACKET STATUS-ERROR: Refer to CI Microcode problem #2, above. This error would result in a CI_Port re-initialization, of which VMS-4.* only allows 50 retries prior to CI_Port shutdown.

4. CI_PORT MISCELLANEOUS ERROR TYPE=50000 (IQRE): The CI_Port "Internal Queue Retry Expired (IQRE)" Miscellaneous Error will cause VMS CI_Port re-initialization, of which only 50 are allowed before CI_Port shutdown. The cause was CI microcode mis-handling of a "Send Message" command failure that would trigger CI Virtual Circuit closure. This error is obvious in the VMS Error Log.

5. CI7x0 "LOCAL STORE PARITY ERROR": The CI microcode will incorrectly handle messages/datagrams "apparently" received from CI_Node numbers higher than #15 (decimal), that might be accidentally received (with good CRC) due to CI_Path noise. Such messages cause referencing an area in CI Local Store that has not been initialized, resulting in CI "Local Store Parity Errors". This event triggers a VMS "CI PORT ERROR BIT SET" Error Log entry, and CI_Port re-initialization. This CI microcode problem is fixed in V7.0 CI microcode.

> NOTE: There are also other legitimate hardware causes for the CI7x0 LOCAL STORE PARITY ERROR, published in VAX FOCUS PRODUCT REPORT, that should also be investigated.

6. CI750 "READ-LOCK-TIMEOUT" MEMORY SYSTEM ERROR: The CI750 may intermittently exhibit "Read-Lock-Timout MEMORY SYSTEM ERROR" with heavily loaded VMS applications using the "BBSSI or BBCCI" machine instructions on a VAX-11/750. This CI error is seen in the VMS Error Log on VAX-11/750 systems as "CI Port Error Bit Set", and will cause CI_Port re-initialization. Another CI error which may appear from the same problem is "CI750 DATA STRUCTURE ERROR TYPE-'B' OR TYPE-'C'".

The problem lies within the VAX-11/750 CPU microcode for the BBSSI / BBCCI instructions, and is not due to a CI750 design problem. The cause is that the BBSSI or BBCCI may be interrupted after starting an "interlocked memory read" when the last instruction byte lies across a VAX page-boundary. This BBSSI/BBCCI problem is fixed in Version "099" of VAX-11/750 CPU microcode, first released on VAX750 CONSOLE Media TU58 #41, P/N BE-T204K-ME in VAX DIAGNOSTIC RELEASE #23.

3.5 VAX-11/750 CPU MICROCODE VERSION "099" BENEFITS

Version "099" of VAX-11/750 CPU microcode was initially distributed with EVNDX VAX DIAGNOSTIC RELEASE # 23 on VAX750 CONSOLE Media (TU58 #41), Part Number BE-T204K-ME, within file "PCS750.BIN". The current VAX750 CONSOLE Media, Part Number BE-T204L-ME of DIAGNOSTIC RELEASE #24, is required with Revision "F1" within this VAXcluster REVISION MANAGEMENT DOCUMENT. Therefore, this new VAX750 CONSOLE update will be the first to officially upgrade CPU microcode to Version "099", which until now had only been documented in the VAX FOCUS PRODUCT REPORT.

A brief description of changes will be included here.

1. BBSSI / BBCCI INSTRUCTION "INTERLOCK READ" HANG (Also CI750 "READ-LOCK-TIMEOUT"/R.L.T.O. MEMORY SYSTEM ERROR): The CI750 may intermittently exhibit "R.L.T.O. MEMORY SYSTEM ERROR" with heavily loaded VMS applications using the "BBSSI or BBCCI" machine instructions on a VAX-11/750. The problem lies within the VAX-11/750 CPU microcode for the BBSSI/BBCCI instructions in that they may be interrupted after starting an "interlocked memory read" when the last instruction byte lies across a VAX page-boundary. This BBSSI/BBCCI problem is fixed in Version "099" of VAX-11/750 CPU microcode, first released on VAX750 CONSOLE Media TU58 #41, P/N BE-T204K-ME in VAX DIAGNOSTIC RELEASE #23.

2. DIVP INSTRUCTION "SYSTEM HANG": The VAX750 microcode can hang in a loop when executing the DIVP under these unusual conditions - Non-longword aligned Stack Pointer; Stack Pointer within 16 bytes of Page Boundary; FIRST-PART-DONE (FPD) bit set in PSL; and a pending UNIBUS Interrupt. This problem was predominantly seen with DIBOL Version 2.1 and earlier. It is fixed in Version 099 of CPU microcode.

3. "CALLS" INSTRUCTION: An incorrect "Reason Mask" may be delivered if an ACCESS-VIOLATION occurs when CALLS is used on a "write-protected" stack.

4. "EDITPC" INSTRUCTION: This instruction may incorrectly post a RESERVED OPERAND FAULT with rare, although legitimate operand strings. This is an obscure problem only seen in VAX Architectual testing.

5. "INTERRUPT / EXCEPTION" HANG WITH INVALID SCBB: If SYSTEM-CONTROL-BLOCK-BASE points to a non-existant memory location, a CPU interrupt or exception would result in an infinite microcode loop and hung CPU, until version 099 of VAX750 CPU microcode.

3.6 VAXCLUSTER REGISTRATION IN COLORADO

The CSC in Colorado provides a remote support service which plays an integral role in the servicing of VAXcluster Systems. As such, their ability to screen a VAXcluster System call quickly means quicker service to the customer, a more effective program, increased level of service to the Branch, and overall a more positive relationship between DEC and the customer. The registration information is stored in the comments field in the customer record on the HOST system in Colorado. During call screening the CRR becomes aware of this information which causes the CRR to undertake certain actions which normally would not be done - verification that the node is in a VAXcluster System, if an intermittent or undefined problem will send the call to the VAXcluster Support team immediately.

All VAXcluster Systems under Field Service contract in the US are to be registered with Colorado. Additionally, as new CPU's are added to the configuration, they too must be registered.

In order to register the VAXcluster System with Colorado, follow the steps listed here:

* CALL THE CSC IN COLORADO 800-525-6570

* ASK FOR VAX DATA ENTRY

* YOU WILL BE ASKED FOR CERTAIN INFORMATION SUCH AS:
  - CUSTOMER NAME
  - LOCATION
  - VAXCLUSTER CONFIGURATION
  - SYSTEM SERIAL NUMBERS OF THE CPU'S, HSC'S

3.7 VAXCLUSTER WALL CHART KIT

VAXcluster Wall Chart: Your System At-A-Glance

DIGITAL's all new VAXcluster Wall Chart is a visual tool that helps you manage a VAXcluster System more efficiently and productively. Designed to give you a quick representation of the components of the VAXcluster System, the VAXcluster Wall Chart provides information on:

- o CPUs
- o HSCs
- o Disk drives
- o Tape drives
- o Terminal servers
- o VAXcluster consoles
- o Terminals
- o Optional items you may want to include

The VAXcluster Wall Chart can be ordered through DECDirect (1-800-258-1710) part number EK-VCLWC-PK FOR $250. This kit will be available August 25, 1986.

The VAXcluster Wall Chart has multiple uses. You can use the Wall Chart to make system management and operation easier, since the operations staff can see the most up-to-date representation of your VAXcluster System. Or, you can use the VAXcluster Wall Chart as a planning tool. You can do your software planning and management using the Wall Chart. You can also use the VAXcluster Wall Chart to plan for a new VAXcluster System, or to plan an upgrade of an existing VAXcluster System.

Service personnel who need quick access to information also benefit from the VAXcluster Wall Chart. The Wall Chart provides such information as:

- o Node names and numbers
- o Disk allocation class
- o System ID
- o Root directories
- o VMS version

Furthermore, the VAXcluster Wall Chart can be used as a computer room display for customers and as a tool to show both information and needs to upper management.

The VAXcluster Wall Chart contains:

- o A white 35" X 45" wallboard
- o Vinyl labels for CPUs, HSCs, disk drives, tape drives, terminal servers, VAXcluster consoles. terminals, and blanks for optional display items
- o Clear plastic envelopes with insertable display cards for mounting on the front of devices in the computer room with information coinciding with that on the wall chart
- o Black vinyl letters and tape
- o A precision edge knife
- o A zippered portfolio for storing unused pieces

All vinyl labels can be easily positioned and repositioned on the chart so you can display your most current VAXcluster System configuration. The labels are simply peeled off and then pressed back into place. This means you can move the labels as often as you need, or want to. In addition, identification of cluster devices in the computer room is made easier when you mount the plastic envelopes with the insertable display cards. The kit contains adequate components to display a 16 node VAXcluster System.

3.8 TA78/81 SUBSYSTEM PROBLEMS

For some time now, there has been an investigation into the problems seen with DSA type tape subsystems. Most notably, the TA78 has seen the problems wherein it is sent off line, the formatter is declared inoperative and VMS BACKUP cannot 'restart', when it encounters excessive errors.

The intent here is to outline the errors that we have identified, the causes and cures that have been designed and the status of ongoing investigation.

The problems can be broken into four different problems, of which three have been fixed by different sections of the system.

1. Blank Tapes: a problem was discovered in the handling of blank or degaussed tapes. This error would cause the subsystem to hang and/or the HSC would declare the formatter inoperative.

2. Position Lost: a problem usually encountered when attempting to mount or initialize a tape (not necessarily blank). This would spawn a protocol error and result in the formatter being declared inoperative.

3. Restart: under VMS BACKUP, when excessive errors occurred, the restart option did not work.

4. Offline: under DSA, a tape drive cannot be taken off line without a problem. The HSC will declare the drive went offline without request. This is an unresolvable situation today.

What follows is a short dissertation on each of these problems.

1.) TS78 Microcode

PROBLEM

During the initialization process, it was discovered that an optimized rewind command was causing a problem between the HSC and the TS78. At the start of initialization, the tape attempts to read to determine if any valid data is resident on the tape. On occasion, it would attempt to read some random data, which it could not (of course) complete reading. At this point, the BOT flag had not yet been cleared and the position count is still zero, as nothing had been read, although the drive was down tape some distance. The rewind command optimization looked at the BOT flag, and seeing it set, would ignore the rewind, assuming it unnecessary at this time. Nothing else could happen in the drive, as everything else looks for the actual BOT status in the formatter buffer.

SOLUTION

The TS78 microcode has been re-written to un-optimize the rewind command for this situation. This was first tested at the University of Wisconsin, September 1985 and has been used in many sites since then.

SCHEDULE

It is now available in M8972 modules of rev. D1 and as a FCO (#TA78-1-003/ EQ #1419-01).

2.) HSC Code

PROBLEM

When a tape drive sets the 'Position lost' bit, it then sends a request to the HSC for 'Reposition for Termination'. The HSC would then clear the error bits in the TS78 and pass the failure back to VMS.

> NOTE: This is the key to the failure. When the HSC cleared the error bits in the TS78, it DID NOT clear the position lost bit.

VMS would then issue a Set Unit Characteristics command to the TS78, via the HSC, with a Format byte of zero. The assumption from VMS was that the density that was being used was wrong.

When the HSC issued the SUC command to the TS78, the TS78 would reject the command because the Position lost bit was set.

At this point the HSC would retry the command twice with the same results and then declare the TS78 INOPERATIVE.

SOLUTION

The fix for this problem, in the HSC software, was to clear the Position lost bit during error recovery for the Reposition for termination thus allowing the subsequent SUC command to succeed.

SCHEDULE

HSC V3.00 has been sent 13 May 86 to SDC and release is expected by mid July. The numbers are: QX926-HG for HSC50 and QX927-H7 for HSC70.

3.) VMS BACKUP Utility

PROBLEM

Problem description and background

If, in the course of writing a save set to tape, the BACKUP or Standalone BACKUP Utility encounters bad media, or other excessive hardware-related or media-related errors, the utility will provide an opportunity for operator intervention in the backup operation.

If the output volume is the first volume in the backup operation, only QUIT and CONTINUE are available as recovery options. If, however, the output volume is some subsequent volume in the backup operation, then RESTART is also available. RESTART causes BACKUP or standalone BACKUP to restart the backup operation at the beginning of the current save set volume.

With version VMS 4.4 and earlier, if more than a threshold number of errors were detected on the output tape and the operator wished to select the RESTART option, the operator had to remove the tape from the drive before replying to the BACKUP prompt. On tape drives attached to an HSC this caused the tape drive to disappear from the controller's table of valid devices. In this event, the entire backup operation had to be restarted.

SOLUTION

With the installation of the SPR kit, the utility unloads the current tape from the drive as soon as the RESTART option is taken and then prompts for a replacement volume. It is important that the operator NOT load the new tape until the utility has prompted for it, after the RESTART option is taken.

After the SPR kit is installed, a new standalone BACKUP kit will have to be built using the STABACKIT command procedure, as documented in section 2.8.2 of the System Manager's Reference Manual.

NOTE: that a new method is required to recover from tape errors.

1. Answer 'YES' to BACKUP's restart prompt. This must be done BEFORE unloading the tape.

2. BACKUP will then unload the tape for you and prompt for a new tape to be loaded.

3. Load the new tape and answer yes to the prompt.

SCHEDULE

VMS patches to Backup have been received in SHR and CXO. All testing is complete in these labs and these patches are available to the test sites. When field testing is complete, these patches will be available to the field.

The VMS patches for V4.3 and V4.4 will be available on or about July 15,1986 subject to acceptance testing. They will be locate on the following node; CSSE32::sys$public:TAP043 for V4.3 and CSSE32::SYS$PUBLIC:TAP044 for V4.4.

4.) Drive Off Line

This situation occurs when a drive is taken off line or when an unexpected event occurs (loss of vacuum, bumping switch,etc). The system cannot recover from this situation. There has been a meeting between Tapes Engineering and VMS Engineering and three possible solutions have been proposed. These will be investigated and the best will be chosen and implemented. Meetings are ongoing to discuss further investigations of these alternatives.

SUMMARY

Although each of these is a fully independent item and none requires either of the others to be installed, it is recommended that all three fixes be installed to ensure that the tape subsystem is up to the highest level it can be.

HSC code is planned to be released to the field by mid July and the patches to VMS Backup will be released by VAXWorks after the test sites have reported that sufficient time has been logged and the patches are good. This should also occur around mid July.

APPENDIX A

ADDTIONAL INFORMATION

A.1 US AREA VAXCLUSTER CORE GROUP CONTACT LIST

U.S. MANAGEMENT CORE GROUP
****

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Name	Phone	Node	Mail/stop	Role
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Software Unit:

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Name	Phone	Node	Mail/stop	Role
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****

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Joe Canonica	DTN 323-4266	OBIWAN::CANONICA	KYO	TECH

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Software Technical Backup Unit:

Kelly Green	DTN 521-2211	10378::GREEN	WRO3/T8	TECH

A.2 FCO SHEETS

d i g i t a l	FCO	Level of Urgency: 1 Page 1 of 20

FIELD CHANGE ORDER — Number: C1750-E1-1-004

Applicability: Retrofit C1750s to Revision Level "E1". This FCO incorporates ECO L0101-MK009. Field spares stock should also be upgraded. FCO upgrades L0101 Part Rev to "J1" and C1780 MICROCODE to V7.0. FCO implementation is no longer restricted.

Problem/Symptom: 1. Numerous Functional Errors ("arbitration Timeout", "internal queue retry error"). 2. Need a variable sanity timer. 3. Fix "BUFFER LENGTH VIOL.", potential DATAGRAM FREE_Q corruption and theoretical BUFFER ambiguity by checking "valid" bit when using cached BUFF_DESC. 4. "Sanity Timer/ARB_TO" V6.0 CI_ucode Cluster hang problem.

Quick Check: Following locations should contain following parts:

Location	Part #	Location	Part #	Location	Part #
E114	23-296F3	E95	23-297F3	E76	23-298F3
E174	23-299F3	E154	23-300F3	E134	23-301F3

Compatibility/Prerequisite FCO: C1750-R-00C1

Est. Time to Install: 1 hour per node

Special Tools or Test Equipment: See Page -3-

FCO Parts Information

Order by FCO Kit#:	Quantity:	Part Number:	Description:
EQ-01421-01 EQ-01421-02 EQ-01421-03 FA-04706-01		See Page -2-	

EQ Kit Variation System/Option Applic: N/A

Approvals

CSSE Engineer Bob Brassard	F.S. Product Safety	F.S. Logistics Ed Duggan
CSSE Manager Jan Sicard	F.S. Microfiche Libraries VAX	Affected Population:
ESD&P Micropub. Fred Therriault		Initial Kitting:
Revision:		Hardcopy Publication:
FCO Release Date		Parts Availability:

FCO KIT CONTENTS:

	Quantity	Part Number	Description
EQ-01421-01	(1 EA)	23-296F3-00	Microcode ROM
	(1 EA)	23-297F3-00	Microcode ROM
	(1 EA)	23-298F3-00	Microcode ROM
	(1 EA)	23-299F3-00	Microcode ROM
	(1 EA)	23-300F3-00	Microcode ROM
	(1 EA)	23-301F3-00	Microcode ROM
	(1 EA)	36-19208-01	Wire Marker "1"
	(1 EA)	36-19210-10	Wire Marker "J"
	(1 EA)	FA-04706-01	FCO Document
EQ-01421-02	(1 EA)	BB-FG70B-DE	Magtape

NOTE: Magtape with 1 save-set "CIDO20.A" containing C1780.BIN @ V7.0, C1780/C1750 functional (EVGAA/B) and Repair-level (EVCGA/B/C/D; ECCGA..E; EVCKA..F/CIBCI) diagnostics, 4 Supervisors (E*SAA), and EVXCI CI_Exerciser files.

***** Directory of CIDO20.A save-set is included ***** in APPENDIX-I of this FCO. *****

EQ-01421-03	(1 EA)	BB-F104A-ME	Magtape

NOTE: Magtape with only C1780.BIN file @ V7.0 for Self-Maint. customers without Diagnostic License.

FA-04706-01	(1 EA)		FCO Document

digital	FCO	Level of Urgency: 1
		Page 1 of 20

FIELD CHANGE ORDER Number: C1780-F1-1-005

Applicability: Retrofit C1780s to Revision Level "F1". This FCO incorporates ECO L0101-MK009. Field spares stock should also be upgraded. FCO upgrades L0101 Part Rev to "J1" and C1780 MICROCODE to V7.0. FCO implementation is no longer restricted.

Problem/Symptom: 1. Numerous Functional Errors ("arbitration Timeout", "internal queue retry error"). 2. Need a variable sanity timer. 3. Fix "BUFFER LENGTH VIOL.", potential DATAGRAM FREE_Q corruption and theoretical BUFFER ambiguity by checking "valid" bit when using cached BUFF_DESC. 4. "Sanity Timer/ARB_TO" V6.0 CI_ucode Cluster hang problem.

Quick Check: Following locations should contain following parts:

Location	Part #	Location	Part #	Location	Part #
E114	23-296F3	E95	23-297F3	E76	23-298F3
E174	23-299F3	E154	23-300F3	E134	23-301F3

Compatibility/Prerequisite FCO: C1780-R-00D1

Est. Time to Install: 1 hour per node

Special Tools or Test Equipment: See Page -3-

FCO Parts Information

Order by FCO Kit#:	Quantity:	Part Number:	Description:
EQ-01422-01	See Page -2-		
EQ-01422-02			
EQ-01422-03			
FA-04707-01			

EQ Kit Variation System/Option Applic: N/A

Approvals

CSSE Engineer Bob Brassard	F.S. Product Safety	F.S. Logistics Ed Duggan
CSSE Manager Jan Sicard	F.S. Microfiche Libraries VAX	Affected Population:
ESD&P Micropub. Fred Therriault		Initial Kitting:
Revision:		Hardcopy Publication:
FCO Release Date		Parts Availability:

FCO KIT CONTENTS:

	Quantity	Part Number	Description
EQ-01422-01	(1 EA)	23-296F3-00	Microcode ROM
	(1 EA)	23-297F3-00	Microcode ROM
	(1 EA)	23-298F3-00	Microcode ROM
	(1 EA)	23-299F3-00	Microcode ROM
	(1 EA)	23-300F3-00	Microcode ROM
	(1 EA)	23-301F3-00	Microcode ROM
	(1 EA)	36-19208-01	Wire Marker "1"
	(1 EA)	36-19210-10	Wire Marker "J"
	(1 EA)	FA-04707-01	FCO Document
EQ-01422-02	(1 EA)	BB-FG70B-DE	Magtape

NOTE: Magtape with 1 save-set "CIDO20.A" containing C1780.BIN @ V7.0, C1780/C1750 functional (EVGAA/B) and Repair-level (EVCGA/B/C/D; ECCGA..E; EVCKA..F/CIBCI) diagnostics, 4 Supervisors (E*SAA), and EVXCI CI_Exerciser files.

***** Directory of CIDO20.A save-set is included ***** in APPENDIX-1 of this FCO. *****

EQ-01422-03	(1 EA)	BB-F104A-ME	Magtape

NOTE: Magtape with only C1780.BIN file @ V7.0 for Self-Maint. customers without Diagnostic License.

FA-04707-01	(1 EA)		FCO Document

A.3 VAXCLUSTER REVISION CONTROL DOCUMENT

TABLE OF CONTENTS

1.0 INTRODUCTION

This document provides information concerning the compatible revision levels for all the components of a VAXcluster configuration. Revision information for hardware, software, firmware and diagnostics will be noted.

This is the sixth official release of the document. It will be updated as required and released via microfiche through the VAX Library updates and the Speed Bulletin. It is also available over the ENET in the following world access directory on VOLKS:

VOLKS::CLUSTER$REV:CLUSTER.REV

The Revision Management Document for clusters is noted first, followed by individual option revision charts for the VAX CPUs, HSC50/70, UDA50, and disk and/or tape drives that are supported in a VAXcluster configuration.

There is some compatibility information noted; however, more detailed information on the CPUs and options is available in separate documentation. These documents, as well as how to obtain them, are noted in Section 21.0, Revision Documentation.

Read the NOTES Section (22.0) for important information relative to this update.

2.0 VAXCLUSTER REVISION MANAGEMENT DOCUMENT

This section contains a copy of the RM document that is maintained by the VAXcluster Engineering Office.

This document has been signed off by the appropriate groups.

Any discrepancies between the official document and this one will be noted with an (*) asterisk.

OPTION NAME VAXcluster (TM)
CONTROL PROCEDURE AND CONTACT ECOs to VAXcluster components will be reviewed and a determination of whether the VAXcluster revision level should be changed will be made in accordance with general ECO procedures. Contact VAXcluster Program Office for change requests by contacting the Responsible individual as indicated below. INITIAL RELEASE OF REV F1 - 30-MAY-1986 INITIAL RELEASE OF REV E4 - 24-FEB-1986 INITIAL RELEASE OF REV E3 - 04-OCT-1985 INITIAL RELEASE OF REV E2 - 04-APR-1985 INITIAL RELEASE OF THIS DOCUMENT - 04-JAN-1985

REV	F	DRAWN: PAT McGRATH	DATE: 5/30/86	d i g i t a l
DATE	5/30/86	CHECKED: PAT McGRATH	DATE: 5/30/86	TITLE: VAXcluster REVISION MANAGEMENT DOCUMENT
	H I S T O R Y	RESP.ENG: KEN BAKER	DATE: 5/30/86	SHEET 1 OF 22
		MFG. ENG.: DICK GOLEMBESKI	DATE: 5/30/86	Document Number
		FIELD SERVICE: LARRY GOELZ	DATE: 5/30/86	SIZE: K; CODE: RM; NUMBER: CLUSTER-V-0; REV: F

OPTION NAME VAXcluster (TM)		
BRIEF DESCRIPTION OF VAXcluster REVISION LEVELS	REV	ECO #
A1 = 11780, 11782, CI780, VMS V3.1	N/A	N/A
B1 = Add HSC50, RA81, RA60, UDA50, VMS V3.4	N/A	N/A
C1 = Add 11785, CI750, VMS V3.6	N/A	N/A
D1 = Add VMS V4.0, update revision levels of most components	A	N/A
E1 = Add DSA tape (TA78) and VMS V4.1	B	TW001,1A
E2 = Add VAX8600 and updates to revisions of other components	C	MR002,2A
E3 = Add TA81 (new product); VMS 4.2; updates CI750 to REV D1 AND CI780 TO REV E1; HSC50 REV D1	D	MR003
E4 = Add VAX8650 VMS V4.3 HSC70	E	MR004
F1 = Add VAX8200; VAX8300; VAX8500; VAX8800; CIBCI; updates CI750 to Rev E1 and CI780 to Rev F1; VMS V4.4.	F	MR005

TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 2 OF 22 Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

OPTION NAME	
VAXcluster (TM)	

GENERAL INFORMATION:

- It is recommended that customers upgrade their VAXcluster systems to the latest revision as soon as practical and over as short a period of time as possible. The reason for this is we have attempted to maintain VAXcluster Systems functionality integrity during upgrades, but it cannot be guaranteed in all cases.

TITLE	SHEET 3 OF 22
VAXcluster REVISION MANAGEMENT DOCUMENT	Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-O	REV F

OPTION NAME VAXcluster (TM)	
Release REV F1 May 30,1986	Rev F1 included the following: --- The F1 VAXcluster Revision permits the addition of VAX8200, VAX8300, VAX8500,VAX8800, and CIBCI. If the VAXcluster contains any of these processors, take note of the following requirements: o All CI750s, CI780s, CIBCIs and Console Media in the VAXcluster must be upgraded to the minimum specified revision levels. o All VAX hosts must use VMS Version 4.4 minimum. o No restriction as to number or mix of the above BI processors in a VAXcluster.

TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 4 OF 22 Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
11/750	VAX-11/750 Computer System	58,78,	58,78	58,78	58,78
BE-T204?-ME	TU58 #41 VAX 11750 CONSOLE	H	I	J	L
11/780	VAX-11/780 and VAX-11/782 Computer Systems	7	7	7	7
AS-T213?-ME	RXL VAX 11780 STANDARD CONSOLE	G	H	H	J
AS-T215?-DE	RX41 VAX 11780 EUROPE RD CONSOLE	G	I	J	K
AS-T216?-DE	RX4 VAX 11780 REMOTE CONSOLE	H	I	J	K
11/785	VAX-11/785 Computer System	00,01	02	02	02
AS-T793?-ME	RX1A VAX 11785 CONSOLE	D	F	F	H

NOTES:	REVISION HISTORY	ECO NO	TWO02	TWO02A	MR03	MR04	MR05
		DATE	4/12/85	10/04/85	2/24/86	5/30/86	

d	i	g	i	t	a	l	TITLE		
							VAXcluster REVISION MANAGEMENT DOCUMENT		SHEET 5 OF 22

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
VAX8600	VAX8600 Computer System	F1	H	H	H,J
BC-T987?-ME	VAX8600 CONSOLE- NO DIAG PACK	B	E	F	F
BC-T989?-DE	VAX8600 CONSOLE-W/DIAG PACK	B	E	F	F
BB-T990?-DE	VAX8600 MAGTAPE	N/A	N/A	N/A	F
BB-FF58?-DE	VAX8600/VAX8650 UPDATE TAPE 8600-6.0 PACKS TO 6.2 8650-1.2 PACKS TO 1.4	N/A	N/A	N/A	B

NOTES:

REVISION HISTORY	ECO NO	TWO02A	MR003	MR004	MR005
	DATE	4/12/85	10/04/85	2/24/86	5/30/86

d	i	g	i	t	a	l	TITLE	
							VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 6 OF 22

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
VAX8650	VAX8650 Computer System	N/A	N/A	B	B,C
BC-FG45?-ME	VAX8650 CONSOLE-NO DIAG. 1.2 PACK	N/A	N/A	N/A	B
BC-FG47?-DE	VAX8650 CONSOLE-W/DIAG.	N/A	N/A	N/A	B
BB-FG48?-DE	VAX8650 MAGTAPE FOR 1.2 PACK	N/A	N/A	N/A	B
BB-FF58?-DE	VAX8600/VAX8650 UPDATE TAPE 8600-6.0 PACKS TO 6.2 8650-1.2 PACKS TO 1.4	N/A	N/A	N/A	B

NOTES:	REVISION HISTORY	ECO NO	TWO02A	MR003	MR004	MR005
	DATE	4/12/85	10/04/85	2/24/86	5/30/86	

digital	TITLE	
	VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 7 OF 22

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
VAX8200	VAX8200 Computer System	N/A	N/A	N/A	A
VAX8300	VAX8300 Computer System	N/A	N/A	N/A	A
BL-FG81?-ME	VAX8200/8300 CONSOLE	N/A	N/A	N/A	B
BB-FG87?-DE	VAX8200/8300 COMPLETE DIAG (1600 BPI MT)	N/A	N/A	N/A	B
VAX8500	VAX8500 Computer System	N/A	N/A	N/A	A
VAX8800	VAX8800 Computer System	N/A	N/A	N/A	B1
BT-ZMAAD-C3	VAX8500/8800 CONSOLE MEDIA	N/A	N/A	N/A	V22C
ZM920-C3	VAX8500/8800 DIAGNOSTIC SET	N/A	N/A	N/A	V22C

NOTES:	REVISION HISTORY	ECO NO	TWO02A	MR003	MR004	MR005
		DATE	4/12/85	10/04/85	2/24/86	5/30/86

d i g i t a l	TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 8 OF 22

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
C1750	VAX-11/750 Adapter to Computer Interconnect (CI)	C1	D1	D1	E1
C1780	SBI Adapter to Computer Interconnect (CI)	D1	E1	E1	F1
CIBCI	BI Adapter to Computer Interconnect (CI)	N/A	N/A	N/A	B

NOTES:	REVISION HISTORY	ECO NO	TWW002A	MR003	MR004	MR005
		DATE	4/12/85	10/04/85	2/24/86	5/30/86

digital	TITLE	
	VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 9 OF 22

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
HSC50	Computer-Interconnect-based Disk and Tape Controller	C1,C2	D1	D1	D1
HSC70	Computer-Interconnect-based Disk and Tape Controller	N/A	N/A	A1	A1

NOTES:

REVISION HISTORY	ECO NO	TWO02A	MR003	MR004	MR005
	DATE	4/12/85	10/04/85	2/24/86	5/30/86

digital	TITLE	
	VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 10 OF 22

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
RA60	205-Mbyte DSA Disk Drive (removable)	A5	A5,A7	A5,A7	A6,A7
RA80	121-Mbyte DSA Disk Drive (Winchester)	B0	B0	% SEE NOTES	% SEE NOTES
RA81	456-Mbyte DSA Disk Drive (Winchester)	E3,FH,J1	E3,F,H,J1	% SEE NOTES	% SEE NOTES

NOTES: % = NO REV LEVEL RESTRICTIONS	REVISION HISTORY	ECO	TW02	TW02A	MR03	MR04	MR05
		DATE	4/12/85		10/04/85	2/24/86	5/30/86

d	i	g	i	t	a	l	TITLE	SHEET 11 OF 22
							VAXcluster REVISION MANAGEMENT DOCUMENT	

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
TA78 TAPE SUBSYSTEM		B1	B1	B1	B1
TA81 TAPE SUBSYSTEM		N/A	A1	A1	A1

NOTES:	REVISION HISTORY	ECO NO	TWO02A	MR003	MR004	MR005
		DATE	4/12/85	10/04/85	2/24/86	5/30/86

d i g i t a l	TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 12 OF 22

OPTION NAME VAXcluster (TM)	REV	E2	E3	E4	F1
PART NO.	DESCRIPTION				
VAX/VMS	VAX Virtual Memory Operating System	4.1A	4.2	4.3	4.4

NOTES:

REVISION HISTORY				
ECO NO	TWO0 02	TWO0 02A	MR00 03	MR00 04	MR00 05
DATE	4/12/85	10/04/85	2/24/86	5/30/86

digital	TITLE	
	VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 13 OF 22

OPTION NAME VAXcluster (TM)	
Release REV E4 February 24, 1986	REV E4 INCLUDED THE FOLLOWING: ---------- Release of VMS version 4.3 Release of VAX8650 Release of HSC70
	NOTE: Please install all ECO'S to insure that the VAXcluster is at the highest possible rev at all times to reduce the possibility of incompatibility of SOFTWARE, uCODE, and HARDWARE which may cause failures. It is essential that Customers upgrade their VAXcluster to the latest revision as soon as possible.We recognize that some Customers may have to run mixed revisions while they work to one revision across all VAXcluster Nodes. During the period in which they run mixed revisions, new functionality provided by the latest release is not supported. If either a VAX8650 or a HSC70 is added to a VAXcluster Rev E4 is required throughout the cluster. The minimum acceptable VAX8650 rev is specified; later rev's, where available, should be used. CI7XX New revision of the L0101 - Rev "HH1. This revision contains REV 6 Roms and must be used with CI780.BIN REV 6. These should ONLY be installed at customer sites that are having any of the following problems: 1. Buffer Length Violations 2. Arbitration Timeout Errors 3. Internal Queue Retry Errors 4. DATAGRAM FREE_Q corruption L0101 REV "HH1" will NOT ship from manufacturing in CI7XX options and will ONLY be available to field service via EQ kit to upgrade customers having problems

TITLE	SHEET 14 OF 22
VAXcluster REVISION MANAGEMENT DOCUMENT	Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-O	REV F

OPTION NAME VAXcluster (TM)	
Release REV E3 October 04, 1985	REV E3 INCLUDED THE FOLLOWING: ---------- HSC50 has been UPGRADED to D1 The addition of the TA81 (requires HSC50 rev D1 and VMS 4.2) VMS version 4.2 The tape restriction has been eased. Now 8 tapes instead of 6 are allowed per HSC50 in any combination. The block transfer size restriction on transfers to tapes has been eliminated. CONSOLE MEDIA have been upgraded to include new microcode for CI750 and CI780. There is no change to the hardware ROM'S. The VAX 11/785 and the VAX8600 have had many changes made to their console uCODE. Refer to the appropriate revision matrix for complete details of the problems and fixes. NOTE: Please install all ECO'S to insure that the VAXcluster is at the highest possible rev at all times to reduce the possibility of incompatibility of SOFTWARE, uCODE, and HARDWARE which may cause failures. It is essential that Customers upgrade their VAXcluster to the latest revision as soon as possible.We recognize that some Customers may have to run mixed revisions while they work to one revision across all VAXcluster Nodes. During the period in which they run mixed revisions, new functionality provided by the latest release is not supported.

TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 15 OF 22 Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

OPTION NAME VAXcluster (TM)	
Release REV E2 APRIL 12, 1985	REV E2 INCLUDED THE FOLLOWING: --- The E2 Cluster Revision permits the addition of VAX8600 to the VAXcluster. If the VAXcluster contains VAX8600, take note of the following requirements; o All C1750's, C1780's and Console Media in the cluster must be upgraded to the minimum specified revision levels. o All VAX8600 hosts must use VMS Version 4.1A (minimum) Other hosts may use VMS Version 4.1 (minimum) or 4.1A. VMS Version 4.1A is preferred in all VAX hosts. o UDA50's installed in VAX8600 or VAX 11/750 systems must be at microcode level 5 (minimum). UDA's installed in 11/780, 11/782, 11/785 systems must be at microcode level 3 (minimum).

TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 16 OF 22 Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-O	REV F

OPTION NAME VAXcluster (TM)	
RELEASE REV E1 MARCH 26, 1985	REV E1 RELEASE INCLUDED THE FOLLOWING: --- The E1 revision of the VAXcluster adds DSA tape functionality to the VAXcluster. Initial support for the TA78 tape is provided by VMS 4.1. Newer revisions of the CI750 and CI780 microcode are also available in this same time frame. These newer versions are not required by cluster revision E1 but the customer is encouraged to upgrade to these newer versions as they become available. The change to the newer revisions is accomplished by using the latest revision of the CPU console medium. The versions which provide this update are the following: CPU MODEL — CONSOLE — RESULTING CI REVISION VAX 11/750 — BE-T204H-ME — CI750 REV. C1 VAX 11/780 — AS-T213G-ME — CI780 REV. D1 AS-T216H-ME — CI780 REV. D1 AS-T215H-ME — CI780 REV. D1 VAX 11/785 — AS-T793D-ME — CI780 REV. D1

TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 17 OF 22 Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

OPTION NAME VAXcluster (TM)	
RELEASE REV D1 DECEMBER 20, 1984	REV D1 RELEASE INCLUDED THE FOLLOWING: --- The D1 release adds VMS Version 4.0 to the VAXcluster. Use of the VMS Version 4.0 requires the HSC50, CI750, and CI780 to be raised to the minimum revision levels indicated in the Revision Matrix. Uniform application of the latest revision throughout the VAXcluster is preferred.

TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 18 OF 22 Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

OPTION NAME	
VAXcluster (TM)	
RELEASE REV C1 DECEMBER 20, 1984	REV C1 RELEASE INCLUDED THE FOLLOWING: ---------- C1750 and 11/750 Microcode are contained partially on hardware ROM's and partially on the Console Cassette. It is important to use corresponding revision levels for the C1750, 11/750, and Console cassette as shown in the Cluster Revision Matrix. A local disk is required for 11/750 for revisions of the Console Cassette earlier than BE-T204F-ME. If SYE version 3.6 is used on a C1750 it will call the C1750 a "C1780". The version of SYE which recognizes the C1750 is SYE version 4.1 which was distributed with VMS V3.5. Minimum UDA50 controller microcode versions are: Level 3 - for 11780, 11782, 11785 Level 5 - for 11750 Refer to the "VAX/VMS Guide to System Management" for details. The required minimum revision levels for the 11750 processor are as follows: 11750 revision 5 - with no UDA50 present 11750 revision 7 - with UDA50 present Under no conditions can revision 6.0 be used. The required minimum revision levels for the 11750 PCS are as follows: 11750 revision 5 - PCS revision 97 11750 revision 7 - PCS revision 98

TITLE	SHEET 19 OF 22
VAXcluster REVISION MANAGEMENT DOCUMENT	Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

OPTION NAME VAXcluster (TM)	
RELEASE REV B1 DECEMBER 20, 1984	REV B1 RELEASE INCLUDED THE FOLLOWING: --- The RA60 is supported with HSC50 Rev B2 or greater. RA60 revision level A5 (minimum) is required for RA60s in dual-port configurations only, otherwise Rev A4 (minimum) is permitted. Dynamic dual porting of Massbus disks requires the installation of existing ECOs. Contact Colorado CSSE for more details.

TITLE VAXcluster REVISION MANAGEMENT DOCUMENT	SHEET 20 OF 22 Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

OPTION NAME	
VAXcluster (TM)	
RELEASE REV A1 DECEMBER 20, 1984	REV A1 RELEASE INCLUDED THE FOLLOWING: --- 11/780 and C1780 Microcode is contained partially on hardware ROM's and partially on Console Media. It is important to assure that corresponding revisions are used. In all cases, the latest set is preferred. Minimum acceptable revisions are shown in the VAXcluster Revision Matrix.

TITLE	SHEET 21 OF 22
VAXcluster REVISION MANAGEMENT DOCUMENT	Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-0	REV F

INDEX
ALPHA/NUMERIC

TITLE	SHEET 22 OF 22
VAXcluster REVISION MANAGEMENT DOCUMENT	Document Number

d	i	g	i	t	a	l	SIZE K	CODE RM	NUMBER CLUSTER-V-O	REV F

3.0 VAX-11/750 & VAX-11/751 SYSTEM REVISION CHART

(Refer to Option Revision sections for module revision information.)

11750 SYSTEM REV SID	40/48	50/58	60/68	70/78
KERNEL	40/48	50/58	60/68	70/78
RH750	01	01	01	01
FP750	01,02	01,02	01,02	02
KU750	00	01	01	01
DR750	01	01	01	01
DW750	00,01,02	01,02	01,02	02
KC750	00,01	01	01	01
CI750	N/A	B1-E1	B1-E1	B1-E1
DIAGNOSTIC RELEASE				
* (Minumum)		18	18	18
VMS RELEASE:	3.X,4.X	3.X,4.X	3.X,4.X	3.X,4.X
** CPU MICROCODE	094	096,097	098	098,099

Notes:

- o VMS Version 4 backwards compatible to hardware Rev 40/48 in non-CI750 systems.

  VMS V 4.0 requires minimum hardware Rev 50/58 (i.e. L0008) and minimum ucode Rev 98 FOR CI750 SYSTEMS with no UDA50's.

  11/750 systems with UDA50s and CIs must be at Rev 7 prior to VMS V4.0 upgrades and UDA50 must be at Rev 5.

- o UDA50A Rev 5 refers to ucode Version 5.

- o Minimum rev for CI750 is B1. It is recommended that all CI750s be upgraded to the current rev.

* Minimum release of diagnostics to support CI750 option revision.

** 11750 CPU with a CI750 must have 4MB of physical memory.

CPU Microcode version "099" (CMT099) corrects problems with the following instructions: BBSSI/BBCCI (causes CI750 Read-Lock-Timout MEMORY SYSTEM ERROR), CALLS, EDITPC, DIVP, INTERRUPT/EXCEPTION HANGS WITH INVALID "SCBB".

CHART 1

11/750 REV			40	50	60	70	70
KA750							A
MODULE	SLOT	ETCH					
L0002	2	C	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D
		D	CS=D MR=D	CS=D,E MR=D,E	CS=D,E MR=D,E	CS=D,E MR=D,E	CS=D,E MR=D,E-E2
L0003	3	C	CS=C1,C2 MR=E,F	CS=C2 MR=F	PR=H1	PR=J1,K1	PR=J1,K1
		D	CS=E,F MR=E,F	CS=F MR=F	PR=H2	PR=J2,K2, K3	PR=J2,K2 K3
L0003-YA	3	A					PR=A1
L0004	4	D	CS=H MR=H,J	CS=J1 MR=K	PR=L1	PR=M1,N1	PR=P1
		E	CS=J MR=J	CS=K MR=K	PR=L2	PR=M2,N2	PR=P2
L0005	5	D	CS=E MR=H	N/A N/A	N/A N/A	N/A N/A	N/A
L0008-YA	5	B		PR=A1- B2	PR=A1-B2	PR=A1-B2	PR=A1-B2
L0008-YB	5	B		PR=D2	PR=D2	PR=D2	PR=D2
M9313	28 A-B	B	CS=A MR=A,B	CS=A MR=A,B	CS=A	CS=A	CS=A
TU58-XA			F-K	F-K	F-K	F-K	F-K
TU58-XB (54-13489)		E F	F1-F4 H-L1	F1-F4 H-L1	F1-F4 H-L1	F1-F4 H-L1	F1-F4 H-L1
CONTROL PANEL (54-13795)		C	CS=C MR=C,D	CS=C MR=C,D	CS=C MR=C,D	CS=C MR=C,D	CS=C MR=C,D
BACKPLN (70-16486)			WL=B	WL=B	WL=B	WL=B	WL=B

Key: E = Etch Rev; CS = Circuit Schematic Rev; MR = Module Rev;
--- PR= Part Rev; WL = Wirelist Rev

CHART 2

11/750 REV			48	58	68	78	78
KA750							A
MODULE	SLOT	ETCH					
L0002	2	C	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D	CS=C,C1 MR=C,D
		D	CS=D MR=D	CS=D,E MR=D,E	CS=D,E MR=D,E	CS=D,E MR=D,E	CS=D,E MR=D,E-E2
L0003	3	C	CS=C1,C2 MR=E,F	CS=C2 MR=F	PR=H1	PR=J1,K1	PR=J1,K1
		D	CS=E,F MR=E,F	CS=F MR=F	PR=H2	PR=J2,K2, K3	PR=J2,K2 K3
L0003-YA	3	A					PR=A1
L0004	4	D	CS=H MR=H,J	CS=J1 MR=K	PR=L1	PR=M1,N1	PR=P1
		E	CS=J MR=J	CS=K MR=K	PR=L2	PR=M2,N2	PR=P2
L0005	5	D	CS=E MR=H	N/A N/A	N/A N/A	N/A N/A	N/A
L0008-YA	5	B		PR=A1- B2	PR=A1-B2	PR=A1-B2	PR=A1-B2
L0008-YB	5	B		PR=D2	PR=D2	PR=D2	PR=D2
M9313	28 A-B	B	CS=A MR=A,B	CS=A MR=A,B	CS=A	CS=A	CS=A
TU58-XA			F-K	F-K	F-K	F-K	F-K
TU58-XB (54-13489)		E	F1-F4	F1-F4	F1-F4	F1-F4	F1-F4
		F	H-L1	H-L1	H-L1	H-L1	H-L1
CONTROL PANEL (54-13795)		C	CS=C MR=C,D	CS=C MR=C,D	CS=C MR=C,D	CS=C MR=C,D	CS=C MR=C,D
BACKPNL (70-16486)			WL=C	WL=C	WL=C	WL=C	WL=C

Key: E = Etch Rev; CS = Circuit Schematic Rev; MR = Module Rev;
--- PR= Part Rev; WL = Wirelist Rev

KC750 OPTION REVISION DESCRIPTION

KC750 Revision			00	01	02	03	04
Module	SLOT	ETCH					
L0006		A	MR=*2	MR=*3			
		B	MR=B	MR=B1			
		C	MR=C	MR=D			

RH750 OPTION REVISION DESCRIPTION

RH750 Revision			00	01	02	03	04
MODULE	SLOT	ETCH					
L0007	7,8 or 9	C	CS=A	CS=A1			
			MR=A	MR=B			
		D		CS=B,C			
				MR=B,C			

FP750 OPTION REVISION DESCRIPTION

FP750 Revision			00	01	02	03	04
MODULE	SLOT	ETCH					
L0001	1	D	CS=B	CS=C	PR=E2		
			MR=B	MR=C,D			
		E		CS=D	PR=E1		
				MR=D			

KU750 OPTION REVISION DESCRIPTION

KU750 Revision			00	01	02	03	04
	SLOT	ETCH					
5413865-C	attaches to L0005	C	CS=B MR=C	N/A			
L0008-YB	5	A		PR=C2			
G&H Microcode			M198A (2.0)	T909A			

DW750 OPTION REVISION DESCRIPTION

DW750 Revision			00	01	02	03	04
MODULE	SLOT	ETCH					
L0010	10	C	CS=B MR=B	PR=C1	PR=E1, F1		

DR750 OPTION REVISION DESCRIPTION

DR750 Revision			00	01	02	03	04
	SLOT	ETCH					
L0014		A	CS=A MR=A	PR=B1			
DR750 Microcode			T326A	T326A			

KA750 OPTION REVISION DESCRIPTION

KA750 Revision		A	
	SLOT	ETCH	
L0002	2	C	CS=C,C1
		D	CS=D,E
L0003	3	C	PR=J1,K1
		D	PR=J2,K2,K3
OR			
L0003-YA	3	A	PR=A1
L0004	4	D	PR=P1
		E	PR=P2
L0008-YA	5	B	PR=A1-B2
OR			
L0008-YB	5	B	PR=D2
70-16486 BKPLN			WL=C

C1750 OPTION LEVEL REVISION CHART

C1750	00	B1	C1	D1,(**DD1)	E1
L0100	D1(B2*)	D1(B2*)	D1,(B2*)	D1,(B2*)	D1,(B2*)
L0101	F1	H1	H1	H1,**HH1	J1
L0009	A1,A2	A1,A2	A1,A2	A1,A2	A1,A2
L0400	B1	B1	B1,C1	B1,C1	B1,C1
Microcode					
C1780.BIN	Rev 2.0	Rev 3.0	Rev 4.0	Rev 5	Rev 7
BE-T204*-M	E-F	G	H	I	J
				**Rev 6.0	
Back plane	B1,C1	B1,C1	B1,C1	B1,C1	B1,C1
POWER SUPPLY	A	A	A	A	

* (NOTE) "B2" is being marked on "B" etch and is equal to "D1".

** (NOTE) Rev 6.0 uCODE and the "HH1" module are only used if you need to install FCO C1750-DD1-I-004 making the C1750 Rev DD1.

4.0 11780 SYSTEM REVISION CHART

11780-	01	02	2A	03	3A	04	05
KA780-	00,01	01,02	02,2A	03	03	04	04
MS780A-	01	01	01,1A	01,1A	01,1A	01,1A	01,1A
MS780C-	01	01	01,1A	01,1A	01,1A	01,1A	01,1A
-or-							
MS780E-						00	00
-or-							
MS780H-						00	00
DW780-	01	01	01,1A	01,1A	01,1A	01,1A	01,1A
RH780-	01	01	01,1A	01,1A	02,03	02,03	02,03
FP780-	01	01	01,1A	01,1A	01,1A	01,1A	02
C1780-						01,C1	01,C1
DR780						01	01

11780-	06	6A	07
KA780-	05	5A	06
MS780A-	01,1A,1B	01,1A,1B	01,1A,1B
MS780C-	01,1A,1B	01,1A,1B	01,1A,1B
-or-			
MS780E-	00	00	00
-or-			
MS780H-	00	00	00
DW780-	01,1A,1B,C1	01,1A,1B,C1	01,1A,1B,C1 (D1)
RH780-	04,AA1,(AB1) B1, (C1)	04,AA1,(AB1) B1,(C1)	04,AA1,(AB1) B1,(C1)
FP780-	02	02	02
MA780-	00	00	01
KE780A-			01
KU780A-			01
C1780-	01,C1	01,C1	F1
DR780	01	01	01

KA780 OPTION LEVEL REVISION CHART

KA780-	00	01	02	2A	03
M8218	C, (D)	C,D	C,D	C,D	C,D
M8219	B, (C)	B,C	B,C	B,C	B,C
M8220	A, (B)	A,B	A,B	A,B, (C)	A,B,C
M8221	A, (B)	A,B	A,B	A,B	A,B
M8222	A, (B)	A,B	A,B	A,B	A,B
M8223	(A)	A	A	A	A
M8224	(B)	(C)	C	(D)	D
M8225	A, (B)	A,B	A,B	A,B	A,B
M8226	B, (C)	B,C	B,C	B,C	B,C
M8227	A,B, (C)	A,B,C	A,B,C	A,B,C	A,B,C
M8228	A,B, (C)	A,B,C	A,B,C	A,B,C	A,B,C
M8229	A, (B)	A,B	A,B	A,B	A,B
M8230	B, (C)	B,C	B,C	B,C	B,C
M8231	A,B, (C)	A,B,C	A,B,C	A,B,C	A,B,C
M8232	(A)	A	A	A, (B)	A,B
M8233	A, (B)	A,B	A,B	A,B	A,B
M8234	(A)	A	A	A	A
M8235	E1, (F)	(H)	H	H, (J)	(H1), (K)
M8236	(C)	C	C	C, (D)	C,D
M8237	*, (A)	*,A	*,A	*,A	*,A
M9043	*, (A)	*,A	*,A	*,A	*,A
7013628 WIRELIST	(D)	D	D	D	D

KA780 OPTION LEVEL REVISION CHART (cont.)

KA780	04	05	5A	06
M8218	C,D,E	C,D,E	C,D,E	C,D,E
M8219	B,C,D	B,C,D	B,C,D	B,C,D
M8220	A,B,C	A,B,C	A,B,C	A,B,C
M8221	A,B	A,B	A,B	A,B
M8222	A,B,C	A,B,C,D	A,B,C,D	A,B,C,D
M8223	A,B	A,B,C	A,B,C	A,B,C
M8224	D	D	D	E,F
M8225	A,B	A,B	A,B	A,B
M8226	B,C	B,C	B,C	B,C
M8227	A,B,C	(B1,D)	B1,D	B1,D
M8228	A,B,C,	(B1,D)	B1,D	B1,D
M8229	A,B	A,B	A,B	A,B
M8230	B,C	B,C	B,C	B,C
M8231	A,B,C	A,B,C	A,B,C	B,C,
M8232	A,B	A,B	A,B	A,B
M8233	A,B,C	A,B,C	A,B,C	A,B,C
M8234	A,B	A,B	A,B	A,B
M8235	(J1),(L)	J1,L	J1,L	H3,M
M8236	C,D	C,D	C,D	C,D
M8237	*,A	*,A	*,A	*,A
M8238				A
M9043	*,A	*,A	*,A	*,A
7013628				
WIRELIST	D	D	E-K1	E-K1

MS780A OPTION LEVEL REVISION CHART

MS780A-	01	1A	1B
M8211	(C)	C, (D)	C,D,E
M8212	(A)	A,B,C	A,B,C,D
M8213	(D)	D, (E)	D,E
M8214	(C)	C	C, (D)
7013625 WIRELIST	*, (A)	*,A	*,A

MS780C OPTION LEVEL REVISION CHART

MS780C-	01	1A	1B
M8210	(*) , (A)	*,A, (B)	*,A,B, (C)
M8212	(A)	A, (B) , (C)	A,B,C, (D)
M8213	(D)	D, (E)	D,E
M8214	(C)	C	C, (D)
7013625	-	-	E1
WIRELIST	*, (A)	*,A	**

**NOTE: Since we are now implementing part revision on the backplane, we will no longer track the wirelist revision.

MS780E OPTION LEVEL REVISION CHART

MS780E-	00
M8373	B
M8375	C
M8376	D1,E
Backplane 70-19729-00	A

MS780H OPTION LEVEL REVISION CHART

MS780H-	00
M8374	A,A1,A2
M8375	C
M8376	D1,E
Backplane 70-19729-00	A

DW780 OPTION LEVEL REVISION CHART

DW780-	01	1A	1B	C1	D1
M8270	(C)	C, (D)	C,D	C,D	C,D
M8271	B, (C)	C, (D)	C,D, (E)	F1,F2	F1,F2
M8272	A,B (C)	A,B,C, (D)	C,D	C,D	C,D
M8273	(B)	B, (C)	B,C	B,C	(D1)
M9042	(A)	A	A	A	A
M9044	A, (B)	B, (C)	B,C	B,C	B,C

RH780 OPTION LEVEL REVISION CHART

RH780-	01	1A	02	03
M8275	C, (D)	D, (E)	D,E	D,E
M8276	B, (C)	B,C	B,C	(D)
M8277	C,D, (E)	E	E	(F)
M8278	C, (D)	C,D	C,D	C,D
M9041	*, (A)	*,A	*,A	*,A
7013627 WIRELIST	D	D	(E)	E

RH780 -	04	AA1	AB1
M8275	D,D1,E, (F), (H)	D-H	(J1,J2)
M8276	(E), (E1)	E-E1	E,E1
M8277	(H)	H	H
M8278	C,D, (E), (F)	C-F	C-F
M9041	*,A	*,A	
7013627	(H)	E	E

RH780 -	B1	(C1)
M8274	A1	A1
M8275	D-H	(J1,J2)
M8276	E-E1	E,E1
M8278	C-F	C-F
M9041	*,A	*,A
7013627	H	H

FP780 OPTION LEVEL REVISION CHART

FP780-	01	1A	02
M8285	*, (A)	*, A	*, A
M8286	B, (C)	B, C, (D)	B, C, D
M8287	(B)	B, (C)	B, C
M8288	(*)	*	*
M8289	(C)	C, (D)	(C1, E)

MA780 OPTION LEVEL REVISION CHART

MA780-	00	01
M8210	A, B, C	A, B, C
M8212-YA	D	D
M8258	A	B
M8259	A, B, C	D
M8260	A, B	A, B
M8261	B	B
M9045	A	A
WIRELIST:		
MA780A:		
70-16518	A	A
MA780C:		
70-16512	A	A

KE780A OPTION LEVEL REVISION CHART

KE780A-	00
FPLA	23-065C6

KU780A OPTION LEVEL REVISION CHART

KU780A-	00
M8238	(A)

DR780 OPTION LEVEL REVISION CHART

DR780-	00	01
M8296	*	*
M8297	*	*
M8298	(A), (B)	A,B
M8299	(B), (C)	D1
MICROCODE	T392A	T392B
M9046	*	*
WIRELIST:		
70-16896	A	A

NOTE: ECO M8297-TW002 for DR780 was never signed and has been canceled. The DR780 option remains at Rev "01".

C1780 OPTION LEVEL REVISION CHART

C1780	C1	D1	E1, (**EE1)	F1
L0100	D1, (B2*)	D1, (B2*)	D1, (B2*)	D1, (B2*)
L0101	H1	H1	H1, **HH1	J1
L0102	C1	C1, D1	C1, D1	C1, D1
L0104	C, C1, D1	C, C1, D1	C, C1, D1	C, C1, D1
Microcode				
C1780.BIN	Rev 3.0	Rev 4.0	Rev 5.0	Rev 7.0
AS-T213*-DE	F	G	H	J
			**Rev 6.0	
BACKPLANE				
70-17654	A	A	A	A

* (Note) "B2" is being marked on "B" etch and is equal to "D1".

** (Note) Rev 6.0 uCODE and the "HH1" module are used only if C1780-EE1-1-005 FCO needs to be installed making the C1780 Rev "EE1".

5.0 11/782 SYSTEM REVISION CHART

11782	01
11780 SYSTEM	07
MA780	01

(See 11/780 options for revision information)

6.0 VAX-11/785 & VAX-11/780-5 SYSTEMS REVISION CHART

The following is a 'quick' check list for the 11785 unit rev. It DOES NOT replace the RM document but is to be used for reference only.

ALL REVS SHOWN ARE MINIMUM COMPATIBLE REVISIONS FOR EACH PART.

11785	00	01	02
KA785	*00	B	C
KC785	00	A	A
MS780-C	1B	1B	1B
MS780-E	00	00	00
MS780-H	00	00	00
DW780	01	01	01
FP785	00	D	D
RH780	04,AA1	04,AA1	04,AA1
DR780	01	01	01
C1780	01	01	F1
MA780	01	01	01

* Option Revision 00 is equivalent to A

FP785 OPTION REVISION CHART

FP785	00	B1	C1	D1
M7540	B1	B1	C1	C1,D1,D2
M7541	B1,C1	B1,C1	D1	E1
M7542	B1	B1	C1	C1
M7543	A1	A1	A1	A1
M7544	B1	C1	D1,D2,DD1	D1,D2,DD1

KA785 OPTION LEVEL REVISION CHART

KA785	00	B	C
M7459	B	B	B
M7460	B	C	C
M7461	B	B	B
M7462	B	B	B
M7463	B	B	B
M7464	B	B	B
M7465	C	C	C
M7466	B	B	B
M7467	A	A	A
M7468	B	B	B
M7469	C	C	C
M7470	C	C	C
M7471	A	A	A
M7472	B	B	B
M7473	B	B	B
M7474	B	B	B
M7475	B	B	B
M7476	B	B	B
M7477	D	D	D
70-20579-01	C	C	C
Machine uCODE			
SSU***.WCS	01A	01A/01B	01C
AS-T793*-ME	B	B/D	F

7.0 VAX 821 SYSTEM REVISION MATRIX

Option name: VAX 8200 SYSTEM		A	
Part No.	Description		
VMS	OPERATING SYSTEM	V4.4	
ULTRIX-32*	OPERATING SYSTEM	V1.2	
OPTIONS	VAX OPTIONS	REF	
EVNDX	DIAGNOSTICS (see Note 1)	24.0	
821XX	SYSTEM KERNAL	A	

NOTE: 1. The number in the Revision column for EVNDX is the minimum Diagnostic Release number that is compatible with the System Revision.

Option name: 821 SYSTEM KERNEL		A	
Part No.	Description		
T1001	VAX KA820 CPU Module	AB1	
T1008	2MB Memory Module	A1	
H7250	Power AC input Module	A1	
H7251	Power Regulator - +5B, +24, etc	A1	
H7253	Power Regulator - +5v etc.	C1	
54-16133-01	Power Distribution Board	B1	
H9400-AA	BI cage assembly	C1	
54-16572-01	Polaris Control Module (PCM)	A1	
54-16574-01	Scorpio Control Panel (SCP)	A1	
877-D	120v Power controller	A1	
877-B	240v Power controller	E1	

* Not Supported in VAXcluster Systems.

8.0 VAX 831 SYSTEM REVISION MATRIX

Option name: VAX 8300 SYSTEM		
		A
Part No.	Description	
VMS	OPERATING SYSTEM	V4.4
ULTRIX-32	OPERATING SYSTEM	V1.2
OPTIONS	VAX OPTIONS	REF
EVNDX	DIAGNOSTICS (see Note 1)	24.0
831XX	SYSTEM KERNAL	A

NOTE: 1. The number in the Revision column for EVNDX is the minimum Diagnostic Release number that is compatible with the System Revision.

Option name: 831 SYSTEM KERNEL		
		A
Part No.	Description	
The 831 is identical to the 821 except for an additional VAX KA820 CPU MODULE		A
VMS	OPERATING SYSTEM	V4.4

9.0 VAX 8600/VAX 8650 SYSTEM/OPTIONS REVISION CHARTS

The following is a 'quick' check list for the KA86 unit rev. It DOES NOT replace the RM document but is to be used for reference only.

KA86 UNIT REV = H3 = 07HEX (SID REGISTER)

UNIT	REV			
8600	H3	H4	J1	K1
MODULES				
L0200-BA (MEM)	C1	C1	C1	C1
L0201-00 (CSL)	E1,E2	E1,E2,E3,F1	E1,E2,E3,F1	E1,E2,E3,F1
L0202-00 (SBS)	B1-B3	B1,B2,B3	B1,B2,B3	B1,B2,B3
L0203-00 (SBA)	B1,B2,C1	B1,B2,C1-C3	B1,B2,C1-C3	B1,B2,C1-C3
L0204-00 (MCD)	D5,D6	D5,D6,F1	D5,D6,F1	D5,D6,F1
L0205-00 (MAP)	D3-D6	D3-D6,E1	D3-D6,E1	D3-D6,E1
L0206-00 (IDP)	F3-F5	F3,F4,F5,H1	F3,F4,F5,H1	F3,F4,F5,H1
L0207-00 (ICA)	H3-H5	H3,H4,H5	J1	J1
L0208-00 (IBD)	F5,F6	F5,F6,F7,F8	F5,F6,F7,F8	F5,F6,F7,F8
L0209-00 (EDP)	C2,C4	C2,C3,C4,C5	C2,C3,C4,C5	C2,C3,C4,C5
L0210-00 (EBC)	C3-C7	C3-C7	C3-C7	C3-C7
L0211-00 (EBD)	D3,D5	D3,D4,D5	D3,D4,D5,E1	D3,D4,D5,E1
L0212-00 (FBA)	B3,E7,F1	B3,E7,F1,H1&2	B3,E7,F1,H1&2	B3,E7,F1,H1&2
L0213-00 (FBM)	C5,C7	C5,C7,C8	C5,C7,C8	C5,C7,C8
L0214-00 (ICB)	F4-F8	F4-F8	H1	H1
L0215-00 (CSA)	B2-B4	B2-B4	B2-B4	B2-B4
L0216-00 (CSB)	B2-B5	B2-B5	B2-B5	B2-B5
L0217-00 (CLK)	C5,C6,E1	C5,C6,E1,E2	C5,C6,E1,E2	C5,C6,E1,E2
L0218-00 (FJM)	A2	A2	A2	A2
L0219-00 (EBE)	B2-B4	B2-B4	B2-B4	B2-B4
L0220-00 (MCC)	K1-K4	K1-K4	K1-K4	L1,L2
L0222-00 (MTM)	B1,B2	B1,B2	B1,B2	B1,B2
L0223-00 (FTM)	A2	A2	A2	A2
L0224-00 (STM)	B4,B5	B4,B5,B6	B4,B5,B6	B4,B5,B6
L0100-CI780 (ILI)	D1	D1	D1	D1
L0101-CI780 (IPB)	H1	H1	H1	J1,K1
L0102-CI780 (IDP)	C1,D1	C1,D1	C1,D1	C1,D1
L0104-CI780 (ISI)	C,C1,D1	C,C1,D1	C,C1,D1	C,C1,D1
M8270-DW780 (USI)	C,D	C,D	C,D	C,D
M8271-DW780 (UCB)	F1,F2	F1,F2	F1,F2	F1,F2
M8272-DW780 (UMD)	D	D	D	D
M8273-DW780 (UAI)	C	C	C	D1
M9302-DW780 (UNIB TERM)	A	A	A	A
M9040-SBI TERM	A2	B1	B1	B1
M9044-DW780 (UBT)	B,C	B,C	B,C	B,C
M7485-YA UDA50	H1	H1	H1	H1
M7486-UDA50	H2	H2	H2	H2
M8739-TU81	B5	B5	B5	B5

UNIT	REV	REV	REV	REV
8600	H3	H4	J1	K1
BACKPLANES				
70-19193-01(MEM)	A1,A2	A1,A2	A1,A2	A1,A2
70-19194-00(I/O)	C1,C2	C1,C2	C1,C2	C1,C2
70-19195-01(ABUS)	A1,A2	A1,A2	A1,A2	A1,A2
70-19196-01(CPU	A1	A1	A1	A1
70-19197-01(I/O)	A1	A1	A1	A1
70-19198-01(CPU)	A1,A2	A1,A2	A1,A2	A1,A2
DIAGNOSTIC MEDIA*				
BB-T990?-DE CSL TAPE	E	F	F	F
BC-T987?-ME RL02 BOOT	E	F	F	F
BC-T988?-YE UPD TAP	-	A	A	A
BC-T989?-DE RL02 DIAG	E	F	F	F
BB-FF15?-DE MACRO TAP	D	D	D	D
BB-FF58?-ME CSL PATCH	-	B	B	B

SOFTWARE*

VMS OPERATING SYSTEM V4.1, 4.1A, 4.2, 4.3

*NOTE: READ FILE RL2REV.MEM FOR THE REVISIONS OF ALL FILES THAT ARE ON THE RL02.

NOTE: THIS IS NOT A TOTAL RM CHART OF THE 8650, SEE THE OFFICIAL RM DOCUMENT FOR COMPLETE DETAILS.

UNIT	REV		
8650	B1	B2	C1
MODULES			
L0201-00 (CSL)	F1	F1	F1
L0204-00 (MCD)	F1	F1	F1
L0205-00 (MAP)	E1	E1	E1
L0206-00 (IDP)	H1	H1	H1
L0207-00 (ICA)	H3-H5	H3-H5	J1
L0208-00 (IBD)	F5-F8	F5-F8	F5-F8
L0209-00 (EDP)	C2-C5	C2-C5	C2-C5
L0210-00 (EBC)	C3-C7	C3-C7	C3-C7
L0211-00 (EBD)	E1	E1	E1
L0214-00 (ICB)	F4-F8	F4-F8	H1
L0215-00 (CSA)	B2-B4	B2-B4	B2-B4
L0216-00 (CSB)	B2-B5	B2-B5	B2-B5
L0218-00 (FJM)	A2	A2	A2
L0219-00 (EBE)	B2-B4	B2-B4	B2-B4
L0230-00 (MCC)	A1,A2	A1,A2	A1,A2
L0231-00 (CLK)	B1	B1	B1
L0222-00 (MTM)	B1,B2	B1,B2	B1,B2
L0223-00 (FTM)	A2	A2	A2
L0202-00 (SBS)	B1-B3	B1-B3	B1-B3
L0203-00 (SBA)	B1,B2,C1	B1,B2,C1-C3	B1,B2,C1-C3
L0224-00 (STM)	B4-B6	B4-B6	B4-B6
L0212-00 (FBA)	H1	H1,H2	H1,H2
L0213-00 (FBM)	C5,C6	C5,C7,C8	C5,C7,C8
L0100-C1780(ILI)	D1	D1	D1
L0101-C1780(IPB)	H1	H1	H1
L0102-C1780(IDP)	C1,D1	C1,D1	C1,D1
L0104-C1780(ISI)	C,C1,D1	C,C1,D1	C,C1,D1
M8270-DW780(USI)	C,D	C,D	C,D
M8271-DW780(UCB)	F1,F2	F1,F2	F1,F2
M8272-DW780(UMD)	D	D	D
M8273-DW780(UAI)	C	C	C
M9302-DW780(UNIB TERM)	A	A	A
M9040-SBI TERM	A2	B1	B1
M9044-DW780(UBT)	B,C	B,C	B,C

UNIT	REV		
8650	B1	B2	C1
DIAGNOSTIC MEDIA			
BB-FF15*-DE	D	D	D
BC-FG45*-ME	B, REV 1.2	B, REV 1.2	B,REV 1.2
BC-FG47*-DE	B, REV 1.2	B, REV 1.2	B,REV 1.2
BB-FG48*-DE	B, REV 1.2	B, REV 1.2	B,REV 1.2
SOFTWARE			
VMS OPERATING SYSTEM	X4.3, V4.3	X4.3,V4.3	X4.3,V4.3

NOTE: X4.3 IS A FIELD TEST VERSION

10.0 VAX 882BA UNIT REVISION CHART

Option name: VAX 8800 SYSTEM		SYSTEM REVISION		
		A1	B1	
Part No.	Description	REVISIONS		
VMS	Operating System	V4.4	V4.4	
ZM920-C3	VAX 8800 Complete Diagnostic Set	22A	22C	
EVNDX	VAX Diagnostic Index (Reference)	23	23	
882BA-XE/XF	CPU System Kernel	A1	B1	
MS88	Memory Array	A1	A1	
	VAXBI Native Adapters - Reference Only			
CIBCI-M	VAXBI Native CI750 Adapter	See note		
DWBUA-CA	VAXBI Native UNIBUS Adapter	See note		
KDB50-B	VAXBI Native SI Adapter	See note		
KLESI-BB	VAXBI Native LESI Adapter	See note		
DMB32-M	VAXBI Native Comm. Adapter	See note		
DEBNT-M	VAXBI Native NI Adapter	See note		
DRB32-M	VAXBI Native DRB Bus Converter	See note		

Notes: These adapters are included as a reference to which VAXBI adapters may be configured into a system. This does not imply any configuration rules or restrictions.

Refer to option RM documents for current option and unit revisions.

VAX 882BA UNIT REVISION CHART (Con't)

Option name: 882BA Cpu System Kernel		RELEASE REVISION A1	B1	
Part No.	Description	REVISIONS		
PC38N-AA	VAX 8800 Console Subsystem	A1	A1	
87XBA	Basic Hardware Group	A1	B1	
H9652	Front End Cab	A1	A1	
H7059-A	Power Complex	A1	A1	

Option name: PC38N-AA Console Subsystem		RELEASE REVISION A1	A1	
Part No.	Description	REVISIONS		
PC380-AA	KDJ11-CA, RX50-A, RCX50, H7862-C	A1	A1	
RCD52-A	RCD52,RCD52-A 31MB DISK	A1	A1	
MSC11-B	512KB RAM Daughter Board	A1	A1	
54-15539-01	IEEE Interface, 2 Async Serial Ports	B5	B5	
BT-ZMAAD-C3	VAX 8800 Customer Console Kit (NOTE 1)	22A	22C	
BL-FH41*-ME	RX100 VAX 8800 Console (NOTE 2)	A	B	
	CONSOLE2.TSK Main Microcode	1	2	
BL-FH43*-ME	RX102 VAX 8800 VMS Boot File (NOTE 2)	A	B	
	C1780.BIN	6	7	

1. Verify VMS revision for compatibility

2. This item reference only. * = Rev

VAX 8820A UNIT REVISION CHART (Con't)

Option name: 87XBA-XC/XD Basic Hardware Group		RELEASE REVISION		
		A1	B1	
Part No.	Description	REVISIONS		
KA88-AA	CPU Module Set	A1	B1	
KA88-AB	Attached CPU Module Set	A1	B1	
DB88-AA	VAXBI Channel #0	A1	A1	
F1013-00	NMI Load Board	A1	A1	
70-22109-03/04	CPU Assembly	A1	A1	
70-21696-02	CPU Backplane Assembly	A1	A1	
70-21701-01	Memory Backplane Assembly	A1	A1	
17-00555-01	Cable Assembly, CPU to Memory	C1	C1	
17-01172-01	Cable Assembly, Console to CLK	B1	B1	

Option name: KA88-AA CPU Module Set		RELEASE REVISION		
		A1	B1	
Part No.	Description	REVISIONS		
F1001-00	Memory Controller (MCL)	A1	A1	
F1002-00	Shifter Module (SHR)	A1	A1	
F1003-00	ALU Slice 1 (SLC1)	A1	A1	
F1004-00	ALU Slice 0 (SLC0)	A1	A1	
F1005-00	Address Data Path (ADP)	A1	B1	
F1006-00	Cache Control/sequencer (CCS)	A1	A1	
F1007-00	Instruction Decode (DEC)	A1	A1	
F1008-00	Sequencer (SEQ)	A1	A1	
F1009-00	Writeable Control Store (WCS)	A1	A1	
F1010-00	Clock/console Interface (CLK)	A1	A1	

VAX 8820A UNIT REVISION CHART (Con't)

Option name: KA88-AB Attached CPU Module Set		RELEASE REVISION		
		A1	B1	
Part No.	Description	REVISIONS		
F1002-00	Shifter Module (SHR)	A1	A1	
F1003-00	ALU Slice 1 (SLC1)	A1	A1	
F1004-00	ALU Slice 0 (SLC0)	A1	A1	
F1005-00	Address Data Path (ADP)	A1	B1	
F1006-00	Cache Control/sequencer (CCS)	A1	A1	
F1007-00	Instruction Decode (DEC)	A1	A1	
F1008-00	Sequencer (SEQ)	A1	A1	
F1009-00	Writeable Control Store (WCS)	A1	A1	
H7180-A	Floating 5 OR 5.2V 200A Switching Reg	C1	C1	
H7187-A	+/- 2.5 100A Switching Reg	D1	D1	

11.0 CIBCI REVISION CHART

Option name: CIBCI Adapter		A	B
Part No.	Description		
T1017	ADAPTER CONTROL MODULE	B1	C1,D1
T1018	ADAPTER DATA MODULE	B1	C1
L0100	LINK INTERFACE MODULE	D1	D1
L0101	PACKET BUFFER MODULE	H1	J1,K1
L0400	DATA PATH MODULE	B1,C1	C1
H7202-D	POWER SUPPLY	D	D
54-15555	BACKPLANE ASSEMBLY	C1	C1

12.0 HSC50 OPTION LEVEL REVISION CHART

HSC50-AA 60hz, no disks Does not include Disk Data Channels			D1	E1	
HSC50-AB 50hz, no disks Does not include Disk Data Channels			D1	E1	
MODULE	SLOT	ETCH	MR/PR	MR/PR	
SYS TAPE ONLY BET492*-**			V250 *= H-ME	V300 QX926- HG	See note #1 See Warning
UTILTY TAPE BET788*-**			V250 H-ME	V300	See note #1
DIAG TAPE ONLY (BET493*-**)			V200 *= D-DE	V300 E-DE	See Note #2
HSC50 RELEASE NOTES (AAX703*TK)			V250 *= D	QX926- GZ	See Note #3
TAPE KIT ALL CURRENT TAPES AND RELEASE NOTES (QO-ZD300-CG)			V250	V300 N/A	
LO100	14	C B	D1 D1	D1 D1	
LO105	1	D E	D1,D2 E1	E1,E3 E2,E4	
LO106-AA -AC -AH	2	C	C1	C1	
LO107-YA	12	C	C1-C3	C1-C3	

HSC50 OPTION LEVEL REVISION CHART (Con't)

MODULE	SLOT	ETCH	MR/PR	MR/PR
L0108-YA (HSC5X-BA)	4,6,7, 8,9,10	C	C6,C7 C8	C6,C7 C8
		D	C5-C10	C5-C10
		E	C1-C3	C1-C3
		F		C23
L0108-YB (HSC5X-CA)	4,6,7, 8,9,10	C	N/A	N/A
		D	C10	C10
		E	C3,C4	C3-C4
		F		C24
L0109	13	E	E1,E2	E1,E2

HSC50 OPTION LEVEL REVISION CHART (Cont.)

HSC50-AA 60hz, no disks Does not include Disk Data Channels			D1	E1
HSC50-AB 50hz, no disks Does not include Disk Data Channels			D1	E1
MODULE	SLOT	ETCH	MR/PR	MR/PR
TU58-XA			OPTION REVF,K	OPTION REVF,K
TU58-XB (54-13489)		E F	F3,F4 K,L,M	F3,F4 K,L,M
BEZEL ASSY. (70-20186) TU58 UNITS	BACK SIDE FRON DOO		A1	A1
OPERATOR CONTROL PANEL (54-15286			C	C
BACKPN (54-1448)		E	A1,A2	A1,A2
MAN PS (7020033) 60hz= -01 50hz= -02			A1,B1, C1,C2	A1,B1, C1,C2
60HZ= -03 50HZ= -04				C1 C1
OPT PS (70-20184) 60hz= -01 50hz= -02			A1,B1, B2	A1,B1, B2
PWR CTRLR (70-19122) 60hz= -00 (70-20613) 50hz			A1,A2 A3,B1 A1,A2 B1,C1	A1,A2 A3,B1 A1,A2 B1,C1

Key: MR= Module Revision
PR= Part Revision
Note: The 50hz version of the HSC50 is available starting with revision B1.

Note #1: UTILITY TAPE INCLUDED IN SYSTEM TAPE KIT. KIT AVAILABLE THROUGH SDC.

Note #2: DIAGNOSTICS NO LONGER SHIP TO CUSTOMER WITH HARDWARE. DIAGNOSTICS AVAILABLE THROUGH VAXDIAGNOSTIC RELEASE #24.

Note #3 DOCUMENTATION KIT ONLY (RELEASE NOTES AND USERS GUIDE).

IMPORTANT --THE PREVIOUS CHARTS FOR THE HSC50 DO NOT AGREE WITH THE RM DOCUMENT. THE RM DOCUMENT IS CURRENTLY IN THE PROCESS OF BEING UPDATED.

	HSC50	
INST MAN.	EK-HSC50-IN-001	
MAINT. GUIDE	AA-P672A-TC	
USER GUIDE	EK-HSC50-UG-002	
SERVICE MAN	EK-HSC50-SV-002	
TECH. SUMMARY	EJ-25786-45	(INTERNAL USE ONLY)

HSC50 (Rev D1)

FCO HSC50-R-008 AVAILABLE APPROX. 10/85

EQ-01368-01 BE-T492H-ME - HSC50 System Tape (V250)
BE-T788H-ME - Utility Tape (V250)
AAX703D-TK Release Notes

QUICK CHECK: HSC50 firmware is at Rev. V250

HSC50 (Rev E1)

AVAILABLE APPROX. 7/86

QX926-HG - HSC50 System and Utility tapes
Release notes and USERS Manual.

NOTE: This is NOT an FCO. It is a software kit orderable through SDC.

QUICK CHECK: HSC50 firmware is at Rev. 3.00

***** WARNING IT IS MANDATORY TO INSTALL FCO HSC50-R-0005 BEFORE ***** UPGRADING TO V3.00. FAILURE TO DO SO WILL RESULT IN FAILURE TO FIND FILE (EXEC.INI) AT BOOT-UP.

****

FCO HSC50-R-0005 INFORMATION

EQ-01304-01 (FCO PARTS AND DOCUMENTATION)
FA-04581-01 (FCO DOCUMENTATION ONLY)

QTY	PART NUMBER	DESCRIPTION
1	L0105	P.IOC MODULE (REV E1)

QUICK CHECK: L0105 MODULE REVISION WILL BE:

E1 FOR ETCH REVISION D
AND
E2 FOR ETCH REVISION E

13.0 HSC70 OPTION LEVEL REVISION CHART

HSC70-AA 60hz, no disks Does not include Disk Data Channels			A1	B1	
HSC70-AB 50hz, no disks Does not include Disk Data Channels			A1	B1	
MODULE	SLOT	ETCH	MR/PR	MR/PR	
DIAG. FLOPPY BL-FH74*-**			V100 *= A-DE	V300 *= A-DE	See note #2
RELEASE NOTES				QX927- GZ	See note #3
SOFTWARE KIT				QX927- H7	See note #1
L0100	14	C	D1	D1	
		B	D1	D1	
L0111	1	C	A1	A1	
		D	A2	A2	
L0117-AA	2	A	A2	A2	
L0107-YA	12	C	C2,C3	C2,C3	
L0108-YA (HSC5X-BA)	3,4,5, 6,7,8, 9,10	C	C8	C8	
		D	C8-C10	C8-C10	
		E	C1-C3	C1-C3	
		F		C23	
L0108-YB (HSC5X-CA)	3,4,5, 6,7,8, 9,10	D	C10	C10	
		E	C3,C4	C3-C4	
		F	C24	C24	
L0109	13	E	E1,E2	E1,E2	

HSC70 OPTION LEVEL REVISION CHART (Con't.)

HSC70-AA 60hz, no disks Does not include Disk Data Channels	A1	B1
HSC70-AB 50hz, no disks Does not include Disk Data Channels	A1	B1

MODULE	SLOT	ETCH	MR/PR	MR/PR
OPERATOR CONTROL PANEL 54-15286-01				C
BACKPN 5417764-01		C	A1	C1,D1
MAIN PS (7020033) 60hz= -03 50hz= -04			C1	C1
OPT PS (70-20184) 60hz= -03 50hz= -04			B2	B2
PWR CTRLR 30-24374 60hz= -01 50hz= -02			B1 B1	B1 B1
RX33 Drv 30-24962-01			A1	A1

Key: MR= Module Revision
PR= Part Revision

Note #1: SYSTEM, UTILITY TAPE, RELEASE NOTES AND USERS MANUAL INCLUDED IN SOFTWARE KIT.
KIT AVAILABLE THROUGH SDC.

Note #2: DIAGNOSTICS NO LONGER SHIP TO CUSTOMER WITH HARDWARE.
DIAGNOSTICS AVAILABLE THROUGH VAXDIAGNOSTIC RELEASE #24.

Note #3 DOCUMENTATION KIT ONLY (RELEASE NOTES, USERS GUIDE).

IMPORTANT --THE PREVIOUS CHARTS FOR THE HSC70 DO NOT AGREE WITH THE RM DOCUMENT.
THE RM DOCUMENT IS CURRENTLY IN THE PROCESS OF BEING UPDATED.

HSC70 DOCUMENTATION

HSC70 Installation Manual	EK-HSC70-IN-001
HSC User Guide	AA-GMEAA-TK
HSC70 Service Manual	EK-HSC70-SV-001
HSC70 PRINT SET	MP-01426

14.0 UDA50 OPTION REVISION CHART

UDA50A Microcode Date Code	Ver 3 (Y09)	Ver 4 (U21)	Ver 5
M7485-YA	D	E,F	H1
M7486		D	H2

* UDA Rev 5 refers to microcode version 5.

* Quick check for M7485-YA Rev H1: Chip E1 is 23-157F4-00

15.0 RA60 REVISION CHART

NOTE: All you need is Rev. K1 of the drive logic module, which is Rev. 3 of the microcode or above, everything else is backward or forward compatable. K1 fixed a microcode bug, but was not a functional change.

RA60 MODULE	A1	A2	A3	A4	A5	A6	A7
POSTAMP/DATA SEPERATOR 54-15264-01	D1	E1	F1 note 5	F1	F1	F1	F1
DRIVE LOGIC MODULE 54-15266-01 (see note 6)	E1	F1	H1	J1 note 5	K1/H1	K1/H1	L1,M1
RD/WT PREAMP MODULE 54-15268-01	B	C	D1	D1	D1	E1	E2
SD/IO MODULE 54-15270-01	F1	F2	H1	J1	J2,L1, M1 note 5	N1	N1
FRONT PANEL MODULE 54-15272-01	B1	C1	D1	E1	E2	E2	E2,H
CAP/RECTIFIER MODULE 54-15274-01	A1	A1	A1	A1	A1	A1	A1,B
MOTHER BOARD 54-15278-01	D	D	E1	E1	E1	E1	E1
REGULATOR MODULE 54-15276-01	C	C	D	D1	D1	D1	D1/D3
HEATSINK MODULE 54-15280-01	E1	E2	F1	H1	H1	H1	H1
MOTOR CONTROL MODULE 54-15282-01	C	D	D1	D1	D1	D1	C
SPINDLE ASSY 70-17740-01	B1 note 7	B1 note 7	C1	C1	C1	C1	C1
POSITIONER ASSY 70-18452-01	A	A	B	C	C	C	C,D
TRANSFORMER ASSY 70-18477-01	B	C	D1	D1	D1	D1	D1

NOTES FOR THE RA60:

1. THIS CHART REFLECTS PART REVISION LEVELS.

2. ALL MODULE REVISIONS ARE PRESENTLY DOWNWARD COMPATABLE.
   (reference note 6.)

3. HARDWARE REV LEVEL 1 = REV A DRIVE.

4. HARDWARE REV LEVEL IS SWITCH SETTABLE BY F.S. ENGINEER.

5. Postamp/data separator Rev.'F1' has new flip chip handles colored blue.
   Drive Logic Rev.'J1' has new flip chip handles colored gray .
   SD/IO Rev.'K1' has new flip chip handles colored red.

6. An RA60 that is to be run on an HSC cluster,dual ported, on VMS V4.X, must have master microcode version 3.0 OR LATER. This can be checked by looking at the stickers on the master EPROMS of the drive logic. FCO RA60-R0003 documented in Speed Bulletin 358 will upgrade a drive to microcode rev 4 effective 1-Jun-86. Previsious EQ-kits for this FCO would upgrade drive to microcode revision 3.0.

ROM	Version 3	Version 4
E27	23-049B9-00	23-100B9-00
E29	23-050B9-00	23-101B9-00
E32	23-096B9-00	23-102B9-00
E37	23-048B9-00	23-099B9-00

7. Rev.'B1' spindles are not usable in drives that have a spindle lock.

16.0 RA80 DRIVE OPTION REVISION CHART

RA80-A	A6	A7	A8	A9	A10	A11	A12	A13	A14	D1
70-18330-0x (RA80)	F1	F2	F3	H	J	K	L	M	N	P
MSCP HARDWARE REVISION	0	0	0	0	0	0	0	0	0	1
MSCP SOFTWARE REVISION	10	10	10	10	10	10	10	10	10	11
POWER SUPPLY H7660 - A	A2	B1	B1	C						
HDA ASSEMBLY 70-16795-00	C	C	C	C	C	C	C	C		
MICROPROCESSOR MODULE 54-15284-01	B2	B3	C	C	C	C	C	C	C/C1	D1
PERSONALITY MODULE 54-14923-00	D	D	D	D	D	D	D	D	D	D
SERVO MODULE 54-14014-00	M	M	M	M	M	M	M	M	M	M
READ/WRITE MODULE 54-13596-00	E	F	F	F	F	F	F	F/H		

RA80-A	D1	
70-18330-0x (RA80)	P	
MSCP HARDWARE REVISION	1	
MSCP SOFTWARE REVISION	11	
POWER SUPPLY H7660 - A	C	
HDA ASSEMBLY 70-16795-00	C	
MICROPROCESSOR MODULE 54-15284-01	D1	
PERSONALITY MODULE 54-14923-00	D	
SERVO MODULE 54-14014-00	M	
READ/WRITE MODULE 54-13596-00	F/H	

The RA80 must be at MSCP Hardware Revision level 1 to be totally compatible with the HSC50 in a dual-port configuration.

The RA80 is currently at hardware (controller readable) (front panel switch setting) level 1.

The module revision levels are CS revisions.

The top level (RA80-A) changes between A14 and D1 were sheet metal and documentation changes that have no effect to Field Service or the cluster environment.

17.0 RA81 OPTION REVISION CHART

HARDWARE REVISION 0

RA81 70-19062-01	A					
POWER SUPPLY H7660 A/B	A2					
HDA ASSY 70 19044-01	C1					
MICROPROCESSOR 54-15247-00	ETCH B ABCD					
SERVO 54-15251-00	ETCH B ABC					
PERSONALITY 54-15249-00	ETCH B A,B,B1 C					
R/W MODULE ETCH B 54-15253-00	A/B					

HARDWARE REVISION 1

RA81 70-19062-01	B					
POWER SUPPLY H7660 A/B	A2					
HDA ASSY 70 19044-01	C1					
MICROPROCESSOR 54-15247-00	ETCH B CS E/F					
SERVO 54-15251-00	ETCH B C ABC					
PERSONALITY 54-15249-00	ETCH B C B2/D					
R/W MODULE ETCH B 54-15253-00	A/B					

RA81 OPTION REVISION CHART (Cont.)

HARDWARE REVISION 2

RA81 70-19062-01	C	C1				
POWER SUPPLY H7660 A/B	A2	A2				
HDA ASSY 70-19044-01	C1	C1,D1				
MICROPROCESSOR 54-15247-00	ETCH B CS E1	ETCH B CS E2				
SERVO 54-15251-00	ETCH B CS D	ETCH B CS F				
PERSONALITY 54-15249-00	ETCH B CS E	ETCH B CS E				
R/W MODULE ETCH B 54-15253-00	A,B	A,B,C				

HARDWARE REVISION 3

RA81 70-19062-01	D					
POWER SUPPLY H7660 A/B	D2					
HDA ASSY 70-19044-01	C1,D1					
MICROPROCESSOR 54-15247-00	ETCH B E3					
SERVO MODULE 54-15251-00	ETCH B CS E/F					
PERSONALITY 54-15249-00	ETCH B CS F					
R/W MODULE ETCH B 54-15253-00	A,B,C					

RA81 70-19062-01	E1	E2	E3	F	H
POWER SUPPLY H7660-A/B	A2	A2,D1	A2,D1	A2,D1	A2,D1
HDA ASSY 70-19044-01	C	C	C,C1	C1	C1
HDA 70-18491-01					D1
MICROPROCESSOR MODULE 54-15247-00	ETCH B CS H	ETCH B CS J	ETCH B CS K ET C1 C L/L1	ETCH B CS K ET C1 C L1/2	ETCH B CS K ET C1 C L1/2
SERVO MODULE 54-15251-00	ETCH B CS F	ETCH B CS F ET C1 CS J	ETCH B CS H ET C1 CS J1	ETCH B CS H1 ET C1 CS K1	ETCH B CS H1 ET C1 CS K1
PERSONALITY MODULE 54-15249-00	ETCH B CS F	ETCH B CS F	ETCH B CS F ET C1 CS H1	ETCH B CS F ET C1 CS H1	ETCH B CS F ET C1 CS H1
R/W MODULE ETCH B 54-15253-00	D	D	D	D	D

	HARDWARE REVISION 5		HARDWARE REVISION 6			
RA81 70-19062-01	J1		J1			
POWER SUPPLY H7660 A/B	A2,D1 D2		E1 E2			
HDA 70-18491-01	E1		E1			
MICROPROCESSOR 54-15247-00	ETCH B CS K ET C1 C L1/2		ETCH B CS K ET C1/2 C L2,3			
SERVO MODULE 54-15251-00	ETCH B CS H1 ET C1 CS L1		ETCH B CS H1 ET C1 CS L1			
PERSONALITY 54-15249-00	ETCH B CS F ET C1 CS H1		ETCH B CS F ET C1 CS H1			
R/W MODULE ETCH B 54-15253-00	F1		F1			

	CLUSTER SUPPORTED RA81 HARWARE REVISION 7		HARDWARE REVISION 8
RA81 70-19062-01	P1	SEE NOTE	S1
POWER SUPPLY	E2,F1		F
HDA 70-18491-01	H1,J1		J
MICROPROCESSOR 54-15247-00	ETCH B CS K ET C1 CS M		ETCH B CS K ETCH C CS M
SERVO MODULE 54-15251-00	ETCH B CS H ET C1 CS L		ETCH B CS H ETCH C CS L
PERSONALITY 54-15249-00	ETCH B CS F ET C1 CS H		ETCH B CS F ETCH C CS H
R/W MODULE ETCH B 54-15253-00	F1		F1

* NOTE * 70-19062 REVISION P1 INCLUDES THE HDA GROUND STRAP RA81 FCO 14.

18.0 TA78 OPTION REVISION CHART

TA78-BE/BJ	A1	B1	C1
TU78 TAPE DRIVE (SLAVE)	D1	D1	D1
TS 78 FORMATTER	A1	B1	C1
TS 78 POWER SUPPLY	A1	B1	B1

19.0 TA81 OPTION REVISION CHART

TA81-CA/CB	A1	B1
PWA READ AMPLIFIER	A0 225Y	A0 225Y
PWA SERVO CONTROL	B1 236Y	B2 941Y
PWA WRITE DRIVER	A0 216Y	B1 217Y
PWA STI	A0 144Y	A0 144Y
PWA FORMATTER WRITE	A0 981Y	A0 981Y
PWA FORMATTER READ	B1 131Y	B1 131Y
PWA POWER AMPLIFIER	A2 194Y	A2 194Y
POWER SUPPLY 50/60 HZ 50 HZ 60 HZ	A2 963Y 964Y	A2 963Y 964Y
MAGNETIC HEAD	A0 380Y	A0 380Y
REEL MOTOR	A0 162Y	A0 162Y
COMPRESSOR UNIVERSAL	A1 537Y	A1 537Y
120V 24AMP POWER CTRL	A0	A0
220V-240V 12AMP POWER CTRL	A0	A0

20.0 TECHNICAL DOCUMENTATION

CURRENTLY AVAILABLE FROM PUBLISHING & CIRCULATION IN NORTHBORO, MASS. IS A DOCUMENT CALLED A " PRODUCTS DIRECTORY ".

THE PART # IS ED-24847-92.

THIS DOCUMENT HAS THREE PARTS TO IT,

1- FORMS CATALOG	(A LIST OF ALL ORDERABLE FORMS)
2- TECHNICAL DOC. CATALOG	(A LIST OF ALL ORDERABLE DOCUMENTATION FOR DEC PRODUCTS)
3- PROMOTIONAL CATALOG	(SPD'S - BULLETINS - SUMMARIES)

THIS DOCUMENT CONTAINS ALL PART NUMBERS FOR DOCUMENTATION PERTAINING TO DEVICES THAT DIGITAL MAKES. IF YOU NEED TO ORDER DOCUMENTATION FOR YOUR HARDWARE REFER TO THIS DOCUMENT.

BELOW IS A LIST OF DOCUMENTS WHICH PERTAIN TO DEVICES THAT USE THE CI BUS.

DOCUMENTATION TREE FOR THE CI780/HSC50/CI750.

	CI780	
TECH. DESC.	EK-CI780-TD-001	
USER GUIDE	EK-CI780-UG-001	
MAINT. ADV.	EK-CIVAX-RM-001	
	CI750	
TECH. DESC.	EK-CI750-TD-001	
USER GUIDE	EK-CI750-UG-PRE	
MAINT. ADV.	EK-CIVAX-RM-001	
	SC008	
USER GUIDE	EK-SC008-UG-001	
	HSC50	
INST MAN.	EK-HSC50-IN-001	
MAINT. GUIDE	AA-P672A-TC	
USER GUIDE	EK-HSC50-UG-002	
SERVICE MAN	EK-HSC50-SV-002	
TECH. SUMMARY	EJ-25786-45	(INTERNAL USE ONLY)

21.0 REVISION DOCUMENTATION

For additional information on revisions noted above, the following documents should be referenced:

Unit	Document	Updated	Available via	Date
11/725	11/725 Revision Control Document	2/12/86	VAX Library Fiche Speed Bltn. #418	
11/730	11/730 Revision Control Document	11/18/85		
11/750	11750/11751 Revision Control Document	6/28/85	VAX Library Fiche	7/85
	Over the ENET (copy).....		VOLKS::CLUSTER$REV: 750REV.DOC	
11/780 11/782	11780/11782 Revision Control Document	2/86	VAX Library Fiche	2/86
11/785	11/785 Revision Control Document	Available 6/85	VAX Library Fiche VOLKS::CLUSTER$REV: 785REV.DOC	TBD
For all documents over the ENET (copy).....			VOLKS::CLUSTER$REV: 725REV.DOC 730REV.DOC 750REV.DOC 780REV.DOC 785REV.DOC CLUSTER.REV	
KA86-AA	VAX8600 Revision Matrix		VAX Library Fiche	TBD
HSC50	Revision Matrix	12/84	RIGHT STUFF Publication	
UDA50	"	"	"	
RA60	"	"	"	
RA80	"	"	"	
RA81	"	"	"	

22.0 NOTES

CI7X0/CIBCI V7.0 UCODE APPLICABILITY

The V7.0 CI_ucode is being made available for CI7X0 and VAX8800 on a restricted basis as a preliminary FCO, for customers heavily impacted by known errors fixed by and urgently needing V7.0 CI_ucode. The known problems are:

1. VAX8800 CIBCI may exhibit frequent CI "ARBITRATION Timeouts & MISC_ERR_50000" due to the VAX8800's high performance. The CIBCI on VAX8800 will ship with V7.0 CI_ucode PROMs as of APR-1986.

2. Any VAX system with CI "BUFFER LENGTH VIOLATION" packet error, which are crashing with CI DATA_FREE_Q corruption or heavily impacted by this error. Attached CI nodes should also be upgraded.

3. Large VAX8600 or VAX8650 VAXclusters having unacceptable CI "MISC_ERR_50000 or ARB_TIMEOUT" error rates. All attached CI_nodes should also be upgraded to V7.0.

CI780-F1-I-005 FCO KIT CONTENTS:

	Quantity	Description
EQ-01422-01	(6 EA)	Microcode ROMS
EQ-01422-02	(1 EA)	BB-FG70B-DE CI780.BIN plus Diagnostics
EQ-01422-03	(1 EA)	BB-F104A-ME CI780.BIN only
FA-04707-01	(1 EA)	FCO Document (IN EACH KIT)

CI750-E1-I-004 FCO KIT CONTENTS:

	Quantity	Description
EQ-01421-01	(6 EA)	Microcode ROMS
EQ-01421-02	(1 EA)	BB-FG70B-DE CI780.BIN plus Diagnostics
EQ-01421-03	(1 EA)	BB-F104A-ME CI780.BIN only
FA-04706-01	(1 EA)	FCO Document (IN EACH KIT)

REQUIREMENTS: CI750's should have had FCO #CI750-R-00C1 and CI780's should have had FCO CI780-R-00D1 installed.

END